

BAT CONTROL in Schools



Cover photographs: Mexican free-tailed bat (Source: Merlin D. Tuttle, Bat Conservation International (BCI), www.batcon.org); inset photos from left: capturing a bat using a small container (Source: Fly By Night Inc.), eviction tubes used to prevent a bat colony from returning to a building (Source: Fly By Night Inc.), and using a net to capture a bat (Source: Dianne Odegard, BCI)

Back cover: Big brown bats (Source: Merlin D. Tuttle, Bat Conservation International, www.batcon.org)

Bat Control in Schools

Janet Hurley

Extension Program Specialist II –School IPM, Texas AgriLife Extension Service

Diane Odegard

Outreach Coordinator, Bat Conservation International

Diana Foss

Urban Wildlife Biologist, Texas Parks and Wildlife Department

Beverlee E. Nix

DVM, MPH, Zoonosis Control Veterinarian, Texas Department of State Health Services

Bats often use buildings, including schools, as a refuge. Because bats can pose health hazards for people, Texas school districts need to learn how to safely remove bats from schools and take steps to prevent their entry.

Several school districts across the state have experienced problems with bats. Reports of bat sightings in Texas schools in 2010 include these incidents:

- In La Porte Elementary School, about 100 bats were found flying in the gymnasium and many more outside, setting parents on edge and prompting the district to install netting on the outside of the building to keep the bats out.
- Rabid bats were found on three school campuses in Round Rock. The district sent letters home to parents and posted warning signs around the schools.
- The Temple Independent School District (ISD) spent \$46,575 to keep out the nearly 100,000 Mexican free-tailed bats (Fig. 1) that had been living in its football stadium.



Figure 1. A Mexican free-tailed bat in flight. (Source: Merlin D. Tuttle, Bat Conservation International, www.batcon.org)

- Reports of bats in the Bay Elementary School in Clear Creek ISD prompted parents to keep 44 children out of school for 2 days.
- A dead bat found outside a gymnasium in the Beeville Independent School District tested positive for rabies.

To prevent or minimize problems associated with bats, school district personnel should understand basic information about bats, rabies, and the laws pertaining to bats. Each district should develop a site-specific bat management plan that includes education, training, prevention, and response strategies for bats. The goal of the management plan is to keep people safe without harming the bats.



Figure 2. A big brown bat that has captured a moth. (Source: Merlin D. Tuttle, Bat Conservation International, www.batcon.org)

Bats

A basic understanding of bat biology, reproduction, habitat, and behavior can help district officials prevent or manage bat problems most effectively, at the lowest cost, and with the least harm to the bats.

Bats are highly beneficial native mammals:

- Some bat species eat insects (Fig. 2) and consume up to their weight in food each night. A large colony of bats can eat literally tons of insects every night. Bats also consume insects that damage crops. Research has shown that free-tailed bats in South Central Texas may save farmers up to \$1.7 million a year by consuming significant numbers of agricultural pests.
- Other bats feed on nectar and are important pollinators, especially in rainforests.
- Some bats feed on fruits and disperse the seeds. More than 300 species of fruits depend on bats for pollination or seed dispersal; fruits pollinated by bats include avocados, bananas, carob, figs, mangoes, and peaches.



Figure 3. Big brown bats often roost in manmade structures. (Source: Merlin D. Tuttle, Bat Conservation International, www.batcon.org)

- Bats serve as food for owls, hawks, falcons, opossums, and raccoons.
- Bat waste, which is called guano, can be used as fertilizer.

Despite popular belief, bats are not flying rodents; they belong to an order of mammals called Chiroptera (Latin for *hand wing*). Like all mammals, bats produce milk to nurse their young (pups). Although most bat species produce one pup a year, a few species give birth to litters of two to four pups.

Some bat species mate in the fall or winter, but fertilization is delayed and the fetus does not develop until spring. Other species, such as the Mexican free-tailed bat, mate in the spring, and their pups are born in the spring or early summer. By late summer, the pups can fly and feed on their own. The period from the pups' birth to their ability to fly is called the maternity season.

Bats live in a variety of places, including under tree bark and in caves, tree cavities, hollow trees, palm fronds, abandoned mines, and crevices under bridges (Fig. 3). Some species also commonly roost in buildings. Bats are creatures of habit and will return to the same roost for many years.

Of the 33 species of bats known to live in Texas, 10 can live near humans and transmit rabies. Six of those are colonial (living in colonies); the other four are solitary. Table 1 lists these bats and includes information on how to identify them.

Rabies

School districts must take steps to protect students, employees, and visitors from exposure to rabies associated with bats. The Texas Rabies Control Act and Rules (<http://www.dshs.state.tx.us/idcu/health/zoonosis/laws/rules/>) lists bats as one of five high-risk groups for rabies transmission. The other animals listed are coyotes, foxes, raccoons, and skunks.

Rabies is an infection of the central nervous system. It can be fatal unless the person receives post-exposure vaccinations soon after exposure. The rabies virus is transmitted primarily when the saliva of an infected animal enters the victim's bloodstream. Without treatment, rabies may develop within 3 weeks to 3 months.

Over the past 25 years, the United States has averaged 1.5 deaths a year for people exposed to rabies by bats. These people had not been treated after exposure, either because they did not realize they were bitten or scratched, did not understand the danger, or did not take it seriously. A bat bite can be tiny or even invisible to the human eye.

In 2006, the U.S. Geological Survey reported that 1,692 cases of rabies were associated with bats.

The Texas Department of State Health Services (DSHS) maintains summary reports of the species and number of animals tested in each county as well as the results of those tests. These reports are posted at <http://www.dshs.state.tx.us/idcu/disease/rabies/cases/statistics>.

In 2009, a total of 13,220 animals were tested for rabies in Texas. Of those, 12,390 tested negative (not rabid) and 830 tested positive. The results for the 3,862 bats tested that year were 3,419 negative and 443 positive.

The Texas counties with the most bats testing positive for rabies in 2009 were Travis (102 positive results from 724 tests), Harris (91 of 976), El Paso (35 of 241), Williamson (24 of 147), and Smith (22 of 102).

For more information on rabies, see www.texaszoonosis.org and www.cdc.gov.

Table 1. Bat species known to occupy structures in Texas. (Source of photos: Merlin D. Tuttle, Bat Conservation International, www.batcon.org)

Name/photograph	Dimensions/ average size	Description	Roosting behavior
Colonial bats			
	<p>Wingspan: 13–15 in. Length: 4–5 in. Weight: 0.46–0.53 oz</p>	<p>Color: Light rust to dark chocolate brown; individual hairs darker at the bases than at the tips. Other: Tail completely enclosed in the tail membrane.</p>	<p>Females form maternity colonies; males live in bachelor roosts. Will occupy bat houses. Human encounters: Lives near buildings. Goes into torpor in winter when temperatures drop below 68 °F.</p>
<p>Big brown bat <i>Eptesicus fuscus</i></p>			
	<p>Wingspan: 11–12.5 in. Length: 3–4 in. Weight: 0.43–0.49 oz</p>	<p>Color: Medium-sized with brown or black fur on its back and paler fur on the underside. Other: Ears are short and pointed; eyes are small. Is recognized by its erratic flight.</p>	<p>Forms maternity colonies, usually numbering in the thousands, in caves, mines, barns, and buildings and sometimes under bridges. Occasionally occupies bat houses. Will roost with other bat species.</p>
<p>Cave myotis <i>Myotis velifer</i></p>			
	<p>Wingspan: 8–10 in. Total length: 3–3.5 in. Weight: 0.14–0.28 oz</p>	<p>Color: Easily identified by its tricolored fur (black at the base, followed by a band of lighter brown, and dark tips) and the juxtaposition of its black wing membrane surrounding a reddish orange forearm. Can often be identified when hibernating by its distinctive orange forearm. Other: About the size of a matchbook.</p>	<p>One of the first bats to enter hibernation, typically in September or October, and one of the last to emerge in the spring. Makes short annual migrations between winter hibernation and summer nursery sites. Travels an average of 31 miles or less and no more than 50 miles. Spends 6–9 months per year hibernating in caves or mines, mostly when temperatures are 46–55 °F. May return to the same hibernation site every winter. During summer, the sexes live separately; males are often solitary while females form small maternity colonies of 35 or fewer individuals in buildings, tree cavities, and rock crevices.</p>
<p>Eastern pipistrelle (Tri-colored bat) <i>Pipostrellus subflavus</i></p>			
	<p>Wingspan: 10–11 in. Length: 3–4 in. Weight: 0.18–0.49 oz</p>	<p>Color: Brown to black; ears and wings are black. Other: Has a characteristic blunt tragus (part of the ear).</p>	<p>Females form maternity colonies and will share space with other bat species. Will roost in trees as well as buildings. Will occupy bat houses. Human encounters: Found close to water. Often can be seen near streetlights.</p>
<p>Evening bat <i>Nycticeius humeralis</i></p>			

Table 1 continued.







Name/photograph	Dimensions/ average size	Description	Roosting behavior
Colonial bats			
 <p>Mexican free-tailed bat <i>Tadarida brasiliensis</i> Subspecies: <i>T. b. Mexicana</i> (migratory) <i>T. b. cynocephala</i> (non-migratory)</p>	<p>Wingspan: 11–14 in. Length: 3½–4 in. Weight: 0.28–0.49 oz</p>	<p>Color: Gray or dark brown to rusty brown. 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>Can maintain mega-colonies of more than 1 million bats. Human encounters: The species most likely to encounter humans. Lives in bridges, buildings, and any abandoned structure. Will occupy bat houses</p>
 <p>Southeastern myotis <i>Myotis austroriparius</i></p>	<p>Wingspan: 9.5–10.5 in. Length: 2.5–4 in. Weight: 0.14–0.32 oz</p>	<p>Color: A small bat with dense, dull, woolly fur; upperparts brownish to sooty; fur of underparts with white tips and black bases, the general white appearance contrasting sharply with the upperparts.</p>	<p>Hibernates in northern climates but is active throughout the year in southern areas of distribution. Pregnant females form maternity colonies, usually in caves over water. Most females bear twins.</p>
Solitary bats			
 <p>Eastern red bat <i>Lasiurus borealis</i></p>	<p>Wingspan: 11–13 in. Length: 3–5 in. Weight: 0.21–0.49 oz</p>	<p>Color: Medium-sized bat with a reddish orange coat. Adult males are brightly colored, in contrast to the more grayish females and juveniles. Other: Contrasting white markings on wrists and shoulders easily distinguish this species.</p>	<p>Forages in a variety of habitats, mostly over land, along the edges of pastures, croplands, or in other openings dotted with large deciduous trees. Also has been found in cypress stands and near pecan trees along rivers. Prefers forested environments. Hibernates in winter in a variety of locations, including tree hollows, exposed tree trunks, and areas on the ground covered in leaf litter, where humans can encounter them.</p>
 <p>Hoary bat <i>Lasiurus cinereus</i></p>	<p>Wingspan: 13–17 in. Length: 5–6 in. Weight: 0.7–0.88 oz</p>	<p>Color: Large, distinctively marked bat with long, narrow wings. Fur is long, soft, and dark brown to black at the base, followed by a broad band of cream color, then a slightly narrower band of mahogany brown, tipped with white. The outer three colors are visible from the surface, giving the fur a hoary appearance. Other: Contrasting white markings on wrists and shoulders easily distinguish this species.</p>	<p>During summer, prefers tree roosts that are in edge habitats close to feeding grounds. Reaches peak activity at about 5 hours after sunset. May occasionally be seen flying on warm winter afternoons. Human encounters: Usually occur when the mother drops the young during transport or during storms.</p>

Table 1 continued.

Name/photograph	Dimensions/ average size	Description	Roosting behavior
Solitary bats			
 <p>Northern yellow bat <i>Lasiurus intermedius</i></p> <p>Southern yellow bat <i>Lasiurus ega</i></p>	<p>Wingspan: 13–14 in. Length: 3–5 in. Weight: 0.39–0.49 oz</p>	<p>Color: Medium-sized bat with dull, sooty, yellow fur.</p> <p>Other: Lacks distinctive white markings on its shoulders and wrists. Tail membrane is entirely furred above.</p>	<p>Roosts beneath hanging dead palm fronds. Does not migrate, but remains active year round except for brief periods of torpor during severe winter weather. During the winter, northern yellow bats may undergo torpor during periods of inclement weather, though they will emerge to feed on warm evenings.</p>
 <p>Seminole bat <i>Lasiurus seminolus</i></p>	<p>Wingspan: 11–13 in. Length: 1.8–2.7 in. Weight: 0.28–0.53 oz</p>	<p>Color: Medium-sized bat with deep mahogany fur that is frosted at the tips, giving the bat a distinct reddish-maroon hue, unlike the reddish orange of eastern red bats.</p>	<p>Usually roosts alone and in Spanish moss. Emerges from its daytime roost early in the evening and forages among or above the crowns of the trees, over watercourses, and around clearings.</p> <p>Does not hibernate in the true sense; is active throughout the winter when weather permits.</p> <p>Does not leave its daytime roost when the temperature is below 68 °F; whenever temperatures in the evening exceed 68 °F, they emerge and take wing.</p>

Rabid bat behavior

It is impossible to determine whether a bat has rabies just by looking at it. Bats can be grounded for a variety of reasons, including injury or infection with rabies. These signs or behaviors may indicate that a bat has rabies:

- Flying in the daytime
- The presence of dirt in the bat’s mouth or teeth
- Abnormal sounds made by the bat
- Isolation of a colonial bat from its colony
- Cloudy eyes
- Dehydration
- Mucous in the nostrils
- Breathing difficulties
- Spastic paralysis (muscle spasms and rigidity)

The only people who should handle bats are those who are trained and wearing the proper pro-

tective clothing. Other school personnel, students, and visitors should never handle a bat.

Laws

Texas law requires that a district take specific actions after bats are found in a school facility:

- The bat and colony (if present) must be removed.
- Repairs must be made so that bats are excluded in the future.
- The areas where bats roosted must be disinfected.

If a bat is found in a room with an unattended child, a sleeping person, or an intoxicated or mentally impaired person, or if there is the possibility that a person has had direct contact with a bat, the bat must be captured (if possible) and submitted to the laboratory designated by the Texas Department of State Health Services that is closest to your community. The department maintains a listing

of rabies laboratories at <http://www.dshs.state.tx.us/idcu/disease/rabies/information/prevention/pamphlet/prevention.pdf>.

Bats are protected by federal and state regulations. It is a federal violation to use chemicals—including insecticides, rodenticides, disinfectants, and mothballs—to kill bats (<http://www.tpwd.state.tx.us/publications/annual/hunt/nongame/>).

According to the Texas Parks and Wildlife Code (Chapter 63, Section 63.101; <http://www.statutes.legis.state.tx.us/Docs/PW/htm/PW.63.htm>), no one may hunt, sell, offer for sale, buy, offer to buy, or possess after purchase a bat or any part of a bat, dead or alive.

This rule does not apply to animal control officers, peace officers, or health officials who capture a bat that they consider injured or diseased. Also exempted are people who are licensed to provide pest control services and those who transport a bat to a laboratory for testing if the bat has or may have exposed people or domestic animals to rabies.

A bat may be removed or hunted if it is inside or on a building occupied by people. A person may transport a bat to have it tested by a laboratory if rabies is suspected. Also, bats in buildings can be legally removed or evicted.

Bat management plan

School officials and integrated pest management (IPM) coordinators should implement a bat management plan to prevent potential health problems associated with bats and to respond quickly and appropriately to bat sightings. The plan should address prevention, training, and response.

Preventing human/bat contact

The bat management plan should focus on preventing direct physical contact with bats. Direct contact includes touching, handling, or being bitten by a bat. Just seeing a bat is not considered direct contact.

Everyone—especially children—should be taught never to touch a bat or any other wild animal. Any bat that can be approached by people,

especially a bat on the ground, is probably sick or injured.

The best way to prevent contact is to maintain bat-free buildings. Several measures can help prevent bats from entering facilities and establishing colonies:

- Keep window screens in good repair.
- Keep gymnasium doors closed during the early evening and early morning. Bats are foraging at these times and may inadvertently fly into the building to catch insects.
- Screen all attic and soffit vents with ¼- to ½-inch hardware cloth or screen.
- Seal all holes (dime size or larger) in the siding; gaps around gutters, pipes, fascia boards, and molding; and openings at other exterior penetration points. Use netting (½-inch mesh), caulk, foam, or concrete patch. Be very careful to confirm that bats are not present before closing any holes or gaps.
- When buildings are being constructed, take steps to exclude bats:
 - Construct roof flashing and soffits so that bats cannot enter underneath these hard surfaces and then enter the building.
 - Ask neighbors whether a bat colony has been roosting in area trees or buildings; if so, workers can take extra precautions to exclude them.

Preventing rabies transmission

Although only about ½ to 1 percent of all bats are infected with the rabies virus, bats should be considered rabies suspects if they are found on the ground or in buildings or are active during the day.

People are considered potentially exposed to rabies from a bat when they are bitten (Fig. 4) or when a bite cannot be ruled out (such as if a bat flew into them or landed on them (see <http://www.cdc.gov/mmwr/PDF/rr/rr5703.pdf>)). All bats must be tested for rabies by a DSHS-designated rabies laboratory if they had potential or known contact with people or domestic animals or pets.

Employees designated to capture, secure, and remove animals from campus should wear protective clothing, especially heavy gloves, to protect

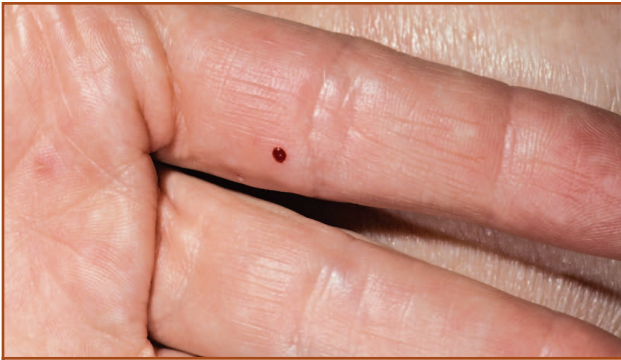


Figure 4. Marks from a bat bite can be tiny or even invisible. (Source: Barbara French, Bat Conservation International, www.batcon.org)

themselves from bites. School faculty, staff, and students should be trained to respond appropriately to bat incidents.

Pre-exposure vaccines are recommended for anyone at increased risk for rabies exposure—animal-control officers, veterinary personal, wildlife biologists, and pest- or wildlife-management professionals who regularly work around high-risk rabies species.

Although the pre-exposure vaccine is expensive, it provides some immunity against unrecognized exposures to rabies. These vaccinations begin with an initial series of three injections administered over a 3- to 4-week period. Once immunized, a person should undergo antibody testing every 2 years to make sure the protection continues. After immunization, a person who becomes exposed to rabies will need only two post-exposure rabies vaccinations.

Training

School districts need to designate and train a responder for each campus or facility. A trained responder is an IPM coordinator, a person trained by an IPM coordinator, or an adult who is otherwise experienced in removing bats safely.

Trained responders should:

- Be familiar with approved management methods when colonies are found on campus and respond as needed.
- Protect themselves and others against rabies transmission.

- Be able to identify all bat species that could be present on school property.
- Safely capture and remove all bats found inside buildings or contact the appropriate person for bat removal.
- Respond appropriately if a person is bitten by a bat.
- Report bat incidents to the proper authorities.
- Ensure that roosting areas that pose a public health risk are cleaned properly after the bats have been removed.

Districts should train more than one employee to remove bats from a school building.

They should also make sure that all faculty, staff and students know who to contact and what to do if a bat has been sighted.

Faculty and staff should understand the importance of:

- Avoiding direct contact with bats
- Evacuating students and others from the classroom or building safely
- Isolating the bat so that others do not come into contact with it
- Calling the designated person to take care of the problem

Students should understand the importance of:

- Avoiding direct contact with bats
- Calmly leaving the area where a bat was found or seen
- Telling a teacher or adult school employee where a bat was found or seen

Response

The district's bat management plan should include a response plan for dealing with bats found on school property. Issues to address include procedures for removing a single bat, responding to a bat bite, responding to a rabies confirmation, removing a bat colony, and, if necessary, working with private contractors.

To prepare for incidents with potentially rabid animals, school officials should also develop templates for parent notification (Fig. 5) and student education (Fig. 6).

Figure 5. Sample notification letter to parents.

Date

Dear Parents and Guardians:

This letter is to inform you that a bat was found in _____ (specific location) at _____ School around _____ (time) on _____ (date). Procedures to remove the bat and protect students, employees, and visitors were followed according to school district and public health guidelines for rabies specimen submission and testing.

[Note: Continue with one of the next three paragraphs]

[1] We have not identified anyone who had contact with the bat.

[2] The individuals who were in contact with the bat have been referred to a physician for medical attention.

[3] We are in the process of identifying faculty, staff, students, and visitors who may have been in contact with the bat. Please interview your children about this incident and call the school nurses immediately at _____ (phone number) if you believe your child touched this bat.

The building was inspected by _____ *[name of school district]* maintenance personnel and approved for occupancy.

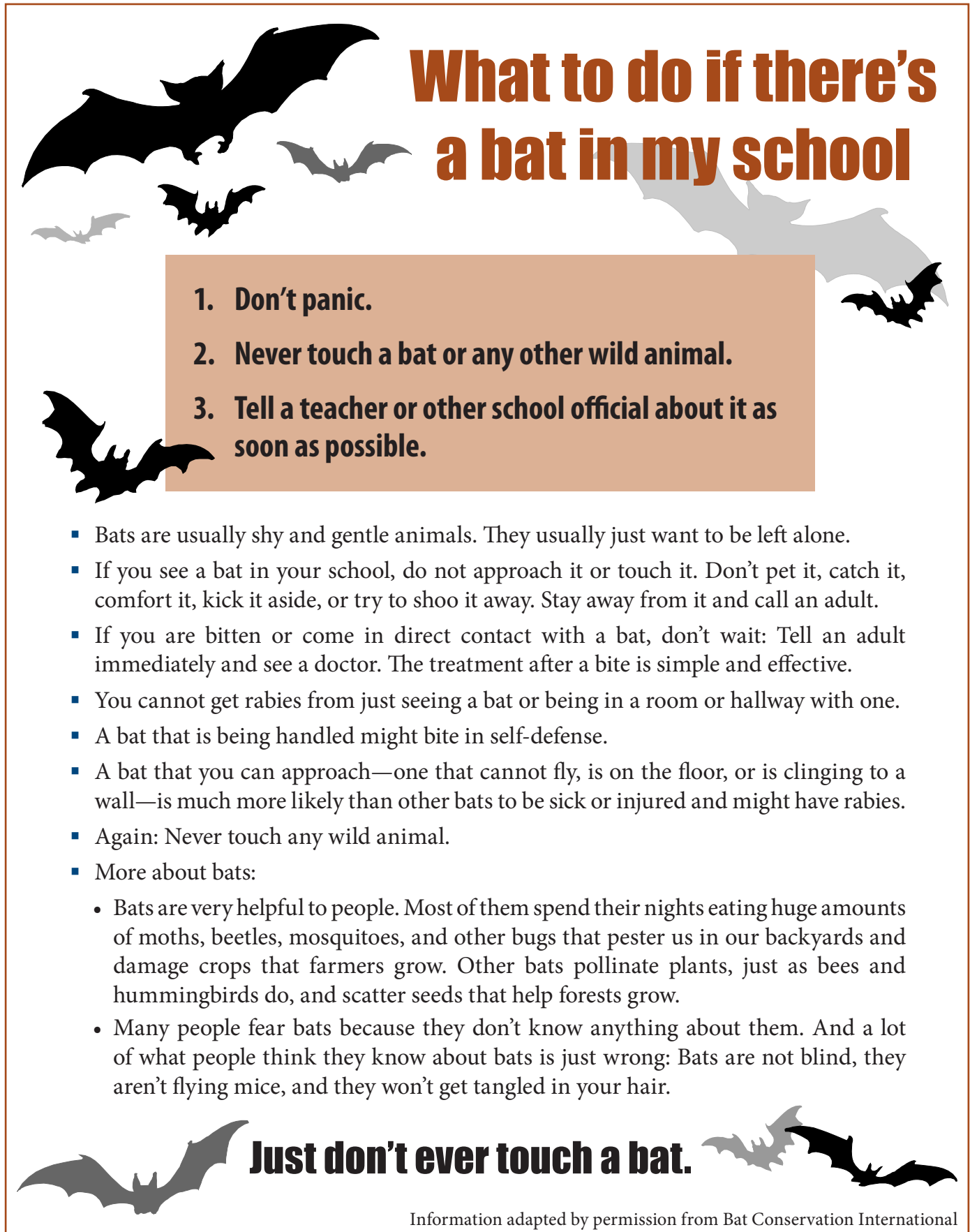
The campus will be monitored for a _____ *[time period]* “watch period,” by trained school district personnel who will inspect the interior and exterior of the facility for any signs of bats. School officials will take the appropriate actions and notify you if any more bats are found.

We are committed to providing a safe environment for our children. Inspections to keep the campus free of pests are conducted throughout the year. Please feel free to contact me if you have any questions.

Sincerely,

Principal

Figure 6. Sample educational flier for students.



What to do if there's a bat in my school

1. **Don't panic.**
2. **Never touch a bat or any other wild animal.**
3. **Tell a teacher or other school official about it as soon as possible.**

- Bats are usually shy and gentle animals. They usually just want to be left alone.
- If you see a bat in your school, do not approach it or touch it. Don't pet it, catch it, comfort it, kick it aside, or try to shoo it away. Stay away from it and call an adult.
- If you are bitten or come in direct contact with a bat, don't wait: Tell an adult immediately and see a doctor. The treatment after a bite is simple and effective.
- You cannot get rabies from just seeing a bat or being in a room or hallway with one.
- A bat that is being handled might bite in self-defense.
- A bat that you can approach—one that cannot fly, is on the floor, or is clinging to a wall—is much more likely than other bats to be sick or injured and might have rabies.
- Again: Never touch any wild animal.
- More about bats:
 - Bats are very helpful to people. Most of them spend their nights eating huge amounts of moths, beetles, mosquitoes, and other bugs that pester us in our backyards and damage crops that farmers grow. Other bats pollinate plants, just as bees and hummingbirds do, and scatter seeds that help forests grow.
 - Many people fear bats because they don't know anything about them. And a lot of what people think they know about bats is just wrong: Bats are not blind, they aren't flying mice, and they won't get tangled in your hair.

Just don't ever touch a bat.

Information adapted by permission from Bat Conservation International

Removing a single bat

If a bat is found inside a school building, school personnel should remove all students and staff from the area. They also should contact the school's trained responders who are authorized to handle bats, or the animal control service.

Note: Most animal control officers respond to bat incidents for the purpose of submitting the animal to a rabies laboratory. They should not be considered part of your school's bat removal or exclusion team.

To remove a bat, the trained responder should:

1. Gather these items before approaching the bat: a long-sleeved shirt or jacket, a pair of thick work gloves, a plastic face shield, a small container such as a cardboard box or coffee can, a sturdy piece of cardboard, and masking or duct tape. A net also may be used (Fig. 7).



Figure 7. A bat inside a building is captured with a net.
(Source: Dianne Odegard, Bat Conservational International, www.batcon.org)

2. Cover the arms and put on the gloves and face shield.
3. Carefully place the box or can over the bat (Fig. 8).
4. Slip the cardboard under the box, trapping the bat in the box.
5. Secure the box and tape it shut. A video on how to capture a bat is available online at



Figure 8. To capture a bat, place a box or can over the bat and carefully slip a piece of cardboard under the bat, trapping it in the box. (Source: Fly By Night Inc.)

http://www.youtube.com/watch?v=mzax0V0DG_M.

6. Immediately notify the designated person that the bat has been secured.
7. If the bat came into contact with anyone, report the incident to animal control or the local health authority and request that the bat be tested for rabies. For a sample bat-on-campus report form, see Figure 9. If animal control services are unavailable in the area, a local veterinarian can, for a fee, submit the bat for testing.
8. If you believe that the bat did not come into contact with anyone, consider the possibilities for human contact in the hours and days before the bat was found. If exposures could have occurred, have the bat tested.
9. If you are certain that the bat did not come into contact with anyone, take it outside, carefully remove all tape, and release the bat. Because bats cannot take flight from the ground, hold the container aloft, lift the lid, and gently tilt the container to the side. The bat should fly out and away. Alternatively, hold the container against a high wall or the branch of a tree and slowly remove the cardboard. After a few moments, the bat should cling to the outside surface and can be left there.

Figure 9. Sample bat-on-campus report.

School Bat-on-Campus Report

School district _____ Campus _____

Date of report _____ Time of report _____

Person completing report: Name _____
Title _____ Phone number _____

Person(s) who found bat: Name _____
Title _____ Phone number _____
Name _____
Title _____ Phone number _____

Person reporting bat to office: Name _____
Title _____ Phone number _____

Date and time of bat sighting _____ a.m./p.m.

Location of bat Interior of building Exterior of building

Describe location: _____

Physical condition of bat Alive Dead

If dead, describe condition Fresh Slight odor Dry/mummified

If alive, flying? Yes No

Human contact with bat? Yes No Uncertain at this time (more investigation required)

If yes:
Name of person contacted by bat _____
Date of birth _____ Phone number _____
(If student) Name of parent/guardian _____

Type of contact:
 Picked up bat with bare hands Touched with bare hands but did not pick up
 Bat brushed against (clothes or bare skin) while in flight
Indicate body part touched _____
 Bitten by bat, confirmed Bitten by bat, suspected Bat landed on person
 If bitten, location of bite: _____

(continued on next page)

10. After the bat has been removed, disinfect the surfaces that came into contact with it.
11. Log and track the incident.
12. Institute a 4-week “watch period” at the campus. During this period, the IPM coordinator or a designated person should inspect the interior and exterior of the facility for any signs of bats. The maintenance department should be notified if any bats are found.

If a bat is found outside a school building:

1. Follow the procedures listed above for removing a bat from inside a building.
2. The principal should notify the staff and students about the situation and remind them never to touch a bat while on or off school grounds.
3. Institute a 2-week watch period on the campus. During this period, the IPM coordinator or another designated person should inspect the interior and exterior of the facility for any signs of bats. Notify the maintenance department if any bats are found. In some regions of Texas, the building may need to be inspected daily during known migration periods to prevent new bat colonies from moving in.

Responding to a bat bite

Anyone bitten by a bat must be referred for medical evaluation immediately. When possible, the animal should be captured and evaluated for rabies. School personnel should follow these steps:

1. Immediately have the bitten person thoroughly wash his or her wound, hands, etc., with soap and water.
2. Contact the designated responder.

The designated responder should:

- Instruct the bitten person to consult a physician for wound care and discussions about post-exposure rabies vaccination. If the animal is proven to have rabies, these vaccinations are critical.
- Follow district procedures to capture the animal, if possible, and hold it until animal control responds to the scene.

- Determine whether any other people came into contact with the bat. If so, gather their names, ages, home addresses, parent or guardian names, and phone numbers. If the bat is found to be infected with rabies, these individuals will need to be contacted and referred to their health care providers. Handle the contact information confidentially.
- Report the incident to the IPM coordinator, who should notify animal control. It is not necessary to notify the health department unless it is part of a school’s procedures. Rabies incidents by law are reported to the local rabies control authority. Local and regional health departments can be consulted about potential rabies incidents.

Responding to a rabies confirmation

If a rabid animal is confirmed from any district facility, district officials should:

- Immediately contact the principal and IPM coordinator for that building.
- Ensure that the appropriate school officials, working with the school nurse and local animal control, notify all people who had direct contact with the animal. These people should be informed of the test results and referred to their physicians.
- Take measures to protect the identity of the people who were exposed to the rabid animal.
- Notify the employees, students, and parents about the incident in general as a reminder of potential rabies risks from animals and of the school’s procedures to protect its charges. Stress to students that they should never touch any bat or other wild animal.

Responding to a bat colony

If a colony of bats is found at a school:

1. The school should notify IPM personnel, who will determine the best way to exclude or remove the colony.
2. The principal should notify parents, explaining the situation and plans for removing and excluding the colony.

3. During and after the exclusion process, the campus should be put on a 4-week watch period, when IPM personnel will inspect the interior and exterior of the facility for any signs of bats. They should notify the maintenance department if any bats are found.

Removing a bat colony

Bats that roost in Texas buildings can be evicted using special exclusion techniques either before or after maternity season. Young bats cannot leave a building until they are old enough to fly. Evicting the adults during maternity season will orphan and kill the babies inside the building. Maternity season varies by species and location, but it is usually from spring to late summer. Generally, the best time for eviction efforts is between September and April, depending on your location in the state.

Removing a bat colony can require significant amounts of time and money. In recent years, Texas school districts have paid from \$5,000 to \$60,000 to remove and exclude bats from school buildings.

If bats are seen in or near the building, identify the species, inspect the building for entry points, consider erecting alternate bat housing, seal potential but unused entry points, make and install bat-eviction devices, and clean up the area as needed once the bats are gone.

1. Identify the species.

Before taking action, know the species involved. A few very rare bats are federally protected. It is important to comply with the laws that protect these animals. There may be more than one bat species sharing the building.

Species identification can also help if the district is considering building alternative housing for the bats. Each species of bat has different housing requirements. For example, the structures for Mexican free-tailed bats need to have an open bottom design. Many bat houses available commercially are unsuitable for North American species.

Although some bats are easy to identify, proper identification requires training, including the use of identification keys. The Texas Parks and Wildlife Department or Bat Conservation International can

help school districts develop a list of the bats most likely to be encountered. The Texas Department of State Health Services Laboratory also routinely identifies the species of bats submitted for rabies testing.

2. Inspect the buildings for entry points and roosting areas.

Identify areas in and around buildings where bats can enter. This step is vital for effective placement of bat-eviction tubes and nets.

To witness bats entering or exiting the building, monitor it during early evening (dusk) and just before dawn. Note all the locations where the bats leave the building. During cooler months, you may need to inspect several nights in a row to establish exit/entry points, because bats do not leave the roost at night in cold weather.

When inspecting the exterior of the building, look along roof lines and behind gutter placement for rub marks, which are stains left by the oils and

dirt rubbing off the bats' hair (Fig. 10). Like rodents, bats will leave some evidence of staining; however, bat stains are harder to see. Also look at ground level for guano—in most cases, the bat-entry points will have some guano buildup if the colony is large enough.

Inside, identify all parts of the building where they may have established roosts. These areas can include chimneys, attic spaces,



Figure 10. Staining can indicate a bat entry/exit point. (Source: Fly By Night Inc.)

wall spaces, ceiling spaces, expansion joints, and roof overhangs. Bats also roost behind gutters, in sports stadiums, and beneath or behind signs and fixtures.



Figure 11. Alternative bat houses should be big enough to house several hundred bats. (Source: Merlin D. Tuttle, Bat Conservation International, www.batcon.org)

3. Consider the risks and benefits of providing alternative housing for the bats.

Some school districts have erected bat houses to provide alternative housing (Fig. 11) for the bats removed from school buildings. Such bat houses can make it less likely that the bats will infest nearby homes or buildings.

After a Texas school district removed a bat colony but did not build alternative housing, the bats moved into neighboring structures. This caused problems for the neighbors and created adverse publicity for the district.

However, erecting bat houses on school property can raise concerns about odors, bat waste, and increased bat/human contact.

If you decide to provide alternative housing, erect it before beginning exclusion efforts. Each bat house should be appropriate for the species and large enough to hold several hundred bats. Place them at the edge of school property, away from students.

For information on how to build, buy, and install a bat house, visit Bat Conservation International at <http://www.batcon.org/>. This organization keeps a list of certified bat houses and vendors that sell them. Plans for bat houses are available at <http://free.woodworking-plans.org/bat-house-plans.html>.

Building alternative housing for the bats does not guarantee that they will move into the housing. If they do, however, the colony may be integrated into classroom teaching, including lessons on conservation and public health issues related to wildlife.

4. Seal all other potential entry points.

Without disturbing active access areas, seal all potential but inactive entry points using caulk, weatherstripping, flashing, or hardware cloth (heavy-duty, ¼-inch, polyethylene mesh). Use the techniques described in the section on preventing human/bat contact to seal these entry points.

5. Install bat eviction devices.

- a. Buy one-way chutes or make them from 2-inch-diameter PVC pipe, clear sheets of plastic, or empty, clean caulking tubes with the ends cut off. Netting also may be used. Specific directions on how to make or where to buy bat eviction devices are posted at <http://www.batcon.org/index.php/bats-a-people/bat-exclusion-instructions.html>.
- b. If using tubes, place the tubes over the holes in the roof or soffit used by the bats. These tubes will allow them to leave but not reenter the building. If bats are roosting in a long horizontal crevice, place a tube roughly every 4 to 6 feet along the entire distance to make sure all the bats can get out (Fig. 12).



Figure 12. In long areas, place eviction tubes about 6 feet apart along the entire distance to enable all the bats to exit. (Source: Fly By Night Inc.)

- c. If using netting, tack down the top and sides, leaving an opening on the bottom for bats to escape. Be sure the netting is secure, or bats can get stuck or reenter the building because of faulty design.
- d. To ensure that all the bats exit the building, leave these one-way devices in place for at least 1 week during warm weather and 2 weeks in cool weather (less than 50 degrees F).

6. Remove the one-way devices and permanently seal the entry points.

Make sure that there are no new signs of bats leaving the building. If you remove the one-way devices too early, you could permanently seal bats inside, killing them and causing odor and sanitation problems for the school.

7. Clean up.

Once the bats have left the building, begin remediation procedures. Remove the guano from interior structures to avoid attracting other pests such as cockroaches or flies.

Guano can pose two risks: excessive weight on structures, and disease transmission from contaminated materials. A naturally occurring soil fungus, *Histoplasma capsulatum*, is sometimes found in bat droppings. A person inhaling the fungus spores can develop histoplasmosis, a flu-like respiratory disease (<http://www.dshs.state.tx.us/idcu/disease/histoplasmosis/faqs/>).

To prevent illness, employees should take precautions when cleaning up guano in a confined area:

1. Wear personal protective equipment, including leather gloves, long-sleeved shirt, long pants, approved eye protection, and a respirator that can filter particles smaller than 2 microns in diameter.
2. Before removing the guano, lightly dampen it with a disinfectant to minimize the amount of dust and spores dispersing into the air. The Centers for Disease Control (CDC) and the National Institute for Occupational Safety and Health recommend using a 10 percent bleach solution (1 part

water to 9 parts of bleach) as a wetting agent.

3. If the guano buildup is more than 2 inches deep, follow CDC procedures (<http://www.cdc.gov/niosh/docs/2005-109/>) to remove it from the building.
4. Bag the affected material or use a professional vacuum (high-efficiency particulate-absorbing, or HEPA) that exhausts to the outside.
5. Check with the local landfill or the Texas Commission on Environmental Quality for the appropriate place to send this material, and send it there.

Like other mammals, bats can attract pests such as mites, ticks, fleas, and flies. Depending on the roosting location, a licensed pesticide applicator may need to apply a desiccant or insecticide dust after eviction to kill the pests and keep them from entering areas occupied by students and staff.

Working with private contractors

Removing bat colonies is a risky undertaking. Hazards include exposure to rabies and bat guano and working at heights. School districts must consider these dangers when deciding whether an outside firm or school employees will attempt the exclusion.

Although a license is not required in Texas for removing a bat or bat colony, proper removal of bats requires an understanding of bat biology and knowledge of legal and appropriate practices. Districts contracting with private firms should develop bid specifications similar to those for other pest control activities:

- List the area to be treated (when possible, include linear or square feet or perimeter footage).
- Specify whether it will be the district or the company that will supply such equipment as ladders and cherry pickers.
- Require a cost breakdown by campus, by hour, or by task. In most cases, the cost should be based on the building.
- Specify whether the company will monitor for bat activity after the treatment; if so, for how long and at what cost?

- Note any guarantees for the work and their duration. Most reputable excluders will guarantee their work for 5 years.

As with all contractors, districts need to consider a few key items when hiring an outside contractor:

- Does the contractor have the necessary experience for the job?
- Will the company be able to accommodate the district if it has a Leadership in Energy and Environmental Design (LEED) building or other structure that will require specific materials?
- Does the contractor have the necessary equipment to perform the scope of work needed?
- Can the contractor provide references for work at other school districts or large buildings?
- Does the pest control company have insurance to cover disease exposures to their personnel, or will it try to get compensation from the school district?
- Do their employees have rabies vaccinations?

For more information

Below is a selection of the many websites containing information about bats, rabies and histoplasmosis.

Bats

Texas Parks and Wildlife Department

- *Texas Caves: Deep in the Karst of Texas* webcasts:
 - Types of bats in Texas
<http://www.tpwd.state.tx.us/learning/webcasts/caves/battypes.phtml>
 - Physiology of bats
http://www.tpwd.state.tx.us/learning/webcasts/caves/physiology_bats.phtml
 - Bat habitats and migration
<http://www.tpwd.state.tx.us/learning/webcasts/caves/bathabitat.phtml>
 - Bat behavior
<http://www.tpwd.state.tx.us/learning/webcasts/caves/batbehavior.phtml>

- Research and conservation
http://www.tpwd.state.tx.us/learning/webcasts/caves/bat_conservation.phtml
- Benefits and threats to conservation
<http://www.tpwd.state.tx.us/learning/webcasts/caves/batbenefits.phtml>
- Bat emergence
http://www.tpwd.state.tx.us/learning/webcasts/caves/bat_emergence.phtml
- *Wild in the City: Urban Wildlife Safari* webcasts
 - Bats
<http://www.tpwd.state.tx.us/learning/webcasts/urban/bats.phtml>
 - Bat house construction
http://www.tpwd.state.tx.us/learning/webcasts/urban/bat_house.phtml

Bat Conservation International

- <http://www.batcon.org>

Texas Department of Agriculture

- Structural Pest Control Service
<http://texasagriculture.gov/spcs>

Texas AgriLife Extension Service

- Publication L-1913, *Controlling Bats in Urban Areas*
https://agrilifebookstore.org/publications_details.cfm?whichpublication=275

Rabies

Texas Department of State Health Services

- <http://www.dshs.state.tx.us/idcu/disease/rabies/>
 - Rabies
www.texaszoonosis.org
 - Rabies in bats
<http://www.dshs.state.tx.us/idcu/disease/rabies/information/bats/>
 - Regional Zoonosis Control offices
<http://www.dshs.state.tx.us/idcu/health/zoonosis/contact/>
 - Maps showing where in Texas bats have tested positive for rabies in current and previous years
<http://www.dshs.state.tx.us/idcu/disease/rabies/maps/>

Centers for Disease Control and Prevention

- Rabies and bats
<http://www.cdc.gov/rabies/bats/index.html>

Histoplasmosis

National Institute for Occupational Safety and Health

- *Histoplasmosis — Protecting Workers at Risk*
<http://www.cdc.gov/niosh/docs/2005-109/>

Schools

Texas AgriLife Extension Service

- Bat Control in Schools
<http://agrifeweb.tamu.edu/batsinschools/>
- Texas School IPM program
<http://schoolipm.tamu.edu>

Arizona Department of Health Services

- Bats at schools
<http://www.azdhs.gov/batsatschools/>
- Videos for children and school administrators
<http://www.azdhs.gov/media.htm#rabies>

Texas Parks and Wildlife

- Keep Texas Wild Teacher Resources: Hanging around with bats
<http://www.tpwd.state.tx.us/learning/resources/keeptexaswild/bats/>

Bat Conservation International

- Educator Navigation
<http://www.batcon.org/index.php/all-about-bats/educators-navigation-page.html>

Texas Department of State Health Services

- Bat rabies awareness poster contest for students
<http://www.dshs.state.tx.us/idcu/disease/rabies/information/bats/contest/>

Centers for Disease Control and Prevention

- Rabies and Kids
<http://www.cdc.gov/rabiesandkids/>

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