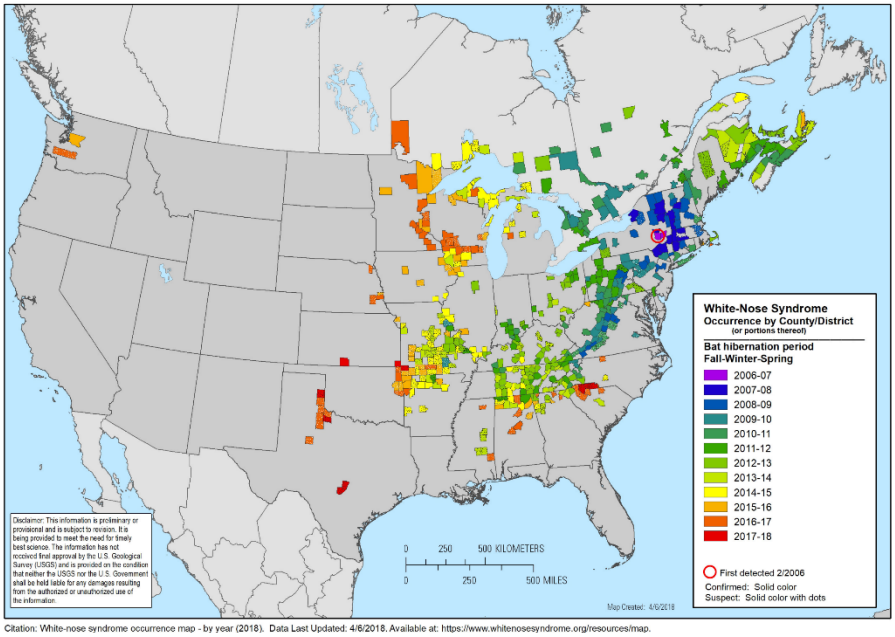
# White-nose syndrome, a deadly disease affecting bats in North America

White-nose syndrome (WNS) is a deadly disease that affects bats during hibernation and is caused by the fungus *Pseudogymnoascus destructans* (*Pd*). The fungus occurs in the cold, humid environments of caves and mines: habitats used by bats for hibernation. The disease is so named for the white, "fuzzy" appearance often seen on the muzzle, forearms, or wings of affected bats during hibernation. The characteristic "fuzz" disappears after bats awaken from hibernation. Bat species that use hibernation as a strategy to survive the winter months, referred to as "cave bats", are most affected by the disease.


Figure 1- Photo of bat from New York exhibiting telltale signs of White-nose Syndrome

A bat's immune system enters a reduced state of activity during hibernation to conserve energy resources. This strategy has worked for bats for thousands of years but the introduction of a new pathogen has proven to be catastrophic to many North American bat species. The reduced period of immunity allows the fungus to spread unchecked over the bat's body, damaging skin tissues, disrupting the bats metabolism, causing dehydration, and depletion of their fat reserves. Symptoms often include deterioration of wing membranes (patagium) and uncharacteristic behavior such as early arousal from hibernation and flying outside during the daytime in winter, presumably in search of food or water. There is no evidence that *Pd* poses a threat to humans, domestic animals, or other wildlife.




White-nose Syndrome occurrence by county/district. Map provided by the U.S. Geological Survey (USGS). Last updated 6 April 2018

Since its discovery in eastern New York state in the winter of 2006-07, white-nose syndrome has spread rapidly across the eastern and central United States and eastern Canada. As of early 2018, thirty-two states and six Canadian provinces have confirmed the presence of the disease, often manifested in large die-offs of affected hibernating bats. In 2012, the U.S. Fish and Wildlife Service estimated that more than 5.5 million bats had died from the disease up to that point. That number has certainly increased, given the continued spread of the disease across the continent.

The fungus is primarily transmitted from bat to bat through direct contact, or from an infected bat to the cave or mine environment, thus infecting healthy bats when they enter these sites. It is now widely

accepted that the fungus was introduced into North America from Europe, where it has been found to occur. European bat species do not exhibit the same fatal response to exposure, suggesting that bats in Europe and Asia coevolved with the fungus. Given that bats do not migrate across the Atlantic Ocean, it is believed that *Pd* was somehow transported across the Atlantic by humans. Fungal spores can be spread by humans on clothing, footwear, and equipment. The discovery of an infected little brown bat (*Myotis lucifugus*) in Washington state in 2016, approximately 1,300 miles from the westernmost known infected site, likely resulted from the transport of the fungus or spores on something other than a bat.

Figure 2- Tricolored bat hibernating in Rhode Island

In February 2016, Rhode Island became the 29th state to confirm the presence of WNS. The detection, while disappointing, was not unexpected. *Pd* and WNS had been previously confirmed present in all other New England states. The fungus was detected in samples collected by the RIDEM Division of Fish and Wildlife as part of a national surveillance effort coordinated by researchers at the U.S. Geological Survey National Wildlife Health Center in Wisconsin. A single tricolored bat (*Perimyotis subflavus*), hibernating in Newport County, tested positive for the presence of the disease. Two other tricolored bats from the same location were determined to be "suspect" for the disease. None of the bats exhibited the typical symptoms often seen in infected bats and there was no evidence of mortality (*e.g.* dead bats) at the site. Additionally, soil samples collected from two other locations, also in Newport County, tested positive for the presence of *Pd*.

***DID YOU KNOW?***

There are seven species of bats that are known to occur in Rhode Island, at least at some time during the year. All are important predators of night-flying insects. Not all of these species of bats hibernate in Rhode Island. For some species, commonly referred to as "tree bats" such as red bats, hoary bats, and silver-haired bats, most individuals migrate to the southeastern United States to spend the winter, returning in spring. We have documented a few individuals of these species overwintering in the state, likely late migrants that took up shelter at the onset of cold weather. The big brown bat, our most common species, generally stays local, often hibernating in the attics of buildings or other man-made structures.

Aside from big brown bats (*Eptesicus fuscus*), which often hibernate in building attics, Rhode Island does not host large numbers of hibernating cave bats. Due to our geology, we do not have mines or natural caves suitable for bats to hibernate in. Some man-made structures can provide appropriate conditions, similar to a cave environment, and small numbers of bats use these structures for hibernation. It is believed that the bats that use these sites did not travel long distances to get there. To date, we have documented four species of cave bats hibernating in the state: tricolored bat, big brown bat, little brown bat, and the northern long-eared bat (*Myotis septentrionalis*). The northern long-eared bat was recently listed as federally Threatened under the Endangered Species Act, a direct consequence of the species' decline due to WNS. The little brown bat is known to travel hundreds of miles to hibernation sites farther north in New England. Several little brown bats captured and banded during summer mist net surveys in Rhode Island have been recaptured or observed at caves in central Vermont in the fall and winter. A little brown bat banded in the fall at a cave in Vermont was recaptured in South Kingstown the following summer.

The impact of the loss of six million insect-eating bats from the landscape remains to be seen. A single bat may consume hundreds, if not thousands, of flying insects in a single night. As WNS continues to spread over a wider

geographic area, many more bats will likely succumb to the disease. Given their low reproductive rate (most cave bat species only produce one “pup” a year) and the normally high rate of mortality of young bats, it will likely be many decades or more before some bat species populations recover to levels that existed prior to the introduction of WNS.

Figure 3- Little brown bat with RI DFW band hibernating in Vermont

Despite the devastating mortality due to WNS, some bats are surviving, even with repeated exposures in WNS-contaminated sites. There is much ongoing, innovative research focused on treatment and controlling the spread of WNS. To ensure that populations have the best chance to recover, we need to protect habitats that are important to bats, including hibernation sites, maternity roosts, and forested habitats. As bat populations recover, they will need places to hibernate, feed, and raise their young.

Figure 4- Wing membrane of a little brown bat showing damage caused by WNS

There are things we can do to help bats and prevent the spread of WNS: Do not enter sites where bats are hibernating or are known to hibernate to minimize disturbance and prevent further spread of WNS. Install a bat house. Little brown and big brown bats will use properly constructed and sited bat boxes. When conducting forest management, leave larger trees with cavities and exfoliating bark, as these are important summer roost sites for some species. If you know of a maternity roost (places where female bats congregate during summer to give birth) report it to the RIDEM Division of Fish and Wildlife. The DFW monitors a number of roost sites across the state to determine reproductive success and to monitor population trends.

If you find dead or dying bats, report it to the Division of Fish and Wildlife (401-789-0281). Never pick up a bat that appears sick or injured. Any contact with a bat should be reported to R.I. Department of Health (401-222-2577). Any contact between a domestic animal and a bat should be reported to the local animal control officer.

For more information on white-nose syndrome please visit the national white-nose syndrome website at: www.whitenosesyndrome.org or: www.nwhc.usgs.gov/disease_information/white-nose_syndrome