



White-Nose Syndrome

A Deadly Enigma

By Craig W. Stihler



West Virginia has more than 4,000 caves, many of which are home to bats that hibernate in them during the winter when insects, their sole food item, are not available. During hibernation, a bat's body temperature drops and metabolism is greatly slowed. This allows bats to survive for months living off of the fat they accumulated in late summer and fall. The best hibernation caves provide optimal temperature and humidity conditions and give the bats a place to hibernate undisturbed during the winter. Where conditions are ideal, bats may congregate by the thousands to wait out the winter. Since the early 1980s, West Virginia DNR Wildlife Resources Section biologists have worked with landowners to protect important bat hibernacula and to monitor bat populations. At some sites, gates or fences have been constructed to reduce human traffic into caves when the bats are present. As a result of these efforts, bat populations have increased. For example, the number of endangered Indiana bats hibernating in Hellhole Cave in Pendleton County increased from 3,330 bats in 1986 to more than 18,000 individuals in 2010.

In 2007, while biologists in West Virginia were documenting increases in bat numbers hibernating in caves, biologists in New York were noting hibernating bats with fungus growing on their muzzles. At first this was no more than a curiosity, but soon it became obvious that something was very wrong. Thousands of dead bats were found at some hibernation sites, and bats were seen flying out of caves in mid-day in the middle of winter. Whatever was killing the bats seemed to be associated with the fungus, and it was spreading. By early 2008, White-Nose Syndrome (WNS), as the condition came to be known, had spread to Connecticut, Massachusetts and Vermont. By early 2009, it had arrived in West Virginia.

During winter bat surveys conducted in January and February 2009, bats affected by WNS were observed in four caves in Pendleton County. Biologists found dead bats at one of the four sites. Surveys in surrounding counties did not find any sign of the disease. Surveys conducted



Yvonne Dromms

Above, dead bats litter the entrance room of Hellhole Cave in Pendleton County. Hundreds of dead bats were found during a 2010 survey. In background, the entrance to Hellhole.

Opposite page, little brown bats hibernating in Big Springs Cave in Tucker County show the tell-tale signs of White-Nose Syndrome. At bottom left, the WNS fungus covers the muzzle of a tri-colored bat. At bottom right, a little brown bat with the WNS fungus on its nose.

in early 2010, however, detected WNS in caves in Greenbrier, Mercer, Monroe and Pocahontas counties. In Pendleton County, the disease was affecting bats in Hellhole, the state's most significant bat hibernaculum. A bat found on a building in Jefferson County also tested positive for WNS that year. By early 2012, WNS had spread throughout the eastern portion of the state where most of the state's caves are found, and it had also been found in bats hibernating in abandoned mines in Fayette County.

Soon after WNS was discovered, scientists initiated several studies to look at the underlying cause of the condition and just how bats are affected. Although the fungus was always associated with the condition, no one knew if the fungus caused WNS or if it was a secondary infection of bats stressed by something else. Research has since shown that the fungus, a newly described species known as *Geomyces destructans*, is the sole cause of WNS. Healthy bats exposed to the fungus develop the disease in the laboratory. Although the condition is known as White-Nose Syndrome, the fungus is often found on the wings, ears, feet and tail as well as the muzzle. Unlike most fungi, this fungus grows well at cold temperatures and thrives in cold, moist cave conditions. The fungus does not grow at warm temperatures, and therefore does not affect active bats or humans. Bats that do not hibernate, like the migratory hoary bat, the state's largest bat, appear to be unaffected.

In a study conducted in several states, including West Virginia, the activity patterns of hibernating bats with and without WNS were examined. Bats normally arouse periodically from hibernation. These arousals



Photo by Jeff Hajenga

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allow them to find water to drink, excrete wastes, and “jump start” their immune systems. However, bats with WNS arouse more frequently than healthy bats, leading to early depletion of their fat reserves. As the fungus grows, it invades the skin. Of particular importance is damage done to the wing membranes. A bat's wings have functions other than flight. For example, they play an important role in maintaining water balance. Bats affected by the fungus are often so dehydrated that their wing membranes are no longer pliable. Although the exact mechanism by which WNS kills its victims is not understood, it is clear that mortality rates can be high.

In West Virginia, populations of two of the state's most common bats, the little brown bat and the tricolored bat (formerly called eastern pipistrelle), declined 93 percent at caves where WNS had been present for two years. Mortality in northern long-eared bats has been quite high in the Northeast. In West Virginia, the initial number of northern long-eared bats at the sites that were examined was low, but none remained after two years. The decline in other species has not been as severe, but certainly higher than populations can



Virginia big-eared bats do not appear to be affected by WNS, although this species hibernates in caves where the fungus has impacted other bats.

Photo by Craig W. Stihler

sustain. One surprise is the Virginia big-eared bat, a very rare species with most of the world's population occurring in West Virginia. Although this species hibernates in caves where WNS has impacted other bats, Virginia big-eared bats do not appear to be affected, and their numbers have actually increased since the fungus was found in West Virginia in 2009.

The long-range effects of WNS are not known, but it is apparent that a great number of bats will be lost. In January 2012, the U.S. Fish and Wildlife Service estimated that more than 5.7 million bats had already died. Some species may become extinct if populations fall to levels which are no longer viable. However, a glimmer of hope exists. The fungus that causes WNS has been found in European caves, and although some bats are affected, the large-scale mortality events seen in North America have not occurred. This may indicate that some bats are able to survive WNS and may pass this quality to their offspring. A small number of bats still live in the original WNS sites in New York, and the fungal infection appears to be less severe now at these sites than during the original outbreak. If there are survivors, biologists hope that populations may be able to recover, although this will take time. Most bats give birth to only one young each year, so populations do not rebound quickly.

To minimize stress to the bats that still remain in West Virginia caves, DNR personnel encourage cavers to avoid going into caves where bats hibernate when

the bats are present — generally September through mid-May. Cavers should also clean and decontaminate all gear between caving trips following the U.S. Fish and Wildlife Service protocol (<http://www.whitenosesyndrome.org/resources/cavers>). In addition, they should never take gear that has been in a cave in a WNS area into caves in areas where WNS has not been found. Given how important surviving bats may be to the recovery of these species, efforts should be made to reduce stress outside of the hibernation period as well.

Putting up a bat house will provide bats with a summer roost where they are welcome. If you have a colony of bats in a building, consider letting them stay there if they are not causing any problems. If you need to exclude a colony from a building, this work should be done before the colony returns in the spring. Fall and winter are the best times to do this work. Again, consider putting up a bat house as an alternate roost so they remain in the area and provide “bug control” services. Information on bat houses and excluding bats from buildings can be found at www.batcon.org.

White-Nose Syndrome is an unprecedented wildlife crisis. Huge numbers of bats are dying and multiple species are affected. Only time will tell how bat populations in West Virginia will change as a result of WNS. Some species may be lost. Other species that were abundant before WNS may survive in low numbers. Species not affected may become more abundant because of the lack of competition. DNR and its partners will monitor bat populations across the state to see how this disease affects the various species and to see if vital information can be gained from bats that contract the disease but don't die. Wildlife Resources Section personnel will assist with research in hopes of finding a way to fight WNS and aid bat populations in recovering.

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