Costa Rica's Campaign for Conservation

The country has attracted substantial foreign funding to aid its efforts to preserve its rich, but diminishing, biodiversity

San Jose, Costa Rica

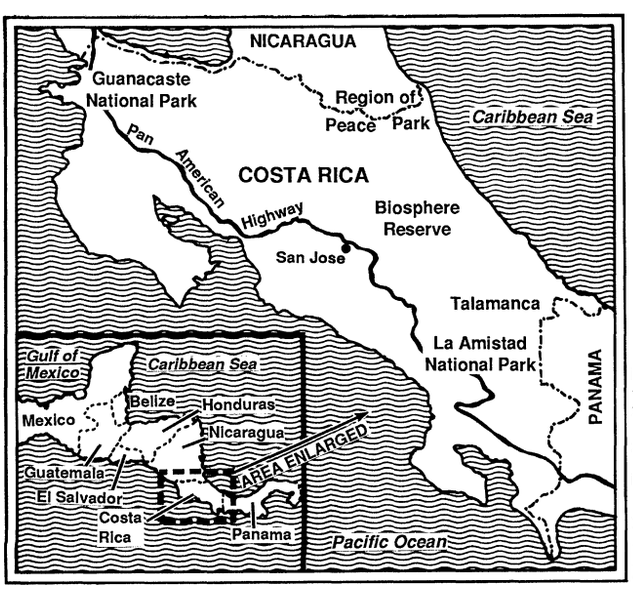
ONLY a few scattered trees stand on the grassy lower slopes of Volcan Orosi in the northwest corner of Costa Rica. But near the top of the mountain, against this spare landscape, lush, deep-green forest towers over the steep terrain. Dense forest once formed a canopy over virtually the whole of Costa Rica, but now only a remnant remains. The forest here was spared from the chain saw because the land was recently bought by the Fundacion Neotropica, a Costa Rican conservation organization.

Further south, at a pension near the misty Monteverde Cloud Forest Reserve, a hand-drawn sign in the lobby says, "$1 will buy an acre of land." Next to it, hatchings on a map of the region show that the size of the reserve has doubled by 10,000 acres in the past year through the efforts of a local conservation league.

From Guanacaste National Park in the northwest to the lowlands of Talamanca in the southeast, a corps of conservationists in Costa Rica is campaigning hard to protect and improve the management of the rich biological and natural resources that still remain. Their efforts have impressed the international conservation community. Through innovative financial transactions and outright donations in the past year, Costa Rica has parlayed foreign contributions into $5.4 million for its conservation activities—an amount almost five times the national park service's annual budget.

Costa Rica has been a magnet for overseas money for conservation because it possesses tremendous biological diversity packed into an area the size of West Virginia. It is one of the biggest centers of tropical research in the world. Moreover, it stands virtually alone among Third World countries in making a concerted effort to halt—perhaps even reverse—the destruction of habitats that in turn is leading to the potential loss of countless species of plants and animals throughout the tropics.

For Costa Rica itself, the aim is not just to preserve wildlife. Environmentally destructive agricultural practices have been undermining the country's natural resources. A high rate of population growth threatens to compound the difficulties, although the current population size is not yet a major problem. Costa Rican officials are therefore attempting to integrate conservation with agricultural development in an attempt to steer the country along a path that will be ecologically sustainable.



Adapted from The New York Times

Biological opulence

Costa Rica, which is the size of West Virginia, abounds with different habitats, including rain forests, dry tropical forests, mangroves, and more.

Since Oscar Arias was elected president 2 years ago, the government's conservation efforts have intensified and goals have broadened. There has been a bureaucratic shake-up to give natural resources cabinet-level attention. Arias is also credited with appointing knowledgeable people to important conservation posts.

Costa Rica "shows that a small developing country with limited financial resources can produce a good conservation program," says Russell Mittermier, vice president for science at the World Wildlife Fund. "Costa Rica is providing extraordinary leadership in the neotropical world," says Dan Martin, director of environmental programs at the MacArthur Foundation, a principal supporter of conservation there.

With the Atlantic Ocean on one side, the Pacific on the other, a volcanic mountain range that cuts diagonally down the center of the country, and a tropical climate, Costa Rica abounds with different habitats. There are rain forests, dry tropical forest, mangroves, and more. Monkeys, macaws, ocelots, rare migratory moths, "glass" frogs, tarantulas, colorful birds called quetzals, orchids, and at least 9000 species of plants are part of the biological opulence of this narrow tract of land.

In February, Unesco named a central portion of the country, a rugged mountainous region with tropical rain forest, a "biosphere reserve." The designation gives the area, part of which is already a national park, added prestige worldwide.

But Costa Rica, which means "rich coast," used to be richer. It has had one of the highest deforestation rates in Latin America. For decades, residents have torn down the country's forests for cattle ranching, crop farming, and simply as a way to claim squatter's rights to the land. Throughout Latin America, not only Costa Rica, a person can claim ownership of a parcel of land if he "improves" it by changing the natural habitat—including cutting down trees.

A lack of funds, compounded by Costa Rica's heavy foreign debt, has hampered the country's conservation activities. The country's external debt is more than $3 billion, one of the highest per capita in the world. Nonetheless, the government has struggled for years to make some headway with its limited funds. In the mid-1970s, it established a broad system of national parks and biological reserves that at present protects 10% of the country's territory and a diverse number of habitats.

Back then, "Costa Rica was already considered remarkable" for its conservation efforts, says Thomas Lovejoy, assistant secretary for external affairs at the Smithsonian Institution. It has "the best national parks

system in Latin America and one of the best in the world" because it encompasses many biological elements.

Self-initiative has contributed to Costa Rica's fund-raising success, but it is not the only factor. Costa Rica has a stable government and has been a democracy for almost 100 years. It has aggressive conservation leaders in both public and private sectors with clear goals in mind, well-established grass-roots conservation groups, a large middle class, and a literate population. The national army was abolished 40 years ago, which freed up more funds for health and social programs. And Arias's award of the Nobel Peace Prize last year certainly has added to the country's prestige.

In contrast, overseas organizations have donated relatively little money to other Central American countries that are also biologically diverse. In Nicaragua and Panama, the governments are unstable, the national economies even poorer, and the conservation programs weaker. "Our investments are secure" in Costa Rica, says Geoffrey Barnard, director of the Latin program for the Nature Conservancy.

Conservation has crucial backing at the highest levels of government in Costa Rica. Arias, who is on the board of directors of the World Wildlife Fund, has established a new Ministry of Energy, Mining, and Natural Resources. He plucked the National Park Service and the forestry program from the Ministry of Agriculture and put them in the new department. The two agencies' missions were impeded under the agriculture ministry because farming and cattle interests often took precedence over conservation, according to Costa Rican government officials and others.

Arias then appointed a highly respected administrator, Alvaro Umana, to head the new natural resources ministry. Umana, who was previously an agriculture ministry official, has a master's degree from Pennsylvania State University in environmental science and, in addition, a doctorate in environmental engineering and a master's in economics from Stanford University. Umana "is a very vigorous young leader. He combines scientific and political skills very fluently," says Martin of the MacArthur Foundation.

Arias also brought in as an adviser Rodrigo Gamez, director of the University of Costa Rica's Institute of Cellular and Molecular Biology. Gamez is conducting a comprehensive analysis of the park system.

The impetus for these bureaucratic changes is a significant shift in thinking among Costa Rican conservation leaders about how to manage the nation's resources. Until recently, conservation and economic development were considered incompatible. Now Umana and other important Costa Rican leaders are vigorously trying to promote the concept of sustainable development both within the park system and the forestry program because, in part, the population growth of the country and Central America as a whole is one of the highest in the world and will soon start to squeeze regional resources.

They predict that without sustainable development, farmers will press to use park land for farming or lumbering; with it, the country will benefit from expanded tourism, a more efficient timber industry, and improved agricultural output.

"The concept of sustainable development is important to meet these problems," Umana said in a speech at a recent international conservation conference in Costa Rica. "It used to be that conservation meant preservation without [the presence of] man, that land should be kept in a bubble. But in Central America, that's not possible. . . . Sustainable development represents a new style." Arias, Umana, and others also firmly believe that sustainable development is ultimately critical in maintaining political stability in Costa Rica.

But Costa Rica faces formidable challenges in reforming agricultural practices and the forestry program. Umana, who

Swapping Debt for Nature

A big carrot that has enticed overseas groups to give money for conservation to Costa Rica, as well as other developing countries, is debt swapping, a financial strategy that substantially multiplies a contributor's investment. Debt swapping "is very crucial" to Costa Rica's conservation efforts, says Alvaro Umana, minister of natural resources.

Here is how it generally works: Banks holding loans to Costa Rica, for example, sell them at a big discount off the original value because they doubt the country can pay them back. Conservation groups and others buy these loans at a bargain price—for Costa Rica, the going price is 17 cents on the dollar—then donate them to the Fundacion Neotropica, a Costa Rican conservation organization, which then owns the debt note.

In turn, the Costa Rican government's Central Bank issues to the Fundacion and other conservation groups bonds that are worth 75 cents on the dollar in local currency. This multiplies the value of the discounted loan almost four times. The conservation groups can use the bonds as collateral and draw 25% interest on them.

Mario Boza, executive director of the Fundacion, says, "Debt swapping is the most important tool to achieve conservation. You multiply money by five. It's a lot of money that's free. We can use it to buy land, pay personnel, and do everything. It's an incredible scheme."

The transaction benefits foreign banks because they get rid of bad debt. It helps the Costa Rican government because the scheme internalizes its debt, saving dollar reserves to pay off other foreign loans. The deal is particularly sweet for American banks because the Internal Revenue Service recently ruled that banks can write off a portion of their donations as a charitable deduction. Banks, conservation groups, and Treasury Department officials are currently discussing whether the face value rather than the discounted market value can be deducted, which, if allowed, would give banks an even bigger incentive to engage in debt-for-nature swaps.

The Fleet Bank of Rhode Island is the latest American bank to take advantage of the scheme. Last month it donated $250,000 to Costa Rica for land acquisition and park management by retiring a portion of the country's debt with the bank. The Fundacion and the Central Bank then transformed the donation into nearly $1 million in colones, the local currency, for conservation.

The money raised through debt-for-nature swaps have already exceeded Costa Rican government's expectations. But it needs a lot more, says Umana. The money raised from debt swapping "will provide for variable costs," he says. Fixed costs already set by law account for almost 90% of the park system budget, for example, so there is little leeway for new programs without additional money.

Costa Ricans are working hard to maintain the current momentum of debt swapping because the administration of president Oscar Arias has only 2 years left. (An incumbent president in Costa Rica cannot run for a consecutive term.) Costa Ricans say that puts them on a tight political and biological timetable to get their conservation programs in order. ■ **M.S.**

oversees both the park service and the forestry program, remarked in an interview, "My biggest problems are controlling deforestation, increasing the efficiency of the forest industry, and funding reforestation.

The deforestation problem in Costa Rica, as in áll of Central America, is acute. Until recently, it was widely believed that 8% to 9% of Costa Rica's land outside nationally protected areas is still densely wooded. But recent satellite photos reveal that only 5% is left. Dry tropical forest has been destroyed even faster than rain forest because it is more accessible, so that now only a remnant is left. A ribbon of dry tropical forest once stretched along the Pacific Coast from Mexico down through Panama, but currently less than 2% remains overall and less than 1% is in protected zones in these countries.

In Costa Rica, Umana says, "It's not the lumber companies that deforest. The lumber companies are now very concerned because they're going to be left without any supplies. Deforestation continues because the system of claiming private property is misunderstood." But teaching peasants and squatters who live in and near the unprotected forests and forest reserves about sustainable development "is a big task," he says.

Umana also wants to build a major reforestation program. Besides providing economic benefits, more trees would prevent severe soil erosion, which is ruining good farmland and reducing Costa Rica's revenue from energy output, according to a study last year by the International Institute for Environment and Development, a nonprofit group based in Washington, D.C. Hydropower provides Costa Rica with virtually all its energy. Sedimentation, however, has slowed the flow of rivers and streams, significantly cutting energy production and revenues, according to the study, "Natural Resources and Economic Development in Central America."

Umana and others are also steering the park service toward sustainable development. The goal is to mesh the park's needs with the livelihoods of nearby residents. Protecting the parks is critical because tourism already brings in $189 million a year to the country, according to government figures. A good portion of this money comes from what Costa Ricans call ecotourists, a special "species" of visitors, who are nature lovers.

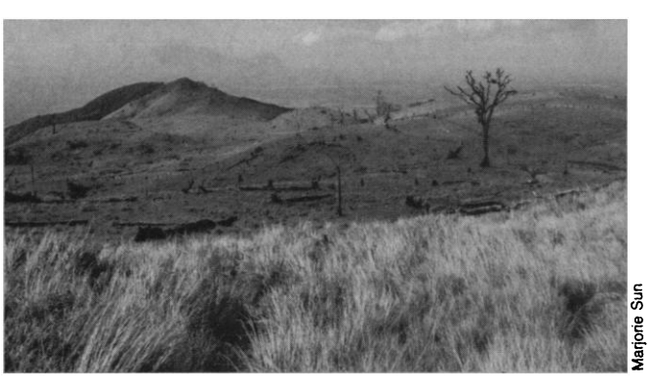
The Costa Rican park service was modeled after its United States counterpart, which has espoused a "caretaker" philosophy. In an interview, biologist Daniel Janzen says that, as a result, Costa Rica's "parks basically have been taken care of by a police force. They have not been managed with

Guanacaste Paves the Way

One of the most visible projects incorporating the Costa Rican government's conservation goals is underway at Guanacaste National Park. For the past 2 years, Daniel Janzen, a University of Pennsylvania biologist, has been energetically leading the drive to restore its dry tropical forest, the first major experiment of its kind, to add more land to the park, and to promote local involvement (*Science*, 14 November 1986, p. 809).

Dry tropical forest has been cut down even more than rainforest in Central America because less rain makes the area more hospitable to people and the land easier to farm. In the dry season, which lasts from roughly November to April, trees in the area are leafless and the grass plains are brown, but the bland landscape belies considerable biodiversity and complex, rare relationships between plants and animals that have only begun to be studied. The resident fauna include rodent-like agoutis, cockroaches that make Manhattan's look like midgets, monkeys, ocelots, scorpions, iguanas, and a wide range of moths.

Since 1985, Janzen has been instrumental in raising more than $8 million of a $12-million target in land donations and cash to enlarge Guanacaste park. (Guanacaste is the name of the national tree.) Part of the money pledged will be used to purchase a large tract of land that is biologically important because it will bridge two existing portions of the parks and stretches from the coast inland to the Pan-American Highway. The tract also includes an airstrip that has been linked with former National Security Council aide Lieutenant Colonel Oliver North and had been used as a staging area to ship arms to the Contras in Nicaragua. President Oscar Arias shut down the airstrip shortly after he took office by declaring the privately owned tract federally protected under eminent domain.



Marjorie Sun

Deforestation at the edge of Guanacaste.
Conservationists are buying up land to save local forest and are trying to promote local involvement in the park.

Janzen's fund-raising success springs from the substance and organization of his plans, his stature as a scientist, and his engaging personality and eccentricities. (He always carries a long cloth snake bag either dangling from his back pocket or tied around his head in the tropical heat to stuff assorted specimens, snakes or otherwise. Janzen is fondly and frequently described as a "character" by American foundation representatives.) A documentary on Janzen's work in Guanacaste by the British Broadcasting Corporation, which was recently televised in the United States, will no doubt help to bring in more funds.

"Dan has helped to galvanize the attention of North Americans in Costa Rica, paving the way for more funding for a variety of projects, not only Guanacaste," says Stephen Viederman, executive director of the Noyes Foundation.

Under Janzen's guidance, the management of the park has shifted from just the park service to an executive committee, which includes natural resources minister Alvaro Umana as chairman, the park service director, Arias adviser Rodrigo Gamez, Fundacion Neotropica director Mario Boza, and local representatives. With overseas contributions, he has hired a Costa Rican with a forestry degree to be the park's administrator; local carpenters to build a bunkhouse for visitors on land purchased by the Fundacion; a marine biologist to teach school children in a nearby fishing village about the area's coastal wonders; local men to help catch moths, pin, and mount them to catalog part of the park's biodiversity; and others to form a team to control fires during the dry season. "We have to integrate the park into the minds and pocketbooks of the community," Janzen says. ■ **M.S.**

regard to their biological needs." Janzen is a University of Pennsylvania scientist who has conducted research in Costa Rica's Guanacaste province for 20 years and has helped galvanize international support for conservation here.

Stipulations by the International Monetary Fund have inadvertently compounded the problem because the organization restricts the number of new employees hired by federal agencies to hold down government debt, Janzen and Lovejoy say.

Mario Boza, executive director of the Fundacion Neotropica, which is Costa Rica's main nonprofit conservation organization, says that the Fundacion and others need to demonstrate the economic benefits of conservation by attracting even more tourists and scientists to the country's protected areas. "Then we can ask the government for more money. That's the way to sell parks," Boza says. "You can argue that conservation is important for our heritage and good for our children and grandchildren. But if you do, you're lost. No one is interested in future generations. People want their reward now."

Boza, who founded the park service and served as its director from 1970 to 1974, is working closely with Umana to push several reforms. Umana says, "We want to buy out the inholdings in parks, improve the management of the parks, and develop management plans for buffer zones with integrated rural development."

Boza says that the Fundacion's main goal until the year 2000 is to enlarge the existing parks from 10% to 15% of the nation's territory. Fundacion is managing the purchased land until the government has the resources to take it over.

He advocates that three categories of parks be established: "large, self-sustained parks; medium-size parks where some species will disappear, such as big cats; and small parks, where many species will be lost and will be just green. These will be heavily used for recreation, but they won't be important for ecology."

Umana's financial wish list for the parks includes another $10 million to buy inholdings in parks, $6 million to add to Guanacaste, $10 million for other conservation activities over the next 2 years, and the expansion of a permanent endowment for which they already have $10 million. "One of the policies I established, not out of want, but out of need, was that we wouldn't declare any more parks unless they were self-financed," Umana says. For reforestation programs separate from the parks system, he says the country needs another $10 million to match government expenditures to plant trees on 37,000 acres a year.

Representatives of American foundations shy away from calling Costa Rica a conservation model for other developing countries because of its unusual political and social achievements. Barnard says, "We hesitate to use the term 'model' [for Costa Rica] because it makes teeth grate in other developing countries. They like to say they're different. But if Costa Rica's not a model, then it's an illustration of the characteristics of success."

Alvaro Ugalde, who succeeded Boza as park service director and served for 12 years until 1985, says that one of Costa Rica's keys to winning foreign funding has been the creation of well-defined conservation projects. "Money is the problem, but it's not necessarily the solution," says Ugalde, who has won international honors for his conservation work. "We started [our conservation efforts] without financial resources, but that hasn't stopped us. There are resources for concrete ideas." Barnard says, "It's often overlooked that the Costa Ricans invested first."

There is evidence the Costa Rica's conservation ethic is rippling across regional borders. Last month, Costa Rican officials signed a letter of intent with Nicaraguan authorities to establish a "Peace Park" along Costa Rica's northeast border. That will be a challenge because the Contras are using the land on the Nicaraguan side as a staging area. Costa Rica and Panama are trying to work together to manage a border park called Amistad. Ugalde is spreading the conservation message in Paraguay and is currently trying to set up a conservation summit among Latin American leaders. "It is possible. This is an issue above politics," Ugalde says.

Martin of the MacArthur Foundation says, "Costa Rica intrinsically is worth supporting. It's inspiring. If there's an effect on other countries, that's a bonus." ■

MARJORIE SUN

Big Science Falters at First Hurdle

Spending for two of the Reagan Administration's highly touted science projects, the Space Station and the Superconducting Super Collider (SSC) could be far below the President's request for 1989 if preliminary recommendations by the House Budget Committee stand. The congressional Budget Committee process of devising a budget resolution is just the start of the annual process of funding research, but already it appears that many science programs will see little or no growth.

At *Science*'s press time, a House budget committee working group was recommending that the overall funding for the National Aeronautics and Space Administration (NASA) be held to an increase of $1.4 billion over its 1988 budget of $8.96 billion. NASA officials say they need at least $1.9 billion more next year to operate the space shuttle orbiter and to move ahead with the space station. The space station program is likely to be cut back sharply if Congress provides less growth, according to NASA.

The budget working group, in fact, was divided on how much money to provide NASA. It left the decision to the full Budget Committee, which was slated to meet 16 March. In an effort to win more funding for the space station and other science programs, members of the House Science, Space and Technology Committee sent House Speaker James Wright (D–TX) a letter on 10 March pleading for a larger allocation for science programs funded through a budget category known as "function 250."

Chairman Robert Roe (D–NJ), and ranking Republican Manuel Lujan, Jr. (R–NM), and 29 other members of the House science committee complain that the Budget Committee does not appear to "fully recognize the importance of vital efforts . . . such as the Space Station, the basic energy sciences, and the National Science Foundation." They warned Wright that they would "vote against any budget resolution which we believe will not serve the nation's best interest. . . ." Notably absent from the letter was any mention of the SSC.

The outlook for the Department of Energy's general science program is bleak. On 9 March, the working group recommended freezing spending for general science. This probably means that the White House proposal to spend $363 million in fiscal 1989 to begin construction of the SSC is effectively dead, according to an aide of Representative Denny Smith (R–OR).

The one bright spot is that the working group proposed funding the National Science Foundation at the President's request—$2.05 billion, a 19% increase. NSF officials, however, expressed concern that this recommendation might not hold up.

Indeed, the Budget Committee's spending allocations cover broad budget functions. The final spending decisions for specific research programs will be made by the House and Senate appropriations committees, possibly as early as June. ■

MARK CRAWFORD