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GREG KENDALL-BALL/NATURE



Colombia has greater biodiversity than any country except Brazil.

ECOLOGY

Peace is killing Colombia's jungle — and opening it up

Scientists are racing to document once-inaccessible regions as industry moves in.

BY SARA REARDON

When the government of Colombia and the left-wing guerrilla group Revolutionary Armed Forces of Colombia (FARC) signed an agreement in 2016 to end five decades of conflict, the world celebrated. But that hard-won peace has come with a hidden cost.

FARC guerrillas once occupied large swathes of Colombia's vast forests, including the Colombian Amazon. The fighters'

presence sent smallholder farmers fleeing to cities and discouraged development. But as FARC has moved out of the forests, industry has moved in — including logging, gold-mining and cattle-grazing. A government analysis found that deforestation increased by 44% in the year of the peace accords.

Now, scientists are racing to document Colombia's rich biodiversity, which is second only to that of Brazil. In the process, they are rediscovering ecosystems that were once largely off-limits. Earlier this year, more than

40 researchers launched a digital platform to collate information on weather patterns, species distribution and other indicators of environmental health across Colombia. Their goal is to predict how the encroaching development could alter the country's forests and other ecosystems — information that could shape policies on land use, water security and other environmental issues as Colombia adjusts to peace.

If the researchers succeed, their efforts could yield insights that benefit other tropical ►



Plant samples collected by researchers at the Humboldt Institute in Bogotá.

nations grappling with climate change and development. “These topics are relevant not just for Colombia,” says Alejandro Salazar, a soil biologist at Purdue University in West Lafayette, Indiana.

For decades, researchers who wanted to study ecosystems in areas controlled by FARC and other armed groups had to get permission from the fighters. Some scientists persevered. Between 1988 and 2002, primatologist Pablo Stevenson ran a field station in the Macarena region, which is home to several primate species and was then under FARC control. The guerrillas would occasionally stop in for coffee, but generally left Colombian scientists alone, says Stevenson, now at the University of the Andes in Bogotá. “They were very respectful.”

Foreign researchers had a harder time — possibly because FARC thought they would command a high ransom. In 2002, Stevenson closed his field station, after guerrillas kidnapped a Japanese primatologist and demanded that Colombian universities pay to get him back. Still, the FARC guerrillas allowed the primatologist to keep working during his three-month captivity. One US biologist who was kidnapped twice by FARC even named a toad species *Atelopus farci*, because its mottled green skin resembled the guerrillas’ uniforms.

But many scientists avoided such field trips altogether. Now, the peace agreement has got them excited about the future. “We’ve been exposed to science in conference rooms,” says Daniel Ruiz Carrascal, a geoscientist at the Antioquia School of Engineering in Medellín. “We haven’t had the chance to go to the field.” He has begun building a network of

temperature and humidity sensors in alpine regions to monitor climate change.

The first wave of peacetime studies has already yielded surprising discoveries. Last year, biologists at the Alexander von Humboldt Biological Resources Research Institute in Bogotá found six new species, including frogs and beetles, after just ten days of searching in one forested area near Medellín.

To paint a broader picture of the environment, Ruiz Carrascal and others launched the Platform for Ecological Analyses on Colombian Ecosystems (PEACE). Their goal is to connect data from satellites, monitoring systems and the small number of scientists who conducted fieldwork during the FARC conflict.

The PEACE consortium’s main project is a ‘datacube’: an environmental model that simulates future change using information on atmospheric conditions, forest cover, fires and animal populations, among other factors. Researchers want to use the model to answer questions such as how ecosystems adapt to unusual conditions in years when the El Niño weather pattern occurs. The researchers also hope to reveal how increased deforestation and human migration caused by Colombia’s peace process might affect the environment. Such data could inform policies to protect ecologically important areas and limit exploitation of natural resources.

Other questions about the future of conservation efforts centre on Colombia’s dismal record of enforcing its environmental laws.

Eighty-four per cent of the deforestation there so far has taken place in protected areas, says Juan Posada, an ecologist at El Rosario University in Bogotá. The continued presence of illegal armed groups further complicates matters. “There are rules in place for biodiversity, but no one is respecting them,” he says.

And any conservation efforts also have to deal with the social issues that have arisen as Colombia tries to recover from decades of conflict. Since the early 1960s, when FARC emerged as a national force, more than 7 million people have fled their homes, largely in rural areas. Landowners who try to return to their abandoned plots are facing an unexpected problem. Jungles that were once cleared for farmland grew back during FARC occupation; the government has claimed much of this land as a natural resource that cannot be used for farming or timber. This has left hundreds of thousands of people with no source of income if they choose to move back to their land.

“This is a part of the conflict nobody saw coming,” says Carlos Zuluaga, director-general of the Antioquia branch of Colombia’s environmental protection agency, CORNARE.

In 2013, CORNARE launched a programme that pays about 3,000 families up to 600,000 Colombian pesos (US\$200) a month to preserve their land, rather than developing it. Zuluaga says that some of these areas could be worth more to Colombia if they are kept ecologically intact, because of their role in the water and carbon cycles.

Paying people to protect ecosystems has been tried in other countries, such as Brazil and Uganda. It can work well, at least in the short term, says Jennifer Alix-Garcia, an economist at Oregon State University in Corvallis. “The long-term sustainability is kind of unknown because most haven’t been in place long enough,” she says. The key, she says, is for governments to choose the areas to protect carefully, and to enforce their agreements with landowners. Otherwise, people could take the government’s money even as they give developers access to their land.

Even if enforcement remains weak, the PEACE researchers hope that their project — and any monitoring sites they set up — will at least help policymakers to understand the scope of the problem. “We are in a way rediscovering our country,” Ruiz Carrascal says. ■

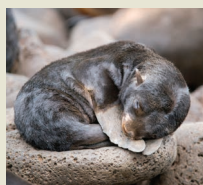
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“This is a part of the conflict nobody saw coming.”

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