

BC Ministry of Water, Lands and Resource Stewardship and BC Ministry of Forests

Standard Operating Procedure (SOP): Decontamination when working around bats and bat habitats

Purpose

To describe Standard Operating Procedures (SOPs) for field staff to reduce the risk of transmission of the fungal agent *Pseudogymnoascus destructans* (Pd) that causes white-nose syndrome (WNS) in bats, among regions of B.C., among sites, and among animals within a site.

Background

White-nose syndrome (WNS), a serious disease that has killed millions of bats in eastern and central North America (<http://www.whitenosesyndrome.org/>), is caused by the fungus, *Pseudogymnoascus destructans* (Pd). Pd is spread primarily by bat-bat transmission but may also be spread by humans. While the disease WNS has not yet been confirmed in BC, Pd was confirmed in guano samples collected in 2022. It is necessary to implement measures to lower the risk of human-associated transportation of fungal spores, according to the SOPs below.

For an overview of Bat Health in Canada, refer to: http://www.cwhc-rcsf.ca/bat_health.php. Spread maps, up to date guidance documents, national decontamination protocols, and other resources are available on this website. For a map of current locations where WNS has been detected, visit <https://www.whitenosesyndrome.org/where-is-wns> and http://www.cwhc-rcsf.ca/white_nose_syndrome_reports_and_maps.php and speak to the BC Small Mammal and Herpetofauna Specialist.

If signs of WNS are detected (dead or dying bats from Nov1 – May 31, day flights of bats observed in the middle of winter, bats with damaged wing membranes etc.), please report them immediately to: B.C. Community Bat Program 1-855-922-2287 or info@bcbats.ca.

In addition, if bat work is conducted in or near fresh water bodies there is a potential to

inadvertently move amphibian diseases including *Batrachochytrium dendrobatidis* (Bd) the causal agent of Chytridiomycosis, and ranavirus strains among wetlands and streams (<https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/wildlife/wildlife-conservation/amphibians-reptiles/amphibian-health>)

Responsibility

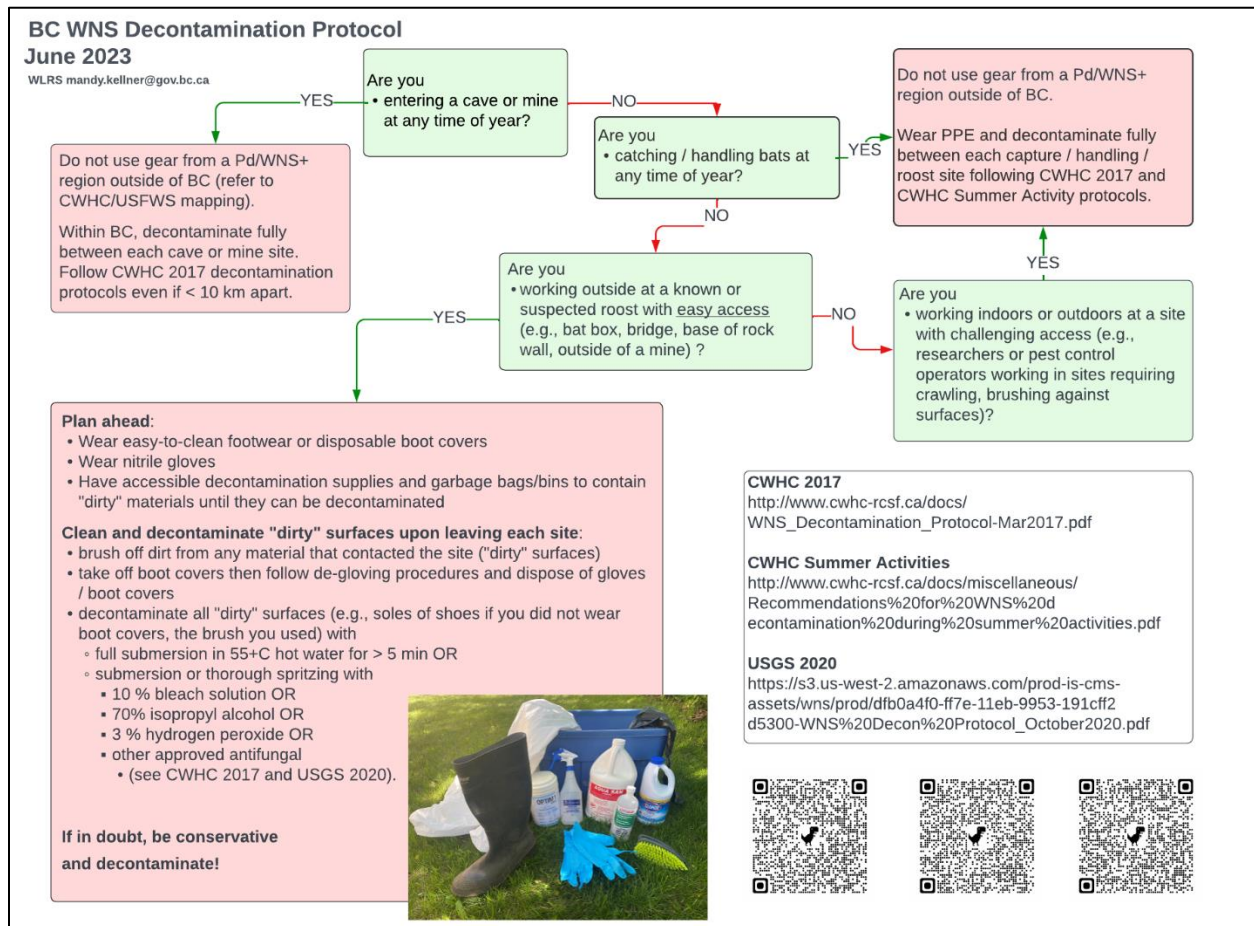
It is essential that all staff and contractors working with bats incorporate these decontamination SOPs into their field and research plans. Even if bats are not directly captured or handled, it is important to be conservative and decontaminate clothes, equipment, and materials when working in or around, or moving between, habitats where bats congregate or any site that is potential or known bat habitat, including mines, caves, summer roost sites including boxes, bridges and attic roosts, and any other potential bat roosts or hibernacula.

Research to date suggests the highest spore-loads on bats are found in winter and spring, although spores have been found on some bats in summer, especially bats in close vicinity to hibernation areas. Spores have also been found throughout summer at maternity roost sites and night roosts, including at bridges used by bats. Because the viability of spores in summer is not fully understood, it is suggested that decontamination SOPs be implemented year- round.

When working around wetland habitats, the Interim Hygiene Protocols for Amphibian Field Staff and Researchers applies (https://www2.gov.bc.ca/assets/gov/environment/plants-animals-and-ecosystems/wildlife-wildlife-habitat/wildlife-health/wildlife-health-documents/bc_protocol-amphibian_field_researchers.pdf) even if animals are not directly sighted or handled.

Overview – when to decontaminate

Use the following flowchart to help determine when and how to decontaminate to prevent the possible human-mediated spread of Pd spores. If in doubt, be conservative and decontaminate fully.



Standard Operating Procedures

The SOP has been divided for ease of use; Section 1 of the SOP addresses the general decontamination procedures, followed by specific recommendations to address three scales of transmission:

Section 1: General procedures to decontaminate field gear, equipment and clothing.

Section 2: Procedures to reduce the risk of introduction of *Pd* into novel regions of B.C.

Section 3: Procedures to reduce the risk of disease transmission among sites within B.C.

Section 4: Procedures to reduce the risk of disease transmission among individual bats within a site.

Section 1 – General procedures for field gear, equipment and clothing

Follow the most up-to-date guidance from the CWHC on cleaning and disinfecting -

http://www.cwhc-rcsf.ca/docs/WNS_Decontamination_Protocol-Mar2017.pdf.

- 1) Clean: The first step in the decontamination procedure is to brush or knock dirt and debris from gear/boots/etc, then thoroughly wash all remaining mud and other debris, as these can reduce the efficiency of the disinfection procedure.
- 2) Decontaminate: Follow the most recent protocols:
 - a) the preferred treatment for submersible gear/clothing is complete submersion in water that maintains a temperature of at least 55 C, for a minimum of 5 minutes (WNSDMWG 2020) and/or
 - b) disinfection according to protocols outlined by the [CWHC \(2017\)](#), with a product listed in Table 1 of the CWHC guidance (CWHC 2017). **It is recommended that you use the hot water method, 70% (or higher) isopropyl alcohol, or 3% hydrogen peroxide.**

Smaller equipment such as boots, ropes, climbing harnesses, mistnets, etc., may be submerged in the above decontamination liquids for the advised time (as per CWHC 2017), then rinsed (as applicable) and dried. Larger equipment or non-submersibles such as headlamps and acoustic equipment, should be sprayed where possible or wiped down with decontamination liquids/wipes, ensuring that the surfaces are wet for the minimum time required before being wiped dry. Clothing should be treated in hot water as above, washed in hot water with bleach in a washing machine, or hand washed with a pre-soak of 10 minutes in one of the decontamination liquids above.

Please read and follow all safety and health recommendations on disinfectant products. The products above may damage gear, pose health risks, and cause environmental damage. It is the responsibility of the users to read the MSDS sheets, follow safety protocols, use protective gear and follow appropriate procedures for disposal.

It is important to note that the information on the efficacy of the recommended chemical disinfection agents may be updated over time, so it is important to consult White-nose Response Team website at <https://www.whitenosesyndrome.org/static-page/decontamination-information> and the Canadian Wildlife Health Cooperative Bat Health site at http://www.cwhc-rcsf.ca/bat_health.php for the latest information and ensure that the

most up to date information on heat and chemical disinfection procedures is followed.

Section 2 - Procedures to reduce the risk of introduction of Pd into novel regions of B.C.

Bat to bat contact is the primary mode of *Pd* transmission, but human-mediated transport of disease spores can potentially occur. Although there has now been *Pd* detected in BC, the majority of the province is as-yet unaffected, so all measures to reduce the chance of human-caused infection are required. There are heightened concerns around movement of gear used in caves and similar environments where *Pd* may thrive. **Any equipment or gear that has been previously been used OUTSIDE of BC in areas where WNS / Pd has been found must NOT be used in B.C.** Consult updated maps for Canada at http://www.cwhc-rcsf.ca/white_nose_syndrome_reports_and_maps.php and for all of North America at <https://www.whitenosesyndrome.org/where-is-wns> , and check in with the B.C. Small Mammal Biologist or Bat Conservation Specialist.

Section 3 – Procedures to reduce the risk of disease transmission among sites

These procedures should be adhered to when moving between all sampling sites. For example, when bat habitats that potentially contain *Pd* spores (known roosting sites including caves, mines, attics, under bridges) are entered, equipment and footwear/clothing should be cleaned and decontaminated, especially if bats are observed/handled. Summer roost sites such as attics and bridges have been shown to support only low levels of *Pd* spores; nevertheless, decontamination procedures must be followed prior to travelling between sites.

Entering caves and mines and/or capturing bats

Entering caves and mines and any bat capture work require full decontamination procedures outlined by CWHC 2017. When working or recreating in caves and mines, decontamination between entry of different mine or cave complexes is now required **even if** the mines/caves entered are <10 km apart, are within the same watershed (along the same river/tributary), and no bats have been handled.

When bats are captured, at the end of each night, or between uses, all nets and

equipment that has been in contact with bats must be decontaminated. Any bags or covers for mistnets need to also be decontaminated if they have been in contact with a potentially contaminated net. Harp traps should be restricted for use at roosts only. Such traps should not be used in foraging situations where bats from different roosts may be forced into close contact during capture in the harp trap thereby potentially increasing bat to bat disease transmission. Plastic collection bags under harp traps are preferable to cloth collection bags as plastic is easier to disinfect or discard between sites/nights due to the smooth, quick-dry surface.

Working at roost sites other than caves or mines

When doing field work at areas where bats are known or suspected to roost, minimize the possibility of transporting spores by decontaminating all gear and clothing that comes in contact with surfaces at the site. This could include the soles of your feet, your hands if you are touching guano, your pen and notebook, the bottom of a bin placed on the ground, etc. Plan ahead to reduce contacts, and either use a disposable physical barrier (disposable gloves, bootie covers, Tyvek suit) or thoroughly decontaminate any clothing and gear that touches the site.

Considerations when moving between all sites

All equipment that has come in contact with a bat or that has been inside or on the ground at a potential bat roost (bridges, below a bat box) and has not been decontaminated should be stored in a waterproof box/tote during transportation to prevent contaminating the vehicle and to prevent the vehicles from acting as secondary sources of cross contamination. All potentially contaminated clothing should also be stored in this manner. After a night of bat capture for example, all clothing worn during the capture, handling and release of bats needs to be removed on site, placed into containers (e.g. construction grade garbage bags) and sealed until they can be washed and decontaminated (as outlined in Section 1).

Use of Tyvek or other disposable overalls over coats and clothing is recommended to reduce the exposure of clothing and hair to spores. Rain jacket, rain pants, and rubber boots are versatile field clothing, and may make excellent outer layers as they are easily washed/decontaminated. Always clean and disinfect the outside surfaces of storage

containers prior to putting in a vehicle.

If the equipment is to be used immediately at another site prior to returning to the laboratory or field station, the SOP should be carried out on a road or other impermeable surface and away from water bodies to prevent environmental contamination from the disinfectant solutions. If there is no time to ensure complete drying, residual solution should be rinsed off with clean water, again working away from water bodies. Even very low residual amounts of some decontamination solutions may adversely affect bats on contact or contaminate water.

Information on *Pseudogymnoascus destructans* and movement of soils in BC

Pd thrives in cold, damp conditions such as caves. *Pd* spores can persist in bat guano, in soil, and on other substrates in warmer and drier conditions. Research has shown that *Pd* levels do decline rapidly in warm soil likely due to the natural biota; however, viable spores were still found after four months ([Urbina et al 2021](#)). Some caution is therefore warranted when considering transfer of soils. However, the overall risk to bats is low, considering that low probability of a bat picking up *Pd* in soil and the likelihood of *Pd* persisting on a bat through the active season.

Testing soil samples for the presence of *Pd* is of low effectiveness and high cost.

The best way to avoid human-mediated *Pd* spread through movement of soil is by reducing the movement of soil that may contain spores. There are many unknowns about the persistence of *Pd* – be conservative!

1. Do not move soil to or from caves or mine sites.
2. Keep soil transfer local, to further reduce the low probability of spreading *Pd* spores to novel regions. This is particularly relevant if the soil to be moved is from sites with potential *Pd* from bat droppings. This includes soil from around buildings and bridges with known or suspect bat roosting habitat.

Section 4 - Procedures to reduce the risk of disease transmission among individual bats within a site

It is recognized that bats roosting together have a high likelihood of bat-to-bat contact

and transmission of spores. However, when capturing bats at foraging sites or when bats are travelling through daily or seasonal migration corridors, there is a potential for researchers to increase the level of fungal transmission by bringing bats into closer contact with each other. Compared to the winter season, the density or viability of *Pd* spores on bats during the summer is expected to be low given higher daily average temperatures and the ability of bats to groom frequently to prevent *Pd* proliferation. However, bat researchers are obligated to implement as high a level of decontamination procedures as is logistically feasible.

Extracting bats from nets

Latex/vinyl/nitrile disposable gloves should be used for all extractions of bats from nets. A new pair of gloves should be used for each bat. The teeth of small bats may be felt through latex gloves, but they are less likely to puncture the glove material. Leather gloves may be necessary when handling larger bats such as Big Brown bats and Pallid bats. If non-disposable gloves are used, they must be decontaminated (as described in Section 1) and rinsed between individual bats, thus requiring many pairs of gloves per trap session. Alternatively, large disposable gloves may be worn over non-disposable gloves, and changed between individual animals. Dexterity can be compromised with the use of gloves, especially when two pairs of gloves are worn, one over the other. If bare hands are in contact with a bat or contaminated equipment, wash with soap and water (preferred) or thoroughly wipe with several hand wipes (e.g. diaper wipes) if water is unavailable (not the preferred method). Decontamination liquids in Section 1 may pose health risks when exposed to bare skin.

Professional judgement should be used to strike a balance between reducing bat to bat disease transmission and risking the safety and health of the bat and human. This is particularly the case for captures of bats emerging from roosts. For example, bats using the same maternity roost are likely to be in contact with each other and sharing a roosting surface. If a large number of bats emerging from this roost into a mistnet or harp trap makes changing gloves between bats an obvious added stressor to captured bats that remain in nets longer due to this procedure, the researcher may determine that gloves not be changed in between each bat. In this situation the researcher may also determine that equipment to measure bats will come into contact with multiple bats to ensure that the processing time of a large capture number from a roost is completed in a timely manner. The most important thing

to remember when netting a roost is that all precautions are taken to not transport spores into the roost site or out of the roost site. In other words, all equipment arriving to the site and leaving the site need to be decontaminated or contained.

Holding and processing of bats

Captured bats should be placed in holding bags, one bat per bag. Bags should be new or cleaned using the decontamination procedures described in Section 1. Care must be taken to not touch the outside of the bag with potentially contaminated gloves which would cause contamination to any other surface that it subsequently touches. All holding bags are porous to some extent to enable bats to breath. As such, if spores are present, they may escape the bag. In general, bats in bags, while they await processing, should be placed somewhere that can be easily decontaminated.

Processing equipment must be decontaminated between bats, or better yet, it should not touch the bat. Having several sets of processing equipment will allow time for decontamination between uses. Equipment should only touch the bat if absolutely necessary. Placing the bat in a thin plastic sandwich bag (foldable baggies work best) and measuring through the bag is one method to avoid direct contact between callipers, weigh scales, rulers etc., and avoids treating equipment between individual bats. Care must be taken to ensure the plastic never covers the bat's nose or otherwise interferes with breathing.

The researcher must be aware of what his/her hand touches after it has been in contact with the bat, i.e. a gloved or bare hand that has been in contact with a bat should not touch processing equipment, headlamps, record books, data sheets etc. as these may cross contaminate. A dedicated record keeper that does not touch handling equipment will avoid cross contamination of pens, field books, etc. Since headlamps need constant adjustment while extracting and processing bats, they can be covered with a disposable shower cap which can be changed between handling individual bats. Practicing the steps involved in processing a bat and minimizing cross-contamination is recommended prior to field deployment.

Genetic sampling

If genetic sampling is performed, the tip of the biopsy punch should be dipped in

ethanol and flamed between individual bats, unless new punches are used for each bat. If more than the tip of the biopsy punch comes in contact with the bat or contaminated surfaces, the punch should be discarded or the entire punch decontaminated (as in Section 1). The boards used as backing when biopsy punching must be decontaminated between bats or the board can be wrapped in several layers of cling-wrap plastic such that the biopsy punch does not penetrate to the board, and the cling-wrap plastic must be changed between processing individual bats.

SUGGESTED MATERIALS

- Plastic tote or box to store contaminated field equipment or clothing
- Buckets and totes for mixing disinfectant solution and soaking equipment
- Spray bottle and instructions (MSDS) for disinfectant solution mixing
- Scraper, brushes, hand-brushes
- Rubber dishwashing gloves, rubber apron
- Clean cloth bags for temporarily holding animals
- Disinfectant liquid and/or wipes as per CWHC Table 1 (CWHC 2017)
- Latex, vinyl or nitrile gloves for handling animals
- Plastic sheets, wax paper or cling-wrap plastic to cover working surfaces
- Biopsy punches (adequate for all animals) and sterilizing solutions (ethanol) and alcohol burner/lighter for disinfecting instruments when animals are biopsied for genetic sampling
- Container for waste disposal and contaminated gloves, plastic covers, etc.
- Tyvek/disposable overalls and/or change of clothes and footwear

REFERENCES

Canadian Wildlife Health Cooperative. 2017. Canadian National White-nose Syndrome Decontamination Protocol for entering bat hibernacula. 07 March 2017. Available:

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https://s3.us-west-2.amazonaws.com/prod-is-cms-assets/wns/prod/dfb0a4f0-ff7e-11eb-9953-191cff2d5300-WNS%20Decon%20Protocol_October2020.pdf

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