"The mind likes a strange idea as little as the body likes a strange protein and it resists it with a similar energy. It would not perhaps be too fanciful to say that a new idea is the most quickly acting antigen known to science. If we watch ourselves honestly we shall often find that we have begun to argue against a new idea even before it has been completely stated."

Wilfred Batten Lewis Trotter, 1872-1939, English surgeon.

HI-TECH CONSERVATION

Dancing with Wolves and Other Carnivores

Red Wolf. Photo courtesy of the US Fish & Wildlife Service (FWS).

Researchers are developing non-lethal methods of controlling carnivores, such as movement activated guards with strobe lights and sound recordings that can drive the animals away form unwanted territories. The work is part of a six paper special section co-edited by the Wildlife Conservation Society's Adrian Treves on the conflict between people and carnivores in the December issue of *Conservation Biology.*

Conflicts with carnivores are rising as people spread into remote habitats and as large carnivores recover from past eradication efforts. The past solution by wildlife managers of killing "problem" animals is currently being questioned as this method is in direct contradiction with the goal of conservation and could impede the recovery of rare carnivores. Researchers conducted experiments with the high-tech solutions and found that the consumption of prey decreased. The cost and complexity of the equipment still remain as limiting factors but the promise is there that non-lethal methods of predator control can be developed [Condensed from a news release - Society for Conservation Biology, November 26, 2003].

Mapping Wetlands from Space

The importance of wetlands as treasures of ecological diversity is now well established. They store and purify water for domestic use, recharge natural aquifers as they run low, retain nutrients in floodplains, help control flooding and shore erosion, and regulate local climate. Most of all, wetlands support life in spectacular variety and numbers: freshwater wetlands alone are home to four in ten of all the world's species, and one in eight of global animal species. An assessment of the monetary value of natural ecosystems published in *Nature* in 1997 arrived at a figure of 27.7 trillion Euros (33 trillion dollars), with wetland ecosystems making up 12.5 trillion Euros ($14.9 trillion) - or 45% - of this total.

Ducks and wetland habitat. Photo courtesy of FWS

The Ramsar Convention on Wetlands - established by the UN in Ramsar, Iran, in 1971 - governing the preservation and stewardship of wetlands has designated more than 1310 Wetlands of International Importance, a total area of 111 million hectares. The Convention's 138 national signatories are obliged to report on the state of listed wetlands they are responsible for. One of the critical gaps in monitoring wetlands is their waterlogged inaccessibility and thus the attainment of status information. Last November the European Space Agency (ESA) initiated the *Globwetland project*, to map 50 sites in 21 countries as a means of overcoming this difficulty. Satellite-derived and geo-referenced products including inventory maps and digital elevation models of local wetland topography, vegetation types, land cover use, and the surrounding catchment areas (including the dynamics of the local water cycle) will aid local and national authorities in fulfilling their Ramsar obligations, and should also serve as effective tools for wetland managers and researchers. Radar imagery provided by ESA's Envisat to users across four continents (North and South America, Asia and Europe) is able to differentiate between dry and waterlogged surfaces, and so can provide multitemporal data on how given wetlands change seasonally.

Freshwater accounts for merely 7% of the water on earth and freshwater consumption rose sixfold in the past century, a rate more than double the population growth. With global warming factored into this equation our precious wetlands and their hydrological regulating capacity will become even more vital in the years to come.[Condensed from a news release of the European Space Agency, November 24, 2003].

The Mouse Encylco'genia'

This may look like an ordinary 172 page book but if you look closely the paper is water-soluble and includes all of the 60,000 active genes in the mouse. To read this book researchers punch out the paper dots containing the DNA clones - copied from the genes expressed in mouse cells - and then just add water! The paper disappears and DNA appears. Within a few hours, unlimited copies of the genes can then be made using the DNA amplification technique PCR. Only 10 copies of the mouse encyclopaedia have been published so far.

New Scientist magazine reported in December that this novel approach (pun intended) to the publication of genomic research, developed by the RIKEN Genomic Center in Yokohama Japan, was motivated by the high cost of delivering genetic material to universities and biotech companies (up to $5,000 USD for the whole genome). A similar book on the human genome is under

development. Will this become the ultimate in 'Vanity Publishing'? The rich and famous paying to have their genome committed to print? I guess we'll have to wait and see.[From www.newscientist.com/news, December 08, 2003].

HOW EFFECTIVE ARE 'ENDANGERED SPECIES LISTINGS'?

Researchers from the University of Michigan, in a report published in the December 2003 issue of *Conservation Biology*, conclude that ESA listings do **not** necessarily help, and may even harm, rare species on private lands because landowners may destroy or harm their habitat to avoid land-use restrictions. The first study on this topic, the report focused on the Preble's Jumping Mouse, a 'threatened' species which lives in riparian areas of Colorado and Wyoming. The findings showed that some landowners certainly worked to assist the threatened mouse while others discourage it from living on their properties. The latter group was predominantly formed from those that were economically dependent upon agriculture. The survey showed that 56% of landowners would not allow a biological survey to determine the abundance and distribution of the mouse on their land, information that is vital to the development of conservation plans.

So, what is the solution? Education and inclusion! Better approaches could include the education of landowners as to how conserving the mouse's habitat can benefit them (for instance, riparian vegetation also benefits landowners by reducing erosion); reimbursing landowners for the cost of fencing to keep cows away from riparian areas; and reducing landowners' fears of regulation by including them in the conservation decision-making process. The listings must be maintained as public and scientific alerts but their effectiveness can be improved by studying where they fail to reach the sympathy of our fellow citizens and what their concerns actually are. [Condensed from a Society for Conservation Biology newsletter, November 25, 2003].

Endangered Black Rhinos. Photo courtesy of the FWS

The endangered California Condor. Photo courtesy of FWS.

CONSERVATION STRATEGY FOR THE GREAT APES

At a meeting in Paris at the end of November 2003 conference organizers stated that all Great Ape species risk extinction, either in the immediate future or at best within 50 years, because of a series of factors including forest destruction, poaching, live animal trade, and humans encroaching on their habitat. At least $25 million USD is needed to save Gorillas and Chimpanzees from the threat of extinction according to the United Nations Environmental Program (UNEP).The money is needed to set up protection areas and to promote conservation measures.

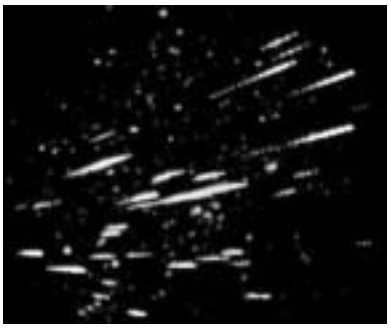
Mother and child. Photo by Richard Ruggiero. Courtesy of UNEP.

Less than 10 percent of the Great Apes remaining forest habitat in Africa will be left undisturbed by 2030 if the building of roads and other infrastructure continues at today's pace, according to a recent UNEP report. UNESCO research shows that the Western Chimpanzee has disappeared from Benin, Gambia and Togo. UNEP said Orangutans in Southeast Asia could have almost no relatively undisturbed habitat left by 2030.[Condensed from a Reuters news story November 26, 2003].

THE FIRST MASS EXTINCTION

A great debate has been raging for decades over what caused "The Great Dying", the death of 90% of life on earth that occurred over 250 million years ago. A meteorite has been largely accepted as the source of the dinosaurs' demise close to 200 million years later however the root of The Great Dying has remained a mystery until now. Researchers at the University of Rochester believe that they have now identified the cause.

These findings add weight to the argument that a major meteorite struck the Earth 251 million years ago, triggering enormous changes in climate and unprecedented volcanic activity. According to the researchers' theory this double blow had a major affect on the composition of the atmosphere from which the biodiversity took thousands of years to recover—leaving only a relative handful of plants and animals alive. Asish Basu, professor of earth sciences at Rochester, was influential in the acceptance of the dinosaur extinction theory with the discovery of "shocked quartz"- special crystals indicative of a large impact- beneath the Deccan Traps of India. These areas of huge volcanic deposits have been dated to 65 million years ago, the time of the dinosaur extinction, which suggests that a giant impact preceded these giant lava flows.



Meteors. Photo courtesy of NASA.

In 1991 Basu published a study in *Science* that showed a massive, ancient lava flow in Siberia dated precisely to the greatest of all extinctions, 251 million years ago, that wiped out nine of every 10 life forms on Earth. Further testing by Basu and Robert Poreda, co-author of the current *Science* research, showed that both the Siberian and the Indian lava had come from as deep as 1,800 miles beneath the earth's surface. Something brought all of this lava up from near the earth's core before the Earth itself was fully formed. A wide global distribution of metal grains displaying metallic characteristics that were indicative of being formed by extreme heat, such as that in a severe meteorite impact, were later discovered in a rock layer called the Permian/ Triassic, or P/T boundary. The very fact that these grains had not deteriorated from weathering means they must have been buried quickly under sedimentary deposits, again, indicative of a major impact.

Basu and Poreda plan to continue searching for evidence of a catastrophic impact in the P/T layer in different sites around the world. They hope that if enough samples from enough locations show evidence of a major impact, then scientists will be able to construct the exact scenarios of how the two largest mass extinctions in history were caused by meteorite collisions.[Information from a University of Rochester press release and reported in *Science*, November 21, 2003].

THE SPERM WHALE - OCEAN CANARY

One of the most abundant Great Whale species, found in all the oceans and seas in the world, the Sperm Whale was chosen by scientists aboard the *Odyssey* research vessel as a living indicator of the state of our world's seas. The mission by the US-based *Ocean Alliance*, a whale conservation and research body, is ongoing since 2000 but the results are ominous. Tissue samples taken from about 900 sperm whales in various parts of the world indicate unexpectedly high levels of pesticides and DDT. As canaries were once used in mines to determine dangerous gas levels this 18 meter, 60 tonne 'ocean canary', the biggest toothed predator in the world foretells danger for the world's ocean waters. Other toxins like organohalogens and polychlorinated biphenyls (PCBs) that have made their way into the oceans through rivers and rainfall have also been found in the whale tissue.

Sperm Whale. Photo courtesy of the FWS.

Sperm Whale. Photo courtesy of H. Whitehead Laboratory, Dalhousie University, Canada.

The researchers state that these high levels could indicate danger for the species, resulting in improper development of fetuses, high levels of sexual abnormality, cancers, birth defects, or sterility. These toxicants could ultimately have serious implications for humans who feed high on the oceanic food chain. Studies suggest that these poisons are already showing up in the breast milk of nursing mothers, such as in Canada's Inuit people for whom fish has been a staple of their diet for generations.[Condensed from a story by Nita Bhalla, Reuters News Service May 12, 2003].

HOT HOT HOT! IS HERE TO STAY

Let the naysayers melt away, global warming is here to stay. In a *Science* article Dec. 5th, as part of a "State of the Planet" assessment, leading US climate experts say that there is no doubt that global warming is real and that industrial emissions are one of the leading causes. Surprise! Surprise! The result is going to be droughts, heat waves, extreme precipitation events and related impacts such as wildfires, heat stress, vegetation changes and a rise in sea-level. The researchers' statistics show that there is a 90% probability that average global temperatures will rise between 1.7 and 4.9 degrees Celsius (3.1 and 8.9 degrees Fahrenheit) because of anthropogenic influences on climate. This will result in the further melting of the polar ice caps, flooding and the loss of coastal areas and small islands. Data shows that carbon dioxide (CO2) levels have risen 31% since pre-industrial times and CO2 has earned the status of the # 1 greenhouse gas, trapping the sun's energy and causing a rise in temperatures.

The solution? Global recognition of the problem and then global cooperation and action to rectify it - no small order in todays fractured world.

THE WHITE-WINGED GUAN OF PERU

A rare species, the White-winged Guan native to the Peruvian Andes, was discovered in 1877 by a Polish ornithologist but was considered extinct for close to

The White-winged Guan, Penelope albipennis. Photo courtesy of FWS.

100 years. It was rediscovered in 1977 by Gustavo del Solar, a hunter-turned-conservationist who founded a special breeding project to reintroduce it to the wild. With only an estimated 300 in the wild, del Solar says that the long-tailed black birds, with their distinctive white feathered wings and red throats, face extinction again unless he can raise cash to keep his project in northern Peru going. The Guan, *Penelope albipennis,* has been officially classified as endangered since 1990. Their habitat is the so-called dry forest, an ecosystem in northern Peru in which the trees are dry and leafless except during summer rains. They are at risk from locals who hunt them for food and who raid the forest for timber. [Condensed from an Environmental News Service (ENS) story by Jude Webber Dec. 31, 2003].

PROTECTING THE CASPIAN SEA

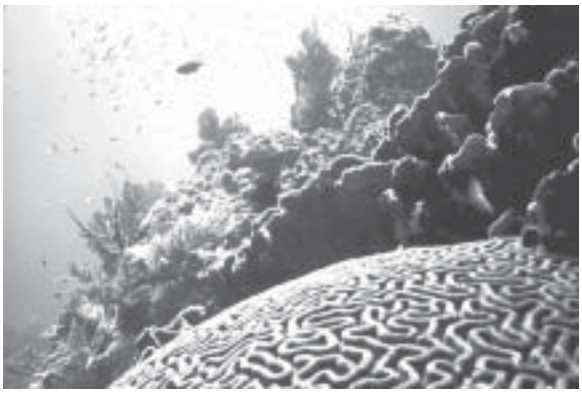
Some of the largest oil reserves in the world lie beneath the Caspian Sea, a fact which has contributed greatly to its degradation by industrial pollution, leaks from oil extraction and refinement, toxic waste, and sewage. The five bordering countries, Azerbaijan, Iran, Kazakhstan, the Russian Federation, and Turkmenistan met in November to adopt and sign the *Framework Convention for the Protection of the Marine Environment of the Caspian Sea*.

The Caspian Sea is the world's largest freshwater lake, containing some 400 endemic species. By ensuring the sustainable use of its living resources millions of people in this region will benefit. With an area of some 373,000 sq. km (144,016 square miles), the Caspian Sea has a shoreline of 7,000 kms (4,350 miles) in length. The lake is fed by some 130 tributary rivers, with 75 % of its inflow coming from the Volga River.

The issues that the Convention will work to resolve include: pollution from land-based sources, invasive species, environmental emergencies, environmental impact assessments, monitoring, research and development, and the exchange of information. The world can take heart upon seeing another sign that multilateral cooperation for sustainable development is indeed possible.[Visit the Caspian Environment Programme at: http://www.caspianenvironment.org/].

NUTRIENT POLLUTION AND THE CARIBBEAN CORAL REEFS

Coral reefs, the crown jewels of the Caribbean, continue to die off at an alarming rate particularly over the past 20 years. In the December issue of the journal *Ecology Letters* researchers claim to have identified one of the reasons for the dramatic decline - chemical nutrients. They looked specifically at the fungus *Aspergillus*, which kills the elegant Gorgonian Sea Fans through a disease called aspergillosis, common in plants, birds and humans with weakened immune systems. They also studied two species of Montastraea Corals which are killed by yellow band disease.



Coral reef. Photo courtesy of FWS.

The scientists from the University of North Carolina, Oregon State, Cornell, and California State University manipulated nutrient levels by using time-release fertilizer rich in nitrogen and phosphorous directly on reef sites. They discovered that even modest levels of nutrient pollution could increase mortality in tests that were comparable in concentration to what is often prevalent in the Caribbean. Once diseased the reefs rarely recover and in death often become covered with algae and other microorganisms. The good news is that, unlike rising ocean temperatures due to global warming, the nutrient levels have the possibility of being lowered

The Caspian Sea and surrounding countries.

Shade-grown coffee. Photo courtesy of Karen Kuhl at the Selva Negra Coffee Estate.

through regulations or other control methods. [Press Release, University of North Carolina at Chapel Hill].

HOT DEBATE OVER A CUP OF SHADE COFFEE

Shade coffee is a traditional farming method of growing coffee under a canopy of diverse trees, thus protecting many bird species as well as the tropical forests. Supporters claim that one of the keys to success in encouraging this method is a rigorous shade certification program.. There are currently two such programs; Bird-friendly Coffee from the Smithsonian Migratory Bird Center, and Eco-OK from the Rainforest Alliance. However these methods can be expensive and the poor small coffee farmer is not using them. To this end they recommend giving coffee farmers financial incentives to maintain biodiversity-rich shade farms and to preserve adjacent forest fragments

Critics claim that while shade certification sounds good in theory, it does not always work in practice. Lack of rigorous certification programs means that shade coffee growers range from traditional farms where shade is provided by a diverse canopy, to multi-crop coffee farms where shade is provided by Cacao and a few other economically valuable trees. The latter are not necessarily bird friendly nor beneficial to the tropical forests. They argue that providing economic incentives for shade coffee could encourage farmers to clear more forest and indeed extensive areas of native forest have in some cases been replaced by low-diversity, multi-crop shade coffee farms in Mexico and Central America.[From the Society for Conservation Biology, November 25, 2003].

WORM PROTEIN RELATED TO LONGEVITY

The lowly worm may not be so lowly! Researchers at the University of Fribourg, in Switzerland reported in the journal Nature that a single protein could be an important key to extending the normal lifespan of worms and possibly even humans.

Worm. Copyright Stephen Aitken.

By knocking out a protein called TOR that regulates cell growth in the nematode worm, or *C. elegans*, the scientists discovered they could extend its lifespan from 15 to 25 days. The protein is present in plants, animals, and humans and is involved in the regulation of metabolism and energy. It senses the availability of nutrients and translates that into protein synthesis and cell growth. It has been known for some time that dramatically reducing the caloric intake of mice and other rodents extends their lifespan. TOR could be the link that explains how and why this happens. If there is a lot of food TOR expression is high, protein synthesis and cell division is high. But if there is no food, TOR activity is low and longevity is enhanced.

So how does all of this work? The researchers suspect the protein interacts with other cell signaling pathways in the body to regulate cell growth. Although the mice without TOR lived nearly twice as long as normal mice, they were less fertile and other metabolic changes were noted. TOR is being touted as a possible drug target against cancer due to its role in protein synthesis and cell metabolism.[Condensed from a Reuters news story by Patricia Reaney, December 12, 2003].

ARMED AND DANGEROUS

The Lethal Blowfish as a Pain-killer?

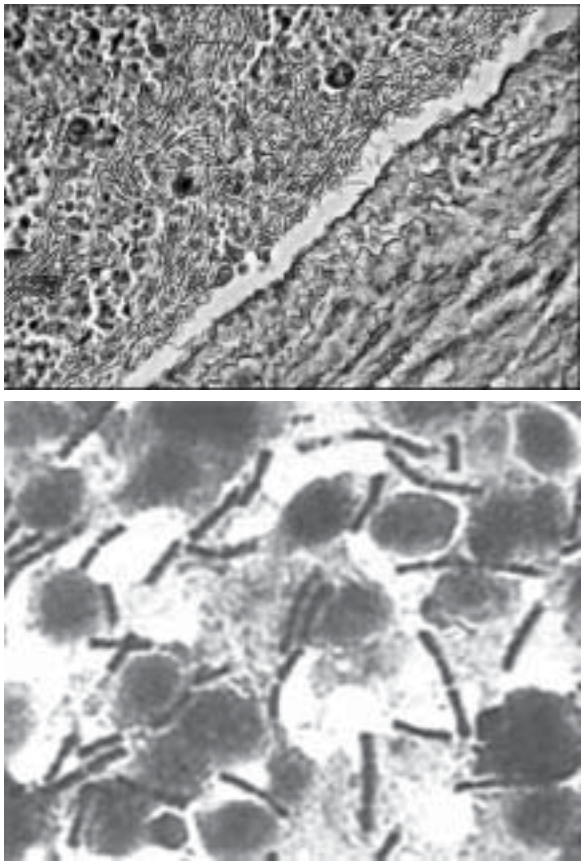
A small Canadian company "International Wex Technologies", reports that early trials show positive results from tetrodotoxin in relieving the pain of cancer patients. The new drug, derived from a blowfish poison - a substance so dangerous that a mere trace can paralyze a person within minutes, has been shown to ease pain where no other medication has worked. It is up to 3,200 times stronger than morphine.

The pain-killer, labelled Tectin, is a sodium channel blocker that stops nerves from sending pain signals to the brain. The company says Tectin differs from other painkillers in that it doesn't have the same side effects as morphine and its derivatives, doesn't interact with other medicines, and is not addictive. Wex says that each puffer fish can provide about 600 doses of the drug from within its liver, kidneys and reproductive organs, so there is no shortage of the toxin. Yet! Analysts say that it would be premature to tout Tectin as a drug to rival morphine as it still has to go through the crucial phase III trials, where test numbers have to reach at least 400 patients. Also, there is an image problem to be resolved. The Blowfish is seen as one of the deadlier inhabitants of our marine environment.[Condensed from a Reuters news story by Rachelle Younglai, December 1, 2003].

The Deadly Workings of Anthrax

It pays to know your enemy. Failure to do so could cost you your life! Researchers have been working intently on the genes and proteins in the highly persistent life-cycle of *Bacillus anthracis*, the bacterium that causes anthrax. Tiny spores of this highly infectious pathogen can survive drought, bitter cold and other harsh conditions

for decades, yet still germinate almost instantly to infect and kill, once inside an animal or human host. Scientists have been studying anthrax spores since 1876, when they



were first described by the German bacteriologist, Robert Koch. Anthrax spores are made of many layers of material, like a golf ball, with the DNA protected in the core. The spore's tough outer coat is surrounded by a loose-fitting layer called the exosporium. When the spore gets inside a human or animal host - the first step in the infection process - sensing agents in the exosporium signal the spore to "hatch," or germinate, and start producing more bacteria.

A collaboration of scientists from three major research institutions - the University of Michigan, The Institute for Genomic Research (TIGR), and The Scripps Research Institute have reported the first analysis of a bacterial pathogen using the combined investigative tools of genomics and proteomics. It is also the first study to document, at a molecular level, all the genes and proteins involved in *B.anthracis* spore formation. Their work provides information other researchers can use to develop new vaccines and treatments targeted at specific points in the complex process of anthrax growth and spore formation. One of the most surprising findings of this study is that up to one-third of the entire genome is devoted to making spores, a highly complex and intricate process with each mature anthrax spore containing about 750 individual proteins. The spore is vital to the organism's life cycle as it allows the anthrax bacterium to survive conditions that would kill most other living things.

Complete data from the collaboration's study of the genome and proteome of *B. anthracis* spores has been posted on the National Center for Biotechnology Information's Gene Expression Omnibus database at www.ncbi.nlm.nih.gov where it will be freely available to the scientific community. While the data will be extremely valuable to biomedical researchers developing anthrax spore countermeasures, it has no value related to the use of anthrax as a biological weapon. [Condensed from the Journal of Bacteriology, Dec. 18, 2003; and news story on www.brightsurf.com, December 17, 2003].

Amphibian Deformities - An Emerging Disease

Disease emergence is a complex process of ecological change. Understanding the complexities involved is vitally important for the prevention of future epidemics in wildlife and in humans.

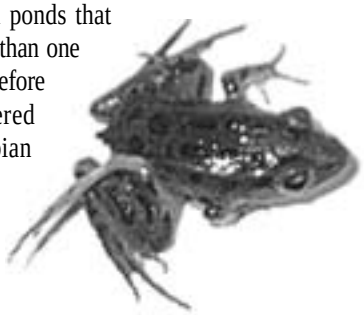
A historical research project described in the December issue of *Conservation Biology* shows that while amphibian malformations and the parasitic worm that causes them have been found in lakes and ponds for more than 50 years, they have substantially increased in their abundance during this last 50-year period.

Anthrax bacilli in dog lung *(top)*; Anthrax detail *(bottom)*. (Photos courtesy of Ron Neumeyer at: www.microimaging.ca).

Frog deformities have been in the public eye for the past decade. Severely malformed frogs, toads and salamanders have been found among 60 different species in nearly all US states, as well as parts of Canada, Japan, and several countries in Europe. The high number of amphibian deformities is of great concern to ecologists as severe limb deformities cripple amphibians, making it difficult for them to catch food or escape predators. The presence of amphibians in lakes, ponds, and other wetland environments is important for a number of reasons. They are an integral part of the food web - they gobble up a large number of insects and aquatic plants, and snakes, fish, and birds eat them. They also serve as an indicator species signaling subtle changes in the environment.

The culprit for many of the deformities in amphibians turns out to be Trematodes - parasitic flatworms that burrow into the hind legs of tadpoles. Both field and lab studies show that the more abundant the parasite, the more frequent and severe the malformations. Sightings of these deformities have occurred since the 1940's but the current study attempted to determine if today's observations differ from those observed historically. The finding of greatest significance is the increase in the number of lakes and ponds that support deformed frogs. While fewer than one dozen of these sites are known from before 1990, the researchers have discovered more than 50 hot spots for amphibian malformations during the last seven years. Based on this evidence, the frog and other amphibian deformities have been classified as an emerging disease, one that has subs-tantially

A deformed 3-legged frog. Copyright Stephen Aitken



Acadian forest after first cut in two stage harvesting system. Photo courtesy of Jim Wood, Canadian Forest Service.

Mixed white and red pine boreal forest, Petawawa Research Forest, Chalk River, Ontario. Photo courtesy Darwin Burgess, Canadian Forest Service.

increased in occurrence, distri-bution and severity during the last 30 years. [University of Wisconsin-Madison News release, Dec. 10, 2003].

THE HANGUL - RED DEER OF KASHMIR

The red deer, *Cervus elaphus hangul*, known commonly as the Hangul, was once the main attraction of a mountain-ringed sanctuary on the outskirts of Kashmir's main city, Srinagar, where they grazed in huge herds. Now, less than 200 of the deer remain, the collateral damage of a separatist revolt that has been raging for the past 14 years. This majestic looking deer with a brownish coat and two antlers, found mostly in the forests of Dachigam, 25 km (15 miles) from Srinagar has been slaughtered for food by both the muslim militants and their security force adversaries. Under federal wildlife law, poachers convicted for killing endangered animals, which include the Snow Leopard and the Brown Bear, can be sentenced to up to seven years in prison but no one has ever been prosecuted for killing the Hangul.

In an effort to arrest the fall of the species and eventually increase the Hangul population, the state government has decided to spend $176,000 to set up conservation breeding centres and deer parks at two famous hill resorts, Pahalgam and Gulmarg. [Condensed from a Reuters story by Sheikh Mushtaq, December 2003].

THE TREES THAT SHELTER

Acadian Forests - Threatened

The Maritimes is the only region in Canada that is home to Acadian forests, which cover approximately the same area as the temperate rainforests of British Columbia. The Acadian forest contains 39 species of native trees and more than 30,000 species of wildlife, fish, plants and insects. The wolf, wolverine and caribou are now extirpated (locally extinct) in New Brunswick. The eastern cougar, Canada lynx, and at least 45 plant species are threatened or endangered.

The New Brunswick government is considering a proposal from multinational pulp and paper companies to convert 40% of its public forests to tree farms so they can double their annual cut. Much of this forest is endangered Acadian forest, one of the great mixed forests of Canada. New Brunswick is at a critical juncture in its history - will the pulp and paper sector dictate the future of the Acadian forest on Crown lands for its benefit, or will the public regain control of these public forests? [Wildcanada.net Action Alert, Thursday, January 22, 2004 from www.wildcanada.net].

Boreal Forest Protection

Environmental groups struck an agreement with four natural-resources companies and two aboriginal groups in December of last year to push the Canadian government to protect the country's northern forests. The groups hope Ottawa will eventually create a network of connected preservation areas in the massive boreal forest, which stretches across the country from Alaska to the Atlantic and provides breeding habitat for 30 percent of North America's birds. Backers of the preservation effort say the boreal forest plays a key role in mitigating the impact of climate change, but only 10 percent of the region is protected from development. [Condensed from a Reuters story, December 2, 2003].

Carbon Sequestration and Root Longevity

A study published in the journal *Science* in November of last year has found that large differences in root replacement rates between forest types might alter current predictions of how carbon absorption by soil will act to ameliorate global warming from excess human caused carbon dioxide. Greenhouse management strategies may need reassessment since some forests will not transfer carbon from the atmosphere to soils at the speed needed to reduce global warming.

Researchers used a novel technique to measure the longevity of roots in trees growing in forest plots infused with a computer controlled flow of CO2. Some forests would do a better job tha others in taking up carbon dioxide from the atmosphere and placing it into the soil. Pine forests have slow root replacement which decreases the potential to accumulate carbon in the soil in the short term, while the fast root replacement coupled with increased root production in Sweetgum forests led to a rapid and significant increase in soil carbon. [Condensed from an ENS story, November 24, 2003].

The Atlantic Rainforest of Brazil

The Mata Atlantica, home to 5 percent of the world's fauna and 7 percent of its flora, is now the second-most endangered rain forest in the world after the near extinct jungles of the island of Madagascar.

The forest is today home to 1.6 million species of animals. It has the highest recorded tree diversity in the world. Some 70 percent of Brazil's population, or 120

million people, now live in areas where the forest once stood. They have cleared huge swaths to build cities like Sao Paulo and Rio de Janeiro, currently at a rate of one soccer field per four minutes. However the Atlantic rain forest is till the size of many European countries. After an 11-year fight, Brazil's lower house of Congress last May voted for tougher protection. [Condensed from a Reuters news story by Andrew Hay, May 12, 2003].

The Phylogeography of a Rainforest Tree

The morphology of *Symphonia globulifera* (Clusiaceae) is uniform across a natural range that includes the New World tropics and Africa. This would indicate, as with many rainforest trees of this area, that it either had excellent dispersal mechanisms or the species established a broad range prior to the formation of present geographic barriers. In a study featured in *American Naturalist* the authors address such questions in the first phylogeographic study of a rainforest tree.

Symphonia globulifera has a detailed fossil pollen record, which the authors used to calibrate a molecular clock for DNA sequences obtained from African and Neotropical populations and to estimate when these populations were separated. The study revealed that, although trees from different populations look the same, the evolutionary history of these populations is probably quite distinct. Salt-intolerant seeds would indicate that marine dispersal of *S. globulifera* is improbable, yet the authors demonstrate that *Symphonia* expanded into Mesoamerica, the Amazon basin and the West Indies via oceanic currents at least three times. The three major New World clades - found in Mesoamerica, the Amazon basin, and the West Indies - diverged over 15 million years ago, and appear to have been genetically isolated ever since, giving *S. globulifera* the status of "living fossil".

Map of the Mata Atlantica rainforest. Illustration courtesy of the Panama Govt.

Only 7 percent of the original Atlantic Rainforest remains. Photo by John Maier courtesy of General Motors.

Stamp of British Honduras showing the Waika Chewstick (*Symphonia globulifera*).

Panama contained the largest number of genetically distinctive populations, in contrast to Amazon basin *Symphonia*, which displayed no genetic differentiation across 2500 km of lowland forest. The authors suggest that the strong phylogeographic structure in the Panamanian isthmus stems from its history as a land bridge between Central America, South America, and the proto-Isthmian archipelago of islands, which were connected approximately 3 million years ago. [Smithsonian Institution News release, December 8, 2003].

Conservation Partnership Saves Chilean Rainforest

The Nature Conservancy in partnership with the World Wildlife Fund, The Global Conservation Fund at Conservation International, and local organizations in Chile, have purchased $7.5 million worth of temperate rainforest in southern Chile's Valdivian Coastal Range. The rainforest is home to one of the world's largest woodpeckers; the Pudu, the world's smallest deer; and the Alerce Tree that can live up to 4,000 years. The purchase of the 147,500 acre property at public auction, after the bankruptcy of the forestry company that had logged the land, builds upon existing conservation efforts by the Chilean government and local environmental organizations in the region.

The acquisition was facilitated by FleetBoston Financial Corporation, the largest major creditor of the bankrupt forestry firm, Bosques S.A. When FleetBoston learned of the significance of this forest, the company decided to balance its interests as a creditor with its commitment to be environmentally and socially responsible. Now that the forest has been saved from logging, the Conservancy will work with Chilean public and private organizations to transfer the land into Chilean ownership. The public-private partnership is a new concept in Chile but its development into environmental responsibility has allowed it to embrace this new model for conservation. This project, of major significance for biodiversity worldwide, is being lauded as a great example of what is possible when many stakeholders work together cooperatively. [Condensed from an ENS story, November 6, 2003].

GREENHOUSE EFFECTS OF A BENEFICIAL KIND

Medicinal plants are being harvested from the wild in an unsustainable and reckless manner throughout the world. Issue 4 (3) of *Biodiversity* documented the situation in *The*

Himalayas of India: A Treasury of medicinal plants under siege. The Forum section of issue 4 (4) reported on the *Biodiversity & Health* Symposium in Ottawa sponsored by *Tropical Conservancy* that addressed this problem as well. The WWF reports that some 150 species are reported to be threatened in at least one European country as a result of over-collection and that well-known North American plants at risk of extinction in the wild include some species of and varieties of Echinacea, Goldenseal (*Hydrastis canadensis*) and American Ginseng. A consistent level of active components is an important aspect of developing medicinal plants commercially, an industry that has been growing at a rate close to 10 per cent a year in the developed world.

Researcher Praveen Saxena of the University of Guelph has come up with a practical solution. Dr. Saxena, in collaboration with Dundas greenhouse owners Andrè and Pascale Harster, has developed a $2-million project to systematically cultivate medicinal plants that are uniform in their qualities, predictable in their growing time, and harvestable year-round from the greenhouse. While cultivation is almost non-existent in the Third World, in some parts of the developed world as much as half of the medicinal plants may be cultivated. Secondary metabolites, the chemicals that give the plants their special qualities, are often produced by plants in response to stress and this is very difficult to control in a field setting. Key medicinal chemicals have been shown to vary in the same species of plants by 7-to-10-fold. Another variation is potential dangerous elements picked up from the growing environment such as heavy metals including lead, mercury and aluminum. When all the vagaries of present medicinal plant production are lumped together, the Harsters and Prof. Saxena believe that the greenhouse and its controlled environment and genetically selected plants will not just augment medicinal plant quality and commercialization, but in some places may replace medicinals grown either wild or cultivated in fields.

Nardostachys jatamansi, an endangered medicinal plant endemic to the Himalayas. Copyright Stephen Aitken

There is a three-step process to the research. Prof. Saxena's Guelph laboratory has been growing pure lines of plants in a nutrient-water mix. The plants are then transferred to the Dundas greenhouse, where they are grown in a variety of soil, water and fertilizer conditions. They then go back to Guelph, where Prof. Saxena and his associates analyze their chemical profiles. The two-year goal is to sell plants to the herbal companies that have a variation of only about 5 to 10 per cent in the amount of active biochemicals. Watch for the upcoming article in *Biodiversity 5 (2)* by Dr. Praveen Saxena. [Information from a Globe & Mail article Saturday, January 24, 2004, by Stephen Strauss; also pers. comm. with Dr. Saxena].

THE CONTROL OF BALLAST WATER INVASIVE SPECIES

Ballast water is fresh or salt water pumped into the hull of a ship to help maintain stability. The quantity is then increased or decreased according to the operational needs of the ship. Every year more than 10.000 M tons (10 billion tonnes) of ballast water is transported and discharged around the world. This results in the transfer of microorganisms to new ecosystems where they were not previously found and can result in serious and often irreversible harm to sensitive ecological communities around the world. In the US, the European Zebra Mussel infested over 40% of internal waterways and has cost between US$750 million and US$1 billion in control measures between 1989 and 2000. In southern Australia, the Asian kelp, *Undaria pinnatifida*, is rapidly displacing native seabed communities. In Europe, regions in both the North Sea and the Mediterranean have experienced uncontrolled growth of "killer algae". This has reached pest proportions in many areas and has caused huge economic impact by killing fish in fish farms.

Ballast water can be exchanged before the ship travels too far or it can be treated. The International Marine Organisation (IMO) discourages ballast water exchange for safety reasons. The draft Convention for the Control and Management of Ships' Ballast Water and Sediments promotes ballast water transfer, but no single technological solution has emerged to solve the problem. Options being considered include: mechanical treatment methods such as filtration and separation; physical treatment methods such as sterilisation by ozone, ultra-violet light, electric currents and heat treatment; and chemical treatment methods such as adding biocides to ballast water to kill organisms. Combining the first two of the above, Norway's National Institute of Technology is presently working on *OceanSaver,* a project funded by the European Union, to design and build a cost effective Ballast Water Treatment system for use on board ships. [Information from the Gallon Environment Letter, Vol. 9, No. 2, January 22, 2004; Email circulation: ggallon@ecolog.com].

MALAYSIAN CBD CONFERENCE SETS BIODIVERSITY TARGETS

Human activities are responsible for a species extinction rate higher than at any other time in the history of the earth. In order to address this alraming fact, representatives from over 160 countries came to the following agreements in Malaysia in mid-February:

To conserve at least one-tenth of each ecosystem type (eg. mountains, desert, marine etc.),

to increase efforts to stabilize the populations of threatened species, to ensure that global trade does not endanger any plant or animal species, and to expand the world's protected areas such as biosphere reserves and wildlife parks.

The agreements reached are part of a commitment made by world leaders at the World Summit in 2002 to significantly reduce the rate of biodiversity loss by 2010. At this time, about 12 per cent of the Earth's land surface is "protected." While this exceeds the target of 10 per cent that was set by conservation groups a decade ago, many protected areas in developing countries are known as 'paper parks' because governments have not committed the finances to effectively manage them.

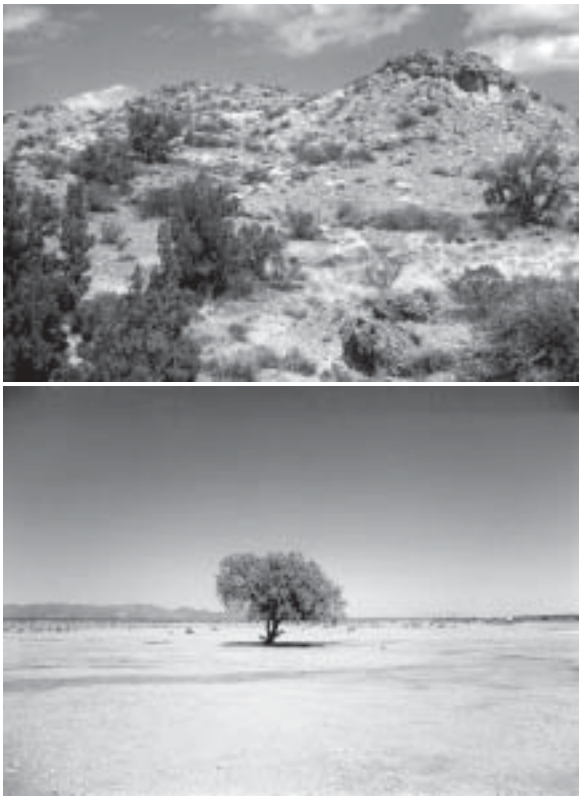
The CBD members also agreed to initiate a separate forum to develop a global framework for those corporations or scientists who want access to biological resources in the developing world. A working group was established to decide ways of compensating indigenous communities for the commercial success of their resources and traditional knowledge. The debate is still on whether these rules should be binding on the parties concerned. The progress towards finalizing these rules — as well as towards the 2010 target to slow down biodiversity loss — will be reviewed at the next major conference in Brazil in 2006. [Condensed from an article by Ehsan Masood on February 23, 2004 at: http://www.SciDev.Net]

ONE MILLION SPECIES THREATENED BY CLIMATE CHANGE

Climate change is the most significant new threat to the extinction of species. A study in the year's first issue of *Nature* suggests that between 15 and 37 per cent of species could go extinct due to the global warming that is likely to occur between now and 2050. This computer generated analysis studies the responses of more than 1,000 animal and plant species in six regions around the world, which together represent 20 per cent of the planet's land area, to changing temperatures under three different climate-change scenarios. The report also suggests that a rapid shift to technologies that do not produce greenhouse gases could save up to a fifth of all land species from extinction.

When the projections are extrapolated globally and include the other groups of plants and land animals, the analysis suggests that over a million species could be threatened by climate change. Indeed these figures may be an underestimate since the *Nature* paper only looks at the impact on individual species and not on the linkages between them. For instance, the extinction of pollinating insects could lead to a ripple effect where many other species dependent on these insects die out (see *The global decline of pollination services* by Kevan & Viana *Biodiversity* 4(4): 3-8).

The study was conducted by researchers at the University of Leeds, UK, the UNEP World Conservation Monitoring Centre (WCMC) in Cambridge, UK, as well as the Conservation International's Center for Applied Biodiversity Science (CABS) in Washington DC. [The *Nature* articles cited were: Nature 427, 107 (2004)/ Nature 427, 145 (2004); Information also obtained from an article by Katie Mantell, January 8th, 2004 at: http://www.SciDev.Net].



Bosque del Apache National Wildlife Refuge *(top)* (Photo courtesy of FWS); Desert Ecosystem *(bottom)* (Photo courtesy of Stefan Agamanolis)

AN INTERNATIONAL TREATY TO PROTECT ALBATROSSES AND PETRELS

South Africa has become the fifth nation to ratify the Agreement on the Conservation of Albatrosses and Petrels - an international treaty to protect the world's rarest seabirds, legally in effect on February 1, 2004. South Africa is home to many populations of these threatened seabirds. It is a world leader in research and conservation initiatives crucial to these species. Australia and New Zealand signed the agreement in 2001, Ecuador and Spain ratified earlier this year.

Albatrosses and petrels are threatened globally at sea and on land. Direct contact with fishing operations, particularly ensnarement in longline fishing operations, entanglement in marine debris, pollution, and overfishing of their prey are major threats. In breeding colonies, they are threatened by predators, habitat damage, competition with other animals for nest space, parasites, and disease. The strength of the treaty is that it is legally binding on the signatory states requiring them to take specific actions to improve the conservation status of these rare birds. As well, the treaty provides a central point for the collection and analysis of data that will be used to develop a comprehensive record of albatross and petrel populations globally. [Condensed from am ENS article, November 7, 2003].