



# ECHOLOCATOR

Volume 4, Issue 1

January 2015

## LAST CHANCE

Join the Wisconsin Bat Program in August 2015 for the final Natural Resources Foundation fieldtrips to observe fall swarm at Neda Mine before WNS arrives.

To learn more visit :  
[www.wisconservation.org](http://www.wisconservation.org)

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## White-nose Syndrome in Wisconsin

Heather Kaarakka

It was with a heavy heart that we announced the first confirmation of white-nose syndrome (WNS) in Wisconsin in March. During routine WNS surveillance, Bat Program staff discovered 13 individuals with fungal growth in a single site in Grant County WI. No mortality was observed and even infected individuals appeared healthy.

With no known, feasible cure for WNS, little can be done to combat the disease now that it has entered Wisconsin's cave bat populations, however Bat Program staff will continue surveillance efforts to track the spread, and limit human-assisted transfer of the fungus through decontamination. Any information the Program can gather is another data point to add to the National fight against white-nose syndrome.



One of several individuals observed with fungal growth at Wisconsin's first WNS positive site,

## Project Edubat– Education Taking Flight

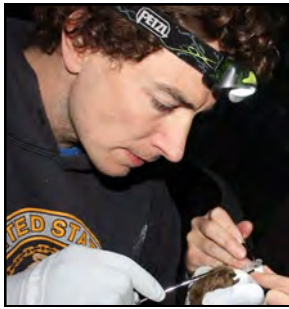
Cynthia Sandeno, Acting Regional Wildlife Biologist, USFS



There is an urgent need to educate the public about the ecological and economic importance of bats, as well as the threat of white-nose syndrome. Project EduBat is an engaging educational program designed to prepare, inspire, excite, and motivate people of all ages to take part in conserving our bats!

This important program has already resulted in the creation of brand new education curriculum geared to national education standards, interpretative materials, "train the trainer" workshops, and a live webcast. All of these free resources are available at <http://batslive.pwnet.org/edubat/>. New activities and lessons are still being developed.

Perhaps the most exciting aspect of EduBat is the creation of bat educational trunks that will be available across the country. These trunks contain everything needed to help educate children and adults about these amazing animals and the WI Bat Program will have their very own. Available at the end of January, this important resource will be available to anyone interested in teaching about bats. There would be no fee for the use of these trunks; however, shipping costs will need to be covered. There is also daily information about bats available on the EduBat Facebook page: <https://www.facebook.com/ProjectEduBat>. Please join us in using these resources to help turn others into Bat Champions!



## Acoustic Project Update

J. Paul White

We've seen many changes over the years since the acoustic bat monitoring project began in 2007, but one thing has remained consistent: Wisconsin has dedicated volunteers who love bats. The great men, women and children of the acoustic bat project have year after year braved the mosquitoes-ridden forests, paddled the dark waters, and dealt with the ever-faulty monitoring equipment to collect information on the State's bat population. In 2014, over 300 volunteers took part in 409 acoustic bat surveys in 54 counties. Survey participants spent over 550 hours this year monitoring bat activity, spending an average of 81 minutes per survey.

Many routes were repeated in spring, summer and fall which helped demonstrate seasonal changes, while some surveys included areas that have never before been surveyed for bats. One new region was Wood County, where Tracy Arnold from the Wood County Land Conservation Department coordinated several acoustic bat surveys. Vilas County had the most surveys completed at 50, which was a combined effort by volunteers from the North Lakeland Discovery Center and Eagle River volunteers (Vilas Co. Land & Water Conservation Dept.).

You might ask why are we collecting this

data and how is it being used?

As recent as this year, volunteer-collected acoustic data was used to inform the State's understanding of the northern long-eared bat range, a species that is proposed to be federally listed as endangered by the US Fish and Wildlife Service. The acoustic data has also been used to update Wisconsin's wildlife action plan which is a strategic approach to wildlife conservation. The plan is the result of a statewide effort to identify species of greatest conservation need (SGCN), and outlines priority conservation actions to protect species and their habitats. And of course, there is the invasion of white-nose syndrome, which makes the acoustic data even more important.

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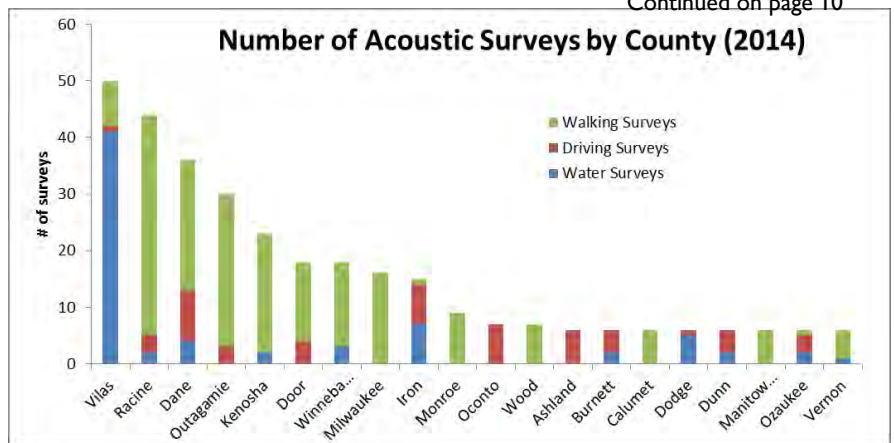


Figure 1 Number of Acoustic Bat Surveys by County and survey method. Not shown are counties with 5 or less surveys completed (n=34).



## Roost Project Update

Heather Kaarakka

This summer's maternity roost monitoring effort was a great one.

Volunteers found, reported and counted 24 new roosts; 75 total sites were monitored, and over 80 volunteers conducted over 250 emergence counts this summer! **THANK YOU** to our volunteers for their support and work this summer! We would not be able to continue the project without you. Several sites were again monitored bi-weekly or weekly (or more often!) significantly adding to the important datasets from these sites.

2014 again presented a cold, late spring and reports from folks monitoring their roosts this summer again showed delayed returns by their colonies, as well as mortality over the course of the season.

While unfortunately not found by volunteers, we now have roosts from another species to add to our

database: the northern long-eared bat! As our volunteers were busy keeping an eye on their own roosts, the WI Bat Program headed out into the field to track this little-understood species. More information on the northern long-eared bat project can be found later in the newsletter.

We completed another round of Bat Blitzes at Yellowstone Lake SP, and counted 4,186 little brown bats in June, and 2,099 in August. Cause for the drop in population is not known, but we speculate that the late, cold spring caused a delay in everything and roosts may have seen mortality, especially of pups because they were born later than normal. We are excited to report that 6 new bridge roosts were confirmed over the summer! Little is understood about the use of bridges by bats, but with every new bridge site we add to our understanding of these roost structures.

Look for the full 2014 Roost Report on our website in the coming month. As always, if you wish to participate in the roost project in any capacity, please contact me. (Contact info on back)•



## Cave and Mine Catalogue Update

Jennifer Redell

In this journey of WNS preparation and (sadly, now) monitoring in Wisconsin I keep thinking about our little crew traversing the long dark

tunnels of some of our largest bat mines... in the pitch black vastness we can only see as far as the light from our head lamps reaches, but we make the entire journey that way through miles of complex labyrinthine passages. So in the new light of WNS in WI we continue our efforts to learn as much as we can while we still have time, and partner with promising research projects in order to further our understanding of the disease.

Last winter 85 of our catalogue sites were visually inspected and surveyed, and we took swab samples from bats for WNS testing at 19 of those sites. In addition to the unfortunate discovery of WNS in Grant County, we added more than 10 new, unlikely hibernacula to the catalogue. As we continue to locate and survey new sites we continue to learn more about the distribution and hardiness of Wisconsin's bats. Due to their small size or extremely exposed nature many of these new sites are only suitable for a single species, nor do they fall clearly into a distinctive category of "cave" or "mine." Through a bit of continued history-detective work I am hoping we can locate and survey similar new sites this winter.

The summer of 2014 saw two complex mine gating projects begun and completed in southwest Wisconsin. Bat-friendly gates are designed to allow bats to fly unimpeded through the gate while restricting human access through the use of removable bars or doors. Not every hibernating bat population requires protection by the installation of a bat-

friendly gate, however some sites are out of sight of watchful landowners or the landowners have repeated issues with trespassing and winter disturbance making them suitable candidates. If cave/mine owners indicate they are interested in a bat-friendly gate, we apply Federal funds for WNS work or use gift money from donors to support the gate project.



Bat-friendly gate being installed at a mine entrance in SW WI, summer 2014

Next comes determining what type of gate is suitable and feasible for the site while working with the landowner to ensure their goals for site access are met. The logistics of cave gating include choosing materials and determining how materials will be transported to the site (which is often remote) as well as how will the gate be constructed (power sources are typically not available). We used a boat and numerous volunteers to haul long, heavy, angle iron bars across a pond and constructed the gate in standing water near

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## Northern Long-eared Bat Listing

Heather Kaarakka

Because of drastic declines observed in bat populations in the Northeast from white-nose syndrome (WNS), one of Wisconsin's four cave bats, the northern long-eared bat (*Myotis septentrionalis*), was proposed in fall 2013 to be listed as federally endangered. This *Myotis* species, like the little brown bat, is particularly hard hit by WNS, and researchers in the East routinely observed mortality rates of over 95% in infected sites.

Decision on status listing was to be made in fall 2014, but due to the desire of US Fish and Wildlife Service (USFWS) to continue to gather information about the species and its ecology, a third comment period remained open through December 2014 and the decision was extended for another 6 months.

The northern long-eared bat roosts in trees during the day in summer, and in effort to protect the species at all times of the year, USFWS voluntary Interim guidelines restrict harvest and cutting of trees from April through September when bats are likely present in the forest.

Another possible outcome for the northern long-eared bat is to list the species as federally threatened which would award the species protection and can specify conservation measures that are necessary and advisable for the conservation of the species.

A final decision is to be made in April 2015.



## Investigation of Possible Transmission Routes of White-nose Syndrome

Joseph Hoyt UC– Santa Cruz

White-nose syndrome is spreading rapidly across North America, and managers have noted how quickly the fungus that causes the disease can spread through a bat population the first winter it arrives at a cave or mine. When bats are hibernating they are thought to be relatively inactive, only arousing for brief periods about once a month to maintain normal functions including drinking and mating. This raises the question: how is it that by the end of the first winter nearly 100% of bats can become infected with the fungus. One answer to this could be that during these brief periods of arousal bats are having very high rates of contact with other bats. Contact rates can vary both among individuals (certain individuals can be more curious or social and have more contacts) and among species (some species of bats are known to be highly social and hibernate in large groups, which could result in more contacts).

In order to investigate this question we applied a fluorescent tracer dust to bats at the beginning of hibernation to measure contact rates of bats over a single winter. This dust can be passed from the original dusted bat to other bats it may come into physical contact with. We dusted two species of bats, the tricolored bat (also known as eastern pipistrelle; *Perimyotis subflavus*) and the little brown bat (*Myotis lucifugus*). These two species were chosen because they are both highly affected by white-nose syndrome, but have very different social behavior during hibernation. The tricolored bat roosts primarily alone whereas the little brown bat roosts in small to large clusters.

We found that little brown bats spread the dust to many more bats of their own species than tri-colored bats. The less social tricolored had very few contacts over the winter, and hardly any additional bats of this species became contacted with the fluorescent dust. In contrast, in one site, one little brown bat contacted over 150 other bats, which helps to explain how most bats in a cave can be become infected over a single winter.

**Joseph R. Hoyt** is currently a graduate student in Ecology and Evolutionary Biology at University of California, Santa Cruz. He first worked as a lab technician with the New York State Department of Environmental Conservation's Wildlife Pathology Unit from 2008 to 2009. There he worked on isolating, culturing and describing the optimal growing conditions for *P. destructans*. Since then he has been researching white-nose syndrome in the field for a total of four years, and has recently received an NSF EASPI fellowship to investigate the presence or absence of *P. destructans* in China. He also enjoys craft microbrews and fine Wisconsin cheese.



Joe and his crew cover bats with UV light reactive dust in a site to investigate movement and possible transmission routes.

## 2014 Wisconsin Bat Festival in Milwaukee



M. LaBarbera

The generous contributions of sponsors and donors (both new and continuing) made it possible for the Organization for Bat Conservation to bring bats from around the world to educate the public about bat conservation. Attendees had face to face encounters with the giant Malayan flying fox, endangered Rodrigues fruit bat, vampire bats, Jamaican leaf-nosed bats, big brown bats, and straw-colored fruit bats. In-kind donations to the silent auction raised \$650 for the Wisconsin Bat Conservation Fund, supporting statewide bat conservation efforts in perpetuity.

This year's event reached more than 1300 attendees over three days and three venues. Additionally, 100 individuals (volunteers and staff) donated their time, travel, and energy to share their love and knowledge of bats with the public.

Volunteers and staff engaged families in hands-on activities-- they were the faces of the Festival who provided meaningful experiences to adults and children. We had great attendance in the Science Symposium, which serves to deepen the public's knowledge about bat conservation efforts. Presenters from agencies, universities, and nature centers shared their stories and expertise as well as research and monitoring results with the public. Science presentations this year covered a wide range of topics including rabies, white nose syndrome, acoustic monitoring, bats of Cuba, and caves.

## Raising Funds for the WI Bat Program the Cold Way

March 1 Bayfield Wisconsin– It takes dedication to help conserve Wisconsin’s bats, and no one has made a bigger sacrifice in the name of bats than Brian Heeringa, Jennifer Maziasz and Sarah Holmes during the 2014 Bayfield Polar Plunge. Dressing as a bat, bat girl (representing bat biologists) and WNS respectively, the three braved frigid Lake Superior to raise a whopping \$1,100 with \$660 going directly to the Wisconsin Bat Conservation Fund and the remainder going to the Bayfield Recreation Center. A giant thank you to the three for raising money to support bat conservation in the state!

Right: WNS and the bat prepare to jump in. Photo: Bemused Design & Photography



## What has the Bat Program purchased with donated funds?

With funding donated from private citizens and through Natural Resources Foundation, WBP has been able to purchase the following items this year.

- 20 Bat bunkers– These long-lasting bat houses were purchased in partnership with Kent Borcharding and they will replace degraded bat houses on state properties in southwest Wisconsin.
- Yellowstone Lake State Park projector—The new projector for the park will allow Yellowstone Lake SP staff to continue to educate campers and visitors about bats before watching the amazing emergence

- in the evening.
- Supplemented cave gate–Some of the donated money was able to aid in the installation and completion of a bat-friendly gate in southwest WI.
- Additional hand-held PIT tag reader– WBP was able to purchase another hand-held PIT tag reader to scan for tagged bats underground.



Example of the bat bunkers purchased for state properties

## Images from the field

Big brown bats hanging out in a bridge



Crossing a river to find a bat



An cluster of Eastern pipistrelles, a species that typically hibernates alone

Photo: J. Hoyt

# Northern Long-eared Bat Pilot Project

**Paul White**

Prompted by the arrival of the deadly bat disease white-nose syndrome and a pending federal listing as endangered by the US Fish and Wildlife Service, the Wisconsin Department of Natural Resources' (WDNR) implemented a pilot project in the summer of 2014 to help better understand roost use by maternity colonies of northern long-eared bats. Prior to this effort, northern long-eared bat summer habitat use in Wisconsin was derived solely from mist-net and acoustical data, but these datasets provided no way to understand roost tree characteristics and colony size. Free-flying bats were captured in June and July 2014 in the four study areas using high mist-net systems. Female northern long-eared bats were tagged with radiotransmitters, and followed to their day roosts using radio telemetry. Nightly emergence counts were conducted to estimate population size.

**Summary of results:**

Fourteen female northern long-eared bats were radio tagged within the four study regions. Twelve of these tagged bats were successfully tracked to 26 roost trees within the Flambeau River State Forest, Sandhill Wildlife Area and Black River State Forest. Average tracking period was 5.9 days (range: 3-9) and each bat used an average of 3.2 trees (range: 2-6). Average time spent in one roost was 1.7 + 0.5 days and



the greatest number of consecutive nights in one tree was 4. Seven tree species were confirmed as northern long-eared bat diurnal roosts: red oak, red maple, aspen, sugar maple, white oak, white ash and black ash.

The WDNR intends to build from the 2014 research by investigating northern long-eared bat ecology in other regions of Wisconsin in 2015, and also examine known maternity areas to understand yearly habitat use. Funding for the project will come from a federal grant.

Above: Trees to where NLEB were tracked. Bottom shows the transmitter antenna of a tagged bat sticking out from under bark.

Left: Female northern long-eared bat tagged in Black River State Forest.

## Volunteer Profile: Jacki Whisenant

**Volunteer projects you are involved with:**

Bat Program acoustic and roost monitoring projects.

**Why you volunteer:**

I volunteer because I enjoy helping out and making some small contribution to work that needs doing.

**What do you get out of it:**

I get an hour's worth of time to myself each time I go to count



bats, which is very peaceful. Several of the sites are in areas that are away from noise and traffic, so it's a nice break that we don't often get with schedules crammed to bursting. Acoustic monitoring was also a completely new experience, and quite fascinating to see the echolocation calls sketched out on the screen as bats flew by.

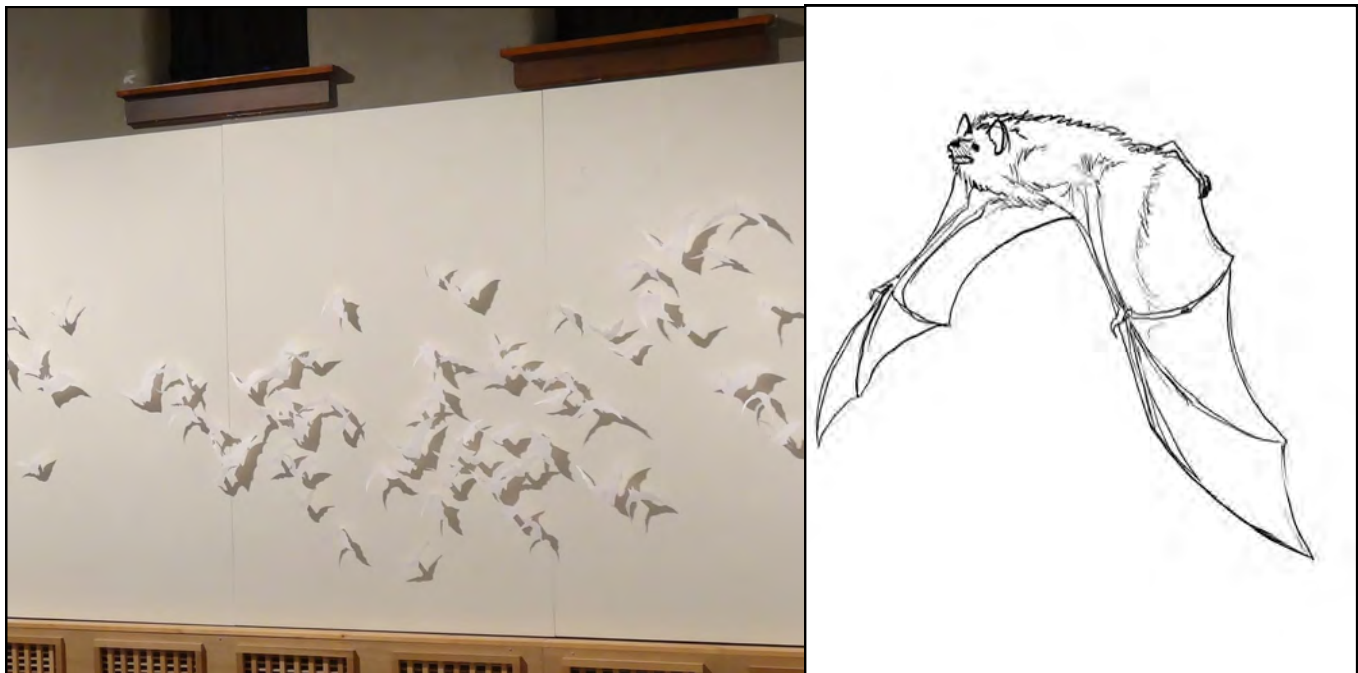
### **What is your favorite part of the program:**

Every year I am impressed by how welcoming the DNR bat folks are, (and bat folks in general!) and of course, bats! There is always something new to learn, and staying active in an area of interest encourages you to continue investigating.

### **What you tell others to get them excited about volunteering:**

Not only do you get to see a bat show at sunset, but you are helping keep track of each site in order to learn more about the roosting patterns. Each data point contributes to the whole, so it is positive on many levels! Baby animals usually have a high interest factor for people, so I make it a point to tell folks how you can start to tell when the little ones start flying - there was one session in the middle of the summer where a small bat circled the Picnic Point area once, then latched back on to the bat house, eventually crawling back inside. Too soon! Usually the response I get is "Oh really? You can just... volunteer and do things like that?" Of course! Volunteering is healthy both for the benefits it provides your chosen organization but also for the volunteer themselves - it feels good to donate time and know that it is useful, even in a small way. Like I said before, the folks here are very inclusive and they make it very easy to contribute and be a part of the program.

"...it feels good to donate time and know that it is useful, even in a small way."



Jacki studied art at UW Madison and has returned to school for biology. Above left, a wall installation of Jacki's and right, one of her sketches. Jacki lives in Madison and is an invaluable part of CBM Bat Monitoring in the area.

## Newly Described Bat Fungus Honors the Late David Redell

### Jennifer Redell

Before the discovery of white-nose syndrome (WNS), a fungal disease caused by *Pseudogymnoascus destructans*, there were no reports of fungal skin infections in bats during hibernation. A recently published paper, *The Fungus Trichophyton redellii* sp. Nov. Causes Skin Infections that Resemble White-nose Syndrome of Hibernating Bats, by Lorch, et. al in the Journal of Wildlife Diseases describes a newly discovered fungus found growing on hibernating bats in Wisconsin and other states. The genitive species epithet honors the late David Redell, WDNR bat ecologist, for his discovery of the infections caused by this fungus and for his contributions to bat conservation and research.

In 2011 Wisconsin Bat Program staff observed hibernating bats with visible fungal skin infections in multiple caves and mines, similar in appearance to WNS, but outside the range of *P. destructans* and WNS at that time. Other states also reported similar fungal infections.

Tape impressions or swab samples were collected from affected areas of skin from bats with these fungal infections in 2012 and analyzed by microscopy, culture, or

direct DNA amplification and sequencing of the fungal internal transcribed spacer region (ITS). A psychrophilic species of *Trichophyton* was isolated in culture, detected by direct DNA amplification and sequencing, and observed on tape impressions. Deoxyribonucleic acid indicative of the same fungus was also detected on three of five bat carcasses collected in 2011 and 2012 from Wisconsin, Indiana, and Texas. Superficial fungal skin infections caused by *Trichophyton* sp. were observed in histopathology for all three bats. Sequencing of the ITS of *Trichophyton* sp., along with its inability to grow at 25 C, indicated that it represented a previously unknown species, described herein as *Trichophyton redellii* sp. nov. Genetic diversity present within *T. redellii* suggests it is native to North America but that it had been overlooked before enhanced efforts to study fungi associated with bats in response to the emergence of WNS.

Lorch et al. 2014. The fungus *Trichophyton redellii* sp. nov. causes skin infections that resemble white-nose syndrome of hibernating bats. *J. Wildl. Dis.* 51: 36-47.

<http://www.jwildlifedis.org/doi/abs/10.7589/2014-05-134>

## Remote Monitoring of Bats

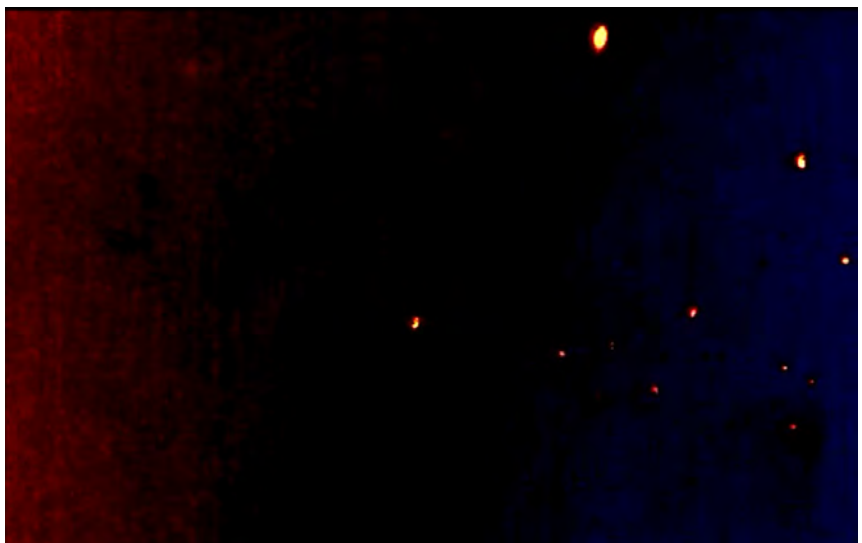
### Heather Kaarakka

The Wisconsin Bat Program has recently deployed equipment at several winter hibernacula that allow for remote, long-term monitoring while bats are hibernating underground. Thermal cameras were installed at several sites in 2013 and allow the Program to record and log behavior and phenology for bats in the sites while not entering the site. The thermal cameras record changes in temperature and have been set up on clusters of bats to determine how often bats wake from torpor naturally (WNS-free). When a bat is in torpor, its body temperature matches that of the surrounding habitat and will not show up on the camera. As the bat wakes, it warms and is displayed as orange against the black or blue background.

The thermal cameras will continue to gather information for several years and aid in our understanding of behavior of WNS-free and WNS-affected bats.

In addition to thermal cameras, a remote reader for bats tagged with passive

integrated transponders (PIT) tags has also been deployed. PIT tags are similar to RFID chips and are a method of permanently marking individuals. A remote reader deployed at a hibernaculum entrance records the ID number of the tag, date and time when the bat flies through. The reader was deployed in spring 2014 and over the summer has recorded several individuals flying into and out of the site several times.



Thermal camera footage from an underground site displaying warm bats as orange spots against the blue and black colder background.



# WISCONSIN BAT PROGRAM VOLUNTEERS- THANK YOU!!!

Since 2007, the WPB has had help from more volunteers than can be listed on this page.

## Acoustic Monitoring

Thank you to the countless nature centers, universities, regional coordinators and volunteers who help make hundreds of acoustic surveys happen every year.



Sue Holloway waits to start an acoustic survey on a lake



Volunteers counting bats at Yellowstone Lake SP

## Roost Monitoring

Thank you to the landowners and bat counters who keep both eyes on their residents over the summer.

## Bat Festival

Thank you to the volunteers who help coordinate, run and plan the Bat Festival and without whom, the festival could not happen.



### WAYS TO GET INVOLVED

The Wisconsin Department of Natural Resources' Wisconsin Bat Program relies heavily on grants and funding support from citizens who are interested in bat conservation. Get involved and help Wisconsin's bats in one of several ways:

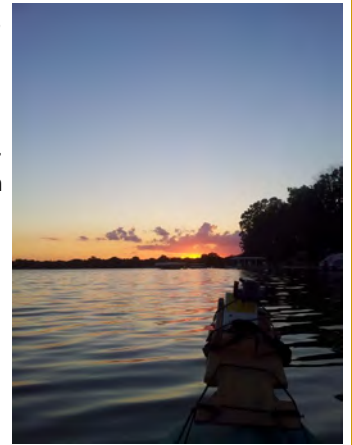
- Become an acoustic monitor
- Conduct a summer roost count
- Put up a bat house in your yard
- Help out at the WI Bat Festival
- **Donate** to the *Wisconsin Bat Conservation Fund*— your gift is tax deductible (<http://www.wisconservation.org/>)

## Acoustic Update Cont'd

Echolocation calls recorded during acoustic surveys can be stored in perpetuity.

These permanent, historical records of species presence and relative abundance in both WNS-free landscapes and WNS-affected regions will be of use to conservation planners, researchers and land managers into the future. To quote the White-nose syndrome National Plan (USFWS 2011), "Monitoring WNS-affected bat populations is necessary to determine which species may be at risk of local extirpations and extinction due to WNS, and WHERE conservation and management

activities would be most effective." With the help of our dedicated volunteers, the Wisconsin Bat Program continues to develop a state-wide perspective on bat populations and their associations with natural communities. We hope to continue the sustained momentum through the 2015 acoustic monitoring season.  
THANK YOU!



## Cave and Mine Cont'd

the mine entrance at the first project site The second project site had multiple entrances, of both vertical shafts and horizontal adits, as well as sloping sink holes that needed to be secured using a variety of materials and methods. We are grateful to the owners of these significant hibernacula for their active participation in the projects and for protecting the bats that hibernate on their land.



### Design of bat-friendly gates

Multiple factors are considered when designing bat-friendly cave gates, however, in general they are often constructed with horizontal angle-iron bars spaced 5 and 3/4 inches apart to allow for unrestricted flight and exclusion of unauthorized human visitors. Far left: Former, outdated bat gate at Horseshoe Bay Cave in Door County. Left: New, updated bat-friendly gate at Horseshoe Bay Cave, designed by the WBP and installed in 2012.

## Horseshoe Bay Cave Update

Jennifer Redell

In partnership with Door County, the Wisconsin Bat Program (WBP) continued inventory and monitoring work within Horseshoe Bay (HSB) cave, met with other partners and stakeholders, and developed a final Management Plan for Horseshoe Bay (HSB) Cave which was unanimously approved by the Door County Board of Supervisors in June of 2014. Approval of the Management Plan was the final step of the Horseshoe Bay Cave project begun in 2012 to inventory the cave's geologic, cultural, and biological resources, improve and rebuild the cave's bat-friendly gate, and to learn more about this important bat hibernaculum through increased monitoring efforts at the cave. At the outset of the project the outdated cave gate was redesigned and rebuilt to be both more bat friendly and user friendly. A directional infrared beam-break bat counting system was installed near the entrance which allows us to monitor both cave population and ecological trends (fall swarm and spring emergence timing). Additionally, a PIT (Passive Integrated Transponder) tag reading system was



installed to capture information about tagged bats. Both systems required a remote power source, so a solar panel system was installed outside the cave to allow for use of technology in bat monitoring at the site. Both PIT tagging and banding allow us to identify individual bats at summer and winter colonies, track their movements, gather data about overall health and longevity, monitor survival after WNS arrives, and monitor reproductive success. In future years, as fewer bats remain, the need to understand the apparent successes (or failures) of these individuals becomes critical. Currently there

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## Bat Diet Analysis Project

Heather Kaarakka

Bats are a major predator of night-flying insects in North America. As such, they may act as natural pest control for agriculture and forestry industries. But to determine what role bats play in pest suppression, we must first understand what exactly they eat and how much. Researchers from UW-Madison, Zach Peery and Claudio Gratton, are interested in what we stand to lose in terms of natural pest suppression should WNS significantly impact bat populations in the state. We know little about bat diets regionally, so Dr. Peery and Dr. Gratton have written a grant proposal to help investigate what bats in Wisconsin eat through genetic analysis of guano. Guano is collected several times over the summer and sent to the University for analysis using DNA sequencing techniques. This summer, over 15 volunteers collected guano samples from their roost sites. Collected samples include guano from both little brown bats and big brown bats. The newly funded project is slotted for a 5-year timeline, and hopes to also investigate possible changes in insect populations as WNS impacts bats in the region.



Little brown bat guano collects on plastic below a bat house in Madison.

## New Insights into the Seasonal Transmission of White-nose Syndrome

Kate Langwig UC– Santa Cruz

Since the arrival of the fungus causing the disease white-nose syndrome in the mid-2000's, bat researchers have noted the markedly seasonal patterns in bat mortality from disease. Similar to "flu season" for humans, there is also a "white-nose syndrome season" that occurs each winter when bats return to hibernacula, the caves and mines where they spend the winter. Each winter since 2006 has therefore brought about additional detections of the disease across an ever broadening geographic area, as well as the continued death of thousands of bats. It has remained unknown, however, if bats were infected year-round, which could mean faster spread of the disease westward if bats were transmitting the fungus during important migration periods.

Research we recently published in the journal *Proceedings of the Royal Society B* shows that bats are most infected with the fungus that causes white-nose syndrome during the winter while they are hibernating. When bats lower their body temperatures during the winter, the fungus is able to grow on their skin, invading the tissue and setting off a cascade of physiological disruptions. As the fungus grows, contacts among bats become increasingly infectious, resulting in most individuals in sites be-

coming infected by the end of winter. This exceedingly high infection rate and high fungal loads at the end of winter has likely driven the high mortality observed at the end of the winter season. Fortunately, most bats that survive to the end of hibernation and migrate to maternity colonies clear latent infections over the summer. Surviving females give birth at the maternity colonies, and their young are not infected with the fungus. However, when bats return to infected hibernacula in fall to mate in "swarms", some bats become re-infected with the fungus. As bats remain active throughout the fall fattening and mating period, infections remain light, and little bat-to-bat transmission occurs. It is not until bats begin hibernating that the fungus begins to grow on their skin and most transmission takes place.

This research provides important insight about the timing of potential treatments for white-nose syndrome. Although no treatments are currently ready for widespread field deployment, the timing of application will be critical in ensuring success. If treatments offer only short-term protection, like fungicide treatments which might only inhibit fungal growth for a

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## Horseshoe Bay Cave Update (cont'd)



Conducting bat surveys and other work in HSB Cave is difficult due to muddy passages and standing water

are banded and PIT tagged bats in Wisconsin and Minnesota that are occasionally re-sighted during winter hibernacula surveys or summer mist-netting. As part of the HSB Cave project approximately 8% of the cave's total population was either banded or PIT tagged in order to monitor individuals. Numerous banded and PIT tagged bats have already been re-sighted in HSB cave as part of winter survey efforts. Understanding both timing of hibernation and distribution of bats hibernating in HSB Cave is critical for determining how to balance bat use of the cave with human access and use. More than 1,200 individual bats hibernate in the cave from October 1- May 15; most are little brown bats, however all four cave hibernating species are present. One-third of the population hibernates within 50 feet of the cave entrance, while the majority of bats hibernate in the Big Room, nearly 1,000 feet from the cave entrance. In the winter of 2014, low water conditions allowed WBP staff to travel beyond the Big Room for the first time since 2010 when bat surveys were first begun at the cave. Staff were able to complete the muddy crawl and swim all the way to the Waterfall Room, 2,000 feet inside where 100 bats were discovered hibernating. Finding relatively large numbers of bats using this room indicates these individuals are accessing the back part of the cave via a second entrance (likely a narrow fissure or bedrock crevice, because no human sized openings are known to exist above

the cave); high water typically keeps part of the passage between the Big Room and Waterfall Room flooded (sumped) during fall and spring when bats enter and exit hibernation areas.

In order to allow public access to HSB Cave the final Management Plan was developed to include protection for site resource, including bats, balanced with opportunities for access to the cave for both scientific purposes and education. The Management Plan outlines goals, processes, and procedures for County management of the site, protection and preservation of cave resources, opportunities for science, education, and resource monitoring, access, visitor restrictions, and safety considerations. The HSB Cave

Live photograph of a groundwater amphipod, *Crangonyx* sp., collected in HSB Cave, the first record of its kind in WI



Photo: S. J. Taylor.

Inventory compiles all known resource information about HSB Cave with the results of recent inventory efforts to document the presence of geological, cultural, and biological resources, including bats. Some exciting results of the initial biotic inventory include the documentation of likely cave obligate invertebrates, including an aquifer adapted amphipod and a potentially undescribed collembolan. Creating guidance for managing a sensitive and critical resource like HSB Cave will help preserve the cave in its natural state for future generations of humans, and bats.

## WBP Wish List

The Wisconsin Bat Program relies heavily on grants and donations from Wisconsin's citizens. If you do not have the time or interest in volunteering for the WBP, but would still like to contribute, please consider donating to the gift account so the program may purchase much needed supplies and equipment to complete bat research and conservation in Wisconsin.

- Roost PIT tag reader- \$2,950 per site
  - Track PIT tagged bats at summer roost sties to investigate movement and site fidelity.
- Hibernaculum remote PIT tag reader-\$2,950
  - Remotely track midwinter, spring and all bat movement at hibernacula
- Roost infrared camera- \$299 per camera
  - Remotely observe bats at a maternity roost and record behavior



Thermal camera footage from early morning swarm at a roost site in Lafayette County WI.

## New Insights Cont'd

few days or weeks, it will be important to apply these at a critical time when fungal loads are high, and after most bats become infected. Our research suggests these types of treatments would be most effective in winter as most bats remain uninfected during fall.

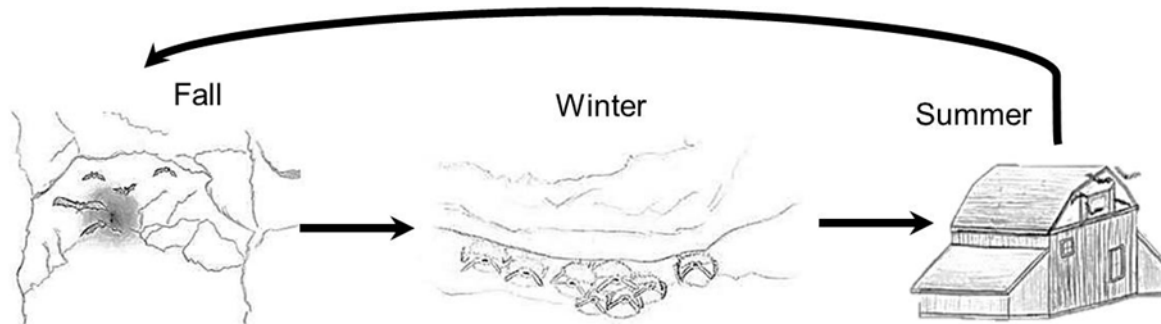
As this winter rapidly approaches in Wisconsin, we will continue our surveillance efforts for white-nose syndrome. Our current study in Wisconsin examines which species might be important in spreading the fungus from bat to bat, and how the fungus invades and establishes in new sites. These efforts will provide important additional information on which species are most important to treat, and which site characteristics will be most likely to contain white-nose syndrome survivors. This study, combined with the information described above about the seasonality of white-nose syndrome, will provide a more comprehensive understanding about how and why white-nose syndrome causes such devastating impacts, and what efforts might be taken to mitigate the effects.

Kate Langwig is a Ph.D. candidate in Ecology and Evolutionary Biology at the University of California Santa Cruz, and has been working on white-nose syndrome for seven years. She

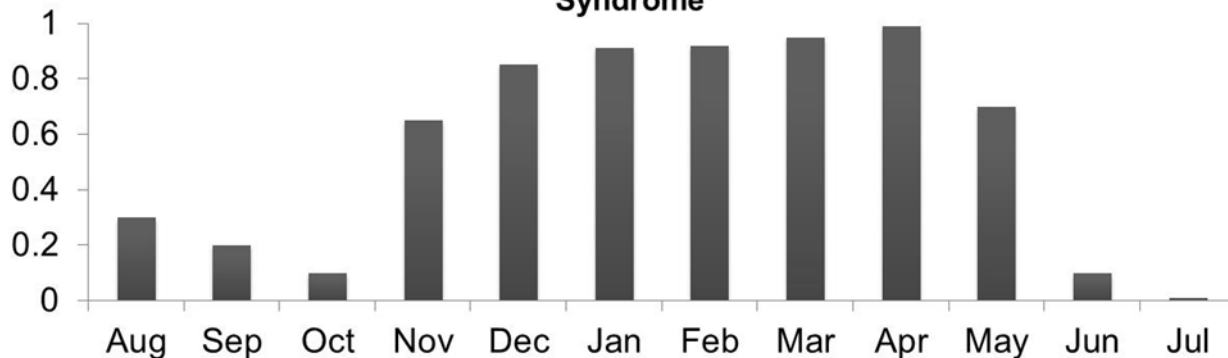
has authored 13 publications on the ecology and impacts of white-nose syndrome, and has been named a National Science Foundation Graduate Research Fellow, and a National Geographic Young Explorer. She has been working on bats of Wisconsin for three years, and greatly enjoys her visits to the Midwest (especially the beer and cheese!) Learn more at <http://people.ucsc.edu/~klangwig/>.



Photo: R. von Linden



**Fraction of Bats Infected with Fungus Causing White-Nose Syndrome**



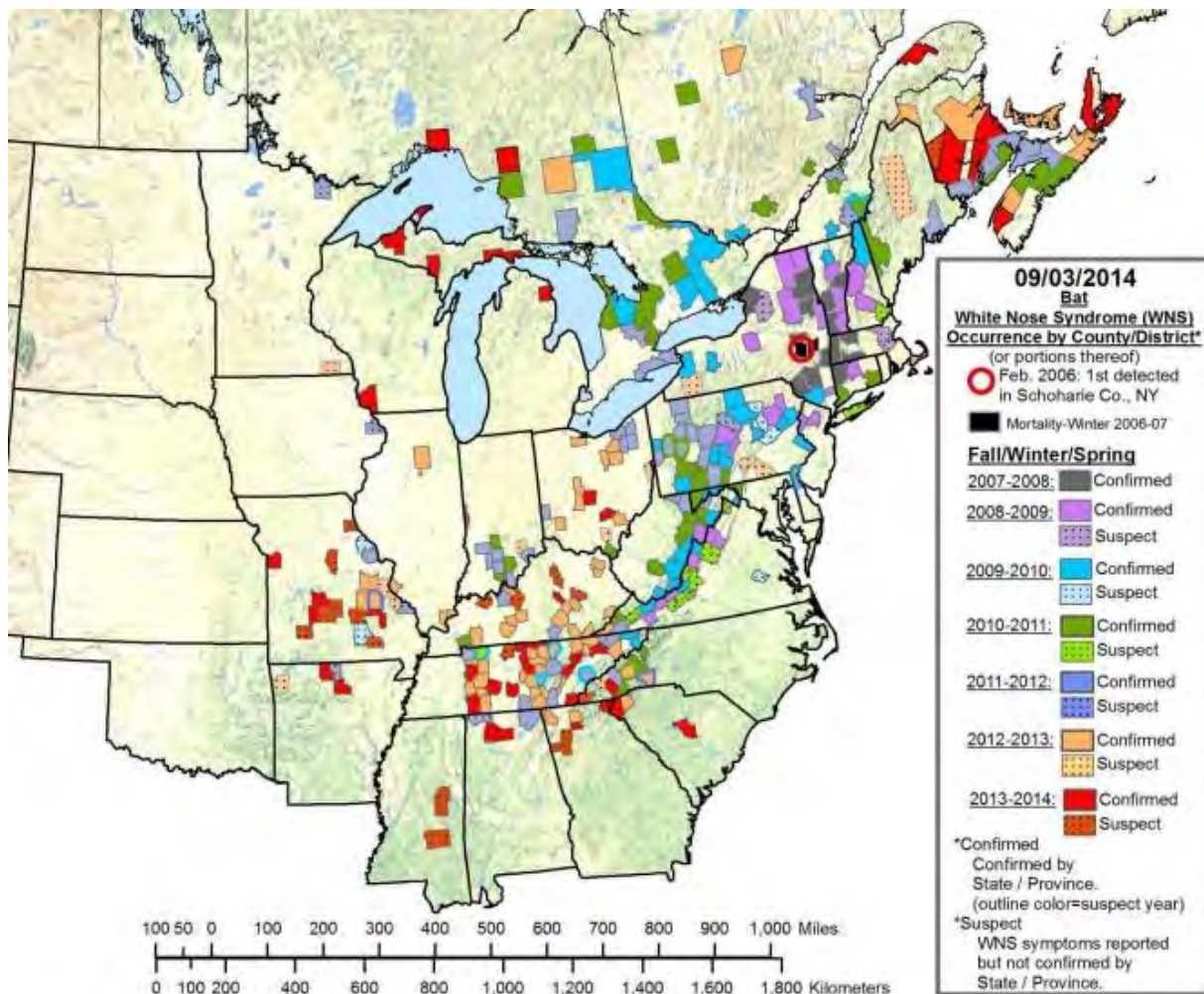
**Featured Bat:  
Eastern red bat (*Lasiurus borealis*)**



The eastern red bat is a medium-sized bat in the genus *Lasiurus* and related to the hoary bat. It is a member of the group of bats that migrate south for winter instead of hibernating in caves or mines. This bat has bright brick-red or orange fur with light frosting at the tips of some of the hairs.

In Wisconsin, the red bat is relatively common, and can be found roosting in leaf clusters in summer and fall. This species is generally solitary except when they may form groups when migrating south. During fall migration is also when red bats mate.

In winter, the red bat can use its heavily furred tail membrane to stay warm when it curls it around its body like a blanket. Little is known about eastern red bat winter behavior and distribution, but it is thought that the species moves further south out of Wisconsin during cold months. In southern areas, red bats are sometimes observed flying and foraging during warm spells throughout winter.



Map by: Lindsey Heffernan, PA Game Commission

## What do I do if I find dead or flying bats this winter?

As white-nose syndrome (WNS) invades Wisconsin, landowners have the potential to find infected bats. Dead bats at summer roost sites in January-February, and flying out of caves and mines in January-February are both signs of WNS. Knowing of these occurrences helps the Wisconsin Bat Program (WBP) track the disease and potentially make management decisions based on the information.

If you see either of these behaviors, please take the following actions:

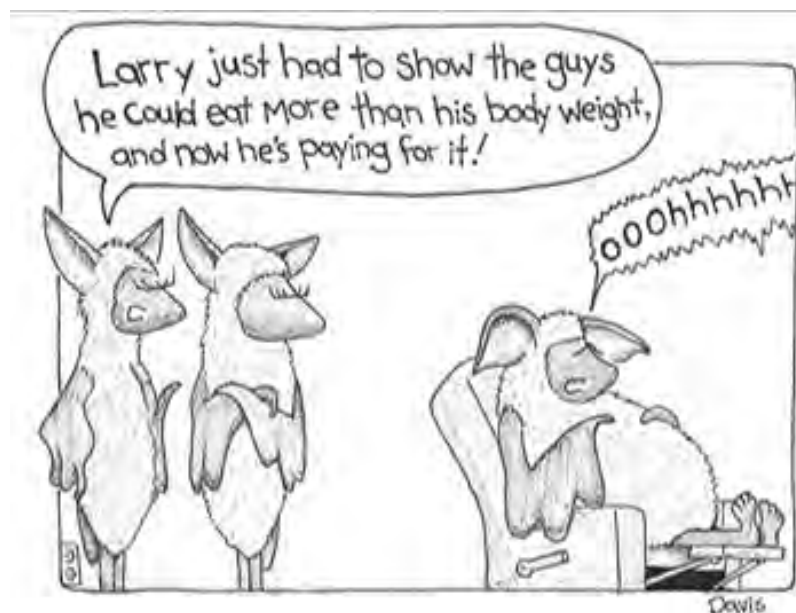
1. Alert the Wisconsin Bat Program of the occurrence by calling the bat call line: 608.266.5216, emailing [dnrbats@wisconsin.gov](mailto:dnrbats@wisconsin.gov) or submitting a dead bat report on our website: <http://wiatri.net/inventory/bats/Reporting/>. Please describe in detail what you saw. Also note that the call line does not have personnel on 24 hours a day, so please leave a detailed message. Someone will return your call or email as soon as possible. An option to **upload a photo** now exists on the reporting form, please utilize if you can as this will expedite identification of species and condition of the bat.
2. If the bat is still alive, DO NOT pick up the bat. Photograph the occurrence, and take notes on behavior. Alert the WBP by one of the following methods above. Please also note your location in your message.
3. If the bat is dead, USE GLOVES to double-bag the carcass in plastic bags and place it in a safe, cold place outside or in a freezer. Alert the WBP and someone from the program will arrange to collect the bat from you if it is needed for testing.

Thank you in advance for watching for usual or atypical behavior of bats this winter.



### Wisconsin Bat Festival t-shirts available!

T-shirts from this year's WI Bat Festival are available from the Program! Women's, men's and kids sizes available. \$10 each— [dnrbats@wisconsin.gov](mailto:dnrbats@wisconsin.gov) or [jennifer.redell@wisconsin.gov](mailto:jennifer.redell@wisconsin.gov) for purchase information.



Program website: <http://wiatri.net/inventory/bats>

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Report colonies, caves, or unusual bat behavior at [DNRbats@wisconsin.gov](mailto:DNRbats@wisconsin.gov)



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To subscribe or unsubscribe to the WI Bat Program mailing list, please visit the [GovDelivery site](#) or follow the mailing list link on the Bat Program website.

If you have suggestions for articles, or have a story you would like to contribute, contact:

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Or

[Jennifer.Redell@wisconsin.gov](mailto:Jennifer.Redell@wisconsin.gov)



Scan this barcode with your smartphone to go directly to the Wisconsin Bat Program Website!

**NEW!!**

The Wisconsin Bat Conservation Society is an annual membership where groups and citizens can support bat projects that need immediate funding. Specifically, these funds will be used for WNS research, landowner support in WNS prevention and control, surveillance, inventory, monitoring, applied management, and education about the benefits of bats. For details about how to donate head to: [www.dnr.wi.gov](http://www.dnr.wi.gov) keyword <bats>

**\*If you see sick or dead bats this winter, please contact the program!**

The Wisconsin Department of Natural Resources' Wisconsin Bat Program relies heavily on grants and funding support from citizens who are interested in bat conservation

## Support the Wisconsin Bat Conservation Fund



The Wisconsin Bat Conservation Fund is a permanent endowment managed by the Natural Resources Foundation of Wisconsin. Contributions to the Fund will support bat conservation needs in Wisconsin.

Yes! I would like to make a contribution to the Wisconsin Bat Conservation Fund.

**Gift Amount**

- \$25
- \$50
- \$100
- \$250
- \$500
- \$ Other

Please send me information on how I can leave a bequest to the Fund through my estate plan.

**Name(s)** \_\_\_\_\_

**Address** \_\_\_\_\_

**Phone** (\_\_\_\_) \_\_\_\_\_ - \_\_\_\_\_

**Email** \_\_\_\_\_

Make checks payable to the Natural Resources Foundation and mail to: Natural Resources Foundation of Wisconsin, Attn: Wisconsin Bat Conservation Fund, PO Box 2317, Madison, WI 53701. The Natural Resources Foundation is a 501(C)3 tax-exempt organization. Receipt of gift will be officially recognized by the Foundation. Contributions are tax deductible to the extent allowed by law. Visit [www.wisconservation.org](http://www.wisconservation.org) to donate online.