Little Bats: A Big Deal

What can we do in our classrooms to help Mother Nature's natural bug zapper?

by **Sarah Pappalardo**

WHAT COMES TO mind when you or your students think of bats? Old movies and cartoons about vampires? Winged creatures swooping down from the sky, just to get tangled in your hair? Or do you think about one of Mother Nature's most efficient bug zappers, helping to eliminate mosquitoes and other "pest" insects? No matter what your initial thoughts are, bats are vitally important to our ecosystems in North America and around the globe. Here you will find general information about these winged creatures, threats to them globally, and what we can do in our own classrooms (or backyards) to prevent their populations from declining further.

Three Widespread Species

The little brown bat, or *Myotis lucifugus*, is one of the most geographically prevalent species of bat in North America: they are found from Alaska to Mexico, and are equally spread between the East and West Coasts. They roost (sleep) in a variety of places, such as trees, buildings, and under wood piles during their active months: mid-May through early September for northern populations and mid-March through early November for southern populations.[2] However, they typically keep their day roosts and night roosts separate to deflect predators (like owls, hawks, snakes, and domestic cats) off their trails. During the winter months, they roost in caves or abandoned mines (referred to as hibernacula) in order to separate themselves from their other roosting sites.[2] Little brown bats are insectivorous, and prefer insects with an aquatic life stage such as mosquitoes and mayflies. The bats will also consume midges, flies, gnats, wasps, and moths. Most bat species can eat up to half of their body weight in insects per night, and nursing females will actually consume their body weight — or more! — each night. These dietary preferences lead to their preferred roosting sites being wooded areas near water sources.

Only found in the eastern half of North America, Indiana bats — *Myotis sodalis* — live mostly in limestone caves (year-round) or under the bark of large trees, in buildings, or under bridges (in the summer).[3] Like little brown bats, Indiana bats are small and dark grey or brown, but have softer fur that is less shiny; typically, only experts can tell little brown bats and Indiana bats apart. They, too, eat lots of "pest" insects: flies, bees and wasps, beetles, and caddisflies, to name a few. Southern Indiana bats eat mostly land-based insects, while northern Indiana bats primarily eat insects from wetland areas.

The big brown bat — *Eptesicus fuscus* — is a third common bat found from southern Canada through Mexico and into Central America. They are aptly named the "big" brown bat because they range from 2.7 to 3.6 inches in length, with a wingspan up to 10.5 inches. They are the

most common bats found in cities, towns, and rural areas, and can be found foraging through diverse habitat areas, as they are highly adaptable to their surroundings.[4] They only eat in the summer when their preferred insect prey — mostly beetles, but also moths, flies, and wasps — are alive and active. Big brown bats are considered to be of extra help to farmers because they also eat the corn root worm, which is broadly seen as the worst agricultural pest in the United States.

White-Nose Syndrome: A Critical Threat to Bats

Although bats are hugely important for insect control, pollination of crops, and nutrient dispersal — via their guano (bat poop) — they have faced an insidious killer over the past decade. Since 2006, when it was first documented in caves around Albany, New York, *Pseudogymnoascus destructans,* also known as white-nose syndrome (WNS), has been a fungal pathogen that lives and grows on the bats, causing vast colonies across the continent to be wiped out.[5] Originally seen in European bat populations, the fungal infection does not directly kill the bats. The infection, which is characterized by the presence of a white fungus around a bat's ears, nose, and other body parts,[7] disrupts their hibernation period by waking them early due to irritation. This causes them to use up fat stores prematurely, and also leads to starvation when the bats cannot find food during the colder months. Scientists estimate that the North American little brown bat is expected to lose 99% of its north-eastern population by 2030 (from an estimated 6.5 million bats 100 years ago to less than 65,000 in 2030) due to the rapid spread of white-nose syndrome and its effects.[9] Currently, many known little brown bat roosts and hibernacula have been closed to human traffic to prevent further spread of the fungus, and many researchers have started investigating ways to stop the spread using fungicides and other chemicals, but with little success at this time. Interestingly, European bat populations have not had the vast die-offs the North American populations have had from white-nose syndrome, but scientists have not been able to pinpoint why; it is hypothesized though that little brown bats (native to North America) are more susceptible to the issues WNS causes.

On a positive note, research has begun to show population recovery in some little brown bat colonies across their North American range. After surviving white-nose syndrome, some bats have adapted a lower sensitivity to the fungus, thus reducing their episodes of premature arousal from hibernation. Bats in some populations have also shown an adaptation to the fungus by either increasing their fat reserves prior to hibernation, or by choosing hibernacula that are less hospitable to the fungus in the first place[7] (such as colder or drier microclimates). More research into combating the spread of the fungus and mitigating its effect on bat populations needs to be done to diminish the likelihood of little brown bat extinction.[10]

Other Threats to Our Natural 'Bug Zappers'

Another large threat affecting common bat populations is climate change, which causes roosting and feeding sites to become compromised (increased temperatures and moisture lead to further fungal growth, thus promoting WNS growth and transmission), increasing the likelihood that *Pseudogymnoascus destructans* will appear. Research strongly suggests that bat populations are highly at-risk because of bats' acute sensitivity to climatic cues for essential life processes such as waking from torpor, migration, and breeding.[11] A change in the water sources close to bat roosting sites and hibernacula could also affect their survival if the insect species were to change or become driven out from the area, due to increased precipitation, water temperatures, or even drought-like conditions.

Persistent organic pollutants (POPs), as well as other chemicals used in non-organic farming processes and pest control (PCBs, DDT, and PBDEs), build up in bats' tissues, affecting the function of their vital organs such as the brain and liver. This is an especially major threat to little brown bats.[8] Studies have also recently linked exposure of little brown bats to a range of chemicals to the bats' susceptibility to contract white-nose syndrome because of the effect the chemicals (pesticides, herbicides, plastics,

etc.) may have on their nervous systems.[8] Whether from the chemicals themselves or due to increased issues when faced with the fungus during their hibernation months (the fungus irritates them, thus waking them from hibernation and forcing them to search for food in the winter — possibly starving or freezing to death), further research needs to be done to determine what is contributing to the bat population decline.

What You Can Do to Help Bats

If we would like to continue to take advantage of bats' beneficial insect control we must find ways to mitigate the effects of both white-nose syndrome and chemicals used across our schools, farms, and yards. There are many ways in which teachers and students can help little brown bat and other susceptible bat populations across North America. These include the following:

- Educate yourself and your students: DON'T BE AFRAID OF BATS! It's a common misconception that bats will purposefully dive at you. This only happens if there is a swarm of insects surrounding you, and even then, it would be unusual for bats to get especially close.
- (*Science, Art, ELA*) Spread the word to your school and local community about why bats are so beneficial. Have students research and create infographics (a sample: https://www.easel.ly/viewEasel/4756267), posters, and flyers to promote knowledge and address common misconceptions about bats. Knowing is half of the battle! [A great online educational resource from the U.S. Fish and Wildlife Service is https://www.whitenosesyndrome.org/what-can-you-do-help. It has information on how to spot unusual bat behaviors and how to remove bats if they get into your house: if you find injured or deceased bats, or a roost with white-nose syndrome-affected bats on your home or school property, call your local nature center, park ranger office, or Department of Natural Resources. They can remove the injured bats and possibly help the rest of the bats in the roost.]
- (*Science, Photography/Art, STEM*) Students can conduct a modified BioBlitz[13] to investigate what insects are in their school yard, local park/wetland, or own yard. Are these insects ones that would be on the menu for commonly-found bats? What other predators would eat those insects? Would the area be suitable for bat roosts? Are there any places there where bats might be staying already?
- (*Science, STEM, Geography, ELA, Health*) Discuss pathogens such as bacteria and fungi and how they spread by contact. (Cold and Flu season in schools is a great time to discuss this!) White-nose syndrome can be spread through contact when people walk through caves, much like you can catch the flu if you share a soda or shake hands with someone who is carrying the flu virus. Have students research where caves are located in their state, and whether they are possibly sites for bat roosts. Are the caves accessible to tourists? Have they been closed to protect bat populations or other species? Are there viruses or bacteria that spread easily through contact in other species? (You could extend this to humans, as well, during a health unit on pathogens or diseases that spread by contact.)
- (*Science, TechEd, STEM*) Construct and install bat boxes in your yard or on school property (get parent or administration permission first, of course!), or fundraise to purchase a few bat boxes for your school. Be sure that they are the right type of bat boxes for your area.[12] See http://www.batmanagement.com/Batcentral/batboxes/whyfail.html or http://www.batcon.org/resources/getting-involved/bat-houses/install for suggestions on how to build them or where to purchase appropriate boxes. Students need to use engineering skills and math skills to construct the bat houses, and will need to utilize problem-solving skills to decide where to place them successfully for local bats.

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Notes

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