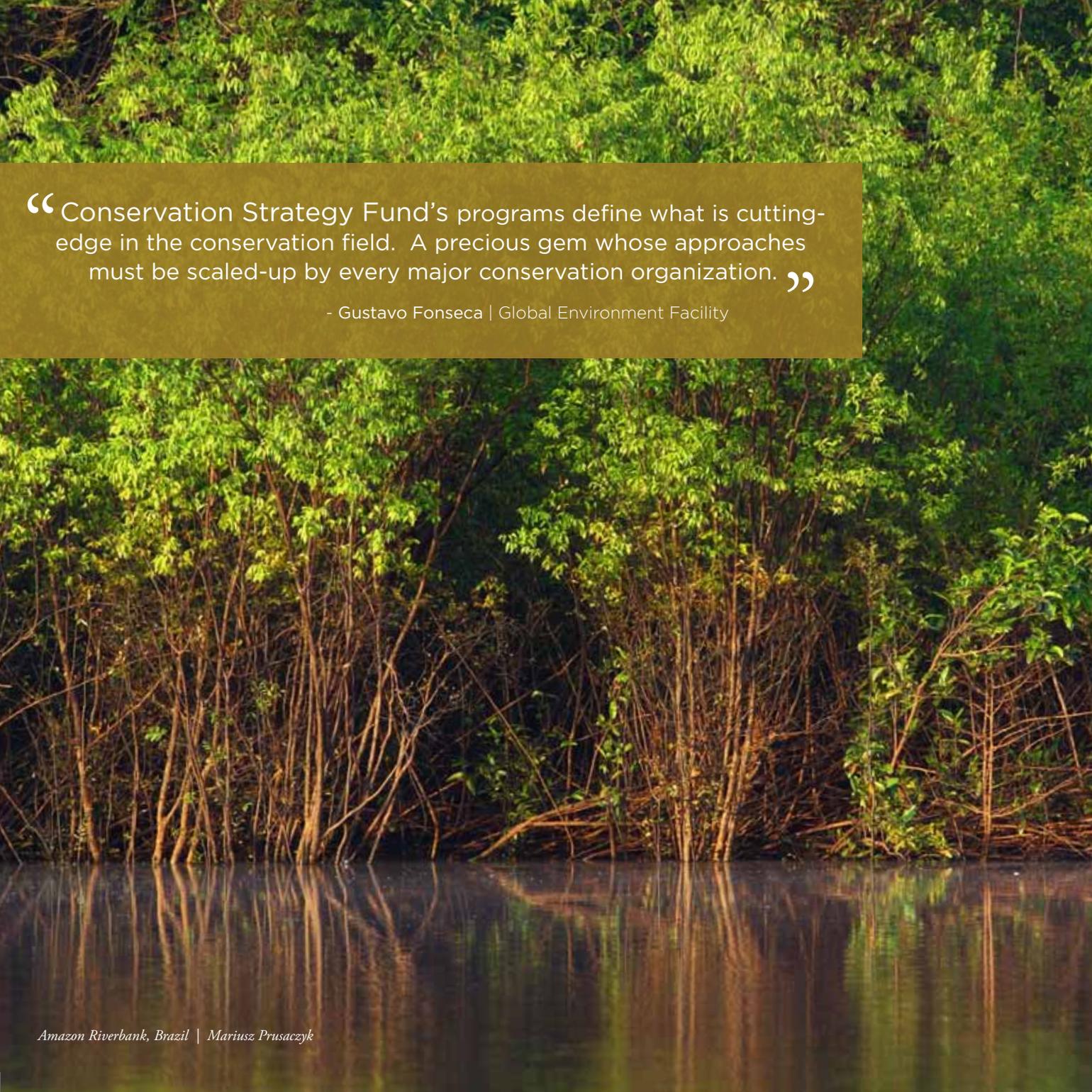




0392363 27300292802128901892179 **CONSERVATION STRATEGY FUND** | 1998-2013 392329280



“Conservation Strategy Fund’s programs define what is cutting-edge in the conservation field. A precious gem whose approaches must be scaled-up by every major conservation organization.”

- Gustavo Fonseca | Global Environment Facility

Amazon Riverbank, Brazil | Mariusz Prusaczyk



## We still live on a sublime planet,

a wet satellite pulsing, branching, purring, leafing, splashing and howling with life. Conservation Strategy Fund’s first 15 years on the globe are a flicker of time in Earth’s long biography. Yet it is within this very micro timescale of human affairs that an extinction crisis has gathered. I’ll spare you the grim statistics of species at risk. But I will say two things about it: It’s serious and it can be deflected. The combined effects of climate change and habitat loss will put many species out of business in the next century. But the combined efforts of smart, committed people will sustain many more.

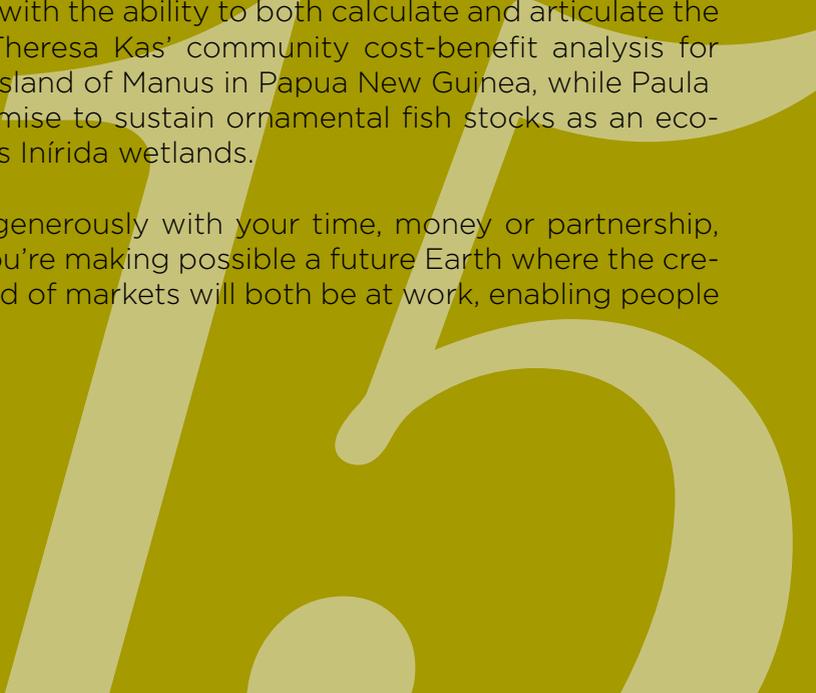
At Conservation Strategy Fund, we’re all about making these committed people smarter about a – *maybe the* – key aspect of conserving nature: economics. I’ll be honest, it’s an uphill challenge to fit unspoiled nature into the machinery of our modern market economy. That’s why our staff, instructors, research fellows, students and many partners are people who don’t mind walking uphill. It’s our way of life.

The 15 stories we’ve selected here are about these people. They show how CSF’s unique training and research programs equip people with the ability to both calculate and articulate the benefits of doing development right. Theresa Kas’ community cost-benefit analysis for example, led to forest protection on the island of Manus in Papua New Guinea, while Paula Zuluaga’s game theory experiments promise to sustain ornamental fish stocks as an economic mainstay in Colombia’s world-class Inírida wetlands.

To all of you who have supported CSF generously with your time, money or partnership, please accept my humblest gratitude. You’re making possible a future Earth where the creative hand of nature and the invisible hand of markets will both be at work, enabling people all over the world to live well.



John Reid, President & Founder



# Conservation Success

Conservation Strategy Fund's economic approach to conservation has helped save over 20 million acres of natural ecosystems and has inspired thousands of people around the world to craft smart environmental solutions.



**Volcán Baru**  
*Panama*

CSF helps Panama choose an alternate road that would provide bigger economic benefits and lower environmental costs.

**Panama Canal**  
*Panama*

CSF analysis encourages revision of expansion plans. New scheme recycles water instead of building 3 dams, costs less and keeps over 10,000 people in their homes.

**Fish in Colombia's Lakes**  
*Colombia*

CSF Research Fellow uses game theory to seal local agreements that prevent over-fishing.

**Coiba**  
*Panama*

CSF graduate finds that with minimal facilities this 430,825-acre marine preserve will deliver big benefits to local communities.

**Amazonas Highway**  
*Brazil*

CSF's road report helps save 10 million acres of forest, two billion tons of CO2 emissions and over \$100 million for the Brazilian economy.

**Bala Dam**  
*Bolivia*

CSF's first-ever analysis helps protect Earth's most diverse park and saves \$1 billion for Bolivia.

**Fernando de Noronha**  
*Brazil*

A CSF financial modeling program for park concessions enables needed infrastructure for Brazilians to discover their natural treasures, like this island gem.

**Wild Chocolate**  
*Bolivia*

CSF market study helps "wild" chocolate company succeed and supports a forest-based economy.

**Jalapão's Golden Grass**  
*Brazil*

CSF graduates show that a planned water diversion would dramatically alter livelihoods and threaten valuable ecosystems. The study contributes to the creation of 1.7 million acres of protected areas.

**Tanzania Parks**  
*Tanzania*

Economic study with Tanzania National Parks shows how to bring visitors to unfamiliar parks and increase revenues, conserving natural habitats for wildlife country-wide.

**Antiplano Marvels**  
*Bolivia*

A CSF Research Fellow's research helps increase revenues for a park and its neighbors.

**Peru Parks**  
*Peru*

A CSF graduate's study leads to 4-fold increase in park funding. He later brings in CSF to help shape a policy to ensure developers offset impacts on natural areas.

**Virunga**  
*Democratic Republic of Congo*

A CSF graduate fights to protect the oldest national park in Africa and its 800 gorillas from oil drilling.

**Jigme Dorji National Park**  
*Bhutan*

A CSF graduate conducts cost-benefit analysis encouraging local people to engage in conservation through the building of campsites for the park they call home.

**Manus Island**  
*Papua New Guinea*

CSF graduate guides local cost-benefit analysis that leads to protection of community forest reserves.



Jaguar | Mikadun

# SAVING

the number one park in  
biological diversity



## ACT ONE: MADIDI NATIONAL PARK, UNPLUGGED

The ink was hardly dry on Conservation Strategy Fund's Articles of Incorporation when a request came in from scientists Adrian Forsyth and Enrique Ortiz at the Smithsonian Institution: Analyze a giant proposed dam that would flood the most biologically diverse protected area in the world.

For about half a century, engineers and politicians have looked at the Bala Narrows in northern Bolivia and seen two things: money and power (the electric sort). Both could be made by plugging the gap in a ridge at the very edge of the Amazon. At this point, the Beni river forms a torrent that gathers nine Andean tributaries before it squeezes through the funnel of the Bala Narrows and spills out onto the Amazon plain. At the Narrows, the average annual flow of 2,200 cubic meters per second is enough to power all of Bolivia, with water to spare.

Over the decades, the arguments in favor of stopping up the Beni had evolved: to render longer stretches of the river navigable; then to

provide power for Bolivia's mining industry; then to control the flow of water so that downstream lands could be more successfully farmed. In 1998, the government declared the dam a priority for yet another reason: to supply Brazil's huge energy market.

But building the Bala dam would create an inland sea covering 250,000 – 600,000 acres (100,000-270,000 ha), at least twice the size of California's Lake Tahoe. The entire flooded area would be within the boundaries of the Madidi National Park and the adjacent Pilón-Lajas homeland of the Indigenous Tsiman and Mosen peoples. Madidi happens to be the number one park on the planet in terms of biological diversity.

CSF's first ever research project spelled out some harsh economic realities. For example, Bolivia would have to construct approximately 600 miles of transmission lines to take the Bala dam's power to reach desired markets in central and southern Brazil. And the energy would compete with Brazil's low-

cost generators, Bolivia's very own natural gas and smaller dams higher up the Andean slope.

Estimated costs were steep—ranging from \$1.8 to \$3.2 billion. Added to unsure power markets were tradeoffs in terms of managing flows for both power and farming, which, in any case, was proposed for lands with no access to markets. CSF's report concluded that financial losses on the project could run Bolivia upwards of \$1 billion and possibly deepen the country's poverty. At best, the Bala dam had a one-in-five chance of proving economically viable.

Nearly 15 years later, the Bala Narrows remains unplugged and Madidi's luxuriant jungles above water. The park is a magnet for nature tourism that benefits locals. CSF's study was the decisive evidence needed to bury the Bala plans and a watershed event in using numbers for nature in one of the most special places on Earth.

# 10,000 PEOPLE

keep their homes



## SHAPING SHIPPING: THE PANAMA CANAL

One of CSF's central ideas is that we can change the world by grabbing levers connecting to very big things, and pulling at the right time. The Panama Canal qualifies as a very big thing. The hundred-year-old waterway has been the most transformative piece of infrastructure in the Western Hemisphere and, in 2000, was set to transform Panama all over again. That's when CSF helped a small, local organization pull on one of those levers for change.

It all started with a discussion over dinner at our very first course, in 1999. A young Panamanian lawyer named Eyra Harbar, who worked for the local non-profit law firm Centro de Asistencia Legal Popular (CEALP), was concerned about a plan to dam three rivers and pipe the water into the Canal as part of a scheme to expand it.

The plan was designed to permit the passage of today's huge "Post-Panamax" ships, which

have lowered the cost of global shipping, but don't fit through the canal's aging locks. Those locks work as a set of elevators, lifting ships over the isthmus on a pillow of fresh water supplied by the surrounding jungle. Locks big enough for Post-Panamax vessels would need four times as much water as the old ones, and the plan was to siphon the water from rivers to the west of the Canal's physical watershed.

CSF and CEALP showed that the plan didn't add up.

For starters, the project's budget estimates ran as high as \$8 billion. Our 2001 report, "Economic Considerations on the Panama Canal Watershed Expansion," calculated that interest payments on such a debt could easily outstrip new revenues from expanding the canal. The plan had other costs, too: The massive diversion of freshwater, and three dams that would flood rainforests, crops and villages, displacing over 10,000 people. Resettling people would

likely require deforesting part of the Mesoamerican Biological Corridor, an ecological link between North and South America.

The head of Panama's Canal Authority hotly contested Conservation Strategy Fund's conclusions in the press. But, amid protests, the ill-conceived plan was shelved, and our findings were eventually vindicated. The Panamanian people voted for a very different plan to expand the Canal. It used recycling pools instead of dams to supply the needed water, costing up to \$3 billion less than the original expansion plan, displaced no one, left rivers free flowing and caused zero deforestation. A tug on the right lever at the right time delivered a victory for Panama's taxpayers, rural villages, the rainforest – and even for global shipping.



“The Jalapão study put a thematic mark on my career. Ever since then, I’ve been able to focus on the environmental and ecological economics as my main theme of research.”

- Wilson Cabral de Sousa Junior, *Instituto Tecnológico de Aeronáutica & CSF course grad, Brazil*



Dunes of Jalapão | Marcos Amend



## ALL THAT GLITTERS IS GRASS

Capim dourado means “golden grass” in Portuguese. Whether rooted in soil or pulled from the ground, capim dourado’s thin stems glow with a golden iridescence, and can be woven into bags, hats, baskets and even jewelry. Hundreds of Brazilian artisans in the northern state of Tocantins depend on it for their livelihood.

That nearly changed. The year was 2000, and three Brazilians—Wilson Cabral, Paulo Garcia, and Fani Mamede started talking at our first-ever Brazilian course. Garcia, who was a conservationist living in the Jalapão region, told the other two that something big was afoot in his neck of the woods: the idea of constructing a major diversion of the Tocantins River. The goal would be to send more water into northeast Brazil’s São Francisco watershed. The São Francisco watershed is a huge breadbasket, and the additional water was being eyed for crops and parched towns in the

country’s Northeast.

Garcia cautioned that the diversion could threaten the area’s notable ecosystem known as the Jalapão—a zone where two Brazilian biomes intersect, an outdoor lover’s paradise where 100-foot sand dunes meet rivers, waterfalls, and exotic plant life. This landscape is home to rare and threatened fauna and includes flora such as the capim dourado.

Which brought the CSF grads to another potential problem with the project. Paulo and Wilson knew that the people of potentially affected towns like Mateiros, where capim dourado crafts help sustain the local economies, weren’t even aware that the diversion had been proposed.

Over a course of some six months, the three CSF graduates completed a study of the project. Their cost-benefit analysis showed that the Brazilian government would lose hundreds of millions on the diversion, largely

because 70 percent of the water diverted might be lost to evaporation. In fact, the study authors warned, in times of drought the diversion might steal virtually every drop of available surface water.

The outcome? Beginning in 2002, the government backed away from, and ultimately decided against the diversion near Jalapão. Emboldened park officials then created both a state and federal protected areas in the heart of the region, covering more than 1.7 million acres.

“The Jalapão study put a thematic mark on my career,” says Cabral, who essentially convinced government authorities that, when it came to Tocantins, the color of money was gold as much as it was green. “Ever since then, I’ve been able to focus on the environment and ecological economics as my main theme of research.”

# 3 new PROTECTED areas

Ruaha National Park |  
Robin Moore



## SAFARI ECONOMICS: MAKING MORE OF TANZANIA'S MEGAFAUNA

Tanzania's national parks teem with the big storybook animals: rhinoceroses, lions, elephants and hippopotami. Only a few parks however, have historically teemed with visitors.

In 2001, Tanzania National Parks (TANAPA) official Ezekiel Dembe came to CSF's training and presented an inspiring challenge. Wildlife officials wanted to add land to the already world-class 12-park system in the East African country. But to get approval, his agency would have to find a way to reduce crowding in the popular Northern parks and promote those in the South and West. Any solution, he explained, also had to increase revenues; in a country where tourism is the second biggest contributor to GDP, the park system is

expected to run a surplus.

After the course Dr. Dembe and CSF polled some 1,000 tourists. We found that an overwhelming share of international visitors simply didn't know about the southern and western parks and, after the big investment to get to Tanzania, were hesitant to stray from the beaten path of marquee parks like Kilimanjaro and Serengeti. Mikumi? Ruaha? Many of the surveyed tourists were unaware that Tanzania's less heralded parks existed, and didn't know that they too host fantastic wildlife.

Following the data collection, CSF and Dembe hosted a two-day retreat for TANAPA staffers at the country's Arusha National Park. They discussed the findings, which suggested charging

higher fees in the popular parks, luring high-end visitors to spend more inside parks rather than on hotels and operators outside, and marketing the little-known parks to put them on the tourist map.

In 2004, TANAPA raised park entry fees. Then again in 2006 and last year. Today fees at northern parks Killimanjaro and Serengeti are \$70 and \$60, respectively, for foreigners, compared to \$30 when we started. Most southern parks charge half the Serengeti price. Tourism, meanwhile, has boomed by over 50% in a decade, revenues have grown steadily and the agency has succeeded in expanding the park system from 12 when we met Dr. Dembe, to today's 15.



“If we didn’t have a study like the one produced by CSF and TNC, it would have been impossible to prove to the government that there were economic facts telling us this project wasn’t feasible.”

- Ezekiel Miranda,  
Boquete Resident,  
Panama



Resplendent Quetzal | worldwildlifewonders



## RESPLENDENT ROADKILL, ALMOST

**O**n a clear day from the top of western Panama’s 11,400-foot Volcán Barú, you can see the Pacific Ocean to the south and the azure Caribbean to the north. A little harder to spot is the best route around the dormant volcano, the centerpiece of the 35,000-acre Volcán Barú National Park. In 2003, CSF and The Nature Conservancy (TNC) performed an analysis to find out.

Why did we care? The cloud forests that cling to the volcano’s flanks are connected to the vast Amistad International Park (PILA in Spanish). And the still roadless valley in between is alive with Central America’s marquee bird, the Resplendent Quetzal, which sports an impossibly long tail and tidy green ‘fro. Locals cared for reasons both mystical and practical; the birds drew tourists to the so-called quetzal trail, which would be paved over if the road were to go around the north side of the mountain.

Panama’s President, Mireya Moscoso, favored that route. As

a concession, she proposed a curious one-lane design and called it, without irony, the Camino Ecológico (Eco Road). The Camino was unpopular with the locals, who asserted that it would be decidedly un-ecológico. Our research confirmed that the choice made bad business sense too. We found that the narrow design would cause traffic snarls and danger, encourage deforestation, and drive up park operations costs. CSF’s report showed that the investment would lose nearly \$1 million. Moreover, there was a good alternative.

The southern route around the mountain wasn’t perfect, but it was better. It was longer and would require expensive new bridges. But the route had bigger economic benefits and lower environmental costs, giving it a higher overall economic return. The two-lane blacktop would traverse already deforested land instead of protected wilderness. Farms established on the productive volcanic soils had been struggling for decades to access markets.

“The [Camino Ecológico] is marked by a fundamental contradiction: It is an apparent compromise between a traditional road and a scenic footpath,” wrote the report authors, CSF’s John Reid and TNC’s George Hanily. “The notion of reconciling environmental protection with economic development is worthy, but this design achieves neither.”

In 2004, Panama’s new president, Martín Torrijos, canceled the Camino and gave permission for the Southern Route, which has been largely completed.

According to local leader Ezekiel Miranda, who lives in the shadow of the volcano, “If we didn’t have a study like the one produced by CSF and TNC, it would have been impossible to prove to the government that there were economic facts telling us that this project wasn’t feasible and that there was a better alternative.”



# Pulling people out of poverty with a **PARK**

Arbol de Piedra, Eduardo Abaroa Andean Fauna National Reserve, Bolivia | Pedro Szekely



## CAPTURING VALUE AT BOLIVIA'S MOST VISITED PARK

**T**he Arbol de Piedra, or “Stone Tree,” is a lone 20-foot rock that has been sculpted by wind and sand to look like a resilient yet stunted tree. It’s a good metaphor for the tough life on the Andean high plains, and the icon of Bolivia’s Eduardo Abaroa National Wildlife Reserve.

The popular 1.7 million-acre park is often likened to Yellowstone for its mix of geysers, hot springs, moonscapes, and mountains. It draws roughly 80,000 visitors annually, but its vastness and isolation (650 miles from La Paz) make oversight difficult. Tailings from in-park mining sites and a lack of public facilities have contributed to park pollution. Visitors drive over fragile land. In surrounding communities, 99.4 percent of the population lives in poverty.

In 2007, Conservation Strategy Fund Research Fellow Paola Lozano set about discovering how much visitors would be willing to pay in entry fees if the park could upgrade its facilities and management. She surveyed hundreds of visitors, with eye-opening results.

Survey participants—most of them European tourists—said they’d willingly spend approximately 85 to 90 percent more money for a great park experience. In exchange for the almost \$50 per day in extra spending, participants said they’d expect improvements to the park’s infrastructure, including better roads and hospitality services.

Paola advised park management that entry fees for foreign visitors could be raised from \$4 to as much as \$30 without significantly reducing their numbers. After some delibera-

tion, her recommendation was accepted in 2010 and fees were raised to \$20 for international visitors and kept at \$4 for nationals. The 80,000 visitors that year were nearly identical to the 2009 numbers. The resulting five-fold gain in revenues in 2010 opened new possibilities for revenue-sharing with the local communities of Quetana Grande and Quetana Chico, whose income from the park multiplied by a factor of seven, to over \$500,000 annually, while still increasing entry-fee income for park management to nearly triple its former total.

Paola’s story is just one example of how economic expertise can lead to environmental gains and an improvement in the livelihoods of those that call it home.



“**Better use** of many existing park tourism services could generate the resources needed to cover future costs.”

Coiba National Park, Panama | Laszlo Ilyes



## FROM PRISON TO PARADISE

**C**oastal habitats worldwide produce billions of dollars in fishing and tourism income. In drawing up a management plan for one of its premier island sites, the Coiba National Park, Panama’s government was faced with decisions over how to make the most of the island gem’s economic potential without damaging its fragile ecosystems. In 2007, CSF joined the Smithsonian Institution and Conservation International to solve that dilemma.

The 430,825-acre marine preserve was once a prison colony rich with old-growth forests, coral reefs, and sea life. The park is 14 miles from Panama’s Pacific coast and teems with hundreds of species of sea life that include parrotfish, maidens, marlin, sharks and crocodiles. With only six primitive government-run cabins on the island, many a resort developer could

just imagine the money to be made on a sprawling, five-star hotel.

CSF course graduate Ricardo Montenegro’s research made it clear that Coiba could generate ample benefits without a lot of construction. He found that minimal fishing and modest visitor infrastructure were consistent with sustaining a long-term stream of benefits to locals and to the broader economy.

Montenegro argued that the area’s artisanal fisherman were thriving, and should be left to make a relatively comfortable living—instead of potentially suffering, along with the islands and outlying areas, from overfishing. He reported that Coiba’s tourists, many of them scuba divers and snorkelers, find the destination to be a great experience at an affordable price.

Montenegro and CSF suggested

that concessionaires be invited to offer revenue-generating services—as long as they worked within very strict environmental standards. Finally, he showed that the revenue already generated by the park justified that more money was available to be funneled back into park management and oversight (the plan suggested reinvesting \$11 million over five years).

“What the study basically proved,” says Montenegro, “is that a better use of many existing park tourism services could generate the resources needed to cover future costs.” That means that Coiba, without being overhauled or turned into an amusement park, could largely take care of itself.



“The people themselves must assess the social and economic costs of protection and conservation of important ecosystems.”

- Theresa Kas,  
The Nature Conservancy &  
CSF course graduate,  
Papua New Guinea



Manus Island | Michael Thirnbeck



## COMMUNITY COST-BENEFIT ANALYSIS

In September 2009, Theresa Kas visited the small village of Sohoneliu in the Manus Province of her native Papua New Guinea. It was a dramatic change of scenery from Stanford, where, a month earlier, she had completed Conservation Strategy Fund’s international “Economic Tools for Conservation” course. Kas, who works with The Nature Conservancy, saw that deforestation was on the rise and traditional hunting was dwindling, and wondered if the local economy’s resource base was careening toward collapse. So she pulled out her CSF notes and put them to use.

She asked locals questions like these: Were they better off clearing more forest for farming, or preserving the habitat that had long been the primary source of their sustenance? What were the advantages of a quarry that they’d built on the

nearby Lawes River, which had since become clogged by sediment?

“The people themselves must assess the social and economic costs of protection and conservation of important ecosystems,” Kas explains, “These are the river and forest.”

Theresa didn’t stop with the difficult questions. She gave the locals tools to answer them, thanks to the cost-benefit analysis skills that she learned from CSF. Kas helped the people of Sohoneliu look at their daily decisions in the big scheme of things, using numbers. They concluded that deforestation and subsistence farming provided them with fewer benefits and narrower dietary choices than harvesting food from the jungle and their traditional gardens. In the wake of constructing the quarry, they discovered that illnesses and

health care issues in the village were on the rise.

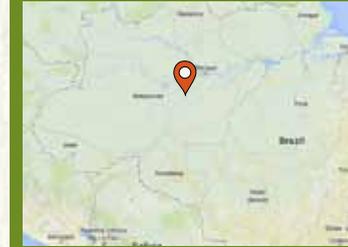
“They realized the unwise choices they had made,” explains Kas.

Following the meetings, the villagers rallied, developing management plans for nearly 25,000 acres of forested land. The reach of Kas’s teachings didn’t stop at Sohoneliu. Many other inland, neighboring communities took their cues from Kas, in the form of cumulatively setting aside approximately 250,000 acres of traditional land for careful management.

In Kas’ view, the CSF course isn’t just helping nature. “A healthy environment,” she observes, “will lead to healthy people.”



10 million acres  
**SAVED**



## THE ROAD LESS TRAVELED BR-319

**W**hen it comes to the math of improving one of the world's most controversial roads, it's important to include all the numbers. In 2009, powerful government officials lobbied for the paving of BR-319, a nearly impassable, 500-mile route through Brazil's Amazon rainforest. The road was opened by the country's military rulers in the 1970's but soon abandoned for lack of use. Supporters of the plan to reopen it claimed that the road would bring economic opportunities to isolated communities as sure as downpours came from the Amazonian sky. But CSF's study showed the numbers don't begin to add up. In fact, they're not even close. To this day, BR-319, which if blacktopped, could have an environmental ripple effect on the world, remains tangled in luxuriant jungle.

At first glance, the pro-road argument seemed logical: paved roads lower transportation costs. Paving BR-319 would link the northwestern, isolated Brazilian city of Manaus with the population-dense

communities further south. It would connect the poor communities living near BR-319 to the rest of the world (a bus company gave up on running the torturous route years ago). Children in the affected areas would have access to additional schools.

But our research, led by the organization's Leonardo Fleck and Marcos Amend, both CSF course graduates who later joined the staff, found that the \$265 million required to rebuild the worst 400 km of the route would markedly improve the lives of only a few hundred inhabitants—a hyperbolic investment of about half a million dollars per person. The analysts also looked into the environmental costs of deforestation the road would cause.

With help from students at Brazil's Universidade Federal de Minas Gerais, Fleck and Amend reported that paving BR-319 would, over a 20-year span, lead to the clearing of 10 million acres of forest, which in turn would release around two billion tons of CO2 into the sky. All in all, the report stated, the deforestation costs alone could run

\$900 million. Adding insult to injury, protecting the newly vulnerable forest that remained could run the Brazilian government another \$250 million, according to our calculations done for an official task force. Overall, the report found that paving BR-319 might return only 6.5 cents of benefits for each dollar of taxpayers' investment.

CSF's sobering report ultimately landed in the hands of officials in Brazil's Ministry of Environment, the federal Senate and staff of the environmental agency in Amazonas state. It was also widely circulated in CSF's broad network of Brazilian course graduates in government and NGOs. The study, along with a firm stance by environment minister Carlos Minc, brought BR-319 to a halt in 2010. The action saved Brazilian taxpayers hundreds of millions of dollars, and opened a historic window of opportunity to conserve the heart of the Amazon.

# The business of bringing **PEOPLE & PARKS** together



Fernando de Noronha Park, Brazil | Romulo Rejon Pego



## **BRAZIL'S** **FERNANDO DE NORONHA PARK**

**F**rom Acadia to Zion, Big Bend to Yosemite, U.S. citizens take them for granted: signs and stairs, benches and bathrooms. Invisible as it may be, infrastructure is key to a park's value proposition. Visitors willingly pay for a park experience that includes beauty, awe, and a few safeguards and conveniences. And people will defend what they love, which is why we wanted to help them get to know, and love, the Fernando de Noronha National Marine Park.

Fernando de Noronha is an archipelago of 21 islands off the country's northeastern coast where Brazil stretches to within two time zones of Africa. Until recently it was a staggeringly beautiful park with a surreal problem: like many Brazilian parks, Noronha received too few people. The country's parks are all short on infrastructure. Without mundane conveniences like

parking lots and guides, Brazilians opted not to spend their money on nature.

CSF's Leonardo Fleck helped change that. Working with Brazil's park service and the United States Forest Service, in 2010 Fleck developed a financial modeling program for concession operators that led to the creation of badly needed infrastructure and services. Among other things, the program helped analyze the financial feasibility of proposed improvements and operations. Could a concessionaire, for instance, make money by offering limited visits to protected beaches? By opening a gift shop?

At Fernando de Noronha, Fleck collected data on services like diving operations and boat trips. He helped the park service prepare to put the concession contracts out to bid and analyze the proposals that came in. In the

end the firm awarded Noronha's contract was one that had committed to providing the park with plenty of basic infrastructure. The costs for improved infrastructure were paid in part by the park's first ever entry fee, a change that hasn't discouraged visitation. Since the fee was established in September of 2012, visitor numbers to Noronha are actually up 10 percent.

CSF ran a special training course for park service staff and provided financial analyses for over 20 parks. Fleck believes even greater payoffs for improved amenities are yet to come. "People tend to create attachments to parks," he says. "You come with your kids to be close to nature and to create connection. The next thing you know the children return again and again, not just alone but with their kids and families, too."

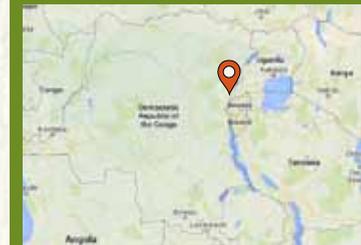


“Our contributions far outweighed what the oil company was offering the local communities.”

- Ephrem Balole,  
Virunga National Park &  
CSF course graduate,  
Democratic Republic of Congo



Nyamuragira, Virunga National Park, DRC | Photovolcania



## CONGO OIL

Virunga is the oldest national park in Africa. The 1.9-million acre World Heritage site hosts an incredible array of vegetation, landforms, and wildlife. It’s also in one of the toughest, war-torn corners of the globe, the eastern Democratic Republic of Congo. The violence and hardships of working there breed toughness and require bottomless reservoirs of optimism from the region’s environmentalists.

So in the summer of 2010, when British-based SOCO International received permission to probe for oil inside the storied park, CSF course graduate Ephrem Balole rolled up his sleeves and met the challenge head on.

Ephrem, a Virunga planning officer, secured support from UNESCO and the World Wildlife Fund while the park administration filed a lawsuit against SOCO for its incursion. SOCO, meanwhile, launched a high-profile goodwill campaign, promising that its oil would bring Virunga communities schools, jobs, roads and better livelihoods, plus \$200,000 in revenue.

Ephrem was ready to fight a battle of numbers.

He used the cost-benefit analysis learned with CSF to prove that nature conservation would provide a greater economic boost to Virunga than oil exploration. He illustrated that a robust park—complete with food services, lodging infrastructure, and transportation services—could generate as much as oil to the surrounding communities.

A Virunga without oil exploration, Ephrem added, had already provided its local communities with nine schools, a healthcare center, tree plantations, a networked water supply, and a small hydroelectric generator. In fact, park policy has been to share 30 percent of its revenues with local communities.

“Virunga National Park is the key to increasing tourism in our country based on its location and what it has to offer. The schools, health care centers, roads, dams, tree plantations, biomass briquettes and employment all help alleviate poverty,” says Ephrem “All of this already exists; it is more than what is expected from the oil

companies.”

By his calculation, oil’s local benefits would be far less than the costs to wildlife and livelihoods, including impacts on Virunga’s elephants, hipopotami, and buffalo, the waters of Lake Edward and its outlying savannahs, and risks to several hundred of the 800 or so mountain gorillas still in existence. Putting a price on the gorilla’s mere existence is an impossible task, but gorilla tourism has long been a thriving business in the park.

In late 2010, Balole and others from Virunga National Park met with government policy-makers and members of parliament. They provided their numbers—and obviously made an impression. In March of this year, the Minister of the Environment rejected SOCO’s environmental impact study and—at least for now—suspended all oil activities within the park.

Ephrem showed that being tough and cheerful - and correct on the numbers - can be enough to tackle even the biggest of adversaries, and to give at least a reprieve to an icon of African nature.

# A wild bean **PREVENTS** deforestation

Cocoa pods | Leung Chopan



## WILD CHOCOLATE

**W**e found this long bridge that connected a rainforest community and consumers in the city,” says Alfonso Malky. “It was made of chocolate.”

In 2011, CSF’s Malky discovered a complex, but promising web of connections between economics, the environment, and the human condition when he created a market study for the Bolivian chocolate company Selva Cacao (“Jungle Chocolate”).

This story starts millions of years ago with the emergence of the cacao tree in South America’s rainforests. It was domesticated thousands of years ago and is now grown in vast plantations throughout the tropics. The stuff Selva Cacao uses, however, is still from wild trees in the Amazon Basin of Bolivia.

The company asked CSF to analyze the economic feasibility of employing indigenous forest

populations to harvest wild cacao (“cacao” is a synonym for “cocoa”) and then make it into commercially viable chocolate bars. Malky began to ask questions. What were the benefits of wild cacao? How would villagers take to the opportunity? What makes for popular chocolate?

He discovered that harvesting wild cacao had multiple benefits. The bean grew without farmers having to resort to deforestation, soil abuse, or pesticides. Malky and other researchers also learned that villagers in communities like Carmen del Emero already knew how to collect the wild cacao beans. CSF proposed that Selva incentivize its potential workforce with a revenue-sharing model in which ten percent of all chocolate sales would go to the households involved in gathering wild cacao. Not only would the plan put extra money in people’s pockets—it would keep villagers from doing other work that might involve deforestation.

Then there was the matter of taste.

“We hosted focus groups, and people tried the wild chocolate side-by-side with products many considered some of the best chocolates on the market,” says Malky, describing the blind tests he ran. “The wild chocolate was always chosen first or second.”

Malky found that in the La Paz market brand loyalty was weak. Believing that there was room for a distinct (and only slightly more expensive) newcomer, he projected that Selva could sell 30,000 bars per month.

A year and a half later Malky sees Selva’s rainforest-sourced chocolate in stores all over town. It’s still a small business, but the chocolate bridge it built to the rainforest makes a real difference to people and their ability continue to coexist with the forest.

Budget for protected areas  
increases by **400%**



Machu Picchu, Peru | Anton Ivanov



## NUMBERS FOR NATURE IN PERU

**F**ernando León is a business school graduate most commonly seen in suit and tie. He's also one of Peru's most successful conservationists. His country has tropical forests covering an area the size of California, a coastline rich in marine life, and protected cultural marvels like Machu Picchu. A veteran of years working in the government, he was frustrated by the meager funding allocated to protecting the country's natural heritage.

In 2006, Fernando came to CSF's course at Stanford to add economic analysis methods to his toolkit. On his return home he undertook an ambitious study to estimate the contribution of the country's protected areas to the national economy. "The report convinced the Ministry of Economy and Finance to increase the budget for the protected areas system by 400 percent," Fernando reports.

Several years later in a post at the newly created cabinet-level Ministry of Environment, Fernando was charged with developing a policy that would require developers to compensate for their environmental impacts. Relatively few countries have such policies, so he didn't have precedents to follow, just one to set.

In late 2010, Fernando called in CSF to help. Over several months, Fernando and CSF President John Reid hammered out drafts of a set of broad guidelines that would require offsetting areas to be permanently conserved, with long-term financing and, most importantly, accounting for projects' indirect impacts. Indirect impacts include, for example, the vast areas often cleared for agriculture when a new road is built in a forested area.

The guidelines gained new momentum with the naming of long-time environmental advocate

Manuel Pulgar Vidal to lead the ministry later that year. He convened a working group, including CSF, the Peruvian Society for Environmental Law, the Wildlife Conservation Society, the Nature Conservancy, GiZ and others, to move the policy forward, culminating in a ministry directive in 2012, and a more formal draft Ministerial Resolution in 2013. The policy has the potential to be an international model for protecting nature by internalizing the environmental costs of development.

Environmental gains like these are won because there is someone with Fernando León's entrepreneurial creativity, ability to bring people together, and access to some timely knowledge on how to use numbers for nature.



“The CSF fellowship has been a wonderful gift. Their belief in me from the beginning has given me the confidence to go forward with my project. This program is a tremendous opportunity for anyone.”

- Paula Andrea Zuluaga  
CSF Economic Research  
Fellow, Colombia



## GAME THEORY GOES NATIVE IN COLOMBIA

Game theory emerged in the 1940's as a math-driven, esoteric science of how people alternately cooperate and compete to get what they want. It's been used in business, diplomacy and military strategies and won famed Princeton economist John Nash the Nobel Prize in 1994. Now, far from the halls of academia and the corridors of power, it's also being used to conserve nature.

Paula Andrea Zuluaga is a CSF Economic Research Fellow. That means the young Colombian economist is applying economics to conservation in a creative and compelling way that won her one of our coveted research grants and the help of a CSF mentor, Rocío Moreno. She's applying game theory to figure out how native fishermen can set - and stick to - agreements that will conserve their resource over time. Success will

bolster the survival of a lattice of wetlands and lakes in Colombia's Orinoco Basin. The area, near the town of Inirida, has been nominated as a Ramsar site, a club limited to wetlands of global significance.

Paula actually plays games with the fishermen. She divides them in small groups and has them individually choose how much hypothetical fish to catch, then repeats the process in multiple rounds. If they all catch a lot, the stock collapses, and with it their hypothetical incomes. Moderation by all leads to a sustainable yield and maximum long-term income for the group. If only one player "overfishes" while the rest show restraint, he reaps a huge catch from the healthy stock while the others don't. The trick, in the game and in life, is how to curtail the impulse of individuals for the benefit of the group.

Paula's research tests options such as taxes on excessive gains, shaming over-exploiters, or simply allowing the fishermen to discuss catch levels between rounds. The research also provides locals a space to reflect on the enforcement of limits on gear and certain no-fishing zones. She discovered that communication was the most effective intervention, and, through the process itself, helped six communities ratify self-regulation agreements.

Paula and the many other CSF research fellows are the future of economics-driven conservation. They take cutting-edge knowledge to another sort of edge, the one that defines the place where people meet intact ecosystems and find ways to coexist.

# NUMBERS

for nature



Snow leopard | Scott E. Read



## AND, FINALLY, LEOPARDS, TIGERS AND BEARS - A WORK IN PROGRESS

There's one park in the Kingdom of Bhutan where the ranges of the Royal Bengal Tiger, the snow leopard and Himalayan black bear overlap and where communities have lived in harmony with nature for hundreds of years. A trekker's paradise, Jigme Dorji National Park is also known for its astounding biodiversity, breathtaking alpine meadows and majestic snow-capped mountains. But, until recently, it was missing one thing: proper campsites.

Forestry Officer Lhendup Tharchen, a 2010 graduate of a CSF course offered in collaboration with the Ugyen Wangchuk Institute for Conservation and Environment, wanted to know whether

campsites inside the park could provide revenue to locals, as well as defray management costs. So he broke out his spreadsheets and ran the numbers.

His cost-benefit analysis encouraged local people that it would work. The park developed a plan that would allow the local communities to not only directly engage in conservation, but also provide an opportunity to supplement their modest income from Yak milk. Basic infrastructure has now been constructed – by the locals themselves through support from the government – and includes tent sites, water sources, and fencing. Camping fees will be given to the communities through an endowment fund, with 10% going directly

to the park. The experiment starts this fall, when the sites receive their visitors.

This story from Jigme Dorji reminds us that it's not always the sweeping policy initiative or dramatic development battle that determines the long-term success of conservation. Sometimes it's as simple as campsites.

In fact, 15 years have shown us that success is made up of many contributions, both large and small, from many people putting the right skills to work at the right time.

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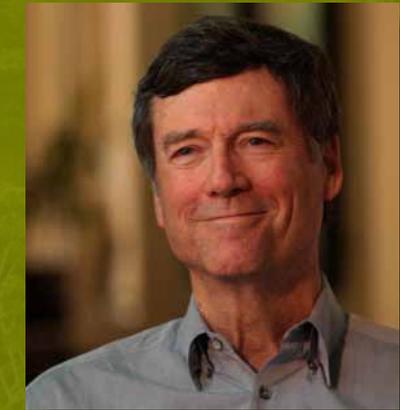
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- Steven McCormick,  
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