

Virtual Creature Festival Lesson: White-nose Syndrome

Explore the 9 native bats of New Jersey and why they are essential to the ecosystem, why they are beneficial to humans, and why we must work harder to protect them. This article focuses on a wide-spread disease that impacts bats.

One of the most prevalent and devastating threats to our native bat species, as well as bats all around the United States and Canada, is a disease called white-nose syndrome (WNS). WNS is caused by a fungus called *Pseudogymnoascus destructans* (Pd). Pd thrives in dark, damp, cold places, putting bats that hibernate in caves at a high-risk for contracting WNS. While these bats are hibernating, the fungus will adhere to them. Sometimes the fungus is visible as a white, powdery substance that coats their body. In many cases, it can be seen heavily effecting their wings to the point where they are degraded so much that there are holes or tears. This disease also makes the bats more active in the colder months while they are supposed to be hibernating, which causes them to burn up the stored fat they need to survive through the winter. In some instances, caves have lost 90 to 100% of its hibernating bat populations. In other cases, bats have been seen with Pd but show no symptoms and do not experience the effects of WNS.

It is vital that we move quickly to research and understand more about WNS so a cure can be tested and produced. Bats are mammals, and only have 1 pup, or baby bat, per year. It will be a long journey to restore bat populations to where they were before WNS was first seen in 2006. [Click here](#) to learn more about WNS and watch a research team's process in trying to better understand the disease.



A healthy little brown bat. [Source](#).



A hibernating little brown bat with visual signs of white-nose syndrome. [Source](#).



Research shows that WNS only affects bats and can spread by contact, inhalation, or ingestion. Even though humans cannot contract WNS, or experience effects from Pd, we do know that it can be **spread by humans**. While we are out exploring, if we unknowingly encounter Pd, it can stick onto our clothing, shoes, and gear. Therefore, it is important to be aware of your surroundings and be sure to clean your clothing and gear after you have been out and about, and before and after you explore caves and mines. Next time you spot a bat flying around at night, be sure to treasure the moment. Help our native bats by spreading the word about WNS and the important role that bats play in our world.

WNS has been seen affecting **7 different cave hibernating bats**. 6 of which are native to New Jersey*:

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

The **fungus, Pd**, has also been detected in some **species that do not hibernate in caves** but have **not been confirmed with WNS**. 2 of which are native to New Jersey*:

- Silver-haired bat*
- Eastern red bat*
- Southeastern bat
- Rafinesque's big-eared bat
- Virginia big-eared bat

Want to learn more? Here are some white-nose syndrome resources:

- [White-nose Syndrome Response Team](#)
- [National Parks Service on WNS](#)
- [Northeast Wildlife Disease Cooperative](#)
- [U.S. Fish and Wildlife Service](#)

Classroom or Home Activity

Activity 1: The Unnoticeables: Consider using this activity as a virtual demo for how bats can come in contact with the fungus that causes white-nose syndrome, or for human hygiene lessons. It also demonstrated the transmission of germs and the benefits of handwashing for humans.

If you have ever used glitter for a project or opened a letter from a “friend” who included glitter in the envelope (glitter bomb!) you know how difficult it may be to clean up. It sticks to everything and even days later, you may notice a tiny bit on your foot or on your hands despite your conscientious efforts. In this same way, the fungus *Pseudogymnoascus destructans*, can be transferred to bats through bat to bat contact, as the tiny fungi particles in the air or when they touch something that the fungus is on in the cave...like the rocks!

To demonstrate this fungal transference, try this activity...

All that Glitters... is Fungus

Materials:

- Glitter
- Hand lotion

Part One:

1. Place a drop of lotion in the palm of your hand and rub your hands together so the lotion is distributed.
2. Now take a very small pinch of glitter and place it in the center of the palm of one hand.
3. Using a paper towel, try to remove the glitter from your hands. Do this in 30 seconds or less.
4. Discuss your findings. Since the glitter was all contained in one spot, you may have gotten it all.

Part Two:

1. Place a drop of lotion in the palm of your hand and rub your hands together so the lotion is distributed.
2. Now take a very small pinch of glitter and place it in the center of the palm of one hand.
3. Then, take your hands and rub them together for about 10 seconds.
4. What do you notice about the glitter?
5. Using a paper towel, try to remove the glitter from your hands. Do this in 30 seconds or less.
6. Discuss your findings. Since the glitter was not all contained in one spot, did you have difficulty getting it all?
7. Carefully observe your hands to determine if they are glitter-free. Are you noticing any glitter “hiding” on your hands? In what areas? Do others have similar findings? Discuss.

Questions for Part Two and to Summarize

1. If you were to touch another person’s hands after Part Two, #3, what is your prediction? Now try it and discuss.
2. If you were to place glitter on the kitchen counter, or on a desk at school what do you think would happen? If it were a small amount, would everyone even notice it?

This simulation can demonstrate how germs are transmitted or, in this case, how *Pseudogymnoascus destructans* is often unnoticeable and can be transported from one place to another leaving populations of bats in greater peril. This fungus is not found in one easy to find spot but is scattered about caves and on the bats themselves.

How can this activity be used for other topics? If you were to modify this activity, how would you do it and why? If you were in a full class setting, what extensions and enhancements could be made?

(Source: Activity adopted from a lesson plan on infectious diseases by Molly Napolitano, PE and Health teacher.)



Bats and Climate Change

The Upper Columbia Basin Network comprises nine park units between the Rocky Mountains on the east and the Cascade Mountains to the west. These parks and their partners are dedicated to understanding and preserving the region's unique natural resources through science and education. Their goal is to develop a strong scientific foundation for stewardship and management of park natural resources. By doing so, to help fulfill the National Park Service's mission of conserving our national treasures for future generations.

To read their article entitled *Bats and Climate Change*: <https://irma.nps.gov/DataStore/DownloadFile/483639>

Environment, host, and fungal traits predict continental-scale white-nose syndrome in bats.

Included in this American Association for the Advancement of Science article, scientists demonstrate that temperature and humidity levels are amongst the variables considered when studying this disease.

As stated in the abstract, white-nose syndrome is a fungal disease killing bats in eastern North America, but disease is not seen in European bats and is less severe in some North American species. We show that how bats use energy during hibernation and fungal growth rates under different environmental conditions can explain how some bats are able to survive winter with infection and others are not. Our study shows how simple but nonlinear interactions between fungal growth and bat energetics result in decreased survival times at more humid hibernation sites; however, differences between species such as body size and metabolic rates determine the impact of fungal infection on bat survival, allowing European bats species to survive, whereas North American species can experience dramatic decline.

To read more: <https://advances.sciencemag.org/content/2/1/e1500831>

For more ideas and activities to address the Next Generation Science Standards or the new initiative that mandates the teaching of climate change in NJ public schools, contact Kate Reilly, Manager of Education. Duke Farms at kreilly@dukefarms.org