

“House bats”

Species' names:

- Little brown bat, *Myotis lucifugus*
- Big brown bat, *Eptesicus fuscus*

There are nine species of bats in the Northeast, but these are the only two that commonly roost in buildings.

Size:

Little brown: 3–4 inches long. $\frac{1}{16}$ – $\frac{1}{2}$ ounce. 9" wing-span. New York's most abundant species of bat.

Big brown: 4–5 inches long. $\frac{3}{8}$ – $\frac{5}{8}$ ounce. 12" wing-span.

The Indiana bat, *Myotis sodalis*, an endangered species found in New York State, can be confused for the little brown bat. (Remember, an endangered species cannot be harassed, collected, harmed, or killed without a federal permit, and your chances of winning the lottery are much better than your chances of getting a permit to do that.) Of course, an Indiana bat is not likely to be found in a house. It's not easy to tell them apart, but here's how:

Little brown bat:

Brownish nose

Long hairs on toes.

Hairs stick out beyond end of toes

Calcar* usually lacks keel, or only has weak keel

Indiana bat:

Pink nose

Short, unremarkable toe hairs

Calcar has prominent keel

*The calcar is the bone that juts back from the anklebone to support the tail membrane. It's "keeled" if there's a flat ridge of skin sticking off its side that looks like the keel of a boat.

Signs of their presence:

- At dawn or dusk, may see bats entering or leaving the building. This is easiest to see at dawn, because bats swarm and fly around the entrance hole a few times before entering the roost.
- Sounds: Bats can see, but they use ultrasonic pulses to guide their flight and locate insects (called "echolocation"). Roosting bats may squeak or scurry when disturbed.
- Scat: Piles of black, dry, guano usually found under the main exit hole in the attic. Can be found scattered throughout an area, particularly in roosts where bats enter and fly about, but roost in a specific area such as a wall void or the intersection of the beams and rafters. May also see scat on the side of the house, usually below a hole or crack. Large piles of guano are usually found beneath areas that are

used often, or by large numbers of bats. Individual droppings for the little brown bat are about the size of a grain of rice. The scat of the big brown are about twice that size, and are typically chunkier, due to the types of insects they eat, such as beetles. Bat droppings look like mouse droppings, but mouse scat isn't found in large piles, and is also a little smaller. Also, bat droppings will crumble into powdery dust but mouse droppings won't. You may see pieces of insect wings, or their reflections, in bat scat.

- Rub marks along the edges of exit holes: Slight brown discoloration that's a mix of body oils and dirt.
- Roosts: During the summer, they'll use different roosts during the day and night. The daytime roost is usually in an attic, barn, garage, soffit, cave, underneath shutters or roof shingles, in wall voids, or behind siding or chimneys. At night, they'll rest in a breezeway, under an awning, or in a garage or similar areas. In the winter, both species hibernate in colonies in caves, mines, and deep rock crevices. Big brown bats are more likely to hibernate in buildings, often in the attic or in wall voids.

Diet:

Entirely insects. A colony of 100 little brown bats can eat hundreds of thousands of insects each summer. They eat many insects that damage crops and ornamental plants, such as moths and flies.

Typical activity patterns:

Social style: Females of both species are colonial, while the males are usually solitary or found in small bachelor groups. Females roost together to raise their young. Pregnant females look for a hot niche within the roost that will serve as an incubator. These maternity colonies are often found in attics, soffits, wall voids, behind chimneys, in barns, tree cavities, rock crevices, and caves.

Daily activity: Nocturnal, with peak feeding at dusk and dawn (crepuscular). After feeding in the early morning, they'll return to the daytime roost and hang out, in a slightly dormant state. After their evening feeding, they'll usually rest. Females return to the roost often to nurse their young.

Hibernator? Both bats hibernate in colonies in caves, mines, and deep rock crevices. Big browns will also hibernate in buildings. The body temperatures of both species drops to within several degrees of the "room temperature." Big brown bats can tolerate below-freezing temperatures for short periods, which is why they

are often found roosting in buildings. Their heart rates also drop dramatically. The little brown's will fall below 20 beats/minute and the big brown's to 42–62 beats/minute. Compare that to their heart rates during the rest of the year: 250–450 beats/minute for bats when they're resting, 800+ beats/minute when they're flying. *Migrates?* Both species will migrate locally. Their hibernacula are usually within several hundred miles of their summer roost, but some big brown bats will hibernate in their summer roost. (Some of the other species of bats found in New York, the “forest bats,” may migrate far to the south like birds.)

Where found:

Distribution in NY and the Northeast: Everywhere.

Habitat: Forests and forest edges, areas with lakes and ponds, parks, orchards, fields, suburbs, cities.

Territory and home range: The maternity colonies begin to disband shortly after the young are capable of flying, typically in late July. Depending on the weather, females will remain together through early October. From late July through early September, bats actively explore new roosts and often show up in locations where they weren't seen earlier in the year.

Breeding habits:

Pair bonding style: Polygamous. Females raise young by themselves (although they share the roost with other females and their young).

Breeding dates: Bats have an unusual habit. They mate during the fall, but the females store the sperm in their bodies for months. Fertilization doesn't take place until the late winter or early spring, when the bats emerge from hibernation or return from the south. Gestation: 50-60 days.

Birth period: Late May through early July (births are typically staggered over a 2–3 week period).

Litter size: Little brown: 1 pup; big brown: 2 pups.

Weaning dates: Young begin flying at 3–4 weeks old.

In late July, they begin to leave the roost with their mothers.

Amount of time young remain with parents beyond weaning date: Not well-studied yet. Some scientists believe that the young probably follow their mothers back to the hibernacula. Some of the young probably return to the roost in which they were born.

Common nuisance situations:

Time of year: Peaks from the third week of July through the first week of August, although there may be calls any time of year.

What are they doing?

- Females may roost in colonies in buildings to raise their young. Their scat and urine can damage insulation and household goods and attract other pests.
- Sometimes, a lone bat enters the house and flies around. This usually happens in July and August, when the young are learning to fly.
- During an extreme heat wave, several bats may enter the living quarters, seeking a cooler roost. This is when they'll show up in places they normally don't use.
- Big brown bats will hibernate in buildings (little browns don't seem to.) In the winter, a big brown bat may leave its roost in the attic and fly around in the living spaces. This usually happens when the temperature of the attic roost changes dramatically, disturbing their hibernation—during a thaw, or during the very coldest part of the winter, if the attic is much colder than the rest of the house.
- Disease risks: Rabies, histoplasmosis. In New York, bats are a rabies vector species.

De-bunking myths about bats:

- There's an epidemic of rabies in bats. Wrong. The incidence of rabies in wild bats is very low, and outbreaks in colonies appear to be rare. The Dep't. of Health has been tracking the percentage of rabid bats in New York since 1965, and the number has remained remarkably constant. They believe it's no more than 3–4% of the overall statewide bat population—and probably much less. (“Probably much less,” you ask? The Dep't. of Health knows *exactly* how many bats they've examined for rabies and *exactly* how many of them were rabid: 3–4%. But theirs is not a random sampling of bats, as you know. Think about it. In general, bats that are submitted for rabies testing either exposed a person or pet, or looked sick. Yet, of these “sick” bats, only a small fraction actually had rabies. So the chances are good that in the overall population, even fewer carry the virus).
- If one bat in a colony is rabid, they're all sick. *Wrong again.*
- Not all grounded bats are sick! Young pups sometimes become grounded when they're learning to fly.

- Overwhelming fear of contracting rabies from a bat. This is a tricky one. Although your chances of being exposed to a rabid bat are very low (see above), it is true that most Americans who died from rabies in the past decade did have the bat strain. There are probably several explanations. Most people notice if they've tangled with a skunk, raccoon, or fox. And most people are smart enough to go right to the doctor if they think they've been exposed to rabies, so even if they were, they receive treatment and they don't die. But many people encounter bats at night, while they're drowsy (and not thinking clearly) or even while they're sleeping. They may not realize they were scratched or bitten, or may not remember the encounter by the time they wake. So they see no reason to go to the doctor. Unfortunately, that means that if they did get infected with the virus, by the time they realize it, it's too late. *The bottom line: this is a fatal disease, so even though it's unlikely, don't take chances.* However, if someone's so terrified that it's causing problems, try to help that person understand this risk more clearly.
- Bats almost never attack people (they will bite in self-defense).
- They are not hair stylists. They don't aim for a person's hair. And bats are excellent fliers. They may swoop close to a person's face, but if you don't thrash about, they won't fly into you.
- The bats that live in New York eat insects. They don't suck blood. (The common vampire bat, found in the tropics and sub-tropics, does feed on blood—from livestock, mostly—but it will bite people.)
- Bats don't chew holes in buildings.

Legal status in New York:

Both the little and big brown bat are unprotected. Bats are rabies vector species, so you may need to consult with the county health department and follow their guidelines for disposing of the animal.

Best practices

- If there's a possibility that a person, pet, or livestock has been exposed to rabies, you are legally required to follow the directions of the county health department, no matter what your customer requests. Humanely capture any bat that had direct contact with a person, was in a room with a sleeping person, was around an unattended child, or was in a room with a mentally-disabled or impaired (i.e., intoxicated) person. Call the county health depart-

ment. Do not release or discard the bat without talking to a county health person first!

- There's one way in which bats are quite different from many of the other nuisance species you'll deal with: for most of those animals, removing one nest site won't affect the local population. But bats have so few young that the destruction of one maternal colony can probably hurt local bat populations. Please try to persuade your customers to accept an approach using nonlethal techniques. They are highly effective for bats.

Safety tips (for contact with bats or their droppings)

- Wear leather gloves, disposable Tyvek™ coveralls, goggles, and a proper respirator.
- Ventilate the area, if possible.
- Don't stir up dust. The dust could contain the spores of the fungus that causes histoplasmosis, which can be inhaled. Don't sweep or vacuum, unless using a commercial vacuum intended for this purpose, and then follow the manufacturer's instructions.
- Instead, thoroughly wet the materials with a household or commercial disinfectant. Wipe up with a damp sponge. Play it safe and don't use a bleach solution, because bat guano contains ammonia. Although the concentration of ammonia in their droppings isn't as strong as it is in bird droppings, there could be a lot of guano. Do NOT mix bleach with ammonia because the fumes are toxic.
- Spray dead bats and their droppings with disinfectant, then double-bag for disposal.
- Be aware of potential pesticide residues in the attic from previous control attempts.
- For more information, refer to chapter four and the resource list.

If one bat has accidentally flown into the house:

- Remove any pets from the room, then seal the room. Shut the doors and place a towel under the door. Close any heat registers. Close all but one window (which should be screened). Then turn on a dim light. You want just enough light to see—if you make the room too bright, you'll disturb the bat, and it will probably try to hide in the most remote, darkest place it can find. (In a large, cluttered room, searching for a tiny bat is not fun.)

Stay quietly nearby and wait. The bat should calm down in 10–15 minutes. The air flow from the window should attract the bat, so it should land on the screen. When it lands, you can capture it by

covering it with a plastic container and slipping a piece of cardboard underneath. If there's definitely no concern about possible rabies exposure (see above) the bat can be taken outside and released. (Or you could remove the screen from the window and let the bat fly out on its own.) If the bat doesn't calm down quickly enough, leave the room sealed. Return the next day, at dusk. The bat should be calm. Repeat the dim light-window capture process.

- Don't worry about it flying at you, and don't chase or swat at it because that will only panic the bat. When indoors, bats normally fly around the room a few times until they find the exit. They make steep, banking turns, flying up as they approach a wall, and swooping down as they near the center of the room.
- Check the windows, especially if there's an air conditioner in the window. Gaps between the upper and lower window, or around a storm window, should be sealed.

Timing of bat-proofing is critical

- April through early May (may be in the roost, but no young yet): complete bat-proofing—with use of checkvalve—is OK
- Mid-May through early August (when there are young in the roost): **ONLY** limited bat-proofing
- Late August through November (after the young have left the roost, and before the weather causes dangerous roof conditions): complete bat-proofing—with use of checkvalve—is OK again.

Limited bat-proofing (mid-May through early Aug.):

This approach allows you to protect both the people and the bats. Seal potential points of entry into the living quarters (most important step); then work on unused cracks and holes on the outside of the building. There are probably many of them, because bats can enter a building through a crack that's only $\frac{1}{4}$ " wide by $1\frac{1}{2}$ " long, about the size of a stick of gum or a stubby pencil. Do NOT seal the primary hole, and don't separate the mothers from their pups. You must let the females enter and exit the building freely.

Complete bat-proofing (April through early May, then again from late-August through November):

First step: Find their entrances. Inspect the house for signs of warped, shrunken, or loose materials, especially at joints. Pay special attention to roof drip edges, dormer tie-ins, roof corners, ridge caps, vents, and deteriorated walls, roofs, and eaves. In the attic, cover the windows, then turn off the lights. Look for light peeping through gaps, cracks, and holes. Then use a flashlight to take a better look at these potential entry points.

Second step: Determine which entrance is the primary exit hole. Here are a few ways to do that. Look around for piles of guano, which may accumulate beneath the primary exit hole, or stick to the wall near the hole. Rub marks are typically seen on the wall if there's guano stuck to the wall. Or stage a "bat watch." At dawn or dusk, stand outside the building and watch where the bats enter or leave. Why bother? Because if you seal this hole while there are still bats inside, they'll probably panic and fly into the living spaces as they frantically seek a way out of the building. There's an easy way to avoid this problem: install a "checkvalve" (one-way door) over the main exit hole (see below).

Using a one-way door (checkvalve) to exclude bats:

- This will allow the bats to leave on their own, but they won't be able to get back inside. Here's how it works. Bats exit at bottom, but when they attempt to return, their sense of smell guides them back to the hole. They land on the mesh near the hole—and stay there, sniffing around. They just don't crawl down the mesh. (Good thing: if they did, they would be able to slip back underneath the mesh, crawl up the building, and find their hole. But don't worry about that. They trust their noses.)
- You can use a commercial checkvalve or make your own, following this design developed by Dr. Stephen Frantz, NYS Dep't. of Health: Place $\frac{1}{4}$ " or $\frac{1}{2}$ " polypropylene mesh or screening over the entrance holes, forming a long sleeve or tent. The screening should cover the hole and extend about 3 feet below the hole. It also should stick out about 3–5 inches from the wall, so the bats can crawl beneath the screen to leave. Secure the screening at the top and sides with duct tape or staples; leave the bottom open. Leave the screening in place for 3–5 days and check that all the bats have left. Then you can remove the one-way door and permanently seal the hole.

If there are no young present, or this is a preventive action, you can:

- Install a one-way door to allow any bats that are still inside to leave the building.
- Seal all cracks that are larger than $\frac{1}{4}$ " wide by $1\frac{1}{2}$ " long and holes that are larger than $\frac{1}{2}$ " x $\frac{1}{2}$ ". Bats can wriggle through very small holes! Bats can't chew through exclusion materials the way rodents do, so you have many choices for materials: caulk; expanding foam; "Stuf-Fit,"TM a knitted copper mesh that's like steel wool, only it doesn't rust; window screening; bird netting; or "flash-band," a self-adhesive aluminum-faced sealant. Some NWCOs seal cracks with expanding foam using the TodolTM foam gun, and then finish with a bead of silicone over that. The mesh size of screening or netting shouldn't be larger than $\frac{1}{2}$ " x $\frac{1}{2}$ " or the bats will be able to crawl through it.
- Screen chimney flues and caps with mesh that's $\frac{1}{2}$ " or smaller. (Remember to check local fire codes for information about covering chimneys.)
- Seal any gaps in the flashing around the chimney, and where the chimney cap meets the chimney.
- Screen vent pipes with $\frac{1}{4}$ " mesh.
- If the bats are roosting behind shutters, remove the shutter or space it further away from the wall by installing small blocks between the shutter and wall.
- There are two ways to change an attic that may make it less attractive to the bats. Neither has been well-studied. It's also possible that the bats will simply move into another area without leaving the building. But here they are: 1) Increase the ventilation and decrease the temperature of the roost area, so it's not as attractive an incubator. In attics, install fans, windows, ridge or soffit vents, or insulation in the walls. 2) If you can't seal all of the holes, install a few floodlights or fluorescent bulbs in the roosting area. The lights should be left on all day and all night for several weeks. In later years, turn the lights on during the spring or summer occasionally, to discourage the bats from recolonizing the site. Leaving the lights on for so long could increase the risk of an electrical fire.

If young are present:

- Wait until they're old enough to fly—usually by mid-August. Then, install a one-way door over the entry hole. They'll leave but won't be able to re-enter.

Trapping strategies:

Live traps:

- A resting bat can be captured with a plastic container or a butterfly net (wear leather gloves). If you can reach it, cover the bat with the container, then slip a piece of stiff cardboard between the container and the wall. To release the bat, hold the container on its side on a secure place, such as against a tree, or on a ledge. Then remove the cardboard.
- One-way doors. See previous description of use in the section on complete bat-proofing.
- Multiple-capture traps. There are several different types and sizes of multiple-capture traps for bats. The BatrapTM consists of a tube that leads the bats through a one-way baffle into a chamber, in which they're confined. Like a one-way door, this trap allows the bats to leave the building but keeps them from re-entering at that spot. (Of course, you'd still need to bat-proof to make sure the bats can't enter the building in other places.)

Multiple-capture traps are a bit trickier to use than a one-way door. If you're inexperienced with this tool, try to learn its proper use from a skilled NWCO. For example, it's important to correctly estimate the number of bats in the roost. You need to match the size of the trap to the number of bats that may be captured, because if too many bats are confined in the trap, they might suffocate. Another danger is that if bats remain in the trap too long, they might overheat from exposure to the sun, and die.

If your customers insist on seeing the bats, a multiple-capture trap will satisfy that need and allow you to then release or relocate the bats. (If the customer insists on having the bats killed, this is a safe way to capture them. But do try to talk them out of that.) One benefit of using a multiple-capture trap is that it may create a great "teachable moment." You can show the bats to the neighbors and talk to them about the benefits of having bats around, and debunk myths. You may be able to convince them to bat-proof.

Another option that allows you to prove that you got rid of the bats is to use a one-way door and a video camera. Place the camera near the exit holes, set it to record, and leave it running. Then you can show the tape of the bats leaving the roost to your customers.

What to do with the bats:

- Follow the Dep't. of Health's directions if there's been rabies exposure, or if dealing with a sick bat, one's that grounded, or one that's behaving strangely.
- For healthy bats that can be released, on-site release (coupled with bat-proofing, of course) is preferred over relocation.
- Relocation is tricky. Bats will fly great distances to return to a favored roost, so if the customer didn't bat-proof, the problem may happen again. You'd have to travel hundreds of miles to make sure the bats wouldn't be likely to return to that spot. If you did that, what would happen to the bats during the trip? If some became too stressed or overheated, they might be grounded after release. That might increase the disease exposure risk for people, pets, and wildlife in that area. Also, how fair is this to your customer's neighbors? Sure, they see you capture the bats and take them away, but you know the chances are good they'll return.
- Special concerns with very large maternity colonies: If the site is really good, there could be thousands of bats, perhaps as many as 3–7,000. Obviously, the bats have been there for a long time. Can you convince your customer to choose the two-season solution instead of the quick-fix, which might cause long-term harm to the local bat populations? Here's what a more relaxed approach would look like. In the first year, you install two or three bat boxes in the early summer. Let the bats raise their young in the building, and give them time to check out those newly-installed boxes. In the late fall, you can begin limited bat-proofing, but don't close the main entry hole. In early May of the following year, install a checkvalve over the main hole. Once you are certain all bats are out of the structure, you can finish permanent bat-proofing by sealing the primary entrance hole.
- Offer the bats an alternative roost nearby by installing a bat box in the yard (optional, but highly recommended, especially for larger colonies). Why? Many people find that they like having bats nearby, because of all the insects they eat. Another good reason to install a bat box is that it may prevent that colony from moving into a nearby building. Installing bat boxes this far north does require some careful planning. See *A homeowner's guide to northeastern bats and bat problems* from Penn State University or contact a bat specialist or Bat Conservation International for details (www.batcon.org). It's best to locate the bat box

where people are less likely to encounter the bats. If this isn't possible, the area immediately around the box can be fenced to prevent people from disturbing the colony and encountering a bat that's fallen out of the box.

Preferred killing methods:

- CO₂ chamber (a smaller chamber is better)

Acceptable killing methods:

- If there's been no rabies exposure, with care, can use stunning and chest compression. Be careful about contact.

Methods that don't work well, or aren't legal in New York:

- Ultrasonic devices aren't effective.
- Customers may also ask about using moth balls or insect spray. Moth balls can be dangerous, especially to children. One of the active ingredients, naphthalene, can be inhaled, eaten, or absorbed through the skin. That means that if you store clothing with moth balls, you can absorb the chemical the next time you wear the clothes. It's true that naphthalene is registered as a pesticide for bats in New York, which means that NWCOS with a commercial pesticide applicator license can use the product. Naphthalene flakes may help to repel a bat colony *if* the site is confined and has *little or no* ventilation, but the recommended application rate is high, and vapors could enter the living spaces and endanger people.
- No fumigants are registered for bat control.