



# When Hot Forests Get Hotter



Of all the unknowns about the effects of climate change, one of the most worrisome is how tropical forests will react to a warming world. Such forests sequester huge quantities of carbon and thus serve as one of the most important defenses to accelerated warming.

A unique experiment to be launched this fall in Puerto Rico's El Yunque National Forest—the only tropical forest in the national forest system—is designed to shed light on how these lush ecosystems will be affected by climate change.

Scientists have conducted relatively little research into the effects of climate change on tropical forests. This lack of data makes predicting the pace of global

warming difficult. Tropical forests contain one quarter of the planet's land-based biomass, exchanging more carbon with the atmosphere than any other type of habitat.

"All ecological processes have what we call a high-temperature threshold," says Tana Wood, an adjunct scientist with the U.S. Forest Service who is one of three co-leaders of the project. "There's some evidence that these canopy leaves may already be very close to that threshold."

That could be a big deal. Currently, tropical forests are a net carbon sink—they take up more of the stuff than they release. If that threshold is exceeded, they may become a net source of carbon. That could trigger a dangerous positive feedback loop—the warmer it gets, the more carbon such forests would release.

Technicians are building a network of infrared heaters at the site of the experiment and an 80-foot tower. Those heaters will raise the ambient temperature by four degrees celsius. Researchers will monitor the reaction of the plants that grow there at the root level and high in the canopy.

They hope that the information gathered in the experiment will allow climatologists to fine-tune models designed to gauge the timing and extent of climate change.

"The importance of this work on a larger scale is that it will help us understand and predict what will happen," says Molly Cavaleri of Michigan Technical University, one of the experiment's co-leaders.

"Tropical forests are hugely important in the overall carbon cycle."

Anecdotal evidence suggests climate change is already impacting such forests, although the overall effect is unknown. Some tropical forests in Asia, for example, have seen slower growth rates as the climate has warmed, while forests in the Amazon have seen increased growth rates.

Studies in more temperate latitudes have yielded surprising results. For example, a recently completed study in Michigan in which the soil was warmed in a sugar maple forest found that the amount of carbon dioxide given off by roots decreased as the forest warmed.

A recent study of plants in the Pacific Northwest by researchers at the University of Washington showed that the majority of species of mountain plants have migrated down to warmer elevations rather than up to where the air is cooler. Scientists believe they did so due to decreased water availability in their usual habitats.

Tropical forests may be particularly vulnerable to climate change because they inhabit a relatively stable environment. Temperature fluctuations in the tropics are less than they are at higher latitudes.

"Will tropical forests continue to provide this crucial service of taking up carbon dioxide in a warmer world?" Wood asks. "That's what we're trying to answer."

The \$2 million experiment is being funded by the U.S. Department of Energy and the Forest Service. That's enough money to keep the experiment going for three years, although researchers hope to secure funds to continue the experiment beyond then.