

Ecologist proposes a new model to help meet global forest restoration goals

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Karen Holl is an expert in the restoration of tropical forests like this one in Colombia. Credit: University of California - Santa Cruz

Tropical reforestation is an important part of the global effort to mitigate climate change, but ecologist Karen Holl says current international goals may be overly ambitious.

"The science and practice of [restoration](#) are often quite separate, says Holl, an expert in tropical forest restoration. "Scientific research takes place at a small scale, and we've rarely tried to integrate results on the broad scale people are talking about. There's a mismatch between these really big goals and what's being done on the ground."

For decades, tropical forests around the world have been cleared to make way for agricultural and wood products, leaving a wake of environmental devastation behind. Tropical deforestation is a significant contributor to [climate change](#), generating 12-15 percent of global carbon emissions.

To turn that around, the international environmental community has embraced ambitious

forest restoration goals: Thirty countries have signed on to restore areas equivalent to the size of Venezuela by 2020; participants at the 2014 United Nations Climate Summit set a global target of nearly four times that by 2030.

Given the current scale of [scientific research](#), those goals may be unattainable, warns Holl, who advises nongovernmental organizations (NGOs) and policy makers around the world and recently authored a "Perspectives" column in Science magazine on this topic.

Most scientific studies are done on relatively small plots—typically a few acres—and results are literally rooted in local conditions, making them difficult to scale up to anywhere near the scope of international agreements.

Restoring vast amounts of forest will require major shifts in planning and science, says Holl.

A call to action

Restoration goals need to be tailored by region and employ a multi-stakeholder "bottom-up" approach that engages landowners, NGOs, local governments, researchers, private companies, and indigenous and community groups, says Holl. That will be the key to the development of cost-effective management practices that are practical at a large scale.

For years, restoration has focused on returning ecosystems to "predisturbance" conditions. Today's climate-change goals are broad and pressing, and Holl urges planners to identify locations where restoration of large areas of forest is ecologically, socially, and economically feasible.

Common sense steps include focusing on areas already set aside for conservation, rather than highly productive agricultural lands that landowners likely won't want to take out of production. Similarly,

Holl recommends selecting areas that will yield additional environmental benefits, such as protecting water supplies from damage caused by deforestation.

"As we're realizing the environmental effects of deforestation globally, and the local effects on livelihoods, too, the challenge is finding ways to make forest restoration beneficial to humans and the economy, as well as the climate and the landscape," she says.

Tropical forest restoration alone won't solve climate change, emphasizes Holl. "We have to drastically reduce human-caused greenhouse gas emissions." Reforestation yields additional benefits, though, including conserving biodiversity and improving human well-being.

Analysis based on first-hand experience and international collaborations

Holl's vision is based on first-hand experience and collaborations in Brazil, Colombia, Venezuela, and elsewhere. She oversees one of the longest-running, large-scale tropical-forest restoration projects in the world, a 14-year study in Costa Rica that has yielded valuable insights into the science and practice of restoration. Forest recovery takes decades, but most scientific studies last less than five years.

Fourteen years in, she is still learning from her plots. "We just wrote a paper about nutrient cycling in the litter that falls on the forest floor after a decade of restoration," recalls Holl. "What we're seeing now is really different from what we saw after three to five years."

Her team's focus has also broadened from forest ecology to encompass economic and social factors. Funding from the National Science Foundation has enabled her team to reach out and engage students from local elementary and high schools, too.

"You can do all the science in the world, but if it's not practical, if people aren't bought in, you're not going to change the way people do things," says Holl. "It's really important to work synergistically."

Holl collaborates with researchers and land management groups in every Latin American country where she works. "It's the people on the ground who know how to get things done," says Holl. Fluent in Spanish, she nevertheless says she relies on her local partners to navigate the governmental systems in their countries.

"When I started, I thought the work was too small scale, and it wasn't integrated with the community," recalls Holl, who proceeded to work differently, developing the "bottom up" approach she advocates for today.

Holl just completed a meta-analysis of academic papers about tropical reforestation, and her expertise is in demand at international conferences. She looks forward to branching out in coming years, spending more time working with international organizations and intergovernmental organizations, and expanding her reach to more countries.

"I see my role as working with people in Latin America who are going into leadership positions," she says.

Act globally—and locally

At the same time, Holl is committed to landscape restoration in Santa Cruz, where her students get valuable hands-on experience.

"I feel strongly about working where I live," says Holl, who partners with the UC Natural Reserves on the restoration of Younger Lagoon Reserve, located adjacent to the Seymour Marine Discovery Center on the city's westside.

Tropical forest ecology is a far cry from the coal fields of Virginia, where Holl did her doctoral research. "It was a steep learning curve. I had to learn a lot about tropical systems quickly," she recalls.

The number of Latin Americans doing high-quality research on [tropical forests](#) has jumped in the past decade, which gives Holl hope.

"It's heartening," says Holl. "We get bad news

about the environment every day. I encourage my students to pick something that they enjoy doing and where they feel they can make a positive difference."

Provided by University of California - Santa Cruz

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