A fungal plague is killing Georgia's bats. Scientists are fighting back

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On a bright December morning, three wildlife biologists waded through knee-deep water and past scribbled graffiti into a dark drainage culvert in northeast Georgia.

As the last glimmers of daylight dissipated a few hundred feet inside the tunnel, Emily Ferrall pointed her spotlight at the ceiling to reveal a now-rare sight: A single, tricolored bat asleep—no bigger than a clothespin—in a narrow gap in the concrete.

Tricolored bats are among the smallest in North America and were once common in Georgia. But over the last decade, their numbers have fallen off a cliff. Across the animals' historic range, spanning most of the country east of the Rocky Mountains, many colonies have declined by 90% to 100%. That precipitous drop led the U.S. Fish and Wildlife Service to propose listing them under the Endangered Species Act last year.

Bats are under pressure on many fronts, with climate change, human development and wind energy contributing to the decline of many species. But Ferrall, a wildlife biologist with the Georgia Department of Natural Resources, is here looking for signs of the deadly disease that is the most significant threat to tricolored bats.

The culprit is a fungal plague known as white-nose syndrome. Named for the white fungus visible on the wings and muzzles of infected animals, it thrives in cold, damp environments—the same habitats preferred by hibernating bats.

As the animals slip into a winter slumber and their body temperatures drop, the fungus takes hold. The spores irritate the bats, causing them to wake up repeatedly and burn through fat stores they need to ration until warmer temperatures arrive. The result is dehydration, starvation and, in nine out 10 cases in species that are affected, death.

Experts say the quiet disappearance of tricolored bats, or Perimyotis subflavus, should be a grave concern for humans. A world without bats would be overrun by mosquitoes and other pests.

"Imagine if there was some sort of disease that affected people and 90% of us died from it," Ferrall said. "That's what's happening to these bats."

White-nose first appeared in New York in 2007 and has since spread to 40 states and eight Canadian provinces. The fungus arrived in Georgia in 2013 and began to rip through the state's caves, killing huge numbers of tricolored bats, the federally endangered northern long-eared bat (Myotis septentrionalis) and other species.

The disease has now been found in bats in 15 North Georgia counties. The presence of the fungus that causes white-nose has been detected in six others—plus two more that are presumed positive—though no cases of the disease have been confirmed in bats in those counties yet.

The drainage culvert the scientists visited in early December is significant. While white-nose had been detected in Georgia's caves for years, bats in this culvert tested positive for the fungus in 2022, marking the first time the disease had been found in a manmade structure used by hibernating bats. As human development claims more of their natural habitat, researchers say the animals are often making their homes in the built environment that replaces it.

The Atlanta Journal-Constitution is not revealing the location of the culvert, as curious visitors could inadvertently spread the fungus to new locations.

During their December survey, Ferrall and the other DNR experts examined a few of the bats for signs of fungal growth and used a handheld spring scale to weigh them. No animals showed signs of white-nose, but that doesn't mean the site is free of the disease. Ferrall said the fungus often doesn't show up until later in winter.

Many bats in the culvert were already tagged with tiny metal bands that

Georgia DNR uses to track and identify the animals over time. Ferrall said they will return to the site in early 2024, as part of a campaign to visit every cave and culvert in the state used by bats at least once every two years.

Surveys like this are critical to tracking the spread of the fungus. At the same time, efforts are ongoing to develop treatments for the disease in Georgia, and researchers are optimistic.

Since the mid-2010s, a coalition of scientists from Kennesaw State University (KSU), Georgia DNR, the U.S. Fish and Wildlife Service and other partners have tested treatment methods in an abandoned rail tunnel in Georgia's northeastern-most corner, Rabun County.

The site, known as the Black Diamond Tunnel, was home to more than 5,000 tricolored bats before white-nose arrived in 2014. In about three years, the colony had shrunk to only 152.

Each winter since 2016, the research team has returned to the site to treat the tunnel environment with airborne volatile organic compounds, or VOCs, that are known to inhibit fungal growth.

"Fumigation is a well-known approach to microbial control. We use it in agriculture all the time," said Chris Cornelison, an associate professor of applied microbiology at KSU, who has led the research. "So we're trying to take lessons from other fields and apply it here."

So far, the results have been promising.

Since the treatment of the site began, the bat population has grown to 272 by February 2021 and then 364 a year later, according to findings published in the scientific journal *PLOS ONE*. In the winter of 2022–2023, Cornelison said there were more than 550 bats present.

This winter is the first since 2016 that the team is not fumigating the site, but they are counting the bats to see whether the population continues on its upward trajectory—or backslides. A survey of the site in early January yielded more encouraging findings: Cornelison and his colleagues counted 720 bats, the most they've observed since their treatments began.

As they continue to gather more data, Cornelison said his team will be able to determine how much the chemical applications contributed to the bats' rebound.

Cornelison said it's widely thought that humans are responsible for bringing white-nose to North America. Now, he says, it's up to us to find a remedy.

"As a conservation biologist, I believe that when humans negatively impact a species, it's incumbent upon us to try to counterbalance that—to try to right the wrongs," he said.