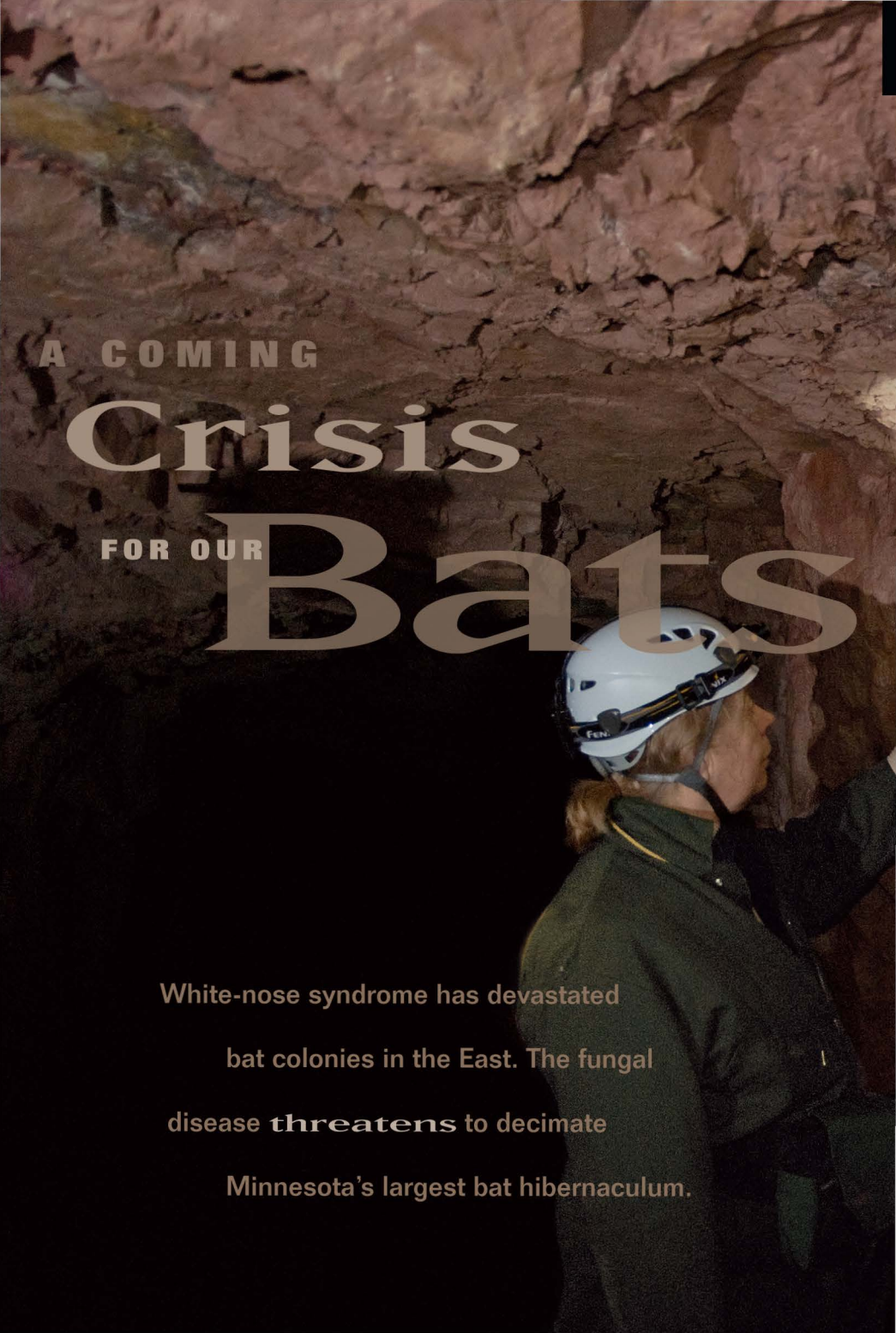


A person wearing a white helmet and a dark jacket is seen from the side, looking into a dark cave. The cave walls are made of reddish-brown rock. In the upper left, several small white bats are visible against the rock face. The overall lighting is dim, with a spotlight effect on the person's helmet.

A COMING

Crisis

FOR OUR

Bats

White-nose syndrome has devastated
bat colonies in the East. The fungal
disease **threatens** to decimate
Minnesota's largest bat hibernaculum.

DNR mammalogist Gerda Nordquist examines bats clinging to a wall of the Soudan mine near Tower. The old mine is an important hibernaculum for three species of Minnesota bats and a potential spot for white-nose syndrome to gain a foothold in the state.



By John Myers

Photography by Deborah Rose, DNR

In a dark alcove off the main tunnel, where the only light came from our hard-hat headlamps, we found him hanging upside down.

He would be banded No. 1084, a little brown myotis that spent winter 2,341 feet below the surface of the Vermilion Iron Range, on Level 27 of Soudan Underground Mine, the lowest level in Minnesota's deepest state park.

The bat was sound asleep with a dozen or so of his bat buddies when James Pointer, park interpretive supervisor, gently plucked him from his perch and passed him to Gerda Nordquist.

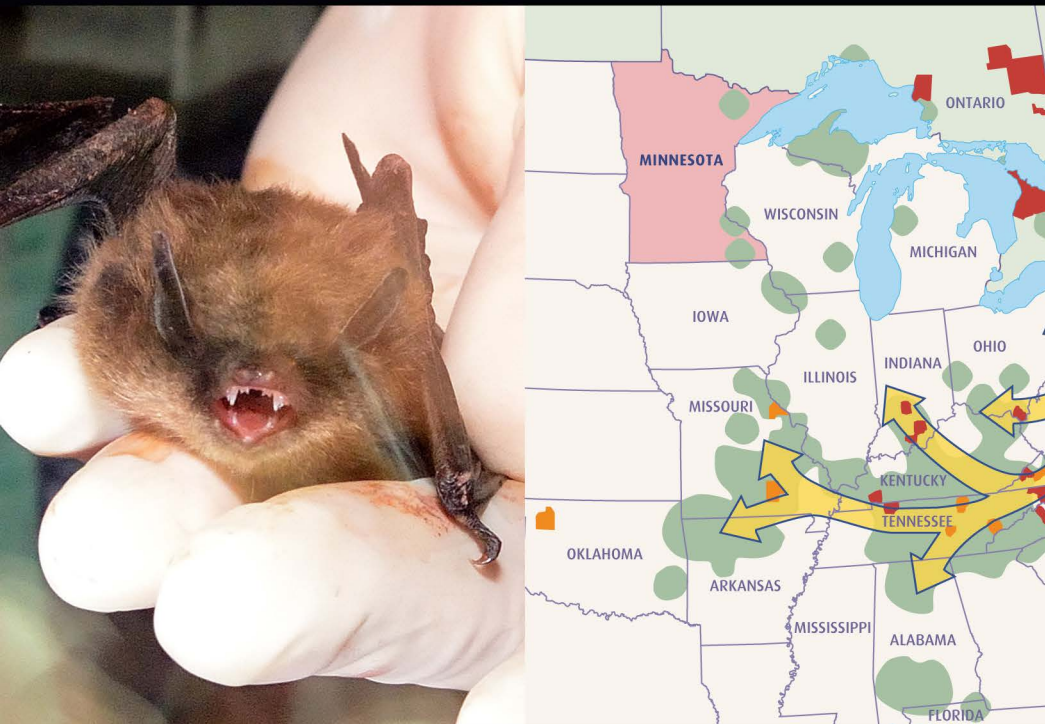
"This one looks just fine. No scarring, no white stuff," said Nordquist, a Department of Natural Resources mammalogist and the agency's bat expert.

Had there been scarring on its wings or a fuzzy white growth on the bat's muzzle, Nordquist might have suspected white-nose syndrome. This disease, caused by the fungus *Geomyces destructans*, has killed more than 1 million bats in eastern states in just the past five years.





Nordquist and DNR biologist Kelly Pharis examine the wings of a hibernating little brown myotis for signs of white-nose syndrome. The fungal disease attacks the wings of bats and leaves scars as it destroys live cells—disrupting the vital role wings play in bat health.



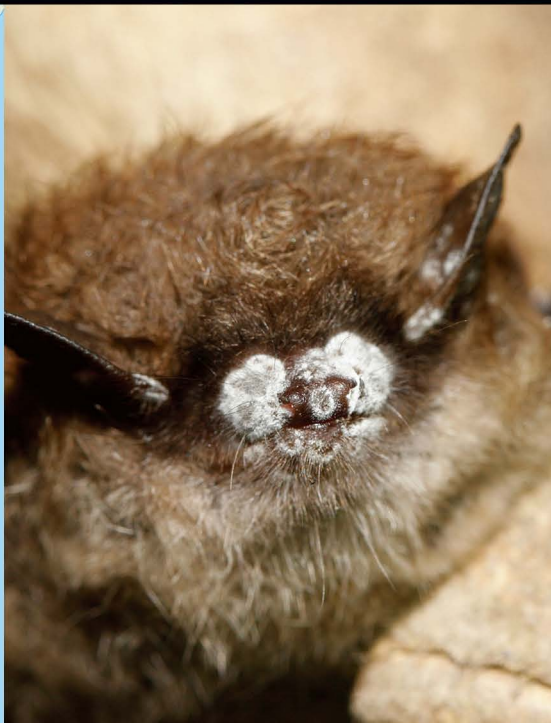
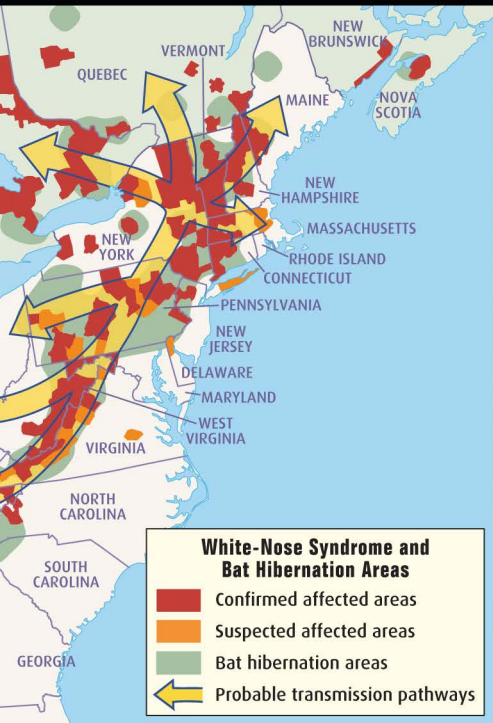
The U.S. Fish and Wildlife Service calls WNS “the worst wildlife health crisis in memory.” WNS has killed more than 90 percent of bats in colonies where it has struck. This past year the fungus reached four more states and two Canadian provinces. Since discovery in a cave near Albany, N.Y., in 2006, the fungus has spread to 19 states and four Canadian provinces. Nothing has been

found to stop it, and scientists aren’t fully sure how WNS works or where it came from.

“When you start doing bat research, you find out there are more questions than answers,” Pointer said.

Bats that hibernate are the ones most affected by WNS. These bats are considered a critical element in Minnesota’s ecosystems, eating vast amounts of insects that not only

The muzzle of a healthy little brown myotis (left) from the Soudan mine is examined for fuzzy white growth (right), which indicates white-nose syndrome on this East Coast bat. The map illustrates the rapid spread of the disease as of May 25, 2011. The disease was first observed on the East Coast in 2006.



bug people and spread disease but also damage agricultural crops and forests. Each little brown myotis can eat its weight in mosquitoes in one night. It's not yet clear what losing an entire species of bat might mean.

But bat No. 1084 and his bat neighbors in the Soudan mine appeared to be fine during the annual bat survey conducted in March. Surveys of caves and mines in

Minnesota this past winter and spring found no evidence of WNS.

"This might be the last year we have for a base count before we start seeing it," said Nordquist, who has been counting bats in this mine since 1984.

Mega Hibernaculum. No. 1084 made irritated clicking sounds as Nordquist weighed



MARVIN MORIARTY/USEFWS

What You Can Do

- Report dead bats. Report bats flying during the day, clinging to trees or building exteriors in winter when snow is still on the ground, or showing white fungus on muzzles or wings. Do not handle bats. Call the DNR toll-free Animal Report Line at 888-345-1730 or go to www.mndnr.gov/reportbats.
- Do not enter Minnesota caves or mines if you have been in caves in states where WNS is known to occur.
- Observe all cave closures. If you enter an open cave, thoroughly decontaminate all footwear, clothing, and gear upon leaving. See www.fws.gov/whitenosesyndrome/cavers.html and click on *decontamination protocols*.
- Learn more at www.caves.org/WNS/ or www.batcon.org.

A hibernating bat infected with white-nose syndrome clings to a wall inside Vermont's Greeley Mine.

him (7 grams, or $\frac{1}{3}$ of an ounce) and spread his wings as DNR animal survey specialist Kelly Pharis snapped digital photos.

"He's not happy," Nordquist said. No. 1084 was still clicking when Pointer returned him to the mine wall.

We made our way down a tunnel, over mining debris—pieces of lumber, rails for ore cars, and chunks of ore. Here miners once blasted, picked, and shoveled the iron ore that made the steel to build the nation's bridges and skyscrapers, as well as ships and tanks and guns for two world wars. The mine operated from 1882 to 1962.

Rust-tinted groundwater oozed from the iron formations in some places. In far corners there were giant chunks of banded jasper rock with stripes of white, black, gray, and red, which seemed to glow in the light of our headlamps. And bats in groups of two and 10 and 20 hung along the way. Nordquist

kept track of each bat with her hand counter.

Bats come here by the thousands in late summer and stay for the winter. Level 27 is a perfect place for bats to spend winter—dark and quiet with a stable temperature around 50 degrees, even when outside temperatures drop to 30 below zero.

The mine is home to the largest known wintering concentration, or hibernaculum, of bats in Minnesota. An estimated 10,000 to 15,000 bats hang along 52 miles of horizontal tunnels and vertical shafts. "It could easily be twice that many, we just don't know," Nordquist noted. Less than half the mine has been surveyed for bats because many of the tunnels are inaccessible to people.

Summer Show. In late summer, thousands of bats make nightly trips out of the mine to gorge on the last insects of the season.

They also gather at this time to mate and introduce young-of-the year to their winter home. The park has programs for the public to watch this bat-swarmling phenomenon. Dozens of people come for the show as twilight fades to dark.

While the visitors wait for the bats, Pointer tells bat stories, mixed with some bat biology. Then the exodus starts as a trickle, like the first kernels in a popcorn popper. It builds to a whirling, swirling frenzy as bats emerge from an old, unused shaft and go forth to devour mosquitoes, moths, and other flying insects. The nightly show outside the mine slows by late September as insect numbers wane. As winter's first snow falls, the bats are in the mine to stay.

By April, bats begin venturing out in search of bugs. Some stay in the area, and a few probably use the mine for a daytime roost all year, Pointer said. But many bats disperse to find fertile grounds for summer feeding. One bat banded in the mine found its way to Park Rapids, 150 miles away.

Bats can live for 30 years or more, and some come back to the mine year after year.

"We've found some of them on the same levels, in just about the same spot, years after they were first banded," Nordquist said. "It may be a familial thing," with generations of bats hibernating with their mothers.

The mine's bat population appears to be stable, according to 27 years of surveys. And bats are doing well in other hibernacula in the state, including at Forestville/Mystery Cave and Banning state parks.

"Minnesota bats appear healthy," said Nordquist, who's been studying bats and exploring caves in Minnesota for more than 30 years. "They're doing pretty well."

Wing Damage. Because female bats usually have only one pup each year, Nordquist noted, the bat population would take years to recover from any major loss like the kind eastern states are seeing from WNS—if it could recover at all.

All of the bats affected by WNS in other states have been insect eaters that hibernate. All four of the bat species that hibernate in Minnesota—little brown myotis, northern myotis, tricolored bat, and big brown bat—have been affected by WNS in the East, although big browns to a lesser extent. Little browns, Minnesota's most common bat, are the hardest hit, suffering 99 to 100 percent mortality where WNS strikes.

Migrating bats—such as Minnesota's hoary, red, and silver-haired bats—haven't been shown to be affected. Scientists say that's probably because they don't spend much time in caves and mines where the fungus thrives in cool, damp conditions.

Scientists are narrowing in on how the disease kills bats, said Paul Cryan, a research biologist with the U.S. Geological Survey in Fort Collins, Colo., and one of the nation's leading experts on WNS. Most of the infected bats appear to lose weight and become disoriented, flying during daylight hours and in winter when they should be hibernating. Scientists think that even before the telltale white fungus appears on the bat's muzzle, the disease has been destroying live cells, especially damaging bat wings.

"We have evidence that the skin infection caused by the fungus is sometimes so bad that it has the potential to kill bats by disrupting important roles that the wings play in maintaining bat health," Cryan said. "The fungus gets deep into wing skin and destroys and replaces blood vessels, nerves,

Soudan Underground Mine State Park interpretive supervisor James Pointer records the location and number of hibernating bats on a map of one of the mine's tunnels. This work is part of an annual bat count at the mine and other hibernacula, such as Forestville/Mystery Cave State Park.







Vermont's Aeolus Cave, once an important hibernaculum, is littered with bat remains, following an outbreak of white-nose fungus that began sometime in 2008.

glands, and all kinds of other things.”

Some bats die directly from the infection, Cryan said. But WNS also causes bats to wake up from hibernation, possibly because they are dehydrating as their wings deteriorate. The search for water depletes their fat reserves so the bats, with no insects available in winter, die of starvation.

Cave of Bones. Ann Froschauer, U.S. Fish and Wildlife Service national communications leader on white-nose syndrome, wasn't sure what to expect on her first visit to an infected area at Vermont's Aeolus Cave. “When we got inside, the first thing my brain told me was pine needles. It looked like a carpet of pine needles,” she said. “But it was a carpet of bat bones. The cave was full of dead bats in various levels of decays.”

Before WNS hit, Aeolus Cave had as many as 400,000 little brown myotis in win-

ter. During Froschauer's visit in October, researchers counted 36. “When I got home from that trip, even though we had done a field decontamination of our clothes and boots and gear, I still noticed tiny little bat bones stuck in the treads of my boots,” she said. “That's when I lost it. I sat in the basement of my house and cried.”

Winifred Frick, a University of California Santa Cruz environmental researcher and national bat expert, concluded that, given the current rate of spread, little brown myotis will be regionally extinct in the northeastern United States in 16 to 20 years.

“It's difficult to explain this kind of loss, not just in sheer numbers but in biodiversity of mammals,” Froschauer said. “We may lose entire species in a very short time.”

Scientists believe these highly social animals spread the disease among themselves. But they also believe that the fungus could

be spread by people who visit infected caves and unknowingly carry the fungus to new areas on shoes, clothing, or gear. Tests show microscopic WNS fungus spores remain on clothing, shoes, and equipment when people leave infected areas. The spores in the cave remain deadly long after bats are gone, snuffing hopes of recolonization or reintroduction.

The fungus, never before seen in North America, is genetically identical to a fungus found growing on the muzzles of bats in Europe. Although these European bats have developed the same white fungus, they aren't dropping dead from it.

Glimmers of Hope. If there is any hope, experts say, it's that not all bats in WNS infected areas have perished. Big brown bats appear more resistant than little browns. A few remnant populations of bats from affected species like little browns remain in some infected areas. No one is sure how they have hung on.

The U.S. Fish and Wildlife Service and dozens of federal, state, tribal, and non-profit agencies, including the Minnesota DNR, participated in the development of a national WNS battle plan. More than \$1.6 million in federal grants have been awarded over the past year to researchers to study the problem and to get the word out on the disease and how to avoid spreading it. Still, some environmental groups such as the Center for Biological Diversity say the federal effort has been too small and too slow.

Several state and federal resource agencies have closed old mines and caves on public lands to reduce the chances that WNS will move in. That move has disappointed cave

explorers as well as local business owners who worry that tourism might suffer. The cave at Banning State Park has been closed for years to protect hibernating bats and will remain so now that WNS threatens bat survival. Mystery Cave, which has about 18,000 visitors annually, remains open. The DNR expects state park visitors will heed warnings not to enter if they have recently been in caves in WNS-confirmed states.

Because of a fire in the main elevator shaft in March, the mine at Soudan Underground Mine State Park is currently closed. Park interpretive supervisor James Pointer said bats were seen flying in various areas after the fire. A detailed survey of the bat population won't be possible until next winter when bats return to the mine to hibernate.

If the disease is found in Minnesota, the DNR might have to reconsider closing its bat hibernacula to visitors, Nordquist said—if for no other reason than to keep from spreading WNS to unaffected sites in western states.

In the meantime, DNR staff are developing a state WNS response plan and have listed the WNS fungus as a harmful invasive species. They're in the process of listing the little brown myotis and the big brown bat as state species of concern, along with the northern myotis and the tricolored bat. And they are getting the word out about this disease and what to do if you encounter a suspicious-looking bat.

"We don't know yet if some bats will develop a resistance, or if it just might miss a few isolated populations, or if we can find something to slow it down," Nordquist said. "If not, white-nose syndrome could be the end of many of our bats." 