

Supporting Decontamination Documentation for Cavers
(WNS Decontamination Supplement 1 of 2)
U.S. Fish and Wildlife Service
Version 01.25.2011

I. GENERAL INFORMATION

The US Fish and Wildlife Service (USFWS) strongly recommends, first and foremost, compliance with all cave¹ closures, advisories, and regulations in all Federal, State, Tribal, and private lands. However, where such closures are not required or recommended, the following protocol outlines the best known procedures to help reduce the transmission of the fungus *Geomyces destructans* (*G.d.*), believed to be the cause of white-nose syndrome (WNS), to important bat habitat and populations. WNS is responsible for significant bat mortality in eastern North America, and threatens bat populations across the continent.

While adoption of the following decontamination procedures found in this supplement are likely to add extra time and money and decrease the overall life expectancy of equipment; the gravity of the situation necessitates that anyone who visits caves must be willing to do everything possible to avoid potentially contributing to the further spread of the disease.

If not permitted or trained by the appropriate government agency; then please do not handle bats. However, if you should observe live or dead bats (multiple individuals in a single location) that potentially are exhibiting characteristic signs of WNS (see Section 1), contact a wildlife professional in your state wildlife agency (<http://www.fws.gov/offices/statelinks.html>) or contact your nearest USFWS Ecological Services Field Office (<http://www.fws.gov/offices/>).

II. RATIONALE FOR DECONTAMINATION

The USFWS asks that anyone entering caves for recreational purpose read and understand the premise for taking further precautions to prevent the possible spread of the fungus, *G.d.* (use of "cave", here forth, includes all caves, fissures, mines, portals, etc.):

- The USFWS recommends that all cave visitors observe cave closures and advisories on all Federal, State, Tribal, and private lands. Some agencies have instituted management policies stipulating annual or seasonal cave closures. Other states have instituted, or are considering instituting, selective cave closures based on bat population density and/or usage. **Please visit <http://www.fws.gov/WhiteNoseSyndrome/cavers.html> for a list of current cave closures.** If closure information from a state in which you plan to go caving is not listed, contact that state's wildlife agency to obtain the latest information on cave access.
- Currently, WNS and/or *G.d.* is found in Connecticut, Delaware, Indiana, Massachusetts, Maryland, Missouri, New Hampshire, New Jersey, New York, Oklahoma, Pennsylvania, Tennessee, Vermont, Virginia, and West Virginia, and the provinces of Ontario and Quebec, Canada.
- Bat-to-bat transmission is believed to be the primary vector for the spread of WNS. However, large distance jumps of WNS and/or *G.d.* have occurred to caves in West Virginia, Virginia, Missouri and Oklahoma that are not easily explained by the natural movement of bats themselves, and are potentially the result of human transmission.
- Research is underway to improve our understanding of WNS transmission, including the human component, and results of pilot studies have become available:

¹ The use of the word "cave" in this document includes natural caves, man-made mines, or any other site that may harbor *G.d.* spores.

- Work conducted by the U.S. Geological Survey, National Wildlife Health Center has found viable fungal spores in cave sediment.
- Research conducted by the New York State Department of Environmental Conservation, Wildlife Pathology Unit has isolated fungal spores off of 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 infected bats.

III. PREVENTING SPREAD OF WNS

To help prevent spread of WNS to unaffected caves, it is important that you NOT transport or use any exposed clothing or gear outside of a WNS-affected state or region for use in a WNS-unaffected state or region. Clothing or gear that has been or is suspected of being exposed to *G.d.* may be reused in other affected caves; however, the WNS decontamination procedures provided in this document should always be followed for items used in affected caves prior to entering another affected cave or leaving the affected state or region. Used gear that must be transported out of affected states or regions should be decontaminated, contained, and sealed prior to leaving the affected area and should not be stored or transported in close proximity with unexposed equipment. If gear cannot be decontaminated, either for safety reasons or fear that equipment may be damaged, it should not enter subsequent caves but rather be designated for use in that one specific cave.

As stated in the WNS Decontamination Protocol v. 01.25.2011 (Available at: http://www.fws.gov/WhiteNoseSyndrome/pdf/WNSDecontaminationProtocol_v01252011.pdf), the most effective course of action to guard against the transportation of *G.d.*, or any similar microbe, is to fully decontaminate clothing and gear after exiting each and every cave visited. In areas of high cave density, however, circumstances may allow for multiple caves to be visited on the same day. Assuming that bat-to-bat transmission will likely account for a greater level rapid spread of the fungus between caves in close proximity, and that only aspects of decontamination are going to be feasible within cave complexes visited on the same day in remote locations. Since limited hibernacula data show that bats easily move upwards of 10 miles in search of resources (i.e., food, caves, mates) during portions of the fall, winter, and early spring, cave visitors should, at the very minimum, use full decontamination procedures on a daily basis and between any two caves more than 10 miles apart when visiting multiple caves on the same day. Whenever there is a question on the distance or status of caves (affected vs. unaffected), visitors should always choose the most conservative approach of decontaminating gear, clothing, and equipment between each individual cave visited, especially in already affected areas. Care should be exercised at all times to prevent contamination of clean clothing, equipment, and/or vehicles.

IV. RECOMMENDED DECONTAMINATION PRODUCTS:

All necessary and appropriate precautionary, use, storage, and disposal information should be apparent on each of the product labels. It is critical that all users read and follow all label instructions provided on the products mentioned in this protocol. It would be a violation of federal law to use, store, or dispose of a regulated product in any manner not prescribed on the approved label/MSDS.

The following chemical (with a minimum of 0.3% quaternary ammonium compound, unless otherwise denoted) and natural products were tested in the laboratory and found to be effective for killing the conidia of *Geomyces* spp.:

1. Lysol® IC Quaternary Disinfectant Cleaner - (A product effective at 1:128 dilution, or 1 ounce of concentrate per gallon of water.)²

² Use of some products which contain quaternary ammonia, isopropanol, and other potentially harmful chemicals or boiling water in confined spaces needs to be approached carefully due to inhalation or

2. Professional Lysol® Antibacterial All-purpose Cleaner (A product effective at 1:128 dilution, or 1 ounce of concentrate per gallon of water.)²
3. Formula 409® Antibacterial All-Purpose Cleaner (Off-the-shelf concentrations as specified by label)²
4. A 10% solution of household bleach (A product effective at 1 part bleach to 9 parts water)²
5. Lysol® Disinfecting Wipes (0.28 % di-methyl benzyl ammonium chloride)^{2&3}
6. Boiling in water for 15 minutes²

V. DECONTAMINATION PROCEDURES:

Given the increasing evidence presented in Section I on the possible role of human transmission, the USFWS asks that cave visitors please follow these procedures for containment and decontamination to reduce the transfer of the fungus from cave to cave. Please periodically check <http://www.fws.gov/WhiteNoseSyndrome/cavers.html> for updates to these procedures.

Any clothing, footwear and/or equipment, including outer clothing, should never be used in subsequent caves unless a thorough cleaning and decontamination recommended below can be performed between each cave or exceptions (e.g. within 10 miles, affected vs unaffected) discussed in Section III are met. A cave should only be entered with clothing, footwear, and equipment that have been fully cleaned using the protocol below and rinsed prior to entry to remove residue of chemical product used. Upon entering and exiting any cave, scrub off all dirt and mud from your clothes, boots, and gear. Prior to leaving the cave, ensure that clothing, boots, and equipment that were used in the cave are placed in a sealed plastic bag or plastic container with lid to be cleaned and decontaminated off site, if all decontamination is not feasible at cave entrance. In all cases, outer clothing should be removed prior to entering a vehicle and after/between cave visits. A clean change of clothing is recommended. Companion animals should be kept out of caves as fungal spores could adhere to fur and be transferred to a subsequent cave.

As mentioned, the first step of decontamination is to remove all soil and organic material from equipment, clothing, and boots using a brush and preferably water (best done at entrance of cave upon exiting). This is especially important since organic material (i.e. clay soils) can prevent the chemical products from penetrating clothing, boots, and equipment.

A. Submersible Gear (i.e. clothing and equipment that can be submerged without damage):

Wash all clothing and any appropriate equipment in washing machine or by hand using conventional detergents. Washing can be done in cold, warm or hot water. Laboratory testing has found Woolite® fabric wash to be an effective detergent for this procedure. Rinse thoroughly, and then follow by soaking for a minimum of 10 minutes in one of the recommended decontaminating products listed under Section III, then rinse and air dry. Please notice when boiling water is selected as the decontamination method, all gear must be submersed for 15 minutes, then followed by air drying.

contact risks of the product. Since products/procedures may also cause damage to clothing, gear, and sensitive electronic equipment, all users should be aware of these risks prior to entering cave environments. Use of personal protective equipment to reduce contact with the product is strongly encouraged, particularly if extended contact is anticipated or as recommended by the manufacturer. Always read and follow the MSDS information and all safety/use criteria for every product used.

³ The active ingredient is considered to be at the effective concentrations known to kill the conidia of *G. pannorum*; however, the efficacy of field application remains to be demonstrated. So, equipment decontaminated with Lysol® Disinfecting Wipes should be used with extra precaution until laboratory results are finalized.

If multiple entries into a single cave are planned, the trip necessitates extended efforts in a remote location, with NO vehicular travel to new or additional caves, and full decontamination is not possible, then visitors should, at a very minimum, swap out and/or use disposable equipment between cave visits. Similarly, other sensitive equipment (i.e., camera, headgear, lights) should be swapped out or wiped using an appropriate decontamination product (i.e., Lysol[®] disinfectant wipes) prior to entering each new successive cave. All footwear should be intensively scrubbed to remove all dirt and debris, and then wiped using Lysol disinfectant wipes (if procedures listed below are not feasible).

1. Footwear:

When safety permits, rubber (wellington-type) caving boots (which withstand harsh decontaminating products and are easily cleaned) are recommended. Boots need to be fully scrubbed and rinsed so that all soil and organic material is removed. The entire boot, including soles, leather uppers and other portions, should then be decontaminated with an appropriate product listed under Section III for a minimum of 10 minutes, then rinse and air dry.

2. Ropes and Harnesses:

It is the responsibility of each person using vertical gear, including caving or life-support equipment (e.g., harnesses, webbing, and ropes), to ensure that the decontamination protocols in use are chemically compatible with their equipment. **To date, only Sterling rope and webbing have been shown not to be damaged by the following decontamination protocol:** Wash rope/webbing in a front loading washing machine on the gentle cycle using Woolite[®] Extra Delicates detergent. Treat by immersion in a 1:128 dilution of Lysol IC Quaternary Disinfectant Cleaner for 10 minutes. Rinse in fresh, clean water for a minimum of two rinses and allow to air dry.

If you are using other brands of rope and webbing not mentioned above, these products have yet to be tested for integrity after decontamination. In cases where safety following decontamination has not yet been evaluated, then ropes and webbing should be dedicated to one cave or not used at all to prevent the spread of WNS.

B. Non-submersible Gear (i.e. equipment that will be damaged by submersion):

Clean thoroughly with soap and water (or use Lysol[®] Disinfecting Wipes). Decontaminate by applying one of the recommended chemical products listed under Section III to the outside surface for a minimum of 10 minutes, then rinse and air dry.

1. Cameras, Computers, and Other Electronic Equipment:

If possible, do not bring electronic equipment into a cave. If practical, cameras and other similar equipment that must be brought in a cave should be placed in plastic casing (i.e., underwater camera housing) or wrapped in plastic wrap where only the lens is left unwrapped to allow for photos to be taken. The plastic casing should be decontaminated using one of the appropriate products found above. The plastic wrap should be discarded after use and followed up by decontaminating the camera surface with Lysol[®] Disinfecting Wipes, realizing this product could damage the body of the camera.

2. Vehicles:

In addition to gear, vehicles used to transport equipment can also harbor spores. Keep vehicles as clean as possible by taking extra precautions (e.g. storing gear in clean containers, bringing a change of clothes, conducting all work outside of the vehicle once in the cave) and decontaminating storage containers along with all other clothing, gear, and misc. equipment using the appropriate decontamination products found in Section IV.

It should be noted that product guidelines should be consulted for compatibility before using any decontamination product listed under Section IV. **In order to insure the user's safety and most effective measures are taken to prevent unintentional spread, it is very important that all users**

understand these products were tested independent of each other. For example, detergents and quaternary ammonium compounds (i.e. Lysol® IC Quaternary Disinfectant Cleaner) should not be mixed directly with bleach as this will inactivate the bleach and in some cases produce a toxic chlorine gas.

VI. SIGNS OF WNS

First and foremost, *G.d.* may be present with NO apparent signs at all, so always take the necessary and appropriate precautions in decontaminating equipment, clothing, and associated items. If signs are present, realize that the white fungus is only one of the many signs. Other possible WNS signs commonly observed in winter and spring include:

- Abnormal behaviors including:
 - daytime activity on the open landscape, including bats on buildings and structures
 - population shift to entrance of the hibernaculum (cave or mine)
 - decreased arousal with disturbance inside hibernaculum
- Excessive or unexplained numbers of dead or dying bats at/near cave entrances
- Visible fungus on flight membranes, muzzle, and/or ears of live or fresh dead bats

Such conditions and/or observations should always be put in context of the season. Many variables (e.g., warmer temperatures during winter, different species specific habits, and seasonal life cycles) can cause bats to fly about on the landscape during daylight hours. For example, during summer months, bats are normally viewed near dusk and dawn, but during winter healthy bats may be observed out during the day. Furthermore, different bat species naturally go into varying degrees of torpor (a sleep state) during hibernation, and therefore, can arouse and exit hibernacula more frequently especially under warm conditions. This may not be unusual behavior for bats.

VII. CLOSING REMARKS:

Please, understand the effectiveness of this protocol depends solely on the adherence and successful implementation by each cave visitor. Everyone must **FIRST** consider the risk of transmission and decontaminate, to the extent necessary, their clothing, boots, and equipment prior to entering and/or upon exiting the cave environment, both within and between States. Furthermore, no decontamination procedure can ever be 100% effective, so it is essential that cave visitors take the initiative to understand and practice the intricacies of this decontamination protocol prior to entering cave environments.

Important Note: The most updated information on known WNS affected states (mapped version), protocols, and cave closures are posted on the U.S. Fish and Wildlife Service White Nose Syndrome website at: <http://www.fws.gov/whitenosesyndrome/>. We recommend that you visit the website periodically to ensure that you are using the most recent protocol.

Note: Protocol updated as of 1-25-11

Please visit <http://www.fws.gov/WhiteNoseSyndrome/> for the most updated information.