White-Nose Syndrome: Year Six, and Counting

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It's February, as I sit here writing, gazing out at the deep, beautiful white snow that covers Vermont's landscape. The appearance is tranquil. However, with another kind of white—the appearance of the fungus on hibernating cave bats known as White-Nose Syndrome, there is no tranquility.

We have already learned of new sites affected by White-Nose Syndrome (WNS) this winter. Indiana and North Carolina are the latest states added to the list, bringing the count of WNS-confirmed states to thirteen, plus two Canadian provinces. In addition, bats from Missouri and Oklahoma have tested positive for the fungus associated with WNS, *Geomyces destructans*, but not yet for WNS. Virginia, West Virginia, Tennessee, and Pennsylvania all report new sites. The winter counting has just begun.

In this article, we will summarize the disease progression of WNS, inform you of the status of WNS research, and discuss the variety of federal, state, and other management strategies underway. Throughout, we will discuss the involvement of the caving community and the effects of WNS on caving and cavers.

Disease Progression

Exactly six years ago, Paul Rubin, a professional hydrologist and NSS caver, took photographs of some sick-looking bats in Howes Cave, the non-commercial section of New York's Howe Caverns. This remains the first documentation of what has become known as White-Nose Syndrome (WNS), but we didn't know it at the time.

In the winter of 2006-2007, discovery of large and odd bat mortalities in four New York caves (the NSS' Schoharie and Gage Caverns, the Northeastern Cave Conservancy's Knox Cave, and the state of New York's Hailes Cave—a protected Indiana bat hibernaculum since the 1970s) caught the rapt attention of northeastern cavers and the New York Department of Environmental Conservation. But spring arrived, bats emerged from hibernation, and all seemingly quieted down—until the following year.

In the winter of 2007-2008, WNS exploded across the northeast, spreading widely across New York, Vermont, Massachusetts and Connecticut. In 2008-2009, WNS spread to the Middle Atlantic region. In 2009-2010, the spread continued, but a new wrinkle was added when evolving research techniques permitted us to differentiate between bats with confirmed WNS, and those upon which just the fungus, *G. destructans*, has been found. Is the fungus an early sign of the disease? Were we seeing disease-resistant bats? We don't know. Tennessee, Missouri, and Oklahoma had sites in this category. Tennessee also had two confirmed sites, as did Canadian provinces Ontario and Quebec.

Cal Butchkoski, a bat researcher from the Pennsylvania Game Commission, created the now-ubiquitous WNS map, which has been a terrific aid to all of us tracking the progression of WNS. Just today, we received a new update with another site in West Virginia added to the map. Unfortunately, these updates are expected to be frequent until the end of spring as reports trickle in, bat samples are analyzed, and results confirmed.

WNS Research

Science is slow. The process of developing a hypothesis, controlling for errors, carrying out the prescribed work, collecting and analyzing data, describing the results, and getting them published (requiring peer review), can take years. WNS has moved very quickly. State and federal bat biologists and wildlife managers—both pubic and private—have scrambled to get ahead of the curve. Research funding is in short supply, but more on that later.

We still do not know for sure that the fungus, *Geomyces destructans*, is the cause of WNS, although scientists believe it is clearly implicated. We still do not know if humans are a significant vector for WNS—or a vector at all. We still don't know if some bats are resistant to WNS and can recover. We do know the disease continues to spread, and kills significant numbers of bats in hibernacula—well above 90% in many cases.

WNS research has been progressing on several fronts. This includes understanding the fungus itself—its life cycles, what it needs to take hold and grow, its genetics. Investigation also includes work on how bats are responding to WNS—immune system responses, behaviors in the hibernaculum, wing damage, species affected and under what conditions. In addition, research continues into possible treatments. In this section, we'll focus on some of the major highlights from the past year and current work.

WNS Transmission

This is probably the topic of most interest to the caving community. People involved in the WNS investigation generally agree that the primary method of WNS transmission is bat to bat. This has been proven in the laboratory, and field experience continues to confirm this. For example, the newest WNS sites in North Carolina and Indiana have been gated and closed to visitation for years, ruling out a human vector.

Some work conducted at the U.S. Geological Survey's (USGS) National Wildlife Health Center laboratory suggested that environment-to-bat transmission was possible. Results were inconclusive and experiments are being repeated.

Many management strategies, however, continue to focus on the potential for human transmission. From the U.S. Fish and Wildlife Service's (USFWS) caving advisory to decontamination protocols, the focus is virtually all on humans. Similarly, other federal and state agencies follow suit. Perhaps this is because there is no known way to stop bat-to-bat transmission, so the feeling is that something must be done.

Many media reports and agency press releases use general terms to describe the potential for human transmission, such as "increasing evidence." Few reporters push back and ask for the evidence. Let's be extremely clear here: to date, six years into the WNS investigation, there is no documented or published proof of human transmission of WNS.

Is there potential? Most would agree the potential exists, but opinions on how relatively significant that potential is vary widely. The risk is probably highest among researchers who are directly and intentionally handling bats and visiting WNS sites. That is why protocols for cleaning and disinfecting clothing and equipment are so strict. For cavers, some of whom travel widely, the risk involves being an inadvertent transporter of the fungus to an unaffected region, creating a new epicenter for the disease. That is why the apparent "jumps" to places like Missouri or Oklahoma cause such alarm, even though the finding of the fungus at these sites has not been linked to humans.

So, what is the evidence? The USFWS cites only three reports:

a. "Work conducted by the USGS NWHC has found viable fungal spores in cave sediment."

b. "Research conducted by the NYDEC Wildlife Pathology Unit has isolated fungal spores off a backpack, coveralls, and a fabric instrument bag upon exiting a cave."

c. "Other research has demonstrated that bats can develop WNS through infection directly from an affected cave environment, and in the absence of bats."

That's it. That's all there is to date in

terms of research, although all these studies are frequently cited by agencies, cavers, environmental advocates, and the media to buttress opinions and management actions. But what is in these reports? Let's take a closer look.

The USGS study, **Geographic Distribution of the Psychrophilic Fungus (*Geomyces* sp.) Associated with White-Nose Syndrome (Blehert, et al),** was funded in part by the NSS. Cavers assisted in collecting 550 sediment samples from 114 hibernacula in 24 states bordering on and east of the Mississippi River in the winter of 2008. The purpose was to determine whether or not the newly described fungus was ubiquitous to the cave environment. Due to difficulties with the polymerase chain reaction (PCR) analysis, a more sophisticated, but more costly technique was developed, and only 24 samples were finally analyzed, from 19 sites in WNS-affected states and 5 non-affected states. 3 of the WNS-affected samples showed *G. destructans* (CT, MA, NH); none others tested positive. (Source: Progress report to the NSS and USFWS. A manuscript has been submitted for publication.)

In the second instance, also unpublished, NYDEC's Joe Okoniewski showed that he was able to culture viable *G. destructans* from a cave pack. His abstract, **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),** presented in Pittsburgh last May on this subject simply said: "Conidia of *G. destructans* were observed in swab or rinse samples of apparel and gear used in WNS-affected hibernacula." He cultured the fungus in a lab. No transmission to another site was attempted. Interestingly, he also noted, "We have not yet found *G. destructans* growing on anything in hibernacula except live or freshly dead bats." (See references)

Similarly, in the third citation, it wasn't a laboratory test, but a field experiment, that demonstrated that bats could get WNS from the environment. An abstract was also presented at Pittsburgh, **Investigations into the Environmental Transmission of WNS to Hibernating *Myotis lucifugus* (Hicks, et al)** (see sidebar for link)**.** This study is also unpublished. There were a number of questions raised about methodologies, but non-infected bats brought in from Wisconsin and sealed into two mines did get WNS. So, at least in this one study, the environment was able to sustain viable fungus from the spring until the following fall without host bats. Whether or not there was decaying matter is undetermined, and how long such viability would last is also undetermined.

NSS member Dr. Hazel A. Barton, Ph.D., Ashland Endowed Professor on Integrative Science, Department of Biological Sciences, Northern Kentucky University., was awarded a major research grant by the U.S. Fish and Wildlife Service. See text below for details

That's it for transmission research. However, this is changing. One of the six major grants awarded by the USFWS in October, from the funds we successfully lobbied Congress to appropriate in 2009, went to Northern Kentucky University microbiologist and NSS member, Dr. Hazel Barton for a project entitled, **"Natural history of *Geomyces* in cave environments: phylogeny, ecosystem activities, natural and anthropogenic transport,"** in the amount of $271,182.

This is the first major study specifically intended to focus on human transmission potential in the context of understanding what it takes for this fungus to move, take hold, grow, and colonize. While it won't provide answers tomorrow, it should help us get off the "do we or don't we" merry-go-round and answer several long-standing questions.

Three major topics the research will address are:

1. The timing and dynamics of *Geomyces destructans* transmission;

2. Does fungal growth/occurrence vary with hibernacula, and why?; and

3. How long can the fungus remain viable under environmental conditions?

These are interrelated questions. Understanding the structure of the fungus - how it might attach and be transported - should help identify high risk activities and solutions. But, even if human transport is possible, the growth cycle and nutritional needs of the fungus, as well as the environmental conditions, need to be favorable for disease transmission to occur.

In terms of transmission, Barton will be looking at the structure of the fungus itself (e.g. curved conidia, vs. straight), and how it attaches to materials - natural (rock, clay), skin, hair, clothing, and equipment. These will be collected and tested, after washing and other methods of cleaning.

She will also look specifically at how well people pick up spores in different environments: recreational cavers and their equipment, tourist visitors to show caves, bat researchers handling bats, mist nets, and researchers at known WNS-infected sites.

Materials from all of these people will be collected, processed, and analyzed. Comparing normal collection of *Geomyces spp.*, that is, people doing "normal" activities, to the WNS control site, along with survivability studies, should conclusively determine whether the anthropomorphic spread of WNS is possible and/or likely. It should also inform about risky behaviors, such as reuse or not cleaning research and caving equipment and supplies between caves.

This two-year project will take hundreds of samples, collected from a wide geographic area of the country, and run thousands of analytic tests. The results should answer a lot of questions and bring a far higher level of sophistication to disease management than we have today.

Major WNS Published Research

A number of research papers on WNS have been recently published. The one that has received the most attention is ***An Emerging Disease Causes Regional Population Collapse of a Common North American Bat Species,*** by Winifred Fricke and collaborators, published August 6, 2010 in *Science*. The researchers applied mathematical modeling to the declining population numbers of *Myotis lucifugus* (Little Brown Bat) in the Northeast. If mortality rates continue as they have, the researchers predict regional extinction, called extirpation, is as little as 16 years (see references for link to article in *Wired Science*). This has led a few states (Massachusetts, Vermont, Wisconsin) to propose adding species of bats to their state endangered lists.

White-Nose Syndrome Fungus (Geomyces destructans) in Bats, Europe, by Germany's Gudrun Wibbelt, and an international group of collaborators, was published in *CDC Emerging Infections Diseases*, Vol. 16 Number 8, August 2010. This study confirms a number of observations of the fungus on European bats. The genetic sequencing of the European samples is identical to the U.S. samples, although in no cases were there mortalities. The presence of the fungus is widespread in Europe, and appears to have been so for at least decades. No bats are known to cross-migrate the Atlantic (although the CDC published an interesting report in 2003 on bat translocation in ships, on planes, in luggage, and by hurricane winds). No European bat species

are the same as North American bats, and while all of the European bat species that tested positive for *G. destructans* are of the *Myotis* species—those most affected by WNS in the U.S.—all apparently co-exist without problem. This leads the researchers to hypothesize that the bats and the fungus co-exist in Europe, which supports the premise that the fungus in the U.S. is an exotic release of a pathogen into a previously uninfected ecosystem.

Another study, ***Geomyces destructans Sequencing Project, Broad Institute of Harvard and MIT,*** was released in October. It completed the full sequencing of the entire genome of the fungus. Because of the importance of wide availability of this information to researchers, all the work was made public and can be found at the link in the references.

In November, ***Wing pathology of white-nose syndrome in bats suggests life-threatening disruption of physiology***, Paul Cryan, USGS, et al., was published in Biomed Central's *BMC Biology*, Volume 8. This research opinion piece looks at how the fungus affects wing functions of bats and may cause their demise. From their abstract:

"The characteristic lesions of WNS are caused by the fungus Geomyces destructans, which erodes and replaces the living skin of bats while they hibernate. It is unknown how this infection kills the bats. We review here the unique physiological importance of wings to hibernating bats in relation to the damage caused by G. destructans and propose that mortality is caused by catastrophic disruption of wing-dependent physiological functions." (see sidebar)

North American Society for Bat Research - Other Research

At the North American Society for Bat Research (NASBR) annual Symposium, which took place in Denver, October 26-30, 2010, approximately 400 bat researchers assembled to present their research papers and posters. This is primarily an academic gathering, with university professors and their graduate and undergraduate students sharing what they've been working on for the past year. This gathering covers all sorts of topics, and is an upbeat and fascinating venue to learn anything and everything there is to know about bats.

WNS has taken a high profile over the past three years, as one would imagine. The NSS has funded numerous research projects on WNS, and this symposium is where a number of them are presented. It's nice to see the NSS logo up on the screen of PowerPoint presentations and receiving credit for partnering in the investigation of WNS.

WNS presentations at this year's meeting covered microclimates in caves and mines, video documentation of bats with WNS in their hibernacula, immune response of WNS bats, passive acoustic monitoring as a non-invasive surveillance technique, heat-trapping roost modules as a mitigation strategy, reports of population change data at summer acoustic monitoring sites, the impact of WNS on maternity colonies, fatty acid metabolism and lipid transport by *G. destructans,* wing injury recovery in WNS bats, survival estimates, factors affecting cave temperature and WNS implications, patterns of fat accumulation and depletion in WNS bats, documentation of the declines of six hibernating bat species from WNS in the northeastern U.S., and a comparison of other hibernating mammals and potential for natural selection to help bats rebound from WNS.

There was also a plenary panel session on WNS, featuring an introduction and basic primer (presented by Al Hicks), why WNS is not considered an ordinary disease (presented by Tom DeLiberto, USDA's Animal and Plant Health Inspection Service's, or APHIS, National Wildlife Disease Coordinator), a brief presentation on the Draft National WNS Plan, which hit the streets during the conference (presented by Allison Whitlock, the Northeast's new WNS Coordinator), and the current state of knowledge and research gaps (presented by Paul Cryan, USGS). An all-too-short Q&A was moderated by Tom Kunz (Boston University), Gary McCracken (University of Tennessee, Knoxville), and David Blehert (USGS).

NSS Board of Governors member Jennifer Foote presented a poster, ***Hibernating Bat Counts in New Mexico Caves,*** demonstrating collaboration between the caving community and the Bureau of Land Management (BLM). There was plenty of networking going on, and discussion was plentiful of the latest in state and federal management proposals and scientific investigation. I had the opportunity to meet directly with researchers the NSS has funded, as well as speak with others about prospective projects.

Looking at the breadth of subjects, it's easy to see that people are working on many aspects of WNS, but there is still a tremendous amount that is not known about the disease, the fungus, how it affects bats, what bats it affects, where it affects them, and what we might do about it.

Funding for WNS Research

The last of the money Congress appropriated in 2009 was awarded in six research grants issued in October, and future funding is very much up in the air. Congress adjourned last fall without approving a budget for 2011. No new funding specifically for WNS is in the pipeline, federal agencies don't know what their base budgets are for the fiscal year which began Oct. 1, 2010, and all but a couple of states are in significant deficits.

As of this writing, we don't know what funding is being proposed by the Obama Administration for 2012. The NSS is working with other advocacy groups and academic researchers to try to obtain additional research funding, but the political and fiscal environment is very uncertain. Our best guess is that core USFWS funding for endangered species, prevention extinction, and state wildlife grants will continue at some level, but its uses are limited, and not targeted toward hard science research.

Private funds are in short supply. The NSS has raised over $100,000 for WNS research, through our WNS Rapid Response Fund. Many thanks to all who have contributed. We have been able to fund a dozen critical and timely research projects, providing bridge and match funding, and enabling projects that would not have otherwise occurred. Bat Conservation International has also provided significant funding, as well as a few other private sources, but it hasn't come close to what is needed. Without hard science to answer questions and provide guidance, all we will have is management, monitoring, and surveillance.

Management Activities

State and federal agencies, bat biologists, and non-governmental organizations, including the NSS and cave conservancies, have all struggled over the past year to address WNS challenges. A wide variety of approaches are being taken, with mixed results.

Probably the most significant development was the issuance of the Draft National WNS Plan by the U.S. Fish and Wildlife Service. Nearly two years in the making, the Draft was posted in the Federal Register in October, and public comments received through December 26. The NSS submitted detailed comments (see sidebar for links to the Draft Plan and NSS Comments) and a list of NSS members willing to serve on the various WNS Working Groups.

Over 9000 comments were received, and USFWS is reviewing all of them. Once revised and adopted, the Plan is intended to be a "static" framework, to be followed by "dynamic" implementation initiatives. Some task forces are already working.

Other federal agencies, including the U.S. Forest Service (USFS), the BLM, and National Park Service (NPS), have issued a variety of orders and policy statements as they try to address WNS or prepare for or attempt to prevent its arrival. Sometimes these have been done in collaboration with

the organized caving community; other times not.

New Mexico

For example, New Mexico issued a Final White-Nose Syndrome Interagency Response Plan early November that was developed collaboratively with fourteen federal and state agencies, the NSS and local grottos, and private landowners. I had the opportunity to attend the Albuquerque meeting on November 8, and was impressed with the easy working relationship evident among the collaborators. Clearly, the caving community and agencies benefited from long-standing relationships working on caving projects on federal lands.

Agency personnel expressed their interest in a different approach than had been taken in other regions with blanket cave closures and the ensuing backlash, such as in Colorado. With no WNS near New Mexico, they also had the luxury of taking both a preventive approach, as well as a collaborative one, working to develop baseline data, such as identifying significant bat hibernacula for targeted management if and when WNS approaches.

It's a fact of life that the extent of caves and bats is unknown on the vast expanses of federally owned land west of the Mississippi. Agencies don't know the extent of what exists on their lands, and have scant resources to find out. Working with the organized caving community makes eminent sense.

Wisconsin

In contrast, is the situation in the state of Wisconsin, where state officials issued emergency orders declaring four bat species as threatened, and named the *Geomyces destructans* fungus a "prohibited invasive species."

Wisconsin Department of Natural Resources (DNR) says this was done to permit a range of management options, including forcing cave owners—public, private, and commercial—to choose between excluding humans or excluding bats from their caves. Several caves have been sealed—not just gated—to prevent bats from entering. Officials have yet to say where these bats are expected to go, and how this will prevent WNS from spreading if and when it arrives in Wisconsin.

While downplaying some of the authority granted by the emergency orders, state officials can get court orders to go on private land and confiscate private possessions (gear, equipment, etc.) in order to prevent the fungus from entering the state or to gain compliance of landowners with management strategies.

This was roundly criticized from within and outside Wisconsin. Formal comments in opposition were filed by a wide range of interests, including the NSS, the National Caves Association, bat researchers Thomas Kunz and Merlin Tuttle, other cavers, scientists, environmental organizations, and private property rights advocates. Such a stink was raised at a hearing of the state's Natural Resources Board, that a 45-day hiatus was declared for parties to work toward a solution. While rules were adopted, their review may go to the state legislature.

Tension and Consequences

One of the consequences of the lack of research funding has meant that WNS response has been heavy on the management, surveillance and monitoring aspects, and light on the hard science. That has not only created tension between the caving community and some agencies and managers, but also tension between the academic community and wildlife managers. The scientists are concerned that management strategies are out ahead of the science, and the managers are concerned that science may be too slow to have the desired impacts: stopping or containing the disease and getting bats on the road to recovery.

Cavers are also concerned that having the focus only on bats belies greater conservation goals: other cave biota, groundwater protection, and protection of the caves themselves and other cave resources, including archaeological and paleontological artifacts. Further, the caving community strongly believes it is not necessary to sacrifice access to caves in order to effectively protect bats. In many cases closure orders and advisories affect all caves, regardless of whether they are used by bats significantly or at all.

Indeed, such blanket approaches can have terrible unintended consequences. For example, the blanket closures on state and national forest lands have put additional pressure on privately-owned caves. The increased traffic isn't good for the caves, nor for landowner relations.

Just recently in Indiana, following the report of WNS in that state, a private landowner threatened to bulldoze her cave shut so as not to "have to deal with the feds." This cave is a former commercial cave, with easy passage, beautiful formations, and an historic "signature room" with names and dates going back to the 1700s. Bats do not use this cave. What a tragedy it would have been for this cave to be closed. Thankfully, an NSS member with good relations with the landowner was able to avert the disaster—at least for now.

Conclusion

White-Nose Syndrome is continuing to present major conservation challenges. These challenges are evident in the struggles over the proper management approaches, and the shortage of hard science answers to whether or not WNS can be contained, stopped, or cured. What will happen to our bats? Can they recover to pre-WNS population levels? Are management strategies to support that kind of recovery even realistic?

Mammoth Cave National Park just issued a lengthy WNS Plan, including details on how it will handle the nearly 400,000 visitors who pass through the cave each year. Will Carlsbad Caverns soon implement something similar? Or should we simply heed the cry of the Center for Biological Diversity and just close every cave and mine?

What is realistic in terms of funding? Can we prioritize research and management activities in a way that is realistic, and balances overall conservation needs, including those of bats, cave resources in general, and the need and desire to educate the public and continue to discover, explore, and study?

The title of this article is *White-Nose Syndrome – Six Years and Counting*. What are we counting? The number of dead bats? The number of affected states? The number of WNS plans or working groups? The number of members leaving the NSS? The number of closed caves?

As one who loves caves and bats, it tears at my very being to witness what is going on. Maybe bats will recover; maybe not. People need to see and appreciate them in their natural environment. It breaks my heart to hear of young people who can't venture into a cave to be introduced to its unique environment—to be shown the proper gear and techniques, to learn how fragile and irreplaceable these resources are, to experience the beauty and yes, the joy of discovery.

To date, caving has been something anyone can experience. Basic clothing and equipment is inexpensive, or can be borrowed. Unfortunately, current trends are heading toward making cave visitation something only the elite will be able to do—people with money to travel to far away places, or degrees or titles after their names, giving them exclusive access.

Cave managers and agencies shouldn't kid themselves—people will continue to go into caves—it's human nature. No administrative closure order will ever prevent that from happening. The NSS and its members have a responsibility—to the future of our organization, and to the future of caving and cave conservation. We must continue to collaborate in the investigation of WNS—to stay engaged, or risk becoming irrelevant. We must continue to be the place people will come for their first caving experience —where they learn safely, learn about the cave itself, all it holds, and why it is valuable. We must continue to fight to provide that experience.

WNS References

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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.

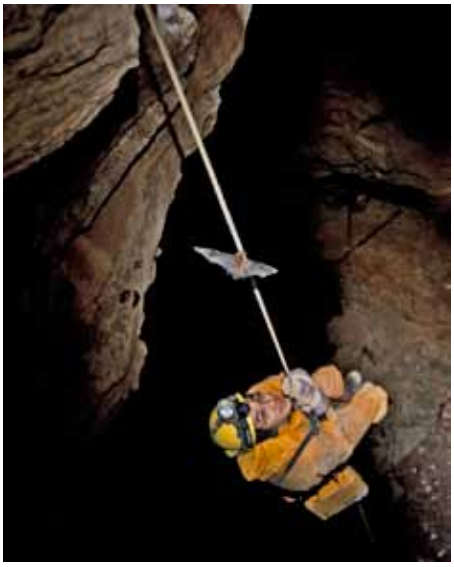
However, in January, 2010, bats were observed flying outside the entrance of the cave. WVDNR's Craig Stihler contacted me to assist in organizing this bat count. The goals of the survey were to document any effects of WNS on the various species of bats, to get an accurate count of the endangered bats, 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.



Stephen Alvarez

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

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