

RE-LEAF



FROM THE HEAT

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More likely heard than seen, howler monkeys proclaim their treetop territories at volume.

The trail over dark earth and dense vegetation leads to a small circle where dappled light, louvered by giant palm fronds, splashes down through the forest canopy. Some of the taller trees are in the embrace of strangler fig vines, but bromeliads and air vines still fall from their branches.

High up in a majestic breadnut tree, a black howler monkey grunts at the visitors and reaches for a branchful of leaves. In places like this, deep in the upland broadleaf forest of northwestern Belize, you gain an appreciation for biomass. As forester Darrell Novello puts it, pointing

CAN TREES PUT A LID ON GLOBAL WARMING? SEEKING ANSWERS IN A BELIZEAN FOREST

to the canopy, "The trees are getting thicker and new stuff is coming up, so the forest is growing."

This may seem self-evident, but to Novello, who monitors this patch of rain forest for Programme for Belize (Pfb), its owner and manager, it is a daily wonder. To the conservation community, it is that and more. Not only do tropical forests serve as treasure troves of biodiversity, but they harbor what could be an antidote to the threat of global warming.

In one of nature's most dazzling magic acts, forests use the sun's power to transform water and carbon dioxide into growing plant tissue. Carbon dioxide, or CO₂—the most important greenhouse gas in Earth's atmosphere—traps heat and warms the globe. Together with water, sunlight and the magic of photosynthesis, carbon dioxide also powers plants to produce carbohydrates. When forests are saved, regenerated or managed in a sustainable way, the carbon in CO₂ is sequestered in living plants and trees. The more biomass, the more carbon. Now being embraced by conservation-minded countries and private industry, carbon sequestration is showing promise as a way to mitigate the effects of greenhouse gases.

The stakes are high. Under an international climate-change treaty, signed in 1997 by 174 nations in Kyoto, Japan, CO₂-emitting industries may soon be required to either cut back or compensate for their greenhouse gas emissions. One way they may compensate is by storing more carbon elsewhere.

Snowbird: Familiar summer resident of North America, the scarlet tanager winters in the forests of Rio Bravo.



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BY PAUL CLANCY • PHOTOGRAPHY BY TONY RATH

And one ready-made storehouse waiting to be tested is the living forest. Several projects brokered by The Nature Conservancy are putting serious money at the disposal of countries and conservation groups to do just that. "I think it's a wonderful opportunity to preserve an unusual natural environment at a relatively low cost," says Linn Draper, president of American Electric Power.

Tia Nelson, deputy director of the Conservancy's climate change programs, agrees. "The benefits to watersheds, biodiversity protection and to local communities are huge," she says. "That's why we're at the table."

Now the time has come to test whether the concept really works. The 20-foot circle marked by red ribbons is a carbon sequestration-monitoring plot in the forests of the Rio Bravo Conservation and Management Area, in Belize. Both here and in the magnificent plateaus and cliffs of northwestern Bolivia, scientists are measuring the girth of trees and the masses of limbs, leaves and vines, as well as the carbon content of the soil. It will take years before the results can be calculated, but there is little doubt that "new stuff," as Novello puts it, is adding to the amount of carbon captured from the atmosphere.

The payback for Belize is something that only a visit to these forests can adequately explain: the flash of black and orange as a jaguar crashes through the forest undergrowth, or a fleeting glimpse of a jaguarundi, margay, ocelot or puma—the other sleek, fast cats that reside here. Before daybreak visitors may be startled awake by the ferocious territorial roar of the endangered black howler monkey. Rio Bravo supports 70 species of mammals, of which 15 are watched with concern by international organizations.

On the botanical ledgers, there are mahogany trees, but also dozens of less famous species like the give-and-take palm (watch out for its thorns!), allspice and black poisonwood. On morning walks, bird-watchers may glimpse par-



Duke University researchers Susan Minnemeyer and Josh Pott measure the height of a mahogany tree, which can take hundreds of years to regenerate.

rots, motmots, toucans, three rare forms of hawk eagle, giant Jabiru stork, noisy crested guans and great curassows—just a few of the 390 bird species recorded in the area.

The sprawling Rio Bravo Conservation and Management Area, near the borders of Mexico and Guatemala, was born when Coca-Cola Foods abandoned plans for turning part of the land into citrus groves. Instead, Coca-Cola donated the land to the Conservancy, which turned over the deed to the newly formed Programme for Belize. With the help of the Conservancy and the Massachusetts Audubon Society, PfB began assembling the pieces of what would become Rio Bravo's

present 260,000-acre enclave of tropical forest and archaeological treasures.

Since 1995, the Conservancy has formed alliances with Wisconsin Electric Power Company, Detroit Edison Company, Cinergy Corporation, PacifiCorp, Suncor and Utilitree (a consortium of electrical utilities). Marshaling \$5.7 million among them, they acquired land that would eventually add 33,000 acres to Rio Bravo.

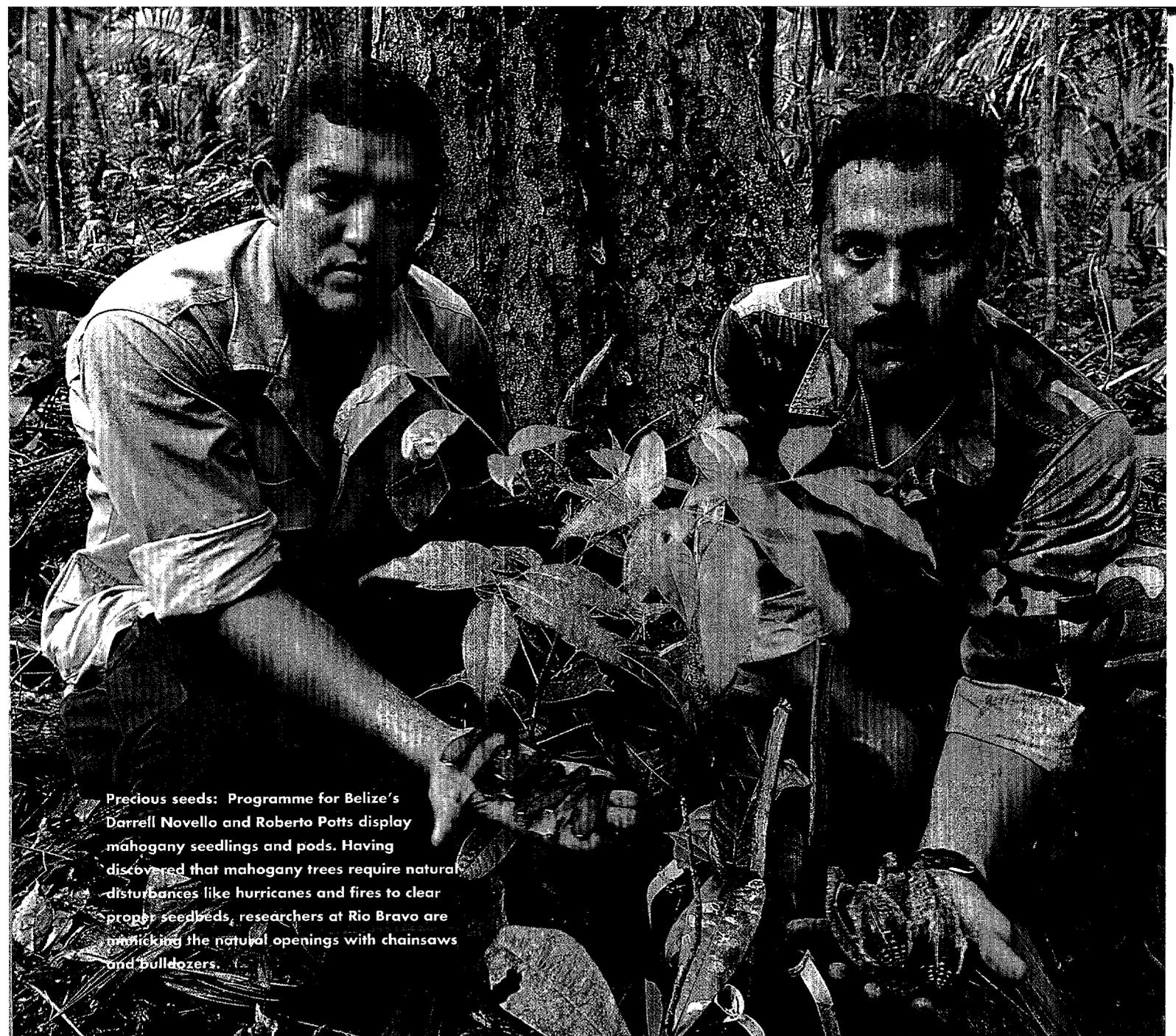
It was a close call. Also bidding for the land was a community of farmers who have turned much of the surrounding forest into plowed fields. "PfB bought it out from the front of the bulldozers," says Dan Campbell, the Conservancy's Belize program director. "If it hadn't been for carbon sequestration and the funds it brought in, a lot of the forest would be gone."

The Conservancy has become a leader in working with energy companies to turn carbon into conservation. For a small down payment on their future mandate to reduce greenhouse emissions, the companies could be making a big difference.

The Bolivia land is a case in point. In March 1998, together with Bolivian partner Fundación Amigos de la Naturaleza, the Conservancy pledged \$2.5 million to the carbon sequestration project at Noel Kempff Mercado National Park, a remote wilderness rising from Amazon rain forests to spectacular cliffs and waterfalls, harboring several hundred species of rare and endangered wildlife. With the leadership of American Electric Power (AEP),



Friendly forestry is a theme at Rio Bravo, where logging is strictly controlled to provide wood for local economies and trees for the forest. Rio Bravo's rain forests support 70 mammal species, including the ocelot [left], a secretive species of concern.



Precious seeds: Programme for Belize's Darrell Novello and Roberto Potts display mahogany seedlings and pods. Having discovered that mahogany trees require natural disturbances like hurricanes and fires to clear proper seedbeds, researchers at Rio Bravo are mimicking the natural openings with chainsaws and bulldozers.

MAKING WAY FOR MAHOGANY

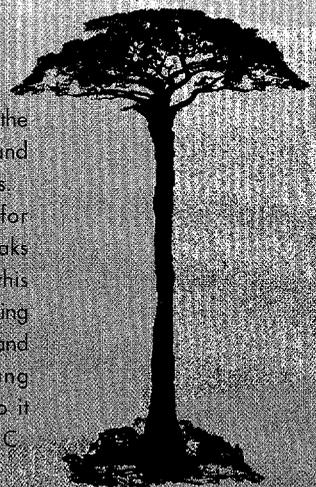
The jaguar may be king of this forest, but its crown is shared by the mahogany tree. Some of these great giants—wider than a jeep, older than the United States—still stand, testimony to what the forests once looked like. But without help, they won't regenerate for hundreds of years.

Just off a trail in the forest, a giant mahogany tree stands at the edge of a pie-shaped area that has been cleared by bulldozers. Nearby, another wedge

has been opened up by chainsaws. At a third, trees have been girdled by machetes and left to die. The patches look a little like a hurricane or fire has passed through—exactly the condition they're meant to mimic. According to the findings of ecologist Laura Snook of Duke University, that is the optimal condition for the trees to germinate: the "seed shadow" areas, downwind of the mother trees, are designed to test the theory

The seeds, descending on helicopterlike wings, will take root in the sunlight of these manmade gaps and will be watched for the next 40 years.

Alfredo Leal, a Programme for Belize field biologist assistant, speaks of the patience required of even this telescoped period. "What we're taking out is replaced by the mother tree, and in 40 years, we'll have young mahogany trees growing. And so it continues." —P.C.





A blue-crowned motmot, one of 390 bird species recorded in the Rio Bravo area. Log skidders tread carefully in Rio Bravo's experimental forest, where conservation and carbon storage are combined.

they found two additional investors in PacifiCorp and BP America. Together, the companies put up \$7 million. The money was paid to forest companies to permanently retire the logging rights to 1.6 million acres, more than doubling the size of the now-3.76-million-acre park.

Over the next 30 years, the Belize and Bolivia projects could prevent an estimated 20 million metric tons of carbon from being released into the atmosphere—a carbon release equivalent to that of 80 million megawatt hours of coal-fired power generation, enough to supply electricity to more than 8 million homes for a year. These are figures to command respect from the power companies looking to lessen their impacts. “We’ll burn this year in excess of 50 million tons of coal, and there are large carbon dioxide emissions associated with that,” says Dale Heydlauff, AEP’s vice president for environmental affairs, “so we determined a few years ago that it really was incumbent on us to find cost-effective strategies for reducing the level of carbon dioxide emissions in our system.”

At 100 stations in Rio Bravo and 620 at Noel Kempff, local managers gauge the progress of the arrested biomass. Every two years in Rio Bravo—and every five years in Noel Kempff—they measure the girth of the trees. They make estimates, based on models, of the amount of carbon in the leafy canopy. They weigh fallen leaves and branches; they test the soil. In both Belize and Bolivia, the now-protected forests would have gone under the plow or the logger’s chainsaw. By measuring plots in nonforested areas for comparison, they calculate the metric tons of carbon that would have been lost had the forests not been saved.

Tropical forests are not only nature’s most efficient carbon reservoirs, but also keepers of the greatest biodiversity on the planet. Simply put, saving carbon is saving rain forests. And tying all this together with the pledges of private companies puts a whole new tool in the hands of those who are fighting to keep the world’s most lavish ecosystems intact. Says Tia Nelson: “Its potential value is probably one of the most important breakthroughs we have in conservation.” Adds Hermes Justiniano, executive direc-

tor of Fundación Amigos de la Naturaleza: “Carbon projects such as these put a value on the forest. For the first time, they give the forest its right to live.”

The Rio Bravo land sits astride incalculably rich history, which for humans goes back at least to the Stone Age and includes 1,700 years of Mayan civilization. The land overlays no less than 60 substantial ancient sites, including one of the largest Mayan cities ever found. From about 2,800 to 1,100 years ago, the complex of cities and villages grew and the forests were leveled. Then the Mayan culture collapsed, and the forests had almost a thousand years to regrow before logging resumed. Slowpaced at first, the extraction of mahogany and Mexican cedar reached a furious pace by the 1950s as logging technology advanced, followed by the industry’s decline and inevitable collapse as marketable trees became scarce.

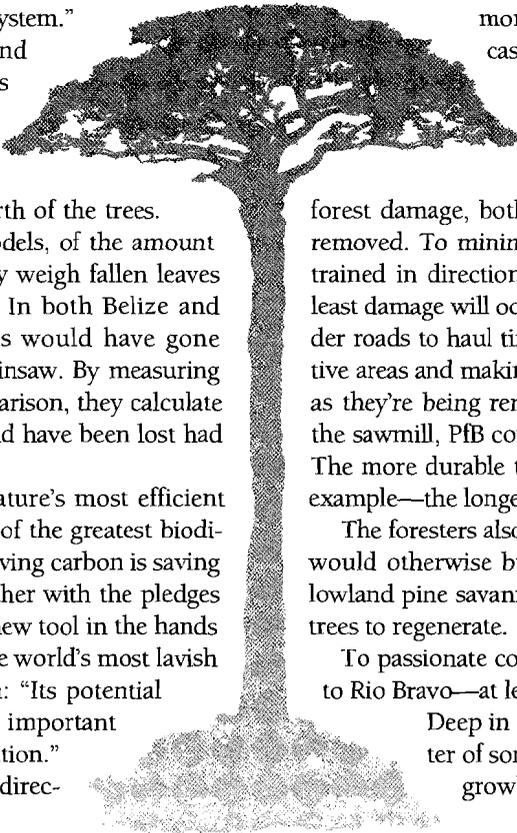
Rather than celebrating the missing loggers, Programme for Belize is actually reviving the timbering tradition in Rio Bravo. The difference is sustainability. More than half of the land is set aside as a nature reserve, with no timbering permitted. Where cutting is allowed, foresters have counted and mapped all trees more than 12 inches thick—and, in the case of mahoganies and Mexican cedars, every tree above 8 inches. When they fell and remove a tree, they do it like surgeons.

Traditional logging results in vast forest damage, both when trees fall and when they are removed. To minimize these impacts, PFB’s foresters are trained in directional felling—dropping trees where the least damage will occur. Loggers take care in routing skidder roads to haul timber from the forests, avoiding sensitive areas and making sure the logs don’t tear up the earth as they’re being removed. Then, through contracts with the sawmill, PFB controls and sells the finished products. The more durable the products—desks and flooring, for example—the longer the carbon is held in storage.

The foresters also are schooled in suppressing fires that would otherwise burn unhindered through Rio Bravo’s lowland pine savannas. The goal is to permit carbon-rich trees to regenerate.

To passionate conservationists, there’s a troubling side to Rio Bravo—at least at first.

Deep in the palm-draped forest, over the chatter of songbirds and the squawk of parrots, the growling, snapping, tearing of a machine



throwing its weight around rends the air. Rounding a bend in a wide path, a bulldozer attempts to negotiate a sharp turn with three fat logs in tow. No matter how well prepared the spectator, it is troubling to see such towering trees being ripped out of the rain forest.

Darrell Novello is monitoring the operation closely and doesn't like what he sees. The bulldozer's winch is supposed to keep one end of the logs off the ground so they don't plow through the woods and leave a deep scar.

"It's wrong," Novello says uneasily to his assistant, Ariceldo Awayo. "It's not lifting it up."

Novello quickly confronts the operator. In rapid Creole, he tells the young man he'll have to call it off unless the job is done right. Attempts to fix the winch are unsuccessful and the operation grinds to a halt. It will take days to work this out and the bulldozer will have to wait. But speed is not as important a consideration as doing the job right.

Many visitors to Rio Bravo have problems with the taking of a single tree, says Nimmi Nandra, the education coordinator for Rio Bravo's Hill Bank Station. But, given the local economy, it would be morally unacceptable to lock away all this land, she says. "In a poor country like Belize, people are going to do whatever they have to do to

put food on the table."

Programme for Belize hires local residents to work as rangers, foresters and contractors. It also helps nearby communities set up alternative businesses. In Isabella Bank, a group of women can and market preserves such as cashew fruit, pineapples and mangoes. Other ventures include honey production and handicraft training. "This is what grass-roots conservation is all about," Nandra says.

The most recent 33,000 acres bought under carbon sequestration at Rio Bravo added a critical piece to a wildlife corridor that runs deep into Mexico and Guatemala. Together, they comprise the largest forest block in Central America, according to Roger Wilson, the technical coordinator for Programme for Belize. "It's the completeness of the system that's a rare commodity in itself." For Pfb, now in its 10th year, the injection of more than \$5 million has given the organization breathing room and the ability to take actions it could not before for lack of funding. Says Wilson, "The bottom line is that carbon sequestration opens up a whole new area of financing for conservation." ❁

PAUL CLANCY last wrote for *Nature Conservancy* on crayfish.

The Conservancy has joined forces with partner organizations and corporations to help turn carbon-rich trees into conservation at Bolivia's 4-million-acre Noel Kempff Mercado National Park.

