



Survivors and silver linings

WHITE-NOSE
SYNDROME TAKES A
HEAVY TOLL ON BATS
BUT SPURS RESEARCH
AND PROTECTIONS TO
AID RECOVERY.

Paul White, a DNR mammologist who leads the Wisconsin Bat Program, swabs a little brown bat for evidence of the fungus that causes white-nose syndrome.

A BR

2006

First incidence of white-nose syndrome detected in New York state

2008

First reports of mass mortality in hibernating bats



DNR conservation biologist Heather Kaarakka uses radio tracking to help learn more about the habitat bats need during the summer.

MICHAEL KIENITZ

Lisa Gaumnitz

While white-nose syndrome has raced through Wisconsin's cave bat populations pretty much as state bat biologists expected and feared, they didn't expect the response they'd get from people like Bev Paulan, Kent Borcharding and Jim Edlhuber.

Each summer, Paulan logs 300 miles on her car recording bat calls to identify and tally bat species; Edlhuber counts bats emerging from the bat house on his property; and Borcharding builds another bat house for Yellowstone Lake State Park, bringing his total to more than 100 houses at that site and 1,000 in Wisconsin and other Midwestern states.

These three are among the hundreds of volunteers who have helped Wisconsin prepare for the arrival of white-nose syndrome (WNS), a bat disease that has killed millions of beneficial insect-eating bats in North America since its discovery in New York in 2006.

Working with DNR and partners, volunteers were able to significantly advance knowledge about Wisconsin bat species, their locations and their abundance before the disease arrived. Now that WNS is here, these volunteers are documenting its toll on bat populations and counting survivors.

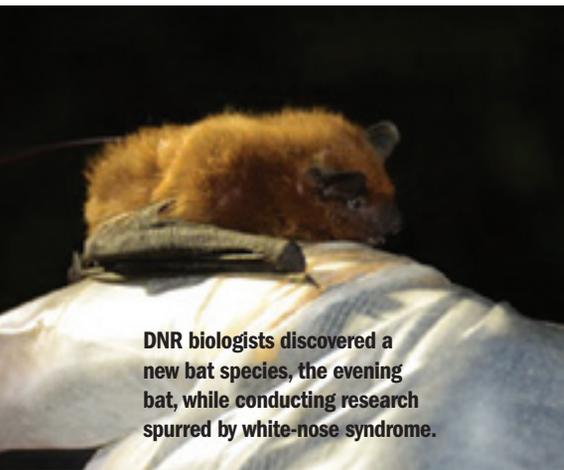
"Wisconsin has a long and storied history of wildlife conservation and we are so fortunate that deep-seated passion has carried over to bats for countless Wisconsin residents," says Paul White, a mammologist who leads the Wisconsin Bat Program for the Department of Natural Resources.

White-nose syndrome, named for the powdery white fuzz that develops on

THE HISTORY OF WHITE-NOSE SYNDROME AND BATS IN WISCONSIN

2010	2014	2015	2016	2017
Wisconsin Bat Program starts bat survey to gather baseline data about state bat populations	White-nose syndrome first found in Wisconsin; UW-Madison and Wisconsin Bat Program begin bat diet study	First declines in hibernating bat populations observed in Wisconsin; 14 caves and mines infected; first evening bat caught in Wisconsin	Wisconsin conducts its first white-nose syndrome treatment trials; first declines seen in summer bat populations in the state	Only two of 60-plus Wisconsin bat hibernation sites surveyed are free of WNS

THINKSTOCK



DNR biologists discovered a new bat species, the evening bat, while conducting research spurred by white-nose syndrome.

HEATHER KAARAKKA



Cave and mine specialist Jennifer Redell, in red, leads a tour of a Door County cave as part of outreach and education efforts of the DNR's Wisconsin Bat Program.

DOOR COUNTY PULSE

hibernating bats' noses, ears and wings during infection with the fungus *Pseudogymnoascus destructans*, causes bats to wake more often during hibernation, thus burning up critical stores of fat they need to survive winter.

Since WNS was documented at a single Wisconsin site in April 2014, it has spread to more than 50 mines and caves in 24 of the 28 Wisconsin counties with known bat hibernacula. Bat populations in Wisconsin hibernacula where WNS has been present two or more years have declined 30 to 100 percent.

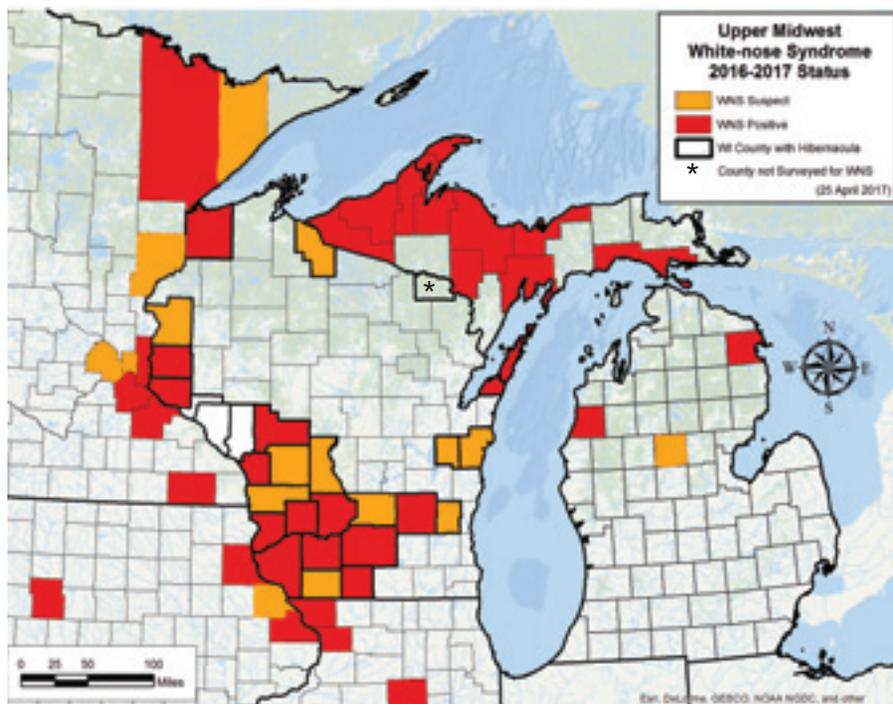
How to help surviving bats this summer

It's too early to know if or how these cave bats — little brown bats, big brown bats, northern long-eared bats and eastern pipistrelles — will rebound and how their loss will affect people, agriculture and ecosystems. A single bat can consume thousands of insects each night, and researchers have estimated that bats save Wisconsin farmers alone \$600 million to \$1.5 billion on pesticides every year.

"It's unlikely the disease will kill every single bat in the state, so now is the time for everybody to help surviving bats stay healthy and help rebuild bat populations over time," says Heather Kaarakka, a conservation biologist who forms the core of the Wisconsin Bat Program along with White and Jennifer Redell, a cave and mine specialist.

People can help by building and installing bat houses; avoiding disturbing bat roosts between June 1 and Aug. 15, when bats raise their young; helping to monitor bat populations; and donating money for bat work, Kaarakka says.

Most importantly, people can report the bat roosts (buildings, bat houses or trees) where bats are present in summer as well as sites where bats are no longer showing up. Bats continuing to return to summer roosts are likely survivors



of WNS. Email location information to DNRbats@wisconsin.gov.

Knowing those locations can help DNR and partners investigate why bats from certain hibernaculum may have survived at higher rates, and understand if certain bats are genetically more resistant to the disease than others. These surviving bats are what will help species rebound after white-nose syndrome, White says.

Wisconsin's actions to prepare for WNS — from placing cave bat species on the state threatened species list to trigger special protections, to building a robust volunteer network, to hosting annual educational bat festivals — increase the odds of bats' recovery. Perhaps most importantly, WNS has accelerated bat research, education and awareness and created partnerships among scientists, cave and mine owners, citizens and rec-

reational cavers.

"The disease is pretty bleak," Redell says. "But the human part of you always has to hope, and the silver lining is if we can channel the increased awareness and enthusiasm about bats to help the other 1,200 species in the world."

In fact, there has been one bit of good news to emerge recently. DNR biologists discovered Wisconsin's first new bat species in more than 60 years while researching summer habitats for WNS-vulnerable bats.

The newcomer is an evening bat, a beetle-eater that flies to the southeastern United States in winter and returns north in the spring. And more good news: It is not known to be vulnerable to white-nose syndrome.



Lisa Gaumnitz is a natural resources educator and program and policy analyst for the DNR.



RESEARCH, PROGRESS AND DISCOVERIES FROM THE WISCONSIN BAT PROGRAM

Here are condensed updates of 2016 research, progress and discoveries from the Wisconsin Bat Program; check the program's website, <http://wiatri.net/inventory/bats>, for longer versions in the January 2017 Echolocator newsletter. Volunteer efforts involving bats are described in "Citizen-based monitoring is critical for Wisconsin," in the June 2016 *Wisconsin Natural Resources* magazine.

■ URGENT SEARCH UNDERWAY FOR VACCINES

Wisconsin scientists have been racing the clock to create vaccines to prevent white-nose syndrome in bats. Their task is daunting: Few vaccines have been developed for fungal diseases, even for humans or domestic animals. In addition, the vaccine must be placed in something the bats can ingest, and traditional methods and timelines for testing don't transfer well to bats.

Results are mixed so far. Fungal experts at the University of Wisconsin-Madison School of Medicine identified and are testing a protein for its ability to induce an immune response to WNS in bats, and UW veterinary experts are testing how to deliver that protein in a gel that bats ingest and transfer as they groom one another.

In a preliminary trial of these potential vaccines last winter, DNR biologists captured and immunized bats, treated bats infected with fungal spores, and placed them in an environmental chamber intended to mimic hibernation conditions. These lab tests delivered promising preliminary results but maintaining bats in captivity under artificial conditions is not ideal for judging real-world efficacy.

Whether or not the team's search for a vaccine succeeds, methods developed in this study are being applied to other bat diseases where vaccines could be useful.

– *Tonie Rocke, USGS National Wildlife Health Center, Madison*

■ GUANO SHOWS MORE MOSQUITOES IN BAT DIETS

All of Wisconsin's bat species consume insects, but their favorite foods and seasonal appetite changes are largely a mystery. Do certain bats mostly munch on moths or prefer a buffet of beetles?

A UW team has been analyzing bat guano in collaboration with DNR, the U.S. Forest Service Center for Forest Mycology Research and citizen scientists to better understand the diets of little brown and big brown bats and possible impacts of their foraging on insect populations.

The insects consumed by bats are digested and excreted but their DNA remains in guano. UW researchers have extracted and sequenced the genetic material so they can compare DNA in bat guano with known genetic sequences to determine the kinds of insects bats are eating.

Based on guano samples collected by citizen scientists and DNR staff in 2014, preliminary results indicate that big browns prefer beetles and little browns favor a variety of moths and flies. Some exciting results also suggest that during certain times of the year both species consume a variety of aquatic flies such as mosquitoes and midges, perhaps in much greater quantity than previously thought.

Bat diets also appear to change depending on landscape composition. Guano samples from 2015 and 2016 are now being analyzed and will soon provide an even better understanding of Wisconsin bats and the benefits of their snacking habits.

– *Amy K. Wray, UW-Madison*

■ CREATING WINTER HOMES FOR VULNERABLE BATS

An underground water reservoir that once served the Badger Army Ammunition Plant near Baraboo has been repurposed as a new winter home for bats. It's part of experimental efforts to entice species vulnerable to white-nose syndrome to use artificial, fungus-free hibernating sites.

In fall 2016, resource managers from the Ho-Chunk Nation and DNR took first steps to encourage bats to move into this new home, removing invasive shrubs and building and installing bat-friendly gates to the cistern. The gates allow bats to freely access the site on Ho-Chunk land while limiting access to humans. Foam-board baffles added to the ceiling inside the cistern provide "traps" for rising warm air, creating a range of temperatures for bats to select.

The partners, along with USDA-Dairy Forage Research Center and the Town of Sumpter, have been monitoring bats at Badger for many years. They worked from what little information is known about hibernation sites in general to create this potential winter home.

Partners are carefully monitoring the cistern for signs of winter residents and also are keeping an eye on a site in Madison where Dane County converted a tunnel beneath a former county building into an artificial hibernaculum.

– *Randy Poelma, Ho-Chunk Division of Environmental Health, and Jennifer Redell, DNR*

■ BATS ROOSTING IN TREES MORE ADAPTABLE THAN THOUGHT

Two Wisconsin bat species vulnerable to white-nose syndrome may be more adaptable in their summer habitat needs than previously thought and can benefit from sustainable forest management.

Those are preliminary conclusions of DNR research that is part of a multi-state, multi-year project funded by a federal grant to learn more about several hibernating bat species that use forests extensively in summer. The information will inform a habitat conservation plan to help biologists manage bats on the post-WNS landscape.

DNR researchers captured and outfitted female northern long-eared bats and eastern pipistrelles with small radio transmitters and tracked the bats back to the trees where they roost. Their research has revealed that northern long-eared bats are quite adaptable. They use many different tree species, both live trees and dead trees, and are found in the crevices or under bark that is sloughing off the trees.

"We do think they can positively respond to sustainable forestry," says Paul White, who leads DNR's Wisconsin Bat Program.

Radio-tracking of eastern pipistrelles started in 2016 and will continue next year. First-year results revealed that bats were roosting in leaf clusters in hardwood trees in small groups of six to 14 bats and that live spruce trees were one of their habitats.

– *Lisa Gaumnitz, DNR*