Solving the mystery of the dying bats

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Deep in a cave in Mifflin County, Pa., surrounded by icicles and tilted slabs of rock, DeeAnn Reeder shone her headlamp on a tiny bat.

It was dead.

Cradling it in gloved hands, she stretched out its wings, fanned out its minuscule toes, and examined its snout.

"I've seen worse," Reeder whispered, "but, boy ... he's just covered in fungus."

The Bucknell biology professor studied the bat. She knew it was white-nose syndrome, first discovered three years ago in a cave near Albany, N.Y. Bats that should have been hibernating inside were dead on the ground outside.

Since then, a million bats have died in the Northeast. Some caves have had 99 percent mortality.

In a growing what-done-it mystery, white-nose spread last year to Pennsylvania and New Jersey.

The latest models predict the little brown bat, the most numerous in the nation, could be extinct in seven to 30 years.

"That's incredibly fast," said Greg Turner, the Pennsylvania Game Commission's endangered-mammal specialist. "Unprecedented is the

word."

"Humans have done a pretty good job of killing a lot of animals, like the buffalo," he said, "but nothing like this has ever been recorded. It's pretty bleak. That's the only way to say it."

The bat decline echoes that of the world's frogs. And colony collapse disorder among honeybees.

Some suggest links to pesticides or cascading effects of an altered environment.

White-nose isn't just about bats. It's also about bugs.

A lactating female can eat her body weight in insects in a single night. Scientists estimate the million bats lost so far would have eaten 694 tons of insects just last year.

Their diet includes crop pests and mosquitoes, which can spread West Nile disease and equine encephalitis.

Many of the bats so widespread in the summer here -- living in attics, barns and steeples -- winter in caves such as the one in Mifflin County, said Scott Bearer, a bat expert with the Nature Conservancy, which owns the cave.

"Bats have a real value in the environment. This is an ecological disaster," said Jeremy Coleman, the U.S. Fish and Wildlife Service's national white-nose syndrome coordinator. "If we lose them, I suspect that people will learn to appreciate them too late."

Earlier this month, the national nonprofit Center for Biological Diversity filed emergency petitions asking the U.S. government to close all federal

caves because humans entering them without disinfecting their gear possibly could spread the fungus. The center also asked that two of the less-common species affected be listed for protection under the Endangered Species Act.

Researchers still know little about white-nose.

It wasn't until April 2008 that David Blehert, a U.S. Geological Survey microbiologist, isolated the fungus as a hitherto unknown member of the Geomyces genus. He named it destructans -- for what it was doing to the bats.

They still don't know if the fungus itself is the killer. It could be a contributing factor or a symptom.

But Blehert said it caused severe skin lesions in bats -- an obvious liability.

Bats, like other hibernating mammals, often rouse during the winter. One theory is that they're rebooting their immune systems.

But white-nose bats are inexplicably rousing too often and for too long, depleting their fat reserves. Starving, they leave the cave to find food. But the insects they need aren't there in winter.

In Pennsylvania, more than 13 sites in six counties are infected with white-nose.

In New Jersey, white-nose was found last year in the state's three most populous sites -- all to the north -- and two other sites.

Mick Valent, principal zoologist with the state Department of Environmental Protection, suspects the number is higher.

Last year, large-scale bat deaths didn't occur until February. So officials in both states are bracing for more.

Turner and Bearer didn't want to add to the casualty list. But the researchers knew their very presence in the cave might cause harm by rousing the bats from hibernation.

So they decided to enter just once this year. "We'll get this one snapshot," Bearer said.

Aiming their headlamps, Turner and Bearer would spend the next few hours crawling and slithering through a mile of passages, counting every bat they saw.

Back toward the cave entrance, Reeder and two graduate students processed bats they had collected.

Researchers are frantically gathering blood and DNA samples, both for current studies and as a potential record of the fungus' spread.

The Smithsonian Institution is serving as a national archive of data and corpses.

In the cave, Reeder's students weighed each bat and measured its forearm to determine body mass index.

Sarah Brownlee put a female into a small brown bag and set it on a portable scale. It was 6.4 grams -- less than a quarter ounce.

Reeder flinched. "God, they're small."

Later, however, another female weighed 8.2 grams. "A nice fat girl," Reeder said. "That's what we like to see."

The students clipped hair between each bat's shoulder blades, then glued on a data-logger, smaller than a dime.

Programmed to record the bat's temperature every 10 minutes, they might show whether there was a pattern to arousal cycles.

Brownlee has set up motion-sensitive infrared cameras in caves to record what the bats do when they rouse. Are they grooming off the fungus, consuming even more energy?

Back at Bucknell, Laura Grieneisen of Carlisle will place the bats in a box with one end cooler than the other. She hopes to show which temperatures the white-nose bats prefer and whether that's different from healthy bats.

So far, no one has found a treatment, although they are investigating potential vaccines and a spray that contains an ingredient from a drug for athlete's foot. They plan to dose bats in Bucks County's Durham Mine with antifungal vapors.

Last fall, Congress approved $1.9 million for white-nose research. The U.S. Fish and Wildlife Service has dedicated funds along with states and private groups including Bat Conservation International and the National Speleological Society, a caving group.

It's not nearly enough, Reeder said. "We need money to do the assays. I need bodies out in the field."

It's a race against time. "I view this thing like a wildfire that's just blowing so hot and so fast across the country," she said. "We've got to figure out, do we do a firebreak?"

So far, white-nose has not spread west of the Allegheny Front -- a

continental divide roughly along the I-99 corridor in Western Pennsylvania.

If they find a treatment, they can target bat caves along this line -- or wherever else makes sense at the time.

The problem is, the bats go where they go, some migrating hundreds of miles.

One ray of hope has come with the recent discovery of the fungus in a cave in France. It lends credence to the hypothesis that bats in Europe, perhaps similarly decimated long ago, developed an immunity.

Turner and Bearer finally emerged from the cave, mud-covered and bruised from the jagged rocks and tight spaces.

Last year, there had been 4,100 bats. This year, just 750. About 82 percent had died.

"Unfortunately, that's good," Turner said. It wasn't 99 percent, as in other caves.

The researchers trooped wearily back to their cars, a quarter mile along a snowy slope above a frozen stream.

An hour later, in a basement lab posted "Bucknell bat cave," Reeder's students transferred the bats to cages.

Many were motionless, still in a torpor. Others crawled about groggily.

"OK, ladies," Brownlee said, carrying a cage toward a huge cooler, calibrated to mimic conditions in the cave.

Infected with fungus, the bats will likely die soon. But perhaps not before they help the researchers uncover more of their secrets.