



Bat Monitoring Along the Mississippi River, 2016–2019

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)*.

Four of the eight bat species found in the Twin Cities area are only here in the summer; they spend their winters in the southwestern U.S., Mexico, and even Central America. The other four species, rather than migrating, hibernate here over the winter, roosting in caves or buildings. Three of these hibernating species—the little brown, northern long-eared, and tricolored bats—are **highly susceptible to WNS**. The big brown bat is also a hibernating species but has exhibited resistance to the disease.

Prior to this bat monitoring program, only four species had been documented at Mississippi National River and Recreation Area (MISS) (Table 1). Big brown bats were observed during bat surveys at Fort Snelling State Park in 1995. Dead hoary bats found at Fort Snelling and near Cherokee Park are in the collection at the Bell Museum of Natural History. A silver-haired bat and little brown bat were observed by NPS staff in the MISS office parking ramp.

Comprehensive bat surveys conducted by the Minnesota Department of Natural Resources (MNDNR) in the 1980s indicated seven species were



Surprise! Though Minnesota is north of the evening bat's normal range, they were recorded on approximately 50% of sampling nights each year along the Twin Cities portion of the Mississippi River. U.S. ARMY PHOTO.

present in the five counties around MISS. Their list of known hibernacula (where non-migratory bats hibernate for the winter) did not include any locations within the MISS corridor.

Acoustic survey and mist-netting efforts conducted in 2015–2017 by the MNDNR and the University of Minnesota Duluth's Natural Resources Research Institute captured six species in mist nets: little brown, big brown, eastern red, hoary, and silver-haired bats, along with a single evening bat, the first record of the species in Minnesota. The same six species, plus the tricolored bat, were detected acoustically.

Breaking the Ultrasonic Barrier

Beginning in 2016, we placed ultrasonic audio recorders throughout the park to identify what bat species are present. Bats give different calls while in flight to help them navigate and to locate things like food. Like bird songs, we can identify bat species by their calls, but the calls are ultrasonic—beyond the range of human hearing—so special microphones and software are used to record and identify them. But, also like birds, some bat species have similar calls, and there can be variation in the calls of any one species. As a result, the software we use to analyze and identify the recordings is not 100% accurate. In these cases, a proportion of call files are reviewed “manually” using a spectrogram to verify the identifications.

Table 1. Bat species documented at Mississippi National River and Recreation Area before the start of this monitoring program in 2016 and after four years of acoustic monitoring (2019). Asterisk (*) indicates winter hibernating species.

Common Name	Scientific Name	Pre-2016	2019
Big Brown Bat *	<i>Eptesicus fuscus</i>	Y	Y
Eastern Red Bat	<i>Lasiurus borealis</i>	N	Y
Evening Bat	<i>Nycticeius humeralis</i>	N	Y
Hoary Bat	<i>Lasiurus cinereus</i>	Y	Y
Little Brown Bat *	<i>Myotis lucifugus</i>	Y	Y
Northern Long-eared Bat *	<i>Myotis septentrionalis</i>	N	Y
Silver-haired Bat	<i>Lasionycteris noctivagans</i>	Y	Y
Tricolored Bat *	<i>Perimyotis subflavus</i>	N	Y

We Have Eight Species!

The four bat species previously documented at the park were reconfirmed: big brown, hoary, silver-haired, and little brown bats. The eastern red, northern long-eared, tricolored, and evening bats were also confirmed, three of which were expected because the park lies well within their known ranges.

The evening bat was a surprise addition because Minnesota is north of the typical range for this species. However, it was observed by other researchers in both Wisconsin and Minnesota in 2016, prompting us to start listening for them. We ended up with 12 manually verified recordings of evening bats, suggesting they are at least occasionally present in the park.

All eight species were recorded each year, but big brown, little brown, and silver-haired bats were the most common, being recorded on 90% or more of sample nights annually. Those same three species, along with the eastern red bat, were recorded at all of the survey sites every year.

Activity levels for big brown, eastern red, hoary, silver-haired, and evening bats appear to be stable, while activity levels for little brown bat, northern long-eared bat, and tricolored bat appear to be declining.

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.

We are working with the NABat Midwest Bat Hub (<https://midwestbathub.nres.illinois.edu/>) to create statistical models of bat occupancy, 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.

MISS staff took over all aspects of bat monitoring in 2023.



Twin Cities bats (top): Big brown bat, northern long-eared bat (WISCONSIN DNR/D. REDELL), silver-haired bat (WISCONSIN DNR PHOTO), hoary bat (USGS/P. CRYAN); (bottom) eastern red bat, tricolored bat, little brown bat, and evening bat (U.S. ARMY PHOTO). NPS PHOTOS UNLESS CREDITED OTHERWISE.

Read the full report, Goodwin, K. R., and A. A. Kirschbaum. 2021. *Acoustic monitoring for bats at Mississippi National River and Recreation Area: Data summary report, 2016–2019. Natural Resource Data Series. NPS/GLKN/NRDS—2021/1322*, at <https://irma.nps.gov/DataStore/DownloadFile/662358>.

For more information on bat monitoring, visit www.nps.gov/im/glkn/bats.htm.