

Protocol for Wildlife Rehabilitator Response to White-Nose  
Syndrome Affected Bats in the Northeastern United States

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Protocol for Wildlife Rehabilitator Response to  
White-Nose Syndrome-Affected Bats in the Northeastern United States

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for

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**Purpose:**

This protocol was written to assist state and federal agencies to effectively utilize wildlife rehabilitation in response to emerging White-nose Syndrome in North American cave-dwelling bats. **These protocols are subject to change as new information regarding WNS distribution, cause of infection, treatment and/or containment is discovered. These protocols also reflect state-specific requirements for wildlife rehabilitation and may vary from state to state.**

Supporting Documentation:

Appendix A: WNS Rehabilitator protocol

Appendix B: References

Reference A: List of State Contacts

Reference B: *Diagnostic and Treatment Update for the Rehabilitation of Insectivorous Bats*

Reference C: *The Project: Realities and Recommendations*; presentation for manager's session, WNS Strategy Meeting, Albany NY, June 2008

Reference D: AVMA Guideline for Humane Euthanasia

Reference E: NWRA Code of Rehabilitator Ethics

Reference F: Wing Scoring Protocol

Reference G: IWRC-NWRA Minimum Standards of Care

Reference H: Bat World Sanctuary Wing Banding Position Statement

Appendix C: WNS Bat Intake

Appendix D: Waiver sheet

Appendix E: WNS Bat Care Record

Appendix F: Recommended Equipment List

## **Introduction:**

White-Nose Syndrome (WNS), an affliction of six northeastern bat species, is responsible for the loss of tens of thousands of hibernating bats in the winters of 2007 and 2008 and continues to be affecting bats this winter (2009) in and around caves and mines in eastern and upstate New York, Vermont, western Massachusetts, northwestern Connecticut, and more recently, Pennsylvania and New Jersey. For the most current information on the spread of WNS, visit [http://www.fws.gov/northeast/white\\_nose.html](http://www.fws.gov/northeast/white_nose.html).

As WNS spreads through the northeast, public concern and sympathy for affected bats has, and is, being raised.. As the public encounters sick and dying animals in mid- to late winter, it has become clear that a meaningful response is necessary. In winter of 2007/2008, the New York Department of Environment and Conservation (NYDEC) collaborated with wildlife rehabilitators to attempt to rehabilitate and release WNS-affected bats. Bats were sent to agency-selected wildlife rehabilitators in two states. Fifty percent of the affected bats survived through rehabilitation after proper housing, care and feeding and were subsequently released.

Given the need to deal with the public in a compassionate manner and the remarkable success of the NYDEC project, WNS bats brought in by the public may be allowed to come into approved rehabilitation facilities that follow the protocols outlined in this document. Further, wildlife rehabilitators are often well-known to the local community, are trained in critical care and triage, and are keen observers of normal vs. abnormal animal behavior. They are a valuable resource in observing disease progression and watching for changes in local wild populations.

## **Need for Public Response:**

The public expects agency help with injured, orphaned, and displaced wildlife. Many members of the public have great sympathy for wildlife and will not accept standard responses, such as “let nature take its course” or “its going to die anyway”. WNS has generated sympathy for and interest in bats, which should be encouraged. However, it is also imperative that members of the public do not attempt to care for bats on their own. This document provides guidelines for state response for rehabilitation and for approved wildlife rehabilitators or other qualified entities to intake and triage WNS-affected bats should a response be required for public concerns about affected bats.

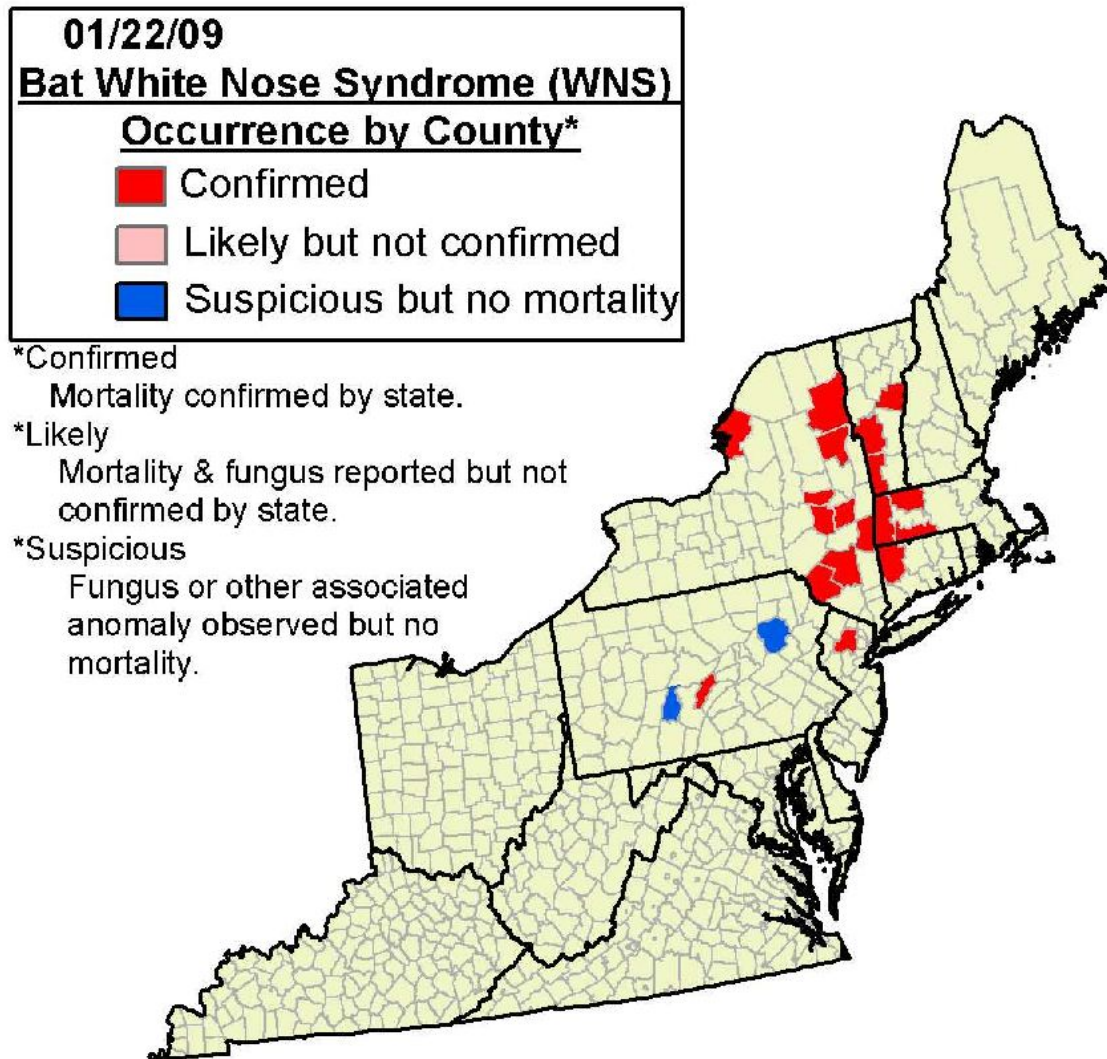
## **Identification of WNS**

Suspect bat WNS is currently defined in the field as:

- White, powdery fungus seen around the muzzle, ears, wing/limbs, and/or tail;
- Excessive/unexplained bat mortality at the winter hibernaculum;
- Thin and/or dehydrated (wrinkled and flaky appearance of furless areas);
- Delayed arousal from torpor following disturbance;
- Aberrant bat behaviors (found on ground inside or outside the hibernaculum, roosting near hibernaculum entrance, increased bat activity outside the hibernaculum during cold weather)

These symptoms are primarily observed from November through May. Not all of these signs must be present for a bat to be considered affected by WNS, however, the more signs exhibited by an individual bat, the higher the level of suspicion that the bat is affected. Most rehabilitators may receive sick bats from the general public who will not have any knowledge as to the origin or conditions at the hibernaculum. It is imperative that any rehabber receiving bats during the winter contact the state biologist ([Appendix B](#)) to report the bat's capture location and reason for submission to assist in WNS surveillance.

At this time, only crevice-dwelling bats [for example, little brown bat, northern long-eared bat, Eastern pipistrelle (tri-colored) bat, small-footed bat, and Indiana bat ] within the WNS-affected region (see map below) are considered to be potentially WNS-affected.



Note, the map of affected counties will be updated when necessary. Coordinate with your state wildlife agency to ascertain whether additional counties have been confirmed to be affected or check the U.S. Fish and Wildlife Service website for recent WNS occurrence information: [http://www.fws.gov/northeast/white\\_nose.html](http://www.fws.gov/northeast/white_nose.html).

## **RECOMMENDATIONS FOR STATE AGENCY RESPONSE AND GENERAL REHABILITATION GUIDELINES:**

NOTE: The following recommended steps are suggestions and may be tailored by applicable state agencies. WNS-affected states have widely varying permitting processes and regulations governing wildlife rehabilitation, and it is beyond the scope of this document to address these steps on a state-by-state basis. State agencies should maintain and distribute a list of rehabilitators who are agency- approved to take WNS bats. The U.S. Fish and Wildlife Service WNS coordinator will maintain a regional list of rehabilitators and state agency WNS coordinators.

Agency personnel and approved rehabilitators will have access to a moderated Yahoo-based discussion group to get timely advice from other rehabilitators and address WNS coordinator concerns and questions.

### **Transport of WNS-Affected Bats**

#### **Animal Transport Recommendations**

1. Live bats should not be directly handled by the general public. Encourage them to transfer bat(s) to a secure box with lid using objects that can be cleaned and disinfected or saturated with disinfectant and discarded in the trash.
2. Place the transport box inside another clean box or bag before placing it inside the vehicle to transport to the rehab facility. Ask the public to clean off their shoes with water and/or 10% bleach disinfectant prior to leaving their property in the transport vehicle or ask the public to transfer the bat to you outside of your bat care facility.
3. Do not open the transport box to examine the bats until you are inside the dedicated bat quarantine room (see Quarantine, Isolation and Handling Section).
4. If selected individuals are identified to pick up and transport sick bats reported by the public to rehab facilities, these individuals should follow strict cleaning and disinfection protocols (see below) of their vehicles following each transport event if WNS is suspected.
  - Primary cleaning should be done first to remove as much organic debris as possible. Debris should be brushed or scraped from the vehicle. Washing of the vehicle should follow. High pressure spraying equipment (i.e., 200 - 1000 psi) may help to clean wood pores, cracks and crevices.
  - The vehicle should always be cleaned from top to bottom. Also be sure to wash the underside of fender wells and the vehicle frame.
  - Apply an appropriate disinfectant with a low pressure sprayer and allow its proper contact time to elapse. *Iodophor* disinfectants are commonly used for vehicle disinfection and are considered to have a broad spectrum of antimicrobial activity. They are also considered more environmentally safe than phenolic disinfectants and more stable than hypochlorite-based compounds. The interior of the vehicle should also be thoroughly cleaned and disinfected prior to leaving the site.

Source:

<http://www.cfsph.iastate.edu/BRM/resources/disinfectants/Disinfection101Feb2005.pdf>].

Trained volunteers, and/or animal control officers should be recruited for transport of bats to drop points to reduce the workload of rehabilitators or other caretakers and minimize public interaction with affected bats.

### **Requirements for WNS Bat Rehabilitators:**

**Note:** Rehabilitators are usually volunteers and self-funded. Care of critically ill bats is extremely time consuming and expensive. (See Appendix B: Reference B and C). Prospective rehabilitators must be aware of the time commitment required and labor-intensive nature of care for this particular group of animals. In addition, though wildlife rehabilitators assist state wildlife agencies and serve at the discretion of those agencies, they are not agency employees and should not feel pressured to participate or fear that their licenses may be revoked for nonparticipation.

**Rehabilitators must be willing to work closely with state WNS coordinators and FWS contacts.**

Because bats require a great deal of specialized care, agency personnel should select rehabilitators who either specialize in bats or who have prior experience working with bats.

The following are recommendations for the selection of qualified rehabilitators:

- In states that do not have a wildlife rehabilitation program, it will be necessary to identify qualified individuals who have the experience to care for WNS-affected bats.
- Rehabilitators must have prior experience working with bats or be willing to work with experienced persons prior to accepting WNS-affected bats.
- Rehabilitators must have pre-exposure rabies vaccination and an acceptable titer level.
- Rehabilitators must be willing to follow established principles of wildlife rehabilitation (e.g. adherence to NWRA's professional ethics (Appendix B) and IWRC/NWRA *Minimum Standards of Care* (Appendix B), willing to use subcutaneous (sub-Q) fluids, appropriate housing, adherence to containment protocols and the care protocol supplied in Appendix A.
- Rehabilitators must be willing to provide or obtain appropriate euthanasia to end suffering.
- Rehabilitators must have access to veterinary care.
- Rehabilitators should be trained on wing-scoring protocol (Appendix B).
- State agency personnel will provide guidance to rehabilitators for bats that die while under care (see section on Disposition) In some states it may be necessary to submit these cases to the state rabies lab. Other states may opt to submit carcasses to labs working with WNS cases. Developing protocols for the disposition and submission of these bats will be the responsibility of state agency personnel.
- Most bat rehabilitators will have difficulty distinguishing *M. lucifugus* (little brown bat) from *M. sodalis* (Indiana bat), therefore photo documentation of all bats coming in should

be required if a state biologist is unable to verify the species shortly after arrival into the rehabilitators care.

- There is a very real possibility that some WNS-affected bats coming into rehab will be federally- or state-listed species. Therefore, a rehabilitators must have state or federal permit coverage to handle and maintain listed species.

**Quarantine, Isolation and Handling Protocols are found in Appendix A and must be implemented by rehabilitation personnel.**

### **Standards of Care:**

**Note:** the following section is intended to guide agency personnel in evaluating the competence and readiness of potential rehabilitators and facilities as well as providing recommendations for general procedures necessary to document WNS in bats undergoing rehabilitation. This section does not constitute instructions for bat rehabilitators. Specific care guidelines are provided in Appendix A and references are provided in Appendix B (References B, C and H).

#### **Intake:**

- Maintain a call log to track where animals are observed and recovered.
- Secure waiver and recovery location from whoever initially recovered the bat (Appendix D).
- Start data sheet and assign number (Appendix C).
- Collect standard metrics; gender, age class, weight, forearm length, etc.
- Apply wing-scoring protocol.
- Photograph wings, face, and any visible scarring or fungus (may request state agency personnel to take photos of personal camera is not available).
- Start a care record sheet (Appendix E)
- Contact state WNS coordinator

### **Specific Rehabilitation Protocols: See Appendix A**

#### **General Bat Care Guidance:**

**Critical care:** Most WNS-affected bats collected outside during cold periods will be suffering from exposure in addition to WNS-caused emaciation and dehydration. These bats require critical care procedures and must be carefully evaluated. Bats deemed on intake to be nonreleasable should be humanely euthanized. **NOTE:** Non-releasable bats from WNS-affected areas may not be held as permanent captives.



Hydration: Incoming bats must be warmed and given boluses of subcutaneous rehydrating fluids until normal renal function is established. Once normal hydration is established, animals may safely be treated for medical conditions such as injury or ectoparasites.

Long-term Maintenance: Once bats are stabilized, they may be transitioned to a whole-mealworm diet. Mealworms must be gut loaded and maintained so as to be nutritionally complete. Bats must be fed and watered from appropriate dishes. Bats must be housed in soft-sided crates or cages, not hard-sided containment such as glass aquaria or plastic ‘critter keepers’.

Transition bats to cages large enough to allow flight once animals are stabilized, gaining weight, and self-feeding. Caging, roosting areas, and feed/water dishes must be cleaned and disinfected appropriately. Equipment used with WNS-affected bats may not be used for other bats or other animals without first thoroughly cleaning and disinfecting according to established protocols (**See Quarantine, Isolation and Handling Protocols in prior section**)

Environmental enrichment is a necessity for bats in captivity and is required in the IWRC/NWRA *Minimum Standards of Care* (Appendix B). However, enrichment items and methods must adhere to the established containment protocol or be disposable.

Release: Bats should be released under the direction of the state WNS coordinator and as close to the site of recover as practicable. Weather conditions must be conducive to foraging. Bats should be in good body condition with pelage intact (normal body weights by season can be provided by state WNS coordinators). Bats should be released after sundown. It is not advisable to release at dusk as the risk of predation is very high.

Carcass handling: Rehabilitator must notify the state WNS coordinator of any deaths or euthanasia. The coordinator will direct rehabilitators on a case-by-case basis. A mechanism for carcass processing and delivery will be established that is workable for rehabilitators. Rehabilitators will be supplied with prepaid shipping containers and clear carcass handling instructions for submission to labs for further analysis.

Rehabilitator Support and Resources: Bat World Sanctuary maintains a Yahoo Groups list to provide advice to rehabilitators working with WNS-affected bats. This list is open by invitation only and is moderated by the author. Subscription requests can be sent to [batworldova@verizon.net](mailto:batworldova@verizon.net). In addition, the **Diagnostic and Treatment Update for the Rehabilitation of Insectivorous Bats** (Appendix B) is available as either a free web-based publication or a downloadable document from [www.batworld.org](http://www.batworld.org) (click on rehab data).

Training: It may be advisable to develop regional rehabilitator training workshops. Such trainings could be incorporated into various training opportunities offered by state wildlife rehabilitation organizations or national organizations such as National Wildlife Rehabilitator’s Association or International Wildlife Rehabilitator Council. In addition, Bat World Sanctuary offers a week-long summer training session specifically for insectivorous bat rehabilitation.

Disposition of Animals: **The final disposition of any WNS-affected bat taken in for rehabilitation will be decided by the state WNS coordinator. The WNS coordinator will provide the rehabilitator in advance the general decision-making process regarding the fate of non-releasable**

or releasable WNS-affected bats. Rehabilitators have the option to refuse to participate in WNS-affected bat rehabilitation if the ultimate outcome is to euthanize releasable animals.

Equipment: See the Recommended Equipment List (Appendix G)

Rehabilitators are, for the most part, self-funded volunteers. They may not have recommended supplies on hand or ready cash to buy supplies. In addition, equipment used for WNS-affected bats must not be shared with other bats or any other taxa. Agencies or funding organizations are requested to provide as much equipment as practicable in exchange for cooperative efforts designed to protect free-ranging insectivorous bat populations.

**Distribution and Dissemination of Rehabilitator Protocol:**

Distribute the response protocol and list of approved rehabilitators/drop points to Rehabilitators and associated organizations, Animal Control agents, Public Health, veterinarians, Pest Control Operators, Nature Centers, Caving groups, Conservation organizations, and local Bird Supply retailers.

## APPENDIX A

### **REHABILITATORS CAPTIVE CARE PROTOCOL FOR WNS-AFFECTED BATS**

*Quarantine, Isolation and Handling Protocols should be agreed to be followed prior to taking in WNS affected bats. If bats can be identified as originating from a particular hibernaculum, those bats may be housed together. Bats of uncertain hibernaculum origin should be housed separately and preferably in separate rooms. If housing bats in separate rooms is not possible, then all bats may be in one quarantine room, BUT there should be dedicated separate equipment for each housing unit, gloves must be changed between handling different groups.*

#### **Quarantine, Isolation and Handling Protocols:**

1. The bat quarantine area should be a separate, contained room dedicated to only housing WNS-suspect bats. Outside flight-conditioning cages should be kept away from other species pens and separated from each other by a minimum of 20 ft.
2. Once an animal enters the quarantine room, it should be considered exposed to WNS if other bats are present and not be returned to the general patient population.
3. Stock all necessary animal care supplies you will need inside the bat quarantine room so that you will not have to repeatedly enter and exit this area once inside. If possible, have someone from outside the room bring any forgotten item to place just inside the door so you do not have to exit the room once bat handling has begun. Ideally, there should be a dedicated set of supplies that are only used in this room. When it is necessary to remove items from the room for thorough cleaning and disinfection, do not mix these items with other supplies from outside the room. Clean and disinfect quarantine room items separately from the rest of facility supplies, including laundry.
4. All bats entering a rehab facility should be held in quarantine for a minimum of 30 days before being transferred to a pre-release flight cage. Any individual bat or group of bats collected from the same location (within 5? miles) AND same time period (3 weeks) can be housed together upon admission.
5. DO NOT house bats collected from different locations (greater than 5 miles apart) together at any point during the rehabilitation process. Each quarantine group will require its own pre-release flight cage.
6. Bats received from known WNS affected counties should be housed in a separate, contained area (separate room) from all other animals. If WNS-suspect bats cannot be isolated from other animals under one's care in a separate room, then bats should not be accepted as patients.
7. Tree bats should NOT be housed at the same facility as those caring for cave dwelling bats such as little browns, big browns, northern long-ears, eastern pipistrelles, or Indianas from areas where WNS is suspected or confirmed.
8. Bats from known WNS affected sites should be handled only after other bat patients have been handled to reduce the risk of cross-contamination.
9. Bats should only be handled using disposable exam gloves and wearing dedicated, protective clothing (i.e.: coveralls, smock/scrubs, Tyvek suit, rain gear) that should be removed prior to exiting the room. Disposable shoe covers or rubber boots that can be clean and disinfected are recommended foot wear when inside bat housing areas. Launder protective clothing according to protocol at least once weekly or whenever they become soiled. It is highly recommended that personnel working inside the bat

quarantine shower upon exiting the room/flight cages and before they handle any other patients in the main facility.

10. Animal cages should be located as far from the entry/exit doors as possible and away from blowing fans/vents to reduce the risk of aerosolization of fungal spores and contamination outside of the quarantine room.
11. Limit the number of people who have access to the bat isolation room and pre-flight cages.
12. Disinfectant foot baths should be used upon exiting any room/flight cage area housing bats to reduce the risk of unintentional transmission of disease to outside the bat holding room. Use a boot brush to wash all upper and lower surfaces of boots while standing in the bath. Boots can then be allowed to air dry and removed at the room entrance. Bath changing frequency depends on the type of disinfectant but should be changed out whenever it becomes dirty if prior to the scheduled replacement.

Table 1. Recommended Disinfectants (**under construction!**)

Disinfectant	Recommended changing frequency	Manufacturer/Cost
10% chlorine bleach (i.e.: Chlorox)	Minimum every 2-3 days, daily if dirty or located in the sun	\$5/ 1 gal (concentrate)
Isopropyl alcohol (70% rubbing alcohol)	Surface cleaner; not recommended for foot bath	
PureGreen24?	Minimum every 2 days?	<a href="http://www.puregreen24.com/">http://www.puregreen24.com/</a> ; \$40/ 1 gal (ready-mixed)
Benefect?	Minimum once weekly unless dirty	<a href="http://householdtraditions.com/benefect.htm">http://householdtraditions.com/benefect.htm</a> \$45/1 gal (ready-mixed)

## Disinfection Protocols

1. All items to be removed from the quarantine room for a more thorough cleaning should be initially cleaned to remove debris and sprayed/soaked in disinfectant while in the quarantine room. Items should then securely bagged for transport out of the room to the laundering site.
2. If possible, steam autoclave non-disposable items in contact with bats with suspect WNS prior to reuse with new patients, regardless of species; otherwise.
3. All nondisposable items (inside and outside caging, feeding equipment, cloths, clothing, etc.) in contact with bats must be cleaned with hot water and detergent (preferably antifungal soap such as 2% chlorhexidine [Nolvasan] scrub) followed by disinfection with 10% bleach solution (1 part bleach in 9 parts water). All organic debris must be removed prior to disinfection with bleach to be effective. Items must be in contact with bleach solution for a minimum of 10 min for disinfection to be effective. Cleaning and disinfection procedures should be repeated 3 times prior to reuse with other patients.

4. All disposable items and trash should be sprayed with disinfectant to saturation and discarded into a dedicated trash receptacle for the bat room. Trash should be double-bagged and discarded in the regular trash when the receptacle is full.
5. Vacuum bags should be burned or discarded after use in a contaminated room. Furnace and air condition filters should be discarded weekly and daily spraying of filters with 1:4 dilution Nolvasan to decrease the numbers of fungal spores. Steam cleaning must maintain water temps >109°F to be effective. [Source: “The 5 minute veterinary Consult Clinical” KH Rhodes, LP Tilley 2002].
6. Bat quarantine room should be thoroughly disinfected at the end of the season or once all bats have been transferred to pre-release flight cages before it is used to house any other species. All surfaces should be cleaned with antifungal scrub (Nolvasan) and sprayed with disinfectant.

## **Intake**

On intake all bats should be checked for injury. Minor abrasions and injuries can be treated twice daily with topical applications of antimicrobial flushes or creams. Severe injuries should be checked by a veterinarian and treated accordingly. All information here is treated in much greater detail in *Diagnostic and Treatment Update for the Rehabilitation of Insectivorous Bats* (Appendix B).

*Warming:* Let bats reach normal body temperatures on their own, ie, warm to the touch. If a bat is not responding normally, ie, shivering or not warming on its own, it may be necessary to use an additional heat source such as an incubator or warm-water. However, nonresponsive bats must never be placed prone on any heat source as damage to internal organs may result. Signs of overheating include rapid, shallow breathing/open mouth breathing, rapid heart rate with weak pulses.

*Rehydration:* Bats must be rehydrated with SubQ boluses of LRS warmed to body temperature. Oral fluid therapy will not provide adequate rehydration for these animals. Bats must not be fed prior to rehydration adequate to stabilize normal cellular function. A reliable indicator of adequate hydration is urination which should appear pale yellow in color once the animal is sufficiently rehydrated. Bats may be temporarily housed on white cotton sheeting (not terrycloth) so that urine is more visible. Severely emaciated animals should be offered small meals (~.25 cc) of a pre digested liquid recovery diet such as Vital HN after rehydration. Less severely emaciated animals should not be fed before normal urination is observed.

*Records:* An intake and record sheet should be started for each bat, recording the weight, urination/defecation, and other required information. (Appendix C and E)

*Identification* Each bat should be marked for identification by fur clipping or by using a non-toxic livestock marker. (Livestock markers can be punctured with a flat toothpick and then stirred to soften. Use the flat end of the toothpick to apply color to the forearm, ears, or tail membrane.) If agencies require that bats be banded prior to release, bands must be placed by experienced state personnel, not rehabilitators unless they have adequate experience to prevent band-related injuries (See Appendix B for Bat World Sanctuary banding position).

## Housing And Food/Water Stations

**IMPORTANT:** WNS bats must be kept separate from any other animals, including other non-affected bats. Because colonial bats require companionship, single WNS bats should be transferred to other rehabilitators who are housing affected bats from the same region. Multiple bats recovered from the same site potentially may be housed together; however, it is not recommended that animals from different recovery locations be mixed. While it is considered cruel to house colonial bats singly, group housing must be carefully weighed against disease transmission concerns, length of time in captivity, and the ability of the rehabber to provide an appropriately enriched environment for solitary animals. Such questions must be resolved with input from the state WNS coordinator. Note: Because male *Eptesicus fuscus* have been known to severely injure each other in captivity, we do recommend housing them singly during the fall/winter breeding season.

Bats can be temporarily housed in a JEEP soft crate model #JP5526GG or similar soft-sided crate or cage. Rehabilitators should have enough crates to house WNS bats separate from any other animals. Additionally, there should be enough WNS-dedicated crates so that bats can be shifted to clean crates while used crates are being disinfected and/or laundered.

Blue surgical towels, cotton/linen table napkins (in dark colors), or flannel receiving blankets can be draped and secured over the interior framework of the cage to provide roosting spots for the bats. Be sure to use enough cloths cover at least three walls of the cage. Roosting pouches may also be used.

Water dishes such as plastic pill containers or contact lens cases, which can be found at most pharmacies, can be secured to the support poles inside the cage using Velcro. Narrow, shallow trays or finch-sized coop cups (small d-cups or honey cups are preferred) should be used for both training and for self-feeding bats. Good examples of narrow trays are common drawer organizers: <http://tinyurl.com/2z697l>. Two 4" to 8" trays or 2 coop cups per every 4 bats is recommended. Dishes should be placed against the wall of the cage or on the floor in order for bats to hang head down over the dish while self-feeding. If aggressive bats are preventing other bats from self-feeding, more dishes should be placed on an opposite side of the cage. Feeding stations can be partially obscured by draping, or silk or plastic foliage so that less aggressive bats can feed in comfort. Any material used to obscure or provide additional hiding placed must adhere to the disinfection/containment protocol described in section [protocol under development].

**Heat:** A small reptile heating pad on a dimmer switch set to half power, a human heating pad set to low, or a reflector light with a 25-watt red bulb should be provided for supplemental heat. Pads should be inside a fabric case and placed on the outside of a cage wall, never on the floor. Debilitated bats cannot escape floor heat and will sustain life threatening damage. Once bats are stabilized, heating sources should be removed and replaced with a heat bulb to remove spot heat. Cave-dependant bats are known to preferentially roost on heat sources, which contributes to chronic dehydration, discussed below.

**Humidity:** Maintaining a humidity level of 60-80% is crucial. Residential air-conditioning and heating systems typically force humidity levels that are akin to desert conditions. In these conditions, bats suffer from skin conditions suspected to result from chronic low-grade dehydration. The underlying causes of observed skin and wing conditions has yet to be identified, but maintaining proper humidity levels and temperatures that do not allow bats to

enter into long-term torpor seems to reduce the development of severe skin problems. In winter, when WNS bats can be expected, humidity must be supplied artificially. Whole room humidifiers and air washers can be used to maintain high humidity levels. Bats must be watched closely for stiff wing membranes or flaky dry skin, as these are typical indicators of too-low humidity. Hygrometers and thermometers should be installed to monitor relative humidity and ambient temperature.

**Lighting:** Lighting should include access to full-spectrum light, bearing in mind that fluorescent units are only effective at approx 18” from the light source. In addition, compact fluorescent bulbs emit a great deal of ultrasound. Ballasted incandescent bulbs are available that are effective over greater distance; however, these bulbs put out great deal of heat and also contribute to a decrease in humidity. Lighting should be timed such that natural seasonal photoperiods are maintained.

**Enrichment:** Cage furniture should be provided in an effort to provide an enriched environment that stimulates natural behaviors as per instructions in *Diagnostic and Treatment Update for the Rehabilitation of Insectivorous Bats*. Provision of an enriched environment is spelled out in the IWRC/NWRA Minimum Standards of Care for wildlife rehabilitation. However, enrichment materials must adhere to the disinfection/containment protocols described in Section?? [protocol under development]. Enrichment need not be costly or unsanitary. Provision of companions and multiple roost and feeding sites is the best means of enrichment. But other methods such as providing cloth slings, horizontal roost sites, natural or artificial foliage, tunnels, paper towel tubing, etc., can be used. These methods can be constructed from spare bedding material or other materials that can be disinfected or disposed of. Natural enrichment such as leaves, branches, etc., can be microwaved to kill parasites and other organisms, then disposed of as necessary. Once bats are stabilized and ready for long term housing, they will need access to flight cages for conditioning. Free standing pop-up mesh tents work well for this purpose. There are several models available, though most need to be modified to provide flooring and prevent escapes.

Group housing during initial rehab or flight conditioning must be discussed with and approved by the state WNS coordinator.

### **Initial And Subsequent Feeding**

Bats must be adequately hydrated prior to feeding. Severely emaciated bats should receive Vital HN or another liquid recovery diet as per instructions in *Diagnostic and Treatment Update for the Rehabilitation of Insectivorous Bats*. Once stabilized, bats should be transitioned to a blended diet. As soon as a bat is eating, defecating, urinating, and drinking normally, it should be taught to eat live mealworms from dishes and supplemented with blended food as necessary. Do not assume that bats will recognize mealworms as food. Bats that require hand-feeding of either blended food or whole mealworms should be fed twice daily, as much as they can consume both am and pm, approximately 12 hours apart. *Myotis lucifugus* and *Lasionycteris noctivagans* tend to learn to self-feed very quickly. *Eptesicus fuscus* and *Perimyotis subflavus* learn after some guidance, though some individuals take longer than others. Some species, such as *Myotis septentrionalis*, are very hard to transition to self-feeding. The ability of *Myotis sodalis* to learn to self feed is as yet unknown.

Mealworms must be gut-loaded via the substrate they are kept in. Allow mealworms to feed on high-protein baby food cereals in which the grains are fine enough to be sifted, allowing easy access to mealworm removal. Mealworms must receive moisture food and be supplemented with Vionate before feeding to the bats as per instructions in *Diagnostic and Treatment Update for the Rehabilitation of Insectivorous Bats*. Prior to feeding, sift enough mealworms from the substrate and place in a tray with one end under a light source. Mealworms will move away from the light, leaving shed skins, dead larvae, and remaining substrate behind.

## **Daily Management**

All bats should be given daily physical examinations. This is the only way to ensure that individual bats are accounted for, are maintaining weight, and are not developing disease or sustaining injury. Daily exams allow for quick detection of developing problems, thereby increasing the likelihood of successful treatment. Bats have been observed to become familiar with individual persons and to exhibit signs of stress when unfamiliar persons interact with them. In order to maintain healthy bats, personnel changes must be minimized.

Fecal matter should be removed from floors daily. It is not recommended that cage walls or roost materials be cleaned daily as removing all traces of scent markers may be distressing. Portions of cage walls can be cleaned on a rotating basis using a 10% bleach solution followed by thoroughly rinsing with cool water.

Water and food dishes should be washed with dish soap and hot water (>110 °F) and thoroughly rinsed with cold water. Fresh dishes of water must be provided to the bats. Tap water may be used but if regional tap water is suspect filtered water or distilled water is preferable. Water can be treated with Calcimize, a water conditioner that provides trace amounts of calcium, but not in amounts that can jeopardize animal health.

Roosting pouches and sheeting should be washed daily. Hot water and mild unscented laundry soap are adequate for cleaning fabric roosting materials.

## **Veterinary Management**

Please note that state WNS coordinators may decide what if any medical treatment may be used for WNS bats. The following guidelines presume that medical management is permissible.

All bats should be triaged on intake to determine health status. Any injuries or nutrition/hydration issues must be addressed. While not immediately imperative, fecal samples should be analyzed for endoparasites and captive groups treated according to findings as per instructions in *Diagnostic and Treatment Update for the Rehabilitation of Insectivorous Bats*.

## **Euthanasia**

Whenever possible, euthanasia should be performed with inhalant anesthesia such as Isoflurane or Halothane as per instructions in *Diagnostic and Treatment Update for the Rehabilitation of*



*Insectivorous Bats.* Because of bats' high tolerance for carbon dioxide (CO<sub>2</sub>), it is considered an inhumane method of euthanasia. Euthanasia methods must conform to AVMA guidelines causing minimal stress and a rapid loss of consciousness before death.

### **Flight Conditioning**

Because rehabilitated WNS-affected bats cannot be released until the following spring, prerelease flight conditioning is 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**

Releases must be coordinated with the state WNS coordinator. Bats should be released as close to the recovery site as practicable within home range ((if known). Weather conditions must be conducive to foraging. Bats should be in normal body condition with pelage intact. Bats should be released after full dark. It is not advisable to release at dusk as the risk of predation is very high.

## APPENDIX B

### REFERENCES

Reference A: List of State Contacts (in progress or fill in your own state agency)

Reference B: *Diagnostic and Treatment Update for the Rehabilitation of Insectivorous Bats*  
<http://www.batworld.org/worldbatline/data.html>

Reference C: *The Project: Realities and Recommendations*; presentation for managers session  
WNS Strategy Meeting, Albany NY, June 2008 (WEB LINK HERE—to be established, also  
available from the L. Sturges)

Reference D: AVMA Guideline for Humane Euthanasia  
[http://www.avma.org/issues/animal\\_welfare/euthanasia.pdf](http://www.avma.org/issues/animal_welfare/euthanasia.pdf)

Reference E: NWRA Code of Rehabilitator Ethics <http://www.nwrawildlife.org/page.asp?ID=2>

Reference F: Wing Scoring Protocol  
[http://www.fws.gov/northeast/PDF/Reichard\\_Scarring%20index%20bat%20wings.pdf](http://www.fws.gov/northeast/PDF/Reichard_Scarring%20index%20bat%20wings.pdf)

Reference G: Bat World Sanctuary Wing Banding Position Statement  
<http://www.batworld.org/main/positionstatements/position%20statement-%20banding.pdf>

Reference H: IWRC-NWRA Minimum Standards of Care: <http://www.iwrc-online.org/pub/Standards%203rd%20Edition.pdf>

**APPENDIX C**  
**BAT INTAKE RECORD**

ASSIGNED ID # \_\_\_\_\_

DATE: \_\_\_\_\_

SPECIES: \_\_\_\_\_

LOCATION FOUND/COLLECTED (Town, County, State):  
\_\_\_\_\_

REASON FOR  
SUBMISSION: \_\_\_\_\_

IDENTIFYING MARKS  
\_\_\_\_\_

BAND NUMBER  
\_\_\_\_\_

Sex: \_\_\_\_\_ / Adult Juvenile / Weight: \_\_\_\_\_ grams/ Forearm length \_\_\_\_\_ mm

**PHYSICAL EXAM RECORD (Circle)**

**GENERAL CONDITION:**

thin/emaciated      crusty snout      weak      lively      matted/dirty fur

abnormal behavior/(describe: \_\_\_\_\_)

**HYDRATION STATUS:**

good      fair      poor

**FUNGUS :**

on snout      on limbs/wing membrane      on ears      body absent

**DISCOLORATION** - can be light or darkened areas:

forearm(s) uropatagium elbows feet hairless areas

**WING & TAIL MEMBRANE:**

good tears holes

Wing Score: \_\_\_\_\_

per Wing Scoring Protocol :

[http://www.fws.gov/northeast/PDF/Reichard\\_Scarring%20index%20bat%20wings.pdf](http://www.fws.gov/northeast/PDF/Reichard_Scarring%20index%20bat%20wings.pdf)

**EYES:**

bright droopy/sunken glassy swollen discharge (watery; mucoid; crusty)

responsive

**MENTAL STATUS:**

alert lethargic/depressed unresponsive

**RESPIRATION:**

normal labored shallow noisy slow rapid

**GUMS (visual observation only, do not physically check gums):**

bright red pink bluish

**LEGS/FEET/TOES/THUMBS:**

functional swollen fractures claw injury

**ADDITIONAL INFORMATION (not necessarily for rehabilitator to complete)**

NUMBER OF BATS OBSERVED AT LOCATION: \_\_\_LIVE      \_\_\_DEAD

INCREASED BAT ACTIVITY IN AREA:    YES                    NO

DATE OF ONSET:

**Disposition**

**Date** \_\_\_\_\_

**DIED                    EUTHANIZED                    DOA**

**MEDICAL TREATMENT PROVIDED:**

**YES (provide treatment record to lab)**

**NO**

**NECROPSY:**

**DATE** \_\_\_\_\_

**FACILITY** \_\_\_\_\_

**RESULTS:**

\_\_\_\_\_

**Sent to Lab**

\_\_\_\_\_

**RABIES TESTED RESULT:** +    —    inconclusive

**IF BAT RELEASED:**

**RELEASE DATE:** \_\_\_\_\_

**RELEASE LOCATION**\_\_\_\_\_

**BAND NUMBER**\_\_\_\_\_

**TRANSFERRED:**

**DATE** \_\_\_\_\_

**REHABILITATOR / FACILITY**\_\_\_\_\_

**NOTES:**

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**APPENDIX D: Bat Intake Waiver**

[http://www.batworld.org/worldbatline/pdf\\_files/batadmission-waiver.pdf](http://www.batworld.org/worldbatline/pdf_files/batadmission-waiver.pdf)

PUBLIC WAIVER (taken from the Bat World website):

Bats are a rabies vector species. Rabies is an infectious viral disease that effects the nervous system of humans and other mammals. People get rabies from the bite of an animal with rabies (a rabid animal). Any wild mammal, like a raccoon, skunk, fox, coyote, or bat, can have rabies and transmit it to people. It is also possible, but quite rare, that people may get rabies if infectious material from a rabid animal, such as saliva, gets directly into their eyes, nose, mouth or a wound.

People cannot get rabies from having contact with bat guano (feces), blood, or urine, or from touching a bat on its fur (although bats should never be handled!). You should contact your local health department if you have been bitten by a bat or if infectious material such as saliva from a bat has gotten into your eyes, nose, mouth, or a wound, or if the bat has been found in a room with a person who cannot reliable rule out contact, such as a sleeping person, a child, a mentally disabled person or an intoxicated person\*. If no one has been bitten or had direct contact with this bat, please rewrite the following statement in your own handwriting:

**No one has been bitten or had direct contact with this bat.**

\_\_\_\_\_  
NAME: \_\_\_\_\_

PHONE: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

CITY/STATE: \_\_\_\_\_ ZIP: \_\_\_\_\_

By signing below, I state that all of the information above is true:

SIGNATURE: \_\_\_\_\_

DATE: \_\_\_\_\_

\*Bats and Rabies: A public health guide (1998). The US Centers for Disease Control and Prevention. [www.cdc.gov](http://www.cdc.gov)





## APPENDIX F: Recommended Equipment List

### **Caging:**

Gear Inc. JEEP softcrate model #JP5526GG

(<http://www.petgearinc.com/JEEP%20CRATES.htm>) or similar. Collapsible cages should have mostly mesh walls, as bats cannot cling to rubber coated canvas or tight weave material walls often used in collapsible cages.

Critical care phase caging can also be provided with small collapsible dog/cat carriers from Target [http://www.target.com/Pet-Carrier/dp/B0009NWVEG/qid=1226631194/ref=br\\_1\\_15/179-0848492-0936448?ie=UTF8&node=14287971&frombrowse=1&rh=&page=1](http://www.target.com/Pet-Carrier/dp/B0009NWVEG/qid=1226631194/ref=br_1_15/179-0848492-0936448?ie=UTF8&node=14287971&frombrowse=1&rh=&page=1).

**Note:** Each rehabber should have 2 cages so caging can be switched out and disinfected. Cage covers can be laundered in a standard washing machine then hung to dry. Cloth drapes, enough to cover at least three walls of the cage, to provide roosting sites. Blue surgical towels (available in bulk from suppliers such as XXX) or cotton/linen table napkins in dark colors may be used. Other alternates are dark hemmed cotton flannel sheeting, old Crown Royal bags with drawstrings removed, flannel receiving blankets, or any cotton cloth with a loose enough weave for roosting. Avoid polar fleece or other synthetics. Urine tends to pool on synthetic material and results in dirty, greasy bats. Roosting pouches (see [http://www.batworld.org/bat\\_bazaar/bat\\_bazaar.html](http://www.batworld.org/bat_bazaar/bat_bazaar.html) -- scroll to roosting pouches) may also be used. This might be a worthwhile project to which the public or volunteer groups could contribute. Wildlife rehabilitators have been gifted with bedding, pouches and quilts from volunteer groups.

### **Water dishes:**

Plastic pill containers or contact lens cases that can be found at most pharmacies, glass tea light holders (10 for \$1.99 at IKEA), plastic film canisters cut to size (free at most photo processing centers), or small finch-sized coop cups (filled halfway with glass marbles) are all acceptable. Velcro can be used to attach plastic dishes to the support poles of the cages. Coop cups can be hung from mesh sides.

### **Food trays:**

Mealworm trays for self feeding: <http://tinyurl.com/2z697l> (Stick with the narrow dishes). Small coop cups or honey cups (<http://www.redbirdproducts.com/cagesaccessories.htm>).

### **Mealworms:**

An initial order of 20,000 medium sized mealworms will be needed to make a 2<sup>nd</sup> stage recovery diet, as well as provide whole food to stabilized animals. Note that more mealworms will be needed if the bats survive. Sunshine Mealworms is a good source: 800-322-1100 as is Nature's Way: 800-318-2611. Both companies offer discounts for rehabilitators.

Baby Food Cereal can be used as mealworm substrate, as can a blend of oat bran, wheat bran, ground flax meal, and rodent chow. For long term care, refer to the Bat World Sanctuary medium described at [http://www.batworld.org/worldbatline/pdf\\_files/tartar%20control%20diet.pdf](http://www.batworld.org/worldbatline/pdf_files/tartar%20control%20diet.pdf).

Moisture food for mealworms such as sweet potatoes, fresh corn, fresh green beans, fresh carrots, apples, etc.

### **Nutritional Supplies:**

- Multivitamin Vionate (<http://www.squirrelsandmore.com/product/1493/vionate-vitamin-supplement.htm>)
- Critical care recovery diet Vital HN: <http://www.squirrelsandmore.com/product/611/vital-hn.htm> Critical care recovery diet alternate: Enteral Care HLP (currently on backorder from manufacturer).
- Flax seed oil (can be purchased at health food stores).
- Bland baby foods: applesauce, pears, bananas, garden vegetables, sweet potatoes and corn, carrots and green beans, etc..(these are used to vary the flavors of the diet,)

### **Medical and misc supplies:**

- Lactated Ringers Solution (LRS): Purchased at veterinary clinics or through rehabilitator groups.  
1 cc and 3cc o-ring syringes: <http://www.squirrelsandmore.com/product/425/1cc-slip-tip-oring-syringe.htm>, <http://www.squirrelsandmore.com/product/426/3cc-oring-slip-tip-syringe.htm> for feeding or administering SubQ fluids
- 29 ga insulin needles (depending on state may be available at pharmacies without a prescription) for administering subQ fluids
- 18 and 25-gauge needles: <http://www.medcareproducts.com/prodinfo.asp?number=NN> for drawing up fluids (18ga) or administering subQ fluids to larger bats (25ga)
- Heating pads , purchased at pharmacies and department stores
- Revolution (for kittens) to treat external parasites (once animals are stabilized). Purchase at veterinary clinics; requires a prescription.
- Glass medicine droppers for feeding
- Interdental brushes: <http://store.facevaluesonline.com/300410853402.html> for grooming or cleaning teeth
- Forceps or tweezers: <http://www.allheart.com/ma25730.html>, <http://www.sciencelab.com/page/S/PVAR/10-385-B>, or available at hobby/craft shops, for feeding
- Cotton swabs. Purchased at pharmacies and department stores

- Cattle markers in assorted colors  
[http://www.jefferslivestock.com/ssc/product.asp?CID=2&pf\\_id=16190](http://www.jefferslivestock.com/ssc/product.asp?CID=2&pf_id=16190) or farm supply stores, for marking individual animals
- High-quality iris or manicure scissors. Purchased at pharmacies and department stores
- Large capacity humidifier: <http://tinyurl.com/2ofedr> or similar

For a detailed list of rehabilitator supplies, please see  
<http://www.batworld.org/worldbatline/basicsupplylist.html>.