

WNS REFERENCES

NSS White Nose Syndrome Website

www.caves.org/WNS/index.htm

NSS White Nose Syndrome Rapid Response Fund

www.caves.org/WNS/Rapid_Response.shtml

NSS Comments on Draft National WNS Plan

www.caves.org/WNS/WNS_NSS_Comments_on_Draft_WNS_National_Plan,_Dec._26,_2010.pdf

USFWS- A National Plan for Assisting States, Federal Agencies, and Tribes in Managing White-Nose Syndrome in Bats

www.fws.gov/WhiteNoseSyndrome/pdf/WNSNational%20Plan_DRAFT_10.21.2010.pdf

Detection of the Conidia of *Geomyces destructans* in Northeast Hibernacula, at Maternal Colonies, and on Gear – Some Findings Based on Microscopy and Culture

(Okoniewski et al)
www.fws.gov/WhiteNoseSyndrome/pdf/AbstractsofPresentedPapersandPostersFor_scroll_to_page_17

Investigations into the Environmental Transmission of WNS to Hibernating *Myotis lucifugus*

(Hicks et al)
[www.fws.gov/WhiteNoseSyndrome/pdf/AbstractsofPresentedPapersandPostersFor_\(see_page_12\)](http://www.fws.gov/WhiteNoseSyndrome/pdf/AbstractsofPresentedPapersandPostersFor_(see_page_12))

America's Most Common Bat Headed for Eastern Extinction

(Brandon Keim)
www.wired.com/wiredscience/2010/08/bat-extinction/

White-Nose Syndrome Fungus (*Geomyces destructans*) in Bats, Europe

(Wibbelt et al)
www.cdc.gov/eid/content/16/8/1237.htm

“Geographic Translocation of Bats: Known and Potential Problems”

(Constantine)
www.cdc.gov/ncidod/eid/vol9no1/02-0104.htm

Geomyces destructans Sequencing Project, Broad Institute of Harvard and MIT

www.broadinstitute.org/annotation/genome/Geomyces_destructans/MultiHome.html

Wing pathology of white-nose syndrome in bats suggests life-threatening disruption of physiology

(Paul Cryan et al)
www.biomedcentral.com/1741-7007/8/135

Hellhole Cave, West Virginia: WNS Photo-documentation Trip and Bat Survey, February 20, 2010

A joint project of the National Speleological Society, West Virginia Division of Natural Resources, and the U.S. Fish and Wildlife Service

Peter Youngbaer, NSS White Nose Syndrome Liaison

Hellhole Cave, in Pendleton County West Virginia, is a 28-mile-long cave, and the state's largest bat hibernaculum, home to six bat species. Long a popular caving destination, the cave is on private property, and is now closed to protect federally endangered Indiana bats (*Myotis sodalis*) and the rare Virginia Big-eared bats (*Corynorhinus townsendii virginianus*).

Typically, West Virginia Division of Natural Resources does a biennial survey, consistent with the recovery and management plan for the Indiana bat. The last survey (2007) showed over 112,000 bats. The majority are Little Browns (*Myotis lucifugus*), but some 4-5% of the known Indiana bats live here, and over 6,000 Virginia Big Ears—about 45% of the entire known population on the planet. The normally-scheduled survey in 2009 was cancelled, due to the discovery of WNS at West Virginia's Hamilton Cave and the desire to leave the bats undisturbed.

However, in January, 2010, bats were observed flying outside the entrance of the cave. WVDNR's Craig Stihler contacted me to assist in organizing this bat count. The goals of the survey were to document any effects of WNS on the various species of bats, to get an accurate count of the endangered bats, photo-document the larger concentrations of bats (some clusters number in the thousands), and to replace data loggers.

This project came together very quickly over 3-4 weeks. While awaiting laboratory confirmation of WNS in a couple of Little Brown bats, organization moved forward

on several fronts. I was asked to organize cave/bat photographers from around the country and get official NSS Project status, while logistics were organized in terms of equipment, travel, and permits and waivers.

Fifteen people on three different crews went in to document three separate areas of the cave. Each crew had guides from the Germany Valley Karst Survey, a biologist, and photographic crews. The jobs were to photograph everything, count and observe bats, replace temperature and humidity data loggers, and remove an appropriate number of bat carcasses, if any. We were able to connect with and include a National Geographic photographer and assistant, (NSS members Steve Alvarez and Alan Cressler) who were working on the WNS story that appeared in the December, 2010 issue.

Ryan von Linden brought NYDEC's camera equipment to demonstrate the less intrusive photographic methods NY has used for bat surveys, compared to hand counting. The bats are photographed, the humans leave quickly, causing fewer disturbances, and the bats are then counted back in the office.

The bad news: upon arriving at the sinkhole entrance, plenty of bats were readily observed exiting the cave and flying outside on the nearly three feet of snow left over from a major storm. Many bats flew off into the distance to a certain death, given the absence of food supply this time of year. Others were seen landing and “wing-walking” on the snow.



Mike Chu nearing the top of the 160-foot drop into Hellhole

Stephen Alvarez

In the entrance room (a 160-foot drop into a huge bell chamber), bats were everywhere: flying, on the walls, and the floor littered with carcasses. Virtually all were Little Browns. From one 15-meter square sample area, a gallon-size Ziploc bag was filled with dead bats. The rest of the floor was the same. In contrast, the 2007 survey observed only one bat in the entrance room.

The Little Brown bats were clearly hard hit. At their different roosting sites, WNS was in clear evidence, and carcasses found along the way. In the deepest recesses of LBB roosts, lesser amounts of the fungus were



Peter Youngbaer

Shipp Room photographic and bat survey crew

evident, implying that bats had moved to the entrance area, consistent with behaviors observed in northern sites.

The Indiana clusters also showed WNS, but not anywhere near as affected as the Little Browns. Signs of WNS were seen on only 1.6% of the Indiana bats, and the raw number of Indiana bats was up nearly 5,700 individuals, to 18,577—the largest number on record. Ryan von Linden, from NYDEC, said these sites looked like what they had seen in year one of an infestation in NY. For comparison, the data from the northeastern sites affected for several years has shown that the Indiana bat mortality numbers are in the 50% range, as compared with the Little Browns well into the 90% range.

The good news: No evidence of WNS was seen in the Virginia Big Ears. This was extremely encouraging, as their roosts are located in places along the routes where the other infected species pass. As was the case with the Indiana bats, the population of the VBEs was up over 5,000 individuals, to 10,025, also a record.

Some pre-trip speculation had hoped that things might be different with this species. Why? 1. It's a different species; 2.

They roost in very dry areas (70% humidity or less, as confirmed by data loggers); 3. They roost in very cold areas—mid to low 30 degrees F, (again, temperature loggers at the sites have shown this consistently); 4. They rouse quickly, which may indicate they don't need to burn the sort of fat reserves other species do in order to amount an immune response to WNS.

All of these things will need to be studied and analyzed, of course, but, for now, the news is very good for the Virginia Big-eared bats. Let's hope it stays that way. A caution: we've seen WNS progress very slowly in other low-humidity sites, but not be stopped, so we'll need to see that the VBEs continue to remain untouched over a few years. This is just one site, and one observation, but it's clearly a highly significant one.

Good news aside, Hellhole's bats took a large hit from WNS: 2007's total of over 112,000 bats declined to just 66,789, with the majority of losses being Little Browns, with 38,155 remaining. In 2011, we have reports and video of a lot of bats flying again from Hellhole's entrance, most likely Little Browns.

For the record, the other species

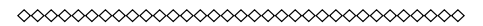
recorded on this survey were Tricolor (*Perimyotis subflavus*) 51; Big Brown (*Eptesicus fuscus*) 1; and Eastern Small-footed (*Myotis Leibii*) 0. *

After the survey, literally thousands of photographs needed to be processed, compiled, and analyzed. A comparison of the traditional clicker and cluster density methods of counting needed to be compared to the new photographic methods, and the analysis of the temperature and humidity logger data.

A huge thanks to the cavers of the Germany Valley Karst Survey for not only safely and efficiently guiding the crews to the sites, but also for use of their field house for pre- and post-cave meetings.

One last, but important note: Hellhole is leased by a limestone quarry, which electronically monitors the cave for any unauthorized intrusion. As a result, we know that no one had been in the cave since September 1, 2007. Thus, we know that WNS arrived here by bat-to-bat transmission, not via humans.

Project Participants: Craig Stihler, WVDNR, Barbara Douglas, USFWS, Peter Youngbaer, NSS, Gordon Brace, GVKS, Steven Alvarez, Christopher Beauchamp, Calvin Butchkoski, Lewis Carroll, Michael Chu, Alan Cressler, Ed Devine, Yvonne Droms, Jeff Hajenga, Brian Masney, Mark Minton, Seth Perlman, Ryan von Linden, Jack Wallace, and Daniel Zinz.



*(Source of data: Hellhole Cave, Pendleton County, West Virginia, Results of the Winter Bat Survey Conducted on 20 February 2010, Prepared by Craig Stihler, West Virginia Division of Natural Resources, Wildlife Resources Section, Wildlife Diversity Unit, 15 June 2010).



Mark Minton

Cal Butchkoski counting Virginia Big-ears in the Plecotus Room



Michael Chu

Jeff Hajenga above the Shipp Room



Stephen Alvarez

Virginia Big-eared bats (*Corynorhinus townsendii virginianus*)



Yvonne Drome

Little brown bats, one with band, in Bat Room



Michael Chu

Virginia Big-eared bats (*Corynorhinus townsendii virginianus*)

Virginia Big-eared bats with ears curled up



Jeff Hajenga

Little browns with WNS seen on way to Shipp Room



Brian Maeney

Little browns with WNS in Bat Room



Ryan von Linden



Brian Maeney

Virginia Big-eared bats in the Plecotus Room