



CANADIAN
WILDLIFE HEALTH
COOPERATIVE



GOT BATS?

A GUIDE FOR CONSERVATION-MINDED BAT EXCLUSION IN NOVA SCOTIA

October 2020

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(Select sections from the complete guide: *HOW TO MANAGE BATS IN BUILDINGS IN NOVA SCOTIA*)

**CREATING A WORLD
THAT IS SAFE AND SUSTAINABLE
FOR WILDLIFE AND SOCIETY**



Acknowledgements

Cover Photo by Jordi Segers

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Table of Contents

| | |
|---|-----------|
| Section 1. Executive Summary | 3 |
| Main Messages | 3 |
| Background | 3 |
| The Importance of Bats | 3 |
| Human Health Concerns | 4 |
| Section 2. Excluding Bats from an Existing Roost | 5 |
| Steps for Excluding Bats from Buildings | 5 |
| Step 1. Assess the Situation | 6 |
| Step 2. Bat-proof the Human-occupied Living Space | 7 |
| Step 3. Identify the Entry and Exit Points | 9 |
| Step 4. Install Bat Houses | 10 |
| Step 5. Evict the Bats | 10 |
| Step 6. Exclude the Bats by Sealing the Roost | 13 |
| Section 3. Other Options for Managing Bats in Buildings | 14 |
| Section 4. Conservation Measures and Landowner Stewardship | 14 |
| Section 5. Resources | 15 |
| 5.1 Definitions | 15 |
| 5.2 Exclusion Decision Tree | 16 |
| 5.3 Helpful Resources | 17 |
| 5.3.1 Bat White-nose Syndrome (WNS) | 17 |
| 5.3.2 Excluding Bats from Buildings | 18 |
| 5.3.3 Bat Monitoring, Conservation, and Ecology | 19 |
| 5.3.4 Bat Houses | 20 |
| 5.3.5 Bat-related Human Health Concerns | 21 |





FULL DOCUMENT "HOW TO MANAGE BATS IN BUILDINGS IN NOVA SCOTIA" CAN BE FOUND AT:
[HTTP://WWW.CWHC-RCSF.CA/WNS_RESOURCES.PHP](http://www.cwhc-rcsf.ca/wns_resources.php)

Section 1. Executive Summary

Main Messages



- Bats are critical to the agricultural industry but many species are listed as endangered. Thus, it is crucial to protect the bats that remain.
- When working with bats, be mindful of the human health risks they potentially pose including rabies virus and histoplasmosis, even if they are low risk in the province.
- When excluding bats, the timing of evictions is very important. Bat exclusions should only take place from the beginning of September until the end of April, otherwise the bat pups will likely die.
- When excluding bats, use one-way exit devices for a minimum of 5-7 nights, with at least 3 consecutive nights of good weather (*i.e.*, temperature above 10°C, winds less than 16 km/h, and no rain).
- There are many other options besides exclusions for dealing with bats in human-made structures. Try to encourage property owners to coexist with bats by creating bat-friendly habitat and putting up bat houses.

Background



The Importance of Bats

Ecosystem services are the worldwide benefits that are provided to humans by the natural environment, including wildlife. Bats provide many ecosystem services including: insect control, pollination, and seed dispersal. The roles of bats in pollinating crops and agricultural insect pest control result in huge economic savings. **It has been estimated that the ecological services of bats are valued at somewhere between \$3.7 and \$53 billion for the U.S. agricultural industry each year.** This can be important for Nova Scotia (NS) farmers, where blueberry farms alone bring in \$31.7 million a year. Lowbush blueberries have at least seven common crop pests in NS, of which the most destructive is the blueberry fruit fly (*Rhagoletis mendax*, Diptera [true flies]). In NS, 7.7% of the diet of juvenile little brown myotis (*Myotis lucifugus*) is Diptera species. However, in 2014, three bat species were federally listed as endangered in Canada: the little brown myotis, the northern myotis (*Myotis septentrionalis*), and the tri-colored bat (*Perimyotis subflavus*). These species were all listed after experiencing large population declines from bat white-nose syndrome (WNS). WNS is a disease caused by a cold-resistant fungus called *Pseudogymnoascus destructans* (*Pd*). In a 2012 study, it was estimated that **at least 5.7 to 6.7 million bats had died from WNS in North America since its introduction in 2006, that number is likely much higher now but total loss is difficult to quantify.** Once infected, *Pd* appears to lead to rapid dehydration and electrolyte loss in bats, resulting in bats arousing more frequently from hibernation which causes them to burn their limited energy reserves and emerge from hibernation too early. However, there are few insects available in winter, even on warm days, so the affected bats often starve to death or die from cold exposure. Seven bat species have been identified in NS: the little brown myotis, the northern myotis, the tri-colored bat, the big brown bat (*Eptesicus fuscus*), the silver-haired bat (*Lasionycteris noctivagans*), the hoary bat (*Lasiurus cinereus*), and the eastern red bat (*Lasiurus borealis*).



Human Health Concerns



There are two primary human health concerns associated with bats: rabies virus and histoplasmosis. Rabies is a deadly infectious disease that can occur in any mammalian species and is caused by rabies virus. There are several different variants of rabies, including those found in terrestrial mammals (e.g., foxes (*Vulpes* spp.), striped skunks (*Mephitis mephitis*), and common raccoons (*Procyon lotor*)) and those found in bats. Cases of bat variant rabies have been reported in bats, terrestrial wildlife species (i.e., red foxes [*Vulpes vulpes*]), and domestic animals (i.e., domestic cats [*Felis catus*]) in NS. **Rabies prevalence in natural bat populations is approximately 1%.** However, bats exhibiting abnormal behaviours are more likely to have rabies. **The simplest and best way to prevent rabies exposure is to never touch or hold a bat with bare hands.** Therefore, if it is necessary to remove a bat from a property, then it is crucial they are handled wearing thick gloves that cover the hands, and if possible, the forearms. Wounds caused by bats can be very hard to find because the bite puncture marks are very small (less than 1 mm in diameter) and scratches are generally less than 1 mm long. **Thus, if there is any possibility that a human or domestic animal was bitten or scratched by a bat, it is very important that a local public health office or Regional Medical Officer of Health and/or a local veterinarian and a local Department of Lands and Forestry Field Office are contacted in order to assess the situation.** If a bat bite or scratch does occur, immediately wash the wound for fifteen minutes with soap and water, 70% ethanol, or a povidone-iodine solution, and contact your local health department. If a bat bite or scratch is identified, then rabies post-exposure **prophylaxis** (PEP; preventative treatment) will likely be recommended as a course of action. **If possible, safely collect the bat so it can be submitted for rabies testing.** You can find more details about the proper steps to take after potential exposure to bat variant rabies at the following website: <https://novascotia.ca/dhw/cdpc/documents/CDPC-Rabies-Response-Plan.pdf>.

Histoplasmosis is an infectious fungal disease of humans and animals caused by *Histoplasma capsulatum* (*H. capsulatum*) that most often causes a noncontagious (i.e., cannot be spread from an infected individual to uninfected individuals) pneumonia when spores of the fungus are accidentally inhaled by a susceptible individual. There have been no human cases of locally acquired histoplasmosis in NS; however, it is possible that *H. capsulatum* might be present in Atlantic Canada. Bats can become infected with *H. capsulatum* and thus carry the fungus and deposit it in their guano (bat droppings). Therefore, when working in areas with large amounts of bat guano, it is possible to breathe in the fungal spores when the guano is disturbed, especially when the guano is dry and spores become airborne. The best strategy to reduce the likelihood of an infection is to minimise the dust that becomes airborne while working in areas contaminated with bat guano. One way to do this is to thoroughly dampen the guano by spraying a 10% household bleach solution (1 cup bleach and 9 cups water) on it before it is shovelled or swept. **It is also strongly recommended that personal protective equipment (PPE), especially a Canadian Centre for Occupational Health and Safety (CCOHS)-approved respirator (TC 84A-XXXX N95), is worn to decrease the chance of inhaling the fungal spores.** Ultimately, it is recommended that removal of any accumulated bat guano be done by professionals that have the proper equipment and knowledge to minimise the biosafety risk associated with this activity.

Bat bugs, or **ectoparasites** of bats, may be an additional health concern. A bite from a bat bug is not painful but it may become itchy and develop a small welt due to a common allergic reaction. However, bat bugs do **NOT** transmit any known human diseases, such as rabies virus or Lyme disease.



Section 2. Excluding Bats from an Existing Roost

The best management option for bats is to leave them in their **roost** site. However, sometimes this is not possible, either due to human concerns, due to other circumstances (*e.g.*, unoccupied structurally unsound building that needs to be torn down for public safety reasons), or if the bats themselves are consistently put at risk (*e.g.*, if they are under constant threat of predation from a cat). In such cases, it will be necessary to exclude bats from a building. **In this situation, it is essential to contact your local Department of Lands and Forestry Field Office and an appropriate Pest Control Operator (PCO) that has the permit and training to do bat exclusion work.** In consideration of exclusion, it is important to understand the following terminology:

Eviction is removing bats from a building using one-way eviction devices.

Exclusion is the process of sealing entry and exit points once bats have left the building, to prevent them from re-entering the roost site.

*Remember that under the **Nova Scotia Wildlife Act** it is illegal to kill bats without a permit issued by the Department of Lands and Forestry.*

Steps for Excluding Bats from Buildings

The following are the steps that should be followed when determining how to exclude bats from a building:

Step 1. Assess the Situation

Step 2. Bat-proof the Human-occupied Living Space

Step 3. Identify the Entry and Exit Points

Step 4. Install a Bat House

Step 5. Evict the Bats

Step 6. Exclude the Bats by Sealing the Roost

Eviction is removing bats from a building using one-way eviction devices.

Exclusion is the process of sealing entry and exit points once bats have left the building, to prevent them from re-entering the roost site.



Figure 1. Sometimes human concerns, such as unoccupied structurally unsound buildings that need to be torn down for public safety reasons, do not permit bats to remain in a building.



Step 1. Assess the Situation

A. Solitary bat or maternity colony?



Determining whether there is a solitary bat or a maternity colony roosting in a building is important because it will result in very different exclusion methods. A solitary bat in a human-occupied space of a building should be removed immediately. Generally, a solitary bat found in a home is there because it is confused or accidentally gained access. So, if you open the windows and doors, it will usually fly out on its own. Make sure to close the doors to other rooms to prevent the bat from going further into the house. Any ceiling fans or fans with blades should be turned off to avoid bats flying into them and becoming injured. Turning off the room and outside lights will further help the bat find its way out of the house, and **all people and pets should exit the room until the bat leaves**. If the bat does not leave on its own, it may require physical assistance (*i.e.*, wearing thick gloves and placing a small container gently over the bat once it lands, and then releasing it outside onto a tree limb or other elevated position [refer to *Section 2.3.1.1.1 Solitary bat or maternity colony?* in the full document [73 p.] for detailed directions]).

If you are uncomfortable or unsure about having to remove a bat on your own, please get in touch with a professional (Pest Control Operator or Conservation Officer [CO]). During the process of removing a bat from a building, if there is even a possibility that someone has been bitten, scratched, or touched by a bat, it is imperative that provincial health officials be notified (links provided below). In this case, the captive bat should **NOT** be released until a provincial health official has been contacted and it has been determined whether the bat is required for rabies testing. Additionally, if a bat has been found in a room with an unattended child, or a sleeping, mentally impaired, or intoxicated person, the bat should be captured and kept for rabies testing, and provincial health officials should be immediately contacted for further instructions. Please get in touch with a local [public health office](#) or a [Regional Medical Officer of Health](#) as soon as possible, and a local [Department of Lands and Forestry Field Office](#), if it is necessary to submit the bat for rabies testing

B. Day roost or night roost?

The key difference is that day roosts are roosting sites where bats spend an extended period of time during daylight hours, mainly during summer and early fall. In contrast, night roosts are temporary resting spots that bats use in the night between feeding excursions. Bats that use night roosts are rarely problematic for people as the bats remain outdoors and have minimal human interaction. If possible, it is recommended that night roosting bats are left alone, but if necessary, there are methods to humanely discourage bats from night roosting (*e.g.*, pinning curled pieces of ribbon to the roost site so that they can sway in the wind). As always, it is **NEVER** recommended that bats are directly handled by people. However, there are several options to indirectly discourage bats from night roosting, although **these deterrents must be put in place when bats are NOT present** (see *Section 2.3.1.1.2 Day roost or night roost?* in the full document [73 p.] for more information).





Products that should NOT be used include aerosol dog or cat repellents, as they often contain the mildly toxic pesticide methyl nonyl ketone. Moth balls are also not suitable as deterrents for bats because in order for them to be effective naphthalene (the active ingredient) would be required in such large quantities it would pose a health hazard to humans. Ultrasonic devices are also not recommended as deterrents because they have not been proven to be overly effective. **Pesticides, smoke, and other chemical repellents are all dangerous deterrents for bats and are not recommended.** While artificial lighting is a suitable deterrent for a night roost, it is not recommended as a deterrent for bats day roosting in a maternity colony because if light is shone at the roost entrance, the bats will not use it and become trapped inside their roost if other exits are not available. **If it is suspected that there is a maternity colony in a building, do not use artificial lighting as a deterrent while excluding bats.**

If there is a maternity colony of bats day-roosting in a building and it needs to be removed, please contact your local **Department of Lands and Forestry Field Office** for advice. After the situation is assessed please continue with the following steps to exclude them if necessary:

Step 2. Bat-proof the Human-occupied Living Space

Direct human-bat contact should be prevented, when possible, to protect human health from diseases such as rabies and histoplasmosis that are known to be associated with bats. This means that bats found in spaces occupied by humans cannot remain there, and further action will be required to exclude them from these areas. This does not include bats that are roosting in attics that are not accessed regularly or bats that forage outside around the house. Preventing bats from entering a living space can take place at any time of year provided that the area is not part of a maternity colony. Unlike rodents, bats are not looking for food in buildings, so they are not exploring these structures but simply using certain points to enter and exit their roost. If a bat is in a living space, it is likely accidental, either resulting from a fall down a chimney or chute, or from a pup that has lost its way to the roosting area.

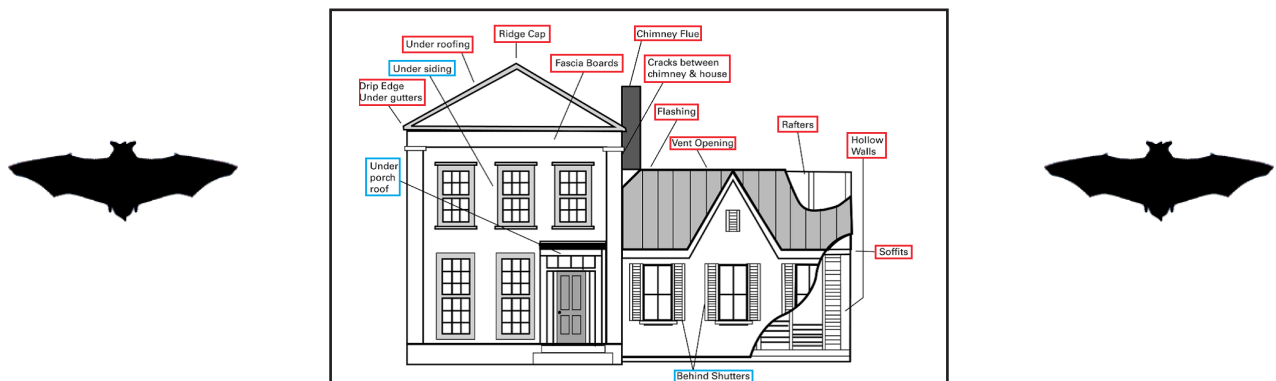


Figure 2. Common roost sites for bats in buildings (general maternity colony roosts are in red and solitary roosts are in blue, although some of these are interchangeable).

Image by Julianne Leekie for the Kootenay Community Bat Project, based on original image by Dr. Stephen C. Frantz, Global Environmental Options, LLC



The first step in bat-proofing the interior of a building is to locate any spaces connecting the living space to the roost site. Provided you do not enter the actual roosting area, this does not disturb the bats and can be performed at any time of year. **Bats can enter or exit a space as small as 15 mm in diameter (which is approximately the size of a dime), or 6 mm wide and 19 mm long (which is close to the size of a small safety pin [Size 000]).** Some common openings may include:



Photo by Tessa McBurney

Figure 3. Chimneys and fireplaces provide common openings for bats to access the living space.

- the space around the frame of attic hatches and doors
- the flues of chimneys and fireplaces
- the spaces around piping or plumbing
- open windows and doors
- openings in windows, unscreened windows, or loose windowsills
- openings associated with air conditioners, fans, and ducts
- tears or defects in screens
- improperly sealed pet doors

The second step is to seal the openings. The spaces can be temporarily sealed using newspapers or rags, or the openings can be permanently sealed with wood, flashing, weather stripping (including draft sweeps), screening, copper mesh, or galvanised (steel) wire mesh. The galvanised wire mesh can be attached with screws. Copper mesh can be a good option, but it should not come in contact with galvanised metal, as it can cause rapid corrosion of the metal when wet. All types of mesh and screening should have mesh smaller than 1 cm (0.5"). Once in place, the mesh can be covered by a latex (water-based) caulking. Latex caulking is safest for bats, but the sealed openings should be checked periodically as this type of caulking may shrink and crack over time. The mesh can also be covered by aerosol foam. **Silicone, polyurethane, or other non-water-based caulking materials should never be used as they often have higher volatile organic compound (VOC) content.** Aerosol foam can be used as a sealant or also to cover mesh, however, **it should only be used after bats have left the structure for the season (between November 1st and March 31st).** First, ensure bats are not in the space by sticking a long object into the space, such as a stick or a straw. Expandable foam can entomb bats, thus it should NOT be used if there is even a slim possibility that bats are still around and may return to the structure. Backer rod foam insulator can be placed behind the aerosol foam as an extra precaution to prevent any entombment. Aerosol foam also breaks down in heat over time, especially when exposed to weather and UV light, so it may not be the best option for external holes. If using aerosol foam, make sure to wear gloves to protect your hands. **When sealing off access points associated with ducts and chutes, it is imperative that they are sealed off at the top of the chute, rather than at the bottom.**



Photo by Jordi Segers

Figure 4. Prevent rodents (e.g., squirrels) from chewing through caulking.



Sealing the chutes at the bottom has been found to lead to high bat mortality, because the bats fall down the chute and then are unable to climb up the slippery surface and become trapped. Since bats cannot fly straight up, they rely on their ability to climb rough surfaces to escape ducts and chutes. Not only is the associated bat mortality an issue, but a collection of dead bats in a duct may create odour problems as well. If the access point for bats is louvres or covers of ducts that are still functioning, screens that allow for proper air movement but have a mesh size smaller than a bat is able to crawl through can be installed to prevent bats from getting in. **Do NOT place mesh or spark arrestors over fireplace flues that are still in use.** Only certified products tested by a third party should be used with your fireplace to prevent fire hazards. It is possible to purchase certified manufactured flues with caps that meet the CSA standard (e.g., Selkirk models). Outside heating season, it may be possible to close the dampers on fireplaces and flues as long as they are opened prior to use. It is also important to ensure that entry and exit points to the roost site are not affected by any alterations at this time (for more information see *Section 2.3.1.6 Step 6. Exclude the Bats by Sealing the Roost* in the full document [73 p.]). While bats are unable to chew through any of the recommended sealants, rodents may be able to accomplish this (especially with aerosol foam) and reopen the entry or exit point. For this reason, if rodents have access to these areas, it would be prudent to layer copper mesh or steel wool between applications of caulking, which hinders their ability to chew through the caulking material. Steel wool can be used but it can rust and degrade over time.

Step 3. Identify the Entry and Exit Points

When assessing the exterior of buildings, it can be difficult to detect all possible entry and exit points where bats gain access to interior spaces in the building. Therefore, the best way to identify these entrances and exits to day roosts in buildings is to conduct an emergence survey at dusk (see *Section 2.3.2 Emergence Survey* in the full document [73 p.] for more information).

Step 4. Install a Bat House

To provide bats with an alternative, safe roosting space prior to or after exclusion from their original roost, a bat house can be installed nearby. While there is little evidence that bats will choose bat houses over suitable alternative roosting sites, and it may take years for bats to adopt a bat house as a roost, it is still recommended to provide these bat houses for bats when they are being excluded from an existing roost. More detailed instructions on using bat houses can be found in *Section 2.4.2 Create a New Roost (Bat Houses)* in the full document (73 p.).



Figure 5. Install a bat house.



Step 5. Evict the Bats

It is crucial to consider the time of year when planning to evict bats from a building. Little brown myotis, northern myotis, and the tri-colored bat give birth between late June and mid-July. After birth, it takes approximately three weeks for pups to learn how to fly, or become “**volant**”. Since most aggregations of bats in NS buildings are maternity colonies, if bats are evicted prior to the pups becoming volant and feeding on their own, **the pups will be trapped inside the building without their excluded mothers to feed them, and they will likely die.** Therefore, this should never be done, not just for the conservation of bats, but also to avoid human health issues related to having many dead and decomposing animals sealed in a house. **Bat exclusions should only take place from the beginning of September until the end of April.** Bat exclusions should NOT take place from May 1st until August 31st. The best time for exclusion is from mid-to-late October when the young are able to fly, and bats have left their summer residence but are not yet hibernating.

It is advised to contact the Nova Scotia Department of Lands and Forestry in advance whenever you plan to remove bats from a building, regardless of the time of year. **An Endangered Species permit must be obtained from the Department of Lands and Forestry to exclude bats between April 16th - October 31st.** If bats are not present in the building, it is not necessary to obtain a provincial permit to conduct work from November 1st - April 15th; however, if bats are determined to be present, a permit will be required.

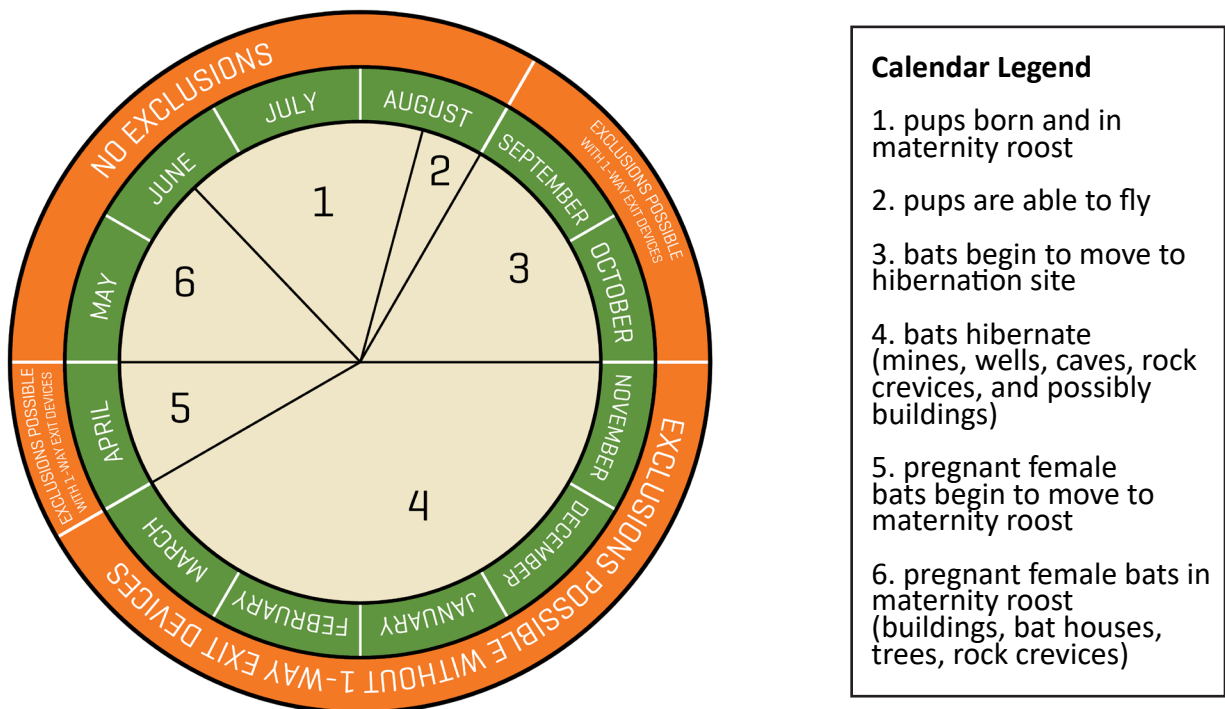


Figure 6. Calendar demonstrating when it is appropriate to exclude bats from a structure and when they should not be excluded.

Image adapted from Craig and Sarell 2016

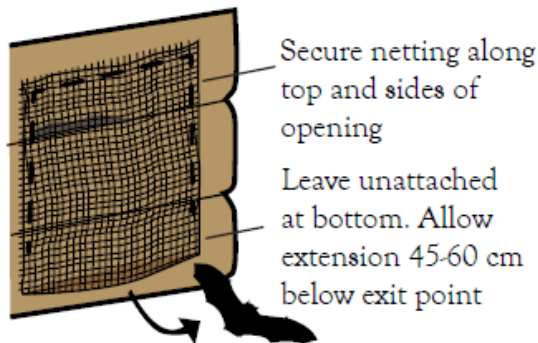


Figure 7. How to position a one-way mesh exit device on a vertical surface. Use lightweight polypropylene netting with mesh smaller than 1.0 cm.

Image from Craig and Sarell 2016

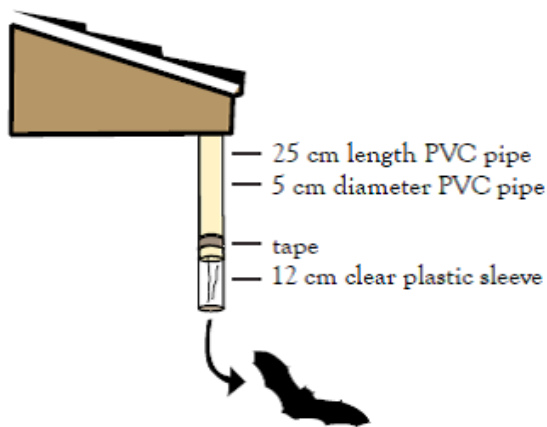


Figure 8. How to position a one-way exclusion tube on a horizontal surface. Use PVC pipe, a clean caulking tube, or flexible tubing.

Image from Craig and Sarell 2016

If the exclusion takes place when bats are still roosting in the building, then it will be necessary to use eviction devices that allow bats to exit the structure but prevents them from re-entering. If there is uncertainty on whether all bats have vacated a space (*i.e.*, the roost site cannot be accessed and visually checked), then eviction devices should also be used.

For an entrance or exit on a vertical surface, like a wall, a one-way exit device can be constructed from lightweight polypropylene netting (bird netting) that has mesh smaller than 1.0 cm (1/2"; 4x4 strands per inch). **It is sometimes suggested that plastic sheeting can be used as well; however, this will block ventilation and can alter the temperature and humidity of the roost. It is not recommended to use any methods that result in structural changes that block natural ventilation.** The netting should be secured along the top and sides of the opening with the bottom left detached. The bottom should extend 45-60 cm below the exit point. The mesh will prevent the bat from flying back inside the building. Flexible exclusion tubes can also be used on vertical surfaces, just ensure that the tube is not so long that it will twist in the wind.

For an entrance or exit point on a horizontal surface, like the edge of a roof, an exclusion tube can be custom-built to act as a one-way exit device. The tube can be made from polyvinyl chloride (PVC) pipe, a caulking tube that has been cleaned out, or flexible tubing. If a caulking tube has not been properly cleaned out, the rough surface will allow bats to climb up and re-enter the structure if a plastic sleeve is not used. The tube should be at least 5 cm (2") wide and 25 cm (10") long, and placed over the opening. A clear plastic sleeve attached to the end of the pipe will ensure that bats do not re-enter. Bats will leave their roost by sliding down the tube, but they will not be able to re-enter because it is too slippery to climb and too narrow to fly up. Some stores sell "bat cones" that can be used as exclusion tubes (see *Section 4.3.2 Excluding Bats from Buildings* in the full document [73 p.]).

It is important to ensure that eviction devices do not have any sharp edges or features that could potentially injure, entrap, or entangle a bat.



Additionally, it is not recommended that eviction devices are attached with duct tape or similar adhesives that have a chance of falling off because bats can become attached to the exposed adhesive or possibly re-enter the building where the tape has fallen off.

The one-way eviction devices should remain in place for a minimum of 5-7 nights, with at least 3 consecutive nights of good weather (*i.e.*, temperature above 10°C, winds less than 16 km/h, and no rain). Depending on weather and other factors, bats do not exit their roost to feed every night, so by letting the eviction devices remain for an extended interval, it gives all of the bats sufficient time to leave the building at some point during the eviction period. Bats are unlikely to feed in bad weather conditions and will often remain in their roost, which is why it is important to have at least three consecutive nights of good weather during the eviction process. On the last night the eviction devices are in place conduct a second emergence survey (see *Section 2.3.2 Emergence Survey* in the full document [73 p.] for more information). If no bats are observed emerging, it will indicate that all of the bats have been evicted from the building. As with the first emergence survey, make sure that this one is conducted on a night with good weather (*i.e.*, no rain, winds less than 16 km/h, and temperatures higher than 10°C). If possible, the bat roost should also be physically checked if it is able to be accessed. Use a flashlight to carefully see if there are any bats still roosting in crevices or cracks. If you enter a roost site, proper PPE (*i.e.*, a CCOHS-approved respirator [TC 84A-XXXX N95]) and a Tyvek suit should be worn. Ensure that you are always conforming to the necessary safe work practices.

If bats are somehow able to re-enter the building at any point during the exclusion process, then one-way eviction devices need to be re-implemented for another 5-7 nights minimum (with at least 3 consecutive nights of good weather).

If the roosting bats have already left for the season or have not yet returned for the summer (generally between **November 1st and March 31st** in NS), then it is **not necessary to use eviction devices**. However, the roosting area should be carefully checked with a flashlight to ensure that all bats have left the maternity colony. Again, make sure all crevices, corners, and cracks are thoroughly examined and wear an approved respirator (TC 84A-XXXX N95).

Ideally if bats are found hibernating in a building in the winter, they can be left for the winter and excluded the following spring before the end of April when the temperature consistently remains above 0°C. Bats produce little guano throughout hibernation and create little disturbance. **It is extremely likely that if a bat is excluded from a building during hibernation, it will either freeze to death or die of starvation.** Please contact the toll-free number 1-833-434-BATS (2287), the NS Species at Risk Hotline (1-866-727-3447), or biodiversity@novascotia.ca if you find any bats in the winter.



Photo by Jessica Humber

Figure 9. Hibernating *Myotis* sp.



Step 6. Exclude the Bats by Sealing the Roost

Once bats are successfully evicted from a building, it is essential to tightly seal all entry and exit points to prevent re-entry. At this time, the one-way eviction devices can be removed, and all entry and exit points can be sealed using wood, flashing, weather stripping (including draft sweeps), screening, copper mesh, or galvanised (steel) wire mesh.

(Only use aerosol foam as a sealant after bats have left for the season.)

(Do NOT use silicone, polyurethane, or other non-water-based caulk materials.)

To ensure that the exclusion is successful, it is additionally important to seal all other gaps and spaces that bats could use to enter the building. This is ideally also done after the bats have left for their hibernacula in mid-to-late October.

After exclusion, the roosting area should be cleaned. If it is possible to access the roosting area, remove the guano and urine-stained insulation, address any issues with the vapour barrier, check wood for rot, and reapply insulation. Prior to cleaning, thoroughly dampen the guano with a 10% household bleach solution (1 cup bleach and 9 cups water) and wear an approved respirator (TC 84A-XXXX N95) to prevent histoplasmosis. Wear gloves while handling guano-stained materials or dead bats. If any dead bats are found, please submit them directly to the Nova Scotia Wildlife Division (902-679-6091) or contact the Canadian Wildlife Health Cooperative (CWHC) (1-833-434-2287/902-628-4314) for assistance. Handle dead bats carefully ensuring there is no direct contact (*i.e.*, wear gloves), and store in a leak-proof container with: contact information, date, and location. Ensure that if any building alterations are made that they are in accordance with provincial building and fire codes.

It is recommended that licensed Pest Control Operators or Nuisance Wildlife Control Operators (NWCOs) are contacted to assist with or complete the entire exclusion process. Once bats are evicted from a structure, they may attempt to re-enter the building through new access points. It might take several attempts to successfully exclude bats from a building.

See *Section 2.3.3 Decontamination Guide* in the full document (73 p.) for instructions on how to decontaminate equipment to prevent the unintentional spread of WNS.



Photo by Jordi Segers

Figure 10. It may take more than one attempt to successfully exclude bats from a building.

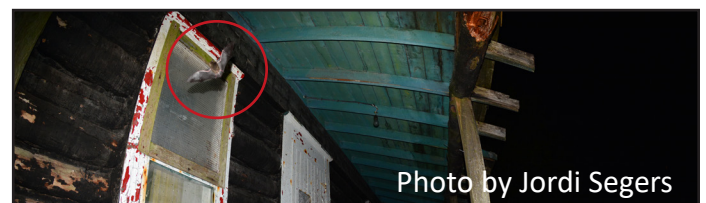


Photo by Jordi Segers

Figure 11. To ensure that the exclusion is successful, it is important to seal all other gaps and spaces that bats could use to enter the building.



Section 3. Other Options for Managing Bats in Buildings

Rather than excluding bats, the ideal situation would be to leave bats in an existing roost whenever possible. If the bats are roosting in a non-residential building or unused structure, such as an old shed or barn, then the best approach is to leave the bats without any alterations to the structure. The most important considerations occur when bats are able to enter a living space that is used by humans. Bats cannot remain in spaces occupied by humans, and further action will be required to exclude them from these areas and to protect the human living area from contact with the bats. As long as bats are unable to access the living space, they can safely remain in other areas of the structure. **It should be noted that ANY structural alterations or improvements should only be made when bats are no longer present.** Additionally, if the property owner is receptive to the idea, bats can be encouraged to roost on a property, which has the added benefit of natural insect control. This can be done in the following ways:

- Enhance current roosting conditions by creating dark spaces with lots of small crevices for bats. This should only be done if there are no human health-related concerns associated with the bats in the building and bats are unable to gain access to the human living space.
- Create new roosting opportunities by providing bat houses (refer to *Section 2.4.2 Create a New Roost (Bat Houses)* in the full document (73 p.) for detailed instructions).
- Enhance bat habitat by keeping dead or dying trees and rock formations for roosting, planting hedgerows, and supplying a water source such as a small pond. Ensure all artificial lighting is removed.
- Improve food availability by planting a garden with native plants that attract the insects bats like to eat.

Section 4. Conservation Measures and Landowner Stewardship

There are opportunities for landowners to get involved in bat conservation in NS. It is important for people to **REPORT** bat sightings by contacting the Canadian Wildlife Health Cooperative at 1-833-434-BATS (2287) or atlanticbats@cwhc-rcsf.ca. Sightings can also be reported to the Mersey Tobeatic Research Institute (MTRI) by contacting the NS Species at Risk Hotline 1-866-727-3447 or www.batconservation.ca. The Nova Scotia Department of Lands and Forestry can be contacted directly at biodiversity@novascotia.ca. Whether a solitary bat is spotted or there is a maternity colony in a building, it is crucial to identify where bats are hanging out. This is especially important for bat white-nose syndrome (WNS) surveillance season (November 1st-May 31st), and locating maternity colonies in the summer. By providing this information, you are contributing to bat research that is essential in conserving bat populations. The toll free numbers, e-mail addresses, and website listed above can be used to report any bat-related activities you observe on your property or to ask any questions you might have about the bats living in Nova Scotia.



Section 5. Resources

Document should be cited as the following:

McBurney, T. 2018. Got bats? A guide for conservation-minded bat exclusion in Nova Scotia. Tech. Rep. Charlottetown, PE: Canadian Wildlife Health Cooperative, Canadian Wildlife Health Cooperative Atlantic Office. 22 p.

5.1 Definitions

ectoparasite: a parasite that lives outside of its host (*i.e.*, on the outside of the skin; *e.g.*, ticks)

eviction: removing bats from a building using one-way eviction devices (should only take place from the beginning of September until the end of April)

exclusion: the process of sealing entry and exit points once bats have left the building, to prevent them from re-entering the roost site

Nuisance Wildlife Control Operator (NWCO): someone who relocates, traps, or removes wildlife considered a nuisance

Pest Control Operator (PCO): someone who uses a variety of methods to remove or kill pests or nuisance animals

prophylaxis: measures taken to prevent the spread of a disease (*e.g.*, rabies)

roost: where a bat rests

volant: able to fly



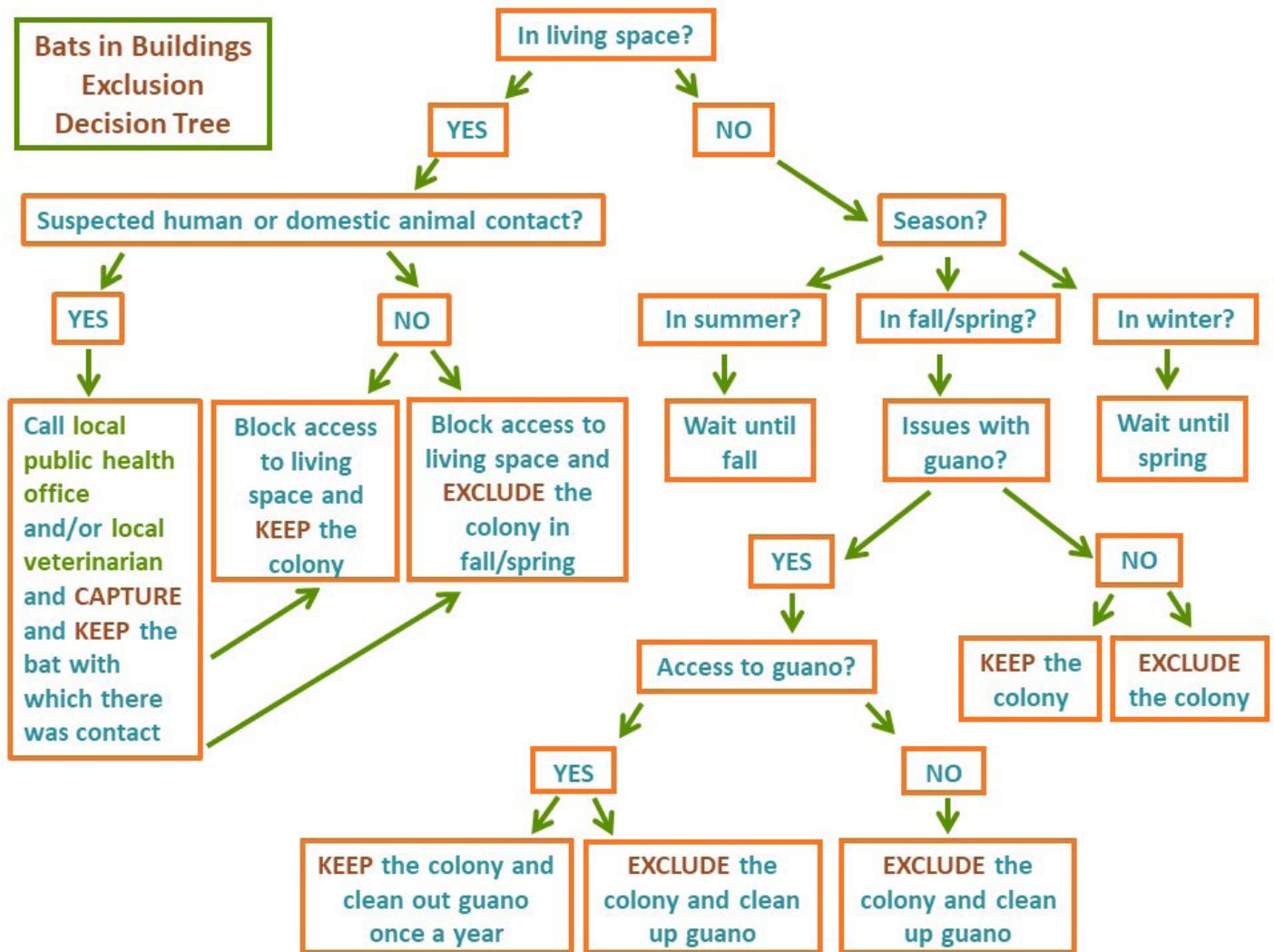
Figure 12. Little brown myotis in flight.



Figure 13. Northern myotis hanging out.



5.2 Exclusion Decision Tree





5.3 Helpful Resources

5.3.1 Bat White-nose Syndrome (WNS)



Canadian Wildlife Health Cooperative

Bat White-nose Syndrome Resources:

http://www.cwhc-rcsf.ca/wns_resources.php

Bat White-nose Syndrome Surveillance:

<http://www.cwhc-rcsf.ca/wns.php>

Canadian National White-nose Syndrome Decontamination Protocol:

<https://www.youtube.com/watch?v=kQjALbixJKY>

Decontamination Protocol for Entering Bat Hibernacula (full):

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

Decontamination Protocol for Entering Bat Hibernacula (2-pager):

<http://www.cwhc-rcsf.ca/docs/BatWhiteNoseSyndrome-DecontaminationBrief-Dec2016.pdf>

Submission Protocol for White-nose Syndrome Specimens:

http://www.cwhc-rcsf.ca/docs/WNS_Specimen_Submission_Protocol.pdf

US White-nose Syndrome Conservation and Recovery Working Group

National White-nose Syndrome Decontamination Protocol (US):

<https://www.whitenosesyndrome.org/mmedia-education/united-states-national-white-nose-syndrome-decontamination-protocol-april-2016-2>





5.3.2 Excluding Bats from Buildings

Alberta Community Bat Program

Bats and Buildings:

<https://www.albertabats.ca/gotbats/>

Got Bats? Alberta Guide for Managing Bats in Buildings:

http://www.albertabats.ca/wp-content/uploads/Alberta_Bats_in_Buildings.pdf

Batcone

Retailer of Bat Eviction Devices:

<http://www.batcone.com/>

Bat Conservation International

Bat Conservation International- Bats in Buildings:

<http://www.batcon.org/resources/for-specific-issues/bats-in-buildings>

Community Bat Programs of BC

Got Bats? 7 Steps for Managing Bats in Buildings in British Columbia (BC) (full):

http://www.cwhc-rcsf.ca/docs/7_Steps_for_Managing_Bats_in_Buildings.pdf

Got Bats? 7 Steps for Managing Bats in Buildings in BC (2-pager):

http://www.cwhc-rcsf.ca/docs/7_Steps_for_Managing_Bats_in_Buildings_-_2_pager.pdf

Got Bats? Frequently Asked Questions Regarding Bats in Buildings in BC:

http://bcbats.ca/attachments/bat_FAQ.pdf

Québec Bat Group

Practical guide for the conservation of bats in an agricultural setting (in French) :

<https://mffp.gouv.qc.ca/guide-pratique-conservation-chauves-souris-milieu-agricole/>

US White-nose Syndrome Conservation and Recovery Working Group

Acceptable Management Practices for Bat Control Activities in Structures:

<https://www.whitenosesyndrome.org/mmedia-education/acceptable-management-practices-for-bat-control-activities-in-structures-a-guide-for-nuisance-wildlife-control-operators>





5.3.3 Bat Monitoring, Conservation, and Ecology

Canadian Wildlife Federation

Help the Bats Resources:

<http://cwf-fcf.org/en/explore-our-work/endangered-species/help-the-bats/>

Canadian Wildlife Health Cooperative

Shipping and Handling Instructions for Wildlife Specimens:

<http://www.cwhc-rcsf.ca/docs/CWHC%20Shipping%20and%20Handling%20Instructions.pdf>

Submission Protocol for Wildlife Specimens:

http://www.cwhc-rcsf.ca/forms/cwhc_atlantic_submission_form.pdf

Submission Protocol for Wildlife Specimens (in French):

http://www.cwhc-rcsf.ca/report_submit.php

Merlin Tuttle's Bat Conservation

Worldwide Bat Conservation:

<http://www.merlintuttle.com/>

Mersey Tobeatic Research Institute

Nova Scotia Bat Conservation:

<http://www.batconservation.ca/index.php?q=node/add/batreport>

Nova Scotia Species at Risk Hotline

1-866-727-3447

Neighbourhood Bat Watch

Citizen Science Bat Monitoring in Canada:

<http://batwatch.ca/>

Instructions for Bat Colony Counts:

http://batwatch.ca/sites/default/files/pdf/Bat_Colony_Validation.pdf





Nova Scotia Department of Lands and Forestry, Wildlife Division

902-679-6091

biodiversity@novascotia.ca

<https://novascotia.ca/natr/wildlife/biodiversity/>

Local Nova Scotia Department of Lands and Forestry Offices

<https://novascotia.ca/natr/staffdir/offices.asp>

The Natural History of Canadian Mammals- by Donna Naughton

5.3.4 Bat Houses

Alberta Community Bat Program

Bat House Information for Alberta (including bat house designs):

<http://www.albertabats.ca/bathouses/>

Building Homes for Bats- Alberta Bat House Guidelines:

<http://www.albertabats.ca/wp-content/uploads/ACBP-Bat-Houses-in-Alberta.pdf>

Bat Conservation International

Bats Magazine- Bat Houses:

<https://www.batcon.org/issue/volume-11-issue-1/>

Canadian Bat Houses

Canadian Retailer of Bat Houses:

<http://canadianbathouses.com/>

Canadian Tire

Nature's Way Cedar Bat House:

<https://www.canadiantire.ca/en/pdp/cedar-bat-house-1421964p.html>

Community Bat Programs of BC

Building Homes for Bats- A Guide for Bat Houses in British Columbia:

http://www.bcbats.ca/attachments/Bat_houses_in_BC_2015.pdf





Information on Where to Install Bat Houses in BC:

<http://www.bcbats.ca/index.php/bat-houses/where-to-install-a-bat-house>



Lee Valley

Organization for Bat Conservation:

<https://www.leevalley.com/en-ca/shop/garden/wildlife/houses-and-habitats/70692-bat-house?item=AG138>

Québec Bat Group

Practical guide for the conservation of bats in an agricultural setting (in French) :

<https://mffp.gouv.qc.ca/guide-pratique-conservation-chauves-souris-milieu-agricole/>

The Bat House Builder's Handbook- by Merlin Tuttle

5.3.5 Bat-related Human Health Concerns

Histoplasmosis

Centers for Disease Control and Prevention (CDC)

Histoplasmosis- Protecting Workers at Risk (full):

<https://www.cdc.gov/niosh/docs/2005-109/pdfs/2005-109.pdf>

Histoplasmosis- Protecting Workers at Risk (2-pager):

<https://www.cdc.gov/niosh/docs/2005-109/pdfs/2005-109FS.pdf>

NIOSH-approved N95 Particulate Filtering Facepiece Respirators:

https://www.cdc.gov/niosh/npptl/topics/respirators/disp_part/n95list1.html

Government of Canada

Pathogen Safety Data Sheets: Infectious Substances – Histoplasma capsulatum:

<https://www.canada.ca/en/public-health/services/laboratory-biosafety-biosecurity/pathogen-safety-data-sheets-risk-assessment/histoplasma-capsulatum.html>





Rabies Virus

Centers for Disease Control and Prevention (CDC)

Compendium of Animal Rabies Prevention and Control:

(Part 1. Rabies Prevention and Control C. Prevention and control methods related to wildlife)

<http://nasphv.org/Documents/NASPHVRabiesCompendium.pdf>

Nova Scotia Department of Health and Wellness

Rabies Response Plan:

<https://novascotia.ca/dhw/CDPC/documents/CDPC-Rabies-Response-Plan.pdf>

University of Prince Edward Island

Medical Surveillance Plan for Research Involving Biohazardous Materials (rabies safe work practice):

<https://www.upei.ca/policy/adm/ord/gnl/0012>

Nova Scotia Department of Agriculture, Food, and Fisheries

1-800-279-0825/902-424-4560

Nova Scotia Department of Health and Wellness

1-800-387-6665/902-424-5818

Nova Scotia HealthLine

811/1-866-770-7763

Local Public Health Offices

<http://www.nshealth.ca/public-health-offices>



Photo by Jordi Segers

Figure 14. Bat and bat house.



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