



50 STATES, 50 FIXES

North Carolina's Bogs Have a Dirty Secret, and That's a Good Thing

Peat bogs have huge potential to store planet-warming carbon. The ones in North Carolina just need some help to get healthy again.

Peat soil at Angola Bay Game Land in North Carolina.

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Depending on how it's treated, this North Carolina soil can be a blessing or a curse.

In its natural state, the soggy, spongy soil known as peat stores exceptional amounts of planet-warming carbon. Peatlands cover only about 3 percent of land on Earth, but they sock away twice as much carbon as all the world's forests put together. They also offer protection from wildfires, floods and drought, and support rare species.

But decades ago, in peatlands across North Carolina, people dug ditches to drain the waterlogged earth, often to fell old-growth trees or plant new ones for timber.

As peat dries, its virtues turn upside down. The soil itself becomes highly flammable. Even without burning, drained peat starts to emit the carbon it once stored, converting a climate solution into a climate problem.

The land no longer soaks up floodwaters. And in times of drought, there's little water for the ecosystem to fall back on.

Now, nonprofit, state, federal and private sector scientists and engineers have teamed up on what amounts to a series of giant plumbing projects. They are coaxing water to stay on the land to restore moisture to the peat.





Alex Parker, with the North Carolina Wildlife Resources Commission, front, and Eric Soderholm of the Nature Conservancy, at Holly Shelter Game Land, hit by the Juniper Road fire in 2011 and now designated for restoration.



An undisturbed peatland area at Angola Bay Game Land and a zone cut through with roads and ditches, bottom right, that was once used as a pine plantation.

Built up over thousands of years, peat is formed when plants die but don't fully decompose because of low oxygen levels in the saturated soil. (That's why [preserved bodies are sometimes pulled out of bogs.](#))

There are many different kinds of peatlands, including [tropical](#)

[swamps in the Democratic Republic of Congo](#), [bogs in the Scottish Highlands](#) and the pocosin wetlands of North Carolina, which are characterized by a thick blanket of evergreen shrubs. And [they get even less credit than trees](#) for the work they do.

50 States, 50 Fixes is [a series about local solutions](#) to environmental problems. More to come this year.

“Peatlands are priceless,” said Eric Soderholm, who is in charge of peat restoration in North Carolina for the Nature Conservancy, a nonprofit organization that has joined with state and federal agencies and with university researchers on several projects. “It’s a lot easier maybe for people to think about what’s growing above their heads than to think about what is growing below their feet.”

Protecting intact peatlands and restoring degraded ones are both critical to fighting climate change, [researchers have found](#).

But it’s not easy to undo past harms.



Teams are planting Atlantic white cedar, a species devastated by centuries of overharvesting and habitat loss, at Angola Bay. Adjustable barriers help contain stormwater, which will gradually resaturate soil.

Equipment gets bogged down, quite literally. Traversing the land by foot is its own challenge because the brush grows so tightly in pocosin peatlands.

“You come out with much less clothing than when you walked in because it’s been shredded and carried away,” Mr. Soderholm said.

Above all, there’s the sheer scale of the degradation and the cost to repair it.

At Angola Bay Game Land, a nature preserve north of Wilmington, N.C., 140 miles of ditches run across 7,500 acres. The Nature Conservancy purchased the land in 2002 and transferred it to the state four years later. In 2022, a rewetting project got underway.

Bulldozing roads to refill the ditches may have been the simplest solution, but it wasn't an option because the state wanted to preserve access for hunting and fishing as well as firefighting and research.

Instead, team leaders followed methods used in earlier efforts at national wildlife refuges in the state. They installed adjustable dams and aluminum barriers meant to stop rainwater flowing out through the ditches so that it could slowly soak back into the spongy soil. In addition to rewetting the peat, the structures reduce runoff toward communities downhill.



Alex Parker, a biologist with the North Carolina Wildlife Resources Commission, on a weir at Angola Bay Game Land.





North Carolina's peatlands are home to carnivorous plants like this Venus flytrap at the Green Swamp Preserve.

"When I think about what we've been doing out here, I think of it as triage," said Fred Wurster, a hydrologist who recently retired from the U.S. Fish and Wildlife Service and has worked on national wildlife refuge projects and also advised on the Angola Bay project. "The first step is just to stop that loss of water, slow the drainage."

In place of pine plantation stands, the team planted more than 250,000 native seedlings: Atlantic white cedar, buttonbush and two species of cypress.

It's too soon for monitoring data at Angola Bay, but research on an earlier project at the Pocosin Lakes National Wildlife Refuge [found that the water table levels had increased](#) by 65 percent in the first year after restoration began, leading to a 58 percent decline in carbon dioxide releases.

Still, there's a carbon trade-off to contend with. Rewetting degraded peatlands often increases emissions of methane, another carbon-based greenhouse gas. As efforts to restore peatlands gain popularity worldwide, it's a counterpoint that scientists are working to understand more clearly, said Julie Loisel, a paleoclimatologist at the University of Nevada, Reno, who specializes in peatlands and is not involved in the work in North Carolina.

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Egrets at the Holly Shelter Game Land.



A fire crew from the Nature Conservancy at the Green Swamp Preserve using drones that can remotely start controlled burns. The practice reduces brush, which can fuel wildfires.

“Sometimes you will have big methane pulses, and so you will lose in the short term,” Dr. Loisel said. “But on the annual basis, I think it’s pretty strong evidence that we’re winning, so there’s more carbon stored than carbon released.” Research [shows that controlling water levels can moderate](#) methane releases.

A mix of federal, state and private foundation grants totaling over \$5 million have paid for the rewetting efforts at Angola Bay. Another state project, at Holly Shelter Game Land, is on deck, and promised federal funds have continued for now.

For Alex Parker, a biologist with the North Carolina Wildlife Resources Commission, the potential for restoring biodiversity is the most exciting part. He’ll be using acoustic monitors on the upcoming project to find out what kinds of birds, bats and frogs return with the water.

“This is something that I would like for my children to be able to see,” he said. “This kind of habitat is not widespread.”





Mr. Soderholm of the Nature Conservancy wiped his hand on a tree after collecting a peat soil sample at Angola Bay.



Mr. Soderholm in Angola Bay Game Land. "You come out with much less clothing than when you walked in, because it's been shredded and carried away," he said.