

Biodiversity

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July-September 2001



The newsmagazine of the ASEAN Regional Centre for Biodiversity Conservation

A joint cooperation project between ASEAN and the European Union
and a contribution to the ASEAN Environmental Education Plan, 2000-2005



A Burning Issue

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Plus! Focus
A pull-out section
on fire-resistant species

Letter from the ASEAN Secretariat

Dear Readers,

The Association of Southeast Asian Nations (ASEAN) envisions by the year 2020 a clean and green environment with its rich human and natural resources contributing to development and shared prosperity. To help realize this Vision, the ASEAN Environment Ministers adopted the ASEAN Environmental Education Plan 2000-2005 in October 2000. The Plan aims to translate that Vision into reality through environmental education and public participation, thereby ensuring that the regional cultural traditions are in rhythm and harmony with nature, and citizens environmentally literate, imbued with environmental ethic, and willing and capable to contribute to the sustainable development of the region.

As a collaborative framework for regional and international cooperation, the Plan outlines priority activities that can be successfully implemented at the national and regional levels.

It is in this context that we happily note that the ASEAN Regional Centre for Biodiversity Conservation is publishing *ASEAN Biodiversity*. This newsletter is supportive of our endeavor to boost environmental knowledge and awareness in the region, a topic that falls under one of our areas of cooperation – land and forest fires and transboundary haze.


Haze pollution arising from fires continues to be the most prominent and pressing environmental problem fac-

ing ASEAN today. Each ASEAN member country is striving to be vigilant in undertaking short and medium term measures to prevent or control land and forest fires.

The Hanoi Plan of Action addresses the haze issue through the full implementation of the ASEAN Cooperation Plan on Transboundary Pollution, in particular the Regional Haze Action Plan (RHAP) within the year. It is strengthening the capability of the ASEAN Specialized Meteorological Centre to monitor forest and land fires and provide early warning on transboundary haze.

We have already made substantial progress in the implementation of the three key components of the RHAP: prevention, monitoring and mitigation. In addition, eight Ministerial Meetings on the Environment, 18 meetings of the Haze Technical Task Force, and eight meetings of the Joint Sub-Regional Fire Fighting Arrangements (SRFA) for Borneo and Sumatra were held to review, implement and oversee the RHAP activities.

We welcome "*ASEAN Biodiversity*" as a new vehicle for education and information dissemination in the region. It lets readers know about our plans and activities, which we hope they will continue to support.


RODOLFO C. SEVERINO
 Secretary-General of ASEAN

Call for Papers

We have already identified the theme of the first quarter 2002 issue of *ASEAN Biodiversity*.

The January - March 2002 issue will deal with **Community-based Mapping and GIS applications for Collaborative Natural Resource Management** (deadline for submission: February 28, 2002). For this issue,

we would be pleased to receive contributions on spatial visualizing methods and tools used in learning and negotiation processes related to resource use, management and tenure. Different from conventional participatory literature - which places emphasis on social learning and consensus building - the papers should deal with social learning, conflict negotiation and network building as key ingredients for innovative thinking and actions.

Please submit articles within the given deadlines. Articles should have a maximum of 2,500 words and be submitted in digital (MS Word) and hard format. Drawings and diagrams may be enclosed. Pictures are welcome either as prints or in digital format. The latter should be scanned at high resolution (300 dpi, 200%) and saved in *.tif format.

Please note that the editors reserve the right to edit submitted articles.



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Giacomo Rambaldi
Technical Advisor, Coordinator

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Editor

Sahlee Bugna
Rexie Jane Parreño
Writers

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Creative Artist

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Norma M. Molinyawe
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GUEST EDITORS

**Coordination and Support Unit
for the Regional Haze Action Plan**
(CSU-RHAP) under the Environment Unit
of the ASEAN Secretariat

**ASEAN Regional Centre for Biodiversity
Conservation (ARCBC)**

Headquarters:
P.O. Box 35015 College, Laguna 4031
Philippines
Tels.: +63-49.536-1659 or 536-4042
Telefax: +63-49.5363173 or 536-2865
E-mail: contact.us@arcbc.org.ph
Website: www.arcbc.org.ph

ARCBC Annex
Ninoy Aquino Parks and Wildlife Nature Center
North Avenue, Diliman, Quezon City, 1156
P.O. Box 1614 QC CPO, Philippines
Tels.: +63-2.926-9163 / 925-8406 / 925-8407
Fax : +63-2.925-8408
Email: publications@arcbc.org.ph

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Letters, articles, suggestions and photos are welcome and should be addressed to:

The Editor, ASEAN Biodiversity
ARCBC Annex
Ninoy Aquino Parks and
Wildlife Nature Center,
North Avenue, Diliman,
Quezon City, 1156
P.O. Box 1614 QC CPO,
Philippines
Fax: + 63-2.925-8408
E-mail: publications@arcbc.org.ph

Readers' Corner

Dear Co-Directors

The Asian Development Bank shares the same interest to strengthen and promote biodiversity conservation and management in the Asian and Pacific region.

We congratulate you for having an informative publication and wishing you success in all your future endeavors.

Indira J. Simbolan

Social Development Specialist
Asian Development Bank
Metro Manila, Philippines



Dear Co-Directors

We would like to take this opportunity to thank you for the inclusion of the CREST (Coral Reef Education for Students and Teachers) in the Capsule Reviews of Some Training Resources Database Entries which appeared in your first issue of ASEAN Biodiversity (January-June 2001).

Please let us know how else we can best assist your office on matters related to marine biodiversity. Our email address is: info@imamarinelife.org, [website: www.imamarinelife.org](http://www.imamarinelife.org). At present we have country offices in Asia (Indonesia, Vietnam, Philippines, Hong Kong) and the Pacific (Vanuatu, Fiji, Marshall Islands), an Integrative Biological Research Program based at the University of Guam Marine Laboratory, and our International Headquarters based in Honolulu, Hawaii.

We find the newsmagazine very informative and we hope to be able to find more articles on marine matters in the succeeding issues.

Mary Jean Caleda

International Marinelife Alliance



Dear Co-Directors

It is hard to think of fires at this moment without thinking about the devastating attacks on New York and Washington on September 11th. We offer our condolences to those who have lost loved ones.

But while the international community can so easily acquire billions of dollars to clean up the rubble on Manhattan or fight terrorism, the biological heritage of Asia especially Southeast Asia remains under such severe threats. Indeed earlier this summer US taxpayers were sent a \$40 billion tax refund!

Shall we just continue dreaming of billions of dollars to save our environment? We hope to wake up one day and see the US taking the lead. Meanwhile, the environmental bomb ticks.

Roland Geronimo

Makati City



Dear Co-Directors

We wish to acknowledge receipt of the maiden issue of ASEAN Biodiversity. The newsmagazine will be of great help to our students and faculty of the University of the Philippines (U.P.) Integrated School.

Teresita D. Santos

Head Librarian
U.P. Integrated School, Quezon City

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3rd Quarter in a Nutshell

September 29 – Eighteen new sites in 13 countries have been added to the United Nations World Network of Biosphere Reserves, and two existing biosphere reserves have been extended. The reserves provide a framework for the study and conservation of the environment and for the sustainable use of natural resources. The World Network now consists of 411 sites in 94 countries.

Membership in the World Network of Biosphere Reserves represents a label of excellence that helps secure funding and promotes tourism and the local economy. It also facilitates the exchange of experiences on integrating human needs with environmental conservation.

September 29 – The Department of Environment and Natural Resources (DENR) and the World Wide Fund for Nature (WWF)-Philippines have forged a partnership for the **joint management of the Sulu-Sulawesi Marine Ecoregion (SSME)**, protecting the habitat of the sea turtle and Dugong (sea cow), which are both in the endangered list.

This was announced by Environment Secretary Heherson T. Alvarez after signing a Memorandum of Understanding with WWF for a 5-year plan to develop and implement this long-term conservation program to protect the outstanding biodiversity and natural resources of the country, particularly in the Sulu peninsula.

One of the important features of the US\$ 500,000-program is the establishment of a Tri-National Turtle Reserve between the Philippines, Indonesia and Malaysia to conserve the largest nesting grounds of green and hawksbill turtles in the ASEAN region, effectively expanding the coverage of the existing Turtle Islands Heritage Protected Area.

September 27 – The Philippines' Department of Environment and Natural Resources (DENR) will link hands with the provincial

government of the provinces of Cebu, Iloilo, Negros Occidental and Masbate to pool their resources and expertise in saving the Visayan Sea through the establishment of the PhP100-million (around US\$2 million) **Integrated Visayan Sea Coastal Resources and Fisheries Management Program (VisSea)**.

The Visayan Sea has been identified as one of the biggest and most productive fishing grounds in the country. It is the top source of commercially produced fisheries nationwide with 13.5% and the third largest source of municipal fisheries with 11.5%.

Funding sources for the program include the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ), a government agency of the Republic of Germany, which will be providing technical assistance amounting to P100 million (US\$2 M); the Bureau of Fisheries and Agricultural Resources, which committed PhP2.5 million (US\$50,000); and the Philippine Council for Aquatic and Marine Research and Development (PCAMARD), which has agreed to allocate PhP1 million (US\$20,000). Provincial government offices and Local Government Units will provide staff, office spaces, equipment and additional financial support.

September 21 – A study in the September issue of the journal 'Ecology' states that salmon in the rivers of the Pacific Northwest nourish and sustain the forests through which they travel. Efforts to protect Pacific salmon need to include comprehensive tactics focused not only on the fish, but also on their larger ecosystem.

The health of salmon populations both depends on and influences the vitality of land-based ecosystems. The research calls into question traditional single species approaches to fisheries management, endangered species legislation, and ecological restoration. Salmon benefit from the plants, known as riparian

vegetation that line the banks of their spawning grounds. The riparian plants provide shade that regulate temperature, shelters along the river in which young salmon can find refuge, and also help river sediments stay in place, reducing erosion.

But the salmon give just as much back to the riparian plants. Salmon die shortly after they have spawned, adding vital nutrients to the water and nearby ecosystems. Plants in spawning sites contain a higher level of nitrogen, compared to other areas. Because of the **mutually dependent relationship between salmon and riparian vegetation**, a decline in salmon could cause changes in the forest. Those changes may in turn harm the salmon, and speed up its decline.

September 19 – The Nigerian Conservation Foundation (NCF) stated that **poor management of Nigeria's environment is costing the country around \$5 billion a year in ruined land and lost forests**. Much of the damage results from oil and gas extraction in the Niger Delta region, while illegal logging is speeding deforestation and the southwards advance of the Sahara desert, which threatens to destroy rare plant and animal species in northern parts of the country.

Complaints over environmental management have contributed to years of tension and violence in the oil-rich Niger Delta region of the country, Africa's biggest oil producer.

September 19 – The **Bolivian government designated three wetlands totaling 17,760 square miles as protected sites under the Ramsar Convention**. Endangered species such as the jaguar, the tapir, the giant river otter, and the hyacinth macaw inhabit these wetlands, located in the lowlands of Bolivia. The three wetlands — Bañados del Izogog-Rio Parapeti, El Palmar de las Islas-Salinas de San José, and Bolivian Pantanal — are also home to hundreds of

species of plants and animals that are threatened in other parts of the country and in the rest of the world. The wetlands are linked to the Amazon basin, forming a biological and genetic corridor. They serve as freshwater reserves for the surrounding human communities.

The Bolivian Pantanal is the best-preserved portion of the larger Pantanal system. It regulates floods and droughts in a vast area of Eastern Bolivia. It has rich biodiversity, sustaining at least 197 species of fish, more than 70 species of amphibians and reptiles, at least 300 species of birds, and over 50 species of large mammals. It is bounded by dry forests that are considered among the most endangered and least protected biomass in the world.

The Bolivian government's decision has been recognized as a Gift to the Earth by the World Wide Fund for Nature (WWF), and represents close to 10 % of the global conservation goal of WWF's Living Waters Program. Some 128 countries are now parties to the Ramsar Convention. They have set aside 1,093 wetlands, totaling 336,000 square miles, designated for inclusion in the Ramsar List of Wetlands of International Importance.



September 18 – The World Bank recently approved a grant funding worth \$ 15.24 million to the governments of South Africa and Lesotho for the five-year **Maloti-Drakensberg Transfrontier Conservation and Development Project**. The project is a long-term collaborative initiative between the governments of South Africa and the Kingdom of Lesotho to protect the exceptional biodiversity of the Drakensberg and Maloti Mountains through conservation, sustainable resource and land-use, and development planning. It will support the continued collaboration of the

two countries in transboundary natural resources management and the development of a strategic partnership between the governments, private sector and communities for sustainable conservation and development.

September 18 – The death and **disappearance of breeds of farm animal and plants are threatening long-term food security** and depriving remaining species of the ability to resist disease and harsh climates. The United Nations Food and Agriculture Organization (FAO) says two breeds of farm animals disappear each week, and 1,350 breeds face extinction. Over the past 15 years, 300 out of 6,000 breeds of farm animal have become extinct.

Latest information suggests that 30% of the world's farm animal breeds are at risk of disappearing, and their valuable traits, such as their ability to adapt to harsh conditions, disease, drought and poor quality feed, could be lost too. If diversity continues to shrink, there are increasing risks of producing a large percentage of food based on few varieties or breeds, which could just as easily be wiped out by disease.

September 11 – The Philippines' Department of Environment and Natural Resources (DENR) Secretary Heherson T. Alvarez attended the **Ministerial Conference on Forest Law Enforcement and Governance-East Asia (MCFLEG-EA)** hosted by the World Bank Institute and the Government of Indonesia from September 11 to 13 in Denpasar, Bali, Indonesia. This signals the intention of the Philippines to join other East Asian countries in a campaign to intensify protection of the region's forests through a rethinking of forest law enforcement and governance throughout the region.

The East Asian Conference became a venue for sharing and exploring the best current thinking on forest law enforcement. Senior forestry officials discussed and debated on previously identified issues concerning forest law

enforcement and illegal logging. One of the most important highlights of the Conference was the signing of a Ministerial Declaration of Commitment between environment and forestry ministers and secretaries of East Asian countries to address important issues of forest law enforcement.

August 24 – Research indicates that **Africa's forest elephants are genetically distinct from the better-known savanna elephants**. This means that there are now three species of elephants – two African and one Asian. Compared to savanna elephants, forest elephants are smaller, and have more rounded ears and straighter, thinner tusks. Scientists have proposed the scientific name *Loxodonta cyclotis* for the forest elephants.

August 23 – The World Wide Fund for Nature (WWF)-Australia has established **a campaign to safeguard the Great Barrier Reef World Heritage Area**, considered the most biologically rich marine ecosystem on the planet. The campaign aims to eliminate damaging impacts on the Reef and to create a global benchmark for marine protection through a network of fully protected zones throughout the Marine Park. The Great Barrier Reef requires an extensive network of fully protected areas for its long-term survival. Recent satellite photographs show evidence of sediment pollution from coastal rivers with the potential to smother sensitive coral reefs and other important habitats. The potential for oil exploration and drilling adjacent to the marine park also poses additional major threats.

August 22 – In less than 10 years, **non-native zebra mussels from Europe have pushed native mussel species in the United States to the brink of extinction** and actually carpet some parts of the Mississippi River bed with 10,000 to 20,000 mussels per square yard. The mussels' hard shells can



Photo by Edwin Masteller

cut anything they come in contact with, and can attach to solid objects such as submerged rocks, dock pilings, and boat hulls. They can clog intake pipes at power plants and require expensive treatments to remove them. Competition between the two species occurs at different levels including food and space, to the detriment of the native mussel population.

A study of aquatic nuisance species by the Pacific States Marine Fisheries Commission with support from the U.S. Coast Guard and the Fish and Wildlife Service will seek a solution to the zebra mussel population as well as attempt to return native species to their natural habitats.

August 22 – The **Kissama Foundation revealed plans to reintroduce wildlife to Angola** through the donation of 300 elephants from Botswana. Animal welfare groups welcomed the project but remain concerned about wildlife security in a country that has been at civil war since 1975. The foundation, however, assures environmentalists that the 50,000-acre park is secured by an electric fence and more than 40 trained game guards. Botswana donated the elephants to reduce the country's current elephant population, numbering over 100,000. Relocating animals to restock areas where they traditionally occurred is a more humane solution than lethal culling, an option that Botswana considered.



Photo courtesy of NOAA/NMFS

August 21 – The Steller sea lion, which is protected

under the Endangered Species Act, is facing new threats from salmon farmers and commercial trawlers. Reduced food supply is driving sea lions to infiltrate salmon nets. The Canadian Department of Fisheries and Oceans previously permitted salmon farmers to shoot marine mammal predators if they threaten their stock. This has led to an upsurge in sea mammal killings. Over the past 10 years, salmon farmers have shot nearly 5,000 marine mammals, including 300 Stellers. To protect the animals, the Sierra Club and the Friends of Clayoquot Sound are lobbying to have the fish farms moved inland.

August 20 – **"An Assessment of the Status of the World's Remaining Closed Forests"** shows that 80.6% of the world's remaining closed forests are located in 15 countries: Russia, Brazil, Canada, the United States, the Democratic Republic of Congo, China, Indonesia, Mexico, Peru, Colombia, Bolivia, Venezuela, India, Australia and Papua New Guinea. Targeting conservation funds on these 15 key countries may pay dividends in terms of environmental results. To protect these forests, the report recommends increasing their inclusion in more protected areas, strengthening policies against smuggling and poaching of trees and wildlife, as well as encouraging wealthy countries to invest in conservation efforts in developing nations through debt-for-nature swaps. The United Nations Environment Program produced the report with assistance from the US Geological Survey and the National Aeronautics and Space Agency.

August 20 – Almost 60% of the **secret trails used by California's wildlife to travel between healthy habitat patches are threatened by development**. The loss of these corridors threatens the very existence of the state's most charismatic animal species, including mountain lions, bobcats, Pacific fishers,

wolverines, badgers, salmon, steelhead and mule deer. Hemmed in by human development, the animals are now reduced to traveling through narrow areas ranging from a few feet to a few miles wide to find mates, hunt prey, and satisfy inborn migration patterns. These corridors, referred to as "biodiversity bargains," should be preserved by conservation easements and measures.

August 20 – A study conducted by the Estacion Biologica de Donana of Seville, Spain on the droppings of more than 14,000 of **Europe's largest bats** (*Nyctalus lasiopterus*) shows that the species **complements its meals of insects with birds migrating across the Mediterranean**. The feather content studies in bat droppings peaked noticeably during the spring and fall bird migration seasons. Since the bats weigh only 50 grams and have a wingspan of up to 60 centimeters, their avian prey probably consists of only very tiny birds.

August 17 – The discovery of **gold, silver, copper and zinc deposits in the Piura state of Peru has fuelled fears of the effects of mining activities on the local environment**. Mines would dislocate local communities, destroy the region's agriculture and release large amounts of dust into the strong winds of the area. Developments will also affect a number of rare and endangered animals, such as tigrillos, jaguars, pumas, mountain lions, crested ducks, pelicans and crocodiles. The area also provides a sanctuary for the mountain tapir (*Tapirus pinchanque*), which acts as a seed disperser in the Andes and is classified as fully endangered with extinction by the World Conservation Union Species Survival Commission Tapir Specialist Group. There are estimated to be fewer than 200 of the species in Peru today and 2,500 in the northern Andes, including fragmented

populations in Ecuador and Colombia.



August 16 – The Natural Heritage Trust will fund a national program called **Flora for Fauna to encourage the growth of native species in Australia's urban gardens**. One potential beneficiary of the new program is the endangered Richmond Birdwing butterfly, which has come under increasing pressure due to habitat destruction. If backyard gardeners plant the Australian vine *Aristolochia praevanosa* on which the butterfly normally lay its eggs, they will contribute to its survival.

August 16 – A project by the U.S. Fish and Wildlife Service, Tennessee Wildlife Resources Agency (TWRA), the Tennessee Valley Authority, and Conservation Fisheries Inc. provided the **endangered boulder darter (*Etheostoma wapiti*)** with 15 tons of natural limestone slabrock in a bid to save the rare fish species from extinction. The boulder darter is a small member of the perch family that reaches a maximum length of about three inches. It lives and spawns among boulders that occur in relatively shallow water, three feet deep or less. The boulders must be in flowing water that does not flow too swift nor too slow. These conditions are ideal for the maturation of eggs attached to the undersides of these rocks and guarded by the male. Water pollution and damming activities have caused the decline of the boulder darter.

August 16 – The Patagonian toothfish is in danger of becoming extinct seven years after first being discovered in sub-Arctic waters, according to a study by the World Wide Fund for

Nature (WWF) entitled **"Patagonian Toothfish: Are Conservation and Trade Measures Working?"** The toothfish, which is flaky,



white and popular due to the population decline of other white-fleshed fish, has come under pressure because of illegal, unreported and unregulated fishing. Japan and the United States are the two largest importers of toothfish, which is highly susceptible to over harvesting because it is large and grows slowly.

August 14 – The **Philippine Congress approved the Genetically Engineered Food Right to Know Act**, a bill that requires the labeling of Genetically Modified Organism (GMO)-derived food and food products. Violators risk up to 12 years imprisonment plus a US\$2,000 fine. If the offender is an alien, he or she can be immediately deported without need of any further proceedings. The bill is a result of growing health concerns about the effects of GMOs. Last year, the environmental group Greenpeace said that 11 popular food products in the country were tested positive for GMO contamination. Some farmers are also unknowingly planting genetically engineered vegetable crops in the province of Benguet, which grows almost 70 % of the vegetables in the Philippines.

August 14 – The Association of Southeast Asian Nations (ASEAN) **launched three books** outlining regional actions and strategies **to promote sustainable development and to protect the environment** at a ceremony in Jakarta. These are:

- ASEAN State of the Environment Report 2000
- Fire, Smoke and Haze: The ASEAN Response Strategy
- ASEAN Environmental Education Action Plan

These books were launched by Mr. Rodolfo C. Severino, Jr., the ASEAN Secretary-General, and Mr. Nabil Makarim, Indonesia's newly appointed State Minister of Environment.

August 10 – **Laboratory raised sea urchins have been released in the Florida Keys National Marine Sanctuary** in an attempt to restore the health of Atlantic coral reefs. The sea urchins are critical to coral reef renewal because they eat coral smothering algae. The next stage of the endeavor would be to attempt to reseed the reef with laboratory-cultured coral larvae. Coral reefs throughout the Caribbean and Florida have undergone major degradation over the past two decades. Among the causes of decline is the loss in 1983 of the once abundant grazing sea urchin, which was wiped out by an epidemic disease. This was followed by increasing losses of live coral cover due to coral bleaching, a phenomenon caused when increased seawater temperatures turn corals stark white before dying.

August 10 – Environmentalists urged foreign donors to make **protection of Kenya's dwindling forests a condition for lending**, saying politically motivated destruction of tree cover endangered the farm-based economy. Forest protection is not a specific condition of donors such as the International Monetary Fund, the World Bank and the European Union, although officials of all three bodies have expressed concern to the Kenyan government about shrinking tree cover. Forests cover below two percent of the country but sustain farms employing much of the population of 28 million. Since much of the land in Kenya is arid,

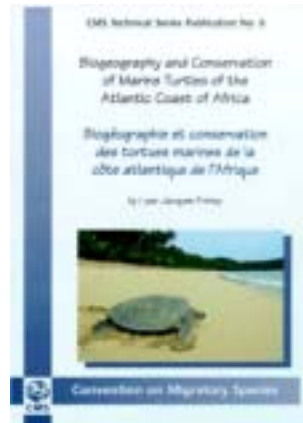
forests act like giant sponges, soaking up moisture during the rainy seasons, and then slowly releasing it to keep rivers flowing to towns, villages and crucial coffee-and tea-growing sectors. Three-quarters of the country's forest have been chopped down by British colonists and Kenyan farmers in the last 150 years, making what remains all the more precious.

August 8 – Environmental groups praised Brazil's decision to protect 5.9 million acres of Amazon rainforest. The land for these protected areas became available through a government program to crack down on land fraud in the Amazon, where some landowners have amassed ranches the size of small European countries. The protected areas include the 705,000 acre Serra da Cotia National Park in Roraima state, as well as four national forests in the states of Amazonas, Para and Acre and two reserves also in Roraima. The same environmental groups urged the international community and the government to help ensure that protection goes beyond mere declarations.

August 7 – Researchers from the United States National Institute of Allergy and Infectious Diseases (NIAID) developed a vaccine from sand fly saliva, which when tested on mice proved effective against Leishmaniasis. The disease, transmitted by sand flies, is a major health problem in many tropical and desert climates. Different species of the single-celled parasite *Leishmania* can cause flesh-eating nose, throat and mouth infections, painful skin lesions and fatal infestations of the internal organs. An estimated 12 million people, primarily in Central and South America, Africa and the Middle East, currently suffer from at least one of these diseases.

August 7 – An IUCN - The World Conservation

Union report titled the "Biogeography and Conservation of Marine Turtles of the Atlantic Coast of Africa" calls for urgent international support to save Africa's sea turtles. The report points out that West Africa provides nesting sites and breeding grounds for a variety of sea



turtles, including Olive Ridleys, Hawksbills, Green Turtles, Leatherbacks and Loggerheads. Since sea turtle populations in the Western Atlantic and Pacific Ocean have fallen dramatically over the years, the discovery that West Africa is a globally important region for sea turtles should spur international action for the area's conservation.

Threats to sea turtles in the region include excessive hunting for their meat, eggs and shells, marine pollution, entanglement in fishing gear, and habitat destruction. The report also outlines some recommendations to sustain the species, such as protection of various nesting and breeding sites from pollution, mapping and monitoring of seagrasses to ensure their health, a crackdown on the turtle shell industry, creation of transborder marine parks as well as increased funding for marine rangers.

August 6 – Indian forest guards in the remote eastern Himalayan state of Sikkim arrested two Russian nationals and their four porters on charges of illegally collecting around 2,000 butterflies, moths and beetles; many of the

butterflies are endangered. The tiny state of Sikkim, which has a population of over 500,000 people, is famous for some 600 varieties of butterflies and 500 species of birds.

August 6 – Indonesia has banned the export and domestic trade of ramin (*Gonystylus bancanus*) due to illegal logging of the tree species in several national parks that provide habitat for the endangered orangutan, Asia's only great ape. The ban resulted from a campaign led by the International Primate Protection League, local guide associations and other Indonesian non-government organizations, with support from the Orangutan Foundation International founded by anthropologist Professor Birute Galdikas, who has lived among orangutans in Indonesian rainforests for the last 23 years.

Ramin is in demand for furniture, flooring, paneling, door and window frames, and others. In April, the Indonesian Minister of Forests enacted a domestic ban and requested the Secretariat of the Convention on International Trade in Endangered Species (CITES) to list the species on Appendix III with a zero quota, which came into force today.

August 3 – The ASEAN Senior Officials on the Environment (ASOEN) met in Bandar Seri Begawan to review developments relating to environmental cooperation in the ASEAN region, and discuss implementation of cooperative activities based on the Hanoi Plan of Action and Strategic Plan of Action on the Environment. Areas of cooperation include transboundary haze pollution, nature conservation and biodiversity, multilateral environmental agreements, coastal and marine environment, and various other environmental activities. There has been considerable progress made in the formulation of the ASEAN Agreement on Transboundary Haze Pollution. The Agree-

ment has already been developed and has been considered by ASEAN Member Countries for adoption.

August 2 – The United States Government, with assistance from The Nature Conservancy, has signed a landmark debt for nature swap to reduce by about one-half the debt which Belize owes to the US. Belize is located in Central America, and is bounded on the north by Mexico, south and west by Guatemala, and on the east by the Caribbean Sea. In exchange for the debt reduction, the government of Belize has agreed to protect 23,000 acres of forestland in Belize's Maya Mountain Marine Corridor, which hosts one of the world's richest assemblages of biodiversity. It is home to more than 220 tree species and 350 bird species. Wildlife that roams the landscape includes the jaguar, ocelot, marguay, Baird's tapir, Morelet's crocodile, scarlet macaw and the endangered West Indian manatee.

The Debt-for-Nature swap also stipulates the provision of a \$5.5 million grant from the US for forest conservation. The Nature Conservancy will also provide \$800,000 to the US government to help finance the agreement.

August 2 – The Wildlife Conservation Society (WCS) reports that more than 2.2 million wild terrestrial orchids are being stripmined each year in the Southern Highlands region of Tanzania due to a growing demand for the plants as food. Up to 85 species are being rapidly depleted because part of the terrestrial orchids is the key ingredient in a type of meatless sausage used in *chikanda* or *kinaka*, a local delicacy. To help protect this region, WCS is pushing to turn a key area of the Southern Highlands, called the Kitulo Plateau, into a national park. If established, the park will be one of the first protected areas in

tropical Africa to be inventoried primarily on the merits of its flowers.



Courtesy Warrant Officer Oulver

July 26 – US officials uncovered 516 shells of the endangered queen conch after an inspection of a shrimping vessel from the Honduras. The queen conch is a marine mollusk whose populations have significantly decreased due to over-harvesting for meat. There is great demand for the shells, which are sold as jewelry, curios, and ornaments in aquariums. These are currently protected by the Convention on International Trade in Endangered Species (CITES). Today, only regulated fishing for conch is permitted in certain waters, and shells can only be imported or exported with proper CITES and U.S. Fish and Wildlife Service permits.

July 25 – The European Commission unveiled new rules on the labeling and traceability of foods containing genetically modified organisms (GMOs). These require that all foods and animal feed derived from GMOs be labeled and, in the case of processed goods, records have to be kept throughout the production process, allowing the GMOs to be traced back to the farm of origin. The requirements also cover highly refined products such as corn oil or soybean oil, where the original GMO content is removed during the production process. These will have to be labeled as derived from GMOs although not actually containing them.

July 23 – The 53rd meeting of the International Whaling Commission (IWC) turned down a proposal to establish

the South Pacific Whale Sanctuary. Environmentalists accused Japan of offering development aid to poor nations to reject the proposal. Japan has been lobbying the IWC to lift a 1986 moratorium on whale hunting for trade. Despite the ban, Japan continues to hunt whales, using a loophole in the IWC moratorium allowing scientific whaling, as justification to take at least 880 minke whales plus a smaller number of endangered sperm and Bryde's whales each year.

July 23 – A Brazilian firm, Coninbra, exporting soybeans free from GMOs has been winning higher premiums from countries where bio-engineered foods have encountered resistance from increasingly health-conscious consumers. Brazil is the world's No. 2 producer of soybeans after the US and the only agricultural exporter in the Americas that forbids the sale of transgenic crops or food. Brazil allows life science companies to conduct GM research on crops like soy and corn on special farms in the country but has never allowed the sale of these foods due to health and environmental concerns.

July 23 – The Cambodian government approved a legislation designed to curb illegal logging to protect the country's forests. Illegal logging was rampant throughout Cambodia during the 1990s, with high-level involvement of the military and former Khmer Rouge members. The government began cracking down on illegal loggers in 1999 when foreign aid donors said they would link future assistance to reforms in the forestry industry and other sectors. Serious offenders could be jailed up to 10 years and fined as much as 10 million riel (\$2,500).

July 20 – As bigger fish are removed from the population, the smaller

fish left behind takes on more influence in breeding the next generation. According to Steven Murawski of the National Marine Fisheries who announced this research, some of the smaller fish reach sexual maturity earlier, producing offspring that are both small and programmed to be mothers while still young. If a genetic change occurs, this may have a drastic effect on fishery resources. Fish that reproduce earlier tend to have less viable offspring, which in turn would continue to produce fewer and fewer fertile offspring.

July 19 – Environmentalists won a temporary victory in their bid to protect a British Columbia forest that is home to the endangered northern spotted owl. A Supreme Court judge overturned several logging permits given to Cattermole Timber Ltd. and ordered the cutting request to be reviewed again by British Columbia's Forest Service.

July 19 – The World Wide Fund for Nature (WWF) announced that melting polar ice is threatening the main food source for Antarctic blue whales and could lead to their extinction. The whales feed on small sea creatures known as krill, which in turn eat microscopic marine algae. The algae live in sea ice and are released in the summer when the ice melts. Studies have shown that as the temperature has increased in recent decades because of climate change, sea ice had diminished rapidly and food supplies for blue whales were getting scarce.

July 18 – The World Bank has adopted a new environmental strategy to ensure that development in poor countries does not come at the cost of pollution and degradation of natural resources. This shows that developing countries are becoming increasingly concerned about the effects of

pollution and the impact that declining natural resources have on health and on their prospects for growth. The new strategy aims to improve the quality of life and growth in developing nations by supporting sustainable environmental management and protecting natural resources such as forests and water, and would be tailored to countries' needs and capacities.

July 18 – Scientists have found fresh evidence that sulforaphane, the chemical contained in vegetables such as broccoli, brussels sprouts, kale, and cabbage, boosts enzymes that provide protection from cancer, according to Dr. Paul Talalay of the Johns Hopkins School of Medicine. Other foods with chemical compounds that inhibit cancer include green and chamomile tea, rosemary, mustard, and turmeric.

July 18 – The African Wildlife Foundation launched the "four corners natural resource management project." This refers to the Caprivi Strip, the only place in the world where four African countries - Zambia, Botswana, Namibia and Zimbabwe - meet. They share the Zambezi River, one of the longest rivers in Africa. The river basin is home to over 40 million people and is already facing competing demands for water, agriculture, power generation, industrial and domestic use as well as wildlife habitat and tourism. All of these can easily kill the river unless careful and considerate planning takes place.

July 16 – The Philippines launched the Samar Island Biodiversity Project, which will be jointly financed by the UN Development Program (UNDP), Global Environment Facility (GEF) and the Philippine government. The World Wide Fund for Nature (WWF) lists Samar

as one of the top 200 endangered spaces in the world. The island has 360,000 hectares of rainforest, and is home to 2,400 species of flowering plants, including 406 native species. Some 197 species of birds on the island have been sighted, 50 of which are native to the Philippines, including endangered species such as the Philippine Eagle, the Philippine Hawk Eagle, and the Philippine Cockatoo. The project hopes to empower local communities, improve livelihoods and promote participation by diverse stakeholders. To facilitate these efforts the project is carrying out community consultations in 35 municipalities, biodiversity monitoring, social assessment and operational planning.

July 16 – Heavy metals are the leading cause of massive deaths of flamingos in two Rift Valley Lakes of Kenya: Lakes Nakuru and Bogoria. Veterinary pathologists found that detectable levels of lead, zinc, mercury, copper, and arsenic have been found in the birds' tissues, which may be the result of the collapse of sewage works in many urban centers and growth of industries whose effluent flow into the lakes. The rise of horticultural farms along most of the Rift Valley lakes have also caused agrochemicals to run off into the lakes.

July 11 – Researchers from the University of Wisconsin-Madison in the United States and the Dutch National Institute of Public Health in Amsterdam unveiled a historical **global land use inventory** that chronicles the massive impact that humans have had as they transformed the global landscape since the 17th century. Historical records such as agricultural land surveys, tax rolls and census data, combined with satellite datasets were used for the inventory. The database is intended to provide a comprehensive picture of the growing

dominance of human land use on global land cover patterns. Data sets could be used within global climate models and global ecosystem models to gain insight into the influence of land cover change on climate and biological and geochemical cycles.

July 11 – Thai scientists are developing a **genetically modified strain of papaya** in a bid to halt the spread of the ringspot virus, which threatens to wipe out the plant. If field trials are successful, seeds of the new strain will be distributed to farmers across Thailand. Scientists hope that opposition and government restrictions on genetically modified products would not discourage the project, which was supervised by Greenpeace International and the National Biosafety Committee.

July 10 – The World Wide Fund for Nature (WWF) released "Wanted Alive! Whales in the Wild," which points out that seven of the 13 great whale species remain endangered or vulnerable despite decades of protection. Aside from commercial whaling, threats include entanglement in fishing gear, toxic chemicals, intensive oil and gas development, habitat degradation, and the effects of climate change. Industrial chemicals and pesticide runoffs accumulate in whales' blubber and are passed by mothers to nursing calves. Measures to protect the whales include reducing collisions between whales and ships in Canada, and minimizing gear entanglement of whales in problem areas around the world, including Mexico, the Philippines, and New Zealand. WWF is also supporting carefully controlled whale watching, which can be a lucrative alternative to whaling. The report is available at: <http://www.panda.org/>

July 6 – A Congo Republic rain forest, described as the most pristine forest left in Africa,

will be protected from logging under a deal between the government and the timber company Congolaise Industrielle des Bois (CIB). The area is densely populated by chimpanzees, forest elephants, red colobus monkeys and gorillas, and contains vast tracts of mahogany trees and other valuable hardwoods. CIB voluntarily withdrew its timber harvesting rights after studies showed the area was virtually untouched by humans. Surveys conducted by the Wildlife Conservation Society and CIB indicated that wildlife showed little evidence of previous human encounters, leading scientists to believe the area never experienced human intrusion. Surrounded by swamp forests and two rivers, the area's geographic isolation has kept humans out.

July 4 – The Bureau of the World Heritage Committee accepted the IUCN-World Conservation Union recommendation for the inscription of three new sites, three extensions and the relisting of one site for its biodiversity values. The Bureau will recommend that the Committee inscribe these areas on the World Heritage List in December 2001.

The new World Heritage Sites are:



Photo courtesy of IUCN

- Rift Valley Lake Reserves (Kenya)



Photo courtesy of IUCN

- Jungfrau-Aletsch-Bietschhorn (Switzerland)



Photo courtesy of IUCN

- The Dorset and East Devon Coast (United Kingdom)

Extensions to Existing World Heritage Sites:

- Galapagos Marine Reserve (in Ecuador, an extension to Galapagos National Park)
- South Island (in Kenya, extension to Siboli/Central Island World Heritage site)
- Kluchevskoy Nature Park (in the Russian Federation, an extension to Kamchatka Volcanoes World Heritage site)

Relisting of World Heritage Sites under additional criteria:

- Kamchatka Volcanoes (in the Russian Federation, renominated for biodiversity values)

July 3 – A remote area of rainforest in northeastern Peru appears to harbor more species of mammals than anywhere else on Earth, according to two separate studies. This region's high diversity may be due to its vast, uninterrupted rainforest. The rapid rise of mountains in the Andes between three and eight million years ago created ridges that isolated animals, allowing them to evolve into distinct species. Water running off the mountains produces richer soils in the western Amazon, allowing higher populations of all species and fewer extinctions. ■

– Research & Compilation by Sahlee Bugna

Editorial

Forest Fires, A Burning Issue

► By **JOHN R. MACKINNON**

The focus of this issue of ASEAN Biodiversity is FIRE.

The ASEAN Regional Centre for Biodiversity Conservation (ARCBC) held a special workshop on this subject in Brunei in March this year, which was attended by experts and representatives from almost all our ASEAN country partners. In recent years the problems of wild fires have become more prominent and the word 'haze' is increasingly referred to as a threat to human health, aircraft safety and of course biodiversity.

The Association of Southeast Asian Nations (ASEAN) takes the matter very seriously and has established a special Haze Technical Task Force to look into these matters; it has also undertaken several national and regional projects to improve our understanding of the fire phenomenon, fire detection, analysis in relation to climate, assessment of damage and establishment of root causes. Are the extensive forest fires that have swept across Sumatra and Borneo the results of changing human behavior, changing climate, and illegal land clearance? Are they inevitable, will they continue? Can we prevent fires? Can we halt fires earlier?

The ARCBC's interest in fire is of a narrower scope. What can the manager of a protected area do on the ground to reduce the damage of fires to the biota under protection? Do the fires matter? Do they really cause irreversible losses of biodiversity or does nature heal over the wounds and recover? Can we recognize special places or special species that are most at risk, and are there particular protective management

measures that can be taken to protect these better? The articles in this issue answer some of these questions.

Fire is not new to our region. Nor is fire always negative in its impacts. The biologist Chuck Warton, while studying wild cattle in Southeast Asia during the 1960s, wrote several papers on the gradual opening up of the forests of mainland Southeast Asia as a result of hundreds of years of use of fire by human communities to clear land. The long-term results



were a changing of local conditions from a largely closed forest system dominated by evergreen forests to a mosaic system of evergreen with deciduous and savannah woodland systems with areas of grasslands and fallow. This change has been highly beneficial to many significant wildlife, such as wild cattle and the big carnivores that follow them – tigers, leopards, vultures etc. Elephants, rhinos, deer and wild pigs have also probably benefited. Indeed, the diversification of the habitat has probably had a positive impact on

biological richness so that we find very long species lists for Myanmar and Thailand.

However, the opening up of the forests has also caused local changes in climate and certainly caused losses in the local flora and fauna of the original evergreen communities.

What we are seeing today in Borneo and Sumatra is different in scale and speed of change, giving nature less time to adapt to the huge changes in the landscape. Literally millions of hectares of forestlands have been cleared and burned and some large forest species are quite unable to cope. Moreover the species that are recolonizing the area after fires are often introduced exotics, such as *Acacia mangium* and *Acacia auriculiformis*. The combination of forest clearance, fires, hunting and capture of young animals for pets has decimated the orangutan populations on both Sumatra and Borneo. Rijksen & Meijaard (1999) in their book 'Our vanishing relative' conclude that 93% of the Bornean orangutan population and 86% of the Sumatran populations have been wiped out during the last century.

Forest fires are indeed a major problem that must be given priority in any nature conservation effort. As can be gleaned from the papers featured in this issue, there is a clear and pressing need for protective management measures, supported by adequate funds. The ASEAN workshop on forest fires thus developed a set of guidelines and mechanisms that included funding and institutional support to minimize fire risks and species extinction. Hopefully, enough funds could be raised while it is not too late. ■



Photos courtesy of ASEAN Secretariat and National Interagency Fire Center, Bureau of Land Management, Idaho, USA

ASEAN's Response Strategy in Addressing Transboundary Haze Pollution

► By **ADELINA KAMAL**

The land and forest fires that hit the ASEAN region in 1997-1998 have been so severe that the United Nations Environment Programme (UNEP) labeled them as among the most damaging in recorded history. Their environmental, economic and social dimensions and impact, and the associated transboundary haze pollution have been profound. The total economic losses in terms of agriculture production, destruction of forest lands, health, transportation, tourism, and other economic endeavors have been estimated at \$9.3 billion.

Over the past two decades, fires and haze in the ASEAN region have been influenced by rapid demographic changes, increased human activity, and climatological factors. The pernicious practice of burning forests to clear land for commercial purposes together with the extraordinarily dry weather has produced a pall of catastrophic proportions. Severe droughts have also combined with developmental and agricultural activities in the rain forests and indiscriminate use of fire for land clearance. These and other contributory factors have made the ASEAN region prone to wildfires, which will remain a serious threat for some time.

As a partnership for sharing experiences, information, responsibilities and benefits, and working toward a common good, the ASEAN is in a strong position to address the problem at the regional level. Since the early 1980s, ASEAN member countries (AMCs) have launched several national and regional initiatives to control the fire-and-haze problem. In the wake of the 1997-98 episode, the ASEAN Senior Officials on the Environment-Haze Technical Task Force (ASOEN-HTTF) formulated the *Regional Haze Action Plan* (RHAP). Their adoption of this instrument in December 1997 was considered a turning point in the

region's approach to preventing and mitigating the damages from recurrent fires and haze.

The RHAP outlines an overall framework for guiding the process of strengthening the region's capacity to address its transboundary haze pollution problem. Its primary objectives are to:

- prevent land and forest fires through better management policies and enforcement,
- establish operational mechanisms to monitor land and forest fires, and
- strengthen regional land and forest firefighting capability with other mitigation measures.

The RHAP therefore has three major components: *prevention, mitigation, and monitoring*. Different countries have been designated to spearhead the activities that fall under each component. Malaysia takes the lead in prevention, Indonesia in mitigation, and Singapore in monitoring fires and haze. Each ASEAN member country will also undertake the national-level actions that relate to the three components. Implementation of RHAP at the sub-regional and regional levels catalyses and complements the measures carried out at the national level.

Since the adoption of the RHAP, the Haze Technical Task Force under the guidance of ASEAN Environment Ministers has undertaken various initiatives, which are highlighted in **Box 1**. Major ongoing ASEAN activities include development of Fire Suppression Mobilization Plans (FSMPs) for all fire-prone areas, promotion of 'zero-burning' policy adopted by ASEAN through dialogue sessions and corporate awareness campaigns, strengthening of monitoring networks including the ASEAN Specialised Meteorological Centre based in Singapore, training program to strengthen the law enforcement capability of Asean Member Countries (AMCs), commu-

Box 1: Highlights of ASEAN's Recent and Ongoing Initiatives on Transboundary Haze Pollution

- Establishment of two Sub-Regional Fire-fighting Arrangements (SRFAs) for Borneo and Sumatra (April 1998);
- Implementation of ASEAN-ADB project - Strengthening the Capacity of ASEAN to Prevent and Mitigate Transboundary Atmospheric Pollution (1998 - 1999);
- Adoption of zero burning policy and strict enforcement of the policy (April 1999);
- Launching of ASEAN Haze Action Online (www.haze-online.or.id), which includes a public-access website on fire and transboundary haze and a restricted intranet-based system for monitoring RHAP implementation (April 1999);
- Establishment of RHAP Co-ordination and Support Unit within the ASEAN Secretariat to provide coordination and support to the implementation of RHAP (April 1999);
- Implementation of Immediate Action Plans (IAPs) in Riau and West Kalimantan Provinces for addressing fires and haze problems in fire-prone areas, and development of an operating procedure for activating forest fire-fighting resources in the ASEAN region (Fire Suppression Mobilization Plans) (1999 - ongoing);
- Convening of dialogue sessions with plantation companies as part of the effort to promote the zero burning policy and raise awareness on zero burning techniques among plantation companies (Jan 2000 - ongoing);
- Establishment of the Sub-Regional Climate Review Group to closely monitor the weather condition especially during the dry seasons (April 2000);
- Establishment of the Sub-Regional Fire-fighting Arrangements Legal Group on Law and Enforcement to discuss legal and law enforcement matters and the implementation of zero burning policy among all relevant parties (June 2000);
- A pilot activity in West Kalimantan Province to explore traditional values of Dayak and Melayu tribes in managing fires and haze in or surrounding their areas (March 2001);
- Development of an ASEAN Agreement on Transboundary Haze Pollution (2001);
- Development of an ASEAN Fire Danger Rating System as part of the effort to strengthen regional wildfire prevention, management and mitigation (ongoing);
- Development of a GIS Database for Sumatra, Borneo and Peninsula Malaysia to strengthen the capacity of the AMCs to use spatial data layers for forest fire prevention, monitoring and suppression planning in the ASEAN region (ongoing);
- Video-conferencing for the ASEAN Secretariat and SRFA Member Countries to provide facilities for discussions and meetings particularly during emergency situations and dry periods (ongoing);
- Capacity development programs for the RHAP-CSU in the forms of training programs on video conferencing, website development/ information management, on-the-job training, etc. (ongoing);
- Strengthening of the RHAP's monitoring network of national- and regional-level institutions, which include the ASEAN Specialised Meteorological Centre (ASMC), national meteorological agencies, and other related agencies in the region (ongoing);
- Development of prototype FSMPs in South Sumatra, South Kalimantan and East Kalimantan Provinces (2000 - June 2001);

More on page 13



Photo courtesy of ASEAN Secretariat

Fire Suppression Mobilization Plan-Field Training Exercise in West Kalimantan Province, July 2000

nity-based fire management activities, and public and community awareness campaigns. A website – ASEAN Haze Action Online (www.haze-online.or.id) – provides a variety of regularly updated information on the haze situation and ASEAN's response in dealing with the issue.

Realizing the need to focus on fire management efforts in specific areas, the Haze Technical Task Force (HTTF) has established a Working Group on Subregional Firefighting Arrangement (SRFA), each for Sumatra and Borneo. Subsequently, the HTTF established two other working groups focusing on legal and law enforcement (the SRFA Legal Group on Law and Enforcement), and climate and meteorological conditions (the Subregional Climate Review Meeting). The RHAP Coordination and Support Unit, a special unit within the ASEAN Secretariat, was set up in April 1999 to support the working groups in implementing RHAP activities. The ASEAN Secretariat and the SRFA members: Brunei Darussalam, Indonesia, Malaysia and Singapore also use video

conferencing facilities to interact among themselves, particularly in emergency situations needing immediate action.

Recognizing the need to further enhance regional cooperation on

transboundary haze, ASEAN has developed an ASEAN Agreement on Transboundary Haze Pollution. This Agreement will address policy and technical measures with regard to monitoring, assessment and preven-

Box 1: Highlights of ASEAN's Recent and Ongoing Initiatives on Transboundary Haze Pollution

From page 12

- A pilot Land and Forest Fire National Disaster Simulation Exercise to create a practice field for learning and strengthening existing institutional structures responsible for coordination and response aspects of national land and forest fire disaster (June 2001);
- Launching of a joint ASEAN-ADB publication entitled Fire, Smoke and Haze – the ASEAN Response Strategy, which provides reviews on fire and haze episodes worldwide, its causes and impacts, the social and economic impacts of the 1997-98 haze episode in the ASEAN region and the ASEAN Response Strategy, particularly the short, medium and long term strategies of the RHAP (Jakarta, August 2001);
- A joint training program for prosecutors and investigators as part of the effort to strengthen the law enforcement capacity of the AMCs (2002);
- Development and conduct of a feasibility study for the establishment of a center to manage environmental disasters with emphasis on land and forest fires and haze (2002);
- Convening of a World Conference and Exhibition on Land and Forest Fire Hazards to bring together international fire experts, senior government officials, researchers, plantation companies, and communities to deliberate issues and discuss strategies with regard to land and forest fires. (Kuala Lumpur, 2002).



tion, technical co-operation and scientific research, mechanisms for co-ordination, lines of communication, simplified customs and immigration procedures for immediate deployment of people and goods across borders in the event of transboundary haze pollution. The Agreement commits AMCAs to take specific actions to prevent and monitor land and forest fires and the resulting haze on a sustained basis. It also intensifies the current regional and sub-regional ar-

rangements through provisions of technical co-operation and procedures for joint emergency response.

The RHAP has been helpful in generating various measures and actions to address the trans-boundary haze pollution issues. Transboundary haze pollution, however, is a problem too large for one agency to manage alone. It requires concrete actions collaboratively undertaken by ASEAN itself, the national governments of AMCAs, the international donor agencies, non-governmental organizations (NGOs), private sector, as well as local communities. It also requires a considerable amount of resources, in terms of time, financial and technical inputs. While ASEAN has taken the lead by undertaking various core measures

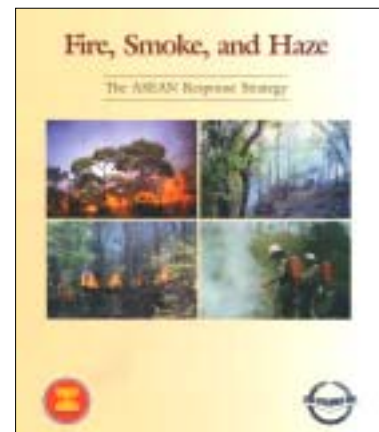
at the regional and national levels, support from all relevant stakeholders would help in speedily alleviating this pollution problem.

The above summary only provides a glimpse of transboundary haze-related activities in the region. ■

Adelina Kamal is the environment senior officer coordinating fire and haze under the Bureau of Functional Cooperation.

References

ASEAN & ADB, 2001 *Fire, Smoke, and Haze: The ASEAN Response Strategy* (Jakarta and Manila)
 ASEAN, 2001 *Second ASEAN State of the Environment Report* (with UNEP; Jakarta)



The ASEAN-ADB joint publication entitled *Fire, Smoke and Haze – The ASEAN Response Strategy* provides a comprehensive review of fire and haze episodes worldwide, their causes and impacts, the social and economic impacts of the 1997-98 haze episode in the ASEAN region, and the ASEAN Response Strategy, with regard to the short, medium and long-term strategies of the RHAP.

For further information, you may refer to this publication and the ASEAN Haze Action Online website. For a copy of the publication, which is also available in CD-ROM, contact the:

Regional Haze Action Plan (RHAP)
 Co-ordination & Support Unit (CSU)
 ASEAN Secretariat,
 70A, Jl. Sisingamangaraja
 Jakarta 12110, Indonesia
 Tel. 62-21-7262991
 Fax 62-21-7230985
 Email: haze@aseansec.org
www.aseansec.org
www.haze-online.or.id



Asean Haze Action Online www.haze-online.or.id has been established by the Regional Haze Action Plan (RHAP) Co-ordination and Support Unit (CSU) of the ASEAN Secretariat. The website provides general information on ASEAN response mechanisms, primarily through the Regional Haze Action Plan, to the issue of haze and forest fire incidences and their impact on the environment. Reports, workshops, relevant legislation and other efforts significant to combating fire and haze are included. Up-to-date news complete with links to country and regional satellite images from organizations such as National Oceanic and Atmospheric Administration (NOAA), the Forest Fire Prevention and Control Project and the Integrated Forest Fire Management Project are also available.



Photo courtesy of Bert Borger, EU Forest Fire Prevention and Control Project, South Sumatra, Indonesia

Impact of Forest Fires on Biodiversity in ASEAN

► By **TERENCE P. DAWSON**

The tropical forests of Southeast Asia are one of the richest ecosystems for biodiversity globally (Meffe and Carroll, 1977). This richness can be attributed to the three biogeographical realms:

Indomalaya, Oceania and Australasia spanning the ASEAN region, and which are further subdivided into several biogeographical regions. In the context of the workshop objectives (see Box), the term forest was defined to include a wide range and variety of habitats

including lowland humid forests, mangroves, savanna grasslands, swamp forests, montane forests and alpine meadows. These habitats support a rich flora and fauna.

The habitual pressures to these fragile ecosystems now count large wildfire episodes, a relatively recent

ASEAN Workshop on Forest Fires

On the following pages, including this page, you will find some of the papers discussed during the workshop “**Minimizing the Impact of Forest Fires in ASEAN**” held from 22-23 March this year in Brunei Darussalam. The workshop brought together more than 60 delegates composed of National Biodiversity Reference Unit (NBRU) country coordinators and Forest Fire focal persons from Brunei Darussalam, Indonesia, Malaysia, Philippines, Singapore, Thailand and Vietnam, resource persons and forest fire experts from the European Union and ASEAN-Member Countries as well as representatives from the ASEAN Secretariat and ASEAN Working Group on Nature Conservation and Biodiversity. The participants met the main objectives of the workshop, which were to:

- Review recent information and scientific findings

on impacts of forest fire on national parks, conservation areas and on biodiversity for each of the ASEAN countries, and

- Develop a set of guidelines and mechanisms (including funding and institutional development) for improving regional effort and pan-ASEAN collaborations in minimizing fire risks and species extinctions resulting from wildfires.

The proceedings will be published shortly and distributed to ASEAN government departments, regional and local institutions, the private sector, non-government organizations (NGOs) and individuals responsible for nature conservation and the protection of national parks and habitats. ■

Many of the fires arise as a result of perverse economic policies that encourage rapid, rather than sustainable exploitation of forest resources.

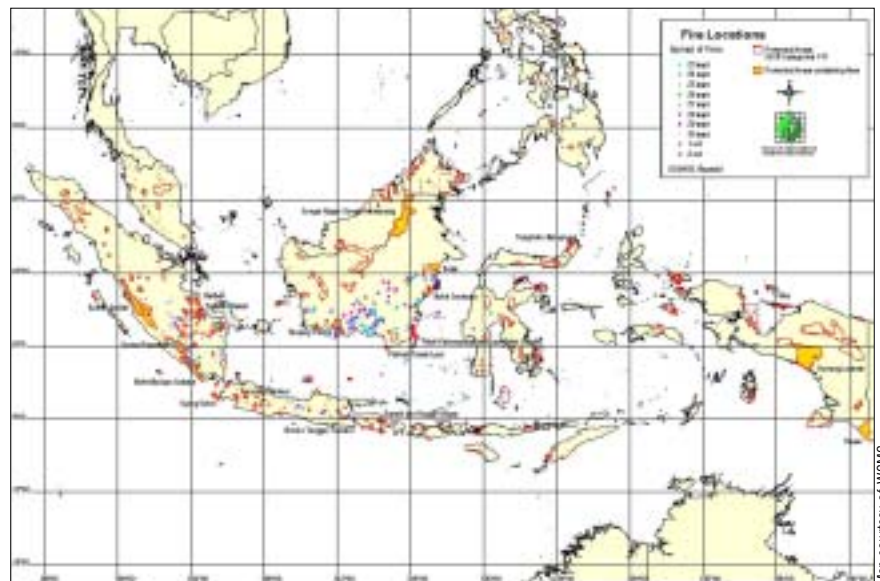
phenomenon, as one of the greatest threats alongside logging, mining, shifting agriculture and other land-use developments resulting from increased population pressures and economic demands. Following intense El Niño Southern Oscillation (ENSO) episodes in 1982-1983 and 1997-1998, many areas in Southeast Asia experienced prolonged droughts, resulting in large numbers of devastating wildfires and associated hazardous haze. Satellite estimates of burned land in Southeast Asia by the Centre for Remote Imaging, Sensing and Processing (CRISP) at the University of Singapore, suggested that between 8-10 million hectares were impacted and 19 designated protected areas were affected by fires in 1997 and 1998.

Almost all the fires were deliberately started by human actions primarily associated with land clearing, such as shifting cultivation, transmigration and logging. Land clearance using fire is traditionally the least expensive and most effective way of clearing vegetation and for improving nutrient poor soils. In many parts of the world, fire is a natural and indeed, essential process that regenerates forest species and recycles essential nutrients, e.g. in boreal forests. In contrast, fires cause severe damage to tropical humid forest ecosystems, destroying or significantly degrading habitats, reducing species populations and causing extinction of endemic flora and fauna. In addition, fires destroy food resources, and affect the health and sources of

income of local and indigenous communities living in the vicinity of fires. Until recently, most ecologists regarded mature tropical humid forests as immune to fire; the moist air in the forest understorey had insufficient drying strength to generate the fuel needed to carry a fire (Uhl, 1998). However, investigations in the rainforests of the Amazon basin revealed soil charcoal layers that corresponded roughly to discontinuities in populations of indigenous forest-dwellers, which was later hypothesized to be the result of several substantial El Niño events occurring roughly 400, 700, 1000 and 1500 years ago, causing droughts severe enough to cause widespread fire and lead to the dispersal of Indian populations (Meggers, 1994). Since the Pleis-

build up as standing dead trees and vegetation begin to fall or shed branches. Decreased canopy cover reduces the capacity of the forest to maintain humidity, and increases the susceptibility of the forest to subsequent fire events in the next drought period with increased intensity, a positive feedback effect (Cochrane and Schulze, 1998). The effects of climate change and global warming are predicted to increase the frequency of El Niño events and associated droughts in the ASEAN region, thus inhibiting further the potential for forests to regenerate naturally.

Many of the fires arise as a result of perverse economic policies that encourage rapid, rather than sustainable exploitation of forest resources. Both international and



tocene Age, persistent occurrences of forest fires have characterized the ecology of Southeast Asia. These fire events can be directly related in time to periods of reduced precipitation that the El Niño events produce. Moreover, Southeast Asia's extended periods of drought during the Ice Age have made vast areas of the region vulnerable to fire.

Once a forest is burned, the reduced canopy cover and nutrients released from burned organic material result in a rapid growth of understorey vegetation. Fuel loads

national economic and development policies like government-subsidized natural forest conversion to plantations, have opened a system susceptible to unprecedented abuse and corruption, as well as provided economic incentives for illegal forest conversion, which governments cannot arrest, either due to lack of enforcement or concern. For example, research by World Wide Fund-Indonesia and the Economic and Environment Programme for Southeast Asia has concluded that up to 80% of the fires in Sumatra

Map courtesy of WCMC



Figure 1: Schematic diagram of the infinite-cycle of managing wildfires

and Kalimantan were started by companies with palm oil plantations, now regarded as the single largest driving force behind forest conversion using fire (Potter and Lee, 1999).

The conceptual framework of wildfire control therefore can be viewed schematically as an infinite cycle of four disaster management processes: prevention, control, impact minimization and rehabilitation (Figure 1). **Prevention** can include activities relating to efforts in avoiding the occurrence of wildfires. **Control** relates to systems and technologies, encompassing early warning, fire suppression, and emergency and response. **Impact minimization** relates to ground and airborne fire combating and tracking systems.

Rehabilitation would include methodologies for restoring habitats and natural areas. All of the above involves commitment by multiple authorities, institutions and communities at the local, regional and national levels.

The ASEAN institutions responsible for biodiversity conservation are, in general, under-funded and lack adequately trained staff. This has been a major constraint to effective conservation. The additional burden placed upon those institutions in dealing with the threat and management of wildfires is difficult to resolve without a national commitment to improving funding mechanisms and incentives at the local level. Many field officers lack even a basic un-

derstanding of fire ecology and management strategies for dealing with wildfire events; a governmental assurance to provide better educational and awareness campaigns would be crucial. The guidelines developed from the workshop can serve as a charter for both institutional reform and for strengthening community integration, these being critical to making any new investment effective.

Much research needs to be done to fully characterize the ecological impacts of fire. The 1997 and 1998 and subsequent fires have probably caused the extinction of significant numbers of species. Even for species that survive, El Niño fire episodes may be contributing to the largest biological selection events in modern history. ■

Terence P. Dawson is a Senior Research Fellow and Leader of the Terrestrial Ecology and Biodiversity Research Programme at the Environmental Change Institute, University of Oxford United Kingdom

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Photo courtesy of Bert Borger, EU Forest Fire Prevention and Control Project, South Sumatra, Indonesia

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**ASEAN Regional Centre
for Biodiversity Conservation**
PO Box 35015, College, Laguna,
Philippines 4031

email: contact.us@arcbc.org.ph
Tel Nos: +63 49 536 1659/4042
Fax: +63 49 536 2865/3173



Photo by John MacKinnon

The Ecology of Forest Fires

► **By TERENCE P. DAWSON, NATALIE BUTT and FLORENCE MILLER**

In many ecosystems, fire is part of the natural regeneration process, stimulating the germination of certain species, clearing space for the invasion and growth of others, and releasing a periodic flush of nutrients into the soil. Yet tropical forests were until recently considered incapable of burning. Their ground layers were found in tests to be too moist to sustain fire, and it was assumed that this was always the case (Uhl, 1998). However, the remains of charcoal in tropical forest soils are testimony to the fact that in the past, fires have had catastrophic effects in tropical forests. Today, vegetation fires are affecting primary and secondary tropical forests. In 1983, three million hectares of lowland rainforest were destroyed in

Kalimantan alone (Whitmore, 1998); in 1997/98, around 4.66 million hectares of forest were impacted across Southeast Asia (Rowell and Moore, 1999).

Southeast Asia is particularly susceptible to wildfire. The World Fire Web's global fire maps show where most of the world's vegetation fires occur: Southeast Asia has more fires than Australia, and is third only to Africa and South America (Environmental News Network, 1999). Mainland Southeast Asia, which is more strongly seasonal and less humid than many parts of insular Southeast Asia, favors the use of fire as a land management tool and supports more fire-prone ecosystems. Wildfires, those fires not meeting their management objectives and there-

fore requiring suppression, are consequently common (Grégoire *et al.*, 1996).

The greater numbers of fires in tropical forests are not solely the result of natural factors and conditions. Primary forests that have been relatively undisturbed are fairly resistant to fire, and an active fire front in an intact closed canopy forest is unimpressive. Except for tree-fall gaps and areas of unusual fuel structure, fire will spread as a thin, slowly creeping ribbon of flames a few tens of centimetres in height (Cochrane and Schulze, 1998), or it will spread through the canopy (Kimmins, 1992). Over much of the burned area, the fire will consume little besides leaves and leaf litter. However, it only takes a bit of open canopy, such as that caused by light clearance and/or drought, to tip the balance from a

fire-resistant to a fire-ready forest. And, while first-event fires in primary forests tend to result in relatively little damage, fires following clearance can be much more harmful.

In general, fire has followed clearance in tropical forests. Logging *per se* does not cause fires, but the indirect effects have been, and continue to be, devastating. Under 'natural' conditions, a large proportion of the heat generated in a fire may be released high above the ground as the fire travels through the canopy – most combustible fuel is in the standing (live and dead) trees. With a closed canopy, little light reaches the ground layers of tropical forest, and there is little vegetation to burn. Thus, the fire on the ground is often much less severe and consumes relatively little of the forest floor other than leaf litter. In areas of open canopy (normally created through clearance), however, all the fuel and the heat energy released are on or near the ground. Much or the entire forest floor may be consumed and heat damage to the upper mineral horizons of the soil may occur.

Fire danger is increased by clearance for a number of reasons. First, it produces quantities of dead, flammable material. Second, the opening up of the canopy allows light to reach the ground layer of the forest, encouraging understory vegetation to grow. The grass, creeping vines and small shrubs that result all pose fire hazards. Finally, the gap created by clearance lets in wind, which reduces humidity, dries out dead materials, and encourages the spread of fire (Bowen *et al.*, 2000).

If the forest re-burns within a few years of the initial fire, the fires will be much worse. The first fire opens up the canopy such that favorable conditions are created for a second fire (Uhl, 1998). Dead material produced by the first fire poses a fire hazard until completely decomposed, and the death of trees in the fire produces gaps in the canopy,

“It only takes a bit of open canopy, such as that caused by light drought, to tip the balance from a fire-resistant to a fire-ready forest. And, while first-event fires in primary forests tend to result in relatively little damage, fires following clearance can be much more harmful.”

leading to problems associated with increased light, wind and dryness described above. Thus, in recurrent fires, flame length, depth, spread rate, residence time and fireline intensity are all significantly higher. Cochrane and Schulze (1998) predict that a second fire will kill 40% of remaining stems. In other words, first fire events are capable of setting a positive feedback system in motion that could lead to the progressive impoverishment and deg-

radation of vast expanses of tropical forest (Figure 1). No other disturbance in tropical forests has this self-reinforcing character with the potential to occur on such a grand scale (Uhl 1998).

Influence of El Niño on the Forest Fire Regime

While forests that have undergone patchy clearance are susceptible to fire, it is weather conditions that tend to tip the balance. During long periods of drought, forests dry out, particularly the dead wood and material on forest floors produced by clearance. Those wishing to clear the forest for agricultural purposes frequently take advantage of the dry conditions to set fires. Unfortunately, fires set towards the end of a dry season, and particularly towards the end of prolonged drought, have a tendency to burn out of control, quickly turning from managed fires to wildfires.

Prolonged droughts affect Southeast Asia with relative frequency, governed largely by the El Niño Southern Oscillation (ENSO). El Niño is a reversal of the ocean-atmosphere system in the tropical Pacific. It has important consequences for

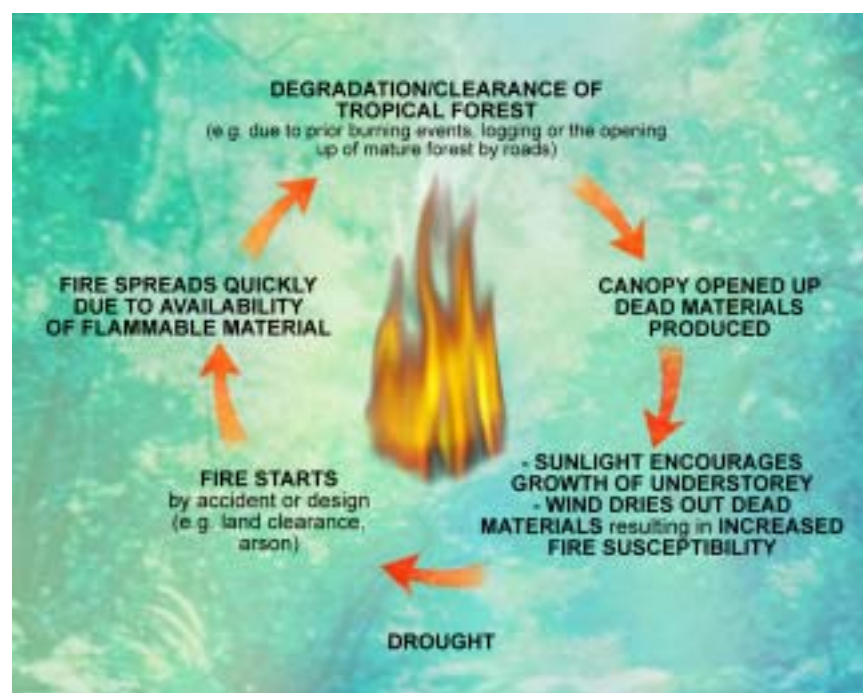


Figure 1. Positive feedback system associated with forest fires

weather around the globe and, in particular, tends to cause drought in the West Pacific.

In normal, non-El Niño conditions (**Figure 2**), the trade winds blow westwards across the tropical Pacific. These winds pile up warm surface water in the west Pacific, so that the sea surface is about half a meter higher at Indonesia than at Ecuador. The sea surface is about 8°C higher in the west than the east Pacific. Rainfall is found in the rising air over the warmest water, and the east Pacific is relatively dry.

During El Niño (see *right hand panel of the schematic diagram*), the trade winds relax in the central and western Pacific. Warm water and air currents no longer flow westwards with the same strength, and the warmest waters move eastward, away from Southeast Asia and towards the central Pacific. Rainfall follows the warm waters, with associated flooding in Peru and drought in Indonesia and Australia (Pacific Marine Environmental Laboratory).

El Niño events tend to occur every two to seven years, and last for a period of twelve to eighteen months at a time. Analysis of data by the US National Oceanic and Atmospheric Administration (NOAA) from the 10 strongest El Niños of the past century has shown that 'they are occurring

more frequently, and that they are becoming progressively warmer' (Rowell and Moore, 1999). Whether or not this change is directly linked to global warming remains uncertain. However, the onset and decline of the 1997/98 El Niño event was predicted accurately by scientists from the Max Planck Institute in Germany, and the model they used incorporated greenhouse-gas concentrations. It seems likely that the rising temperatures caused by climate change could cause El Niño to become more frequent and with increasing intensity. Further, evidence has shown that large-area forest fires load clouds with large numbers of smoke particulates, which condenses the accumulated water vapour and suppresses rainfall, hence tropical fires exacerbates drought events (Leitch *et al.* 1992).

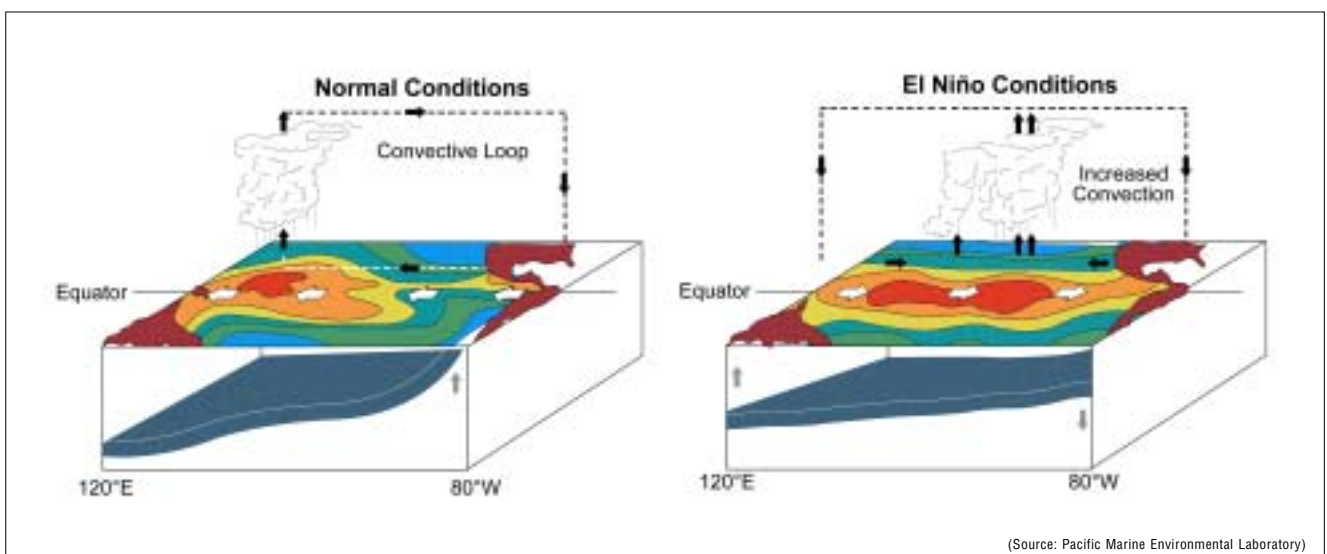
Fire Impacts on Biodiversity

The forests of the wet tropics are one of the richest in biodiversity of any ecosystem on earth (Meffe and Carroll 1977). Tropical rainforests typically occur in areas in which even the driest month of the year has at least 10 cm of precipitation; this is the reason for their abundant, lush vegetation. The annual dry season, although noticeable, is neither dry enough nor long enough to cause the trees to drop their leaves. And

indeed, until the Borneo fires associated with the ENSO event of 1982-83, it was thought that undisturbed rainforests simply could never dry out enough to burn.

Southeast Asia (especially Indonesia and Malaysia) has some of the largest areas of rainforests in the world, dominated by trees of a single family, the Dipterocarpaceae, which includes many valuable timber species that are a mainstay of the tropical timber trade (Whitmore, 1984). Commercial logging is thus one of the chief causes of deforestation in the Southeast Asian tropics.

Another distinctive feature of Southeast Asian rainforests is their large area of peat swamp – wet forests in which organic matter has accumulated for thousands of years without decomposing, resulting in thick peat soils which can reach 20 m in depth. These soils are usually poor in nutrients and are extremely difficult to convert to productive agriculture, but, if properly managed, can often produce valuable Dipterocarp timbers (Whitmore 1984). Recurrent fire events will reduce soil fertility, as the opening of soil surfaces will damage the soil structure. In the next rainy season, the soil particles and ash will be leached by the rainfall into water-courses and estuaries resulting in a decline in water quality.



(Source: Pacific Marine Environmental Laboratory)

Figure 2. Schematic diagram of normal and El Niño conditions in the Pacific Ocean

An assessment of the impact of fires on biodiversity will take months or years, but there are already news reports of alarming consequences for endangered species. Small, slow-moving animals (small mammals, herpefauna) and insects are most likely to be killed outright by fires. During the fire incidents in Kalimantan, it was estimated that 120 adult and 60 juvenile orangutans died in the fires. Another 29 orphaned and displaced orangutans had been found in villages and alongside the roads after escaping from the forests, probably in search of food and water (World Wide Fund for Nature, 1997). Animals that are driven from their normal habitats because of fire become vulnerable to hunting and exploitation by local people, especially when the fires reduce their usual sources of food income. WWF has also noted that 11 protected areas were burnt in the islands of Sumatra, Kalimantan, Irian Jaya, and Java. The areas in which fires are common include the habitats of such critically endangered species as the Javan and Sumatran rhinoceroses and the Sumatran tiger (WWF, 1997).

According to the World Conservation Monitoring Centre, the fires in Indonesia are now threatening at least 19 protected areas, all internationally important, including a World Heritage site (Ujung Kulon in Java), Ramsar Wetland (Berbak in Sumatra) and the Tanjung Puting Biosphere Reserve in Kalimantan. A large number of endangered species is in the path of the fires. Individuals of territorial species fleeing to unburned areas can encounter aggression from the residents and may be killed or injured in fights. Animals with very specific food, habitat, shelter and climatic requirements are most at risk during the post-burn period. Fruit-eating animals and birds such as the orangutan and hornbill species are especially affected, because the trees that they predate on take many years to

mature and fruit. These two species, like many others, are already under tremendous pressure from severe habitat loss. Finally, the loss of key organisms, such as pollinators and decomposers, can significantly slow the recovery of forest ecosystems although interestingly, large herbivorous may actually increase in numbers after a fire event due to the subsequent flush of new vegetation.

Conclusion

Clearance, drought and human activity combined produce the necessary conditions for serious fires in tropical forests. Clearance results in the production of dead, combustible materials (fuel), allows sunlight to reach the forest floor (reducing humidity and encouraging the growth of understorey vegetation), and increases the wind flow through the forest, which both dries out the area and helps to spread fire. During El Niño periods, those people with an interest in clearing areas of forest – be they plantation workers, agriculturists or slash-and-burn cultivators – may take advantage of the dry conditions to set fires. Without firebreaks and careful control over burning (and even with control, under very dry conditions), such fires can quickly become wildfires, causing great damage to healthy forest in the vicinity and associated biodiversity. Forests that have been degraded by human activity or a previous fire event become more susceptible to second or subsequent fires with increasing severity.

More frequent El Niño events do not give forests an opportunity to recover from prior burn events. Large areas of fire-degraded forests may take decades if not centuries for complete regeneration due to loss of keystone species, paving the way for future fires. ■

Terence P. Dawson, Natalie Butt and Florence Miller all work for the *Environmental Change Institute at the University of Oxford, United Kingdom.*

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Photo courtesy of National Interagency Fire Center, Bureau of Land Management, Idaho, USA

FOREST FIRES IN THE ASEAN REGION:

Data, Definitions and Disaster?

► By **PETER F. MOORE**

The Conundrum

Over hundreds of years, fire has been viewed by many as an environmental horror. It has been linked with reduced soil fertility, destruction of biodiversity, global warming and damage to forests, land resources and of course, human assets. Contentions like these fail to make important distinctions about different types of fires and the wrong types of fires in the wrong places (CornerHouse Briefing, 2000).

Forest fires occur either because of anthropological or natural causes. Most fires around the globe are caused by human activity while lightning is probably the most common natural cause of fire. Annually, fires are estimated to burn up to 500

million hectares (ha) of woodland, open forests, tropical and sub-tropical savannahs, 10-5 million ha of boreal and temperate forest, and 20-40 million ha of tropical forests (Goldammer, 1995).

Fire is a paradox – it can kill plants and animals and cause extensive ecological damage, but it is also extremely beneficial, a source of forest regeneration and of nutrient recycling. Fire is nature's way of recycling the essential nutrients, especially nitrogen. For many boreal forests, fire is a natural part of the cycle of the forest and some tree species; notably Lodgepole Pine and Jack Pine are 'serotinous' – their cones open and seeds germinate only after being exposed to fire. Mountain ash, a flowering eucalypt of temperate Australia, also requires a site to completely burn and be

exposed to full sunlight for the species to regenerate. In such circumstances, fire is essential. Burning quickly decomposes organic matter into mineral components that stimulate plant growth, and may also reduce disease in the forest (Gorte, 1995). But fires under extreme weather conditions can also be devastating.

Fire causes severe damage to tropical forest ecosystems, such as those in Southeast Asia, which are characterized by high levels of humidity and moisture. These ecosystems do not normally burn and are extremely prone to severe fire damage. Research from the Amazon indicates that damage from fire, although not initially obvious, can be long-lasting on the tropical forest ecosystem (Nepstad *et al.*, 1999; Cochrane *et al.*, *in press*).

Just as too much fire can cause problems, so can too little. Some countries, notably the United States, have had a policy of suppressing most fires. Under these circumstances fire suppression can lead to unnatural conditions wherein forests, which have historically adapted to small intermittent fire episodes, would no longer burn, leading to a build up of fuels and altered tree species composition. When a fire does start, instead of being relatively small, it would be much more intense and large-scale (Gorte, 1995). During the fires in the United States in 2000 where over three million hectares were burnt and the firefighting costs exceeded US\$1 billion, this result of fire exclusion was evident, though not the only factor.

Fire has played, and will continue to play, a major role in shaping forest ecosystems throughout the world. In almost all forest ecosystems, humans have altered the natural fire regimes by changing the frequency and intensity of fires. People have excluded or introduced fires and changed the nature of the landscape so that a naturally occurring fire will not behave in the same way it would have in the absence of human impact. The interrelationship between humans, fire and forests is a complex one and has been the subject of countless studies and reports (Jackson and Moore, 1998).

People may start too many fires purposefully and yet there are too few circumstances where responsibility for planning, containing and using fires is clear. The benefits of good land management and of the costs of poor practice are too diffuse. The implications and impacts of forest fires remain unclear and poorly understood in most cases.

The Year the World Caught Fire

During late 1997 and early 1998, fires in Southeast Asia, South and Central America, Europe, Russia, China, Australia and the USA attracted world attention. A combination of the dry conditions caused by El Niño and uncontrolled burning practices took their toll on the world's forests. "Unchecked land, bush and forest fires in various parts of the world are rapidly becoming a disaster of regional and global proportions," said the United Nations (UNDAC Mission Report, 1998). It seemed, as the World Wide Fund for Nature (WWF) said at the time, that in 1997 "the world caught fire" (Dudley, 1997).

From Papua New Guinea to Southeast Asia – Malaysia and Indonesia, fires have damaged hundreds of thousands of hectares of forest and other lands. They burned the most in Indonesia, with fires in

Java, Borneo, Sulawesi, Irian Jaya and Sumatra affecting over 9.5 million hectares; of the area burned about 49% or 4,655,000 hectares was forested. The economic cost of the fires was estimated to be between US\$5-10 billion. At the height of the fires, the smoke stretched over one million square kilometers adversely affecting over 70 million people's health.

Other tropical forests also burnt in 1997-98. In Brazil, an estimated 3.3 million hectares of land burnt of which 1.5 million was rainforest in the northern Amazonian state of Roraima alone, scene to some of the worst fires in the region. Further North in Mexico and Central America, 1.5 million hectares of forest were burnt, affecting numerous ecological reserves and national parks. Millions of people throughout the region, including the southern United States, suffered from the resulting pollution.

Temperate forests burned as well. Over five million hectares of forest were affected in the United States and Canada. In Russia, the UN estimated that the total area burned by fires was 2 million hectares. For 1997 and 1998, over 22 million hectares of land, of which some 14 million was forest, were impacted by fire that adversely affected over 130 million people's health (Table 1).

	Area impacted (million hectares)	Forest area impacted (million hectares)	Protected areas affected	Indigenous people affected	Population affected by haze	CO ₂ produced (tons)	Economic Impacts (US\$ billion)
Southeast Asia	8-10	4.66	19	60-80,000	70 million	11 million	10
Amazon	3.3	1.5	N/A	22,000	N/A	N/A	N/A
Russia	2	~2	4	9,000	1 million	30 million	N/A
Central America	~1.5	1.48	2	N/A	At least 50 million	N/A	N/A
Northern America	5.6	At least 4.7	N/A	N/A	N/A	N/A	At least \$0.5
Southern Europe	0.24	0.105	N/A	N/A	N/A	N/A	N/A
Incomplete Totals	22.64	14.4	25	121,000	130 million	41	N/A

Table 1. Global Figures and Estimates of Damage for 1997/98

Fires in the ASEAN Countries

All the countries of the ASEAN region have experienced forest fires. But the extent and obvious impacts of those fires have not gained the same profile or attention as have the fires in Indonesia, dramatically captured on film. The following brief summaries for each country are adapted from the Global Fire Monitoring Centre country profiles.

Cambodia. Fire, though not widespread nor considered a serious threat to the forests of Cambodia, could become a threat if forest degradation continues at the current rate, creating favorable conditions for large-scale forest fire. Fires occur annually in the natural hardwood forests, pine forests, bamboo forests and forest plantations during summer months.

Lao PDR. An estimated 90% of forest fires in Lao PDR originate from slash-and-burn cultivation practices and traditional hunting methods. No reliable statistics are available.

Malaysia. Forest fires in Malaysia have been reported especially in pine plantations in the 1970s and in *Acacia mangium* plantations in the 1980s. Due to the lack of systematic reporting procedures, only recent statistics are available, and only for

Peninsular Malaysia. Fires occur sporadically in natural forests, and are prone to occur in secondary forest areas, particularly those adjoining cultivated sites. The chances of fire occurring and the severity of a fire are greater in monocultures or in heavily disturbed forests. Most fires are caused by human activities, escaping during prolonged hot and dry weather, although often stopping in undisturbed forest.

Myanmar. Foresters of Myanmar have traditionally emphasized prevention over suppression of forest fires. The need to manage teak regeneration and the understanding that forest fires are more difficult to suppress supported this approach. The forests are predominantly natural, damp and the undergrowth mostly moist and green. Forest fire fuels have been managed (reduced) by prescribed burning where other fires had not consumed them.

Philippines. Forest wildfires in the Philippines are all human-caused (carelessness, negligence, accident and incendiarism). There have been no known wildfires caused by lightning. Some 290 forest fires occurred in 1995, the majority (52%) of unknown cause. About 197 forest fires, or 68%, occurred in the central

and northern part of the country. Representatives from various sectors of the community, local government units, non-government organizations (NGOs) and institutions have united with formal government forest protection efforts through Multi-Sectoral Forest Protection Committees established in both the regional and municipal levels of the country.

Thailand. Control of forest fires in Thailand is the responsibility of the Royal Forest Department, carried out by a network of Forest Fire Control Centres with 14 Forest Fire Control Stations, and 20 Forest Fire Control Projects that were initiated by His Majesty the King. The strategies applied in forest fire control include forest fire awareness campaigns (mobile campaign units, mass media, school programs, exhibitions, billboards) and forest fire suppression. Of the total forested areas, about 12% (20,000 km²) are covered by forest fire control and concentrated north of the country since 1993. Of the areas under control, only about 0.5% (100 km²) is affected by fire annually, compared to about 15% nationwide. Fire prevention and control efforts, which include training of staff and local volunteers in fuel management, fire detection and reporting, fire suppression and law enforcement and rescue operations, seem very effective where these are applied.

Vietnam. The country covers a total land area of around 33 million ha, of which approximately 9.3 million ha are classified as forested lands (8.6 million ha natural forests, ~700,000 ha forest plantations). Fire problems include: regularly occurring fires in seasonally flammable deciduous forests; wildfires in pine forest ecosystems and in other natural and degraded vegetation; fires used in shifting agriculture and deforestation as well as in intensively treated agricultural land. The peak of burning activities in Vietnam is during the mid to late dry season (January to April). Recent efforts to



Photo by John MacKinnon

Roasted owl with feathers, anyone?



Photo courtesy of Thailand National Biodiversity Reference Unit

Thai firefighters in action

allocate forested lands to households who use them for grazing and growing commercial trees, have reduced the number of fires and improved the management and protection of forests. In some areas, natural forest cover is returning.

What is known about Fires in ASEAN region (and elsewhere)?

The impact of fires on the forest depends on the scale (extent), frequency, distribution (or patchiness), intensity and seasonality of the fires. These elements combine to produce a distinct fire regime. Varying any one of these elements will alter the fire regime, which can result in long-term impacts on biological diversity and change the forest's capacity to provide ecological services. To characterize the fire regime of an area or country, we must have data collected over some years, which includes appropriate data that enables analysis, and for which the terms and definitions of collection are clear.

For all countries in the ASEAN region, the information available on forest fires is incomplete, with measurement parameters and definitions generally unavailable. In some countries, the information includes:

- Date of the fire;
- Area burnt and
- Location of the fires.

These data would enable the calculation of the number of fires per year, the area burnt and the distribution of fires throughout the year (seasons). Generally, where it is available, this information is not systematically collected across the entire land base of the countries of the region. Apart from Vietnam, the other countries do not seem to collate or publicly report their data. The available data would allow the analysis of the geographic characteristics of forest fires. As successive years of data are collected, a picture of the characteristics of fire for a country can be developed. For example, while Indonesia has the largest extent of forest fires in the region, some of its provinces have very few 'uncontrolled' fires at all (West Papua, Java) while others seem to have many (Riau, Jambi, East Kalimantan).

An important aspect of forest fires that is not addressed well enough (in most parts of the world) are the key questions: Who started the fire and why? The motivations for people lighting fires is a critical element that must be understood in order to identify opportunities to influence change in the regime of fire that is present, if a change is agreed to be desirable. In most cases, fires that are lit in the ASEAN region are deliberately set to achieve a man-

agement purpose (whether endorsed, positive or neither). It is critical to know which fires are important and to whom. There may actually be very few, if any, 'uncontrolled' fires in Southeast Asia, except in extreme drought years when deliberate fires may exceed the preferred boundaries of those who light them. In some cases, there may be little or no opportunity to change the frequency, area burnt or location of fires due to the motivations for starting the fires and the alternatives to fire that might be available.

This circumstance of inadequate data (inconsistently collected and poorly defined) is not restricted to the region. Experience with China, Portugal, Russia, the Mediterranean nations, the European Union and the efforts of the Food and Agriculture Organization (FAO) of the United Nations over decades has provided some information but demonstrated that completeness and consistency remain little more than a (perhaps) desperate dream.

Some Perspectives on Fire

Forest Fire is the concern of many actors in local, provincial, national and international societies. It is worth considering briefly the different perspectives that some major stakeholders may hold on forest fires.

Fire as the user perceives it.

For majority of the people who use it, fire is:

- One of the oldest, most familiar tools available and has been used as a management technique in land clearance and management for centuries;
- The obvious mechanism for thousands of farmers, ranchers and plantation owners on the edge of the agriculture frontier pushing into forests; and
- Normally the least expensive and most effective way of clearing vegetation and of fertilizing nutrient poor soils.

Fire as the fire manager perceives it. For the people allocated the responsibility for managing fire, there are many questions:

- What prevention activities are appropriate?
- What pre-suppression activities and preparation are needed?
- Who do I need to work with?
- Where is the fire now?
- What is the weather now?
- Where will the fire be at a given time in the future?
- What will the weather be then?
- Do I need a crew, machinery, divine intervention or a stiff drink?
- Has the fire report been done?
- What are the restoration steps to be taken after the fire?
- Has the annual fire analysis and report been done?

Fire as the forest ecosystem perceives it. The impact of fires on the forest depends on:

- Scale (extent). How big is the fire?
- Frequency. How often do fires occur in the same area?
- Distribution (or patchiness). What proportion of the forest is burnt in any one fire?
- Intensity. How 'hot' was the fire? How long did it take to burn the area it covered?
- Seasonality. What time or season of year did the fire take place?

Fire as the researcher perceives it. Research sets out to test hypotheses and works to improve understanding. This approach generally requires detailed information that would assess the influence of the

variables being monitored and the assumptions made. Researchers are often interested in 'accurate' fire measurement including the:

- Rate of perimeter spread (meters per unit time, direction);
- Dimensions and shapes of flames (height, length, depth);
- Fire temperatures (at various heights above ground over time and perhaps under the soil surface);
- Residence and burn out times (how long was the fire burning in one spot); and
- Rate of energy release (kilowatts per meter of flame front per second).

In many cases these attributes of fires are very difficult to collect, particularly for high intensity fires.

Fire as the media perceives it. The media does not normally report forest fires unless above a 'threshold' of size, impact or concern. This threshold may vary with the quality of visual material avail-

able and the profile of competing items of news or current affairs. Often the messages conveyed by the print, radio and visual media present a very simple picture of a complex situation. For example, the media tends to report that:

- All forest fires are harmful (not true);
- Forest fires are caused by El Niño and weather (not necessarily true); and
- Forest fires are important only when they happen (not true).

The perspective of the media is perhaps best reflected in the adjectives used in reporting forest fires such as:

- Disasters and Catastrophes that Rage across the landscape and lead to;
- Devastation and Destruction which is due to;
- Arson, Corruption and Big Business impacting upon the;
- Ecosystem, the Poor, the Innocent and the Indigenous.

Notably while all these terms may be in part pejorative, the last two sets are potentially accurate.

What Data do We Have?

While the search for data sets on fires has enabled broad conclusions about the lack of them, there is a need for a systematic data gathering exercise. A review of existing sources of data should examine not only the official information held by government agencies (including non-forest agencies and provincial and local governments), but also the information collected by NGOs (Global Fire Monitoring Centre), projects (Bowen, and ARCBC Workshop on Minimizing the Impact of Forest Fires on Biodiversity in ASEAN) and third parties such as the excellent work done by Liew Soo Chin of the Centre for Remote Imaging, Sensing



Photo by Anya Hoffman, Integrated Forest Fire Management project (IFFM/GTZ), Indonesia

Living through haze

and Processing (CRISP).

What are the Data Requirements?

Development of fire management systems, approaches to fire planning, integrated and sustainable forest management and biodiversity conservation where fire is a factor have been preceded by significant efforts in:

- Analysing fire causes and locations – to enable a focused and directed approach to the fire problem;
- Understanding and predicting fire behaviour – to define and manage appropriate levels of fire response and fire use; and
- Developing fire danger rating systems – to support planning and operations.

These developments all depend, in major part, on the fire data collected that would permit analyses, correlation and improved understanding. In the ASEAN region at present there are some sound and exciting initiatives, including those done by Bowen (2001) and Soo Chin (2001). Timely as they, and other efforts are, in the absence of data on fires, there will be a limit to their utility and a restriction on further development and evolution. The process of defining the useful data to be collected as a standard set of information about forest fires has been addressed many times over the years by a great number of people with relevant interest and expertise, among them experts gathered together by the Food and Agriculture Organization (FAO) and the International Tropical Timber Organization (ITTO).

How do we meet Data Requirements?

Suggestions for consistent collection of data by countries and for the collection of a standardized set of 'core' data have been recommended to FAO (FAO, 1999), ITTO

(ITTO, 1997) and the Consultative Group on Indonesian Forests (Dieterle, 1997), among others. The series of recommendations and proposals by many organizations do not yet appear to have been implemented in any instance. The potential importance of the information to all the affected and responsible stakeholders should be socialized and opportunities to demonstrate the value of the collection of simple sets of data for fires taken.

Conclusions

Fire characteristics in the ASEAN region that are required for the development of sound practices and solutions to the negative impacts of forest fires, are not well known. Few countries worldwide consistently collect the necessary information or make it available. The minimum fire data required may include:

- Date
- Cause
- Size
- Location

Maps of fires, weather parameters and data on fire behavior would enable a more sophisticated analysis. The questions with respect to this issue would appear to be:

- Why has the collection of fire data not become routine practice?
- What can be done to bring it into routine practice?

Project FireFight Southeast Asia is very interested in any ideas and input about the issue of data and its collection for forest fires. ■

Peter F. Moore is the Coordinator of Project FireFight Southeast Asia, an initiative of IUCN-The World Conservation Union and WWF International funded by the European Union.

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BIODIVERSITY LOSS IN SUMATRA, INDONESIA

Vegetation Fires: cause or symptom?

► **By M. RODERICK BOWEN and
BERT H. BORGER**

The Great Fire of Borneo'. This describes the vegetation fires in Indonesia that first attracted international attention in 1982-83. Since then, fires and the smoke haze pollution they produced have hit the world headlines in 1987, 1991, 1994 and 1997-98. The common factor in each of these years was a severe El Niño drought.

What is not generally realized is that thousands of vegetation fires occur every year. And it is these 'routine' fires, rather than just those in El Niño years, that should alert conservation groups to the relentless destruction of natural habitats that is taking place year by year throughout Indonesia.

The European Union-funded Forest Fire Prevention and Control Project

(FFPCP), which is based in Palembang, South Sumatra, has, in the five years since 1996, built up a detailed understanding of vegetation fires throughout the island. The GTZ Integrated Forest Fire Management Project based in Samarinda, East Kalimantan, has gained similar knowledge for the island of Borneo.

This article focuses on vegetation fires and the loss of biodiversity in Sumatra, myths that surround fires, the fate of protected natural areas in Sumatra; it will attempt to answer the question, 'Are vegetation fires the cause or simply a symptom of biodiversity loss?'

Loss of Forest Cover in Sumatra

The diminution of forest cover in Sumatra has been quick in time and dramatic in extent. It began slowly. From the early 1900s to the end of the 1930s, the Dutch progressively

established rubber plantations and agriculture around Medan, north of the island - the *cultuurgebiet*. But by today's standards the loss of forest was small. In the south, migrants from densely populated Java have settled in Lampung from early in the last century and slowly expanded their farms. In this case the loss of forest was comparatively large but, again, the rate of conversion was relatively slow.

Forest loss accelerated significantly from the mid-1960s when government-sponsored transmigration schemes started to move large numbers of landless people from overcrowded Madura, Java and Bali to the pre-cleared forestland in Sumatra. The families came from urban areas, had no farming experience, and were settled on land known by local farmers to be unsuitable for agriculture. The failure of the schemes was predictable but efforts continued until the early 1990s, resulting in great destruction of the forest.

At the same time, numerous logging licenses were issued to companies to harvest timber on a 'sustainable' basis. The lack of effective supervision of the companies and their harvest operations also had a predictable outcome. All saleable timber was cut with no regard for the damage caused to the residual stand. The exploitation continued unabated for the next thirty years.

The final process of forest decline began in earnest in the late 1980s with the change of status of many of the heavily degraded woodlands from 'Permanent Production Forest' to 'Conversion Forest', i.e., the residual trees could be felled and the land used for agriculture. In the Sumatra context, agriculture usually equates with commercial oil palm estates.

Current, and perhaps generous, estimates for the virgin forest area left in Sumatra put the figure at around 5 million hectares, or just over 10% of the total land area. The



Photo by Anya Hoffmann, Integrated Forest Fire Management project (IFFM/GTZ), Indonesia

conservation value of this remaining forest is reduced by its fragmented distribution, continuing illegal logging and encroachment. Almost all the lowland dipterocarp forest has been removed or heavily logged. Closed canopy forests are now largely confined to the least accessible parts of the Bukit Barisan mountain chain and to the most distant corners of the east coast wetlands.

Ten major groups, abetted by numerous smaller companies, drive the expansion of oil palm estates within Indonesia. The government, mindful of the need to feed its people, increase export revenue and provide employment in rural areas, has encouraged the growth of the sector. The pulp wood plantations in comparison play a much less dominant role within Sumatra.

The area planted to oil palm in Sumatra has increased dramatically from 144,000 ha in 1986 to 1.1 million ha in 1996, and to 1.98 million ha in 1998. Its current estimate is 2.5 million ha, which is perhaps conservative given that Riau province alone claims 2.1 million ha. Projections of palm oil consumption suggest that demand would continue to increase. Unless government policy changes, over one million hectares will be planted to oil palm in Sumatra over the next 20 years.

Indonesian Fire Myths

With the many internationally supported fire projects that have come and gone, it would seem reasonable to assume that the phenomenon of vegetation fire is widely understood in Indonesia. Sadly, this is not the case. It has been found that people cling to many false beliefs, either through ignorance, or equally often because it is politically expedient to maintain the lie rather than face the truth. The fire myths and the facts noted here relate to Sumatra, although, with some inter-island variations, are generally applicable throughout Indonesia.

Myth number one is that the fires in Sumatra are forest fires. This is not the case since fire prone environments in Sumatra are grasslands, re-growth scrub, and during severe droughts, heavily degraded secondary forest and smallholder farms. Virgin, lowland, and tropical forests, the primary vegetation of much of Sumatra, do not burn, even in El Niño years.

Why then is the term 'forest fire' so widely used? It may be because 70% of land in Indonesia remains classified as 'Forest Land' and thus any fire that occurs there is seen as 'forest fire.' Or maybe the term is emotive and attracts donors and their money, or maybe it is through ignorance. The term 'vegetation fire' is much more accurate and thus will be used in this article.

The second myth is that smallholder farmers are responsible for most of the fire damage. Here the commonly used term is 'slash and burn', which brings to mind a relentless attack on virgin forests by an army of farmers who cut down the trees, burn them, farm for a year and move on. This land use pattern does not occur in Sumatra and there is no evidence that it is still widely used anywhere in Indonesia. Instead, there are tens of thousands of small settled farmers who cultivate their land on a permanent but rotational basis. These smallholders, who commonly farm a two to four-hectare plot, do indeed use fire each year to clear grass and scrub from the half-hectare of their land that has been under fallow. No effective and affordable alternative is available to them to prepare their plots for cropping. The reality is that there is a shortage of income to buy herbicides as well as labor to practice the 'green' methods of cultivation advocated by idealists. However, through generations of continued fire use and an existence reliant on its use, smallholders are skilled fire users. Moreover, neighbors and the wider community cooperate to con-

trol the fire spreading beyond the intended boundary. It is unrealistic to entertain any notion that smallholder farmers can be persuaded to change their land preparation regime.

Myths three and four relate to fire causes and are easily dismissed from local observation and international fire research. Myth three, which is that fires in Indonesia are started by lightning, is effectively refuted by a total lack of evidence. Myth four is that discarded cigarettes cause fires. Worldwide research shows that cigarettes start few fires. The tiny number of fires ignited by cigarettes is restricted to regions with highly specific weather and fuel conditions, and do not occur in the humid tropics.

Myth five is that all fires need to be suppressed – a notion that is heavily promoted within the ASEAN Regional Fire and Haze Action Group. In all except El Niño years there have been no wildfires to suppress. However, under political pressure from its neighbors, Indonesia has signed on to a no-burn policy. Thus, the new law of 5 February 2001 bans the setting of all vegetation fires and makes the landholder responsible for the suppression of any fire that does occur.

Myth six is that the provision of fire equipment and some training to staff of government agencies based in Sumatra will eliminate the fire problem. This approach has been tried and has, in most cases, failed. What is needed is a fire management capability integrated within the current land management agencies. There is a desperate need for government agencies responsible for land-use policy and land-use planning to move from the present exploitative approach to natural resources, to one of sustainable development that takes into account the need to integrate fire management.

These six myths have too often shaped the proposals and the attempts to deal with vegetation fires in Indonesia. Failure to understand

the underlying causes of vegetation fires and the inability to incorporate the knowledge already gained into fresh plans and new actions, means that there has been little improvement in the fire situation.

The Facts

With the fire myths exposed, what is factually known about vegetation fires in Sumatra? Essentially, research provides us with an estimate of what year, where and why fires occur, as well as the means to reduce their occurrence and the damage they cause.

The locations of fires - now widely known as 'hot-spots' - are obtained from the interpretation of data captured during the thrice-daily overpasses of the National Oceanic and Atmospheric Administration (NOAA) satellites. There are some limitations to the locational accuracy of these data, but when read as a time-series they provide a clear picture of fire numbers and distribution. When NOAA data is combined with the less frequent but highly detailed imagery obtained from SPOT satellites, an accurate and comprehensive story emerges. Incorporating Geographical Information Systems (GIS) data and extensive field visits would further enhance our understanding of the true fire situation.

Fire occurrence in Sumatra is controlled by seasonal rainfall, although the actual fire numbers in each of the island's eight provinces are heavily influenced by land-use. From 1996 to 2000 a wave of land clearance fires moved down Sumatra in a north to south direction. In the north, fire numbers peak before July, in central Sumatra from July to September, and in the far south, August to October; these peak months generally have the lowest rainfall occurrence in each province. Three patterns of fire occurrence, overlaid on the seasonal variations, are recognizable from the satellite imagery. The three can be best described as 'scattered', 'linear' and 'block'.

The scattered hot-spot pattern denotes a sprinkling of short-lived fires over a wide area. The pattern is typical of fires set by smallholders in permanent agricultural land. Such fires are not a threat to biodiversity conservation except in El Niño years. The linear hot-spot pattern is typical of fires that appear along new road lines and indicates the readiness of individuals to seize their chance and occupy a newly opened area as it becomes available. For the conservationist, the message is obvious: improved access causes forest loss. The block hot-spot pattern of burning seen in Sumatra is indicative of large fires that persist day and night over days, weeks and sometimes months. In majority of these cases, fires are the last step in land conversion to estate crops, used mainly to eliminate residual vegetation.

When many fire blocks are found close together within a region, they constitute a 'fire zone'. There are currently seven such fire zones in Sumatra. Five of these are caused by commercial-scale land-clearance to develop oil palm estates. The sixth fire zone marks the progressive destruction of Berbak National Park aided by prawn aquaculture and farming carried out by Bugis migrants on the coastal margin, and by illegal logging throughout. The seventh fire zone, in South Sumatra, has arisen from a combination of failed transmigration schemes and legal and illegal logging. Five of the seven fire zones are in wetlands and are largely on peat soils. Peat soils burn slowly and were the source of the massive transboundary haze of 1997 and of the intermittent episodes in 1998, 1999 and 2000.

Protected Areas

By 1998 according to government lists, there were 302 National Forest Reserves and 138 Protection Forests in Sumatra, covering a total area of 544,000 ha, and proposed sanctuary areas totaling 597,000 ha. The International Union for the

Conservation of Nature (IUCN) notes on its website that within Sumatra there are: three Nature Parks, two Forest Parks, eight Wildlife Reserves, eight Nature Reserves, and six National Parks.

We know that of the six IUCN-listed National Parks - the showpieces of conservation effort - Way Kampas was swept by fires in 1997, Berbak, as noted above, is both fire damaged and heavily encroached, and Gunung Leuser is plagued with illegal logging. We can only guess the fate of the other Reserves, Protection Forests and Parks, but we can fairly assume that many now exist only in name.

Conclusion

We have shown that the massive loss of forests within the wetlands, the plains and in the mountains of Sumatra, with the inevitable wide-ranging loss of their associated biodiversity, have two primary causes. These can be summed up as unsustainable levels of timber harvesting, and the conversion of forest to agriculture. The first allows fire to invade the heavily modified forest; the second uses fire in the conversion process. In both instances, it is the chainsaw that precedes the fire. The vegetation fires of Sumatra are a signal or a symptom of forest destruction, and are not its cause.

The immediate challenge for biodiversity conservation is to work with and influence the government agencies responsible for land-use policy, land-use planning, and land administration. The first aim must be to prevent further loss of the few remaining undisturbed natural forest areas; the second, to protect the less degraded forests with the expectation that, given time, they will return to near their pre-disturbance state.

The omens are not promising. ■

M. Roderick Bowen and Bert H. Burger work with the European Union-funded Forest Fire Prevention and Control Project, South Sumatra, Indonesia.

FOREST FIRE IN MALAYSIA

Its Management and Impact on Biodiversity

► By AHMAD ZAINAL MAT ISA

By the end of year 2000, an estimated 19.93 million hectares of forest cover 60.7% of Malaysia's total land area, with the forested area higher in Sabah and Sarawak than in Peninsular Malaysia. Of the total, 18 million hectares are classified as Inland Dipterocarp Forests, commonly referred to as evergreen rainforests. The generally high temperature and moist conditions in the natural forests that give rise to a high rate of litter decomposition, contributes to the low occurrence of large-scale forest fires in Malaysia.

In the last three decades however, large tracts of forestlands have been planted to monoculture crops. Some 1.65 million hectares of rubber and 2.62 million hectares oil

palm have been established, posing higher fire risks than the natural forests. Also logging activities in the natural forests produce a lot of waste, thereby increasing flammable material, and the opening of canopies reduces the water retention capacity of the forests, which thus become more susceptible to fire. In human settlements located close to forests, where land is cleared through burning for agriculture, fire breaks out often into the natural forests.

Recent forest fires and the resultant atmospheric pollution in Malaysia and throughout Southeast Asia have brought to light the importance of forest fire and smoke management. The worst forest fire reported was in Sabah, Malaysia in 1983 – 1985, where over one million hectares of mostly logged-over forests were burnt, and the cause attributed

to the severe drought (El Niño effect) then.

Forest Biological Diversity

Tropical forests are estimated to cover only about 7%, or approximately 9 million sq km of the Earth's land surface, yet contain at least 50% of all species (Myers, 1988). In this context, the four-layered rainforest of Malaysia is among the top ten mega-diversity sites, and accounts for about one-third of the world's flowering plants under the International Union for Conservation of Nature and Nature Conservation (IUCN) - World Conservation Union classification.

Estimates show that Malaysia has 14,500 species of flowering plants, of which 8,000 flowering plants are found in Peninsular Malaysia. Of the 8,000, some 2,650 are tree species with 890 reaching harvestable sizes of at least 45 cm diameter at breast height (dbh). Of the 890 species, 408 have been marketed internationally under the Malaysian Grading Rules. For the non-flowering plant species such as fungi, algae, bryophytes and lichens, which are also important



Photo by Anya Hoffman, Integrated Forest Fire Management project (IFFM/GTZ), Indonesia

components of forests, further research work is needed to estimate their number. Parris and Latiff (1996) estimated about 1,159 fern species.

Many forest plant species provide an extremely wide range of useful products relied on by both urban and rural people, in particular forest dwellers. Other than as a source of wood utilized worldwide and still predominantly harvested from the various forest types, many of the presently cultivated plants have been selected from the wild and have become food sources for the world populations (Zakri and Latiff 1996). Indigenous people in tropical countries rely on wild and traditionally cultivated plant species for their needs. Of the estimated 250,000 species of plants, only about 3,000 species are regarded as food sources; many more species are believed to have high potential either as food or medicinal sources.

At the Malaysia-Brunei border, the vegetation consists of beach, mangrove, riparian, mixed dipterocarp, heath, and secondary forests, all rich in terms of species, genetic and ecosystem diversity; any degradation of such forests would be a great loss to tropical diversity. However, only heath and secondary forests are more prone to forest fires as they are comparatively drier in certain months of the year.

Impact of Forest Fires on Biodiversity

Peninsular Malaysia

No major fire has been documented in the natural forests, except some isolated outbreaks in pine plantations in the 1970s and Acacia mangium plantations in the 1980s. Estimates reveal that about 1,100 hectares of Pine and Acacia plantations were burned in the 1970s and 1980s. However, since the early 1990s, when the Forestry Departments in Peninsular Malaysia enhanced the documentation of forest fire incidence in the Permanent Reserved Forests (PRFs), about 1,232

fires were reported from 1992 to 1998. Records show that the most number of fires (333) occurred in 1994, of which 84% was attributed to land clearing for farming.

Most forest fires occurred during the prolonged annual dry spells between January to March, and June to August. Fires occurred sporadically in the natural forests, and more frequently in the secondary and peat swamp forests, the gelam forests on raised sand beaches on the east coast, and in forest plantations.

Sabah

Reported incidences of forest fires were more severe in Sabah than in Peninsular Malaysia. The worst fire recorded happened from 1983 to 1985, affecting an area of about one million ha in mostly logged-over forests. This was attributed to the severe drought caused by the El Niño phenomenon.

Most fires are caused by human activities during prolonged hot and dry weather. Reports show that logged-over areas were the most affected by fire and that the fires stopped upon reaching the undisturbed forest.

Sarawak

In Sarawak, fire incidences have not become a major concern because only small areas within forest plantations were affected. There have been no major forest fires in the natural forests except in 1998 when fire started in the peat swamp and secondary forests in the outskirts of Miri town. Forest fires also took place in a hill forest concession area in Southeastern Sarawak, bordering Indonesia.

Sarawak's forest fire management is distributed among three main agencies: the Sarawak Forestry Department (forest fire protection measures and rehabilitation of burned areas); the Sarawak Natural Resources and Environmental Board (implementation of regulation under the Natural Resources and Environ-

ment Ordinance); and the Fire and Rescue Department of Malaysia (fire suppression).

1998 Fire Incidence

In 1997/98, Malaysia experienced one of the most severe forest fire episodes in history as a result of prolonged dry seasons following the El Niño phenomenon. Incidences of forest fires were reported in almost all states, which was unprecedented. Forest fires consumed the most in Sabah, accounting for 73% of the total land area. Table 1 provides a summary of the number of hectares burned during the period.

In terms of forest type, the peat forests suffered the most, with 63,331 (98%) ha burned in 1998 (Table 2). Land clearing for agriculture was identified as the most likely cause of most of the forest fires.

Prevention, Protection and Enforcement Measures Forest Protection Considerations

Protection considerations may include soil, water and fire protection as well as protection of the residual stand from damage. Generally, logging or timber harvest planning in multiple-use forests should consider public safety and protection of the environment. Public relations considerations require special attention for the protection of streams or rivers from siltation and debris, preservation of potential camping and picnic sites along streams and providing buffer zones in recreational forests.

In the monitoring and evaluation of forest management and timber certifications, Criterion 3 (Forest Ecosystem Health and Condition) of the Malaysian Criteria, Indicators, Activities and Standards of Performance (MC&I) requires that states (Forest Management Units or FMUs for Peninsular Malaysia) assess the identification as well as severity of damage caused by human activities and natural causes including fires. The certification process also includes

Location	Area (Hectares)	Probable Causes
Kelantan	605	Snapped electrical transmission lines and land cleaning by farmers
Selangor	255	Land clearing by farmers and disposed cigarettes
Perak	100	Hunting and other unknown causes
Johor	56	Campers and other unknown causes
Kedah	41	Land clearing by farmers
Terangganu	1,315	Land clearing by farmers and other unknown causes
Pahang	427	Land clearing by indigenous people and local farmers nearby, and other unknown causes
Sabah	47,500	Land clearing by local farmers
Sarawak	14,200	Land clearing by local farmers
Total	64,499	

Note: From unpublished reports of Forestry Departments, FRIM and Fire and Rescue Department Malaysia

Table 1. Areas affected by Forest Fires in 1998 by State

Forest Type	Area (Hectares)	Probable Causes
Peat Fores	63,331	Land clearing by farmers and indigenous people, hunting and other unknown causes
Secondary Forest	432	Land clearing by farmers and other unknown causes
Degraded Heat Forest	310	Land clearing by farmers
Heath Forest	250	Unidentified
Logged-over forest	120	Unidentified
Forest plantation	26	Snapped electrical transmission lines, cigarettes and other unknown causes
Montane forest	15	Camper
Coastal swamp forest	15	Clearing by fishing villagers
Total	64,499	

Table 2. Area of Forest Type burned in 1998

assessing the availability and implementation of procedures covering the use of chemicals in the forests and fire management in the respective FMUs.

National Forest Fire Action Plan

As a result of the dense haze episode in 1994 and the outbreaks of forest fires in 1994/95 and 1997/98, the Government of Malaysia took note of the limited forest fire fighting capability in controlling major fires. The Government thus proposed a National Contingency Plan to Combat Forest and Plantation Fires in Malaysia that aims to:

- Establish an immediate and coordinated response system on forest and plantation fires;
- Enhance response with the existing resources in terms of equipment, manpower and training;
- Alleviate or minimize the adverse impact on the environ-

ment resulting from forest and plantation fires; and

- Establish an early warning system to alert the relevant authorities at national and regional levels.

In view of the destructive nature and spontaneity of forest fires, a mechanism for immediate response by all relevant agencies was put in place to reduce the negative impacts such as loss of property and environmental degradation. In 1998, the Government of Malaysia directed the National Disaster Coordinating Committee to include forest fires under its jurisdiction in addition to its existing responsibilities for flood, urban fires and industrial and other natural disasters. This was followed with a draft Standard Operating Procedure (SOP) for forest and plantation fires that will be implemented as soon as possible. The SOP was formulated in line with the Malaysian National Haze Action Plan, which is a com-

ponent of the ASEAN Regional Haze Action Plan. Among others, the draft SOP provides guidelines relating to the responsibilities of various government agencies and chains of command in response to large-scale forest fires.

Levels of Forest Fire Management

Forest fires are normally reported either by the public or through routine monitoring by relevant agencies such as the Department of Environment, the Police Air Wing, the Forestry Department, and the Fire & Rescue Department. Depending on the extent and severity of the forest fires, which are assessed according to the categories described below, responsibility for the management of forest fires rests on the Disaster Management Committees formed at the district, state, and national levels. Membership for each committee and the chains-of-command are given in the SOP guidelines.

Level 1 - Forest fires that can be effectively dealt with by the local Fire and Rescue Department and other relevant agencies; no risk of spreading to other districts.

The District Disaster and Rescue Management Committee, headed by the District Officer, manage these forest fires. It is tasked specifically to mobilize government mechanisms and manpower to combat large-scale forest fires at the district level. Members include District level agencies or officers such as the Fire and Rescue Department, Police Department, Health Officer, Engineer, Forest Officer, Local Chief of Civil Defense, Officers from the National Parks and Wildlife Department, the Information Department, and other relevant organizations.

Level 2 - More serious forest fires that affect more than one district, with the possibility of spreading further and threatening property and life, the extent of forest fire beyond the capacity of the District Disaster Committee.

A state level Disaster Management Committee chaired by the State Secretary is formed and comprises departments similar to the District committee. A Monitoring Centre is also established to monitor and provide immediate assistance when necessary.

Level 3 - More complex fires escalating from Level 2 and affecting more than one State; these fires cause disruption to the daily activities of the public, and may require assistance from the central agencies and even from international organizations.

When fires escalate to Level 2 and 3, committees are similarly formed at the state and national levels. A National Disaster Monitoring Centre is established to coordinate efforts by relevant agencies to combat fire and to provide assistance needed from the Federal Government. At the ground level, a local area control post is established to coordinate activities among different government agencies and to implement directives given by the disaster committee. A 24-hour operations room is also established to receive and monitor the fire fighting activities. Designated officials from the relevant agencies man both the control post and operation room with specific duties listed in the guidelines.

Responsible Agencies

The SOP also provides guidelines relating to the functions and responsibilities of various government agencies, among which are:

National Security Division - serves as Secretariat to the National Disaster Committee and coordinates forest fire fighting efforts and training for all relevant agencies.

Royal Malaysian Police - reports forest fires through routine air surveillance; establishes control posts at the site of forest fires; ensures public order and safety of property, and carries out investigation, if necessary.

Fire and Rescue Service Department - carries out fire suppression and control; ensures safety of

all personnel and the public; provides aerial fire suppression services when required; carries out information gathering and post-fire reporting, and provides training to other agencies and voluntary bodies.

Armed Forces - provide personnel, transportation and machinery when needed; offer medical, engineering, and transportation services; assist in search and rescue mission, and give air ambulance service for emergency transportation.

Forestry Department - provides personnel in ground fire suppression; assists in search and rescue operation; gives technical assistance relating to conditions of the forest, topography, forest, ecotypes, sources of water, etc.; helps in the assessment and post-fire evaluation; offers equipment and transportation, and secures assistance from logging companies, if needed.

Public Works Department - provides machinery, equipment and engineering expertise; offers temporary accommodation for fire fighting personnel as well as for victims of the fire, and coordinates all engineering and civil works.

Department of Environment - serves as the first agency to receive report on fire incidence through its air surveillance unit and through public information; carries out enforcement of law against open burning; monitors air quality index; provides information to the public as well as directly to the relevant agencies, and serves as coordinating agency for early detection of forest fire and haze occurrences.

Meteorological Services Department - provides meteorological information to the public as well as relevant agencies for early warning of potential of forest fires, and assists in weather forecast during large-scale forest fires.

Malaysian Remote Sensing Centre - receives and evaluates real-time information on incidence of forest fires through satellite imagery, and cooperates with international

agencies through exchange of satellite information in assisting early detection of forest fires in Malaysia as well as around the region.

Wildlife and National Parks Department - provides information on endangered wildlife affected by the forest fires and assists in the translocation of affected species, their safety, and rehabilitation of habitat, if necessary.

Social and Welfare Department - establishes temporary shelter for affected fire victims; provides immediate assistance in terms of food, shelter, medical and subsistence allowance for affected fire victims; and facilitates registration of fire victims for government aids.

St. John Ambulance Malaysia and Malaysian Red Crescent Society - assists the Welfare Department in the administration of the shelter, aids the Health Department in providing emergency medical care, and organizes volunteers to provide first-aid to fire victims and as fire fighters.

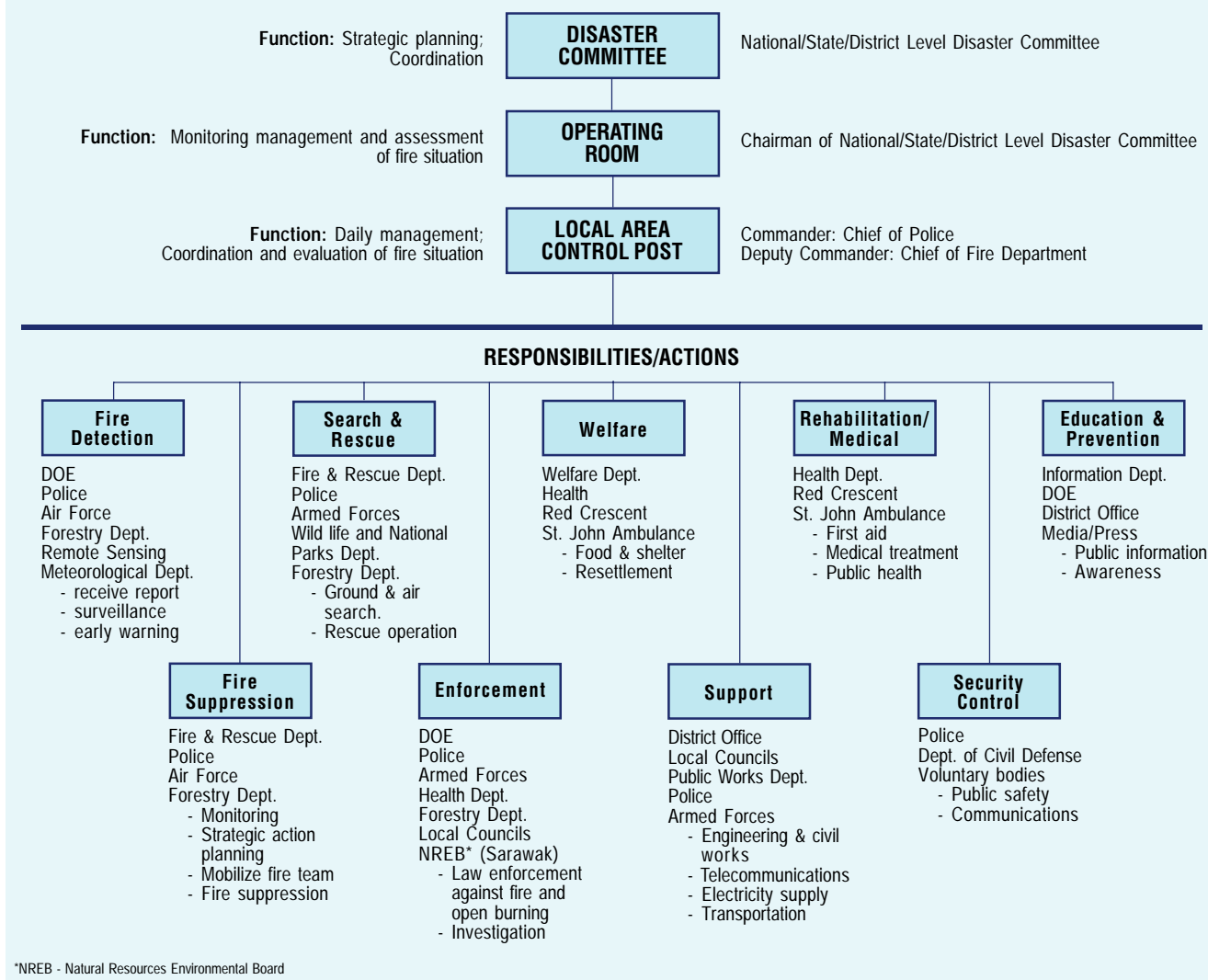
The overall organization charting the agencies responsible in forest fire fighting and management is shown in **Figure 1**.

Conclusion

Although large-scale forest fires are relatively new to Malaysia, their increasing recurrence and intensity requires effective prevention and control methods as well as improvement in the capacity and capability of Malaysia to readily respond to these occurrences. Thus the Government of Malaysia mandated the Malaysian Fire and Rescue Department as the main agency responsible for combating and managing forest fires. The Department has been allocated a substantially bigger financial budget in the last few years, mainly to purchase additional forest fire equipment including two helicopters for rescue and 'water bombing'.

To further enhance concerted efforts at various levels, the proposed SOPs would ensure effective coor-

Figure 1. Forest Fire Management Organizational Chart



dination among all relevant agencies in effectively responding to the management and control of forest fire occurrences in Malaysia. Regionally, or even internationally, there is a need to enhance or strengthen present and future cooperation with other ASEAN countries towards concerted efforts to improve techniques and skills in forest fire management, through exchange of information and training programs. ■

Ahmad Zainal Mat Isa is the Deputy Director of the Forest Plantation Unit, Forestry Department, Malaysia

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A Review of the Protected Area System of Thailand

► By **SAHLEE BUGNA**
and **GIACOMO RAMBALDI**

GENERAL INFORMATION

Thailand has an area of 513,115 km², and is bordered by Cambodia, Laos, Myanmar and Malaysia. The country is situated between two major biogeographical regions, the Indochinese in the north and Sundaic in the South, thus endowing the Kingdom with habitats that contain approximately 7% of the world's flora and fauna (Luangjame et al., 1997).

Thailand lies at the crossroads of the Indo-Malayan Realm, and does not have any unique floristic elements. Majority of local plant species are closely related to those in neighboring countries. As a result, Thailand is considered a collective center of botanical diversity from three major regional elements: Indo-Burmese, Indo-Chinese and Malesian. Identified flora numbers 12,253 species, which are estimated to account for 80% of the total plant species of the country. Recorded flora includes 9,441 vascular and about 2,154 non-vascular plants. Orchids are the most diverse plants in the country with 1,116 species, 177 of which are endemic (OEPP, 2000).

In terms of fauna, it is estimated that 87,500 species exist in Thailand, 18,073 of which have been identified. There are 8,705 invertebrates, majority of which are insects, and 4,072 vertebrates. There are 292 mammals, including bats, ungulates, primates, flying lemurs, pangolins, whales, dolphins and dugongs. There are also 962 bird, at least 123 amphibian, and 318

reptile species.

Since Thailand shares its flora and fauna with many of its neighbors, the number of endemics is not as high as in Malaysia or Indonesia. Recent research by the Flora of Thailand project identified 120 endemic plant species. Endemic fauna include 141 vertebrates, with 6 mammals, 67 subspecies of birds, 29 fishes, 31 reptiles and 8 amphibians (OEPP, 2000).

Threatened species include 457 plants and 554 animals (World Con-

(WCMC, 1997). Over half of the national forest reserve has disappeared and what remains can be found only in national parks and wildlife sanctuaries. As a result of continued habitat loss, species populations have become increasingly vulnerable to overexploitation or poaching.

Marine habitats, mangrove forests and wetlands are threatened by shrimp farming, pollution and degradation. Over-harvesting and the use of harmful fishing methods have severely depleted marine diversity. Wetland and coastal ecosystems are especially vulnerable to environmental changes outside their immediate boundaries. Industrial and domestic wastes pollute rivers, lakes, and



Salawin National Park in Mae Hong Son Province

Photo courtesy of Royal Forest Department

servation Monitoring Center, 1995). Threatened vertebrates number 554, with 114 mammal, 194 bird, 41 reptile, 26 amphibian and 179 fish species needing special protection.

As with the rest of the world, biodiversity in Thailand is undermined by a number of threats. Forest resources are depleted by a combination of over-harvesting of timber, increasing population pressure and poor land use practices. Forests are illegally-logged, and converted to agricultural lands, mining areas and plantations. From an estimated forest cover of 53.3% (273, 508 km²) of the total land area in 1961, only 25.6% was left in 1995

coastal habitats, reducing and destroying biodiversity. Waters are also contaminated by sedimentation from forest clearance, fertilizer run-off and industrial effluents.

An additional controversy is the pressure on resources exerted by around 12 million people residing in the forestlands of the country. It is estimated that a significant percentage of these forest residents occupies vast areas of the country's national parks, wildlife sanctuaries and vital watersheds. According to the Thailand Development Research Institute, more than 20% of the country's 56,000 villages are located within forest reserves (Gray, 1991).

Certainly, biodiversity loss is an inevitable consequence of human activity. Recognition of the reasons behind this loss should provide resource managers with lessons on how to minimize and conserve the diversity of biological resources without compromising development objectives.

THE PROTECTED AREA SYSTEM Legal Framework

Forest and wildlife conservation in Thailand has a long history, dating back to the creation of the Royal Forest Department (RFD) in 1896 and the enactment of the Wild Elephant Protection Law of 1900. Protected areas legislation, on the other hand, began in the 1960s with the promulgation of the Wild Animal Preservation and Protection Act (1960) and the National Park Act (1961). The former provided protection for wild animals in general by establishing wildlife sanctuaries and non-hunting areas. The Act also gave total protection to nine species, specifically: wild water buffalo, Sumatran and Javan rhinoceros, kouprey, Eld's deer, hog deer, Schomburgh's deer, serow and goral. Limited hunting, capture and trade were permitted for other species. The National Park Act laid down provisions for the creation of national parks, which contributed to increased environmental awareness in Thailand. Forest reserves were then established through the National Forest Reserves Act of 1964. The Act also states that it is forbidden to hold, possess or clear land, burn forest, work timber, gather forest products or any other act that may damage the forest.

In 1988, increased deforestation caused a devastating flood in southern Thailand and led the government to impose a ban on further logging of natural forest in 1989.

The development of other conservation laws and policies also affected protected area management. The 1985 National Forest Policy

first provided the basis for a protected area system and targeted the maintenance of 40% of the total land as forest areas. This would be classified into protected (15%) and productive (25%) forests. This ratio was then reversed in the 7th National Economic and Social Development Plan (NESDP) for 1992-1996. The Policy and Prospective Plan for Enhancement and Conservation of National Environmental Quality (1997-2016) currently targets the increase of forest cover to 50% of the total land area, with 30% to be designated as protected and 20% as productive forest (OEPP, 1997).

The 1992 Enhancement and Conservation of National Environmental Quality Act provided policies for the conservation of environmentally protected areas (Chapter III, Part 3), which include:

- Watersheds;
- Unique natural ecosystems;
- Fragile ecosystems that are sensitive and vulnerable to destruction or human impacts;
- Areas with aesthetic values.

The designation of conservation areas is usually recommended by the National Environment Board. Plans for these protected areas should include:

- Land use prescriptions to preserve the environment;
- List of prohibited activities;
- Types and sizes of activities that are allowable subject to an environmental impact assessment;
- Management approach specific to the site;
- Other appropriate protective measures.

In 1993, the Thai Forestry Master Sector Plan set down the concept of a protected area system, which was based on the 1985 Thai National Forest Policy.

Among the most recent plans compiled by the government is the National Policies, Measures and Plans on the Conservation and Sustainable Utilization of Biodiversity

(1998-2002), which was approved as an administrative framework to implement the Convention on Biological Diversity. Seven strategies were outlined in the Plan for implementation:

- Build capacity of institutions to conserve biodiversity;
- Enhance efficiency in management of protected areas;
- Improve incentives for conservation of species, population and ecosystems;
- Conserve species, populations and ecosystems;
- Control and monitor activities that threaten biodiversity;
- Encourage traditional cultural management of biodiversity;
- Promote cooperation between international and national agencies in the conservation and sustainable utilization of biodiversity.

Aside from local legislation, Thailand is also party to a number of international agreements that conserve biodiversity (**See Box 1**).

Box 1: Status of International Agreements

- CITES - ratified in 1983
- Conservation on Biological Diversity - signed in 1992
- Agenda 21 - adopted in 1992
- RAMSAR Convention - ratified in 1998

Protected Areas

The Wildlife Protection and Reservation Act (1992, improved) and National Parks Act (1961) provide the legal basis for protected areas, which are as:

- National park - area with beautiful landscapes, important history, rare plant or animal species and preserved in its natural state for public education and enjoyment;
- Wildlife sanctuary - declared for the preservation of wildlife so they can freely breed in a natural environment;
- Forest park - area with attractive scenery developed for public recreation, but is

too small to be a national park;

- Non-hunting area - designated for the protection of specific wildlife species but smaller than wildlife sanctuaries;
- Biosphere reserve - intended to conserve the integrity and genetic diversity of communities of plants and animals within natural ecosystems;
- World Heritage Site - area with unique natural and cultural values, which are considered to have outstanding universal significance;
- Watershed Class 1 - designated to have permanent forest cover because of its significance as a head watershed;
- Botanical garden - collections of indigenous and exotic species with economic value, planted for research purposes and ex-situ conservation;
- Arboretum - smaller than botanical gardens and established to collect various plant species, especially economically useful flowering plants;
- Conservation mangrove forest - excluded from utilization to serve as shelter and nursery ground for marine flora and fauna;
- Natural conservation area - comprise lands, mountains, swamps, lakes and interesting morphologies that should be protected from economic and social exploitation.

As of 1997, there were 286 protected areas under these various categories, according to the National Resources Conservation Office of the Royal Forest Department.

INSTITUTIONAL SET-UP

Protected area management is largely the responsibility of the **Royal Forest Department (RFD)** of the **MINISTRY OF AGRICULTURE AND COOPERATIVES (MOAC)**. The Department

was established in 1896 to protect and manage all forests owned by the state, as well as implement various laws and policies related to forest conservation and management. RFD facilitates protected area management through its Natural Resources Conservation Office, which is divided into the following:

Natural Park Division - tasked with:

- regulating the use of parks and their resources in accordance with the National Park Act of 1961;
- developing in the park system consistent with management objectives;
- maintaining natural resources in the park;
- providing appropriate recreational activities and facilities;
- introducing and conducting interpretative programs to build visitors' understanding and appreciation of park values.

Marine National Park Division - responsibilities are to:

- implement the National Park Act, National Forest Reserve Act, Wildlife Reservation Act and other relevant legislation;
- apply marine management principles in the development of conservation guidelines;
- recommend sustainable use of park resources incorporating marine park management principles and existing government policy;
- conduct studies on park resources and disseminate information to the public to create awareness on the need to protect the environment.

Wildlife Conservation Division - the division aims to:

- protect wildlife and increase populations following the Wildlife Preservation and Conservation Act of 1992;
- protect wildlife habitats;
- educate the public regarding wildlife protection.

Watershed Management Division- this division largely focuses on the protection and rehabilitation of denuded watersheds, most of which are located in national parks, forest reserves and wildlife sanctuaries. Alternative land use and agricultural practices have been introduced to discourage shifting cultivation. In the 1980s integrated watershed management approaches were established to elicit cooperation from people's organizations and other concerned agencies.

Due to the number of conservation laws and policies in Thailand, other organizations working on biodiversity conservation have considerable impact on protected area management. These organizations are mainly under the jurisdiction of the **MINISTRY OF AGRICULTURE AND COOPERATIVES (MOAC)** and the **MINISTRY OF SCIENCE, TECHNOLOGY AND ENVIRONMENT (MOSTE)**. Aside from the RFD, agencies under MOAC are:

Department of Fisheries (DOF)

- Fisheries management in Thailand started in 1901 when taxes were collected to ensure the steady contribution of fish supply for national consumption and export. The responsibilities of the department are to:

- Implement fisheries-related acts;
- Conduct studies, researches, and experiments in every field of fisheries;
- Explore and analyze fishing grounds beyond Thai waters and promote fisheries cooperation with other nations;
- Develop occupations relating to fisheries.

National Resources and Biodiversity Institute (NAREBI)

- NAREBI was established in 1998 to provide MOAC with more flexibility in implementing natural resource management policies. Environmental management is largely segmented by type of resource, objectives or assignment of responsibilities to agencies as specified by law, resulting in a lack of unity of direc-

Box 2: Ongoing Conservation Projects

Organization	Project Title	Duration
EC	Capacity building to support training and education on coastal biodiversity in Ranong	2000-2003
	Local Participation in Highland Forest Conservation Project	1999-2003
	Sustainable Management of Phu Khleac Wildlife Sanctuary through Community Participation	1997-2004
UNEP	Thailand Biodiversity Country Study	1994-1997
	Biodiversity Data Management Project	1995-1998
DANCED	Western Forest Complex Ecosystem Management Project	1999-2002
	Model Marine National Park Management Project	2002-2006
CIDA	Tree Link	1998-2003
	Canada-Thailand Trilateral Environment Project	1995-2000
UNDP	10-Year Review of Agenda 21 for Thailand: A National Strategy for Sustainable Development	15 months; in the pipeline
	Mekong River Basin Wetland Biodiversity Conservation and Sustainable Use Program	1999-2001
CARE	Integrated Natural Resources Conservation	1994-1999
WWF Thailand	Wildlife Research in Western Forest Complex	1991-1997
	Asian Elephant re-introduction and Conservation Project	1997-2000

tion in the formulation of policies and projects. NAREBI aims to facilitate a new concept of ecosystem management to reduce the institutional overlap and duplication of efforts among various agencies.

Agencies under the **MINISTRY OF SCIENCE, TECHNOLOGY AND ENVIRONMENT (MOSTE)** include:

Office of Environmental Policy and Planning (OEPP) - The OEPP aims to develop environmental policies and plans in accordance with the Enhancement and Conservation of National Environmental Quality Act of 1992. It acts as the coordination center for natural resources management to encourage national sustainable development. The OEPP is also the National Biodiversity Reference Unit (NBRU) of Thailand and thus interfaces the ASEAN Regional Centre for Biodiversity Conservation (ARCBC) with national authorities and institutions in biodiversity conservation efforts in Southeast Asia.

National Committee on the Conservation of Biological Diversity - Created in June 1993 under the National Environment Board, the Committee is tasked with the formulation of plans to implement commitments to the Convention on Biological Diversity, including the National Policies, Measures and Plans on the Conservation and Sustainable

Utilization of Biodiversity (1998-2002). The Committee also coordinates the responsibilities of other biodiversity committees under a number of departments, including the Royal Forest Department, the Department of Fisheries and the Department of Agriculture.

CONSERVATION PROJECTS

A number of international organizations have actively contributed to the implementation of Thai environmental and biodiversity conservation efforts (**See Box 2 for list of projects**). These organizations include, among others:

European Commission - Cooperation funded by the EC dates back to a rural development program in 1997. Current efforts focus on protecting the environment and stimulating the rural economy.

United Nations Environment Programme (UNEP) - supports implementation of commitments to the Convention on Biological Diversity through the UNEP Guidelines for Preparation of the Country Study on Biological Diversity (1991-1992) and other projects.

Danish Cooperation on Environment and Development (DANCED) - initial projects also focused on supporting the implementation of the Convention on Bio-

logical Diversity.

Canadian International Development Agency (CIDA) - majority of biodiversity-related activities of CIDA concentrates on the rehabilitation of natural habitats or conservation of specific components of biodiversity. These include the restoration of forests with cultural importance in Maha Sarakam province in 1996 and the ASEAN Forest Tree Seed Center Project executed by the Royal Forest Department from 1981-1997.

United Nations Development Programme (UNDP) - concentrates funding on initiatives that emphasize the sustainable use of natural resources, several of which were co-sponsored by the Food and Agriculture Organization of the United Nations and the Global Environment Facility.

IUCN - The World Conservation Union - IUCN's relationship with Thailand began in the 1960s when it supported the Royal Forest Department in the creation of the National Parks Act. Current activities will focus on the revision of the protected area system and ratification of the Convention on Biological Diversity.

CARE Thailand - CARE is one of the world's largest non-government international relief and devel-

opment organizations. It has become a leader in sustainable development and emergency aid, reaching tens of millions of people each year in more than 60 countries in Africa, Asia, Europe and Latin America.

World Wide Fund for Nature Thailand - WWF's mission is to stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature.

ASSESSING THE PROTECTED AREA SYSTEM

A Review of Protected Area Systems of the Indo-Malayan Realm (WCMC, 1997) states that the Thai national park system expanded from 16 sites (9,357 km²) in 1979 to 45 sites in (24,222 km²) in 1985. By May 1995 some 105 national parks had been established, including 24 with a marine component, covering 66,185 km² (12.8% of total land area). At the same time there were 38 wildlife sanctuaries, covering 29,185 km² (5.7%) of the national land area.

In 1997, existing national parks and wildlife sanctuaries covered 18.5% of the total area of the country, but this includes quite a lot of degraded and cleared forest. Only 8.2% of the country consists of protected natural habitat.

The Review reveals that in terms of habitat coverage, the system seems to be quite satisfactory and there are no obvious gaps. It recommended the addition of some additional lowland wet evergreen forest as well as more areas of freshwater swamp and mangroves so that the protected area system could be more representative of the various ecosystems of the country.

In terms of protected area management, there seems to be some confusion in the management structure despite the identification of the Royal Forest Department as the primary agency. Over the years,



Women of the Karen tribe

a number of conservation policies and plans have been developed across various ecosystems, and their implementation has been divided among a host of agencies under the Ministry of Agriculture and Cooperatives and the Ministry of Science, Technology and Environment. Added into the mix of overlapping environmental plans and policies are Committees and Institutes that are largely expected to conduct the same tasks. These include the National Resources and Biodiversity Institute (NAREBI), the National Committee on the Conservation of Biological Diversity, and the Office of Environmental Policy and Planning (which serves as the National Biodiversity Reference Unit for ARCBC), which all act as coordinating centers for national biodiversity conservation activities.

Another major issue is the raging controversy on how to address the fact that millions of people are living within forest boundaries, including protected areas.

There is a very strong sense of state ownership of forests in Thailand, which began with the creation of the Royal Forest Department (RFD) in 1896. Its mandate was to manage the country's forests, and as a result, their ownership reverted

back to the King from feudal chiefs who held them earlier. State ownership of forests was further strengthened with the Forest Act of 1941, which declared that any land at the time without ownership rights would be considered as forest and be managed by the RFD. This created and continues to be a controversial issue among rural populations, who consider these forests public land (Buergin, 2000).

National forest policy initially revolved around a "wilderness approach," which recommended the total exclusion of people from protected areas. This is no longer possible given the large population dependent on forest resources and the need to balance its rights to land and traditional resource use. The history of conflicts over access to natural resources is rooted in the process of villagers' "encroachment" of forestland. Changes in land allocation and uses over the years have also resulted in pronounced imbalances in power relations between state, private sector (largely through commercial farmers and land developers) and forest dwelling ethnic minorities.

THE WAY FORWARD

Offhand, the easiest way out of this confusion is to streamline the management structure to manage protected areas in the country. This would reduce overlapping functions and duplicated efforts as well as facilitate the implementation of management approaches to protected areas in line with internationally-agreed-upon principles.

In terms of resolving the issue regarding hilltribe peoples and their rights to resource use, most advocate the legal recognition of community forest practices in Thailand. Indigenous forest management has a long history in inherently diverse ethnic cultures. Recorded evidence of indigenous forest management systems in Thailand was discovered to be over 700 years old, and was

Photo by Oliver Puginier

traditionally practiced without any written document. Current community forest management strategies merge indigenous forest management and approaches that respond to changing ecological and socio-economic conditions, and emphasize access to and control of forest resources. At present, community forests in Thailand are not recognized by the Thai legal system although there are *de facto* practices under a common property resource regime.

Successful community forest movements have developed into region-based community forest networks. There are currently 86 such networks in the northern, and 18 in the northeastern region of Thailand (Buergin, 2000).

In 1990, the government drafted a Community Forestry Bill that retains state decision-making power in relation to forest resource use. This prompted the drafting of a people's version of the bill, emphasizing local rights in communal forest management. Today, the Bill has undergone seven revisions, and has yet to settle the contrasting views of the state and various people's organizations regarding forest resource rights. Conflicting conservation ideologies (people and forest can or cannot co-exist) and different value priorities (environmental conservation versus social justice) also color the issue, dividing the NGO movement as well as civil society.

NGOs in Thailand are often categorized into 'dark green' conservation orientated NGOs and 'light green' or people orientated NGOs (including socially concerned aca-

demics), who obviously have different views regarding the issue. The extent to which the two sides will succeed in realizing their interests in the Community Forest Bill, or whether the bill will be passed at all, remains to be seen.

Experiences in some protected areas however show that it is imperative that local communities share economic benefits offered by national parks and other protected areas. Some sanctuaries recruit employees from local villages. In others local fishermen are hired to take visitors around to view the rich bird life. Rangers at some parks encourage fishermen to provide services to tourists rather than over-fish the sea. Locals are sometimes hired as porters to carry hikers' gear up the mountains. As a result some have become so protective of the sites that they report violations to proper authorities.

In planning for the conservation of ecosystems and biodiversity, these issues have to be carefully assessed and a practical solution has to be proposed for consideration, support and execution by authorities and other concerned parties. An ongoing review (see Box 3) of protected areas and their contribution to sustainable development is a step in the right direction. Initially results of the review state that over 17% of the country is covered by protected areas, with a target of 25% by year 2005. A field study is being conducted in the eastern forest complex of Thailand as part of the review and a roundtable discussion has been conducted with review partners

from government, protected areas, donors and non-government organizations. Activities and discussion that will be undertaken for the review will be used in preparation for the World Parks Congress in September 2003. Such efforts bode well for the future of the protected area system of Thailand. ■

Sahlee Bugna is the writer-researcher of ARCBC. **Giacomo Rambaldi** is the ICT Specialist of ARCBC.

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Box 3: A Critical Review of Protected Areas and their Role in Socio Economic Development of the Four Countries of the Lower Mekong Region

The natural resources of Cambodia, Lao PDR, Thailand and Vietnam have been steadily degrading despite the expansion of the protected area networks in the past few decades. The review, which can be accessed through <http://www.mekong-protected-areas.org>, draws together protected area managers and economic planners to analyze current approaches to protected area management and investigate ways to integrate them more effectively for socio-economic development. Information will be gathered through the conduct of field studies, coordination with national networks, presentation of national reports and exchanges in regional workshops. The review process will culminate in the presentation of national reports at the World Parks Congress in Durban, South Africa in September 2003.

3rd MEETING OF THE ARCBC SCIENTIFIC EXPERTS COMMITTEE / 2nd RESEARCH CONFERENCE

Scientific Experts recommend 37 biodiversity projects

► By **REXIE JANE PARREÑO**

The panel of scientific experts of the ASEAN Regional Centre for Biodiversity Conservation (ARCBC) recommended 14 more biodiversity projects for implementation in the ASEAN region during the 3rd meeting of the Scientific Experts Committee and 2nd Research Conference held from 7 to 10 February 2001 in Tagaytay City, Philippines.

This brings to 37 the number of projects under ARCBC's Research Grant Programme, which has a total budget of about 2.5 million Euro. These will be implemented in Brunei Darussalam, Indonesia, Malaysia,



Members of the Scientific Experts' Committee discuss the Research Grant Programme during their 3rd meeting last 7-10 February in Tagaytay, Philippines.

ARCBC Launches Research Grant Programme

The ASEAN Regional Centre for Biodiversity Conservation (ARCBC) launched its Research Grant Programme, with the signing of contracts between the Centre and three government agencies and one non-government organization for the implementation of biodiversity research projects in the Philippines. The signing ceremony was held on 12 July 2001 at the Conference Room of the Office of the Secretary of the Department of Environment and Natural Resources (DENR) in Quezon City, Philippines; DENR is the executing agency of ARCBC.

The Philippines-based projects have a total worth of 271,525 Euros or over 12 million Philippine pesos and form part of the 2.5-million-Euro Research Grant Programme provided by the European Commission. Co-Directors Mr. Gregorio I. Texon (ASEAN) and Dr. John R. MacKinnon (EU) signed on behalf of ARCBC while project leaders Director Celso P. Diaz, DENR-Ecosystems Research and Development Bureau (ERDB); Dr. Wilfredo Licuanan, Marine Science Institute-University of the Philippines (MSI-UP); Dr. Ely Alcala, Silliman University Angelo King Center for Research

and Environmental Management (SUAKREM) and Dr. Samuel Koffa, Bioresource Conservation Trust for the Philippines, Inc. (BCTPI) signed for their agencies.

DENR Secretary Heherson T. Alvarez and Mr. Gildo Pivetta, Charge d' Affaires a.i. of the European Commission Delegation in the Philippines (who represented Ambassador Yves H. Gazzo), Dr. Aida B. Lapis, Chief of ARCBC Research Branch and Mr. Patrick Hanmer, ARCBC Programme Administrator witnessed the signing.

The projects were submitted to and pre-evaluated by the National Biodiversity Reference Units, one established in each country. The ARCBC Scientific Experts Committee then reviewed and endorsed them to the project Steering Committee for approval. The European Commission approved the projects last June 2001.

Signing of contracts of the other approved biodiversity research projects in Brunei Darussalam, Indonesia, Malaysia, Singapore, Thailand and Vietnam has been scheduled before the year ends.

– **Rexie Jane Parreño**

Philippines, Singapore, Thailand and Vietnam. (See Box on page 38 for related story).

The Scientific Experts Committee comprises well-known scientists that include Hashim Bin Hj Tuah (Brunei Darussalam), Prof. Roehajat Emon Soeriaatmadja (Indonesia), Dr. Saw Leng Guan (Malaysia), Dr. Angel C. Alcala (Philippines), A/P Benito C. Tan (Singapore), Dr. Chaweevan Hutacharern (Thailand) and Dr. Le Xuan Canh (Vietnam).

There was some delay in the approval of the project proposals under the first tranche as the Development Cooperation Office of the European Commission in Brussels, Belgium was then being reorganized. But the EC Delegation in the Philippines expressed optimism that the project proposals will be approved.

The projects focus on the following priority themes: Valuing Biodiversity; Restoring Biodiversity; Tax-

Project proposals were graded based on the following criteria: track record of applicants and research workers, 10 points; quality of project design, 30 pts; justification and creativity of project, 20 pts; social dimension and expected benefits, 20 pts; collaboration, 20 pts. Minimum qualifying rating was 70 pts.

onomy and Systematics. These were reviewed, evaluated and selected by the Scientific Experts Committee, the National Biodiversity Reference Unit

(NBRU) Country Coordinators, and an independent panel of scientific experts from the ASEAN and the European Union.

The NBRU country coordinators initially screened the 89 project proposals submitted for the second tranche. From the 89, the Scientific Experts Committee and the independent panel shortlisted 32 for another screening, and then selected the 14 that were eventually endorsed to the Steering Committee of ARCBC and the European Union for approval.

Project proposals were graded based on the following criteria: track record of applicants and research workers, 10 points; quality of project design, 30 pts; justification and creativity of project, 20 pts; social dimension and expected benefits, 20 pts; collaboration, 20 pts. Minimum qualifying rating was 70 pts.

Below are the titles of the projects under each theme and country. ■

COUNTRY	BIOLOGICAL USES AND VALUES	TAXONOMY AND SYSTEMATICS	ECOLOGICAL RECONSTRUCTION	OTHERS
Brunei Darussalam		Regreening of Burned Over Areas Using Native Species	None	None
Indonesia	Marine Biodiversity Loss in Spermonde Islands, Southern Sulawesi, Indonesia: Assessing Capacity and Impacts of Destructive Fishing Practices	None	None	None
Malaysia	Community-Based Plant and Habitat Conservation, Ulu Padas, Sabah	None	None	None
Philippines	Endemism on Limestone Formations: Herpetofauna of Selected Small Limestone Islands Belonging to Different Pleistocene Ice-Age Islands of the Philippines	None	Ecological Assessment, Restoration and Protection of the Northwest Panay Low-Elevation Forest Ecosystem: Developing Community-Based Agroforestry Solutions for Natural Resource Management and Biodiversity Conservation	
Singapore	Population and Conservation Biology of Selected Threatened Malesian Ornamental Species with Special Emphasis on <i>Johannesteijsmannia</i> H.E. Moore (Palmae)	None	None	None
Thailand	Strategies for Sustainable Management of Fisheries Resources in Pasak Jonlasid Reservoir, Thailand Through Ecological and Socio-Economic Assessment	The Genus <i>Argostemma</i> Wall. (<i>Rubiaceae</i>) in Malay Peninsula and Peninsular Thailand	Community Forest Management and Rehabilitation as Means of Biodiversity Conservation: Case Study at Thung Soong Community Forest in Krabi, Thailand Maintenance of Biodiversity: Conservation and Cultural Practices	None
Vietnam	Conservation of Unique and Valuable Fish Diversity in Phong Nha-Ke Bang Limestone Mountains	None	Introduction of Rare and Endangered Medicinal Plants into Forest Garden of Ethnic Minorities in Northern Vietnam for Biodiversity Conservation	The Study and Conservation of Bryophyte Diversity of Vu Quang Protected Area in Ha Tinh Province of Vietnam
ASEAN-wide		Research on Systematics for ASEAN Scientists (1 st Tranche Budget) Needs Assessments in Taxonomy and Biosystematics for Arthropods and Microorganisms for ASEAN (1 st Tranche Budget)	Biodiversity Impacts of Climatic Change, Fire and Forest Restoration Techniques and the Watershed Roles of Conservation Areas in Southeast Asia	None

FOURTH ARCBC STEERING COMMITTEE MEETING

ASOEN Approves ARCBC Programs for 2002; welcomes Laos and Cambodia

► By **REXIE JANE PARREÑO**

Members and representatives of the ASEAN Senior Officials on the Environment (ASOEN) convened in Brunei Darussalam on 2 August 2001 to appraise the progress of project activities as well as approve the proposed activities of ARCBC for year 2002. This was the Fourth Meeting of the Steering Committee of the ASEAN Regional Centre for Biodiversity Conservation (ARCBC); ASOEN members compose the Steering Committee.

The ASOEN Chairman, Mr. Sunthad Somchevita of Thailand, presided over the meeting, which was also attended by representatives of the ASEAN Secretariat, European Commission-Philippines and ARCBC.

ARCBC Co-Directors Mr. Gregorio I. Texon and Dr. John R. MacKinnon reported on the developments of the project since the last Steering Committee meeting in July last year. As to the planned activities for 2002, the Co-Directors said that the ASEAN Working Group on Nature Conservation and Biodiversity (AWGNCB) during their 11th meeting in 17-18 July 2001 in Melaka, Malaysia delegated to ARCBC the preparation of the project proposal on the water conservation program. This is in line with the program of the Southeast Asia Technical Advisory Committee of the Global Water Partnership to collaborate with the ASEAN on water management, focusing on watershed management and biodiversity conservation.

The Committee also approved the additional activities proposed for year 2002. These activities were

among the recommendations made during the Co-Directors' consultative visit to various management, research and training institutions in Europe during the first quarter of this year. Geared towards promoting and speeding up the transfer of knowledge, advanced technology and expertise that European scientists apply to conserve their biological resources, these activities also aim to encourage and improve collaboration between ASEAN and European biodiversity institutions.

The six new activities are:

- Development of an International Standard Reporting Procedure;
- Mapping Distribution of Plants in the ASEAN region;
- Biodiversity and Environment Policy Forum for ASEAN Senior Officials on Environment and Lawmakers;
- Development of Standards for Habitat Classification in the ASEAN region;
- Developing ASEAN Experts on Systematics;
- Study Tour to Europe by ASEAN Senior Officials for the Environment.

For the proposed study tour, Mr. Demetrio L. Ignacio, ASOEN-Philippines and DENR Undersecretary for Policy and Planning recommended that a reference, specifically an outline of all existing policies on biodiversity conservation be made for this particular activity. The tour aims to expose the ASOEN members to the policies, practices and related issues in biodiversity conservation in Europe.

On the inquiry of Mr. Effendy A. Sumardja, ASOEN Member from Indonesia, regarding the Guidelines

on Minimizing the Impact of Forest Fire on Biodiversity in ASEAN, the Committee was informed that the proceedings of the said workshop is currently being edited, after which it will be published and distributed to all participating countries. The workshop, which was conducted on 22-23 March 2001 in Brunei Darussalam, formulated the guidelines to provide managers, policy makers, among others on the directions in designing programs and policies that would address forest fire-related issues and problems in the region. National Biodiversity Reference Unit Country Coordinators and focal persons on forest fire and representatives from Brunei Darussalam, Indonesia, Malaysia, Philippines, Singapore, Thailand and Vietnam attended the forest fire workshop.

The participation of the Kingdom of Cambodia and Lao People's Democratic Republic to ARCBC's activities was also discussed by the Committee. The two countries formally joined ARCBC last 16 May and 8 June 2001, respectively.

The ASOEN Chair clarified that the Steering Committee shall continue to meet twice a year. He said that the meetings will be held back to back with either the annual meetings of the ASEAN Working Group on Nature Conservation (AWGNCB) or the Informal ASEAN Meetings of Ministers of Environment (IAMME) and annual ASOEN Meetings.

Hence for the year 2002, the 5th Meeting of the SC will be held back to back with either the 12th AWGNCB Meeting or 6th IAMME, while the 6th Steering Committee Meeting will be held together with the 13th ASOEN Meeting. ■

THEIR BIODIVERSITY AND MANAGEMENT IN THE PHILIPPINES

Tackling the Issue on Alien Invasive Species

► By **REXIE JANE PARREÑO**

Whether these are called alien invasive or invasive alien species, these undesired organisms have to be managed properly. Thus the Philippines' Department of Environment and Natural Resources (DENR) led national scientists, environment officers and decision makers in formulating and recommending approaches and possible policies on how to properly manage them during the Workshop on the Biodiversity and Management of Alien Invasive Species in the Philippines.

The ASEAN Regional Centre for Biodiversity Conservation (ARCBC) sponsored the workshop, which aimed to: a) identify and assess their effects on biodiversity in the Philippines; b) identify issues and concerns regarding these species; c) identify and discuss existing policies/regulation and quarantine laws pertaining

to these species; and d) recommend management approaches/possible policies to regulate them.

"The only way we could manage the alien invasive species is by understanding their characteristics and the processes involved in the invasions. Legislation and regulations to restrict the movement of unwanted organisms are very important," DENR Secretary Heherson T. Alvarez said in his keynote address read by DENR Undersecretary Demetrio L. Ignacio, Jr. during the Seminar-Workshop held from 22-23 May 2001.

Secretary Alvarez identified the detrimental effects as "displacement or destruction of indigenous species, pollution of gene pool, loss of species diversity, disruption of energy and nutrient cycling, increased production costs as they may require high input, and so forth."

According to the Convention on Biological Diversity (CBD), "Invasive

alien species are species introduced deliberately or unintentionally outside their natural habitats where they have the ability to establish themselves, invade, outcompete natives and take over the new environments." Parties to the CBD are expected to "prevent the introduction of, control or eradicate those alien species, which threaten ecosystems, habitats, or species" (Article 8h of CBD).

Some of the invasive species introduced into Philippine waters and those others considered under the "watch list" were the Thai catfish (*Clarias batrachus*), golden apple snail (*Pomacea canaliculata*), African catfish or janitor fish (*Clarias gariepinus*), white goby (*Glossogobius giurus*) and eleotrid (*Hyseleotris*).

For instance in 1999, the golden apple snail infested 11% of the irrigated rice fields in the Philippines, displacing the native kuhol (*Pila luzonica*). The species was brought in from the United States in 1980 as a source of animal protein for humans and livelihood. The Thai catfish introduced in 1972 also displaced the native *Clarias macrocephalus* (Guerrero 2001).

In the forestry sector, plantations grow several introduced tree species



such as *Gmelina arborea*, *Acacia mangium*, *Paraserianthes falcataria*, *Swietenia macrophylla*, and *Acacia auriculiformis*. Some species like *G. arborea* and *A. mangium* have become hosts to damaging insects, *Attacus sp.* and *Anoplophora luciphor*, respectively (San Valentin, 2001).

A highly invasive species in the grassland ecosystem is hagonoy (*Chromolaena odorata*), which originated from Mexico, West Indies and Tropical America during World War II. This species is the most threatening plant in the Philippine grasslands, according to Dr. Leonardo M. Florece of the School of Environmental Science and Management, one of the resource speakers. He said that it can outgrow forage species, thereby cutting down the feeds available for livestock; its profuse lateral branches reduce the photosynthetic activity of grasses and eliminates other existing species. Total damage cost of the species is about 21 million pesos (about US\$ 420,000) annually.

Dr. John R. MacKinnon, a British scientist, reported on several major disasters such as introductions of American squirrels to the United Kingdom, British rabbits to Australia, Tamarix and Melaleuca bushes to the United States, all of which caused several billion dollars of damage.

For some economic reasons and other interests, people introduce alien species into new habitats, not being aware of their adverse effects. This has prompted Secretary Alvarez to point out: "There is a relatively low effort made for educating the public about the economic and ecological damage that can result from biotic introductions."

Resource persons were Dr. Theresa Mundita Lim (PAWB-DENR), Dr. Adelina Santos-Borja (Laguna Lake Development Authority), Dr. Rafael Guerrero (Philippine Council for Aquatic and Marine Research and Development), Mr. Horacio San

Valentin (Ecosystems Research and Development Bureau or ERDB) and Dr. Leonardo Florece (School of Environmental Science and Management-UPLB).

Over a hundred participants from various government and non-government offices, DENR, civil society groups and academic institutions joined the seminar-workshop. They formed into workshop groups and identified issues and concerns on the four ecosystems: freshwater, forest, grassland and agricultural. They also identified the direct causes for these problems as well as the existing policies that ought to solve these. The gaps and weaknesses (if any) relevant to these

There is a relatively low effort made for educating the public about the economic and ecological damage that can result from biotic introductions.

policies that call for enhancement were also given details. From here, the participants formulated their recommendations and action plans.

Their major recommendations are summarized as follows:

- Conduct pilot test before introducing alien species to determine their beneficial and invasive attributes.
- Enforce rigid inspection and quarantine regulations to prevent uncontrolled transfer of pests when importing logs and reforestation species.
- Monitor identified alien species invasive to indigenous and endemic species.
- Monitor developments relevant to "altered species" (genetically modified organisms or GMOs).
- Use of "invasive alien species"

instead of "alien invasive species".

- Mobilize inter-agency effort through task forces involving the DENR, Department of Agriculture, NGOs, other government agencies, communities, private entities and other related agencies.
- Improve existing policies and other regulations related to invasive alien species and formulate new policies.
- Enhance public awareness and encourage advocacy campaigns by making people understand the impact of such species and involving them in action plans.
- Conduct more researches on invasive alien species and disseminate results to the public and other appropriate bodies.
- Establish a baseline data on endemic/indigenous and alien species.

Before the workshop closed, Director Texon informed the participants that the proceedings including the recommendations and agreements will be forwarded to the Philippine Council for Sustainable Development through the relevant sub-committee, the House of Representatives through the Committee on Biodiversity and to the Office of the DENR Secretary through Undersecretary Ignacio.

The seminar-workshop was organized by ARCBC in collaboration with the Protected Areas and Wildlife Bureau of the DENR last 22-23 May in Quezon City, Philippines.

It was also held in celebration of the International Day for Biological Diversity, which is 22 May, the date the text of the Convention on Biological Diversity was adopted. This year's theme is "Biodiversity and management of alien invasive species". ■

INTERNATIONAL CONFERENCE ON COMMUNITY INVOLVEMENT IN FIRE MANAGEMENT

Communities in Flames

► By SAHLEE BUGNA

Disturbance and change caused by a variety of agents, including fire, have always been a natural occurrence in our environment, and have played a major role in modifying various ecosystems. Although not all fire is harmful, human-induced fires have since become a cause for concern. Every year, millions of hectares of the world's forests are consumed by fire, resulting in billions of dollars in suppression costs, biodiversity loss, displaced communities and wildlife, and lingering haze that continue to wreak havoc on ecological and human welfare to this day.

In Southeast Asia (SEA), the effects of forest fires have been just as devastating. In the past, forest fires were infrequent since the lush tropical rainforests grow under conditions of abundant rainfall and high humidity, making them less vulnerable. However, human interference and increased El Niño events have combined to increase the frequency of forest fires in SEA. Since 1982, there have been five major fire outbreaks, the most damaging of which occurred in 1997-1998, dubbed by the World Wide Fund for Nature (WWF) as the 'Year When the World Caught Fire.' Fires raged across many SEA countries, destroying an estimated 9 million hectares of forest in Indonesia alone. These were largely attributed to land clearing for agriculture as well as an extended dry season brought about by El Niño.

Since then, regional governments have been meeting in various forums to discuss ways to address the effects of forest fires and haze. In 25-28 July this year, some 120 representatives



Photo by Anya Hoffman, Integrated Forest Fire Management project (IFFM/GTZ) Indonesia

from 21 countries met in Balikpapan, East Kalimantan in Indonesia in a conference entitled Communities in Flames: International Conference on Community Involvement in Fire Management. Project FireFight Southeast

“Every year, millions of hectares of the world's forests are consumed by fires, resulting in billions of dollars of suppression costs, biodiversity loss, displaced communities and wildlife, and lingering haze that continue to wreak havoc on ecological and human welfare to this day.”

Asia, the United Nations Food and Agriculture Organization and the Regional Community Forestry Training Center organized the conference with financial assistance from the European Union and the United States Development Agency (USDA) Forest Service. It took off from the December 2000 regional workshop on community based fire management (CBFiM) organized by Project Firefight Southeast Asia, and aimed to:

- Expose Forestry Departments and Fire Control Agencies to alternative approaches to forest management which promote the participation of local communities in planning and managing their own forest fire regimes;
- Examine the approaches and elements for promoting these alternatives to civil society; and
- Form working groups and formulate action plans that capture the opportunities that these alternatives offer.

The conference stressed two sides of the issue when it comes to forest fires. In some cases, fire is essential for forest regeneration; in others it destroys forests and results in serious adverse social and economic consequences. In most cases, local communities have been identified as the primary agents of damaging forest fires, whether they started them or not. This view tends to fog the

minds of local fire authorities and creates the perception that local communities are the problem, and not part of the solution in fire management. Papers presented in the conference, however, point out that local communities can and do manage fires in various situations and for many different reasons.

The conference further increased awareness in CBFiM, emphasizing that local people are often in the best position to manage or prevent fires. Indigenous knowledge provides varied information on community activities, native species, ecology of local forest types, resource use and positive or negative impacts of forest fires that should be applied when using or managing fires.

The presentations also showed that communities are more inclined to participate in fire management activities when social and economic incentives are present. A sense of ownership makes community participation infinitely more evident, and results in direct involvement. These were attested to by a variety of community-based approaches used in countries from Africa, Asia and Latin, South and Central America. The similarities between these different contexts should be drawn out to provide a better picture of how best to approach fire management at the local level.

While the conference provided a sound base for improved understanding of communities and their approaches to forest fires, it does not state that local people provide a complete solution to fire management. It simply emphasizes that local communities and other stakeholders, such as the government and the private sector, all play a substantial role in forest fire management.

Proceedings of the conference will be released later this year.

More information can be obtained from Dr. Peter Moore, Coordinator of Project FireFight Southeast Asia, at pmoore@cgiar.org. ■

Surfing the Web... of Life

THE Global Fire Monitoring Center (GFMC) <http://www.ruf.uni-freiburg.de/fireglobe/> monitors, forecasts and archives information on vegetation fires (forest fires, land-use fires, smoke pollution) at the global level. With this information, decision makers at national and international levels are supported in evaluating fire situations or precursors of fire that may endanger humans or negatively affect the environment. Established in 1998, the GFMC was designed as an information and monitoring facility, which national and international agencies involved in land-use planning, fire and other disaster management, scientists and policy makers can utilize for planning and decision making. The GFMC supports the design and implementation of fire management and research projects all over the world. One objective of the FIREGLOBE concept of GFMC is to transfer the wealth of scientific knowledge and technologies to the management level and to support development of national and regional fire policies.

Centre for Remote Imaging, Sensing, and Processing (CRISP), Singapore <http://www.crisp.nus.edu.sg> offers a database with SPOT, ERS and Radarsat Images of the Southeast Asian (SEA) region covering the forest fire episode of 1997/98. It also provides a special feature on forest fires and haze in SEA.

ASEAN Fire Weather Information System <http://www.nofc.forestry.ca/fire/asean/>. This website of the Canadian Forest Service is of special interest for Southeast Asia; it features a prototype of the ASEAN Fire Weather Information System with the Canadian Fire Weather Indices for the region. The maps are provided on a day-to-day basis.

ASEAN Haze Action Online <http://www.haze-online.or.id>. In response to the fire and smoke episodes in Southeast Asia between 1982 and 1998, several national and international initiatives, especially in Indonesia were instituted, such as the Haze Technical Task Force (HTTF) organized during the Sixth Meeting of the ASEAN Senior Officials on Environment in September 1995. The HTTF finalized a response strategy - the Regional Haze Action Plan (RHAP), which was completed in December 1997, and endorsed by the ASEAN Ministerial Meeting on Haze (AMMH) held in Singapore from 22 to 23 December 1997. The ASEAN Environment Ministers' requested assistance from the Asian Development Bank to make the RHAP fully operational. The Bank responded by approving the Regional Technical Assistance (RETA) 5778-REG (Strengthening the Capacity of ASEAN to Prevent and Mitigate Transboundary Atmospheric Pollution). One of the activities that came out of the RETA was the ASEAN Haze Action Online. This website also provides the following information and discussion platforms:

- Regional Haze Action Plan (RHAP)

Document;

- Implementation of the RHAP;
- Monitoring: Hyperlinks to institutions involved in regional monitoring and prediction of fire and smoke haze;
- Haze News: Updates on haze situation, ASEAN press releases, press clippings from international, regional and sub-regional media;
- Calendar: ASEAN's fire-and-haze related events can be identified by a search modus;
- Intranet: Information and possible participation in the ASEAN Haze Action Online Intranet Information Services (coming in 2002);
- Haze Forum (coming in 2002): Communication platform on fire and smoke-haze issues in the ASEAN region.

Forest Fire Prevention and Control Project (FFPCP) <http://www.mdp.co.id/ffpcp.htm>. The FFPCP is a joint enterprise between the European Commission and the Indonesian Ministry of Forestry and Estate Crops. The website contains an overview of the activities of FFPCP, as well as coordinates of detected hotspots and fire danger rating.

The Integrated Forest Fire Management (IFFM) Project works with the Provincial Government of East Kalimantan to develop a province-wide fire management system to reduce the impacts of "unwanted" forest and land fires. By developing the necessary technical skills of Indonesian counterparts, providing firefighting equipment and a warehousing system, and working closely with Provincial and District governments, IFFM has the long-term goal of institutionalizing a fire management organization within the existing government structure.

The IFFM website <http://www.iffm.org> describes the major goals, objectives and activities of the IFFM Project's three units: Fire Prevention, Fire Operations and Fire Information.

The website features include:

- Inventory: Inventory and analysis;
- Fire Prevention - overview of fire causes and conflicts in East Kalimantan, six-step outline of Community Based Fire Management, and promotion of Si Pongi fire prevention mascot;
- Fire Operations - allocation of firefighting equipment, status of Local Fire Center construction, firefighter trainings, and recent fire suppression actions;
- Fire Information - background on 1997/98 fires, updates on NOAA/AVHRR Hotspots and Fire Danger Rating, and links to pertinent weather and El Nino forecasts;
- Portions available in both Indonesian and English languages;
- A listing of IFFM reports and other pertinent publications;
- Other links to related web pages.

Profiles

Overview of ASEAN Heritage Parks and Reserves

In 1984, 11 parks and reserves were named as ASEAN Heritage Parks and Reserves when six ASEAN member countries: Brunei Darussalam, Indonesia, Malaysia, the Philippines, Singapore and Thailand signed the ASEAN Declaration of Heritage Parks and Reserves on the 29th of November. The Declaration was made in consideration of *“the uniqueness, diversity and outstanding values of certain national parks and reserves of ASEAN Member Countries that deserve the highest recognition so that their importance as conservation areas could be appreciated regionally and internationally.”*

It further provides that the identified heritage parks and reserves shall be “managed to maintain ecological processes and life support systems, preserve genetic diversity; ensure sustainable utilization of species and ecosystems; and maintain wilderness that are of scenic, cultural, educational, research, recreational and tourism values.”

To this day, or 16 years later, no other park or reserve has been added to the list.

A Brief History

Mr. Effendy A Sumardja, Chair for Southeast Asia Region-World Commission on Protected Areas (WCPA), International Union for the Conservation of Nature and Natural Resources (IUCN) traced the history of the ASEAN Heritage Parks and Reserves during the Workshop on the Criteria in the Selection of and Guidelines for the Establishment of ASEAN Heritage Parks held last year in Vietnam.

He said that the ASEAN Heritage Parks and Reserves is “a category of protected areas conceived for a select group of national parks and nature reserves that have outstanding wilderness and other values”, which the ASEAN Experts on the Environment conceptualized

during their first regional meeting in 1978. They also recommended “these be given the highest regional recognition so that their importance as conservation areas would be appreciated internationally.” Three years later, ASEAN conservationists endorsed the Experts’ recommendation during their first workshop in September 1981, while calling on the United Nations Environment Programme (UNEP) and the IUCN to support the preparation of a regional conservation action plan, focusing on the establishment of the ASEAN Heritage Parks and Reserves.

With financial support from UNEP, the IUCN prepared the Action Plan on Nature Conservation for the region and included the establishment of 10 initial protected areas as ASEAN Heritage Parks and Reserves. On recommendation of the ASEAN Experts Group on the Environment, a group of experts met to consider the action plan; this group then came to be known as the ASEAN Group on Nature Conservation (AGNC).

During their second meeting in 1983, the AGNC proposed a set of principles, objectives, criteria and guidelines for the selection, establishment and management of protected areas in the ASEAN Region. That same year, Brunei acceded to ASEAN and an 11th Heritage Park was proposed.

Finally, the Second ASEAN Ministerial Meeting in Bangkok, on 29 November 1984, issued the important Declaration on Heritage Parks and Reserves that created the first group of 11 Heritage Sites:

Brunei Darussalam

- 1) Tasek Merimbun

Indonesia

- 2) Leuser National Park
- 3) Kerinci - Seblat National Park
- 4) Lorentz Nature Reserve

Malaysia

- 5) Kinabalu National Park

- 6) Mulu National Park
- 7) Taman Negara National Park

Philippines

- 8) Mt. Apo National Park
- 9) Mts. Iglit-Baco National Park

Thailand

- 10) Khao Yai National Park
- 11) Kor Tarutao National Park

Six of these Heritage Parks are in the 1982 United Nations List of National Parks and Equivalent Reserves: Kinabalu, Mulu and Taman Negara in Malaysia, Mt. Apo in the Philippines, and Khao Yai and Tarutao in Thailand. IUCN also included Indonesia's Leuser and Kerinci-Seblat in its list of Nature-Reserves.

The ASEAN Declaration also called for the development of management plans for each heritage site, tasking the ASEAN Heritage Experts Group on the Environment to help draft model guidelines. The UNEP Regional Office for Asia and Pacific provided technical and financial assistance for the manual called "Planning for ASEAN Heritage Parks and Reserves," which was completed in 1986. The manual provides guidelines in planning and an outline for a management plan.

ASOEN Mandates ARCBC to review AHPR Guidelines and Criteria

Following up on the ASEAN Declaration in 1984, the ASEAN Heads of State and Governments adopted the Hanoi Plan of Action on 15 December 1998, which states under Article VI (Protect the Environment and Promote Sustainable Development) the promotion of regional coordination for the protection of the ASEAN Heritage Parks and Reserves, among other actions.

Thus the ASEAN Senior Officials on the Environment (ASOEN) mandated the ASEAN Regional Centre for Biodiversity Conservation (ARCBC) through its ASEAN Working Group on Nature Conservation and Biodiversity to take appropriate action on the matter. ARCBC responded by including in its 2000 Work Plan a workshop to review the criteria and guidelines for the selection, establishment and management of ASEAN Heritage Parks and Reserves, which eventually occurred from 20-22 September 2000 in Hanoi, Vietnam.

During the workshop, Dr. John MacKinnon, EU Co-Director of ARCBC clarified the relationship of ASEAN Heritage Parks with that of the World Heritage Sites. He stressed: "World Heritage Sites are selected as globally outstanding sites that are special and unusual while ASEAN Heritage Sites are selected as regionally representative sites, which although typical are generally the best example of their type." He said that some sites may merit recognition under both headings but most will not, adding that ASEAN Heritage Sites should by no means be seen as junior or secondary to World Heritage Sites and there should be no conflict or confusion about these two different categories of international recognition.

Dr. MacKinnon also recommended the "acceptance of the principles of AHPR and agreement to participate within the program to establish, develop and protect such sites should be enshrined in a Convention on ASEAN Heritage Parks and Reserves and ratified by each member country."

Supporting this contention, Mr. Gregorio I. Texon, ASEAN Co-director of ARCBC, said that there is a need to ponder upon and deliberate on how to strengthen such partnership and cooperation in the management of our region's natural heritage, now enshrined in the national parks/ protected areas system of each country.

He noted however, that after nomination from each country, nothing much has been done about it. He pointed out to the workshop participants of the need "to revisit and review what happened after the identification of ASEAN heritage parks and reserves and later develop further steps to strengthen this concept by defining the criteria for the selection of other sites and formulation of guidelines for the establishment and management of these areas."

Workshop Recommendations

The workshop proposed that ASEAN Heritage Parks be defined as: "Protected areas of high conservation importance, preserving in total a complete spectrum of representative ecosystems of the ASEAN

region". The two objectives for their establishment were to generate greater awareness, pride, appreciation, enjoyment and conservation of ASEAN's rich natural heritage, through a regional network of representative protected areas, and to generate greater collaboration between ASEAN countries in preserving their shared natural heritage.

Among the criteria (with their corresponding definitions) that a site should have to be included under the AHPR as proposed by MacKinnon and adopted by the workshop participants, are:

- **Ecological completeness.** An intact ecological process and the capability to regenerate with minimal human intervention.
- **Representativeness.** Embodies the variety of ecosystems or species representing or typical of the particular region.
- **Naturalness.** Must be, for the most part, in a natural condition such as a second-growth forest or a rescued coral reef formation, with the natural processes still going on.
- **High conservation importance.** Has global significance for the conservation of important or valuable species, ecosystems or genetic resources; creates or promotes awareness of the importance of nature, biodiversity and the ecological process; and evokes respect for nature when people see it as well as a feeling of loss whenever the natural condition is lost.
- **Legally Gazetted Area.** Must be identified, defined and allocated by law or legally accepted instrument of the ASEAN Member Countries; must be used primarily as protected areas with well-defined boundaries.
- **Approved Management Plan.** Must have a management plan duly approved by authorities of each ASEAN Member Country.

The major categories proposed are:

- **Natural Park.** Major potential for education, recreation and ecotourism
- **Natural reserve.** High conservation value but low accessibility or poten-

tial for tourism and recreation.

- **Cultural site.** Cultural practices symbolize the concept of man living in harmony with nature.
- **Prehistoric site.** Protect essential chapters of the evolution and prehistory of Mankind in ASEAN.
- **Peace Park.** Straddle international frontier or in disputed territories, where mutually agreed upon management for conservation can serve both to protect valuable biodiversity but also diffuse political tensions and promote cooperation between neighboring nations.

As to the management of these ASEAN Heritage Parks, the participants recommended the creation of a Task Force at the ASEAN Secretariat in Jakarta, an ASEAN Heritage Parks and Reserves Secretariat, and Focal Point for each ASEAN Member Country. In the interim, ARCBC will act as Secretariat.

They also proposed the formulation of a strategy and mechanism to generate substantial funding support for the management of the ASEAN Heritage Parks and Reserves.

Copies of the draft Action Plan have been provided to all member countries for comments, which are expected to be submitted to ARCBC and the ASEAN Working Group on Nature Conservation and Biodiversity by December 2001. ■

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Profiles



Philippines

Mt. Apo NATURAL PARK

DAVAO DEL SUR; DAVAO CITY AND COTABATO PROVINCE, PHILIPPINES

Mt. Apo towers over the whole Philippine archipelago being the highest mountain of the country. Its highest peak reaches 2,954 meters above sea level and its base is known to be larger than the island of Singapore. In 1982, the United Nations listed Mt. Apo in its National Parks and Equivalent Reserves while the 1984 ASEAN Declaration on Heritage, Parks and Reserves named it as an ASEAN Heritage Site.

The park is also regarded as the last stronghold of the remaining population of the rare and endangered Philippine eagle (*Pithecophaga jefferyi*), which, aside from being the symbol of environmental preservation in the country, has been declared as the national bird. This majestic raptor, mates for life and can live for half a century.

Mt. Apo is a dormant volcano, which last erupted in 1640. This is why its upper

southeastern slopes, when viewed from the provincial Capital of Davao del Sur, sometimes appear to be covered with snow, but on closer look is really sulphur, which is yellow. On its upper slopes also are hundreds of sulphur vents.

It was proclaimed as a National Park on 9 May 1936 by virtue of Presidential Proclamation No. 59 pursuant to Act No. 3915 (National Park Law) enacted on 16 February 1936, covering an area of 76,900 hectares. With the enactment of Republic Act No. 7586 or the National Integrated Protected Areas System (NIPAS) Act of 1992, Mt. Apo was proclaimed as a natural park on 24 September 1996, covering an area of 72,112 hectares within the territorial jurisdiction of two administrative regions of the country. Some 52,244 ha straddle the Davao del Sur municipalities of Bansalan, Digos and Sta. Cruz, and the chartered cities of Digos

Photos by George Tapan

and Davao; and 19,868 ha in the North Cotabato municipalities of Makilala, Magpet and Kidapawan City.

As a watershed, the whole park provides the domestic and industrial water needs of the surrounding communities. Around 19 major rivers and 21 creeks drain its eight major watersheds (Protected Area Suitability Assessment [PASA] list of 1992). Among its four major lakes, the most popular are Lake Agco, also known as "The Blue Lake" and Lake Venado, a famous camping site for mountaineers and a stopover towards the peak. Lakes Macadac and Jordan are found in the summit grassland.

Mt. Apo's vegetation has varying characteristics. The lowland or lowland evergreen forest occurs at elevations ranging up to 1,200 m asl and is characterized by a multi-strata rainforest with closed canopy. Dipterocarps such as lauán (*Pentacme contorta*), apitong (*Dipterocarpus grandiflorus*) and guijo (*Shorea guiso*) and the *Syzygium* species such as malaruhát (*Cleistocalyx aperculatus*), ulayan (*Lithocarpus*), Kalingag (*Cinnamomum*) are the dominant species. Epiphytes (orchids) that include the endangered waling-waling (*Vanda sanderiana*) are also abundant.

Its montane or low montane forest occurs from 1,200 to 1,800 m asl, and is dominated by lauag-lauigan (*Syzygium*), banyas (*Dacrydium*) and species of igem (*Podocarpus*) and ulayan tindog (*Lithocarpus*) as well as the endemic almaciga (*Agathis philippinensis*), which

has been listed in the Protected Area Suitability Assessment (PASA) in 1992 as vulnerable.

The mossy or high montane forest is found on an elevation range of 1,800 to about 2,600 m asl. It is characterized by an abundant and high diversity of mosses, hepatics, liverworts, epiphytes and stunted trees. Grasses such as Cogon (*Imperata cylindrica*) and *Saccharum spontaneum* and ferns are also found, especially along banks of creeks, streams, and rivers and on steep slopes.

The summit or scrubland occurs on elevations greater than 2,700 m asl. Fumaroles that include sedges (Cyperaceae), a fern species (*Gleichenia decarpa*) as well as species of *Ericaceae* and *Rhododendron* are found on this elevation. Mt. Apo has the largest, if not the only habitat, of this type in the Philippines.

Some studies estimate over 800 floral species including endemic species of the genera *Pipturus*, *Sauravia* and *Poikilospermum* and two endangered ones: *Lithocarpus submonticolus* and *Peperonia elmeri*. In the upper montane forest, the endemic species are *Cypholopus microphyllus* and *Nepenthes copelandi*.

Other plants include the highly valued and endangered ones like almaciga (*Agathis philippinensis*) and dipterocarps such as the rare manggachapoi (*Vatica manggachapoi*) and *Shorea palita*.

Previous studies have identified about 272 bird species, of which 40% are endemic to the park. From among all the



Profiles

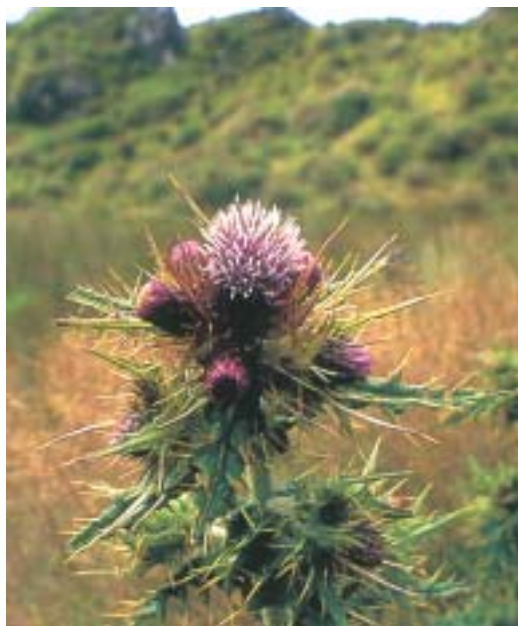
species recorded, two are in the critical list: Philippine Eagle (*Pithecophaga jefferyi*) and abukay (*Cacatua haematopygia*); 10 are endangered, among which are: Mindanao scoops owl (*Otus mirus*), lesser eagle owl (*Mimizuku gurneyi*), Mindanao lorikeet (*Tricoglossus johnstoniae*), and writhed hornbill (*Aceros leucocephalus*).

Mt. Apo Myna (*Basilornis miranda*), Apo lorikeet (*Trichoglossus johnstoniae*), Bagobo babbler (*Leonardina woodi*) and black cinnamon fantail (*Rhipudura nigrocinnamomea*) are some of the endemic birds.

The Philippine Brown Deer (*Cervus mariannus apoensis*) is the most threatened among the 53 mammal species recorded in the area. Other endemic mammals include the tudaya giant rat (*Bollimus bagobos*), tarsier (*Tarsius syriacta*), *Acerodon jubatus*, and the tree shrew (*Urogale everetti*).

Of the 53 species of amphibians and reptiles recorded, 10 (36%) are restricted to the Mindanao faunal region such as bak-bak (*Rana magna*), Lokwak-manobo (*Ansonia mcgregorii*), "tok-tok" manobo (*Kalaula picta*), and cobra (*Naja samarensis*). The ibid (*Hydrosaurus pustulatus*), halo (*Varanus salvator*) and the *Cuora ambionensis* turtle are among those on the critical list.

The mountain boasts several waterfalls and mountain lakes. Lakes Agco and



Venado at the foot of Mt. Apo are the most popular while the most scenic waterfalls are Todaya in Sibulan, Sta. Cruz, and Mabbu and Tagibaka both at Bongolonan, Magpet, Cotabato.

There are also a number of hot springs that are potential sites for eco-tourism. Some of these are: Batasan, at Makilala, Cotabato province; Palaca at Sibulan, Sta. Cruz; Mainit, at Sta. Cruz, Davao del Sur; Lake Agco at Ilomavis, Kidapawan City, Cotabato province and Mainit and Marauer, at Kapatagan, Davao del Sur.

People within the park

Six indigenous groups - Manobos, Bagobo, Ubos, Atas, K'lagans and the Tagacaolo call Mt. Apo their home. They live on the lower slopes of the mountain, which they consider sacred ground and their ancestral domain. To them, the name Apo means "lord" or "ancient ancestor."

Inclusive of the indigenous peoples, the population of the park totals 25,252 or 6,845 households, based on the 1997 census and registration.

Majority of the protected area occupants grow cash crops such as vegetables and fruit trees while a few engage in other off-farm types of livelihood.

Protected Area Management

Both the Protected Area Management Board (PAMB) and the Protected Area Superintendent's (PASu) Office directly manage the park. The PAMB is a multi-sector policy-making body composed of representatives from the national and local government levels, non-government and peoples' organizations, indigenous groups and other local communities; it is chaired

by the Regional Executive Director (RED) of the Department of Environment and Natural Resources (DENR). The PASu is the chief operating officer, whose office is located at Barangay Kapatagan, Digos City and a Liaison Office at the Protected Areas and Wildlife Division-DENR Region XI, Lanang, Davao City [tel.: (082) 234-7441; fax: (082) 234-4401].

The major management zones proposed and identified for Mt. Apo are multiple-use and strict protection zones while a buffer zone would surround the park. The multiple-use zones, which will be divided into three sub-zones: recreation, cultural and special use, will be managed to provide a social fence to prevent encroachment into the protected area by outsiders. The strict protection zone will also be divided into two - habitat and restoration.

Best time to visit

Mountaineers and both foreign and local tourists usually visit the park during the months of March, April and October to December.

Before entering the park, visitors are advised to proceed to the PASu office for a brief orientation about the protected area and the rules and regulations.

How to get there

1) Manila-Davao by plane. Departing from NAIA Terminal 11, Philippine Airlines has six daily flights: 5:10am; 6:55am; 11:00am; 12:45pm; 2:50pm and 4:35pm. For more information, check out its website: www.philippineair.com; wapsite: <http://wap.com.ph/pal>; bookings may be done through: www.philippineair.com/online_reserve.htm. Air Philippines and Cebu Pacific depart daily from the Manila Domestic Airport with the following schedules: (Air Philippines): 5:30am; 8:25am; 3:10pm; reservations may be done through: tel: +63.2.855-9000; fax: +63.2. 851-7922; email: reservations@airphilippines.com.ph (Cebu Pacific): 4:30am; 10:20am; 12:40pm; 1:00pm (via Cebu); and 4:00pm. Call: +63.2.636-4938; book and pay on-line at: www.cebupacificair.com.

Flight time is about an hour and a half. One-way fare (exclusive of insurance and other minimal fees) is about PhP3,000-PhP4,000.

2) Manila-Davao by boat. Two major shipping lines depart from the North Harbor, Manila. Contact WG&A Superferry through its main office: 110 Legaspi Street, Legaspi Village, Makati; tel.: +63.2.894-



3211; 527-2029; 527-2030; 527-4605; fax: +63.2.527-2036. Or check out its website: www.wgasuperferry.com.

Negros Navigation, located at Pier 11, North Harbor, Tondo, Manila is another liner you may call: Tel.: +63.2.245-0601-12; 818-4101-02; 891-6118; 816-2656; Fax: +63.2.818-3707

From the Davao airport, taxis are available to take you to Ecoland Terminal where one can take a bus to Digos City. From the provincial capital, it takes about an hour by car or passenger jeepney to reach the park.

Eco-tourism destinations and activities

Mt. Apo is probably one of the nation's most popular recreation areas and the mountain itself is now routinely scaled by hundreds of climbers each year.

Hiking

Several access routes lead inside the park, but three are the most accessible, with a significant common factor: leeches.

- Northeast trail through Baracatan, which is steep and may take three days hiking/trekking.
- Northwest trail from Kidapawan in Cotabato, which is a two-day hike.
- Southwest through Makilala, which is also a two-day trek.

Lakes and Waterfalls

- **Lake Agco.** Considered as sacred, the lake is heated from below by volcanic vents to near boiling point and is located at Ilomavis, Kidapawan city. Passenger jeeps regularly ply the Kidapawan City to Barangay Ilomavis route.
- **Lake Venado.** Located at Sibulan, Davao City, one can have a full view of Mt. Apo's highest peak, which could be reached through the different routes or trails mentioned above.
- **Tudaya Falls,** Sibulan, Sta Cruz.
- **Mabbu and Tagibaka Falls,** Bongolonan, Magpet, Cotabato.
- **Bacoco Falls,** Kapatagan, Digos City. Jeeps from Digos City reach Kapatagan, from where one can hike to the falls.

Hot Springs

- Batasan Hot Spring at Makilala, Cotabato province.
- Palaca Hot Spring at Sibulan, Sta. Cruz, Davao del Sur
- Kapatagan, Digos City, Davao del Sur
- Mainit Hot Spring in Sta. Cruz, Davao del Sur
- Lake Agco at Ilomavis, Kidapawan City, Cotabato province which could be reached by land transport from Kidapawan City to Ilomavis
- Mainit and Marauer hot springs in Kapatagan, Davao del Sur could be reached by land transport from Digos City.

In his travel guidebook, *26 Days Around the Philippines*, Carlos M. Libosado, Jr. recommends the following places of interest within and around Davao City that one can visit before or after a trek to Mt. Apo:

Philippine Eagle Camp, Malagos: The eagles are captive-bred here. To get to this place, go to Bankerohan Market and take a jeepney for an hour ride to Calinan. At the Calinan public market, take a tricycle to the camp, which should take only 30 minutes. To be assured of public transport back to the city, tour the camp in the morning. You could also hire a jeepney or a tricycle.

Orchid Farms and Gardens: Davao is famous for its orchid farms. A kilometer away from the Philippine Eagle Camp is the **Malagos Garden Resort**, an inland resort blooming with a myriad Philippine orchid species. The resort has a restaurant, a swimming pool and multi-purpose hall. Further down the road is the **Yuhico Orchid Farms**, the biggest orchid farm in Davao. Nearest the city is **Fuentspina Orchid Garden**, which has several varieties of highbred orchids, including the world-famous *Vanda Sanderiana* or Waling-waling. To get there, take a jeepney with the Agdao signboard along C.M. Recto (formerly Claveria) Street or A. Pichon (formerly Magallanes) Street. Get off at the Agdao public market, and then take a tricycle to the orchid farm, which is at the back of Assumption School. Other



orchid farms are the **Derling Orchid garden** in Buhangin and the **Mindanao Flower Market** in Bo. Pampang, Lanang.

Buddhist and Tao temples: You will find a Buddhist temple called **Lon Wa** on J.P. Cabaguio Avenue where you can enjoy peace and quiet amidst a landscape of candle trees and bamboos. Not far from there is a **Tao temple**.

Ethnic experience. Take a jeepney to Lanang District and get off at **Insular Village**, about six kilometers from the city, to visit a **gallery of paintings and sculpture**, and a **souvenir shop** selling **colorful native crafts**. The **museum** is open (9:00-5:00) everyday except Sundays. You could walk from there to **Dabaw Etnika**, behind the Davao Insular Century Hotel, where some Mandaya tribal women show their skills in weaving intricate patterns of abaca fibers.

Where to stay and eat at Davao City

There are no lodging places or inns within Mt. Apo, but the city has several hotels, which also serve meals. Some of these (with their corresponding single [S]

and double [D] room rates) are:

- Marco Polo Hotel (C.M. Recto St.): (S) PhP2, 500; (D) PhP 2,700
- Insular Hotel (Lanang): PhP 2,500 up
- Grand Regal Hotel (Lanang): (S) PhP1, 700.00; (D) PhP 2,000.00
- Apo View Hotel (J. Camus St.): (S) PhP2, 000.00; (D) PhP 2,000.00
- Grand Men Seng Hotel (Magallanes St.): (S) PhP1, 194.00; (D) PhP1,520.00
- Hotel Elena (Lanang St.): (S) PhP750.00; (D) PhP 950.00
- Regency Inn (Villa Abrille St.): (S) PhP599.00; (D) PhP849.00
- Elle's Pension House (Mt. Apo St.): (S) PhP496.00; (D) PhP 576.00
- Tower Inn Hotel (Quirino St.): (S) PhP600.00; (D) PhP750.00
- The Royale House (C.M. Recto St.): (S) PhP295.00; (D) PhP600.00

Note: As of September 2001, the Philippine peso (PhP) equivalent of a US dollar is about PhP 51.50.

Several barbecue stalls serve seafood such as tuna and tanguigue, or Spanish mackerel fresh from the southern Mindanao waters. Some restaurants offering mouth watering but affordable foods within the city are:

- Luz Kinilaw, along Boulevard Ave.
- Jack's Ridge, Shrine Hills, Matina
- Harana Restaurant, F. Torres St.
- Bistro Rosario, F. Torres St.
- Molave Restaurant, McArthur Highway, Matina
- Dencia's Restaurant, G. Luna St.
- Shanghai Restaurant, Magsaysay Avenue. ■

Our special thanks to PASu Leonilo Rivera of Mt. Apo Natural Park for reviewing the article.

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Profiles



Photo courtesy of National Biodiversity Reference Unit (Thailand)

Khao Yai NATIONAL PARK

PROVINCES OF NAKHON RATCHASIMA, SARABURI, NAKHON NAYOK
AND PRACHINBURI, THAILAND

National Parks of Thailand, a book by Gray 1994, et al, describes the park, thus: "Thailand's first, best known and perhaps most famous national park. Khao Yai's myriad attractions include a wealth of wildlife, natural beauty and some of the largest areas of seasonal tropical forest left on mainland Asia."

Khao Yai, meaning "Big Mountain" is the third largest Natural Park of Thailand with the highest peak rising 1,351 meters above sea level. Established in 1962, Khao Yai was the first to be declared a national park in the country.

The park has been declared an ASEAN Heritage Site and nominated also as a World Heritage Site. It is one of the most frequented parks of Thailand, and had a total of 700,000 visitors in 1990.

The 2,172-square kilometer park is one of the most important watersheds for surrounding provinces, in particular Nakhon Ratchasima, Saraburi, Nakhon Nayok and

Prachinburi; it covers portions of the four provinces. It is situated near the most westerly part of the Dongrak Mountain Range, with its highest region located north and west of the park. The lowest lying areas, ranging from 60 to 160 meters above sea level, are found along the valleys of the Khlong Wang Takhray in the southwest and Lam Phraya Than and lower Sai Yai in the east.

As cited in the publication "ASEAN Heritage Parks and Reserves", Dr. Tem Smitinand described five forest types in the park:

Dry mixed deciduous forest. This occurs partly northeast of the Park in the 400-600-meter range. Major tree species include *Azelia xylocarpa*, *Pterocarpus macrocarpus*, *Lagerstroemia calyculata*, *Pterocymbium javanicum*, *Adina cordifolia*, and *Anogeissus acuminata*. The ground flora is composed largely of grass species specially *Bambusa arundinacea*.

Dry evergreen forest. This type occurs largely in the western to eastern borders and largely confined to elevations between 100 and 200 meters. The upper storey is mostly dipterocarps: *Dipterocarpus alatus*, *Vatica cinerea*, *Shorea sericeiflora*, and *Hopea ferrea*. Non-dipterocarps include species of *Lagerstroemia*, *Tetrameles*, *Lophepetalum*, *Azelia*, and *Parkia*. Some of the palms are *Areca triandra* and *Corypha lecomtei* and the ground flora is largely of the *Marantaceae* and *Zingiberaceae* groups.

Moist rainforest. This is the dominant type, occurring between the 400 to 1000-meter elevations. At the lower elevations, dipterocarps are more numerous than in the dry evergreen forests. The dominant species include *Dipterocarpus dyeri*, *D. baudii*, *D. gracilis* and *Anisoptera costata*. There are very few deciduous species and the ground flora does not differ much from that of the dry evergreen forest except perhaps in being denser.

In higher altitudes, among the species are *D. costatus* and *D. macrocarpus* and a number of Fagaceous species such as *Lithocarpus annamensis*, *L. eucalyptifolius*, *L. rodgerianus*, *Quercus fleuryi*, *Q. myrsinaefolia* and *Castanopsis acuminatissima*.

Hill evergreen forest. This type occurs above 700 meters; in many areas, the change from lowland to hill evergreen is quite abrupt. Gynosperms such as *Podocarpus neriifolius*, *P. imbricatus* and *Dacrydium elatum* are dominant. Oaks that appear in the higher levels of the moist rainforest also grow in this forest. Epiphytes, ferns, and several moss and liverwort species are quite abundant.

Grassland and secondary thickets. Largely man-made, this type evolved as a result of farming before the park was established. Grass species include *Imperata cylindrica*, *Themeda arundinacea* as well as *Saccharum* and *Thysanolaena* species.

Dr. Smitinand found out from a group of 125 plant species that 16 were endemic, 17 of Himalayan origin, 14 from Annam highlands and 12 had affinities with Malaysian species. Notable among these species he mentioned is *Aquilaria crassna*, which produces an aromatic wood, called garhu wood, or mai hom in

Thai. The aromatic wood comes from resin in the wood strain within the trunk, and aroma is produced after the fungus darkens the wood, as a result of attack by insects. Mai hom is used for incense, and the best quality pieces can fetch a price of about US\$250 per kilogram.

In Khao Yai, one is likely to encounter a wide range of animals such as elephants, tigers, deer, gibbons and hornbills. Some 250-300 Asiatic elephants may still exist in the park, more than the number found in other protected areas in the country. The park is also home to at least 25 larger mammals including Asian jackal, Asiatic black bear, Malayan sun bear, Javan mongoose, hog badger, clouded leopard, marbled cat, barking deer, scrow and slow loris; and 40 other smaller species.



Photo by John MacKinnon

Among the primates seen and heard close to the park headquarters, along the Pak Chong access road and east of Hew Suwat Waterfalls, are the white-handed or lar gibbon and the more secretive pileated gibbon. Along the roadside, one could spot groups of pig-tailed macaques in the early mornings and late evenings.

Some of the 340 migrant and resident bird species identified include the silver and Siamese fireback pheasants, mountain imperial pigeon, Hodgson's hawk cuckoo, spot-bellied eagle owl, orange-breasted and red-headed trogons, banded kingfisher, large scimitar babbler, brown needletail, possibly the world's fastest bird, and the rare silver pheasant. There are also four hornbill species: the great and the wreathed and the smaller noisy Oriental pied and the more secretive and quiet brown hornbills.

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Climate

One of Khao Yai's great assets is cool, fresh air. Average temperatures range from 28°C to mid-30's in the hottest months of April and May. In the coolest months of December and January, temperature averages as low as 15° C but frequently drop much lower (Gray 1994).

Rainfall is heaviest between May and October and the driest are December and January, with rain averaging no more than 15 millimeters per month. Annual rainfall in the park headquarters has been measured at 2,270 mm, more than 84% falling during the monsoon; in other areas of the park, it averages 3,000 mm (Gray 1994).

Eco-Tourism Activities

As described by Gray, et al (1994), marked trails, numbered as below, are confined to a relatively small, central area to keep the rest of Khao Yai as pristine as possible. These are the best-developed nature trails in Thailand, but the brief descriptions that follow do not reflect the great variety of landscape, vegetation and wildlife hikers will encounter. The sudden appearance of an elephant, the tracks of tigers at salt licks, a stunning view over

grasslands towards more distant peaks and the constant sense of teeming life are some of the enduring pleasures of these tropical byways.

Trail 1: Kong Kacw to Hew Suwat.

One of the park's most popular, the six-kilometer trail, three- to four- hours walk, starts behind the visitor center and is marked with red paint. Hikers should arrange transport back to headquarters. This trail offers some of the best opportunities to observe gibbons at close range.

Trail 2: Kong Kacw to Elephant Salt Lick 2. The six-kilometer trail, frequently used by elephants, also starts behind the visitor's center; it is marked in blue, but is not very visible in the grassland, about 1.5 kilometers from the salt lick. A guide is advisable on this three- to four-hour hike.

Trail 3: Kong Kacw to Pha Kluai Mai. Trailhead is located behind the visitors' center. If one starts at Pha Mual Mai, the trailhead, marked in yellow, is 300 meters east of Pha Kluai Mai.

Trail 4: Pha Kluai Mai to Hew Suwat. Trailhead is on the far side of the camping site and marked in red. This trail is three kilometers long and follows the banks of the Lam Takhong River, offering scenic



Photo by John MacKinnon

views of the river and waterfalls. From March to May, many different orchid species flower (the red *Renanthera* species in particular), especially on and around the waterfalls about halfway along the trail. Blue-eared kingfishers, slaty-backed forktails, scarlet minivets and the occasional little cormorant may sometimes be spotted. Lower down the trail where it is more open, sightings of wreathed and great hornbills are frequent.

Bands of macaques, the occasional elephant or families of gibbons are also common fauna frequently encountered on this trail.

Trail 5: Hew Suwat to Khao Laem grassland. Trail starts across the Lam Takhong River from the Hew Suwat parking area, is sometimes difficult to follow. Nevertheless, one is rewarded with a splendid view of Khao Laem Mountain. Large grass-eating animals such as guai occupy this area. The trail returns the same way to Hew Suwat.

Trail 6: Headquarters to Nong Phak Chi. Starts across the road from the Visitors' Centre south of the park office and is marked in red. It will take about three hours to reach the Nong Pak Chi wildlife watchtower. It is easy to follow this popular trail except for the last 800 meters through grasslands to the tower. The dirt track to the main road leads back to headquarters. The full circuit is six kilometers long. At dawn or dusk, deer and other animals may be seen from the tower. The forest along the trail is notable for many magnificent fig trees and is home to relatively easily seen white-handed gibbons. Herds of wild pig are frequently encountered and, in recent years, rare clouded leopards have been sighted. Rangers also report that tigers cross close to the start of the trail and are occasionally seen in the grasslands on the trail to the Nong Pak Chi watchtower. Dusk would be a good time to see woodpeckers.

Trail 7: Headquarters to Wang Cham Pi. Trailhead starts as in No. 6 and is marked in blue. It is a pleasant, looping trail that would take two to three hours for the full 4.5-kilometer circuit. Bird watchers would enjoy this area, which is a favorite haunt of noisy pied hornbills and others.

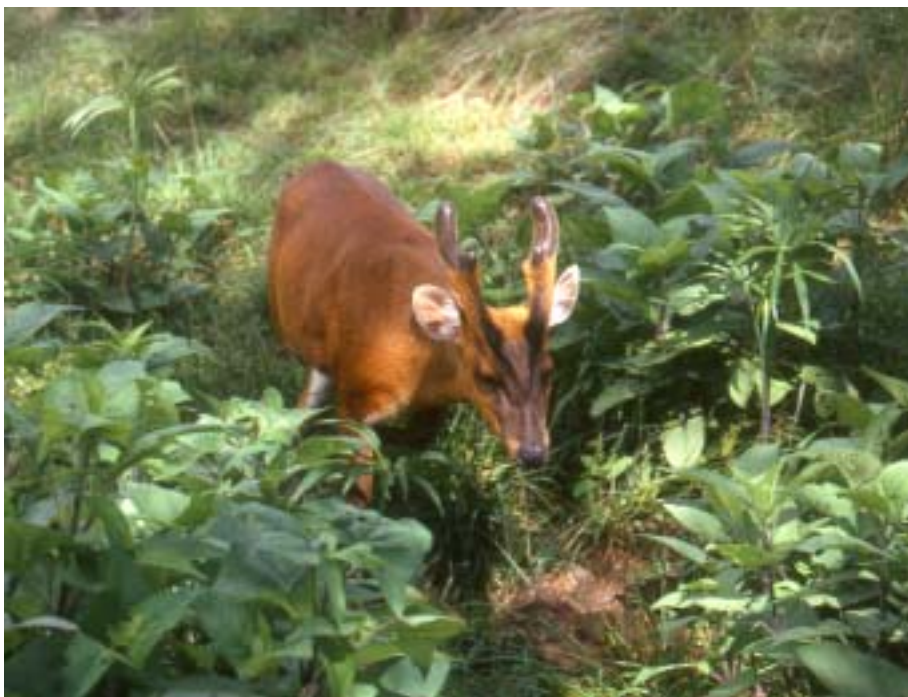


Photo by John MacKinnon

Gibbons also reside here so one can always observe troops of macaques and occasionally a few elephants.

Trail 8: Headquarters Looping Trail. This yellow-marked 2.5-km trail branches off from #6 and ends opposite headquarters. It would take a minimum of one-hour hike.

Trail 9: Headquarters to Mo Singto. This short trail, marked in blue begins as in No.6 and is easy to follow. It is four kilometers long, requiring a minimum of two hours. It ends at a reservoir close to headquarters. Despite its proximity to headquarters, this trail is a favorite tiger haunt as there are many sambar and barking deer close to the grasslands. Closer to headquarters, the rare clouded leopard has also been sighted.

Trail 10: Headquarters to the former TAT Restaurant. Trail starts as in No. 6 or from behind the TAT restaurant. It is marked in red but should not be confused with trail No. 6. It branches to the west and south while trail 6 continues on to the northwest. It is 5.5 kilometers long and would take two to three hours of easy walking.

Trail 11: TAT Restaurant to Tadta-phu Waterfalls. Trail starts behind the TAT restaurant at the end of a dirt trail. It is a round trip of eight kilometers taking five to six hours. During the wetter months, ropes cross many of the small streams; it is thus advisable to take a guide. Close to the

Profiles

waterfalls are grasslands where a number of gaur has been seen.

Trail 12: Dan Chang to Bung Phai. Trail starts opposite a sign for Dan Chang near kilometer 32 and is marked in red. It is an easy roundtrip of three kilometers through the forest and grassland, returning by the same route. Elephants frequent this trail. Transportation has to be arranged to and from the trail start.

The old TAT golf course is regenerating idly; it is such an open space and is off-limits to vehicles. It now offers excellent bird watching. If one is lucky, sambar and barking deer, and tigers, during the week-days, would be sighted quite frequently.

Hew Narok and Hew Suwat Waterfalls

Other attractions in the park are the Hew Narok and Hew Suwat waterfalls, both extremely popular with visitors and easily reached. Park authorities have constructed large parking areas and eating facilities are the best in Khao Yai. A large fence near Hew Narok Waterfall was constructed in 1993 to prevent elephants from falling into the deep gorge as several had done before the barrier was erected. During the wet season, the volume of water in both falls becomes a spectacular view but would be dangerous for swimmers. Panoramic views are possible from several points of the main highway and along the road leading to the top of Khico Mountain.

Bird Watching

There are four hornbill species found in the park; the larger ones are the great and wreathed and the two smaller are the noisy Oriental pied and the more secretive and quiet brown hornbill. Patient bird watchers can see large flocks of wreathed hornbills close to Nong Phak Chi and the 30-kilometer viewpoint, especially in August and September.

Most bird watching is done in an area roughly 20 square kilometers around the park headquarters, less than one percent of Khao Yai's total expanse. Nesting reaches a peak during the hottest months while most species sing at their best during the early breeding season, in March or April. However, many may be heard calling throughout the year. Well repre-



Photo courtesy of National Biodiversity Reference Unit (Thailand)

sented at Khao Yai are dwellers of lowlands and hill slopes; grasslands and scrub; evergreen forests and the forest edge, along with some montane birds.

Shinings

After sunset, the park arranges for groups to go out to selected sites for "shinings" during which one is likely to see a sambar, barking deer or civet; occasionally, an elephant, and very rarely, tiger. Searchlights on park vehicles are turned on to "capture" these animals as they prowl or scurry through the darkness.

Guidelines for Visitors

Khao Yai has about 50 kilometers of marked trails, most of which were originally and are still used by wild animals specially elephants. They are generally easy to follow but some tips are worth noting:

- Except on the short, well-traveled trails, one should not hike alone in tropical forests unless one is experienced or familiar with such areas. Getting lost and dangerous animals

are the main hazards. One can hire park rangers as guides.

- Chances are you may encounter a forest denizen, especially in the early morning or evening. Hikers or motorists should not approach elephants anywhere in the park too closely, and photographers should never fire flashes in their vicinity.
- Trail marks are color-painted on trees, and trailheads are clearly marked. Experienced hikers may follow unmarked trails with map and compass; others should get a guide.
- Arrange for transport back from where you start, as hitchhiking is unreliable.
- Obtain special permission from headquarters if spending nights at park outstations. Policy on overnight stays may change so it is important to check with the Royal Forestry Department authorities in Bangkok.
- Pack repellents for both mosquitoes and leeches, especially during the rainy season as leeches are numerous on the trails. Bring extra food, water, and a compass on long treks.

How to get there

There are two entrances to the park: southern and northern, both about 200 km from Bangkok. By car, one can reach the entrance gates in about three hours.

To reach the southern entrance from Bangkok, take Highway 1 (Friendship Highway) north to Rangsit and then branch off on Highway 305 to Nakhon Nayok. Then take Highway 33 towards Prachinburi, turning left on Highway 3077, leading northwards to the park. From that turn-off, you are 41 km to the park headquarters.

To reach the northern entrance from Bangkok, follow Highway 1 to Saraburi, pass through Muak Lek and turn right on Highway 2090, which is 5 km before reaching Pak Chong. The intersection, located 40 km from the park headquarters, is clearly marked. One can also reach the park from the city of Nakhon Ratchasima.

Park Headquarters and Facilities

The Park Headquarters is located along the Pak Chong access road and east of

Hew Suwat Waterfalls. Visitors are encouraged to make a stop at its large visitors' center, which provides information about the park's terrain, flora and fauna. The office itself, which is adjacent to the center, provides detailed information on all aspects of the park, including arrangements for guides. A large eating area close to the office serves Thai food and cold drinks and also sells a wide range of food and drinks suitable for day or overnight treks; a small shop also sells T-shirts.

If one plans to stay overnight on Friday and Saturday nights and holidays, it is advisable to make advance bookings. The dormitories at Ya Wachon Camp about two kilometers from the park headquarters can accommodate a limited number of visitors. For those who want to sleep outdoors, there is a camping site at Pa Kluai Mai on the road to Hew Suwat Waterfall. Both charge minimal fees.

An option would be the Royal Forestry Department bungalows, which are available by arrangement with the department in Bangkok, but government officials and special interest groups generally get priority.

Other places to stay and eat

One can stay at Juldis Resort Hotel or other high-end resorts, located 15 to 25 minutes' drive to the park's northern gate. Other hotels and resorts both in and close to Pak Chong, offer guide service into the park. Large rest areas close to Hew Suwat and Hew Narok waterfalls provide refreshments and simple Thai food. ■

Our special thanks to Dr. Chumpol Sukgaseem, Chief of Khao Yai National Park, for reviewing the article.

References

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Gray, Dennis, Collin Piprell, Mark Graham. 1994. Khao Yai National Park. In National Parks of Thailand, 1994 Revised Edition, 250pp.

Natural Resources and Environmental Management Division (Tel.: (662) 271-3251, 279-5202; Fax: (662) 279-8088, 271-3251), Office of Environmental Policy and Planning, 60/1 Soi Phibun Wattana 7, Rama VI Road, Bangkok 10400, Thailand

Biodiversity Information Sharing Service (BISS)

► By **ALOYSIUS J.F.M. DEKKER**

Biological diversity covers a vast subject matter and it is not surprising that the amount of information about it is truly huge. What is surprising however, is the very little information readily available to those who need it most: law and decision-makers affecting biodiversity, managers of biological resources, non-government organizations and professional scientists. Most data are scattered in private collections and scientific institutions, and often deal with highly specialized issues and are described in scientific terms. There have been few attempts to collate different data, but often these are not readily available to the general public. So far, none exists for the ASEAN region.

It is this hiatus that the ASEAN Regional Centre for Biodiversity Conservation (ARCBC) tries to fill in with its Biodiversity Information Sharing Service (BISS).

While it is easy to talk about biodiversity in general, most people fall silent when it comes to presenting hard facts. Experts and specialists know a lot in their own fields, but there are pieces of the puzzle that nobody has been able to meaningfully present holistic perspective..

This is what BISS tries to do: put all the pieces together to produce information at a depth and in a format of salient points that anybody, scientists and the general public alike, can understand and work with. This is a mammoth task and it would be foolish to try and obtain all the data by ourselves. Instead, BISS would keep only a minimal dataset itself for critical details, like species name lists and protected area network data. The bulk of the data would

come from direct links into other sources: national databanks in ASEAN countries, international databanks like World Conservation Monitoring Centre (WCMC), museums and herbariums, and private collections. This would enable BISS to focus on the relevant details while still providing access to details when required. ARCBC will assist anybody in the region in making their biodiversity data readily available through the system.

For this reason, ARCBC is particularly keen on contacting persons or organizations willing to share descriptive sheets on species especially lesser known taxa; photographs and locality data of species; descriptions of sites; species lists by site and digital land-cover maps for the ASEAN region. ARCBC will ensure that data presented through such

links are fully acknowledged and that copyright to illustrations, photos, maps or other data would be retained by the rights' holder.

For the current system, ARCBC has basic data on the protected area network in the ASEAN region, and it is trying to install national databanks in each ASEAN country (except Myanmar) that would store and update country-specific data sets.

On a much larger scale, ARCBC is busy compiling ASEAN species' lists for different taxa. At present, the lists of Mammals (939 species), Birds (2,700 species), Amphibia (730 species) are already on the web with their distribution, habitat details and categories under the International Union for the Conservation of Nature (IUCN). A list of Reptiles (1,244 species) would be online within one month; work is progressing on each



list of plants (over 30,000 species currently listed), butterflies (approximately 1800 species so far listed), Philippine Odonata (305 species) and Philippine fungi. BISS links descriptions and pictures to species. Currently, descriptions of 2,500 vertebrates and about 1000 plants are online and pictures of about 2000 species are already on the web server.

BISS has a user-friendly species search engine that provides basic conservation status, distributional and habitat use information and can link to other web sites providing additional information on a particular species. Thus for all mammals, there is a link to the Smithsonian Website in Washington, U.S.A. to check on the taxonomic status of each name; this has further links to specimens held in the US National Museum. Amphibia has links to the Chicago Field Museum, and reptiles with the Heidelberg database. For plants, a useful link is being developed with the Leiden Herbarium in Netherlands. Some 40,000 type specimens held in Leiden can be viewed in high detail over the web. For all threatened birds, there

is a link that allows one to view or download the species descriptions from BirdLife International's new and online version of the 'Threatened Birds of Asia' book.

Point data for locality of species can be viewed by calling up the Xerox mapping routine held on its website. Links are also provided to other well-developed web-based databases, such as those for fish (Fishbase) and coral reefs (Reefbase), which ARCBC does not have to replicate but can facilitate access through its own site.

Selecting the locality-wise search under BISS allows the visitor to examine a range of maps such as biogeographic regions, vegetation, endemic bird areas, important bird areas, protected areas and other priority sites. By clicking on the maps, one can select a site and call up relevant data. Basic data available include descriptions, lists of associated species, photos and habitat data. Again links to other data holders allow the browser access to additional data such as those catalogued by the WCMC. Philippine Protected Areas

may be browsed in each protected area's specific website on the Government's web server. Vietnam Protected Areas allows viewing or downloading sheets of the Vietnam Protected Areas Sourcebook, and for Indonesia there are links to the BioMap programme. Where interesting species are mentioned or listed under sites or regions, these references are made into hot links so users can quickly check out related data.

Although BISS is still being developed, new modules are currently under construction to allow direct downloading of datasets, maps and other resources, such as a habitat-based search engine and inter-linkages with bibliographies and specimen holdings in collections. BISS will also link into ARCBC's experts and resources metadatabase.

You can find BISS under the 'Gateway to biodiversity' key, as well as under the database button on the ARCBC website at <http://www.arcbc.org.ph>. ■

Aloysius J.F.M. Dekker is the EU Database Expert of ARCBC.

National Biodiversity Reference Units (NBRUs) Directory

BRUNEI DARUSSALAM

HJ ABD Rahman bin Hj Chuchu
Director
Forestry Department
Ministry of Industry & Primary Resources
Jalan Menteri Besar Negara,
BB 3910
Brunei Darussalam
Email: jphaq@brunet.bn
Website: www.forestry.gov.bn

CAMBODIA

Mr. Kol Vatana
Deputy Director
Department of Nature Conservation
and Protected Areas
Ministry of Environment,
No. 48 Preah Sihanouk St,
Tonle Bassac, Chamkarmon,
Phnom Penh, Cambodia
Email: moe@bigpond.com.kh

INDONESIA

Dr. J. Sugardjito
Senior Scientist
Research Centre for Biology
The Indonesian Institute
of Sciences
Jl. Juanda 18,
Bogor, Indonesia
Email: ffi@indo.net.id
Website: www.lipi.gov.id

LAO PDR

Mr. Soukata Vichit
Director General
Prime Minister's Office
Science, Technology and Environment
Agency
P.O. Box 2279, Vientiane
Lao People's Democratic Republic
Email: souk@pan-laos.net.la

MALAYSIA

Mr. Azhar Noraini
Assistant Director
Conservation and Environmental
Management Division
Ministry of Science, Technology
and the Environment
Level 4 Block C5, Parcel C
Pusat Pentadbiran Kerajaan
Persekutuan 62502, Putrajaya, Malaysia
Email: azhar@mastic.gov.my
Website: www.mastic.gov.my

PHILIPPINES

Atty. Wilfrido S. Pollisco
Director
Protected Areas and Wildlife Bureau
Department of Environment and
Natural Resources
North Avenue, Diliman,
1156 Quezon City, Philippines
Email: pawb-plan@psdn.org.ph
Website: www.pawb.gov.ph

SINGAPORE

Dr. Lena Chan
Assistant Director
National Parks Board
Singapore Botanic Gardens
1 Cluny Road 259569
Singapore
Email: Lena_CHAN@NPARKS.GOV.SG
nbrc_nparks@pacific.net.sg
Website: www.nparks.gov.sg

THAILAND

Ms. Duangmal Sinthuvanich
Director
Natural Resources and Environmental
Management Division
Office of Environmental Policy and
Planning (OEPP)
60/1 Soi Phibun Wattana 7
Rama 6 Road, Bangkok 10400, Thailand
Email: duangmal@oepp.go.th
Website: www.oepp.go.th

VIETNAM

Mr. Tran Lien Phong
Head
Nature Conservation Division
National Environment Agency
67 Nguyen Du St.
Hanoi, Vietnam
Email: baoton@hn.vnn.vn
Website: www.enviforum.vnn.vn/nv_protec/structure.html

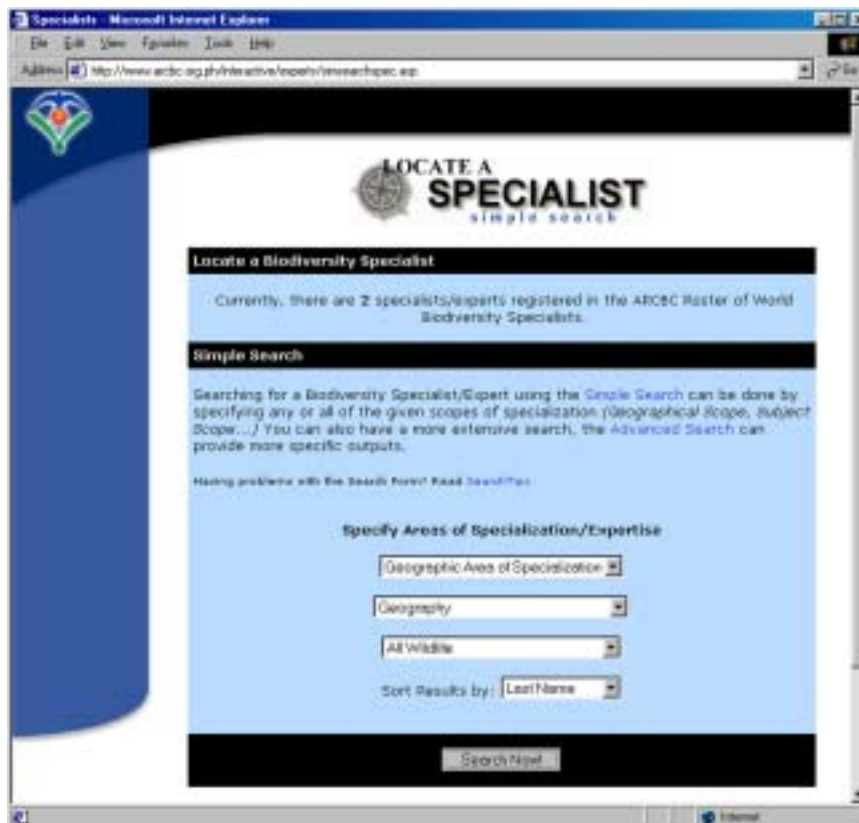
Join the World Roster of ASEAN Biodiversity Specialists

► By **GENIE JOY D. MARFA**

True to its primary goals of generation, exchange and dissemination of information and experience related to biodiversity conservation in and for the ASEAN region, the ASEAN Regional Centre for Biodiversity Conservation (ARCBC) is in the process of establishing linkages and building networks among institutions and main actors focusing on ASEAN biodiversity conservation. It is from these efforts that ARCBC conceived of building a Roster of ASEAN Biodiversity Experts.

This roster is simply a database of people from all over the world, but primarily those with work experience in the ASEAN region and neighboring countries and holding particular expertise in the following fields: Agriculture, Fishery, Biology, Environment and Nature, Forestry, Geography, EcoManagement, Technical, Policy/Legal and Training and Education. It is one of the web databases in the Centre's website (<http://www.arcbc.org.ph>). It includes the following basic information about the experts:

- Personal Information
- Availability for Consultancy
- Contact Information
- Educational Background
- Employment
- Specialization
 - Geographic Scope



- Subject Scope
- Taxonomic Scope
- Work Experience
- Other Related Information

The expert I has the sole right to update his/her profile and preferences online that have been set by the security mechanism of the ARCBC site. The information will be readily available to anyone through the Centre's website. The expert will be able to enjoy opportunities for future collaboration with partner organizations in the areas of Research, Train-

ing, Networking and Resource Management. The Registered Expert will also be able to receive regular news and updates as well as other services provided by ARCBC.

Should you wish to become part of the growing Roster of ASEAN Biodiversity Experts, please register online at <http://www.arcbc.org.ph/interactive> or request a form via contact.us@arcbc.org.ph. ■

Genie Joy Marfa is the Database Developer of ARCBC.



BUILDING ON NANO-DIVERSITY

Microbial Information Management in Thailand

► By CHEN NAN

Microbes play essential ecological roles in balancing nature. Genetic resources contained in microorganisms are largely still waiting to be tapped, although the biological activities and organic compounds they produce are widely used in agricultural activities, pharmaceutical industries, food production, environmental controls and restorations. The direct economic significance of microbes also provides strong arguments for influencing the decision-making process benefiting biodiversity conservation in general.

Although only a small fraction of microbes are named and documented, unlike taxonomical groups with low total species numbers but high public interests such as vertebrates or higher plants, huge amounts of data are being collected largely because of the high rate of new microbial strain discovery. Not all collected data can be published in traditional ways, and a large portion of collected data remains in private notes only. These data face the danger of being lost through the eventual retirement of the data owners. Although some seemingly insignificant data such as microhabitat records of a well known species, or the fact that a species shows negative results in anti disease tests, may not deserve a place in a scientific journal, the accumulation of such data across time and space will enable us to detect possible important patterns and trends. Sometimes records as important as possible new species discovery remain undocumented simply because the

hard evidence, the strain, dies out. Data conservation issues must be treated seriously.

Traditional vehicles for dissemination of research results are paper-based. Certain shortcomings can be identified. Papers can be considered as two-dimensional and data are usually listed to accommodate only one way of viewing. By far, the most common published species inventories are arranged by species names. While in using this kind of inventory, it is not difficult to find out the distribution, habitat uses, substrate, growth medium, preservation methods and other information for given species, it becomes hard to supply basic things like "A list of all species (or endangered species) that occupy certain habitat types". It becomes complicated to answer a question such as "What is the number of species that more than three communities claim to be effective for medicinal uses but which have not been biologically screened?" Microbial species inventories maintained on papers can help little in obtaining information about sites (i.e., for environment impact assessment). In short, obtaining a subset of records that satisfies a range of criteria is extremely impracticable or virtually impossible.

To work around this limitation, inefficient techniques are used. Many books with duplicated information have already been published. It is not surprising to see book titles like "Forest Fungi in Thailand", "Seed Fungi in Khao Yai National Park", "Poisonous Fungi in Thailand", "Edible Fungi in Thailand", and "Endangered Fungi of Thailand". These lists are merely subsets of a larger

data bank distinguished by certain attributes. Data redundancy created in this way makes data updates even more demanding and also results in data inconsistency.

Modern information technologies may help solve some of these problems. Many commercial database management systems and software application development tools enable us to create sophisticated information management systems that run on widely available computer networks or even on the fast growing Internet. The general objectives for biodiversity information system projects are: 1) building mechanisms for compiling existing data in standard formats; 2) supplying tools for basic researches and for detecting information gaps; 3) establishing channels for serving up information in useful formats. The main function of an information system is to process data into information that, in turn, becomes knowledge.

To successfully implement a biodiversity information system, computer software experts with in-depth knowledge of biodiversity issues are needed. Developing a biodiversity system is far more than just composing software codes; it takes careful conceptualization, requirements analysis, designing, construction and testing. Only the right combination of correctly selected technologies, competent specialists and sound management would ensure the delivery and production of flourishing biodiversity information systems.

A case study would help the readers to understand better the various components and issues concerning a microbial information management system.

The National Center for Genetic Engineering and Biotechnology (BIOTEC) is under The National Science and Technology Development Agency of Thailand. One major function of BIOTEC is to take advantage of Thailand's vast microbial natural resources. A field survey team collects various microbes from the wild lands and natural habitats. BIOTEC maintains a modern cultural collection of isolated microbial strains supplied by the field team. A fermentation laboratory grows selected strains in order to produce larger quantities of microbial extracts. These crude extracts are distributed to various screening labs to test their activities against certain diseases such as TB, malaria, cancer, HSV and HIV. Once a crude extract is found active, detailed biochemical experiments will be done in the bio-resource research facilities to pinpoint the exact compound. Simply put, the goal is to find organic compounds that have inhibition effects on certain diseases, while causing no or little adverse consequences to normal human body cells.

The entire process generates various categories of data that have complex interwoven relationships. Initially, different laboratories handled data separately. Sometimes, data were listed using low end, user-oriented database products, notably MS Access. Most of the time, it was even worse that data were handled using electronic spreadsheet products, mostly MS Excel. This arrangement or lack of arrangement causes certain deficiencies:

- **Lack of standardization.** Non-standard data are difficult or even impossible to analyze.
- **Non-existent security measures.** Some of the data are considered as classified information. However, data files have been copied as many times as people wished and passed around on the network.
- **Data redundancy and in-**

consistency. Since the same data has many copies, large data redundancy can be created. When data need to be updated such as classification revision, it is impossible to hunt down all the copies of the same item.

- **Inability to efficiently output data.** When data exists in different formats, in multiple copies and worse, in broken formats, it is hard to generate reports.

We eventually decided to develop a comprehensive microbial information management system. An 18-month in-house software development project started in 1997 and was completed in 1998. The result is the Microbe Management System (Microman) copyrighted by BIOTEC that has been in operation for about 30 months. The Microman system has already become the standard software for data inputting, data processing and information outputting covering BIOTEC's research activities, ranging from field specimen collection, lab culture collection, fermentation operation, and cytotoxicity to bioassay testing. Microman also handles data concerning locations, habitats, and indigenous knowledge of biodiversity uses as well as scientific literature. Microman covers the taxonomic groups of fungi, bacteria, yeast and algae. Currently supporting several laboratories and a couple of dozens of users, the system has gathered nearly one hundred thousand records of all kinds.

Microman is easy to use and it behaves and feels just like any other modern software application. An average user needs just a few hours' training to become productive. There are about 30 inputting forms in the system for accepting data. It also provides 10 kinds of standard reports such as species summary, species distribution map, locality summary, screening summary, researcher summary, catalogue of cultures and spe-

cies inventories. Users are assigned different roles and their access levels in the system are controlled following the center's policy. Usage of the system is automatically monitored. The database is located on a centralized server where users can insert new data, update existing records or query the database from workstations in their own laboratories. Users of the system would immediately feel any data editing by other users.

For readers who are technically comfortable, here is a technical summary. Microman is a LAN and ODBC based two-tier client/server system running under MS Windows. The front end was built mostly with the OOP data centric MS Visual FoxPro (VFP) development environment. Visual Basic for Application (VBA) is used to carry out automation tasks. MS Word, MS Excel and PhotoShop are automated for certain operations. MS SQLServer 7.0 is currently the back-end RDBMS. There are more than 40 tables involved in the system. An auto-documentation process indicates that the front-end application is comprised of nearly eighty thousand lines of codes. Microman is totally event-driven, highly modeless, and it has a Windows compliant interface. Microman is secure, supported by the MS SQL Server built-in security mechanism. We have stayed away from the Internet because of the sensitive nature of some data.

Although computer technology will evolve, biodiversity data maintained in databases must survive over time. Every piece of data in the system must be associated with the contributor for taking responsibilities as well as credits. One hundred or 200 years later, a database record may well become the only documentation about certain facts concerning biodiversity. ■

Chen Nan is a Technical Officer (Biodiversity Information Management) at the National Center for Genetic Engineering and Biotechnology in Bangkok, Thailand

TRAINING RESOURCES DATABASE ENTRIES

Capsule Reviews

► By the TRAINING AND EXTENSION BRANCH, ARCBC

INTEGRATED CONSERVATION AND DEVELOPMENT: A TRAINER'S MANUAL

by Sejal Worah, Dian Svendsen and Caroline Ongleo
WWK UK, Panda House, 1999
ISBN: 1-85850-161-X

This training manual is designed to provide a capacity building resource for organizations involved in Integrated Conservation and Development (ICD)



training and/or planning.

The manual has five main chapters with several sections within each one.

The first three chapters introduce fundamentals of planning and

organizing participatory training workshops. Chapter 4 introduces key concepts and issues in ICD. Chapter 5 focuses on participatory planning, monitoring and evaluation of ICD initiatives and contains a number of training activities related to this.

This manual has already proved to be an extremely useful resource to academic institutions, training institutions, NGOs and government staff involved in ICD. Most of the activities have been field-tested.

For further information, contact: Asia/Pacific Programme, WWK UK, Weyside Park, Godalming, Surrey GU7 1XR, U.K.

TRAINING MANUAL ON INTEGRATED COASTAL MANAGEMENT

By HARIBON, DA-BFAR, DENR-CEP, DOST-PCAMRD, ICLARM, IIRR 1998

The 10-day course provides a comprehensive view of the various tasks of a coastal manager and enhances competencies in particular on planning and management functions.



Each of the nine modules uses a combination of instruction methods that include lecture-discussions, case analysis and participatory

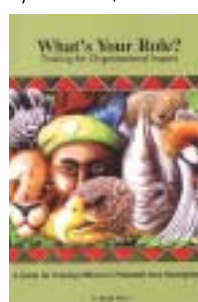
activities such as practical exercises, field work, role playing, debate and workshops. The outputs of a number of sequential modules lead to the development of a coastal management plan that is done in groups and presented by the participants to the panel of critics.

For further information, contact: Dr. Cesario Pagdilao, crp@ultra.pcardr.dost.gov.ph

WHAT'S YOUR ROLE. TRAINING FOR ORGANIZATIONAL IMPACT. A GUIDE FOR TRAINING OFFICERS IN PROTECTED AREA MANAGEMENT

by Ralph Stone
Biodiversity Support Program, 1997
ISBN: 1-887531-26-2

This handbook is designed to help natural resource training officers develop training programs that are systematic, needs-based, and broad-



reaching to enable staff to achieve optimum job performance and, consequently, greater conservation impact.

This is a first-rate manual, full of step-by-step guidelines,

checklists, cartoons and graphics in an easy to read and absorb style. The manual was developed in Africa but is almost entirely relevant for the ASEAN region. Although many parks in ASEAN do not have training officers, this manual is an excellent source of ideas and techniques for anyone involved in training protected areas staff or for managers who want to know what they should expect from a good training course or trainer.

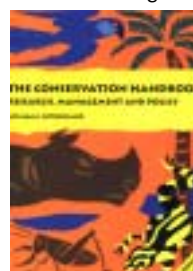
For further information, contact: www.bsponline/publications

THE CONSERVATION HANDBOOK: RESEARCH, MANAGEMENT AND POLICY

by William J. Sutherland
Blackwell Science Ltd., 2000
ISBN: 0-03-205344-5

This excellent book should be on every conservationist's bookshelf. It aims to provide clear guidance on

the implementation of conservation techniques for conservation practitioners. In doing so it contains practical



information, checklists and examples on everything from designing a bird census to producing a logical framework for a proposal to a major donor. Some

19 case studies from around the world show how many of the techniques described have been applied in the field. Inevitably some of the topics are dealt with very briefly, but a good reference list provides plenty of more detailed sources.

This book is useful both for those starting out in conservation as a primer and for practicing conservationists and a source of ideas, examples and approaches. Even better, under a special scheme, practicing conservationists outside Western Europe, North America, Australasia and Japan can get this book **free of charge**.

For further information, contact: gratis@nhbs.co.uk

WILDLIFE FIELD RESEARCH AND CONSERVATION TRAINING MANUAL

by Alan Rabinowitz
Wildlife Conservation Society, 1997
ISBN: 0-9642787-0-7

Based largely on the work of the author in East and Southeast Asia, this book remains the standard text for



training and capacity building in field-based skills for conservation and protected area workers. Part 1 describes simply and clearly a wide range of practical fieldwork techniques and

includes checklists, diagrams, training ideas and examples.

The survey component focuses on large mammals while the information on techniques for other taxa (birds, reptiles, etc.) is quite limited. Part 2 includes a lot of useful, but brief, outline notes and guidance for planners and managers. Part 3 contains more practical guidance on special skills and techniques related to field survey and collection work.

For further information contact: www.wcs.org. ■

ASEAN Regional Centre for Biodiversity Conservation

National Biodiversity Reference Unit Network



ARCBC is a joint cooperation project between ASEAN and the European Union

