☞ 11hr_AC-NR_CRule_10-123_pt02

☞

(FORM UPDATED: 08/11/2010)

WISCONSIN STATE LEGISLATURE ...
PUBLIC HEARING - COMMITTEE RECORDS

2011-12
(session year)

Assembly
(Assembly, Senate or Joint)

Committee on Natural Resources...

COMMITTEE NOTICES ...

- Committee Reports ... **CR**
- Executive Sessions ... **ES**
- Public Hearings ... **PH**

INFORMATION COLLECTED BY COMMITTEE FOR AND AGAINST PROPOSAL

- Appointments ... **Appt** (w/Record of Comm. Proceedings)
- Clearinghouse Rules ... **CRule** (w/Record of Comm. Proceedings)
- Hearing Records ... bills and resolutions (w/Record of Comm. Proceedings)
  (**ab** = Assembly Bill) (**ar** = Assembly Resolution) (**ajr** = Assembly Joint Resolution)
  (**sb** = Senate Bill) (**sr** = Senate Resolution) (**sjr** = Senate Joint Resolution)
- Miscellaneous ... **Misc**

* Contents organized for archiving by: Stefanie Rose (LRB) (August 2013)

CRYSTAL CAVE

W965 State Road 29
Spring Valley, WI 54767
715-778-4414 800-236-CAVE
email: cavelady@svtel.net

March 7, 2011

Representative Jeffrey Mursau
Room 18 North
State Capitol
P.O. Box 8953
Madison, WI 53708

Dear Representative Mursau;

My husband and I addressed the Assembly Committee on Natural Resources on March 2, 2011 regarding clearinghouse rules CR 10-114, CR 10-115, and CR 10-123. During the discussion, we expressed our concern over statements made by DNR staff regarding transportation of the fungus, *Geomyces destructans*. The DNR indicated that the two methods of transport are 1. Bat-to-bat and 2. Human transport. As we repeatedly stated, there was, and continues to be no science to back the statement supporting human transport. Since the two emergency rules were presented in September, and the management plan in October, we have repeatedly requested the DNR provide us with documentation and research which would support this claim. Since the entire White Nose Syndrome management plan is based on this assumption, we felt it only right that affected stakeholders be allowed to see the underlying reasoning behind the proposals. To date no documentation has been supplied. On the other hand, several of the country's top bat researchers have provided comments to the contrary.

At the March 2 meeting I was asked to provide information that states humans are not a vector. Since then, I have received emails and phone calls from the following scientists; Dr. Merlin Tuttle, founder of Bat Conservation International, Tom Aley, founder of Ozark Underground Laboratory, and Peter Youngbaer, White Nose Syndrome liaison for the National Speleological Society. Each either included an email response or offered publications to present to the Committee. I have enclosed copies of their correspondence and the recommended publications. I have also included letters sent to the Natural Resources Committee in October expressing concerns over the emergency rules and management plan.

I would ask that the Committee please request from the DNR, the documentation which refutes the enclosed material.

You have asked me to provide proof of lack of proof. I hope the material included with this letter confirms our statements.

Thank you for your time.

Sincerely,

Jeannie Place Cunningham
Owner and Caretaker, Crystal Cave

White Nose Syndrome – Year Six, and Counting
By Peter Youngbaer 16161 CM FE
WNS Liaison for the National Speleological Society

Introduction

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 sickly-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 1970's) 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 as evolving research techniques began to permit a distinction between bats with confirmed WNS, and those upon which just the fungus, *Geomyces destructans*, has been found. Was this just an early sign of the disease? Were these 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, 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, and 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. And research funding is short, but more on that later.

We still do not know for sure that the fungus, *Geomyces destructans*, is the cause of WNS, although most 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 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. It also includes continued work on how bats are responding to WNS – immune system responses, behaviors in the hibernaculum, wing damage, which species are affected and under what conditions. Research also 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. Most people involved in the WNS investigation 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 done at the U.S. Geological Survey's National Wildlife Health Center laboratory suggested that environment to bat transmission was possible. Results, however, 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 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. It's 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 is for being an inadvertent transporter 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:

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

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.

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 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 PCR analysis, a more sophisticated, but 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 *Geomyces 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 *Geomyces 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 a 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 sidebar for link to the abstract.)

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.

Again, that's it for transmission research. However, there is good news: one of the six major grants awarded by the USFWS in October, from the funds we lobbied Congress for in 2009, went to 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.

The 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 physical transport is possible, the growth cycle and nutritional needs of the fungus, and the environmental conditions necessary to support the fungus also need to be favorable for disease transmission to occur.

In terms of transmission, Dr. 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, and clothing and equipment. These will be collected and tested, after natural 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. Comparison of 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 non-cleaning of research equipment and supplies or cave equipment between caves.

This project will take hundreds of samples, collected from a wide geographic area of the country, and run thousands of analytic tests. It's a two-year project. The results should answer a lot of questions and should 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 gotten 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 sidebar for link to article in Wired Science). This has led a few states to propose adding additional species of bats to their state endangered lists (VT, MA, WI).

"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. In no cases were there mortalities, but the presence 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 *Geomyces 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, and that this supports the premise that the fungus in the U.S. is an exotic release of a pathogen into a previously uninfected ecosystem (see sidebar).

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 reference sidebar.

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, 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 here is where a number of them are presented. It's nice to see the NSS logo up on the screen of PowerPoint presentations and to be given 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 *Geomyces 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 (Tom DeLiberto, APHIS National Wildlife Disease Coordinator – part of the U.S. Forest Service), 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 (Paul Cryan, USGS). An all-too-short Q&A was moderated by Tom Kunz (BU), Gary McCracken (UT 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. There is 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 the 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 there 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 get additional research funding, but the political environment is very uncertain. Our best guess is that some 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 to 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 alike, 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 a 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 Bureau of Land Management (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.

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.

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 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 and 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 National Speleological Society, the National Caves Association, bat researchers Dr. Thomas Kunz and Dr. 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.

One of the consequences of the lack of research funding has meant that WNS response has been heavy on the management, surveillance and monitoring, and light on the hard science. That has 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; 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 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 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 go into a cave to be introduced to this 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.

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 go for their first caving experience – where they learn safely. Where they learn about the cave itself and all it holds, and why it is valuable. We must continue to fight to provide that experience. Let's not kid ourselves – people will continue to go into caves – it's human nature. No administrative closure order will ever prevent that from happening.


FORWARD
E PLURIBUS UNUM

CDC | CDC Home | Search | Health Topics A-Z

EMERGING INFECTIOUS DISEASES

Past Issue
Vol. 9, No. 1
January 2003

Download Article
• PDF
• Help
• Feedback

EID Home | Ahead of Print | Past Issues | EID Search | Contact Us | Announcements | Suggested Citation | Submit Manuscript

Perspective

Geographic Translocation of Bats: Known and Potential Problems

Denny G. Constantine*
*State of California Department of Health Services, Richmond, California, USA

Suggested citation for this article: Constantine DG. Geographic translocation of bats: known and potential problems. Emerg Infect Dis [serial online] 2003 Jan [*date cited*]. Available from: URL: http://www.cdc.gov/ncidod/EID/vol9no1/02-0104.htm

Natural, accidental, and intentional translocation of bats, both intra- and intercontinentally, has been documented. Some bats have been translocated while incubating infectious diseases, including rabies or related lyssavirus infections; others have escaped confinement en route to or at their destinations, while others have been released deliberately. Known events and potential consequences of bat translocation are reviewed, including a proposed solution to the attendant problems.

Among the many potential consequences resulting from the geographic translocation of life forms is the spread of infectious disease organisms harbored by that life form. This consequence was demonstrated long ago by the early devastation of native American human populations caused by pathogens inadvertently introduced by European explorers. Similarly, wildlife rabies outbreaks occurred recently in the United States after foxes, coyotes, and raccoons were translocated to restock areas where these animals are hunted for sport. Wild populations of introduced species can also become common disease vectors where few or none existed before, such as the current role of Indian mongooses (*Herpestes javanicus*) in rabies transmission on Caribbean islands (1), or they can become predators of native species, for example, the wildlife destruction that occurred after ferrets and stoats were introduced into New Zealand (2).

Bats have been translocated through natural, accidental, and deliberate means. Pathogens associated with bats, such as *Rabies virus* (RABV) and related lyssaviruses (3–6), can cause disease after protracted incubation periods, ensuring the extended survival of the host and parasite during periods of translocation. Many bat species enter a hibernationlike state in a cold environment, which further prolongs survival. In this article, I describe some occurrences of bat translocation (published, as well as previously unreported) and the potential consequences of that translocation, as the basis for suggesting preventive measures to alleviate the problems that accompany the relocation of bats across the world.

Translocation of Bats

Natural Translocation

Some species of bats hibernate at the approach of cold weather; other species migrate to warm areas instead. Bats that migrate along coastlines take shortcuts over water and are apparently blown far out to sea at times. Many North American migrant bats have been found in Bermuda, 1,046 km east of North Carolina, United States, during fall and spring migrations, evidently having been blown there by wind along with waves of migratory birds (7). These translocated bats include Hoary Bats *(Lasiurus cinereus)*, Red Bats *(L. borealis)*, Seminole Bats *(L. seminolus)*, and Silver-haired Bats (*Lasionycteris noctivagans*), all species from which RABV has been isolated (8). Hoary Bats are also occasionally found in rabies-free Iceland, also possibly blown there by the wind; one bat was captured in the Orkney Islands, off rabies-free Scotland (9). Similarly, Hoary Bats are sometimes found in the Galapagos Islands, 966 km off the west coast of South America (10).

Translocation after Landing on Ships

Exhausted bats flying far at sea both individually and in flocks have been reported to alight on ships and be transported to unintended destinations. Most records are from the North Atlantic Ocean and involve Red Bats and Silver-haired Bats (11). A Southern Yellow Bat (*Lasiurus ega*) landed on a ship over 322 km from the coast of Argentina (12). A "fruit-destroying bat" was reported sleeping in the rigging of a ship upon arrival in Hawaii from the Philippines (13), and a frugivorous bat (*Vampyressa pusilla*) evidently boarded a vessel passing through the Panama Canal and was later found aboard when the ship was between Australia and Tasmania (14).

Translocation after Using Ships for Shelter

Bats sometimes roost in or on ships in port and may be transported as a consequence. Silver-haired bats were discovered hibernating in hulls of ships, and numbers of them found various refuges on ships and yachts in New York (15). Little Brown Bats (*Myotis lucifugus*) roosted aboard a ship that frequently traveled from Canada to Europe, flying ashore after arrival in the Netherlands and England (16). The presence of individual Little Brown Bats in rabies-free Iceland (9) and Kamchatka, Russia (17), has been attributed to travel by ship. RABV, other viruses, and *Histoplasma capsulatum* have been found in this species (3,8).

On January 21, 1997, a stevedore working in the hold of a ship being unloaded in Long Beach, California, after its arrival from Korea, was bitten on the back of his neck by a bat. A fluorescent rabies antibody test was negative for RABV infection. On February 1, I received the bat for evaluation and determined it to be a Serotine bat *(Eptesicus serotinus)*, which is similar to the Big Brown Bat (*E. fuscus*) but with a slightly more massive skull. The Serotine has been reported in North Africa and England and across Europe and Asia to Korea. Hundreds of ill or dead Serotines have been found infected with the RABV-related *European bat lyssavirus 1* (EBLV-1) in Europe, where one or two persons have died of the infection after bat bites (5). The rabies conjugate used in the rabies test on the Serotine bat's brain reportedly reacts with this virus as well.

Translocation in Shipping Containers

Translocation of bats by ship also occurs when bats are closed inside shipping containers. Free-tailed bats from the tropics are

occasionally transported long distances in fruit shipments (18). A Pallid Bat (*Antrozous pallidus*) was discovered in Victoria, British Columbia, in a shipment of lettuce from California (19), where RABV-infected Pallid Bats have been identified. A Big Brown Bat was found hibernating in a timber container from Canada when it was unloaded in the Netherlands (16). An Asiatic Pipistrelle bat (*Pipistrellus javanicus*) was discovered in a container transported by ship from Japan to New Zealand (20). Sasaki et al. (21) reported the arrival in rabies-free Hawaii of a RABV-infected Big Brown Bat found flying in an automobile container from California. Subsequent study indicated that previously the bat had been transported to California either from Florida in the shipping container or from Michigan in an automobile.

In October 1995, a group of live bats was observed hanging in a dark corner within a large shipping container that had just arrived at a Los Angeles port from Puerto Rico, but the bats escaped as capture was attempted and no further reports of these bats were made. Histoplasmosis, apparently absent in California except for imported human infections, has been diagnosed in some Puerto Rican bats.

Translocation by Aircraft

Bat translocation by aircraft has been reported several times. A Little Brown Bat was found clinging to a seat in an airplane at the end of a flight in Canada (22). An Eastern Pipistrelle bat (*Pipistrellus subflavus*) was recovered from a plane that had just arrived in Texas from Mexico (23); RABV-infected bats of this species have been identified in the United States and Canada. The carcass of a Little Brown Bat, presumably from Tacoma, Washington, was found on a runway at an Air Force base on rabies-free Guam (24). Stebbings reported the arrival in England of a Silver-haired Bat aboard a U.S. Air Force cargo plane from Delaware (25). Observed flying in the plane en route, the bat was captured later while sleeping in a crew member's bed in the aircraft.

An Asiatic Pipistrelle bat was captured May 25, 1993, aboard an airliner en route from Tokyo to San Francisco. This bat was negative for RABV. The next month a Yuma Myotis bat (*Myotis yumanensis*) was discovered flying aboard a U.S. Air Force cargo plane en route from California to Hawaii. This bat was also negative for RABV, although rabies has been diagnosed in the species in California. Evidently the bat was loaded into the aircraft within a shipment of fruit.

In early March 1995, a traveler who had just arrived in Los Angeles by aircraft from South Africa opened his suitcase and observed a bat fly out. The suitcase had been closed three days earlier during darkness in a hut within Kruger National Park. The bat was negative for RABV, and the frozen carcass was sent to me 2 months later with the history of origin in a Los Angeles County community. At first glance, the bat appeared to be a common local free-tailed bat (*Tadarida brasiliensis*), but closer inspection indicated differences, although the bat belonged to a family with similar representatives in warm areas worldwide. After extensive study, I determined the specimen to be a Wrinkle-lipped bat (*Chaerephon pumila*), known throughout sub-Saharan Africa, Madagascar, and southern Arabia. Further research disclosed the transported bat's African origin. This species supports experimental replication of Ebola virus without showing disease signs (26); the remainder of the carcass was immediately sent to a federal laboratory for Ebola virus tests, which proved negative. Several other viruses have also been isolated from the salivary glands of this species in Africa (3).

In June 1997, a woman was bitten by a bat hiding in clothing she was packing before an airline flight from Costa Rica to California. The live bat was restrained in a plastic bag during the flight; it was dead on arrival. The bat was negative for RABV and was identified as a Sinaloan Mastiff Bat (*Molossus sinaloae*), an insectivorous species in which RABV has been reported (5).

Translocation for Confinement

Bats have been transported varying distances, sometimes worldwide, to be maintained in captivity as research animals, as live specimens in zoos or other exhibits, and as pets. Transport for research purposes is not noteworthy except in unusual circumstances. A Big Brown Bat in the incubational stages of rabies was among live bats sent from Canada to a laboratory in Germany, where the bat developed clinical rabies (27). Similarly, six Big Brown Bats that were incubating RABV were in a group sent from the United States to a laboratory in Denmark (28). However, recipient laboratories understood the risks and had taken necessary precautions.

RABV-infected individual bats of the tropical American common Vampire Bat (*Desmodus rotundus*) have been reported throughout their geographic range, which extends from northern Mexico south to Chile and Uruguay (8,29). RABV has also developed in Vampire Bats after being transported to laboratories. In addition, during the 1970s, a group of these bats sent from Mexico to a laboratory in the United States presumably escaped en route, because only the empty shipping container arrived.

Increasing interest in bats has resulted in displaying of more varieties of these mammals, including Vampire Bats, to the public (9). One such display presented a problem I investigated in 1988 after four of eight Vampire Bats escaped their flight cage within a cavelike structure at a southern California zoo 1 month after their arrival from Mexico through a Texas supplier. Two escaped bats were found dead, possibly due to starvation or unusually cold weather. One dead bat had nearly escaped the building, and the other was outside. Neither bat was infected with RABV. The apparent escape route to the outside was through a fragile false cave ceiling, which could not be inspected. This ceiling may have contained the carcasses of the remaining two missing bats, possibly a male and a female. I found no bat bites on zoo animals and no bats or bat feces in likely hideaways in the zoo.

The large fruit-eating bats (genus *Pteropus*) live on land masses, including islands, from Madagascar, India, Southeast Asia, the East Indies, the Philippines, and Australia to the Samoan and Cook Islands of the South Pacific Ocean. They have been popular zoo attractions for many years. RABV was reported in a *Pteropus* in India (8), and RABV-related lyssaviruses were reported in four species of *Pteropus* and an insectivorous species in Australia, where two persons died of these infections (30).

Three additional viruses (*Paramyxoviridae* family) ascribed to *Pteropus* origin have proven pathogenic or fatal to people and domestic animals. Four species of Australian *Pteropus* bats in Queensland carry Hendra virus without developing symptoms. These bats disseminate virus in urine or placental fluid during birthing, and the virus is later ingested by pregnant horses that amplify the virus, which then spreads to people and causes a fatal pneumonia (13/20 horses were infected in a 1994 outbreak, which resulted in two human deaths) (30). The second virus, Menangle virus, is considered to be spread to pigs in Australia by the same four species of *Pteropus* bats, producing stillbirths with deformities in 1998 in 27% of litters, as well as an influenzalike illness in humans (30). The third virus, Nipah virus, identified in urine and saliva of *Pteropus* bats in Malaysia, apparently spreads the virus to pigs and destroyed that country's swine industry in 1998. The virus spread from pigs to hundreds of industry workers; approximately 40% of these workers died of severe viral encephalitis caused by the agent (31).

Importation of fruit-eating bats has long been severely restricted to protect the fruit industry in the United States. The Egyptian Rousette bat (*Rousettus egyptiacus*) is a widespread Old World fruit bat that readily reproduces in captivity; thus colonies occur in some zoos. This species has been implicated in several viral infections in Africa (3). An error occurred in 1994, when thousands of these and other

bat species were permitted entry into the United States for sale as pets or for exhibition (28); this procedural mistake resulted in a policy change to prevent recurrence. Antibodies to *West Nile virus* (WNV) had been reported in the *R. egyptiacus* species in Uganda and Israel (3), and the virus had been isolated in India from the nearly indistinguishable *R. leschenaulti*, which overlaps geographically with *R. egyptiacus* in Pakistan (32). The entry of *R. egyptiacus* into the United States in 1994 suggests a remote connection with the subsequent outbreak of WNV there, first observed 5 years later among captive and wild birds at a zoo in New York (33).

In 1997, two *R. egyptiacus* bats died with rabies-like symptoms in a Denmark zoo; they were later found to be infected with EBLV-1 subtype A, a RABV-related agent known to have caused deaths in European insectivorous bats and in humans. The two infected bats had arrived recently from a Netherlands zoo, where the source captive bat population subsequently was destroyed (34). A replacement colony was similarly destroyed after a bat originating from a Belgian zoo was also determined to be infected (35).

Persons concerned about sick and injured wildlife often try to rehabilitate disabled bats, sometimes transporting the animals a considerable distance from sites of discovery. Unfortunately, an average of 10% of disabled bats tested in North America are found to be infected with RABV, exposing those trying to rehabilitate the bats to rabies. If they have received preexposure rabies prophylaxis in advance, these persons are advised to take booster shots of vaccine; otherwise, they are advised to take both antirabies globulin as well as the full vaccine treatment.

Often, attempting to reverse the negative image of bats usually held by the public, persons trying to rehabilitate sick bats may suppress warnings of rabies hazards, doing both bats and the public a disservice. Moreover, to avoid the embarrassment of repeated exposures to rabid bats, some persons working in bat rehabilitation are known to arrange submission of rabies-suspect bats to a variety of different laboratories in different geographic areas, thus disguising the true history of the bat; this practice may protect the rehabilitator but prevent other persons or pets exposed earlier from receiving adequate antirabies management.

Translocation for Release

Bats have been translocated and released in attempts to establish bat populations in new areas for reasons such as insect control and experimental study. Such efforts are sometimes supplemented by providing living quarters or shelters for bats ranging from elevated boxlike structures to tunnels. Before the knowledge that some insectivorous bats might be infected with rabies or other pathogens, bats were sometimes transported great distances over land or overseas and released in efforts to establish populations at the new location. Tomich (13) assembled historical records about the importation and release in rabies-free Hawaii of Asiatic Pipistrelle bats from Japan and free-tailed bats (*Tadarida brasiliensis)* from California during the late 1800s to establish bat populations for insect control purposes, but the attempts were evidently unsuccessful.

Observing that destruction of old-growth forests eliminated the tree hollow homes of Polish bats, Krzanowski (36) recommended the introduction into Poland of Red Bats and Hoary Bats from the United States because these species take shelter in tree foliage rather than hollows, and they migrate at the approach of cold weather rather than hibernate in tree cavities. However, rabies was discovered simultaneously in North American insectivorous bats, including these two species, discouraging further consideration of the proposal.

The homing abilities of bats have routinely been studied by transporting and releasing marked bats up to 805 km from their home roost, which is then monitored for the return of the marked bats (37). RABV infection has now been identified in 11 of the 12 North American species studied, and histoplasmosis is known in 6; RABV-related lyssavirus infections have been reported in 5 of 12 European species studied (8).

During World War II, field trials were conducted in the southwestern United States to determine the effectiveness of disseminating thousands of free-tailed bats *(T. brasiliensis)* in the air, each transporting a small time-activated fire bomb. The objective was to start thousands of simultaneous fires in adversary target areas, achieved after each bat had sought out a hideaway in various available structures (38). As a participant in the project, I observed that each bomb or dummy bomb, attached by a short string and surgical clip to the bat's abdominal skin, was disengaged after the bat alighted in a refuge and chewed through the string. Thousands of bats were transported ≤1,609 km distant from source bat caves in Texas and New Mexico to test areas in California, New Mexico, and Utah. Frequently, the tests were postponed, and the freshly captured bats were released unencumbered at or near test sites. Unknown at the time, RABV is now known to occur in 0.5% of bats in the source caves (8), so the virus was almost certainly translocated with the bats. *H. capsulatum*, the causative fungus of histoplasmosis, also has been isolated from these bats and their guano in the source caves, but neither bats nor guano have yielded the agent in extensive surveys in California, which is regarded as free of the fungus; no cases of indigenous origin have been detected (8).

Discussion

Bats and the pathogenic organisms they sometimes harbor are being transported by humans within and between continents, and sometimes these transported bats escape. Because bats reproduce slowly (usually only one or two offspring are produced annually by a female), the chances of successful introduction of the species are minimized. Populations would more likely develop should large numbers be freed in places favorable to survival. Although a single escaped bat might not survive long or reproduce, it would seek shelter in places frequented by local bats to which it might transmit pathogens. As has been observed, introduced pathogens include RABV, other lyssaviruses, or various other agents.

Vampire Bats can be especially problematic in view of their possible colonization in warm climates and their dependence on a diet of blood, thus necessitating their biting vertebrates, including man and domestic animals. As reported, in addition to their known role as biologic vectors of rabies to humans and domestic animals and surra *(Trypanosoma evansi)* to horses and cattle, Vampire Bats can also be temporary biologic as well as mechanical vectors of *Venezuelan equine encephalomyelitis virus* and foot-and-mouth disease. They are likely effective mechanical vectors if not biologic vectors of any bloodborne pathogen, including the AIDS virus (29). Various species of fruit-eating bats are infected at times with pathogens destructive to other bats, humans, and domestic animals. However, their entry to many areas is restricted due to concern that their escape would lead to populations destructive to fruit crops.

Accidental or planned translocations of bats between land masses happens almost certainly with far greater frequency than is reported. Such events can be embarrassing, and although incidents that result in successful containment are more likely to be reported, failed efforts can remain unpublicized. Relevant reporting requirements do not exist. Personnel involved in the various described incidents generally have performed very well in efforts to resolve the problems, often with immediately contrived solutions. Inspectors at entry centers are usually exceptionally competent because they must cover a broad array of subject areas, but their competency must be taxed at times. For example, most bats are exceptionally adept at avoiding capture, and even bat scientists with special equipment frequently are outmaneuvered. Some inspectors contact specialists for help in emergencies, but help is not always available or is displaced by

previous commitments and economic necessities. Previous contractual arrangements with institutions such as universities, natural history museums, zoos, or specialized commercial services could dispel most relevant problems, including funding, and maintain program continuity. Unaffiliated specialized personnel would be expected to maintain or acquire relevant competency, but incidents, such as those cited here, show some lapses. Ideally, the services of a bat expert are required. For example, if bats are to be excluded from any vehicle of conveyance, the usual procedures and equipment should be reviewed by responsible persons very familiar with bats, their capabilities, their capture, their confinement, and their exclusion in order to recognize flaws that permit bats to be transported. Thus, experts can help establish and maintain more effective programs.

Acknowledgments

Appreciation is extended to the counties and state of California and to William E. Rainey, Elizabeth D. Pierson, Charles E. Rupprecht, Jean S. Smith, Kevin F. Reilly, Thomas H. Kunz, and Amy Turmelle whose help made relevant reports possible.

After the 1953 discovery of bat rabies in the United States, Dr. Constantine established the Southwest Rabies Investigations Station in New Mexico for the Centers for Disease Control and Prevention and developed its program to investigate the problem and control bat rabies. Now retired, he continues research in the field.

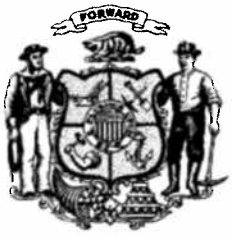
References

1. World Health Organization Expert Committee on Rabies. Seventh Report; 1983 Sep 20–27; Geneva, Switzerland. Geneva: The Organization; 1984. Technical Report Series 709.
2. King C. Immigrant killers. Oxford: Oxford University Press; 1984.
3. Constantine DG. Bats in relation to the health, welfare, and economy of man. In: Wimsatt WA, editor. Biology of bats. Volume 2. New York: Academic Press; 1970. p. 319–449.
4. Rupprecht CE, Dietzschold B, Wunner WH, Koprowski H. Antigenic relationships of lyssaviruses. In: Baer GM, editor. The natural history of rabies. 2nd ed. Boca Raton (FL): CRC Press; 1991. p. 69–100.
5. Constantine DG. Chiroptera: bat medicine, management, and conservation. In: Fowler ME, editor. Zoo and wild animal medicine. Current therapy 3. Philadelphia: WB Saunders Co.; 1993. p. 310–21.
6. Bourhy H, Kissi B, Tordo N. Molecular diversity of the genus *Lyssavirus*. Virology 1993;194:70–81.
7. Van Gelder RG, Wingate DB. The taxonomy and status of bats in Bermuda. American Museum Novitiates 1961;2029:1–9.
8. Constantine DG. Health precautions for bat researchers. In: Kunz TH, editor. Ecological and behavioral methods for the study of bats. Washington: Smithsonian Institution Press; 1988. p. 491–528.
9. Koopman KF, Gudmundsson F. Bats in Iceland. American Museum Novitiates 1966;2262:1–6.
10. Peterson RL. Recent mammal records from the Galapagos Islands. Mammalia 1966;30:441–5.
11. Griffin DR. Migrations of New England bats. Bulletin of the Museum of Comparative Zoology at Harvard College 1940;76:217–46.
12. Van Deusen HM. Yellow bat collected over South Atlantic. Journal of Mammalogy 1961;42:530–1.
13. Tomich PQ. Mammals in Hawaii. 2nd ed. Honolulu; Bishop Museum Press; 1986.
14. Hill JE, Smith JD. Bats: a natural history. London; British Museum (Natural History); 1984.
15. Murphy RC, Nichols JC. Long Island flora and fauna. I. The bats (order *Chiroptera*). The Museum of the Brooklyn Institute of Arts and Sciences Science Bulletin 1913;2:1–15.
16. Voute AM. First recorded transatlantic bat transport. Bat Research News 1980;23:16–8.
17. Hahn WL. *Myotis lucifugus* in Kamchatka. Proc Biol Soc Washington 1905;18:254.
18. Palmer RS. The mammal guide. Garden City, NY: Doubleday; 1954.
19. Schowalter, DB. New records of British Columbia bats. Syesis 1980;13:1–3.
20. Daniel MJ, Yashiyuki M. Accidental importation of a Japanese bat into New Zealand. Journal of Zoology 1982;9:461–2.
21. Sasaki DM, Middleton CR, Sawa TR, Christensen CC, Glen YK. Rabid bat diagnosed in Hawaii. Hawaii Med J 1992;51:181–5.
22. Rand AL. Mammals of Yukon, Canada. National Museum of Canada Bulletin 1945;100 (Biol Ser 29),93:1–93.
23. Burns KF, Farinacci CJ, Murnane TG, Shelton DF. Insectivorous bats naturally infected with rabies in the southwestern United States. Am J Public Health 1956;46:1089–97.
24. Wiles GJ, Hill JE. Accidental aircraft transport of a bat to Guam. Journal of Mammalogy 1986;67:600–1.
25. Stebbings RE. A silver-haired bat, from Dover, Delaware, on its fall migration southward down the eastern United States, ends up 3500 miles in the wrong direction. News release to Reuters dated 22 September 1994.
26. Swanepoel R, Leman PA, Burt FJ, Zachariades NA, Braack LEO, Ksiazek TG, et al. Experimental inoculation of plants and animals with Ebola virus. Emerg Infect Dis 1996;2:321–5.
27. Schneider LG, Mueller WW, Hohnsbeen KP, editors. Rabies surveillance report, April–June 1986. Rabies Bulletin Europe 1986;10:1–29.
28. Rupprecht CE, Smith JS, Fekadu M, Childs JE. The ascension of wildlife rabies: a cause for public health concern or intervention? Emerg Infect Dis 1995;1:107–14.
29. Constantine DG. Transmission of pathogenic organisms by vampire bats. In: Greenhall AM, Schmidt U, editors. Natural history of vampire bats. Boca Raton (FL): CRC Press; 1988. p. 167–89.
30. Mackenzie JS. Emerging viral diseases: an Australian perspective. Emerg Infect Dis 1999;5:1–8.
31. Enserink M. Malaysian researchers trace Nipah virus outbreak to bats. Science 2000;289:518–9.
32. Paul SD, Rajagopalan PK, Screenivasan MA. Isolation of the *West Nile virus* from the fruit-eating bat, *Rousettus leschenaulti*. Indian J Med Res 1970;58:1–3.
33. Nolen RS. Veterinarians key to discovering outbreak of exotic encephalitis. J Am Vet Med Assoc 1999;215:1415,1418–9.
34. Müller WW, Cox JH, Hohnsbeen KP, editors. Rabies surveillance report, July–September 1997. Rabies Bulletin Europe 1997;21:1–28.
35. Müller WW, Cox JH, Hohnsbeen KP, editors. Rabies surveillance report, January–March 1998. Rabies Bulletin Europe 1998;22:1–24.
36. Krzanowski A. O potrzebie wprowadzenia nowych gatunkow nietoperzy do naszych lasow. Sylwan, Warszawa 1954;98:96–9,222.
37. Davis R. Homing performance and homing ability in bats. Ecological Monographs 1966;36:201–37.
38. Couffer J. Bat bomb. Austin: University of Texas Press; 1992.

Comments to the Authors

Address for correspondence: Denny G. Constantine, 1899 Olmo Way, Walnut Creek, California 94598, USA


WISCONSIN STATE LEGISLATURE


FORWARD

Jeannie Place

From: Merlin D. Tuttle [merlin.tuttle@batcon.org]
Sent: Sunday, March 06, 2011 7:52 PM
To: Jeannie Place
Cc: Ed Arnett; Mylea Bayless
Subject: RE: WI Rules on WNS

Dear Jeannie,

Of course there is no science to show that humans are not potential spreaders of WNS. There is also no science to show that the spread of WNS can be stopped, or even significantly slowed through the kind of legislation proposed by the Wisconsin DNR.

I commend the state on its concern for bats and understand that their requested emergency legislation to stop the spread of WNS is well intended. Nevertheless, as Dr. Tom Kunz and I pointed out in our communication to the Wisconsin DNR last October, this hastily considered legislation, which would exclude bats from traditional hibernation sites in commercial caves, could do far more harm than good.

I have extensively studied bat movements, hibernation site fidelity and requirements, and I co-organized the first two national meetings to set priorities for research and management of WNS.

Based on my personal experience and the best available science on WNS, I predict that exclusion, if attempted, will exacerbate the spread of WNS. Bats are loyal to their traditional hibernation sites and likely will expend considerable energy attempting to gain entry at sealed cave entrances before moving to new destinations where, in a weakened, immunocompromised state, they will be far more likely to mix with the state's largest populations. If, as seems to be the assumption, bats in commercial caves are at increased risk of having been exposed to WNS, these would be the last ones that should be forced to move to new locations.

Given the high probability that exclusion will contribute to the spread of WNS, not to mention setting a highly controversial precedent, I strongly recommend against this legislation. If allowed to remain, bats in commercial caves could play an invaluable role in studies to monitor, prevent and treat WNS in bats.

Sincerely,

Merlin Tuttle

From: Jeannie Place [mailto:info@acoolcave.com]
Sent: Thursday, March 03, 2011 2:43 PM
To: Merlin D. Tuttle
Subject: WI Rules on WNS

Merlin, as you may know, the WI DNR has submitted the two emergency rules and management plan to the WI legislature for consideration. They are now called CR 10-114 (lists the four cave bat species as threatened), CR 10-115 (lists the fungus, Geomyces destructans, as a prohibited invasive species), and CR 10-123 (the accompanying management plan). Yesterday, my husband and I, along with several other individuals testified before the Assembly Natural Resources committee in opposition to these clearinghouse rules. We feel WNS can be better managed with good, mutual cooperation between the DNR and stakeholders rather than passing laws.

Jeannie Cunningham

From: "Merlin D. Tuttle" <merlin.tuttle@batcon.org>
To: "Dave Redell" <David.Redell@Wisconsin.gov>; "Gary McCracken" <gmccrack@utk.edu>; "Ed Arnett" <earnett@batcon.org>; "Hallam Sr, Thomas Guy" <thallam@utk.edu>; "Paul Cryan" <cryanp@usgs.gov>; "Mylea Bayless" <mbayless@batcon.org>; "Tom Aley" <taley@ozarkundergroundlab.com>; "Jeremy Coleman" <Jeremy_Coleman@fws.gov>; "Rick Adams" <battings@yahoo.com>; "David S Blehert" <dblehert@usgs.gov>; "Joe Kath" <joe.kath@illinois.gov>; "Shahroukh Mistry" <MistrySh@butte.edu>; "Al Kurta" <akurta@emich.edu>; "DeeAnn Reeder" <dreeder@bucknell.edu>; "Jeannie Cunningham" <jeannie@acoolcave.com>; "Peter Youngbaer" <wnsliaison@caves.org>; "Marianne Moore" <mmoore@bu.edu>; "Eric McMaster" <mcmaster@kwiksew.com>; "Brooke Slack" <Brooke.Slack@ky.gov>; "Craig Stihler" <craigstihler@wvdnr.gov>; "Scott Reynolds" <sreynolds@sps.edu>; "Jonathan Reichard" <jon.reichard@gmail.com>; "Kate Langwig" <klangwig@bu.edu>; "Aryn Wilder" <apw@bu.edu>
Sent: Monday, October 25, 2010 7:59 PM
Attach: WNSConcern.docx
Subject: Emergency Orders IS-49-10(E) and IS-47-10, related to white-nose syndrome management of bats

Dear All,

Today, we sent the attached document to Mathew J. Frank (Secretary, Wisconsin Department of Natural Resources) and to Erin Crain and Gregor Schuurman (WDNR Bureau of Endangered Resources), expressing our deep concern regarding proposed actions in the State of Wisconsin that would force commercial cave owners and active mine operators to permanently exclude hibernating bats as a means of preventing the spread of WNS (see p. 4 of the following web site document).

This recommended action will be considered by the WDNR Board on October 27. Proposed actions would occur this fall. Some exclusions reportedly have already occurred, and others may begin at any time.

Merlin Tuttle and Tom Kunz

Dear Sirs:

We commend the Wisconsin Department of Natural Resources (WDNR) for its concern on behalf of bats under its jurisdiction, and understand that all reasonable emergency provisions regarding management of white-nose syndrome (WNS) should be considered. However, we are deeply concerned about a proposal to exclude bats from traditional hibernacula in commercial caves and active mines. Based on the results of two national meetings that we co-organized to establish research and management priorities for bats impacted or potentially impacted by WNS, excluding bats from hibernacula was judged to be counterproductive to sound management practices.

Additionally, based on our own personal experiences and the best available science on WNS, we predict that exclusion, if attempted, will exacerbate the spread of WNS. Because bats are loyal to their traditional hibernacula, they will likely expend considerable energy attempting to gain entry to sites where cave portals are sealed before moving to alternate destinations where, in a weakened, immunocompromised state, they will be far more likely to mix with other hibernating colonies. If, as appears to be the assumption by the WDNR, bats in commercial caves or active mines would be at increased risk of being exposed to WNS, these individuals would be the last ones that should be forced to move to new locations at any time of year, but certainly not after many have already entered hibernation.

Given the high probability that exclusion will contribute to the spread of WNS, not to mention setting a highly controversial precedent, we strongly urge you to reject this recommendation. If bats are allowed to remain in commercial caves they could play an invaluable role in studies to monitor, prevent, or treat bats affected by WNS.

Sincerely,

Merlin D. Tuttle and Thomas H. Kunz

www.batcon.org

Laurie Ross
Natural Resources Board Liaison
101 S. Webster Street
P.O. Box 7921
Madison, WI 537077921
608.267.7420

October 22, 2010

Dear Ms. Ross,

On behalf of Bat Conservation International, we are submitting the following written comments regarding the proposed Emergency Board Order IS-49-10(E) and authorization for public hearings on proposed permanent Order IS-47-10, revisions to ch NR 40, related to white-nose syndrome management in bats.

Bat Conservation International (BCI), based in Austin, Texas, is devoted to conservation, education, and research initiatives involving bats and the ecosystems they serve. It was founded in 1982, as scientists around the world became concerned that bats essential to the balance of nature and human economies were in alarming decline. Our membership now totals more nearly 10,000 worldwide.

We applaud the Wisconsin Department of Natural Resources (DNR) commitment to conservation and their willingness to take legislative steps in an effort to address the threat of white-nose syndrome (WNS). WNS is a threatening disease that should be taken very seriously and we agree their assessment of the significant risk to Wisconsin's cave bat populations outlined in Matthew Frank's memorandum to the Natural Resources Board dated October 14, 2010. We encourage the Natural Resources Board to provide adequate staff and financial resources to enable the DNR to respond proactively to this disease threat.

We support the requirement of mandatory decontamination for all cave and bat activities occurring within the state of Wisconsin as outlined in additions 2-5 on page 3 Frank's memorandum. If such measures were permanently implemented however, we urge the DNR to provide clear and concise guidelines outlining the specific decontamination requirements to prevent confusion and/or inadvertent non-compliance with this legal regulation. Decontamination protocols have been subjected to broad interpretation, particularly when pertaining to show cave tourism and bat research activities. For example, some organizations are requesting TYVEK suits to fulfill compliance when researchers are

netting summer bat populations, while others only require nightly clothing changes in combination with cleaning equipment. Another example might be variation in interpretation of decontamination for show cave tourists vs. true cavers. These differences in interpretation will not only confuse the stakeholders, but could create unnecessary enforcement administrative costs.

We are concerned, however, about the 6th proposed addition (page 3 of Frank memo) and its potential implications for long-term bat conservation and landowner perceptions of resident bat populations. While we understand the rationale behind trying to limit bat/human interactions in order to reduce potential vectors of transmission, we believe this rule may have several unintended consequences. We encourage the DNR to consider these consequences when reviewing this proposed rule for revision or adoption.

1) It appears that landowners will be liable for the occurrence of *Geomyces destructans* (*Gd*) on their property if they do not restrict access to caves/mines to either humans or bats and responsible for the costs of controlling this prohibited species (Frank memo; page 4). We are concerned that many (if not most) landowners will likely choose bat exclusion as a method of reducing their liability regardless of their specific situation. This may remove significant numbers of natural roost sites from the landscape, thus negatively impacting long-term bat conservation. Although other roosts (both natural and man-made) are not explicitly mentioned in this memo, it follows that landowners may extend their interpretation of liability to other bat roosting sites (snags, barns, bat houses, etc) which could significantly impact bat conservation.

2) Available evidence suggests that while human transmission may play a role in the movement of *Gd*, bat to bat transmission is the primary route of disease. Removing people or bats from some caves may prevent *Gd* from establishing in those caves, but the largest bat roosts are still at risk of transmission from bats. Forcing bats to congregate in only the largest roosts owned by state or federal agencies (who I assume will be restricting human access) may have the unintended effect of condensing populations in fewer sites thereby promoting disease transmission. Although it is too soon to predict which colonies may survive WNS, it may transpire that smaller isolated colonies of bats scattered across the landscape survive WNS due to the variability in roost environments and the sparse roosting congregations.

3) Public perception and value of bats as a critical component of the ecosystem has improved over the past 30 years which has led to significant advancements in bat conservation in the United States. We are concerned that an unintended consequence of this rule may be that the public will perceive bats as a liability, a risk to their income or financial stability, and a vector of disease. For example, many of the show caves currently focus heavily on bat education and this message may be diluted without bats present. If the DNR proceeds with this ruling as it is written, we encourage the Natural Resources Board to provide adequate financial and staff resources to launch and maintain and corresponding education campaign to ensure the public perception of bats and their ecosystem services are not irreparably harmed.

4) Given the spread and voracity of this disease, how will the DNR and the Board measure the success of this rule at reducing the impacts or slowing the spread of WNS? Other states will be watching to see how this rule is implemented. If this rule is adopted, we hope there will be measurable outcomes in place that will clearly demonstrate both the successes and consequences of this ruling.

While we appreciate that the intent of the DNR is to protect bats and conserve resources, we are not convinced that an emergency rule at this time is necessary unless there are biological, wildlife surveillance, or other important issues that prevent addressing this rule using the standard review process. We believe white-nose syndrome is definitely an emergency, but we feel it is necessary to allow adequate time for public hearings and a more lengthy comment period. As indicated in Frank's memo (page 4), less than 20 caves are routinely visited, and the window has passed for safely excluding bats prior to their hibernation season this fall, thus we assume no more exclusions would be occurring between now and next summer season regardless of the adoption of this emergency rule. We encourage the DNR to thoroughly investigate the efficacy and implementation details of this rule by holding public hearings, accepting written comments and working closely with stakeholders.

Thank you for taking the time to carefully consider our comments prior to the revision or adoption of this proposed rule. Please contact me if you have questions or would like clarification regarding our comments.

Sincerely,

Nina Fascione

Nina Fascione
Executive Director
Bat Conservation International

Bat Conservation International's mission is to conserve the world's bats and their ecosystems in order to ensure a healthy planet.

BAT CONSERVATION INTERNATIONAL

www.batcon.org

November 24, 2009

TO: Sam Hamilton, Director, U.S. Fish & Wildlife Service

We the undersigned are writing to express our deepest concern regarding the following recurring issues relative to the management of White-Nose Syndrome (WNS) in hibernating bats: 1) killing bats to slow the spread of WNS; 2) closure of affected roosts; 3) disturbance of roosts; 4) introduction of fungicides and other compounds into caves to combat possible pathogens.

All available evidence indicates that eradication of bats infected with the fungus *Geomyces destructans* will not slow the spread of WNS. Also, such attempts have the potential to eliminate bats that, if left alone, could possibly survive to rebuild resistant populations, and it is not yet possible to distinguish infected from uninfected bats by relying only on external manifestations of the fungal infection (i.e. active fungal growth on the muzzle or skin).

Closure of roosts where WNS has been detected deprives bats of critical habitat that is already in limited supply, precludes recovery, and may facilitate spread by forcing excluded bats to seek new roosts.

Since many WNS-infected bats apparently die from premature depletion of stored fat reserves, and human disturbance can greatly exacerbate loss of these reserves, stringent permitting is needed to minimize (and where possible eliminate) roost disturbance, especially at infected sites.

The arbitrary use of fungicides or other pesticides to treat bats in hibernacula affected by WNS should also be discouraged. Native fungal communities are basic to cave ecosystems and may prevent colonization of exogenous species. Because chemical treatments could irreparably harm microbial populations, they should not be considered without a full evaluation of dosages, delivery methods, potential side effects and long-term impact.

It is important to note that most caves in the United States are on private property where government agencies have no legal authority. Greatest compliance with measures to minimize spread of WNS is likely to be achieved through careful permitting for managers and researchers and through provision of clear guidelines for cavers and the public (i.e., avoid entering caves in infected areas prior to entering uninfected caves without taking all possible precautions to disinfect clothes, boots and gear). Also, when possible, confine activities to single cave systems and avoid caves where bats hibernate.

We emphasize the urgent need for research to define the role of G. destructans or other agents in bat epizootiology and cave ecology. Until we confirm causes and routes of transmission, some of the management strategies that have been suggested are likely to be useless, and in some cases highly counterproductive.

Sincerely,

Tom Aley
President
Ozark Underground Laboratory

Hazel Barton
Associate Professor of Biological Sciences,
Northern Kentucky University

Thomas Hallam
Professor, Ecology and Evolutionary Biology,
University of Tennessee

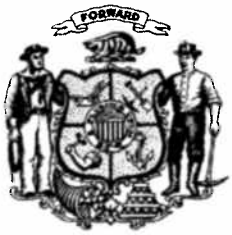
Thomas H. Kunz
Professor of Biology, Center for Ecology
and Conservation Biology, Boston University

Gary McCracken
Professor and Department Head, Ecology and
Evolutionary Biology, University of Tennessee

Merlin D. Tuttle
Founder and President Emeritus
Bat Conservation International

Post Office Box 162603 • Austin, Texas 78716 • 512/327-9721 • FAX 327-9724


WISCONSIN STATE LEGISLATURE


FORWARD

Jeannie Place

From: Peter Youngbaer [wnsliaison@caves.org]
Sent: Thursday, March 03, 2011 5:04 PM
To: Jeannie Place
Subject: Re: Natural Resources committee hearings

Hi, Jeannie,

Thanks for the report - depressing as it is.

The two NR committee members are asking the impossible: to prove a negative. They should be roundly, immediately, and publicly called on that point - but politely.

Proving a negative is virtually impossible. It's like standing on a street corner and whistling and claiming you're keeping elephants away. Someone asks you for your proof, and you point out that there aren't any around.

The burden of proof on implementing a law or regulation is on the proponents of those measures. Your letter should point that out and ask that WIDNR cite their proof. Good science is based on peer-reviewed work that gets published. To date, there is not a single published study documenting human transmission of WNS or Geomyces destructans. Not a one - peer reviewed or otherwise, for that matter.

What little research there is are the three studies I cite in the NSS News article. You can feel free to quote that verbatim. By doing so, you will be showing your knowledge and expertise of the evolving science. But the bottom line is that after six years of the WNS phenomenon, there is no proof of any human vector.

A copy of any letter should be sent to all members of the committee and be made available to the press.

Regarding excluding bats, I don't know about the advisability of including discussion of that in the same letter. I'd opt for keeping it clean and on point as to where the burden of proof properly lies and the impossibility of proving a negative. That said, it sounds like your reply came off a little contrarian, which usually isn't well-liked in legislative circles. Science is on your side here, with the nation's leading bat experts opposing exclusion as a management strategy. First, it's disruptive to the bats; second, removing bats from a cave upsets the entire cave ecosystem, causing irreparable harm to other cave life that depends on the nutrients brought in by bats; third exclusion is extremely difficult to actually do. Bats can and do go in and out extremely tiny openings. Look at the NY experiments on treating bats with a fungicide, where they all escaped from what was thought to be a sealed mine. If the information I've heard from Wisconsin is correct, one of the caves that was supposedly sealed actually wasn't. Finally, how much money is the state willing to spend on sealing caves and mines? And if that is done, congratulations - you've just killed all your bats - in the name of saving them?
Follow their logic to its extreme end and it simply doesn't make sense. Point that out.

Here's what makes sense: WNS is a disease that may or may not come to Wisconsin's bats. If it does, there's not much that can be done to protect them. Whether humans are or are not a transmission vector of the disease, the overwhelming method of transmission - proven and published - is bat to bat. This is acknowledged by virtually everyone working on the issue.

That said, if there is a possibility that humans could transport the disease, the single most effective method of blocking that is to make sure that anyone - bat biologist, caver, tourist, leaves any gear, equipment, or clothing that has been at a WNS site not bring it outside of the infected area.

Hope that helps.

Re: the NSS News - I'm not the person to ask. Dave Bunnell is the editor. Deadlines are six weeks before an issue comes out: e.g.
March 15 for the May issue. I'd recommend contacting him with your idea and get a sense of what he's got in the pipeline in terms of features. The article I wrote is coming out in April - the annual Conservation issue.

Peter

Quoting Jeannie Place <info@acoolcave.com>:

> Peter, we attended the hearing yesterday and two things seemed to dominate.
> 1. Humans are one of two main transport vectors and 2. If we can't
> stop the bats, we have to stop the humans.
>
>
>
> DNR staff spoke first, outlining their plans and at one point it was
> stated, as fact, that there are two known methods of transporting the
> fungus, "bat-to-bat and by human transport". They used the OK occurrence as proof.
> As each of us followed with our testimony, we continued to state that
> there is no proof of humans doing the transport, it is probably almost
> entirely bat-to-bat. Finally, two of the NR committee members requested we provide
> OUR proof that humans are not a major vector. I would like to ask if you
> could provide a letter or information on this transportation issue
> that I can forward to the committee. I would like to get a packet
> together with as much information as I can. FYI, they also brought up
> excluding bats as still on the table for management. One
> Representative asked me if we could just exclude our bats. I told him
> I will not exclude any bats for any reason. Never. He didn't like
> that. He was also the one that suggested to the DNR that maybe they
> should just close all caves, period. Wouldn't that help?
>
>
>
> So, again, I ask for your help. I read the article you've written for
> the NSS, excellent. Great summary. John Lovaas and I are planning on
> a summary of the entire process in WI. Would this be something the
> NSS News would be interested in publishing? Thanks again for all your help.
>
>
>
> Jeannie Cunningham
>
> Crystal Cave, Inc.
>
> W965 State Road 29
>
> Spring Valley WI 54767
>
> www.acoolcave.com

NATIONAL SPELEOLOGICAL SOCIETY, INC.

2813 Cave Avenue
Huntsville, AL 35810-4431
Telephone: 256-852-1300
Fax: 256-851-3241

DEDICATED TO THE EXPLORATION, STUDY, AND CONSERVATION OF CAVES
http://www.caves.org nss@caves.org

October 22, 2010

Laurie Ross
Natural Resources Board Liaison
101 S. Webster Street
P.O. Box 7921
Madison, WI 53707-7921

Re: Emergency Board Order IS-49-10(E) - oppose

Dear Ms. Ross,

On behalf of the 11,000 members of the National Speleological Society, we are submitting the following comments in opposition to the requested emergency order number IS-49-10(E).

The NSS is the country's oldest and largest organization devoted solely to the exploration, study, and conservation of caves and cave resources. Cave resources include, but are by no means limited to bats.

We have been intimately involved in the White Nose Syndrome issue since its inception. Our members discovered it; we own and manage caves in which it has killed bats; we have led in the funding of WNS research and public outreach and education. We are actively engaged in the fight against WNS, working in collaboration with numerous federal and state agencies, and other non-governmental organizations. Our WNS Policy and work plan are available on our WNS website: www.caves.org/WNS.

With that brief background, we are strongly opposed to the approach being taken by Wisconsin's Department of Natural Resources toward WNS. As we indicated in our September 20, 2010 communication to the Board, we find the proposals ill-founded in scientific fact, and ill-advised and heavy-handed in terms of public relations and collaboration. They are radical in terms of anything proposed by any other state or federal agency. Further, we don't believe they will work.

Our issues with the Department's approach are reflected in its Summary, right at the beginning of the request for the Emergency Board Order. WIDNR states, "Implementing the proposed rules before WNS has been detected in Wisconsin will allow the department time to work collaboratively with stakeholders to ensure that appropriate conservation measures are in place." Is the Department saying that without the rules, they are not allowed to work collaboratively with stakeholders? What is preventing the Department from working collaboratively now? Why does WIDNR feel it needs warrants, imposed closure measures, and the threats of civil and criminal penalties? Is it because their actions to date regarding WNS have already alienated their most likely, experienced, and conservation-minded allies – the scientific, recreational, and commercial caving community?

NATIONAL SPELEOLOGICAL SOCIETY, INC.

2813 Cave Avenue
Huntsville, AL 35810-4431
Telephone: 256-852-1300
Fax: 256-851-3241

DEDICATED TO THE EXPLORATION, STUDY, AND CONSERVATION OF CAVES
http://www.caves.org nss@caves.org

As to the science, WIDNR is correct that WNS is a serious disease and potentially threatening to Wisconsin's bats. They are appropriately concerned about doing what they can to prevent the disease, if possible, and protect the bats, if possible. They are also candid about recognizing the limits of what may be possible: ***"Because we have little control over the natural movements of bats, our main focus in WNS management is on limiting the anthropogenic spread of Geomyces destructans."***

However, the NSS strongly believes WIDNR's approach is ill-conceived and ill-advised, and actually counterproductive. They also make numerous statements implying scientific fact, when either the opposite is true, or the science has reached no conclusion.

It is clear from the first four years of WNS that the predominant, if not sole, means of disease transmission is via bat to bat transfer. This is recognized by the U.S. Fish and Wildlife Service, which has taken the lead in developing a national response: ***"WNS is transmitted primarily by bat to-bat contact."*** There are numerous examples from around the country where caves and mines – gated and inaccessible to humans – have become infected. There are also numerous instances of caver travel from the WNS region (prior to any protocols or attempts to stop the disease) to bat caves, yet no evidence of WNS in those caves. If human transfer is possible, or is happening, it is clearly not easy, and clearly overwhelmed by bat to bat infection.

Let's examine WIDNR's statements:

"Research conducted at the United States Geological Survey (USGS) Wildlife Health Center has shown that G. *destructans* is transferred from bat to bat,"

This is true, although the study is unpublished.

"and a multi-agency project demonstrated bats can develop WNS through infection directly from an affected cave environment in the absence of infected bats."

NY and VT took some 79 health Wisconsin bats and placed them in two sealed mines in Vermont. More than 20 bats died immediately (prior to first check) from unknown causes; the rest of the bats also died within months, many showing signs of the fungus. However, the cause of the bat mortalities has not been determined, and many questions were raised by other scientists about methodologies. This is not published.

"There is also evidence of human transfer of G. *destructans* from site to site and/or bat via contaminated equipment, gear or clothing."

There is not a single documented case of human transfer of G.d. to date. None – not in a published or unpublished report that we are aware of.

NATIONAL
SPELEOLOGICAL
SOCIETY, INC.

2813 Cave Avenue
Huntsville, AL 35810-4431
Telephone: 256-852-1300
Fax: 256-851-3241

DEDICATED TO THE EXPLORATION, STUDY, AND CONSERVATION OF CAVES
http://www.caves.org nss@caves.org

This is incorrect. Although the evidence points that way, Koch's Postulates have not been proven, and scientists have not made a determination that the fungus is the cause of the disease. Too many other factors remain unresearched or insufficiently researched to make such a determination. Indeed, if it does turn out to be true that the Geomyces destructans fungus is the causal agent, it would be unusual. Most fungi are not pathenogenic; rather they are opportunistic. It does remain possible, however.

So, the question before the Board is, if the Department isn't focusing on the most prevalent and likely method of WNS infection in Wisconsin's bat population, is it worth the effort to head down such a radical path?

Regarding the decontamination protocols, the NSS favors following the protocols of the U.S. Fish and Wildlife Service. We have funded some of the research that has gone into the protocol development, and believe there should be only one protocol nationwide. This promotes consistency, reduces confusion, and increases compliance.

That said, application of the protocols bears discussion, as their use requires expenditure of money on chemicals that are dangerous to humans and the environment, as well as causing degradation of gear and clothing. They do kill the fungus, however, so balance is required.

If a Wisconsin cave or mine has no WNS, and the researcher, caver, or other visitor has not been in a WNS site, what is gained by the expense and time involved in cleaning and disinfecting gear and equipment before going in, and after coming out, as proposed by the Department? What is accomplished? This is unnecessary.

Given the unlikelihood of human transfer, the single most effective precaution against even such potential transfer is to prohibit the use of any gear, equipment, or clothing that has been in a WNS site. The NSS strongly supports this approach; it has been part of our policy for years. It is relatively easy to comply with. The expansiveness of the WIDNR language is overkill, and unnecessary to accomplish the intended purpose.

Regarding the exclusion of bats from caves, the NSS has some serious concerns with this approach. The major concern has to do with conservation of the entire cave ecosystem. Bats are the primary source of energy for other life forms within the cave. The nutrients provided through their guano, and occasionally their carcasses (by natural causes), are essential for many cave biota.

Why is WIDNR sealing and excluding bats from caves? Our understanding is that some of this has already occurred. We sent a series of questions to Erin Crain, but have only received an acknowledgement thanking us for our questions and promising information in a future report.

NATIONAL SPELEOLOGICAL SOCIETY, INC.

2813 Cave Avenue
Huntsville, AL 35810-4431
Telephone: 256-852-1300
Fax: 256-851-3241

DEDICATED TO THE EXPLORATION, STUDY, AND CONSERVATION OF CAVES
http://www.caves.org nss@caves.org

"There have been long-distance jumps in the spread of WNS, beyond the distance bats would likely transmit the disease. These 'jump" sites have been frequently visited caves often with small bat populations. "

There have been long distances between discovered WNS sites. Some of these sites have been popular caves; others have been closed sites. There is also documentation of caver movement from WNS sites to non-WNS sites, and no infection has occurred. This is circumstantial speculation at best, as little other than bat to bat transmission is known.

"The USGS National Wildlife Health Center has detected G. *destructans* fungal spores in cave sediment demonstrating persistence of the fungus in the absence of bats. "

This is patently false. I was one of the principle investigators for this study, arranging for the sampling of sediments in nearly 30 states in the winter of 2008. Fungal samples were present in 3 of 19 samples analyzed from WNS sites. The collection protocol specified taking samples from directly under or near hibernating bats. This demonstrated some, but not overwhelming, existence in the presence of bats. This study was just published on October 7.

"The New York Department of Environmental Conservation, Wildlife Pathology Unit has isolated G. *destructans* fungal spores on equipment and clothing after exiting an affected cave."

This is correct, but the result must be read in context. NYDEC's Joe Okoniewski did culture viable G.d. from gear used in a WNS-affected site. This is the only documentation to date of the viability of the fungus from gear outside an affected site. However, transmission did not occur, as the fungus went only to the lab. Re-infection has not been proven here, or anywhere, for that matter (see later statement on Koch's postulates). Okoniewski's work has also not yet been published, but he did present an abstract and oral presentation at the May WNS Symposium, in Pittsburgh. That abstract also said, " *All of the 33 samples collected at six hibernacula outside of the hibernation season have been negative. Microscopic searches of swab samples collected from surfaces in hibernacula on which airborne conidia are likely to be deposited have, so far, yielded mostly negative results. In contrast, swab samples from drill-holes at one mine (where direct contact with bats is likely) were mostly positive. Attempts to culture G. destructans from swabs of the same surfaces failed due to rapid growth of other fungi. Conidia can frequently be found on decomposed bat remains in WNS-affected hibernacula, although numbers decline rapidly with time and the growth and activity of other organisms."*

"All available evidence indicates that WNS is caused by an infectious agent and can therefore potentially be spread by all known modes of disease transmission, including direct contact, inhalation, ingestion, fomites (inanimate objects), and human or animal vectors."

Only the first phrase is true: that all evidence indicates an infectious disease. However, there is scant evidence of anything other than bat to bat contact, and no evidence of some of the potential vectors listed.

"*Geomyces destructans* has been identified as the fungus that causes WNS in cave bats."

NATIONAL
SPELEOLOGICAL
SOCIETY, INC.

2813 Cave Avenue
Huntsville, AL 35810-4431
Telephone: 256-852-1300
Fax: 256-851-3241

DEDICATED TO THE EXPLORATION, STUDY, AND CONSERVATION OF CAVES
http://www.caves.org nss@caves.org

Where are the bats going once excluded? Why exclude bats at the time of year when they should have gone into hibernation? The Department denied they were operating an artificial hibernaculum or a captive breeding colony (none has even been successful for insectivorous bats, by the way), but has not answered the question as to where these bats are now overwintering.

WIDNR also makes a statement that it would cost between $100 and $500 to exclude bats from a cave. We see no basis in this cost estimation, and the Board should be concerned about the impact of this proposal on the Department's budget for several of these strategies. For context, the NSS built a bat gate for one of our caves – a single entrance cave in West Virginia – costing over $22,000. This was a typical bat gate, with bars spaced so bats could enter and exit freely. Keeping bats out of a cave entirely requires an extremely tight sealing, as the animals are capable of moving through very tiny spaces.

Sealing would also require a major change in airflow for a cave, causing unknown repercussions for the rest of the ecosystem. While a lesser consideration, it also can ruin the esthetics and beauty of a cave entrance.

The example set by WIDNR, and concerns by private landowners of running afoul of regulations, with the threat of civil and criminal penalties, could also inspire some landowners to seal their own caves, a sure death knell for anything living within. The NSS has worked for decades with private cave owners to educate about the cave and its resources, including cave formations, archeological and paleontological relicts, groundwater protection, and cave life, including bats. These resources can be quickly and irrevocably lost.

In conclusion, the NSS is deeply concerned and dismayed at the approach being taken by WIDNR. While we share the concern about the bats and WNS, there are other ways to accomplish the same goals. These methods are in use by others, and do not cause the same alienation among stakeholders nor threats to the bats and cave environments we are both striving to protect.

If WNS is coming to Wisconsin, the bats will bring it. Nothing proposed by the Department will prevent that. However, what is proposed by the Department can cause a lot of harm – to bats, to the environment, and to relationships with the public.

We strongly urge the Board to reject this request. Further, as the Department wishes this proposal to be considered along with the prior two Emergency Board Orders for permanent order, we urge the withdrawal of the others, as well. Thank you for the opportunity to comment.

Sincerely,

Peter Youngbaer
WNS Liaison