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Bats of the Niagara Escarpment in Wisconsin

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Tri-colored bat
Cindie Brunner illustration

ABSTRACT

The caves and rock crevices of the Niagara Escarpment provide habitat for four of Wisconsin's seven species of bats: the little brown myotis, the northern myotis, the big brown bat, and the tri-colored bat. All four of these species are currently listed in Wisconsin as threatened. In addition, the forests above the escarpment provide summer homes for the migrating bat species, including the silver-haired, eastern red, and hoary bats. All of the bat species found in the escarpment are insectivores. They reduce insect pests and are the only significant predators of nocturnal insects. Because of the spread of white-nose syndrome, a deadly fungus affecting bats, and the negative effects of wind turbines on bat populations, habitat provided by the caves in the escarpment has become even more critical.

INTRODUCTION

Bats are one of the most abundant and misunderstood mammals. Seven species of bats inhabit Wisconsin. Four of those species use the caves along the entire length of the Niagara Escarpment in Wisconsin. Habitat destruction, wind turbines, and white-nose syndrome have caused bat fatalities to rapidly increase in recent years, and all four of the cave-dwelling species are listed as threatened. Due to their important ecological roles, knowledge about these species is invaluable.

All the bat species in Wisconsin are members of the mammalian family Vespertilionidae. These bats travel and hunt using echolocation, emitting high frequency calls that bounce off objects near them and travel back to the bat, allowing them to gauge distance, size, shape, surface texture, and movement of their surroundings (Kurta, 1995; Feldhamer and others, 2007). The frequency range of bat calls is usually between 12 and 160 kHz, with most species' calls being greater than 20 kHz (Feldhamer and others, 2007). The average human can hear up to 18 kHz, so it is possible to hear some species' echolocation calls, but it is not common.

The benefits of bats are numerous and diverse. Around the world, bats are seed dispersers and pollinators for plant species important for food, timber, medicines, or fiber (Fujita and Tuttle, 1991). In Wisconsin, all the bats are insectivorous, and they are the only significant predator of nocturnal insects (Feldhamer and others, 2007). Depending on the size of the individual, season, and air temperature, a single bat will consume between 1.8 and 3.7 grams, which translates to hundreds of insects per night (Anthony and Kunz, 1977). By eating such enormous amounts of insects, bats reduce insect species populations that are common vectors for agricultural plant diseases, as well as those that are general pests (Whitaker, 1995).

> "…bats reduce insect species populations that are common vectors for agricultural plant diseases…"

Bats are often viewed negatively as creatures filled with disease. While the Centers for Disease Control and Prevention (2011) reported about 6 percent of cat-killed bats had rabies, researchers at the University of Calgary (2011) calculated that fewer than 1 percent of healthy bats killed by wind turbines were rabid. However, rabies has been reported in several bat species, and bats are rabies vectors, along with raccoons, skunks, and coyotes (CDC, 2011). In the case of bats, bites are usually due to improper handling by people attempting to pick bats up off the ground or from a wall.

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NIAGARA ESCARPMENT BACKGROUND AND LANDSCAPE DATA

The Niagara Escarpment is a 650-mile-long bedrock ridge filled with caves, cliffs, and ledges that extends from eastern Wisconsin to southern New York. The rocks of the escarpment were formed in ancient marine sedimentary environments and later eroded by glaciers and rivers (Luczaj, 2013). These rock openings throughout the escarpment provide ideal habitat for the four cave bat species found in Wisconsin. Although the cave bats mainly inhabit the escarpment during winter, some species will use caves as habitat periodically throughout the year.

CAVE BATS OF WISCONSIN

There are seven species of bats in Wisconsin, but only four of these are cave dwelling and inhabit the escarpment. The other three species are known as tree bats because they roost in trees. These bats, the silver-haired, eastern red, and hoary, migrate south in the fall and, depending on the species, may fly as far as Central America. The hibernating species, also known as cave bats, enter their hibernacula after the migratory species have begun flying south for the year.

The most common bat in Wisconsin, the little brown myotis (*Myotis lucifugus*) (fig. 1), is found nearly everywhere across the United States, and hibernates mostly in caves over winter (Kurta, 1995). Their summer roosting sites are anywhere from underneath tree bark to attics.

The northern myotis or northern long-eared bat (*Myotis septentrionalis*) (fig. 2) is found across the eastern United States and throughout Canada. They hibernate over winter in caves or abandoned mines, but during summer, can be found in groups with other myotis near their hibernacula (Kurta, 1995). They prefer to forage below the canopy within forests.

Big brown bats (*Eptesicus fuscus*) (fig. 3) live throughout the United States, mainly in cities, towns, and agricultural areas (Kurta, 1995). Unlike most other species, *E. fuscus* is less likely to be found in densely forested areas, but is a very common species overall (Jackson, 1961; Kurta, 1995). This species mainly hibernates in caves and mines over winter, but can also be found in building roofs or walls where the temperature stays above freezing (Kurta, 1995; Rancourt and others, 2007).

The tri-colored bat (*Perimyotis subflavus*) (fig. 4), formerly known as the eastern pipistrelle prior to a genera change (*Pipistrellus subflavus*), inhabits most of the eastern United States, from southern Canada to Central America, although it is quite rare in northeastern Wisconsin due to a lack of suitable hibernacula. *P. subflavus* is usually the first of the four species to enter into torpor, the bat's form of hibernation, in fall, and the last to emerge in spring (Kurta, 1995).

Figure 1. *Little brown myotis* (Myotis lucifugus).

Figure 2. *Northern myotis* (Myotis septentrionalis).

Figure 3. *Big brown bat* (Eptesicus fuscus).

Figure 4. *Tri-colored bat* (Perimyotis subflavus).

CAVES IN THE WISCONSIN NIAGARA ESCARPMENT

Although bats can be found in many caves within the Niagara Escarpment, there are four main hibernacula (shelters used for winter dormancy) that house large numbers of bats. New Hope Cave, Ledge View Cave, Horseshoe Bay Cave, and Neda Mine comprise the only large bat hibernacula in eastern Wisconsin. In fact, Neda Mine is the largest bat hibernaculum in Wisconsin. Many caves in the escarpment are not suitable for winter torpor, due to the small size and exposure of most of the caves. However, these smaller caves are useful for bat use during the summer months for daily torpor. Although an exact number of bats in the caves is unknown, Wisconsin has some of the largest numbers of cave-hibernating bat species remaining in the Midwest.

Conservation concerns

Habitat destruction is a concern for mammals around the world, and bats are no exception. Bats like the Indiana bat, *Myotis sodalist*, are endangered because about 85 percent of the population winter in a total of seven caves or mines in the Midwest (Kurta, 1995). With the rapid spread of white-nose syndrome (WNS), a fungal disease that has killed more than 90 percent of bat populations within infected caves, habitat concerns are particularly great. An up-to-date map of North America showing the occurrence of WNS by county or district can be found online at: www.whitenosesyndrome.org/resources/map.

The causal fungus, *Pseudogymnoascus destructans*, makes infected bat hibernacula a deadly place for bats to reside. The fungus can grow within caves at temperatures between about 39°F and 59°F (Verant and others, 2012). Bats can pick up the fungus directly from the cave, or from contact with other infected bats. The U.S. Fish and Wildlife Service (2011) reports that bats in a cave or mine that has been infected by WNS usually start showing symptoms during winter torpor. These symptoms include white fungus on the bats' snouts and wings. Dead and dying bats at affected hibernacula have low body weight and become dehydrated, especially over winter. Other symptoms of WNS are unusual behavior, including frequent arousals when they should be in torpor, flying in winter, and roosting near the hibernacula entrance, where temperatures may fall below freezing. Because their food source is not available during winter, they either starve or freeze to death, resulting in large piles of dead bats at the entrances to infected caves.

Scientists are still trying to find viable ways to stop or eliminate the fungus. It is estimated that millions of bats have been killed in the United States by WNS since its discovery in 2007. *P. destructans* was identified in Wisconsin in 2014. If you find a large number of dead bats outside a cave, or see numerous bats acting strangely (flying during the day, or crawling around the ground outside of a cave), alert the state Department of Natural Resources or the U.S. Fish and Wildlife Service immediately.

The U.S. Fish and Wildlife Service has established decontamination protocols for entering and exiting caves around the United States in hopes of preventing human transmission of the fungus from one cave to another. The Wisconsin Department of Natural Resources (WDNR) has expanded on these protocols to help control the human-assisted spread of the fungus into Wisconsin. No clothing or gear previously worn or brought in any cave may then be worn into a Wisconsin cave without it first being disinfected. Tourist cavers are exempt from this policy, but they should still be cautious not to wear clothes into a cave that they have worn in a previous cave in Wisconsin or another state. If you can avoid entering a non-tourist cave known to house bats, it would be better to do so. For more detailed information on the WDNR decontamination protocols, visit the WDNR website (http://dnr.wi.gov/topic/WildlifeHabitat/bats.html).

Wind turbines present another threat to bats. Although wind power facilities represent a great source

> "If you can avoid entering a non-tourist cave known to house bats, it would be better to do so."

of renewable energy, scientists estimate that they kill tens of thousands of bats in North America each year, leading researchers to wonder why (USGS, 2015). Bats are killed in one of two ways: they fly directly into a spinning turbine or, in some cases, fly between spinning turbines and are killed by the extreme pressure change from one side to the other (Baerwald and others, 2008). In the Midwest, on average, approximately 8 bats are killed per megawatt produced from the wind turbines (Arnett and others, 2008). Recent studies estimate that Wisconsin alone has a bat mortality rate as high as 32 bats per megawatt produced from wind turbines, which is among the highest mortality rates in the

United States (Strickland and others, 2011). A specific reason for the high mortality rates in Wisconsin is not known, but it may be that the area surrounding the turbines resides in a stretch of land popular for migratory species and may potentially be near a winter hibernaculum utilized by common cave bats. The Niagara Escarpment is such an area. Researchers are currently working on ways to decrease bat mortality, such as reducing turbine speed or installing acoustic deterrents (Horn and others, 2008).

CONCLUSION

The caves and mines in the Niagara Escarpment are very important for bats of eastern Wisconsin. The farming communities of eastern Wisconsin rely on bats for insect control, and without them, would require more pesticides to protect their crops. A few conservation efforts could greatly assist bat species: (1) With the developing threat of WNS, cavers should be extremely cautious when entering caves anywhere on the east coast or in the Midwestern states, including in Wisconsin. (2) Wind farm projects should have pre-construction surveys performed, to avoid placement in a bat migratory pathway. (3) If you have large hibernacula of summer or winter roosting bats on or near your property, inform the WDNR and help monitor our bat population.

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