

Rehabilitation Guidance for Bats in Wisconsin

Wisconsin Department of Natural Resources

November 2014

This document provides guidelines for allowing rehabilitation of bats in Wisconsin. Each bat taken into rehab should be treated as a possible carrier of the fungus causing white-nose syndrome (WNS) and proper decontamination protocols must be followed to prevent inadvertent human-assisted transfer of WNS. Until further notice, no rehabilitation of bats infected with WNS is permitted in Wisconsin and no bat from a WNS-positive county may be admitted to any facility for rehabilitation.

White-nose Syndrome

White-nose syndrome is a devastating bat disease caused by the fungus *Pseudogymnoascus destructans* (Lorch et al. 2011, Minnis and Lindner 2013). The exact mechanism of mortality remains unknown, but the cold-loving fungus invades the skin of hibernating bats. Visible signs of fungal growth appear only when bats are in torpor, and are easily groomed away after the bat arouses from hibernation. However, fungal spores may still be present on the bat after arousal and grooming.

Myotis (Little brown bat and northern long-eared bat) and *Perimyotis* (eastern pipistrelle) species have some of the highest infection rates when compared to big brown bats (*Eptesicus fuscus*) (Langwig et al. unpublished). Symptoms of WNS are never overt except when observed inside and within the immediate area (~100') of a hibernaculum. To reduce risk of admitting WNS-infected bats, no *Myotis* or *Perimyotis* species may be admitted to rehabilitation facilities from November 1 through April 30. In late winter (February-March), pre-screening of non-*Myotis* and *Perimyotis* species may be completed to help prevent admittance of infected bats. See Appendix A for pre-screening protocol. Equipment for pre-screening is available from Wisconsin Department of Natural Resources. *Myotis* and *Perimyotis* encountered from Nov 1 through April 30 should be immediately reported to WDNR and will be dealt with on a case by case basis (for immediate action pertaining to possible *Myotis* and *Perimyotis* admission November 1 through April 30, see Appendix F).

Rehabilitation of all bat species is allowed May 1 through September 30, but decontamination protocol must be followed regardless of time of year.

The activity of bat rehabilitation will be reassessed if and when additional detection of white-nose syndrome occurs in the state.

Rehabilitators should be aware of the following key requirements:

- Rehabilitators must have state wildlife rehabilitation license and endangered/threatened species authorization to handle and maintain listed species.
- It is strongly recommended that rehabilitators have pre-exposure rabies vaccination and follow up every two years with a rabies neutralizing antibody test.
- Rehabilitators must follow established principles of wildlife rehabilitation (e.g. adherence to National Wildlife Rehabilitation Association's (NWRA) professional ethics:

<http://www.nwrawildlife.org/content/wildlife-rehabilitators-code-ethics>) and NWRA minimum standards in Appendix B.

- Photo documentation will be required of any admitted little brown bat (*Myotis lucifugus*), northern long-eared bat (*M. septentrionalis*) and Indiana bat (*M. sodalis*) through the Wisconsin Bat Program Sick and Dead Bat Report form: <http://wiatri.net/Inventory/Bats/Report>; additionally, rehabilitators must maintain data sheets on **all bats** (including tree bats) taken into rehabilitation and submitted via the Wisconsin Wildlife Rehabilitation Database on a **monthly** basis.
- Rehabilitators must follow the Quarantine, Isolation, and Handling Protocols detailed in this document to prevent any possible human-assisted transfer of the disease. See Appendix C for National White-nose Syndrome Decontamination Protocol.
- Decontamination protocol must be followed year-round regardless of required quarantine time period.
- All bats admitted May 1 through September 30 need not follow 30 day quarantine requirement, however must be housed separately based on group (cave/tree bat), origin and time period (see isolation protocol).
- Per results from 2014 bat rehabilitation risk assessment, rehabilitators must contact WDNR Mammal Ecologist and Wildlife Rehabilitation Program Manager before releasing rehabilitated bats kept overwinter.
- WDNR may require marking of admitted bats by trained WDNR personnel prior to release to investigate effectiveness of bat rehabilitation which is currently unknown and undocumented.

If a WNS suspect bat is identified, immediately contact WDNR mammal ecologist for instructions. 608-267-0813; john.white@wisconsin.gov

Admission for care

- No bats from WNS-positive counties may be admitted for rehabilitation at any time.
- At this time, rehabilitators are allowed to admit only those bats captured in their designated region (see Appendix D). If a facility receives a call from a region not their own, the facility should locate and contact a closer rehabilitator to admit the animal. If the facility in the region cannot admit the animal, contact DNR State Mammal Ecologist for final decision on animal.
- It is good practice to maintain accurate records on **all** incoming bats (including tree bats). Be sure to record all information required by state and/or federal agencies, and an animal's final disposition. Submit records of incoming bats via the Wisconsin Wildlife Rehabilitation Database on a **monthly** basis.
- Photo documentation will be required of any admitted little brown bat (*Myotis lucifugus*), northern long-eared bat (*M. septentrionalis*) and Indiana bat (*M. sodalis*) through the Wisconsin Bat Program Sick and Dead Bat Online Report Form (link above).
- Any *Myotis* or *Perimyotis* that is dead on arrival or dies shortly after getting to facility from Nov 1 through April 30 should be submitted to USGS Wildlife Health Lab for WNS testing. Submission guidelines are available in appendix E.

Transportation

The general public should not handle live bats. When bats are in torpor, they will often appear deceased (not moving, not breathing etc.), so proper precautions should be observed such as always wearing thick gloves when moving a bat into a transportation container. Trained and vaccinated volunteers/animal control officers should be recruited to transport live bats using the following guidelines (volunteers without the rabies vaccination should never handle the bats but may handle the secured box carriers):

- Individuals transporting bats must follow decontamination protocols found in Appendix C.
- Bats should be transferred in a secure container with lid using items that may be easily disinfected or discarded.
- The transport box should be placed inside another box or bag before being placed in a vehicle.
- Bats should be transferred to wildlife rehabilitators outside of the bat care facility and the box should not be opened until inside an exam room to determine species identification and final designated room (tree or cave bat room).

Quarantine, Isolation, and Handling Procedures

1. The bat quarantine area must be a separate, contained room housing only cave bats (e.g. little brown bat, Northern long-eared bat, big brown bat, and eastern pipistrelle). Outside flight-conditioning cages should be separated from other bat species by a minimum of 20 ft. During quarantine bats should be monitored daily for signs of WNS. Signs of WNS may include wing deterioration in the weeks after admittance, thin animals, dehydrated wings (wrinkled and not pliable) and fungal growth. Daily monitoring of bats will need to be balanced against the risk of stress due to frequent handling and arousal of the bat. Any suspect signs of WNS should be immediately reported to WDNR.
2. DO NOT house bats from different locations (greater than 2 miles) or from different time periods (greater than 3 weeks) in the same cage at any time, including in pre-release flight cages. Individuals of the same species from the same hibernaculum may be housed together, while bats of uncertain origin must be housed in separate enclosures and preferably be housed in separate rooms. If separate rooms are not possible, separate equipment must be used for each housing unit.
3. Cave bats **must** be housed separately from tree bats (e.g. eastern red bat [*Lasiurus borealis*], hoary bat [*L. cinereus*], and silver-haired bat [*Lasionycteris noctivagans*]), preferably in a separate room. *Pd* has been documented on tree bats such as silver-haired bats (*L. noctivagans*) and eastern red bats (*L. borealis*). The possibility of tree bats acting as vectors for WNS is not fully understood and ideally, all tree bats would go to a single facility that does not house cave bats.
4. All bats entering the rehab facility from November 1 through April 30 must be held in quarantine for a minimum of 30 days before being transferred into a pre-release flight cage. Bats admitted from April 1 through April 30 may be released after April 30 if and when WDNR deems release is possible in spring.

5. After 30 day quarantine, bats need not transfer to an additional room; however, bats should continue to be housed separately from other individuals within quarantine room, and decontamination procedures must be followed.
6. Clean and disinfect quarantine room items separately from the rest of facility supplies. Please consider dedicating “cave-bat only” items used for cleaning such as vacuums and other non-disposable equipment.
7. Bats must only be handled using protective disposable exam gloves and wearing an outer layer dedicated as protective clothing (coveralls and/or pants, shirt and boots) that should be removed **prior** to exiting the room. Disposable shoe covers or rubber boots that can be cleaned and disinfected are recommended.
8. Disinfectant foot baths should be used or dedicated footwear should be removed upon exiting any bat holding area. Use a boot brush to wash all upper and lower surfaces of boots while standing in the bath. In replace of foot baths, disposable shoe covers can be used and discarded when leaving the quarantine room.
9. Launder protective clothing at least once a week or when they become soiled.
10. Animal cages should be located as far away as possible from doors, fans, and vents to reduce the risk of aerosolization of fungal spores.

Disinfection Protocols

All disinfection protocols below are in accordance with The National White-Nose Syndrome Decontamination Protocol: <https://www.whitenosesyndrome.org/topics/decontamination>.

1. All items to be removed from quarantine areas must be cleaned with soap and water **and** sprayed with disinfectant (see Appendix C) in the quarantine room. Items should then be securely bagged for transport.
2. All items that come into contact with a bat including but not limited to gloves, forceps, dishes, holding containers, etc. must be able to be disinfected according to current decontamination protocols or properly disposed of.
3. All disposable items and trash should be sprayed with disinfectant and placed in a dedicated waste receptacle. Trash should then be double-bagged and discarded in the regular trash when the receptacle is full.
4. Furnace and air conditioning filters should have at least an 8 rating on the Minimum Efficiency Rating Value (MERV) chart and replaced according to suggested lifetime of filter.
5. Bat quarantine rooms must be cleaned and disinfected thoroughly once all bats have been transferred to pre-release cages.

Daily Care

Information on daily management and care of insectivorous bats can be found from various sources including Bat World Rescue Sanctuary: http://batworld.org/wp-content/uploads/2011/03/BWS-Standards_Bats_-in_Captivity1.pdf and Bats in Captivity Volume 2: Aspects of Rehabilitation by Susan M. Barnard: http://www.logos-press.com/books/bats_in_captivity_aspects_of_rehabilitation.php

- Any items that come in contact with bats during daily care, regardless of time of year must be decontaminated according to decontamination protocol (Appendix C) before use with another individual.

Euthanasia

Euthanasia may be necessary in the rehabilitation setting. Euthanasia methods must conform to American Veterinary Medicine Association guidelines on Euthanasia of Animals; 2013 edition, as well as Wisconsin Admin. Code (NR19.73 (2) (b)3(c); NR19.73 (3) (c)).

Carcass Disposal

- Rehabilitators should communicate with the WDNR mammal ecologist to determine if samples from carcasses could be used for WNS research and to determine appropriate carcass disposal.
- If carcass is not needed for testing, bat/s should be double-bagged with disposable gloves, bag should be sprayed with disinfectant and disposed of in the trash. To properly dispose of a bat carcass it should be sealed in a zip lock bag and placed into a second sealed bag along with plastic gloves or disposable equipment that may have touched the carcass(<http://www.youtube.com/watch?v=DwysePQG0Sg> a USFWS video on “How to dispose of a dead bat”).

Flight Conditioning

If the WDNR has determined to permit the release of rehabilitated bats held over winter, pre-release flight conditioning will be necessary. Free-standing pop-up screen tents make good, temporary flight cages. Floors should be padded and secured to prevent escape. Roosting areas and feeding and watering areas can be hung directly on screen walls. Branches and silk foliage can be suspended from the ceiling to provide enrichment and practice for obstacle avoidance.

Release

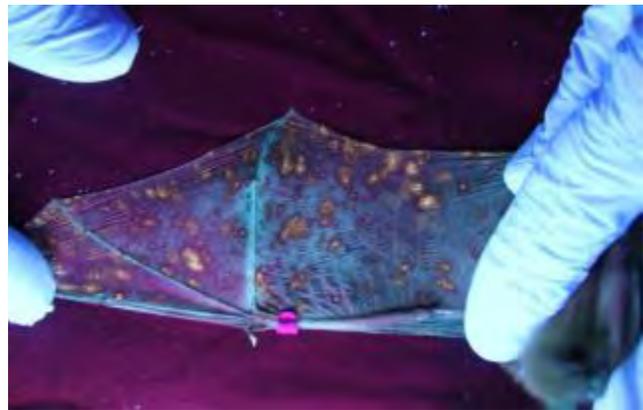
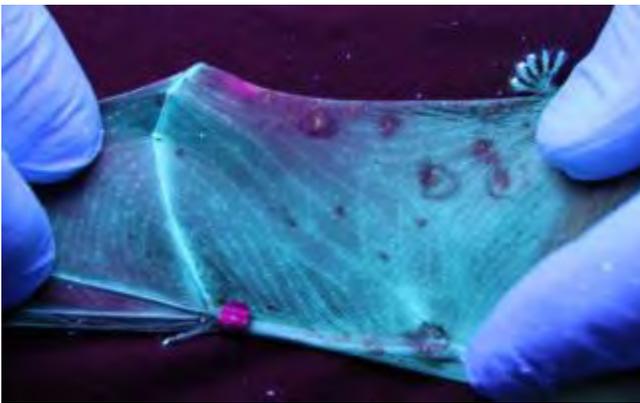
- Per 2014 cave bat release risk assessment, bats in care over winter may be released in spring only if WDNR determines release is permitted.
- Prior to release, WDNR may require captive bats be marked by trained WDNR personnel at each facility to investigate the outcome of cave bat rehabilitation which is currently unknown and undocumented.
- Bats should be transported using protocol described in above transportation section.
- Release of each individual must occur within **2 miles** of capture.

Appendix A

White-nose Syndrome Pre-screening

Bats with presence of *Pseudogymnoascus destructans* (Pd, fungus causing WNS) or those infected with WNS may not display obvious signs of the disease, especially after flight and other activity. Prior to admittance in late winter, bats can be physically inspected to prevent inadvertent transport of the Pd. Wings of the bats can be inspected using a UVA long-wave light and a regular light. Pd is easily brushed from the bat, so minimize handling prior to screening.

1. Using UV to determine presence of Pd (G. Turner and J. Gumbs 2011)
 - a. In a low light or dark area, spread the wings of the bat fully and shine the UV light directly on the wing. Lesions associated with WNS will fluoresce orange under UV. Inspect both sides of both wings. Avoid shining the light into the bat's face as this can cause eye damage.



2. Using back-light for scoring wing damage and scarring (Reichard and Kunz 2009)
 - a. Using a small flashlight or headlamp, shine the light up from a table and spread the bat's wings over the light. WNS can cause excessive scarring which will appear as light areas and holes.



Transillumination reveals the splotchy flight membrane.



- b. <https://www.whitenosesyndrome.org/resource/wing-damage-index-used-characterizing-wing-condition-bats-affected-white-nose-syndrome>

- c. Damage and scarring can have causes other than WNS, so a back-light should be used in conjunction with UV to screen for presence of Pd.

If a WNS suspect bat is identified, immediately contact WDNR mammal ecologist for instructions. 608-267-0813; john.white@wisconsin.gov

Appendix B

National Wildlife Rehabilitators Association/International Wildlife Rehabilitation Council
Minimum Standards for Wildlife Rehabilitation (Miller 2012)

<http://www.nwrawildlife.org/> <http://thewrc.org/>

For raised enclosures, cage bottoms should be constructed of ¼" hardware cloth to allow for drainage; cage bottoms should be covered by natural substrate such as pine bows or shredded cedar, AstroTurf™, rubber mats, Dri-dek™ mats, or similar substrates that will minimize foot damage from the wire and that can be removed for cleaning of the cage.

When possible, all doors should be equipped with a double door system for the protection of the handler and the animal. Whenever possible, the interiors of all outdoor enclosures should attempt to imitate natural habitat/terrain as much as possible. Examples include dirt with raised mounds for burrowing animals, trees or large natural branches for climbing animals, and natural vegetation to provide hides/shelter for all species. Branches should be changed between individuals or groups of animals using the cage. A den should be provided in each cage, with the den entrance facing away from the cage entrance: examples would include a wooden box, fiberglass or plastic animal carrier.

Self-feeders often work well for animals such as raccoons, and may be helpful in reducing habituation to humans.

As mentioned in the General Caging Comments, cages used for raccoons must not be used for any other species due to the high incidence of *Baylisascaris procyonis* (raccoon roundworm) in these animals.

5.2 Special Considerations for Selected Mammals

Since most small mammal young can be housed in the same general manner described above, this section addresses the special housing needs for juvenile and adult mammals (except where noted otherwise). Please refer to Table 6 for specifics regarding cage size.

The order in which the groups of mammals appear below and in Table 6 is based on the standard scientific "evolutionary order" as presented in *A Field Guide to the Mammals of America North of Mexico* (Appendix B, Burt/Grossenheider).

Marsupialia (Opossums):

Hammocks made of one-inch square wire mesh or from burlap sacks, attached to wall or roof (and removable for cleaning); tree limbs and logs at various heights to promote climbing. Plastic barrels for hiding or other things in which to hide (logs, boxes, etc.). Large (ferret-sized) exercise wheels may be used to keep young opossums active.

Chiroptera (Bats):

For bats under rehabilitation, many different considerations are important to proper enclosure construction. Security is of top concern regardless of cage size. For example, most bats can easily escape through a 1/2" x 1" crack. Two different types of caging are necessary to accommodate the differences in the roosting behavior of crevice-dwelling and foliage-roosting bats. Crevice-dwelling bats (free-tailed bats, pallid bats, big browns, silver-haired bats, Myotis bats, evening bats, big-eared bats, and pipistrelles) roost in rock crevices, hollow trees, under bridges, beneath bark and in caves and buildings. Foliage-roosting bats (red bats, Seminole bats, yellow bats, and hoary bats) roost in the open in trees and other vegetation.

Appropriate temperatures for adult bats receiving rehabilitation and infant bats being hand-raised are very important considerations. These temperatures are generally between 90°F - 100°F. A heating pad, set to low, can be attached to one side of the cage to create a

temperature gradient. Do not place heating pads on the floor of the container. A bird brooder or a 25-watt red light bulb may be used instead of a heating pad. Place the brooder or light at the top of the cage on the outside. Incubators are inappropriate for bats, as a temperature gradient is needed rather than a constant temperature. Humidity should be provided by use of a humidifier or by keeping a small, damp sponge inside the cage. Padding should be placed on the cage floor to protect injured adults and/or infant bats. Soft fabric allows the bat(s) to climb and hide. Terrycloth is inappropriate due to risk of entanglement.

Caging for crevice-dwelling bats (restricted/limited activity):

All walls and floor of an enclosure should be lined with a soft, snag-resistant fabric such as t-shirt or flannel material. Aquaria, or any sort of hard-sided cage, should be avoided. Adult bats will echolocate when in an unfamiliar setting. When they do this in a hard-sided enclosure, the sound waves bounce back from all sides; the bats realize they are confined, causing unnecessary stress. Use of the smallest-size Reptarium® or a Port-A-Bat® is a better choice. Environmental enrichment can include items made from fabric such as roosting pouches, constructed of a soft non-loop fabric. The addition of ramps or bridges should be constructed from Rubbermaid™ shelf liner or similar product.

Caging for foliage-roosting bats (restricted/limited activity):

Foliage-roosting bats are prone to abrasion-type wing injuries, so they should be encouraged to hang freely rather than cling to the cage side, where they may rub their wings. The cage should be covered with soft, lightweight 1/16" mesh to avoid toe and foot injuries. Port-A-Bats® or Caterpillar Castles® are good choices for housing foliage-roosting species; the mesh is much finer and softer than that of a Reptarium®. A square of Con-Tact® Grip Liner may be attached to the ceiling of the cage; this will encourage the bat to hang freely rather than cling to the cage side. Environmental enrichment should be provided by securely attaching small branches with silk leaves against the ceiling of the cage.

Unlimited activity/mobility flight cages:

Outdoor flight cages should be double enclosed or have a double entry system similar to aviaries. A screened tent with an extra door flap works well for outdoor housing if the area is secure from predators. If a double enclosure is used, the inside cage should be constructed of a frame covered with soft, lightweight 1/16" mesh, netting or nylon screening. One side can be covered with 1/4" mesh to allow insects to enter the enclosure. The outside of the enclosure should be covered with sturdy 1/4"-1/2" metal screening (hardware cloth or hail wire) to protect from predators.

Roosting pouches or boxes should be placed inside flight cages along the ceiling for crevice-dwelling bats. Small branches with silk leaves should be secured along the ceiling for foliage-roosting bats. Hanging plants also work well for shelter and resting areas. A tarp should be placed over a section of the cage to shade the roosting area and to provide shelter against inclement weather.

Water dishes should be small and can be made from baby food jar lids that are placed on the cage floor or film canisters that are cut to one inch high and hung on cage walls (Velcro™ works well to attach these canisters). Small cups can be hung from the sides of the cage for foliage roosting bats; however, marbles or small stones should be placed inside the cup to prevent the bat from falling in and drowning. Food dishes should be placed against cage walls and should be shallow enough to allow bats that self-feed to easily climb

in and out, but deep enough to prevent mealworms from escaping. For certain species, such as western pallid bats, food and water should be provided on the ground. Internal light sources used to attract insects should have covered bulbs (plastic, not metal) to prevent bats from having contact with hot light fixtures. Ideally, both a low-wattage incandescent light and a 'black light' (UV) should be provided, as these attract different species of insects.

Environmental enrichment should be included in all caging to provide mental stimulation. Items that are placed into cages to provide diversity should be free of sharp surfaces, easily cleaned, and appropriate for the species.

Transport cages for bats:

Transport carriers should be ventilated, well padded, and covered so they protect and provide a sense of security for the bat inside. They also should be constructed so that they can sit securely inside a vehicle. For example, a screen window can be sewn or glued into a cloth compact-disk carrier (with the plastic insert removed). A seat belt can then be slipped through the handle to secure the carrier during transport.

Ursids (Bears):

Den should be made of solid wood, concrete blocks or bricks, 8'x8'x6'. This will house one adult or two juveniles. Flooring substrate ideally should be natural (dirt and grass) in order to avoid damage to the foot pads. If floors are concrete, ensure that the floor slopes into a drain for cleaning and provide heavy rubber mats to avoid foot damage. Heavy logs and a large indestructible tub for bathing are also necessary.

Procyonids (Raccoons):

Special cage furnishings for this group include hammocks made of half-inch square wire mesh or from burlap sacks, attached to walls or the roof that are removable for cleaning, and plastic barrels or other things in which to hide (e.g., logs). Additionally, tree limbs and logs at various heights to promote climbing should be in enclosures. A wading pool or container applicable to the animal's size should be provided to allow bathing and food handling. Outdoor enclosures should allow 30 square feet per animal when raccoons are group housed. An enclosure which is 12'x18' (216 square feet) could house seven raccoons. Cages used for raccoons should not be used for other species due to possible parasitic infection. Raccoon caging should be constructed of a material that enables it to be flamed or steam-cleaned in order to destroy parasites after each use.

Mustelids (Badgers, Weasels, Skunks, etc.):

This group contains ambitious diggers. The bottom of the cage must be secured so that the animal cannot dig out. A metal garbage can turned on its side and lined with tree trimmings or shavings can be used as a den. A large wooden box with soil should be provided for digging.

Felids (Cats):

Large branches and logs (some hollow) should be provided for climbing, along with high platforms for resting above the cage floor. Other furnishings are plastic barrels or other things to hide in (logs, boxes, etc.).

Marine Mammals:

Shall be housed in accordance with Animal and Plant Health Inspection Service (APHIS) Standards and follow NOAA Fisheries Programmatic Environmental Impact Statement (PEIS) on the Marine Mammal Health and Stranding Response Program (MMHSRP) 2009,

Table 6: Minimum Housing Guidelines for Infant to Juvenile Mammals

Note: This table is not intended to be used independently; it should be used only in conjunction with the information in Chapter 5, Sections 5.1 and 5.3

Order/Family	Infant Care			Nursing/Pre-weaned			Juvenile Outside		
	W	L	H	W	L	H	W	L	H
Marsupialia									
Opossums	(L) 10 Gallon 38 Liter			(L) 3 ft x 3 ft x 3 ft 0.9 m x 0.9 m x 0.9 m			10 ft x 12 ft x 8 ft (L) 3.0 m x 3.7 m x 2.4 m		
Insectivora									
Shrews & Moles	(L) 10 Gallon 38 Liter			20 Gallon (L) 76 Liter					
Chiroptera (Bats)	6 in x 8 in x 6 in 15 cm x 20 cm x 15 cm			12 in x 18 in x 12 in 30 cm x 46 cm x 30 cm			8 ft x 16 ft x 8 ft 2.4 m x 4.9 m x 2.4 m		
Little Browns & Pipistrelles							8 ft x 16 ft x 8 ft 2.4 m x 4.9 m x 2.4 m		
Evenings, Reds, Myotis, Big Brown							8 ft x 16 ft x 8 ft 2.4 m x 4.9 m x 2.4 m		
Free-tails, Hoarys, Pallids & Yellows							10 ft x 20 ft x 8 ft 3.0 m x 6.1 m x 2.4 m		
Carnivora									
Bears	(L) 20 Gallon 76 Liter			3 ft x 6 ft x 3 ft (L) 0.9 m x 1.8 m x 0.9 m			20 ft x 36 ft x 16 ft * (L) 6.1 m x 11.0 m x 4.9 m		
Black Bears									
Raccoons, Coatis & Ringtails	(L) 10-20 Gallon 38-76 Liter			3 ft x 3 ft x 3 ft (3) 0.9 m x 0.9 m x 0.9 m			10 ft x 12 ft x 6 ft (4) 3.0 m x 3.7 m x 1.8 m		
Mustelids									
Martens	(L) 10 Gallon 38 Liter			3 ft x 3 ft x 3 ft (L) 0.9 m x 0.9 m x 0.9 m			4 ft x 8 ft x 6 ft (L) 1.2 m x 2.4 m x 1.8 m		
Fishers	(L) 10 Gallon 38 Liter			3 ft x 3 ft x 3 ft (L) 0.9 m x 0.9 m x 0.9 m			6 ft x 8 ft x 6 ft (L) 1.8 m x 2.4 m x 1.8 m		



Table 7: Minimum Housing Guidelines for Adult or Adult-sized Mammals

Note: This table is not intended to be used independently; it should be used only in conjunction with the information in Chapter 4, Sections 4.1 and 4.3

Order/Family	Adult Outside			Restricted Injured Adult		
	W	x L	x H	W	x L	x H
Marsupialia						
Opossums	(1) 10 ft	x 12 ft	x 8 ft	(1) 2 ft	x 2 ft	x 2 ft
	3.0 m	x 3.7 m	x 2.4 m	0.6 m	x 0.6 m	x 0.6 m
	(1) 4 ft	x 4 ft	x 8 ft			
	1.2 m	x 1.2 m	x 2.4 m			
Insectivora						
Shrews & Moles				(1) 10 Gallon		
				38 Liter		
Chiroptera (Bats)				12 in x 18 in x 12 in		
				30 cm x 46 cm x 30 cm		
Little Browns & Pipistrelles	8 ft	x 16 ft	x 8 ft			
	2.4 m	x 4.8 m	x 2.4 m			
Evenings, Reds, Myotis	8 ft	x 16 ft	x 8 ft			
Big Browns,	2.4 m	x 4.8 m	x 2.4 m			
Free-tails, Hoarys, Pallids & Yellows	10 ft	x 20 ft	x 8 ft			
	3.0 m	x 6.1 m	x 2.4 m			
Carnivora						
Bears	(1) 20 ft	x 36 ft	x 16 ft *	(1) 8 ft	x 12 ft	x 8 ft
Black Bears	6.1 m	x 11.0 m	x 4.9 m	2.4 m	x 3.7 m	x 2.4 m
Raccoons, Coatis & Ringtails	(1) 10 ft	x 12 ft	x 8 ft	(1) 2 ft	x 3 ft	x 3 ft
	3.0 m	x 3.7 m	x 2.4 m	0.6 m	x 0.9 m	x 0.9 m
Mustelids						
Martens	(1) 4 ft	x 8 ft	x 8 ft	(1) 2 ft	x 2 ft	x 2 ft
	1.2 m	x 2.4 m	x 2.4 m	0.6 m	x 0.6 m	x 0.6 m
Fishers	(1) 6 ft	x 8 ft	x 8 ft	(1) 4 ft	x 3 ft	x 3 ft
	1.8 m	x 2.4 m	x 2.4 m	1.2 m	x 0.9 m	x 0.9 m
Weasels & Minks	(1) 6 ft	x 8 ft	x 6 ft	(1) 3 ft	x 3 ft	x 3 ft
	1.8 m	x 2.4 m	x 1.8 m	0.9 m	x 0.9 m	x 0.9 m
River Otters	(1) 6 ft	x 12 ft	x 6 ft *	(1) 4 ft	x 3 ft	x 3 ft *
	1.8 m	x 3.7 m	x 1.8 m	1.2 m	x 0.9 m	x 0.9 m
Sea Otters	(1) 6 ft	x 12 ft	x 6 ft	(1) 6 ft	x 8 ft	x 6 ft
	1.8 m	x 3.7 m	x 1.8 m	1.8 m	x 2.4 m	x 1.8 m
Wolverines	(1) 10 ft	x 12 ft	x 6 ft	(1) 4 ft	x 3 ft	x 3 ft
	3.0 m	x 3.7 m	x 1.8 m	1.2 m	x 0.9 m	x 0.9 m
Badgers	(1) 10 ft	x 12 ft	x 6 ft *	(1) 3 ft	x 3 ft	x 3 ft
	3.0 m	x 3.7 m	x 1.8 m	0.9 m	x 0.9 m	x 0.9 m
Skunks	(1) 8 ft	x 10 ft	x 6 ft	(1) 3 ft	x 3 ft	x 3 ft
	2.4 m	x 3.0 m	x 1.8 m	0.9 m	x 0.9 m	x 0.9 m

Appendix C

National White-nose Syndrome Decontamination Protocol (USFWS 2012)

https://www.whitenosesyndrome.org/sites/default/files/resource/national_wns_revise_final_6.25.12.pdf

National White-Nose Syndrome Decontamination Protocol - Version 06.25.2012

The fungus *Geomyces destructans* (*G.d.*) is the cause of white-nose syndrome (WNS), a disease that has devastated populations of hibernating bats in eastern North America. Since its discovery in New York in 2007, WNS has spread rapidly through northeastern, mid-Atlantic, and Midwest states and eastern Canada. It continues to threaten bat populations across the continent. For the protection of bats and their habitats, comply with all current cave and mine closures, advisories, and regulations on the federal, state, tribal, and private lands you plan to visit. In the absence of cave and mine closure policy, or when planned activities involve close/direct contact with bats, their environments, and/or associated materials, the following decontamination procedures should be implemented to **reduce the risk of transmission** of the fungus to other bats and/or habitats. For the purposes of clarification, the use of the word “decontamination,” or any similar root, in this document entails both the 1) cleaning and 2) treatment to disinfect exposed materials.

Under no circumstances should clothing, footwear, or equipment that was used in a confirmed or suspect WNS-affected state or region be used in a WNS-unaffected state or region. Some state/federal regulatory or land management agencies have supplemental documents¹ that provide additional requirements or exemptions on lands under their jurisdiction.

I. TREATMENTS TO REDUCE RISK OF TRANSFERRING *GEOMYCES DESTRUCTANS*²:

Applications/Products:

The most universally available option for treatment of submersible gear is:

Submersion in Hot Water: Effective at sustained temperatures $\geq 50^{\circ}\text{C}$ (122°F) for 20 minutes

Secondary or non-submersible treatment options (for a minimum of 10 min.) include:

	Clorox[®] (6% HOCl) Bleach	Lysol[®] IC Quaternary Disinfectant Cleaner	Professional Lysol[®] Antibacterial All- purpose Cleaner	Formula 409[®] Antibacterial All- Purpose Cleaner	Lysol[®] Disinfecting Wipes
APPROVED USES	Hard, non-porous surfaces	Yes	Yes	Yes	Yes
	Non-porous personal protective safety equipment	No	Yes (headgear, goggles, rubber boots, etc.)	No	No
	All surfaces, including: porous clothing, fabric, cloth footwear, rubber boots	Yes (Do not use on ropes, harnesses or fabric safety gear.)	No	No	No
DILUTION / TREATMENT (as per label)	Effective at 1:10 dilution (bleach : water) ^{3,4}	Effective at 1:128 dilution (1 ounce: 1 gallon of water) ^{3,4}	Effective at 1:128 dilution (1 ounce: 1 gallon of water) ^{3,4}	Effective at concentrations specified by label ^{3,4}	Effective at 0.28 % dimethyl benzyl ammonium chloride ^{3,4}

¹ To find applicable addenda and/or supplemental information, visit <http://www.whitenosesyndrome.org/topics/decontamination>

² The use of trade, firm, or corporation names in this protocol is for the information and convenience of the reader. Such use does not constitute an official endorsement or approval by state and/or federal agencies of any product or service to the exclusion of others identified in the protocol that may also be suitable for the specified use.

³ Product guidelines should be consulted for compatibility of use with one another before using any decontamination product. Also, 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. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

⁴ Final determination of suitability for any decontaminant is the sole responsibility of the user. Use of some treatments which utilize such method need to be applied carefully, especially in confined spaces, due to inhalation or contact risks of the product. All users should be aware of these risks

Other effective disinfectant(s) with similar chemical formulas (e.g., a minimum of 0.3% quaternary ammonium compound) or water based applications may exist but are unknown and not recommended at this time.

REMEMBER, the product label is the law!

It is the responsibility of the users of this protocol to read and follow the product label and MSDS.

Products must be used in accordance with the label:

Ensuring the safety of those who use any of the above products for treatment is of utmost importance. Material safety data sheets (MSDS) developed by product manufacturers provide critical information on the physical properties, reactivity, potential health hazards, storage, disposal, and appropriate first aid procedures for handling or working with substances in a safe manner. Familiarization with MSDS for chemical products prior to use will help to ensure appropriate use of these materials and assist in emergency response.

It is a violation of federal law to use, store, or dispose of a regulated product in any manner not prescribed on the approved product label and associated MSDS.

- Disinfectant products, or their contaminated rinse water, should be managed and disposed of as per product label directions to avoid contamination of groundwater, drinking water, or non-municipal water feature such as streams, rivers, lakes, or other bodies of water. Follow all local, state and federal laws. State-by-state requirements for product disposal may vary. Note: Quaternary ammonium wastewaters should not be drained through septic systems because of the potential for system upset and subsequent leakage into groundwater.

II. PLAN AHEAD AND CAVE CLEAN:

Dedicate your Gear: Many types of rope and webbing have not been thoroughly tested for integrity after decontamination. Dedicate your gear to a single cave/mine or don't enter caves/mines that require this gear.

Bag it Up: Bring bags on all of your trips. All gear not decontaminated on site should be isolated (quarantined) in a sealed plastic bag/s or container/s to be cleaned and disinfected off-site.

Before Each Cave/Mine or Site Visit:

- 1.) Determine *G.d./WNS* status⁵ of the state/county(s) where your gear was previously used.
- 2.) Determine *G.d./WNS* status⁵ of state/county(s) to be visited.
- 3.) Determine whether your gear is permitted for your cave/mine visit or bat related activity, as defined by the current WNS case definitions⁶ and the flowchart below.
- 4.) Choose gear that can be most effectively decontaminated [i.e., rubber wellington type (which can be treated with hot water and/or secondary treatment options in section I.) vs. leather boots] or dedicated to a specific location. **Remember, under no circumstances should any gear that was used in a WNS-affected state or region be used in a WNS-unaffected state or region.** Brand new gear can be used at any location where access is otherwise permitted.
- 5.) Determine if any state/federal regulatory or land management agency addendum or supplemental document¹ provides additional requirements or exemptions on lands under its jurisdiction that supplement the final instruction identified in the flowchart below.
- 6.) Prepare a "Clean Caving" strategy (i.e., how and where all gear and waste materials will be stored, treated and/or disposed after returning to your vehicle and base area) for your particular circumstances that provides for cleaning and treatment of gear on a daily basis **unless** instructed above to do so more frequently throughout the day.

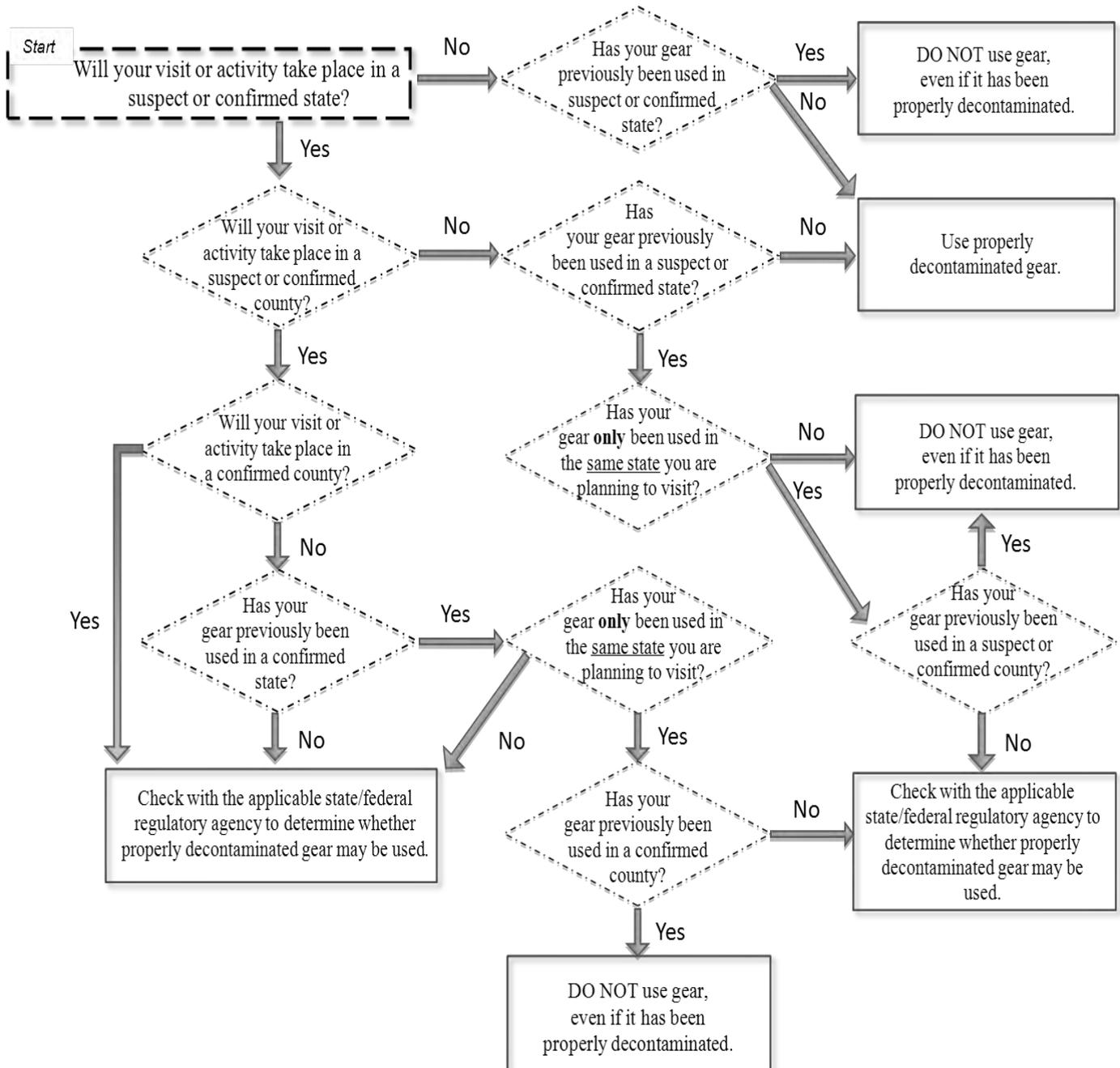
prior to entering cave environments and understand that products and corresponding procedures may cause irreversible harm. Always use personal protective equipment to reduce contact with these products, particularly when recommended by the manufacturer.

⁵ Visit <http://www.whitenosesyndrome.org/resources/map> to determine the WNS status of a county or state.

⁶ Visit http://www.nwhc.usgs.gov/disease_information/white-nose_syndrome/wns_definitions.jsp for current WNS case definitions.

7.) When visiting multiple caves/mines or bat research sites on the same day, clean and treat all gear between **each** cave/mine/site, **unless** otherwise directed in an agency/landowner addendum. It is recommended that known confirmed or suspect caves/mines be visited only after those sites of unknown *G.d.* status have been visited, to further reduce the risk of inadvertent transmission.

Flowchart to Determine Gear Use or Decontamination



After Each Cave/Mine or Site Visit:

- 1.) Thoroughly scrub and remove sediment/dirt from clothing, footwear, and other gear immediately upon emerging from the cave/mine or bat research site. Avoid contamination of vehicles; store exposed gear separately from unexposed gear.
- 2.) Once fully scrubbed and rinsed of all soil and organic material, clothing, footwear, and any appropriate gear should be sealed, bagged in a plastic container and once at home, machine or hand-washed/cleaned using a conventional cleanser like Woolite[®] detergent or Dawn[®] antibacterial dish soap in water (the use of Dawn[®] antibacterial dish soap is **not intended** for use in conventional washing machines.) Once cleaned, rinse gear thoroughly in water. Clean/treat gear used in a suspect or confirmed state prior to transport when traveling back to or through a state **without** known cases of *G.d./WNS*. Use the treatments listed under Applications/Products on page 1 for a minimum of 10 (products) or 20 (hot water) minutes.

Remember: Many types of rope and webbing have not been thoroughly tested for integrity after decontamination. Dedicate your gear to a single cave/mine or don't enter caves/mines that require this gear.

A.) Submersible Gear (i.e. clothing, footwear, and/or equipment that can be submerged in liquid):

Clothing, footwear, and other submersible gear:

Following steps 1 and 2 above, the primary treatment for all submersible gear should always be submersion in **water of at least 50°C (122°F) for a minimum of 20 minutes, where possible**. Some submersible gear (depending on material) could be soaked for a minimum of 10 minutes in the appropriate products listed in the Applications/Products chart on page 1, rinsed thoroughly in water again, and air dried. Note: Although commercially available washing machines with sanitation cycles often sustain desirable water temperatures, their efficacy for killing the conidia of *G.d.* is unknown.

B.) Non-submersible Gear:

Gear that may be damaged by liquid submersion should be cleaned according to the manufacturer's recommendation between cave/mine visits and when appropriate, follow steps 1 and 2 above in addition to following:

Cameras and Electronic Equipment:

Until effective techniques are developed to comprehensively disinfect cameras and electronics, it is recommended that these items only be used in caves when absolutely necessary. Regardless of the cave/mine visited, clean/treat cameras and electronics after each visit using an appropriate product listed in the Applications/Products chart on page 1. Equipment that must be used in the cave/mine may be placed in a sealed plastic casing (i.e., underwater camera housing), plastic freezer bag, or plastic wrap that permits operation of the equipment (i.e., glass lens is exposed) and reduces the risk of exposure to the cave environment. Prior to opening or removing any plastic protections, wipe the outside surfaces with an appropriate product described in the Applications/Products chart on page 1. Plastic freezer bag or wrap should be removed and discarded after each visit. A sealed plastic casing may be reusable if properly submersed in appropriate product as described in the Applications/Products chart and the functionality and protective features of the casing are not sacrificed (check with manufacturer). After removal of any outside plastic protection, all non-submersible equipment surfaces (i.e., camera body, lens, etc.) should be wiped using an appropriate product described in the Applications/Products chart.

- 3.) Reduce the risk of vehicle contamination and transport of *G.d.* to new areas by making sure to
 - A) transport gear in clean containers,
 - B) remove outer clothing/footwear and isolate in a sealed plastic bag or container prior to entering a vehicle. Storage container options vary considerably depending on the type of vehicle; but **always clean and disinfect the outside surfaces of storage containers prior to putting them in the vehicle**.
 - C) remain outside of the vehicle after exiting a cave/mine or completing field work,
 - D) change into clean clothing and footwear prior to entering the vehicle, and
 - E) clean dirt and debris from the outside of vehicles (especially wheels/undercarriage).

OBSERVATION OF LIVE OR DEAD BATS

If you observe live or dead bats (multiple individuals in a single location) that appear to exhibit signs of WNS, contact a wildlife professional in your nearest state (<http://www.fws.gov/offices/statelinks.html>) or federal wildlife agency (<http://www.fws.gov/offices/>, <http://www.fs.fed.us/>, <http://www.blm.gov/wo/st/en.html>, or <http://www.nps.gov/index.htm>). **Do not handle bats unless authorized in writing to do so by the appropriate government agency.**

Note on the use of Pesticides/Products listed above:

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) (7 U.S.C. §136 et seq. (1996))

<http://www.epa.gov/oecaagct/lfra.html>

defines a pesticide as follows:

(u) Pesticide

The term “pesticide” means (in part)

(1) any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest.

FIFRA defines a pest at §136:

(t) Pest

The term “pest” means (in part)

(1) any insect, rodent, nematode, fungus, weed, or **(2)** any other form of terrestrial or aquatic plant or animal life or virus, bacteria, or other micro-organism (except viruses, bacteria, or other micro-organisms on or in living man or other living animals) which the Administrator declares to be a pest under section 25(c)(1).

This document is the product of the multi-agency WNS Decontamination Team, a sub-group of the Disease Management Working Group established by 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 15 March 2012 a national decontamination protocol was adopted 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. This version of the protocol contains some modifications to the 15 March version, intended to clarify the recommendations for the appropriate use of treatment options. This decontamination protocol will continue to be updated as necessary to include the most current information and guidance available.

Appendix D

Wisconsin Bat Rehabilitator Regions



Appendix E. USGS Wildlife Health Lab Guidelines for Submission of White-nose Syndrome Suspect Bats. http://www.nwhc.usgs.gov/disease_information/white-nose_syndrome/USGS_NWHC_Bat_WNS_submission_protocol.pdf



National Wildlife Health Center
 6006 Schroeder Road
 Madison, WI 53711
 Phone: 608.270.2400
 FAX: 608.270.2415



SPECIMEN HISTORY FORM

For mortality events please e-mail a USGS Field Investigation Team member before shipping

Western States: BarbBodenstein, bbodenstein@usgs.gov, 608-270-2447

Central States: LeAnn White, clwhite@usgs.gov, 608-270-2491

Eastern States: Anne Ballmann, aballmann@usgs.gov, 608-270-2445

For single animal cases, Nationwide: Jennifer Buckner, jbuckner@usgs.gov, 608-270-2443

Submitter's name: _____ Telephone: _____
 Address: _____

E-mail: _____

Collector's Name: _____ Affiliation: _____
 Telephone: _____
 E-mail: _____

Date collected: _____

Method of animal collection: Found Dead, Died in Hand, Euthanized
 Method of euthanization: _____

Species: _____
 Number Submitted: _____ Condition: Chilled, Frozen, Preserved Tissues

Specific die-off location (refuge unit, pond, address, intersection, park, etc): _____

State: _____ County: _____ Nearest City: _____

Latitude/longitude (Decimal degree in WGS 84): _____ Zone: _____

Disease onset date: (Best estimate) _____ Disease end date: (best estimate) _____

Species affected: (The diversity of species affected may provide clues to the disease involved.) _____

Age/sex: (Any pattern noticed that is related to age and sex?) _____

Known dead: (Actual number counted) _____ Known sick: _____

Estimated dead: _____ Estimated sick: _____
 (Consider removal by scavengers or other means, density of vegetation, etc.)

Clinical signs: (Any unusual behavior and physical appearance.) _____

Population at risk: (Number of animals in the area that could be exposed to the disease.) _____

Population movement: (Recent changes in number of animals on area and their source or destination, if known.) _____

Problem area description: (Land use, habitat types, and other distinctive features.) _____

Environmental factors: (Record conditions such as storms, precipitation, temperature changes, or other changes that may contribute to stress.) _____

Comments: (Additional information/observations of value such as past occurrences of disease in area, photographs or videos) _____

Appendix F. Immediate Action for *Myotis* or *Perimyotis* Arriving at Facilities November 1 through April 30.

1. Follow Transportation Protocol above regarding transporting container with bat, and opening container to determine species.
2. After determining *Myotis* or *Perimyotis*, house in an emergency (temporary) quarantine room separate from bat quarantine room.
3. Contact WDNR Mammal Ecologist for final decision on bat in facility.
4. If facility has pre-screening supplies, inspect bat with pre-screening procedures (Appendix A) to determine any wing deterioration or fungal growth from WNS.

Literature Cited

Langwig, K. E., W.F. Frick, J.T. Foster, K.P. Drees, M.M. Shuey, T.H. Kunz, A. M. Kilpatrick. 2012 Seasonal Patterns in Infection Prevalence of *Geomyces destructans*. White-nose Syndrome Symposium. Madison WI, June 4-7 2012.

Lorch, J. M., C. U. Meteyer, M. J. Behr, J. G. Boyles, P. M. Cryan, A. C. Hicks, A. E. Ballmann, J. T. H. Coleman, D. N. Redell, D. M. Reeder, D. S. Blehert. 2011. Experimental infection of bats with *Geomyces destructans* causes white-nose syndrome. *Nature*, 480: 376-378.

Miller, E.A., editor. 2012. *Minimum Standards for Wildlife Rehabilitation, 4th edition*. National Wildlife Rehabilitators Association, St. Cloud, MN. 116 pages.

Minnis, A. M. and D. L. Lindner. 2013. Phylogenetic evaluation of *Geomyces* and allies reveals no close relatives of *Pseudogymnoascus destructans*, comb. nov., in bat hibernacula of eastern North America. *Fungal Biology*, 117:638-649.

Reichard, J. D., and T. H. Kunz. 2009. White-nose syndrome inflicts lasting injuries to the wings of little brown *Myotis*. *Acta Chiropterologica*, 11: 457-464.

Turner, G. and J. Gumbs. 2011. Use of ultraviolet light to photodocument *Pseudogymnoascus destructans* in post-WNS bats. Field Observation Note: BATS Research Center.

US Fish and Wildlife Service. 2012. National White-nose Syndrome Decontamination Protocol-Version 06.25.2012.

https://www.whitenosesyndrome.org/sites/default/files/resource/national_wns_revise_final_6.25.12.pdf

Resources for Bat Rehabilitation

Information about white-nose syndrome and coordinated response efforts:

<http://www.whitenosesyndrome.org>

Wisconsin Bat Program Sick/Dead Bat Report form: <http://wiatri.net/Inventory/Bats/Report/>

USGS Long wave UVA fluorescence screening of bat wings:

Page 23: http://www.nwhc.usgs.gov/disease_information/white-nose_syndrome/USGS_NWHC_Bat_WNS_submission_protocol.pdf

AVMA Guideline on Euthanasia:

http://www.avma.org/issues/animal_welfare/euthanasia.pdf

National Wildlife Rehabilitation Association's professional ethics:

<http://www.nrawildlife.org/content/wildlife-rehabilitators-code-ethics>

Filter Minimum Efficiency Reporting Value:

<http://allergyclean.com/article-understandingmerv.htm>