

A person wearing a white Tyvek protective suit, a yellow helmet with a headlamp, and brown waders is working in a dark, rocky cave. They are reaching up towards a large, textured rock formation. The scene is dimly lit, with the primary light source being the headlamp.

A DEADLY

March 5, 2010
GREELY MINE
STOCKBRIDGE, VERMONT

Hip-deep in water, some twenty yards inside Greely Talc Mine, Scott Darling '79 and I take turns poking at the gravelly bottom with a snowshoe. Darling shines his light down into the murk. I swear, loudly, despite instructions to keep quiet. Neither of us can see where I fumbled my digital voice recorder that now rests, surely ruined, on the flooded floor of the cave.

"Maybe an alien anthropologist will find that thing in a million years and listen to it," Darling says with a gentle laugh. "Oh, white-nose syndrome, that's what killed the humans."

My embarrassment is swept away by a single resonant "ploop" that echoes through the mine. "My God, look at that," Darling says, turning his light toward the center of the inky chamber. Silver ripples slowly move over the surface of the water toward us. At the center of the concentric circles floats a small black mass. Something has fallen from the ceiling.

"I think it might be a bat that died," he says with amazement. "I have to check." He wades out into the middle of the pool, yellow helmet and white Tyvek suit shining faintly in the glow of his headlamp.

Darling was joking about the alien anthropologist of course. White-nose syndrome is killing bats not people.

Darling is an affable man, even jolly, with a wide-open smile and craggy good looks that seem rough-hewn from his decades of fieldwork as a biologist for the Vermont Department of Fish and Wildlife. I don't imagine he's regularly given

*As a strange syndrome devastates bat populations,
UVM alumni and faculty probe the darkness for answers*

MYSTERY

A person wearing a white Tyvek protective suit, an orange helmet with a headlamp, and brown waders is working in a dark cave. They are looking down at something in their hands. The background is dark and rocky.

to gallows humor. But three years of watching bats die by the thousands might leave anyone with a few dark jokes.

Since it first appeared in eastern New York in 2006, and Vermont soon after, this strange syndrome has killed almost all the bats in the caves where it has settled. It may be the most abrupt decline of wildlife in American history. More than a million hibernating bats have succumbed and it's sweeping with terrifying speed down the East Coast and toward bat strongholds in the Midwest.

Before white-nose hit, in the mine adjacent to where we stand, Darling and another biologist counted 1,080 bats. After white-nose, they found thirty-three. Here at Greely Mine Two, in 1997, a caver in a wetsuit plunged deep inside and counted two thousand bats. Last year, fewer than two hundred were detected in the main chamber. Today, Darling, his research technician Ryan Smith '02, and wildlife researcher Kristen Watrous G'05, have returned to see if there are any survivors: compared to zero, they're pleased to find 103 bats hanging silently from the gritty walls, alive.

But not the one that fell. Darling holds up a damp dead bat. It looks like a shiny rubber toy. "You can see all the bones. It's emaciated," Darling says, splaying out one wing. He examines it closely and points to a tiny creature crawling along the bat's flank. "That's a parasite, a nematode. I'm going to get this in a bag; we'll take it back to the lab." Then, like I'm not there, he sighs deeply and clucks. "It's sad," he says, "It's sad."

story and photographs by
JOSHUA BROWN



"Once the bats are gone, this won't be in the news anymore," says Ryan Smith, "but there will be long-term consequences to losing our top night-time predators." Previous page: Scott Darling and Ryan Smith in Greely Mine. This page: Scott Darling in Greely Mine.

Cavers at Howe Cavern, west of Albany, New York, were the first to observe white-nose syndrome in February 2006. Like odd chocolates dipped in confectioner's sugar, the bats had a downy white powder around their muzzles and on their wings. Last spring, DNA experts determined that the powder is actually a cold-loving fungus new to science. They promptly named it *Geomyces destructans*. It's clearly implicated in the bat deaths, but whether the fungus is the fundamental cause or merely symptomatic of a deeper, yet-to-be-discovered problem remains unknown.

"Much about white-nose syndrome is a mystery," says Bill Kilpatrick, the Howard Professor of Zoology and Natural History at UVM. He's studied bats for many years and

has been collaborating with Darling on his field studies. "My guess is that the fungus is just the symptom, that there is something else that stresses these bats, that's suppressing their immune system making them vulnerable," he says. But so far no other culprit—bacteria, toxin, virus—has been identified.

Bats afflicted with the syndrome are driven to starvation. Unlike healthy bats that must arouse themselves just a few times each winter, the white-nose bats wake frequently, and often fly out of their caves in mid-winter to look for food. They may be waking in an effort to jump-start their immune systems. Some researchers think that the fungus, which penetrates into their hair follicles and wing membranes, makes bats itch like mad.

Outside, on a January afternoon, there are no insects

to eat of course, so the bats burn their fat reserves and die. At dozens of caves in New England and down the spine of the Appalachians, scientists find bats floundering around in full daylight, trying to drink snow. Inside, rotting social groups still cling to the walls covered with stringy fungus, and emulsified tiny bodies pile high on the floor.

To try to unravel the cause of the carnage, Darling, with a team from the states of Vermont and New York, the US Fish and Wildlife Service, UVM, and others, launched several research projects at Greely Mine. "We've been at the forefront of a national effort to understand white-nose syndrome," Darling says, "because Vermont has been at the epicenter of this problem." In one experiment, the biologists glued data loggers to some bats that measured their fluctuating temperatures, documenting the strange pattern of frequent arousal wrought by the syndrome. In another, Darling and his colleagues traveled to Wisconsin and brought thirty-nine uninfected bats back to Greely. These were sealed in a gated section of the mine to see if "clean" bats could catch the fungus directly from the soil in a cave that had previously held infected bats. "It appears they did," Darling says.

April 13, 2010 MOUNT AEOLUS CAVE EAST DORSET, VERMONT

Under the dark lip of the entrance to Aeolus Cave, high above the twilight Valley of Vermont, Keagan Harsha, a reporter from WCAX-TV, films his report on white-nose syndrome for the evening news. The bright camera light clicks on and I can hear a fragment of his script: "... the largest hibernacula in all of New England..."

"Let's just call it a bat cave," suggests his cameraman. They start take two.

Outside the camera glare, Scott Darling, Ryan Smith, and David McDevitt from the Vermont chapter of the Nature Conservancy that owns this cave, inspect a bat they have caught in a harp trap.

It's feisty and chittering angrily. "That's what we like to hear," says Darling, smiling as the bat bares its comically small teeth. "Looks real healthy," says Smith. They inspect for fungus and wing damage—"zero," says Smith—and place a tiny metal band on its wing. Then they let it go.

They've been here for more than an hour to inspect bats emerging from the depths on their way to summer maternity roosts. Though some of the bats they have caught look in good shape, they have only caught a few. Two years ago, even after white-nose, they caught 214 bats in the same survey.

Soon after the fungus was detected at Aeolus in 2008, Darling and Smith went inside to count bats. They had to cut the survey short. "There were twenty thousand dead on the floor," Smith says. "It was hard to climb around." Tonight, we won't be going in either. Outside, bat bones, like wispy twigs, line the crevices in the rocks.

Bats have been hibernating in Aeolus Cave for ten thousand years, since the end of the last ice age. A mighty portion of Vermont's bats lived here, around three hundred thousand. Now, Darling guesses, only hundreds remain.

It's soot-black around the gated cave entrance, the ground steep and crumbly underfoot. But in the spring night air, Aeolus seems less like a gloomy opening into a hellish underworld and more like the outlet from a once-fertile other world, a dark peaceable kingdom that sent forth bats to aid our sunlit agriculture and devour picnic pests.

"Any farmer will tell you how extremely important

they are because they eat crop pests," said Vermont Senator Patrick Leahy in a recent congressional hearing. Some bat species eat two-thirds their body weight in insects each night. That adds up to trillions of insects, which, uneaten, will be busy.

But Kilpatrick cautions against putting much stock in bats as mosquito control. "We like to tell you that they feed on mosquitoes because then you want bats around," he said in a lecture this winter. "They really don't. They don't eat many mosquitoes; they feed on moths and beetles and other insects." Fearing agricultural losses and ecosystem damage that could reach "into the hundreds of millions of dollars," Leahy has pushed the Department of the Interior to increase research funding for white-nose to nearly two million dollars this year. But for now, scientists, like bats, are in the dark about what's going to happen or what to do.

All six of Vermont's cave-dwelling bat species have been attacked by white-nose, including the endangered Indiana bat and the once-predominate little brown bat. (The state's three migratory bat species, happily, seem unaffected.) If the spread of white-nose continues, the U.S. Geological Survey projects that twenty-five species of hibernating bats in the United States could be in deep trouble, with several headed for extinction. "It's highly possible that the little brown bat, the northern long-eared, and the tricolored will be extirpated from Vermont," says Smith, "in the very near future."

Perhaps heated boxes in caves will help aroused bats stay alive. Perhaps fungicides will be able to knock back white-nose. Some researchers are exploring bacteria that

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Outside of Mount Aeolus Cave, Scott Darling and Ryan Smith examine the wing of a little brown bat, looking for damage from fungus. Tagged with a metal band, the healthy bat is set free. Wing bands give biologists clues about where bats travel—and if they are surviving.

ONLINE
EXTRA

alumni.uvm.edu/vq for a
slide show of bat research

could live on the bats' skin and protect them. There may be hope in the recent discovery of bats in Europe that carry the fungus but appear to be healthy. And not every North American bat with white-nose has died. Perhaps a remnant will be resistant and recover. "But right now this thing is just burning out of control," says Darling, "and it's hard to get the public interested in bats."

To some people, bats occupy the same creepy spot in the brain reserved for cockroaches and rats. But bats are no flying rats; they're not even closely related to mice. Recent evidence shows that they may be more closely related to primates—to us—than to rodents. Bats defy their small size, living for fifteen or more years; the record is forty-three. The only mammals to have achieved powered flight, bats reign as top predators in the nighttime air, echolocating with exquisite precision to distinguish tasty moths from nasty ones.

Darling and other biologists think bats may be spreading the fungus to each other as they mingle at roosts during the summer and fall. But where did it begin? Was it carried by European visitors to tourist-happy Howe Cavern? Did the pathogen arrive on the "dirty equipment of spelunkers who traveled from cave to cave, proud to look like West Virginia miners?" asks UVM conservation biologist Joe Roman in his forthcoming book on extinction. He's convinced that the white-nose syndrome is not, ultimately, natural. "When you look deeply at many of these biodiversity issues," Roman told me, "you often find a human handprint."

The recent discovery of white-nose in Missouri, hundreds of miles farther west than it had previously been detected, gives some credence to that idea. Perhaps boots carry the fungus as far and fast as cavers can drive. It is no surprise that national park managers and wildlife agencies in several states have closed some caves

where bats still live uninfected.

Nine o'clock arrives at Aeolus Cave. The TV crew is gone. The survey is over and the men begin to take apart the trap's central panel of fishing line. Darling seems almost upbeat about the evening's survey results. On the steep hike in, he said he wasn't sure if there were any bats left here. But the final tally shows twenty-five caught and only seven bats had visible fungus. "That's not too bad, guys. I'm feeling okay," Darling says as they zip the trap into a bag, "It's not two hundred, but it's not too bad."

And for bats across the country, that may be all that can be hoped for: that it's not too bad. "We may have one percent to five percent resistance, if we're lucky. That's the best-case scenario," says Darling. But bats have only one pup each year, so "it could take generations," he says, "for these populations to rebound to the levels we have seen in our lifetimes."

Or they might not. More than a third of the world's amphibians stand on the cliff of extinction, pushed by numerous assailants including climate change, pesticides, and an invading chytrid fungus. Bees are mysteriously expiring. Biologists now speak freely of our time as the Sixth Great Extinction in Earth's long history. Some forecast that half of all species will blink out by century's end. "It's not just bats," Darling says, "how many red flags do we need to see that ecosystems are falling apart?"

Maybe Darling's alien anthropologist is not so far-out. Although the press releases coming out from each new state hit by white-nose are quick to assure the public that "white nose is not harmful to humans," they may assume a lonely and near-sighted definition of harm. "White-nose is part of this whole poisoning of our planet," says Bill Kilpatrick, "this is the dead canary in the mine." Except it's a bat. **VQ**

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