

# RECOMMENDATIONS FOR MANAGING ACCESS TO SUBTERRANEAN BAT ROOSTS TO REDUCE THE IMPACTS OF WHITE-NOSE SYNDROME IN BATS

## Background

White-nose syndrome (WNS) is a devastating fungal disease that has killed unprecedented numbers of hibernating bats in eastern North America. The first evidence of WNS was documented in photographs from New York State in 2006; as of January 2016 WNS has spread to 26 states and five Canadian provinces. The fungus causing the disease, *Pseudogymnoascus destructans* (*Pd*), has been detected in an additional four states where signs of the disease have not yet been observed (see current map available at [www.whitenosesyndrome.org](http://www.whitenosesyndrome.org)).

In North America, seven bat species have been confirmed with WNS, and five additional species have been detected carrying *Pd*. *Pd* invades the skin of hibernating bats and the resulting disease often leads to death. Genetic analyses indicate the fungus is likely not native to North America and it is expected that human activity led to its introduction to North America. *Pd* may have originated in Europe or Asia, where it or the disease has been confirmed on 13 bat species. There have been no documented deaths of European bats from WNS.

The best available information indicates *Pd* will continue to spread across North America, exposing more populations and species to the disease. Although bat-to-bat and bat-to-environment-to-bat transmission are believed to be the primary ways *Pd* is spread, human-assisted transmission is also possible. The severity of the impacts of WNS on bat populations justifies taking universal precautions<sup>1</sup> to reduce the risk of human-assisted transmission of *Pd* and to minimize disturbance to hibernating bats potentially susceptible to WNS.

## Purpose

The recommendations below are intended to reduce the potential for humans to disturb hibernating bats or inadvertently transport *Pd* to uncontaminated bat habitats. However, we acknowledge that in some cases, subterranean bat roosts<sup>2</sup> may be under regulatory authority or usage policies that cannot accommodate these recommendations. Where possible, we advise following these recommendations to the extent practicable in the development of site-specific recommendations or policies. Additional guidance is being developed to assist with implementing these recommendations at subterranean sites managed specifically for visitation or tourism. The recommendations below address four main objectives to help wildlife and resource management agencies and non-government organizations develop local strategies to protect bats and subterranean ecosystems.

## Objectives

1. Minimize the risk of human-assisted spread of *Pd* to decrease the probability of long-distance transfer of the fungus to uncontaminated areas.
2. Avoid disturbing bats in their roosts to the greatest extent possible.
3. Carry out science-based best management practices for achieving conservation and recovery goals for bats.
4. Foster cooperation and collaboration among government agencies, non-government organizations, and landowners.

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<sup>1</sup> [http://www.nwhc.usgs.gov/publications/wildlife\\_health\\_bulletins/WHB\\_2011-05\\_UniversalPrecautions.pdf](http://www.nwhc.usgs.gov/publications/wildlife_health_bulletins/WHB_2011-05_UniversalPrecautions.pdf)

<sup>2</sup> For the sake of these recommendations, “subterranean bat roost” refers to cave-like habitats where bats roost or cave-like habitats identified by site-management authorities to be suitable for use as bat roosts (e.g. caves, abandoned mines, tunnels, bunkers or other structures, etc.).

## Supporting Evidence for Concern (See Appendix 1 for description of scientific literature.)

1. *Pd* can persist and grow in the absence of bats.
2. Spores of *Pd* can remain viable outside of subterranean environments.
3. Spores of *Pd* cling to clothing, footwear, and gear and can be inadvertently transported out of contaminated sites.
4. *Pd* may be present on bats or in bat roosts without being visibly detectable.
5. Spread of *Pd* may be slowed by geographic or biological barriers to bat movements that may not be barriers to human movement.
6. Repeated and/or prolonged human disturbance during hibernation is detrimental to bats, especially bats already stressed by WNS.

## Recommendations

1. Where feasible, prevent unrestricted access to subterranean bat roosts, especially while bats are present.
2. Decontamination protocols greatly reduce the risk of transporting viable *Pd* spores on gear but are not 100% effective. In accordance with the National White-nose Syndrome Decontamination Protocol<sup>3</sup>, equipment that has been used in a subterranean bat roost should only be reused in a roost that is similarly or progressively more contaminated.
3. Require visitors to subterranean bat roosts to clean and treat clothing and gear after visiting a subterranean bat roost regardless of season or time of year (refer to the National WNS Decontamination Protocol). On a site-specific basis, management agencies may consider identifying reduced or additional cleaning requirements for gear between roosts in small geographic areas.
4. Minimize disturbance to bats by coordinating and combining, when possible, scientific and management activities involving access to subterranean bat roosts, especially while bats are likely present.
5. Designate “no entry” restriction for subterranean bat roosts when wintering bats are present unless access is to conduct agency-sanctioned or permitted activities. The period of winter occupancy may include fall and spring as well. Additional restrictions to access may be required for sites with sensitive colonies of bats during summer.
6. Partner with individuals and organizations that utilize subterranean bat roosts to best conserve underground environments and their fauna and flora.
7. Work to educate visitors and local communities about WNS and conservation of bats, caves, and other subterranean habitats.

## Conclusion

Many species of North American bats are highly vulnerable to this lethal fungus. Multiple efforts are underway to determine how we can halt the spread of *Pd* and/or reduce the threat of WNS to bats. These efforts involve states, provinces, tribes, federal agencies, universities, conservation organizations, and local communities. Our collaborative efforts are essential to bat and cave conservation. Key to this effort is reducing the risk of human-assisted spread of the fungus and avoiding activities that disturb bats during critical periods of hibernation.

*This document is the product of a multi-agency and organization committee working within the framework of the National WNS Plan (A National Plan for Assisting States, Federal Agencies, and Tribes in Managing White-Nose Syndrome in Bats, finalized May 2011). On March 18, 2016, this document, Recommendations for Managing Access to Subterranean Bat Roosts to Reduce the Impacts of White-Nose Syndrome in Bats, was accepted by the WNS Executive Committee, a body consisting of representatives from Federal, State, and Tribal agencies which oversees the implementation of the National WNS Plan. These recommendations serve as a revision to the 2009 Cave Advisory issued by the U.S. Fish and Wildlife Service (USFWS 2009).*

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<sup>3</sup> <https://www.whitenosesyndrome.org/topics/decontamination>

## **Appendix 1. Supporting evidence for *RECOMMENDATIONS FOR MANAGING ACCESS TO SUBTERRANEAN BAT ROOSTS TO REDUCE THE IMPACTS OF WHITE-NOSE SYNDROME IN BATS***

Since the discovery of WNS in January 2007 and the identification of *Pseudogymnoascus destructans* in 2009 (initially as *Geomyces destructans*, Blehert et al., 2009), considerable attention has been paid to understanding the cause and occurrence of this disease, and the biology and distribution of the fungus. Research in these areas has been funded and conducted by numerous government agencies and nonprofit, private, and academic institutions. The findings of the following studies, published and unpublished, have provided evidence that indicates human activity in subterranean bat roosts has the potential to contribute to the spread of WNS and may impact the survival of hibernating bats.

In the statements below, we use “*Pd*”, although the cited publications may have used the “*Gd*” nomenclature for the fungus.

1. *Pd* can persist and grow in the absence of bats.
  - a. Genetic tests (PCR) confirmed presence of *Pd* and related species in sediment samples from caves and mines that previously held infected bats (Lindner et al., 2011; Lorch et al., 2012a; Peuchmaille et al., 2011a).
  - b. Caves can harbor viable *Pd* for over two years after bats are absent (Lorch et al., 2013).
  - c. Growth of *Pd* on a variety of cave sediments can lead to accumulation of *Pd* spores in the absence of bats (Reynolds et al., 2015).
2. Spores of *Pd* can remain viable outside of subterranean environments.
  - a. *Pd* can remain viable for at least 5 months at room temperature, and under laboratory conditions (USGS-National Wildlife Health Center, unpublished data).
  - b. *Pd* spores can remain viable after being stored for up to eight months dry and/or frozen (Puechmaille et al., 2011b).
  - c. *Pd* stored on dry agar plates at 5°C and 20-30% relative humidity (which is low compared to typical hibernaculum conditions) can remain viable for more than 5 years in the absence of bats (Hoyt et al., 2014).
3. Spores of *Pd* cling to clothing and footwear and can be inadvertently transported out of contaminated sites.
  - a. *Pd* spores were identified by morphology on clothing and gear used in contaminated caves and mines (Joe Okoniewski, New York Dept. of Environmental Conservation, unpublished data).
  - b. Viable fungal spores (many species, not specifically *Pd*) were retrieved from shoes of visitors after tours through Mammoth Cave (Hazel Barton, University of Akron, unpublished data).
  - c. *Pd* has been detected by genetic screening (PCR) and fungal culture on equipment used to capture bats and on gear used in contaminated sites (USGS – National Wildlife Health Center, unpublished data).
4. *Pd* may be present on bats or in bat roosts without being visibly detectable.
  - a. Bats, including Rafinesque’s big-eared bats, eastern red bats, and silver haired bats, in and near contaminated sites may test positive for presence of *Pd* via PCR or fungal culture while failing to exhibit obvious signs of WNS (USGS – National Wildlife Health Center, unpublished data; Bernard et al., 2015; Langwig et al., 2015).
  - b. *Pd* was detected by microscopy, genetic screening (PCR), and culture on bats and bat houses during summer months in upstate NY (Dobony et al., 2011; US Army, unpublished data); *Pd* was detected by PCR on two species of bats in May and June in Tennessee (Grace Carpenter, University of Tennessee, unpublished data).
5. Spread of *Pd* may be slowed by geographic or biological barriers to bat movements that may not be barriers to human movement.

- a. Genetically dissimilar colonies of wintering little brown myotis in westernmost Pennsylvania remained *Pd*-free for 1-2 years after WNS had spread through the rest of Pennsylvania and beyond to the south (Miller-Butterworth et al., 2014).
6. Repeated and/or prolonged human disturbance during hibernation is detrimental to bats (McCracken, 1989; Mohr, 1972; Thomas, 1995; Tuttle, 1979), especially bats already stressed by WNS.
  - a. More frequent arousals during hibernation hasten depletion of critical fat reserves (Boyles and Willis, 2009), which can threaten bats' survival.
  - b. Increased arousal frequency is associated with more severe cutaneous infections in WNS-affected bats and likely contributes to mortality (Reeder et al., 2012).

Secondary evidence:

7. If done correctly, current decontamination procedures have a high probability of significantly reducing the risk of spreading viable *Pd*.
  - a. The effective kill rate of correctly applied decontamination agents or techniques is greater than 99.995% in laboratory experiments (Shelley et al., 2013).
  - b. Appropriate application methods are critical for effective decontamination.

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