



Bat Monitoring in the Great Lakes Network Parks

Bats nationwide are struggling to survive against threats posed by climate change, habitat loss, wind turbines, and a devastating fungal disease called *white-nose syndrome (WNS)*.

The nine species of bats found in the Great Lakes region can be divided into two groups: tree-roosting, migratory bats (four species) and cavity-roosting, hibernating bats (five species). **Hibernating bats are highly susceptible to WNS**, except for big brown bats (*Eptesicus fuscus*) which show greater resistance to the disease.

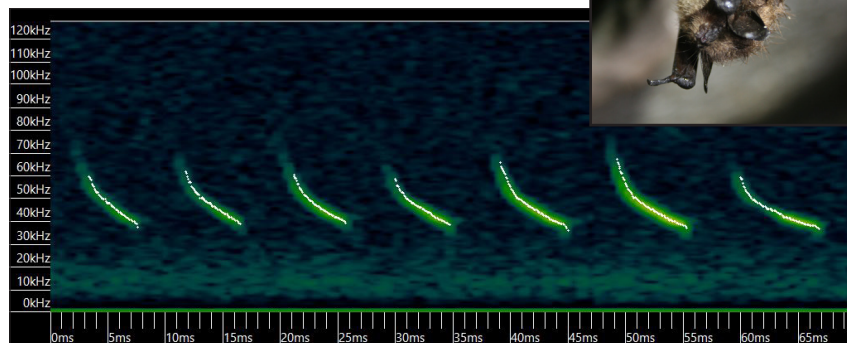
All nine Great Lakes bat species are listed by one or more states as endangered, threatened, or of special concern. The U.S. Fish and Wildlife Service lists the Indiana bat (*Myotis sodalis*) and the northern long-eared bat (*Myotis septentrionalis*) as federally endangered under the Endangered Species Act.

This brief provides a monitoring summary for all nine network parks. More detailed briefs are available for each individual park.

Who's Out There?

Bats give different calls while in flight to help them navigate and to locate things like food. The calls are distinctive and can be used to identify the species that are present, but they are ultrasonic—beyond the range of human hearing (*see sidebar*).

We established a bat monitoring program in 2015, placing ultrasonic audio recorders in the parks to identify which species are present. We are working with the NABat Midwest Bat Hub (<https://midwestbathub.nres.illinois.edu/>) to create statistical models of bat occupancy at our parks, particularly those most affected by WNS. *Occupancy* measures the probability that a species is using an area, while taking into account the fact that we cannot always perfectly detect the species.



Spectrogram of calls made by a little brown bat (*Myotis lucifugus*). Frequency of the sound is shown on the left axis ranging from 0 to 120 kilohertz (kHz). Notice the lowest parts of this repeated, down-sweeping call is at a frequency of 30 kHz.

INSET OF LITTLE BROWN BAT: NPS PHOTO.

Table 1 lists the species known or suspected to occur in each of the network parks based on work done by others prior to the start of our monitoring program. Table 2 provides a summary of what we heard on the audio recorders in each park between 2015 and 2019. Recordings collected between 2020 and 2022 are being analyzed.

In seven of the nine parks, the number of confirmed species exceeded what was previously known. One park (Isle Royale) stayed the same (seven species known and confirmed), while one of the eight species at Indiana Dunes could not be confirmed. However, the Indiana bat is probably still at Indiana Dunes. Its call is very similar to two other species, so even though

What is Ultrasonic?

Ultrasonic is a sound frequency above 20,000 hertz, which is the upper limit of human hearing. Hertz (Hz) is the standard measurement of frequency, or how quickly a sound wave oscillates between high pressure and low pressure over time. Humans perceive the frequency of a sound as “pitch” (e.g., a “high-pitched” sound). Ultrasonic sounds are expressed in kilohertz (kHz), and the 20,000 Hz limit of human hearing is equivalent to 20 kHz.

The average frequencies of bat calls in our region range from 20.1 kHz (hoary bat) to 43.2 kHz (northern long-eared bat).

Table 1. Bat species documented in Great Lakes Network parks before the start of this monitoring program in 2015. Parks: APIS=Apostle Islands, GRPO=Grand Portage, INDU=Indiana Dunes, ISRO=Isle Royale, MISS=Mississippi National River, PIRO=Pictured Rocks, SACN=St. Croix Riverway, SLBE=Sleeping Bear Dunes, VOYA=Voyageurs. Prior records: N (c) = No, park is close to edge of range; N (o) = No, park is well outside of range; N (w) = No, but park is within range; P (w) = Possible, park is within range; Y = Yes. An asterisk (*) indicates winter hibernating species.

Species	APIS	GRPO	INDU	ISRO	MISS	PIRO	SACN	SLBE	VOYA
Big Brown Bat *	Y	Y	Y	Y	Y	Y	Y	Y	N (w)
Eastern Red Bat	Y	Y	Y	Y	N (w)	Y	Y	Y	N (w)
Evening Bat	N (o)	N (o)	Y	N (o)	N (c)	N (o)	N (c)	N (o)	N (o)
Hoary Bat	Y	Y	Y	Y	Y	Y	Y	Y	N (w)
Indiana Bat *	N (o)	N (o)	Y	N (o)	N (o)	N (o)	N (o)	N (c)	N (o)
Little Brown Bat *	Y	Y	Y	Y	Y	Y	Y	Y	Y
Northern Long-eared Bat *	Y	Y	P (w)	Y	N (w)	Y	Y	N (w)	Y
Silver-haired Bat	Y	Y	Y	Y	Y	Y	Y	Y	Y
Tricolored Bat *	N (c)	N (c)	Y	Y	N (w)	N (c)	Y	N (w)	N (c)

the automated analysis identified recordings as being the Indiana bat, they could not be confirmed.

We found that northern long-eared bat occupancy declined by an average of 31% between 2016 and 2020. However, some parks had relatively stable occupancy. Although northern long-eared bats are severely affected by white-nose syndrome, the good news is that they are still flying in the Great Lakes parks.

The Future of Bat Monitoring

When this project began, the Great Lakes region was at the leading edge of the WNS spread. This monitoring program helped parks to document baseline data on their bat populations and to assess changes over time.

In 2022, all parks completed at least six years of bat monitoring, marking the completion of network-supported data collection. In 2023 and beyond, each park is responsible for their bat monitoring program.

Table 2. Summary of bat monitoring for each Great Lakes Network park, 2015–2019. Pictured Rocks monitors bats under a separate protocol, but shares their recordings with GLKN.

Park	First Monitoring Year	No. of Sites	Known / Confirmed Species	Results
Apostle Islands	2015	26	6 / 7	The six bat species previously documented at the park were reconfirmed: big brown, eastern red, hoary, silver-haired, little brown, and northern long-eared bat. A seventh species, the tricolored bat, was also documented.
Grand Portage	2016	18	6 / 7	The six bat species previously documented at the park were reconfirmed: big brown, eastern red, hoary, silver-haired, little brown, and northern long-eared bat. A seventh species, the tricolored bat, was also documented.
Indiana Dunes	2016	30	8 / 7	Seven of the eight bat species previously documented at the park were reconfirmed. Suspected Indiana Bat was recorded but not confirmed.
Isle Royale	2015	28	7 / 7	Seven bat species previously documented at the park were reconfirmed.
Mississippi River	2016	28	4 / 8	Four bat species previously documented at the park were reconfirmed: big brown, hoary, silver-haired, and little brown bat. Four additional species were also documented: eastern red, northern long-eared, tricolored, and evening bat.
Pictured Rocks	2015	30	6 / 7?	Six bat species previously documented at the park were reconfirmed: big brown, eastern red, hoary, silver-haired, little brown, and northern long-eared bat. Acoustic data suggest a seventh species, the tricolored bat, may also be present.
St. Croix Riverway	2016	30	7 / 8	Seven bat species previously documented at the park were reconfirmed: big brown bat, eastern red bat, hoary bat, silver-haired bat, little brown bat, northern long-eared bat, and tricolored bat. One additional species, the evening bat, was also documented.
Sleeping Bear Dunes	2015	35	5 / 7	The five bat species previously documented at the park were reconfirmed: big brown, eastern red, hoary, silver-haired, and little brown. Two additional species, the northern long-eared bat and tricolored bat, were also documented.
Voyageurs	2015	18	3 / 7	The three bat species previously documented at the park were reconfirmed: silver-haired, little brown, and northern long-eared bat. Four additional species were also documented: big brown, eastern red, hoary, and tricolored bat.