



BAT Management Plan

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Introduction

Bats are considered a high-risk animal group for rabies transmission in Texas. They are listed in the Texas Rabies Control Act and Rules as one of five high-risk groups. The other four high-risk animal groups in Texas are skunks, raccoons, foxes, and coyotes.

Rabies is transmitted primarily through the bite of an infected animal. Virus particles in the animal's saliva enter a victim through the bite wound. Unless post-exposure vaccinations are administered promptly after exposure, rabies may develop within three weeks to three months. Without treatment, rabies is an ultimately fatal infection of the central nervous system. Over the last twenty-five years most rabies deaths in the United States have been caused by strains of bat rabies viruses. These deaths occurred exclusively in people who received no treatment for their exposures (either because they did not realize they were bitten or because they were unaware of bats as rabies vectors). More information on rabies may be found at www.texaszoonosis.org and www.cdc.gov.

School administrators and IPM managers should protect students, faculty, and staff from bat species associated with rabies and other potential rabies exposures. Officials should have a general understanding of bats and the principles behind preventing or excluding colony establishment within school buildings. Each district and school should have a written plan for responders to follow when any high-risk rabies species, especially bats, are found on school property.

Currently there are 33 species of bats that reside all across the state of Texas. One of the most common species, the Mexican free-tailed bat migrates to the southwestern U.S. from Mexico in the spring, and then returns to Mexico in the fall when the first cold fronts arrive. Although the majority of free-tailed bats return to Mexico in the fall, some remain year round, including many of those in

the far eastern part of the state. Mexican free-tailed bats, like many other species, often roost in caves. However, due to decreasing habitat, some now commonly roost in buildings

Bat Identification:

Before attempting control of bats, it is important to know which bat species you are dealing with. A few bats are very rare and are federally protected. It is important to comply with the laws that protect these animals.

While some bats are easy to identify, others require training and the use of identification keys. Your Texas Parks and Wildlife Department, or Bat Conservation International, may be able to determine which species of bats are most likely in your school district. Additionally, bats are identified routinely when submitted for rabies testing to the Texas Department of State Health Services Laboratory in Austin.

Direct contact with a bat may result in a potential rabies exposure, so all bats that come in contact with students, faculty or staff must be tested for rabies.

BAT CONSERVATION
INTERNATIONAL
www.batcon.org



Selected References

French, B., L. Finn, and M. Kiser, 2002, *Bats in Buildings: An Information and Exclusion Guide*, Bat Conservation International, Austin, TX
www.batcon.org

Kern, W. H., Jr., 2005, *Bats in Buildings*, University of Florida, IFAS Extension, Fact sheet ENY-268

Salmon, T.P., D. A. Whisson, and R. E. Marsh, 2006, *Wildlife Pest Control around Gardens and Homes*, 2nd Ed., University of California, Agricultural and Natural Resources Publication 21385

Texas Department of State Health Services, "Rabies"
www.texaszoonosis.org

Tuttle, M., 2003, *Texas Bats*, Bat Conservation International, Inc. Austin, TX

Below is an image of a Mexican free-tailed bat "native" to Texas courtesy of Texas Parks & Wildlife Department



Bat Biology:

Bats are highly beneficial wild mammals. Some bat species eat insects and consume up to their weight in food each night. Others are important pollinators. Bats are not flying rodents, but belong to a unique order of mammals called Chiroptera (Latin for “hand wing”). A common myth about bats is that they are blind. Bats have good vision; however, they can also use sound waves (echolocation) to help them navigate and locate food.

Because bats are mammals, they give birth to live young. Most produce one pup a year, although a few species give birth to litters of 2 to 4 pups. Some bat species mate in the fall or winter, but fertilization is delayed and subsequent development of the fetus does not occur until spring. Other species, like the Mexican free-tailed bat, mate in the spring. Fertilization and fetal development follow, and pups are born in the spring or early summer (mid-May to August). By late summer, the pups are able to fly and feed on their own.

Bats live in a variety of places including caves, abandoned mines, hollow trees, under tree bark, in palm fronds and in the crevices under bridges. As natural habitat decreases, some species now commonly roost in buildings. Bats are creatures of habit and will return to the same roost year after year.

Bat Exclusion:

Bats that commonly roost in buildings in Texas, such as schools, can be evicted using special exclusion techniques that work for all bat species. The best way to prevent human/bat contact is to exclude bats from buildings. In some cases, excluding bats from commercial structures like schools is costly and labor intensive. All attic and soffits vents should be screened with ¼ to 1/6 inch hardware cloth or screen. Gaps around gutters, pipes, fascia boards, moldings, holes in siding or openings at other exterior penetration points should be sealed with netting (1/6 inch diameter), caulk, concrete patch or foam to keep bats from gaining entry. Window screens should be in good repair. Gymnasium doors should remain closed during the early evening hours to keep bats from flying into the building in pursuit of insects. During construction on new buildings, crews should keep their eyes open for potential areas where bats can enter, and seal them before a colony is established.

To provide alternative housing for bats that will be evicted from a building, bat houses can be erected nearby. Bat houses should be installed prior to exclusion, so that bats will have an alternative roost. Bat houses should be large enough to hold up to 100 bats and should be placed at the edge of school property, away from students. Bats will not always move into a

bat house after being evicted from a building, but if they do the colony may be integrated into classroom teaching, including public health issues related to wildlife. For more information on how to build a bat house, go to this link. <http://www.batcon.org/home/index.asp?idPage=47>.

Rabies Prevention

Only about one-half to one percent of bats carry rabies virus; however, bats found on the ground or active during the day should be suspected of being rabid. Anyone who has direct contact with a bat in which a bite may have occurred might have been exposed to rabies.

Individuals who work around bats, including workers who clean and remove bat colonies, should consider immunization. The initial series of pre-exposure rabies vaccinations consists of three shots. Vaccines are recommended for anyone at increased risk for rabies exposure, such as animal control officers, veterinary personal, and pest management professionals who regularly work around high-risk animals. Although the cost of the pre-exposure vaccine is expensive, it affords a level of immunity against inadvertent exposure to the disease. Pre-immunized persons have only to receive two additional rabies vaccinations if they are later exposed to a rabid animal.

In the event a school employee, student or teacher is bitten, the animal should be captured and evaluated for rabies with the assistance of the local animal control agency. The person who was bitten should follow these four steps.

1. Thoroughly wash the wound, hands, etc. with soap and water immediately.
2. Report the incident to the IPM Coordinator, who should contact animal control. The local health department should also be notified.
3. Capture the animal, if possible, and hold for animal control to respond to the scene.
4. Consult a physician for wound care. If testing of the animal confirms rabies, those exposed can start the postexposure vaccinations soon after receiving the result.

Definitions:

Trained person – IPM Coordinator, licensed pest control applicator, or person who has been trained by IPM Coordinator or animal control to safely remove bats

Contact – contact with a bat means within direct contact (i.e. bite, touched, handled, etc). Just seeing a bat is not direct contact.

Identification of Bat Species Known to Invade Structures Throughout the U.S.

Name	Dimensions/Average Size	Description	Image
<p>Brazilian Free-tail Bat (also known as Mexican Free-tail) <i>Tadarida brasiliensis</i> Subspecies: <i>T. b. Mexicana</i> (migratory) <i>T. b. cynocephala</i> (non-migratory)</p>	<p>Wingspan: 11 - 14 inches Length: 3 ½ to 4 inches Weight: 8 to 14 grams</p>	<p>Color: Gray or dark brown to rusty brown</p> <p>Other: Large round ears and vertical wrinkles on upper lip; tail projects beyond the tail membrane for about a third of its length</p>	
<p>Evening Bat <i>Nycticeius humeralis</i></p>	<p>Wingspan: 10 to 11 inches Total Length: 3 to 4 inches Weight: 5 to 14 grams</p>	<p>Color: brown to black, ears and wings are black</p> <p>Other: tail completely enclosed in the tail membrane</p>	
<p>Big brown bat <i>Eptesicus fuscus</i></p>	<p>Wingspan: 13 to 15 inches Total Length: 4 to 5 inches Weight: 13 to 25 grams</p>	<p>Color: Light rusty to dark chocolate brown; individual hairs darker at bases than at tips</p> <p>Other: Tail completely enclosed in the tail membrane</p>	
<p>Little brown bat <i>Myotis lucifugus</i></p>	<p>Wingspan: 8 ¼ to 10 ¼ inches</p> <p>Total Length: 3 to 3 ¾ inches</p> <p>Weight: 4 to 5 grams (7 ½ to 8 ½ just prior to hibernation)</p>	<p>Color: Brown to bronze</p> <p>Other: Tail completely closed in the tail membrane</p>	
<p>Southeastern Bat <i>Myotis austroriparius</i> Endangered</p>	<p>Wingspan: 9 – 11 inches Length: 3½ -4 inches</p>	<p>This species has brown fur on top and white fur on the bottom or underbelly.</p>	
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Suggested thresholds to reduce exposure to bats



Locations/Situations	Suggested Thresholds	Nonchemical Control Options
Classroom, gym, or interior of building	1 bat found on ground	Ensure contact has not been made with anyone; Have the following items available before you approach the bat: a pair of thick work gloves, a plastic face shield, a small cardboard box and masking or duct tape; After putting on the gloves and face shield, carefully place a box or coffee can over the bat, place a sturdy piece of cardboard under the box or can, secure the box and tape it shut; carefully remove all tape and open the box outside, then leave the box on its side to allow the bat to leave. Bats cannot crawl up slick surfaces and cannot fly from off the ground.
Building – artificial roosts	1 known colony or evidence of bats inside building	After observing bat entry and exit points, seal up all other potential entry points using caulk, concrete cements for crack and crevice use, weather stripping, flashing, or hardware cloth (¼ mesh) - remember you want to ensure that all bats have left the building before sealing all entry points. See steps to evict bats



Image of caulk tube used to evict bats from office building. Courtesy of Fly By Night



Fly By Night, Inc.
www.flybynightinc.org

Image of bat leaving a building using a caulk tube, notice the hardware cloth used to seal in between tubes.

Images courtesy of Merlin Tuttle, Bat conservation International, unless otherwise noted.

Bat Management Strategies



Inspect

The first step in bat management is to identify areas of potential bat entry point located in and around buildings. Inspections should be conducted during early evening (dusk) and just prior to dawn to locate bats entering or exiting the building. During cooler months, this step may need to be repeated several nights in a row to establish exit/entry points, as bats do not leave the roost at night if temperatures are too cold. This step is extremely important in identifying where to place bat eviction tubes and nets.

Taking Action

A variety of laws and regulations protect bats. In Texas all bats in natural roosts, such as caves, are protected. It is also against the law to use insecticides against bats. However, bats can legally be excluded or removed (evicted) from buildings. In some cases you may need to evict an entire colony of bats from your building. In order to be successful, be prepared to invest significant time and money. The best time for eviction efforts is between late August and mid-May, depending on location in the State.

Steps to Evict Bats:

1. After observing bat entry and exit points, seal up all other potential entry points using caulk, concrete cements for crack and crevice use, weather stripping, flashing, or hardware cloth ($\frac{1}{4}$ mesh)
2. Next, to effectively evict the bats you will need to use one-way chutes (see figure 1). You can make a shoot or one-way valve out of 2-inch (diameter) PVC pipe, an empty and cleaned caulking tube with both ends cut off, ~~plastic netting (see figure 2), or even clear sheets of plastic.~~ Place the tube or netting over the holes in the roof or soffit used by the bats to allow them to leave, but not re-enter the building. If bats are roosting in a long horizontal crevice, place a tube roughly every 6 feet along the entire distance to make sure all bats can get out. For some large areas, netting can be used to form a drape to allow bats to exit, but not return. If using netting, make sure it has a mesh of less than $\frac{1}{4}$ inch so bats won't get caught in it.
3. Leave these one-way devices in place for at least one week during warm weather to ensure all the bats have gotten out.
4. Once the bats are excluded from the building, begin remediation procedures. Bat guano should be removed from interior structures so as not to attract other pests like cockroaches or flies. The naturally occurring soil fungus, *Histoplasma capsulatum*, is sometimes found in bird and bat droppings. Although it is generally associated with bat droppings in caves, where humid conditions are conducive to fungal growth, caution should be used when cleaning up guano in any confined area to prevent inhalation of fungal spores that can cause *histoplasmosis*.

Steps to Cleaning out bats and Guano:

- Employees should wear personal protective equipment. This should include leather gloves, long-sleeved shirt, long pants and either a full face shield or goggles and respirator capable of filtering particles smaller than 2 microns in diameter.
- Bat guano can accumulate quickly in large colonies. Prior to removing these deposits, your maintenance crew can lightly dampen the guano with water and a surfactant (soapy solution) to minimize dust and fungal spore dispersal into the air.
- Like other mammals, bats can have ectoparasites such as mites, ticks, fleas and flies. Depending on the roosting location, a licensed pesticide applicator may need to make an application of desiccant or insecticide dust after eviction to kill parasites and keep them from entering areas occupied by students and staff.
- Ensure that the area has been permanently sealed off from the outside to prevent bats or other pests from entering the area.

Figure 1

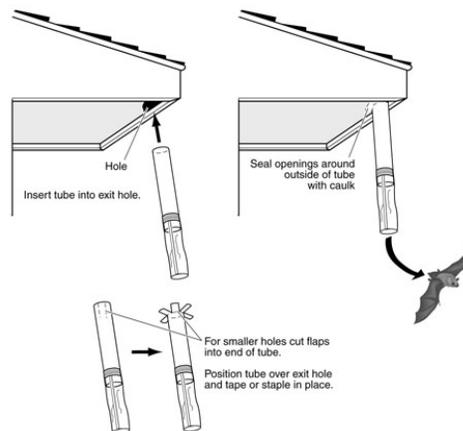
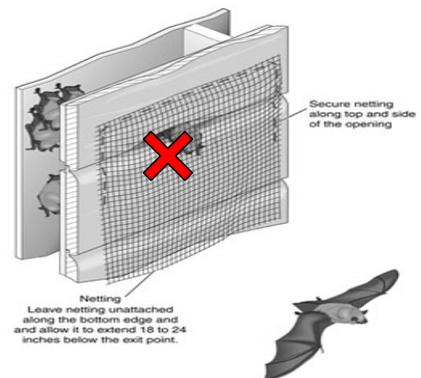


Figure 2



For specific directions on how to make (or where to purchase) bat eviction devices, go to <http://batcon.org/index.php/education/bats-and-the-public/bats-in-buildings/subcategory/68.html>

Recommended Bat Action Plan for School Administrators:

School district administrators and IPM Coordinators should work with local animal control agencies or health departments to develop a “bat incident response plan.” The plan should include notification procedures, responder assignments, personal protective equipment, investigation procedures, health risk-assessments, chain-of-command and so on. Also, the plan should focus on preventing direct contact with bats. Employees designated to capture, secure and remove bats should wear protective clothing to protect from bites. School faculty, staff, and students should be trained to respond appropriately to high-risk animal (e.g., bat) incidents. Templates for parent notification should be developed ahead of time to anticipate incidents with potentially rabid animals.

Procedures for Single Bat Removal:

1. Only trained personnel should remove bats and no students or staff should be allowed in the area
2. Have the following items available before you approach the bat: a pair of thick work gloves, a plastic face shield, a small cardboard box and masking or duct tape.



3. After putting on the gloves and face shield, carefully place a box or coffee can over the bat, place a sturdy piece of cardboard under the box or can, secure the box and tape it shut.
4. Notify the (Designated person) immediately that the bat is secured.
5. Report the incident to animal control and request the bat be tested for rabies. If animal control services are unavailable in your area, a local veterinarian, for a fee, can submit the bat for testing.



Procedures for Principals:

1. No one in your building should try to capture a bat other than designated personnel. Your role as Principal or Building Representative is to protect students and/or staff in your building by isolating the bat if possible. If the bat is on a flat surface like a floor or sidewalk, attempt to place a can, box, waste basket, bucket, etc. over the bat to keep it from escaping. If it is on a wall or ceiling, wait for the designated person to remove the bat.
2. If a bat is spotted in a room or a large area like a gym or band hall, have all occupants leave the room and secure the door/doors.
3. If a bat is spotted in a hallway, isolate the hallway and tell the students or staff in adjacent rooms to close their doors and stay in the rooms until the bat is captured and secured.
4. If a bat is spotted on the outside wall of a building, keep students away until the bat can be removed.
5. The (Designated Person) should be contacted immediately. His office number XXX-XXX-XXXX, his cell number is XXX-XXX-XXXX. If the (Designated Person) cannot be reached, call the Maintenance Department and report the incident. Keep calling until you reach someone. District personnel should respond immediately to capture and secure the bat.
6. Identify all persons who had contact with the potentially rabid animal. Gather their full name, age, residential address, parent or guardian’s name(s) and contact numbers. This information will be used to inform those at risk of rabies test results. Handle this information confidentially. It can be released to animal control officers and health department personnel during the case investigations.
7. Submit the bat to animal control for processing and shipment for rabies testing. If animal control is unavailable in your area, a veterinarian can assist. Know your animal control agencies and your local or regional health department’s contact information.
8. If a rabid animal is confirmed from any district facility, the Principal and IPM Coordinator must be notified immediately. Each facility or campus, working with the school nurse, should notify all persons who had direct contact with the animal and refer them to a physician. Measures should be taken to protect the identity of the persons who were exposed to the rabid animal. Administrators may notify the faculty, staff, students and parents, in general, about the incident as a reminder of potential rabies risks from animals and the school’s procedures to protect their charges.