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Standing strong for our federal forests

Mature and old growth is too valuable to harvest

Dr. Max Holmes President & CEO

Understanding and protecting forests has been at the heart of Woodwell Climate's work from the beginning—from the lush tropical rainforests of the Amazon and Congo, to the vast boreal forests spanning Alaska, Canada, and Russia, to the diverse temperate forests found all across the U.S.

Over the past several years, we have been active in pushing for greater protection of our federal forests. We have published policy-relevant scientific findings, provided public comment on proposed rules, penned and signed open letters with scientific colleagues, and spoken to journalists and legislators.

And we have made strides—the restoration of protection against logging and road-building to more than 9 million acres of Tongass National Forest, and the release of the first-ever inventory of more than 112 million acres of mature and old-growth forest on U.S. federal lands.

But logging has remained the number one threat to these forests. **Now, the Trump administration has set a goal of increasing timber production—logging—in federal forests.**

This is a giant step in the wrong direction.

Our federal forests are critically important climate solutions. They absorb the equivalent of 3% of U.S. emissions from fossil

fuel burning each year, and the largest trees are responsible for the majority of carbon uptake and storage. As forests mature, they also accumulate even more carbon in soils.

Of course, the benefits of mature and old-growth forests go far beyond carbon. They support clean water, healthy soils, and a diversity of wildlife. They are more resistant to the impacts of wildfire and pests, which are increasing challenges in a warming world.

The fight to protect our federal mature and old-growth forests has been going on for years, and it's far from over.

The coming months will bring new proposed rules and plans aimed at increasing logging on federal lands. At every step, we will be ready to ensure the best available science has a voice in the conversation.

We will stand strong for our forests and our collective future. We thank you for standing with us.

Onward,

Max

Forest stability: A marker of our oldest, strongest forests

This metric of ecosystem integrity helps quantify the characteristics of primary forests

Sarah Ruiz Science Writer and Editor

Associate Scientist, Dr. Brendan Rogers has walked in many forests, but primary forests, he says, “just feel different.”

Rogers’ work often takes him to the cool, dark understories of black spruce and pine boreal forests, where he’s learned the subtle markers of a truly old, healthy, stable forest ecosystem.

“Generally cooler, often wetter, the trees are bigger but sparser and more likely to be conifers than shrubs or deciduous broadleaf trees,” says Rogers. “The ground is squishy to walk on, from the build-up of peat-like soils, mosses, and lichens.”



Primary forests are also a critical piece in the climate puzzle. They represent centuries of sequestered carbon, and every year they remain standing these forests continue to pull carbon from the atmosphere and lock it away in their trees and soils. They are also the subject of intense debates in forest management circles because, according to Rogers, despite knowing intuitively when you are standing in a primary forest, quantitatively identifying one is a tricky task.

That fact hasn’t deterred Rogers and his collaborator Dr. Brendan Mackey at Griffith University, from their work to identify and map metrics indicative of primary forests. In a joint project launched in 2018, Rogers and Mackey created an index of one such metric—forest stability.

Measuring forest stability

Forest stability is a measure of a forest’s resistance to disturbances, both manmade and natural. A stable forest has a high level of ecosystem integrity—a holistic term referring to the combination of ecosystem structure, function, species composition, and adaptive capacity. Stability reflects the ability of a forest to maintain all of those elements in the face of disturbance.

To quantify stability, Rogers and Mackey isolated two metrics that correlate heavily with integrity in forests—“greenness” and water stress. Greenness, also known as the fraction of photosynthetically active radiation (fPAR), indicates the amount of thriving, photosynthesizing plants. Water stress is an index of anomalies in vegetation moisture, indicating an area is dryer than usual. Both of these metrics can be remotely derived from satellites and, when combined with additional data, form an index of overall stability level.

This index was first tested by a postdoctoral scientist at Woodwell Climate, Dr. Tatiana Shestakova, who pulled data from NASA’s MODIS satellite sensor to map stability in sample regions in the Kayapo Indigenous Territory in the Brazilian Amazon and southern Taiga region of Siberia. After testing the model, Rogers, Mackey, and Shestakova expanded it to map stability across the entirety of Ontario, Quebec, boreal Siberia, and the Amazon rainforest.

The studies used a method called a time series analysis, which compares satellite data stretching back to 2002 to determine whether a forest had experienced a large-scale disturbance, reducing vegetation greenness and increasing water stress and thus lowering overall stability. These insights were only possible due to the long, consistent dataset produced by MODIS.

“It can be a little bit dicey to assess stability on shorter time scales,” says Rogers. “Because when you work with remote sensing data, forests can fluctuate year to year and sometimes

you can't completely eliminate things like cloud contamination or other errors from the data, so a longer time series helps smooth the data and lets you see the true patterns."

Prioritizing protection for primary forests

These maps of stability have a crucial role to play in informing forest management policy.

"We're trying to analyze and spatially map the ecological condition of forests," says Mackey. "Because this information is needed to help guide where investments for forest protection and restoration go and how they should be prioritized."

For a long time, Mackey says, management conversations did not distinguish between types of forests, lumping monoculture tree plantations into the same category as ancient natural forests, despite the vast differences in their carbon storage, biodiversity, ecosystem benefits, and overall resistance against disturbances.

"We weren't seeing the forest for the wood," Mackey jokes.

Quantifying a characteristic like stability makes it easier for managers to see the difference between the two, identify the forests best able to provide myriad ecological benefits, and ideally, prioritize those for protection.



Mackey uses the example of woodland caribou in Canada, which are considered a threatened species. These animals require large areas of intact primary forest to support successful populations. Overlaying forest stability on top of caribou habitat maps can help decisionmakers narrow in on the largest, highest-stability tracts of forest as top priority for conservation.

According to Rogers, a future goal would be to eventually link maps of forest stability with carbon estimates in order to create forest protection plans with climate mitigation in mind. Research in primary forests has shown they continue to sequester carbon year over year, even though tree growth has tapered off. With primary forests in many places under intense political and economic pressures, it will become even more important to demonstrate the many co-benefits of protecting the earth's stable forests.

"There's no forest anywhere that isn't threatened," says Mackey.

"Development, infrastructure, roading, damming, logging, clearing for agriculture. It's happening everywhere."

Stable forests are resilient forests

Tracking stability of forests also allows us to approach a much harder-to-define characteristic of primary forests—resilience.

Stability and resilience go hand in hand, though they are not the same thing. While resilience speaks to an ecosystem's adaptive capacity or its ability to recover to its original state after some disturbance, stability is a measure of resistance, which is why it correlates so highly to primary forests that haven't experienced any recent large-scale disturbance.

"If the stability index is showing recovery, then there's obviously some resilience happening, but beyond that, primary forests tend to be more resistant to certain disturbances," says Mackey.

"Sometimes resistance is better even than being resilient. You're not destroyed in the first place."

Highly stable forests do tend to have better adaptive capacities as well, which is why they are so critical to protect.

"By and large," says Rogers, "forests are resilient." The stable ones can handle disruptions, and if you leave them to recover they will do just that, as he and Mackey have seen in the data.

But resilience is not infinite. If you hit too hard too fast—overlapping disturbances on an already unstable forest—you can overwhelm its resilience. Fires, larger and more frequent as a result of climate change, have already begun to override boreal forests' adaptation. And there are more changes coming as the planet continues heating up.

For now, at least, Rogers says, "resilience is still largely what we see out there."

above: (top) The floor of a boreal forest, carpeted in a thick layer of moss. / photo by Brendan Roger; (bottom) Planted forests, like this eucalyptus plantation in Brazil, tend to have lower stability compared to natural primary forests. / photo by Mitch Korolev



Woodwell Climate @ Mountainfilm

Woodwell Climate Research Center is once again partnering with Mountainfilm in Telluride, CO this Memorial Day weekend to elevate stories and generate conversations that inspire climate action and environmental stewardship.

Woodwell Climate has been a Mountainfilm sponsor and participant for several years. Each year is memorable and brings fresh ideas, connections, and collaborations and this year promises to be thought-provoking and action inspiring, with climate change featured front and center in films and events.

To learn more, visit: www.mountainfilm.org



WOODWELL CLIMATE CONVERSATIONS SERIES

Climate-Health Nexus

A conversation with Dr. Stuart Harris

Dr. Harris is Founding Chief of MGH SPEAR MED: medicine practiced in Space, Ecological, Arctic and Resource-limited environments, a division of the MGH Emergency Department. He is also the founder and Chief of the MGH Division of Wilderness Medicine, and the Director of the MGH Wilderness Medicine Fellowship. Learn more: woodwellclimate.org/climate-health

In the news: highlights

WBUR quoted Dr. Chris Neill on the positive impacts of EPA regulations on the environment, including on Cape Cod.

Plato University, an education nonprofit, interviewed Dr. Bill Moomaw about forests and carbon sinks for their course on solving climate change.

Many local news outlets covering the Stand Up for Science rally in Woods Hole last week quoted Dr. Max Holmes' comments on the importance of science and using our voices to show support, including *The MV Times*, *Cape Cod Times*, and *The Vineyard Gazette*, and *The Falmouth Enterprise*.

The Falmouth Enterprise wrote a story covering Dr. Chris Neill's recognition by the Massachusetts Association of Conservation Commissions, who presented him with their Outstanding Public Service Award.

The New Bedford Light also quoted Neill in a story about the Continuous Oxygen Monitoring in Buzzards Bay (COMBB) project—preliminary results suggest the bay's water quality is worse than previously shown.

Dr. Yili Yang wrote a "Behind the Paper" blog post for *Springer Nature's Research Communities* that digs into his recent publication of a dataset on Arctic retrogressive thaw slumps. The post also features a graphic by Julie Waite.

WCAI ran a short segment on local impacts of and attitudes about federal workforce cuts and uncertainty in science funding. Woodwell Climate is mentioned as a recipient of federal funding.

Dr. Jen Francis's expertise was heavily called upon this month.

A *CNN* article on extreme temperatures and melting sea ice in the Arctic quoted Francis on the links between Arctic warming, the jet stream, and weather. She was also quoted in another *CNN* story on how the U.S. is feeling the impacts of "weird" polar vortex activity.

Chris Gloninger interviewed Francis for a Substack article on the connections between the Arctic, jet stream, and our future climate.

Commonwealth Beacon quoted Francis in a story covering warming spring temperatures in Massachusetts over the last 55 years.

Science Feedback interviewed five scientists, including Francis, to dig into the details of climate change and "cold snaps."

Francis was quoted in a story from *The Boston Globe* on how older generations experienced colder New England winters than we have now.

Donations play an important role in securing the future of Woodwell Climate Research Center's work—and help safeguard the health of our planet for generations to come.

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**Woodwell Climate
Research Center**

149 Woods Hole Road
Falmouth, MA, 02540-1644

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