Bats in Crisis

(Photo courtesy Greg Turner, Pennsylvania Game Commission.)

It's been compared to the Black Plague for cave-dwelling bats. Scientists fear a newly identified species of fungus could drive some bat species to extinction.

Story By Joe McFarland

Dead bats with patches of white fungi were first noticed in a New York cave in 2006. Since then, White Nose Syndrome has been identified in scores of northeast caves and mines.

Like any secluded hangout, they can be both safe and dangerous at the same time. For millions of hibernating bats across eastern North America, their winter retreat into caves—including hundreds of abandoned mines humans have created—always represented a safe choice for winter survival.

Yet many of America's caves aren't the safe hangouts they used to be, and scientists around the country are now racing to figure out why hundreds of thousands of cave-dwelling bats are suddenly dying—with their noses often covered in a white fungus—during their winter hibernation. So far, these massive die-offs have been documented only in the northeastern United States. Yet the phenomenon is so new, scientists are still at a loss to understand exactly why the white-nose "plague" is having such a toxic effect.

It began in February 2006 when a cave explorer shining a light in a cave 40 miles west of Albany, New York noticed a number of bats with a white fungus covering parts or all of their body. Researchers launched an investigation to study hibernating bats in the winter of 2006-07 and soon discovered a grisly wasteland in virtually all of the caves they visited. In caves from Vermont to Virginia, hundreds of thousands of bats were dead. In some caves, mortality was above 90 percent, and included at least four cave-dwelling bat species.

Researchers were stunned, not only by the extent of the previously undocumented phenomenon, but by the lack of clear evidence proving what caused so many bats to suddenly die.

One obvious suspect: a newly identified species of fungus named *Geomyces destructans* was suspected to be the direct culprit. Or maybe not—researchers understood the cold-loving fungus that thrives in caves could simply be a post-mortem opportunist, feeding on the bat carcasses after the bats died from some unrelated cause.

"It's still not clear precisely what role the fungus plays in the death of bats,"

explained Tim Carter, a bat researcher at Ball State University. "There are several different schools of thought, one being that a fungal infection causes bats to emerge from hibernation early and leave the cave in search of food during cold weather, then die.

"Another (hypothesis) is that the fungus is interfering with the ability of the bats to digest food," he said. Dead, emaciated bats have been found with plenty of food in their digestive tract, but seemed to lack the ability to draw nourishment from the food.

Even if proper digestion of food were possible, bats that break their dormant state in midwinter have almost no opportunities to grab a meal. Mosquitoes and other insects that constitute the bulk of a bat's diet aren't available in the winter, meaning bats that leave their caves (called hibernacula where bats congregate) early in search of food can starve to death—or die from exposure.

Although the fungus and the bat mortality events have not been documented in Illinois or other Midwestern states, scientists have no reason to believe the mass epidemic won't spread.

"Joe Kath, Illinois DNR endangered species manager, states that this could be the equivalent of the Black Plague for bats," Carter continued. "We're talking about mass extinction of an entire (group) of animals."

Such a scenario poses a catastrophic risk to our environment. Despite centuries of superstition and fear relating to bats, the sudden disappearance of these mostly nocturnal predators of insects would have a dramatic, negative impact on the balance of nature. Not only does a bat typically snare enough mosquitoes each night to match their body weight, bats devour millions of moths and insects each year, and many of those insects and their larvae pose major crop risks.

(Photo courtesy Ryan von Linden, New York Department of Environmental Conservation.)

(Photo courtesy Al Hicks, New York Department of Environmental Conservation.)

Mycologists recently identified the fungus associated with WNS as a previously unknown species of soil fungus now called *Geomyces destructans*.

(Photo courtesy Greg Turner, Pennsylvania Game Commission.)

Researchers documenting dead bats in caves have found several different species afflicted by WNS.

Unfortunately, scientists racing to identify the bat plague are hindered by limited evidence. The fungus associated with White Nose Syndrome wasn't even known to exist until recently—it was officially described as a new species of fungus just this spring. University of Wisconsin-LaCrosse mycologist Tom Volk, who helped report the new species in the scientific journal *Mycotaxon*, describes the fungus as belonging to a group of "imperfect" soil fungi that, unfortunately, are perfectly adapted to caves.

"Species of *Geomyces* are known from soil worldwide, often from colder regions," Volk reported. On his Web site (botit.botany.wisc.edu/toms_fungi/may2009.html) he explained, "The fungus appears to be easily spread in the hibernacula because the bats congregate together as they roost in the caves. This would allow for quick spread of the fungus as the bats hibernate."

Volk further explained that all bats found dead in the various caves, even bats that didn't actually have white noses, tested positive for the fungus. And while the new species is related to known *Geomyces* species, the research required to understand this previously undocumented species of life—especially one that appears to be highly toxic to bats, represents an urgent scientific obligation in the race to halt the spread of WNS.

At this time, the precise cause of bat deaths remains unknown. Despite the obvious association of *Geomyces destructans* with dead bats, so far the proof that the fungus is killing bats has not been found.

If *Geomyces destructans* is a newly evolved species—and is proven to be killing bats directly—scientists will examine the biological adaptation the fungus uses to kill bats. If the fungus has simply existed in caves all along, scientists will focus their efforts on understanding what yet-to-be-understood events changed its impact in bat caves.

The U.S. Fish and Wildlife Service this year allocated $800,000 to fund research relating to WNS. If the mystery is not solved, millions of bats might vanish from North America within just a few years.

For more information about WNS, including a current map of the known distribution in North America, visit fws.gov/northeast/white_nose.html.