



Natural Heritage

White-nose Syndrome in Bats

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Taken in February of 2006, a photograph of hibernating bats with strange white fuzz became the first piece of evidence that would be a token illustration of what is now known as white-nose syndrome (WNS) in North America. WNS is a disease that has affected hibernating bats in eastern North America. It is widely thought to be caused by the fungus *Pseudogymnoascus destructans* (Pd). Much has been learned about Pd and the disease since its discovery, but even more remains a mystery. Originally described as *Geomyces destructans*, this cold-loving fungus causes a skin infection and looks like white fuzz on the nose, ears, and membranes of the wings and tail of infected bats. Pd is found in cold and humid (>90%) environments, growing within a temperature range of 40-68 F° making caves and mines ideal environments for this fungus.

Millions of bats have succumbed to WNS, but why is this disease so devastating? Unfortunately, the exact cause of death remains unknown, but there are certain characteristics that make hibernating bats susceptible to WNS. Many bat species eat only insects and adapt to the lack of prey during the winter months by hibernating. During hibernation bats congregate in a cool and moist location (similar to that of the white-nose fungus) and reduce their body temperatures to make efficient use of a limited amount of fat reserves. During this time, a bat's resistance to disease may also decrease. Once a bat is infected with Pd, the fun-

gus erodes through the skin causing discoloration, tears and holes, especially in the wing membrane. Damage to this membrane may disrupt several important functions such as the control of evaporative water loss, body temperature regulation and blood circulation. All of these factors may cause a bat to arouse from hibernation using precious energy stores and decreasing its chance of surviving the winter. Bats are long-lived, with adults typically living from 5 to 15 years, and have low reproductive rates, producing only one young per year. These factors will make population recovery from a disease with an estimated mortality rate of 90-100% difficult.

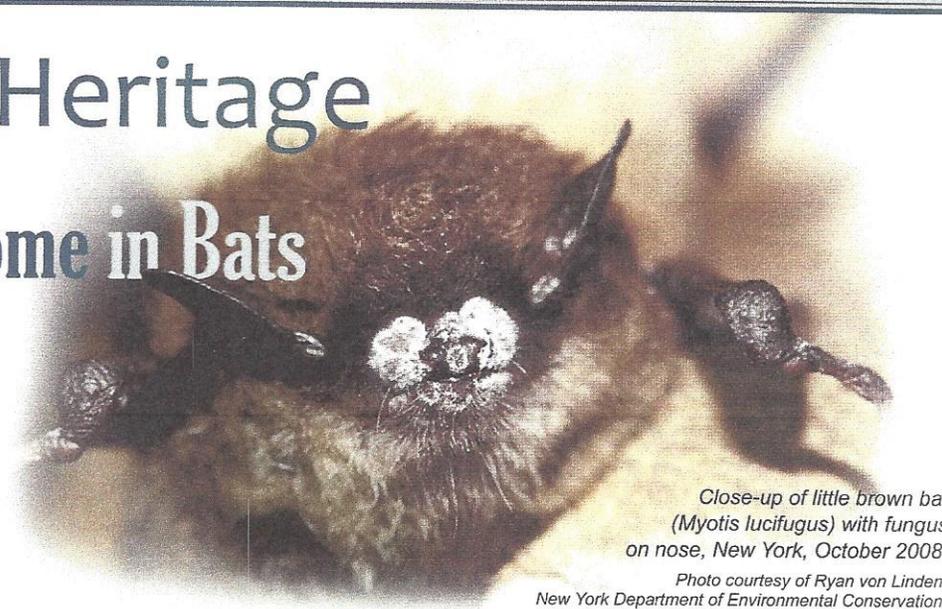
Bats with WNS often exhibit unusual behavior during the cold winter months. Affected bats have been observed flying outside hibernacula during the day in cold temperatures and clustering near the entrance of hibernacula. Large numbers of sick and dying bats near a cave or a mine should be reported immediately to the South Dakota Department of Game, Fish and Parks in Pierre. Do not handle sick or dying bats. Contact the South Dakota Department of Health if a bat has been discovered in your home and you suspect rabies, especially if it has been

discovered in a room with young children or people that have been sleeping. Seven bat species have been known to die from WNS in North America (Table). WNS is not a known threat to humans, pets, or livestock. Note that some bat species (hoary and silver-haired) naturally have an overall frosty look to their fur. The hoary bat does not hibernate underground, but migrates south to warmer temperatures for the winter. The silver-haired bat is also typically migratory, but can be found roosting underground during the winter months.

Table. List of bat species currently known to have diagnostic symptoms of white-nose syndrome, a recently discovered fungal disease in cave- or mine-hibernating bats. Asterisk indicates species that can be found in South Dakota.

Big brown bat*
Eastern small-footed bat
Gray bat
Indiana bat
Little brown bat*
Northern long-eared bat*
Tri-colored bat*

As of 28 January 2014, 23 states and 5 Canadian provinces have confirmed the presence of Pd fungus or documented mortalities due to WNS. It is not known to be in South Dakota. The closest con-



Close-up of little brown bat (*Myotis lucifugus*) with fungus on nose, New York, October 2008.

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

firmation of Pd to South Dakota is in southeastern Minnesota at Soudan Underground Mine State Park and Forestville/Mystery Cave State Park.

The fungus is thought to be transmitted most readily from bat to bat. A bat can also be exposed when coming into contact with cave substrates that harbor the fungus. Given the large area in which the fungus is now known to occur and rate at which this area was covered (~100 miles/year), some suggest that humans can transport this fungus. We don't know how or when the fungus arrived in North America but the first signs of the fungus were in a cave frequented by tourists, which suggests it was carried from Europe by a traveler. It is interesting to note that although Pd is found on both continents, the fungus was not known in Europe until after its discovery in North America. No one had surveyed for the fungus and no bat mortalities attributed to WNS have been reported from Europe. Given its presumed recent arrival in North America, bat species here may simply have not had time to develop resistance to the disease.

There is one simple thing you can do to help conserve bats and prevent the possible spread of this fungus. Do not disturb hibernating bats! Bats are extremely susceptible during this time period and your simple presence in a cave or mine can decrease a bat's chance at surviving the winter. Whether you like bats or not, they provide an important ecosystem service by consuming night flying insects which helps reduce damage to crops and forests. The economic value of the agricultural pest-control service is estimated to be in the billions. Recognizing the importance of these and other pest control services should create at least a tolerance for, if not an appreciation of, these night-flying creatures.

There are legitimate reasons for entering caves or mines. If you normally

enter caves or mines for recreational or professional reasons, make sure you are aware of any seasonal cave or mine closures or permit requirements for the area you wish to enter. Observe these closures. Land management agencies such as the U.S. Forest Service may have seasonal or yearlong closures on certain caves or mines, especially for those that are known to serve as bat hibernacula because of the public safety risk or the potential for harm to bats using these sites is too great. The National Park Service is also implementing actions on their lands that will minimize the risk of WNS spreading to unaffected areas or from infected ones; be aware of and comply with all park-specific plans. Whether or not the cave or mine you are entering is public or privately owned, avoid entering caves or mines in states with WNS and even those found in adjoining states. The importance of not bringing caving gear or clothing from areas known to have Pd into South Dakota and other western states cannot be over-stressed. In ad-

dition, to help reduce the likelihood of fungal spread, always ensure that you clean (decontaminate) all caving gear and clothing after every trip underground. To keep aware of the most up-to-date decontamination protocols visit (<http://www.whitenosesyndrome.org>). Keep in mind that the best and simplest things you can do to help conserve bats during the winter and limit the spread of WNS is to not disturb hibernating bats!

Scientists have learned much about a fungus that was only recently discovered and continue to learn more about the nature of WNS and its cause. Until the mysteries of this emerging infectious disease have been solved, biologist and managers are focused on slowing the spread of the disease and above all, in the pursuit of these endeavors, doing no additional harm to already declining bat populations. For the most up-to-date information about Pd, WNS and the spread of this disease, visit www.whitenosesyndrome.org.

