

A PRODUCT OF THE WHITE-NOSE SYNDROME NATIONAL PLAN

Acceptable Management Practices for Bat Control Activities in Structures

- A Guide for Nuisance Wildlife Control Operators.

White-nose Syndrome Conservation and Recovery Working Group

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Acceptable Management Practices for Bat Control Activities in Structures

The purpose of this document is to provide consistent Acceptable Management Practices (AMPs) for nuisance wildlife control operators (NWCOS) to reduce impacts on bats during bat control or removal activities in structures. These guidelines were developed in concert among NWCOS, state and federal agencies, private conservation organizations, and the Centers for Disease Control in response to recent catastrophic population declines and changes to the protection status of many bat species due to white-nose syndrome (WNS). These AMPs are recommended for use with all structure-dwelling bat species, regardless of their conservation status.

NWCOS regularly interface with the public and are an integral voice for bat conservation. NWCOS are also an important resource for information on the size and geographical distribution of bat colonies and are thus encouraged to communicate with their [state biologists](#), regardless of whether a colony is being evicted from a structure or not. State biologists, in turn, can provide additional resources and information on bats to homeowners and cooperating NWCOS.

This document is designed to provide minimum practices for safely addressing human-bat conflicts, while minimizing disturbance to bats and preventing the further spread of WNS. General background information is included on the significance of, threats to, and biology and behavior of bats in order to illustrate the context and justification for these standards. Please contact your [state wildlife agency](#) to determine if there are specific details about time-of-year restrictions, regulations, threatened and endangered species laws, and/or permits in the state where you conduct work.

Helpful Definitions:

- *Eviction/venting* refers to the use of one-way doors and exits to remove bats from a structure by utilizing their natural tendency to leave the roost at night.
- *Exclusion* refers to closing gaps and sealing holes to prevent bats from entering or re-entering a structure.

Significance of Bats

A great deal of misinformation exists about bats. NWCOS have an opportunity to educate their clients on the significance of bats to humans and the environment, while dispelling common myths. The following talking points may be useful. *More resources can be found in **Appendix B**.*

- Bats are important to our ecosystem, and ultimately our economy. Most bat species in the United States eat insects, including those insects that are agricultural, forest, and disease-spreading pests. During the summer, a bat can eat half its body weight in insects each night.
- Bats have inspired scientific advancements for humans including navigational aids for the blind, blood-clot medications, low-temperature surgery, and military sonar.

Bat Myths and Truths

Myth: *Bats are rodents and will cause similar destruction to a structure.*

Truths: Bats are not rodents, but are mammals in the order *Chiroptera*, meaning literally “hand wing”. Bats do not nest, chew, or claw their way into a structure, but instead take advantage of structural openings or areas of disrepair on the outside of a building. However, bats do leave droppings and urine in roost areas, which can cause health concerns.

Myth: *Bats have many offspring and their populations are stable.*

Truths: Bats are long-lived and have a low reproductive rate. Bats can live up to 30 years and most species produce only one or two young per year. Therefore, drastic population declines, such as those caused by WNS, are very difficult for bats to recover from.

Myth: *All bats are rabid.*

Truths: Bats are a reservoir for rabies virus, and persons who may have had direct contact with bats should be assessed by a medical provider. The naturally occurring infection rate in bats has been documented at only 1% or less in common structure-dwelling species (Trimarchi, 1977; Pybus, 1986). While human rabies deaths are rare in the United States, bats are typically responsible for 1-3 cases each year. Many times these exposures were either unrecognized or went unreported to health officials, so care should always be taken when potential exposures to bats may occur.

Threats to Bats

Bats are faced with a variety of threats including habitat loss (*e.g.*, loss of roost structures and foraging areas), incompatibility with human technology and development (*e.g.*, pesticide use, wind energy development), and outright persecution by people. The most significant threat to hibernating North American bats in recent years is from the disease WNS, first documented in 2007. The following facts about WNS are useful speaking points when discussing bats with the public.

- WNS is named for the white fungus observed growing around the noses of affected bats (Blehert et al., 2008). This aggressive fungus attacks the exposed skin of bats while they hibernate, resulting in dehydration, unrest, and increased activity (Lorch et al., 2011; Reeder et al., 2007).
- Affected bats quickly burn through stored energy and often die in the caves and mines where they hibernate, or out on the landscape (Turner et al., 2011).
- As of December 2014, WNS has been confirmed in 25 states and five Canadian provinces and the causative fungus, *Pseudogymnoascus destructans*, has been found in three additional states.
- Over 5.7 million bats have been estimated to have died as a result of this disease, which continues to spread (USFWS, 2012).

- Federal and state agencies, as well as universities and private organizations, are working together to track and understand WNS. There is no evidence to suggest that WNS has any direct effect on humans.
- Despite significant advances in understanding this deadly disease, much remains unknown about WNS, its spread, and the long-term consequences of losing significant numbers of bats.
- As a result of the drastic population declines caused by WNS, it has become increasingly important to reduce other sources of bat mortality.
- Aggregations of bats in human structures during summer are almost exclusively females and their young. Negative impacts to the low number of WNS-survivors or their young may significantly alter the rate of population recovery.
- **NWCOs have an opportunity to contribute to the conservation of our remaining bats by following simple guidelines for dealing with bats encountered in structures.**

Bat Biology and Behavior:

The purpose of this information is to guide NWCOs in their understanding of seasonal bat behavior and roosting locations within structures.

Each fall, bats migrate either to warmer climates or to hibernation areas. During this time, bats may use structures as temporary stop-over roosts. Long-distance migratory species may use bouts of torpor, a short state of decreased physiological activity, to save energy, while hibernating species engage in repeated, longer bouts of torpor to save energy in cold climates. Hibernating bat species arrive at their hibernation sites in the fall, typically returning year after year to the same caves, abandoned mines, other underground features, or occasionally buildings, where the climate is favorable and stable. Bats mate during the fall swarming period and build fat reserves for the winter ahead. During torpor and hibernation, a bat's heart rate, respiratory rate, and body temperature decrease to conserve energy during the winter months. Females store sperm over the winter and ovulate in the spring, thereby delaying pregnancy until food sources (i.e., insects) are available again (Whitaker and Hamilton, 1998).

Bats emerge in the spring and migrate back to their summer ranges, which may be nearby or several hundred miles or more from their winter roost. Summer roosts are generally found beneath loose tree bark or in tree crevices, but rocks, wood piles, bridges, or buildings* are also commonly used. Female bats find warm roost sites to raise young and many species form maternity colonies, numbering sometimes hundreds or even thousands if space allows. These colonies return to the same familiar roosts each year, unless a site becomes unsuitable or inaccessible (Humphrey and Cope, 1976).

Bat pups (young-of-the-year) are generally born in early- to mid-summer, following a roughly two-month gestation period for most species. Most females give birth to just one pup per year. Pups nurse for about four weeks, or until they are grown enough to begin flying. Young bats may not be weaned

and able to feed on their own until mid- to late-summer (Whitaker and Hamilton, 1998). Males live separately from females during summer and are not involved in pup rearing; they are more transient and solitary but may form small bachelor groups.

Bats emerge from their day roosts around dusk to forage for insects such as moths, beetles, midges, and mosquitoes. They hunt among the trees, in forest clearings, over water bodies, above meadows and cliffs, and in our neighborhoods, using echolocation to navigate and find their prey. Bats alternate between periods of feeding and rest. Bats may use “night roosts” to rest between feeding bouts. Night roosts may include open spaces, such as porch ceilings and under bridges.

Colonies disband in late summer, and bats begin making their way back to their hibernacula or winter roosts.

Bats are generally active at temperatures above 50 degrees Fahrenheit and typically drop into torpor below that temperature or find a location that remains at 35-50 degrees Fahrenheit for hibernation, though microclimate requirements vary by species (Altringham, 1996).

* For some adaptable bat species, buildings and other human-made structures can offer warm, safe, virtually permanent shelters for day-roosting, pup-rearing, and occasionally even hibernation. In addition, they can serve as temporary night-roosts and migratory stop-overs. Structures have become an important resource for bats where natural habitat is limited or dwindling. Consequently, bats are more likely to come into direct contact with people, sometimes presenting a nuisance or health concern.

Species Identification:

There is a great deal of behavioral variability among bat species. Knowing what species is present in a structure can inform eviction/exclusion timing and techniques. **NWCOs should become familiar with the species most commonly encountered in their area and follow state and federal laws, or contact their state wildlife agency for guidance as bats are not always visible during nuisance control activities for accurate species identification. Appendix A includes a list of bat species commonly found in structures, along with their current (2014) listing status and susceptibility to WNS.**

Seasonal Restrictions:

In the absence of a public health threat, evictions and exclusions should not be performed during the maternity season. In North America, the maternity season, when flightless young might be present, can extend from early April to late August, depending on the species, region, and seasonal weather patterns. Roost closure during the maternity season has been documented to result in lower reproductive success (Brigham and Fenton, 1986). Attempts to evict or exclude bats at this time can result in the death of flightless young, as well as an increase in the number of adult bats and orphaned pups that enter the living space, potentially heightening the risk of human/bat contact and rabies exposure. Insects and foul odors may also result from the death of entrapped bats. **Contact your [state wildlife agency](#) for time-of-year restrictions** as maternity season varies by region and species. In the absence of specific guidance

from your state biologist, **maternity season should be considered to begin April 1 and continue through August 31 each year.**

In the absence of a public health threat, evictions and exclusions should not occur during the winter months if there is a history or evidence of winter bat activity in the building. Some species (*e.g.*, the big brown bat) hibernate in buildings and do not regularly exit the structure because there is usually no food source available. Therefore, eviction/venting activities are likely to be ineffective or can result in bats exiting the structure in inclement weather, and exclusion work may result in trapped bats dying inside the roost or ending up in the living space while searching for another exit.

Bat-Proofing the Living Space:

During the maternity season, or when bats are suspected to be hibernating in the building, the best option for protecting concerned homeowners and public health is to bat-proof the living space, or provide “interior seals”. This work consists of locating openings (typically areas where air flows) leading into the living space from attics, garages, walls, or any place that bats are roosting. Entry/exit points can be as small as 5/8-inch round or 1/4-inch wide and 3/4-inch long that open into the living space. Likely openings may include:

- Attic hatches and doors
- Chimneys
- Fireplaces
- Around piping or plumbing
- Open windows or loose windowsills
- Openings around air conditioners and ducts
- Louver fans
- Screens in disrepair
- Pet doors

Getting a Single Bat out of the Living Space:

Bats may occasionally find their way into a living space, especially during the summer months when young-of-the-year are becoming more independent. This is not necessarily an indication that a bat is rabid. If there are concerns about rabies exposures, do not release the bat. Call your local or state public health department to determine if the bat will need to be tested for rabies. Homeowners should contact their physician or health department, and follow the Center for Disease Control’s guidelines to determine if a rabies exposure has occurred, as exposures are not always apparent. See **Appendix B** for resources.

If no potential for [rabies exposure](#) has occurred and weather conditions are appropriate (above 50 degrees F, no rain or high winds), a bat found in a living space can be safely released outside. Close doors to contain the bat in one room, then open windows and exterior doors to the room and stand against a wall while watching for the bat to exit on its own. If physical capture is necessary, wait for the

bat to land on a wall or other surface. A container such as a kitchen strainer or a clear plastic container with a piece of cardboard slid over the opening can be used to safely contain and move the bat. **Leather gloves** are strongly recommended. For the safety of the bat, pets, and the general public, released bats should be placed up off the ground on a window sill or large tree branch or released from at least 4 feet above the ground where they have a better chance of dropping into flight. An [illustrated guide to removing a bat from the living space](#) and a [video link](#) can be found in **Appendix B**.

Bats found in buildings during the winter may not survive if released outside in below-freezing temperatures, high winds, or heavy rain. Contact your state wildlife agency or local wildlife rehabilitators for help if you encounter a bat in a building during these types of inclement weather.

Effective Bat Evictions:

The only effective way to permanently get bats out of structures without harm and to prevent re-entry is to perform a humane eviction, using one-way venting at the primary entries/exits, and a complete exclusion, by sealing up any secondary holes, cracks, or crevices in the structure that could serve as potential entry/exit points. Materials and techniques for conducting bat evictions and exclusions are provided in the Professional Standards of Practice for Structural Management for Wildlife Control Operators (Standards), available through the [National Wildlife Control Operators Association](#). In addition, roost areas that harbor accumulations of guano may contain other health risks, such as histoplasmosis, which are also outlined within the Standards.

An inspection of the living space is recommended before and after eviction work takes place. If bats are found or reported in the living space, refer to the resources in Appendix B for safe removal.

One-way exit devices (i.e., venting) allow bats to leave the structure but not re-enter and are an acceptable and effective means of eviction outside of the maternity season. One-way exit devices must be constructed out of a material that does not have any sharp edges or parts that could damage a bat's wings or form any spaces for bats to become tangled in.

Bats can enter any crevice $\frac{1}{4}$ " inch or wider. Bat-sized crevices may be found on all sides of a building and are often not visible from the ground level. An evening emergence survey ("bat watch") can help to identify the bats' primary access points while engaging the homeowner and gathering pre-eviction baseline data, but a close visual inspection is often needed to locate secondary entrances and other potential access points. Therefore, it is the responsibility of the NWCO to have appropriate training and resources to safely access all sides of the structure, with special attention to the eaves.

Because not all bats will exit every night, one-way exits should be left in place for a minimum of five nights, including at least three consecutive nights of weather conducive to bat flight (temperatures above 50 degrees F, winds below 10 mph, and no sustained or heavy rains) before they are removed and the holes are sealed. If weather conditions are not conducive to bat flight while the devices are in place, the time period should be extended until at least three consecutive good weather nights are achieved.

If time permits, it is also suggested that someone (*e.g.*, the homeowners) watch the vented exits on the last night before the hole is permanently sealed, to verify that no bats remain inside the roost. If bats are found to have re-entered the roost, or if the NWCO discovers that a vent has detached or become loose enough to allow re-entry, then the device should be re-installed and left in place again for the five night minimum.

Contractors should be prepared to make multiple visits throughout the exclusion process, between initially setting up the vent(s), sealing crevices on all sides, and removing vents. **Even for experienced professionals, it may take SEVERAL TRIES to successfully bat-proof a building.**

Bats generally return to the same summer roosts year after year and may go to great lengths to get back into a roost following exclusion. Therefore, eviction/venting and exclusion work should be careful and thorough, and erecting alternate roost structures (*i.e.*, specially-designed bat houses) nearby for displaced bats is recommended.

Note: Night roosts of bats are generally in open areas (*e.g.*, under porches), not usually the inside of a building. However, bat guano may be found under the open roost. Eviction of night roosting bats will most often not be necessary, but the roost spot can be made unattractive to returning bats by hanging ribbons or mylar balloons, which create movement.

Unacceptable Methods

Methods that include poisoning, trapping (*e.g.*, cages, sticky traps), exterminating, translocating, or in any other way harming, harassing, or killing bats do not meet the AMPs outlined in this document.

These methods are illegal in many states and can result in increased cost to the homeowner. In addition, some of these methods may actually be dangerous to people and pets.

Decontamination for WNS:

Decontamination is vitally important for the protection of bats and their habitats and is the primary management option currently at our disposal to slow the risk of transmitting the fungus that causes WNS. While the current recommendations focus heavily on the treatment of equipment in cave and mine habitats, NWCOs should not underplay the potential risk associated with any bat-related work. By following the National Decontamination Protocol, NWCOs will minimize their individual risk of transmitting the fungus when conducting work involving close/direct contact with bats, their environments, and/or associated materials. *See decontamination guidelines in Appendix C or at www.whitenosesyndrome.org*

For EPA-registered pesticides, including anti-microbials, “the label is the law,” and label directions specify the types of materials (*e.g.*, porous vs. impervious surfaces) that can be treated. Associated safety data sheets provide important supplementary product information. In addition, some NWCO equipment may need to be cleaned to the manufacturer’s specifications and then, where permissible by the manufacturer’s guidance, be decontaminated following the WNS protocol.

In addition to items mentioned in the National Decontamination Protocol, disposal or decontamination should be considered for, but not limited to, items used by NWCOs that frequently come in contact with bats or their habitat such as: cones, tubes, chutes, and mesh used to construct one-way doors. *See Appendix C for a more detailed list.*

Please check with the appropriate federal, state, or tribal agency/organization for current management regulations/requirements prior to conducting any eviction/exclusion. Some state/federal regulatory or land management agencies may have supplemental documents that provide additional requirements or exemptions specific to bat evictions/exclusions on lands under their jurisdiction. For the long-term benefit of bats and their habitats, compliance, whether mandatory or recommended, will ensure the most responsible approach to bat exclusions are being implemented.

Bat Houses:

Because bats naturally return to the same location year after year (Neilson and Fenton, 1994), individuals may attempt to reenter the structure they have been excluded from or spend precious time and energy searching for a roost, thereby lowering reproductive output (i.e., producing fewer offspring) (Brigham and Fenton, 1986). Young born earlier in the summer have a significantly higher probability of surviving their first year than those born later in the season (Frick et al., 2009). Therefore, bat houses are recommended as alternative housing for displaced bats. Ideally, bat houses should be erected a few months to a year before a scheduled exclusion to give bats time to find and explore the new roosting option, and should be installed near the original roost to maximize the likelihood of bats finding the new habitat.

There is no guarantee that bats will use a bat house, but research has shown that bat houses can be successfully occupied during and after an eviction (Kiser and Kiser, 1999; Brittingham and Williams, 2000). Choosing the proper location, placement, design, color, and materials are all important factors for increased success (Tuttle et al., 2013). These attributes can vary by species and geographical region. *Guides to bat house design and placement can be found in **Appendix B**.*

Landowners interested in improving their property by enhancing natural roosting options such as large diameter trees, can **contact their [state](#) for forest best management practices** that will benefit local bat species.

This document is the product of the multi-agency WNS Conservation and Recovery 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). This Acceptable Management Practices guidance document will be updated as necessary to include the most current information and guidance available www.whitenosesyndrome.org/NWCO

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Appendix A – Common Structure-Dwelling Bat Species Information:

The following table is provided as an example of the information that can be obtained through your state wildlife agency for each of the species you may encounter in structures:

SPECIES COMMON NAME	SPECIES SCIENTIFIC NAME	RANGE	SEASONAL STRUCTURE USE	TYPICAL COLONY SIZE	WINTER BEHAVIOR	NOTES ON STRUCTURE USE	IDEAL TIME OF YEAR FOR EVICTIONS	WNS CONFIRMED/SUSCEPTIBLE	FEDERAL T&E STATUS (Year updated)	STATE T&E STATUS (Year updated)
<u>EXAMPLE</u> <u>for</u> <u>VERMONT:</u> Little brown bat	<i>Myotis lucifugus</i>	State-wide	April through October	Hundreds	Hibernates in Caves/ Abandoned Mines	Commonly uses attics, barns, churches, bat houses	September 1 through November 1	Confirmed, Significant declines due to WNS	Not Listed	Endangered (2014)

Appendix B - Resources:

Contact your **state wildlife agency or partners for time of year guidelines** that apply to your geographic area. A list of contacts can be found at: <http://www.whitenosesyndrome.org>

More information about bats, their biology and behavior:

- Animal Diversity
 - <http://animaldiversity.ummz.umich.edu/accounts/Chiroptera/>
- Bat Conservation International
 - <http://www.batcon.org>
- Organization for Bat Conservation
 - <http://www.batconservation.org/>
- US Geological Service
 - <http://www.npwrc.usgs.gov/resource/mammals/housebat/>
- US Fish and Wildlife Service
 - <http://www.fws.gov/asheville/pdfs/beneficialbats.pdf>
- US Forest Service
 - <http://www.fs.fed.us/biology/wildlife/bats.html>
- Save Lucy the Bat
 - <http://savelucythebat.org/>
- Conserve Wildlife Foundation of New Jersey
 - <http://www.conservewildlifenj.org/protecting/projects/bat/>

Information about White-nose Syndrome:

- US White-nose Syndrome website
 - <https://www.whitenosesyndrome.org/>
- “Battle for Bats” video:
 - <http://vimeo.com/76705033>

Eviction/Exclusion standards:

- National Wildlife Control Operators Association Bat Standards Training Course
 - http://nwcoa.com/bat_standards.html

Decontamination guidelines:

- <https://www.whitenosesyndrome.org/>

Rabies and other health concerns:

- Your state or local Department of Health
 - http://www.healthguideusa.org/local_health_departments.htm
- Centers for Disease Control
 - <http://www.cdc.gov/rabies/>

Removing a single bat from the living space:

- Bat Conservation International
 - <http://www.batcon.org/index.php/resources/for-specific-issues/bats-in-buildings/there-s-a-bat-in-my-house>
 - Video: http://www.youtube.com/watch?v=mzax0V0DG_M

Bat rehabilitation:

- Rehabilitation Guidance for White-nose Syndrome Affected Bats
 - <http://www.whitenosesyndrome.org>
- Bat World
 - http://batworld.org/what-to-do-if-you-found_a_bat/
- International Wildlife Rehabilitation Council
 - <http://thewrc.org/>
- National Wildlife Rehabilitator Association
 - <http://www.nwrawildlife.org/>

Bat house design and placement:

- Bat Conservation International
 - <http://www.batcon.org/index.php/resources/getting-involved/install-a-bat-house>
- Organization for Bat Conservation
 - <http://www.batconservation.org/bat-houses>
- Pennsylvania Game Commission
 - <http://www.portal.state.pa.us/portal/server.pt?open=514&objID=631013&mode=2>
- Bat Conservation and Management
 - <http://www.batmanagement.com/Batcentral/batcentral.html>
- Bat World
 - <http://batworld.org/bat-house-information/>

Appendix C – Decontamination Protocols:

- The latest up-to-date White-nose Syndrome (WNS) decontamination protocols can be found at: <https://www.whitenosesyndrome.org>
- The following table outlines equipment frequently used by NWCOs to evaluate and perform bat evictions and exclusions, along with tips on proper decontamination and disposal to prevent the spread of WNS.
- For EPA-registered pesticides, including anti-microbials, “the label is the law,” and label directions specify the types of materials (*e.g.*, porous vs. impervious surfaces) that can be treated. Associated safety data sheets provide important supplementary product information. In addition, some NWCO equipment may need to be cleaned to the manufacturer’s specifications and then, where permissible by the manufacturer’s guidance, be decontaminated following the WNS protocol.

<i>Guano Mitigation Equipment</i>	<i>Typically used within a structure's attic or interior living space.</i>	<i>Comment</i>
Disposable personal protective equipment	Tyvek suit, gloves and booties, light duty mask	Dispose of properly following each guano mitigation project or entry into bat roosting areas.
Non-disposable equipment	Clothing, shoes, clip boards	Bag before transport and then decontaminate following WNS guidelines.
Respirators	Typically multiple use style with removable filters	Dispose of filters after each job, and decontaminate respirator following WNS guidelines.
Vacuums	HEPA vacuums are typically used to remove guano and have two components, the unit itself and the hose/nozzle component	Dispose of vacuum bags after each guano mitigation project and clean hard-surfaced unit, hose and nozzle following WNS decontamination guidelines.
Lights	Lights, headlamps and other cursory items used to illuminate the work area in an attic or interior space	Decontaminate according to WNS guidelines.
Clean room setup	Drop cloths, etc., often removed along with guano and insulation	Dispose of following each guano mitigation project.