



CHAPTER 34

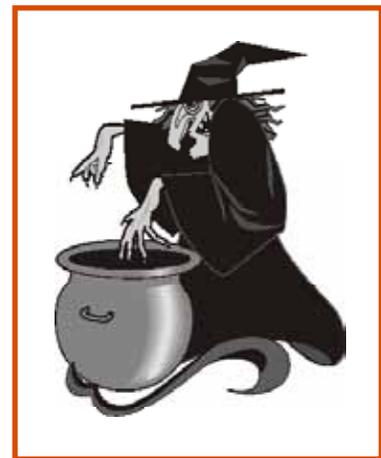
THE BEST CONTROL FOR BATS

BATS
CLASS - Mammalia
ORDER - Chiroptera - means "winged hand" (Chiro = hand, Ptera = wing)
FAMILIES - Vespertilionidae and Molossidae
<http://www.batcon.org/vrcnew/index.asp>

OVERVIEW

Bats are among the most numerous and unique land vertebrates, they occur in about 400 species in 3 families north of Mexico. There are more than 1100 species in the world and bats account for almost a quarter of all mammal species. They are the world's best echo locator. Bats live everywhere, but Antarctica. Bats are not birds, as sometimes believed, but nocturnal, flying mammals. Bats are more closely related to primates (monkeys and humans) than they are to rodents. Some bat species will live over 20 years! Their *wings* are formed by a thin membrane (called the interfemoral membrane) connecting the greatly elongated forearm and fingers with the hind limbs and body. They are the only mammal thus equipped for flight. On average, bats fly at a speed of 20 wing beats per second. Unlike most nocturnal animals, bats have very small eyes but their ears are usually prominent and have a well developed membranous *tragus* which is an outgrowth from the inner base of the ear. Bats primarily use echo location (a type of sonar system) to guide themselves in flight. They emit high-pitched squeaks from the larynx in their throats which are reflected back from solid objects in their paths and are picked up by their ears so that even on the darkest nights they can fly swiftly and unerringly through dense tree growths or other obstructions. Once they locate their prey by echolocation bats can capture it with their mouth, their wings, or tail membranes. Their speed and mobility of flight enables bats to feed upon night-flying insects which form the bulk of their food. A bat leaves its roost at dusk and returns just before dawn - They usually stop at a body of water first for a drink (while in flight) and then feeding begins - a bat consumes 1/3 to 1/2 to about its full body weight in insects daily! That means that even a small colony with a few hundred members can consume hundreds of pounds of insects every day. These insectivores have tiny, sharp teeth for chewing insects - but they can not gnaw through wood, aluminum, or wires like rodents can and do. Bats' feeding cycle begins at twilight. It is common for all members of a colony to leave the roost at about the same time. they feed for an hour or two and then return to roost. Some feeding may occur throughout the night and by sunrise all bats have returned to their daytime roosts. The majority produce one baby a year; a few others may have 2 - 4 offspring, called pups, a year. The babies are flightless and are usually born in early summer. A single bat can eat 500 to 1,000 mosquitoes every hour or 3000 to 7000 per night.

For centuries bats have been associated in legend with vampires, haunted houses, the devil, Halloween, witchcraft and sorcery, and a supernatural fear of them has thus been instilled in many people. This fear is basically unfounded as bats are generally harmless and quite beneficial. Bats do not normally attack humans, as commonly supposed, nor do they get themselves tangled in peoples' hair. Both bats and guano can cause diseases; bats can carry many ectoparasites and their guano can contain both insects and arthropod pests, so both bats and guano should be handled with extreme care and some natural fear. Blood-eating (vampire) bats are not established in North America. Except for 3 species of nectar-feeding bats in Texas and Arizona found along the Mexican border, all bats are all insectivorous (feed on insects). Bats are the only mammals capable of real or sustained flight. There have been about 900 species of bats described worldwide and some 40 species are found in the United States. There are 2 families and 18 species of bats in the eastern U.S. - and 14 species can be found in Florida. All these bats feed on night-flying insects.



During the day, bats seek shelter in dark, protected areas; they prefer locations with fairly high humidity. Once an appropriate site is found, the shelter may become a long-term roost site. Bats roost in chimneys, attics, walls, crawls, hollow floors, barns, mines, caves, hollow trees, etc. during the daytime, hanging head down by means of the curved rigid claws on their hind feet. Some species migrate with the changing seasons like some birds do and follow steady sources of food supply. Others hibernate in caves, trees, or buildings during the colder months. Most species congregate in groups or colonies, some of which number in the tens of thousands or even in the millions. Bats are creatures of habit and will frequent the same roost year after year - even if

they only use it seasonally. When roosts occur in attics or partitions of occupied buildings or in barns, they are usually highly objectionable because of the odor from the urine and feces (guano). Care should be exercised so as not to confuse bat droppings with those of mice or other small rodents. Generally, dry bat droppings *glisten* and easily crush into fine fragments since they are composed of insect parts. Mouse droppings are usually dull grayish-black and do not readily fragment. Each bat hanging in a roost during the day will produce up to 10 or more droppings each day, so even a small group of bats in an attic can produce a considerable pile of droppings within a few weeks, which in turn attracts more and more bats. Bats can roost in or near buildings, which creates problems such as noise, smell, accumulations of feces (guano) and urine, staining and spotting of surfaces, ectoparasites, e.g., mites, lice and the bat bug, *Cimex pilosellus* (which closely resembles the bed bug), fleas and ticks and increased potential for disease transmission, e.g., histoplasmosis, hydrophobia, Chagas' disease, relapsing fever, encephalitis and dermatomycoses. There are 3 general groups of bats: leaf-nosed, free-tailed and evening bats.

CAUTION: DISEASES TRANSMITTED BY BATS.

Rabies. Bat rabies was first described in the U. S. in 1953, but only a **SMALL PERCENTAGE (5% in Michigan)** OF BATS ARE INFECTED with RABIES, BUT ANY BAT SHOULD BE LOOKED UPON AS POTENTIALLY DANGEROUS and should be approached with caution. Rabies can occur in bats without them showing symptoms. The bat that is infected normally does not become enraged and attack people or other animals, most usually become paralyzed and die quite quickly. Hard hats, heavy leather gloves, respirators and coveralls should always be worn during any bat control effort, including inspections. Suspect a bat of carrying rabies if you see any of the following symptoms:



1. Bats attacking other bats.
2. Bats flapping wings on the ground or lying helpless.
3. Bats appearing to be sick, weak or paralyzed.
4. an unusual number of dead bats in a localized area.
5. **Frequent daytime activity**, especially round noon or midday.
6. **Erratic flight patterns together with frequent lighting on surfaces.**
7. Some health departments in New York advise that if a bat is spotted in a home and not captured for testing, that every occupant go get rabies shots.

Note: Never pick up, touch or handle a sick or dead bat! Never touch a healthy bat with your bare hands - it will bite to defend itself like any cornered animal would or the ectoparasites may move onto you. Call the police or county animal control officer to have the bat removed. A bat found lying on the ground is likely to be rabid or sick!

Contact your state or county public health department when any of the above behavioral symptoms are observed. It is often necessary to capture alive those suspected animals so that they may be tested for rabies infection. If at all possible, capturing specimens should be done by, or in cooperation with, public health personnel. If rabies has been confirmed in a bat population, control should never be attempted without supervision of the public health department. Any bat causing a bite should be captured with brain intact for examination by health authorities. **Call as soon as it is caught for advice on transport.**

Ectoparasites. External parasites of bats include parasitic flies, mites, soft ticks, fleas, flies and bat bugs, e.g., *Cimex pilosellus*. Some of those may also attack people and pets. After elimination of a bat roost, parasites may remain behind and migrate through the building. Control of ectoparasites should accompany any bat control effort - try diluted Safe Solutions Enzyme Cleaners with Peppermint and/or borax first. Store small, infested items in vacuum sealed plastic. <http://ohioline.osu.edu/hyg-fact/2000/2105a.html>

Histoplasmosis. Accumulations of bat droppings in attics or soil create an environment suitable to the growth of *Histoplasmosis capsulatum*, a fungal organism producing a severe lung infection often fatal to man, dogs, cats and other animals as well. The fungus is present in droppings; therefore, a large established bat roost in

an attic or cave can be extremely dangerous since fungal spores are continually drawn into your lungs when breathing the dust in the roosting areas. Be sure to clean these areas with proper safety protection and copious amounts of diluted Safe Solutions Enzyme Cleaner or Peppermint Soap and/or borax.

Anyone working around accumulations of bat droppings should wear coveralls, gloves, caps and dustproof respirators. Personal hygiene is particularly important for those working in areas contaminated by droppings or dust from bats. Contaminated clothing should be changed at the completion of the work, followed by thorough bathing/showers. **Bats may also be involved in the transmission of Chagas' disease, relapsing fever, Pasterella pseudotuberculosis, dermatomycoses, Listeriosis, Leptospirosis, Salmonella typhimurium and various forms of encephalitis.**

CHEMICAL CONTROL - If the presence of rabies has been established by state public health officials, the U. S. Environmental Protection Agency may still allow the use of DDT dust, mist or fog to kill bats. DDT can not be used by the general public in this case. Only certified commercial pest control operators or certain government agencies are permitted to do so. Currently EPA has not registered a pesticide for bat control and we don't recommend DDT.

In the Summer of 1978, a lethal anticoagulant chemical known as chloropacinone was registered for bat control in Michigan under the trade name of ROZOL. This chemical can also only be used by certified commercial pest control operators. It is applied as a dust to points of entry and roosting surfaces. Bats collect the dust on their fur and ingest it while grooming. The material causes death by internal hemorrhaging and works slowly over a period of 2 - 4 weeks.

ROZOL has serious disadvantages: It is dangerous to humans and animals if breathed or otherwise ingested in sufficient quantity. It does not break down easily and remains hazardous for a long time. After bats have been eliminated, the remaining dust should be removed to prevent subsequent accidental poisoning of people. Anyone applying or cleaning up ROZOL should wear protective clothing and a respirator and wash/shower themselves thoroughly afterward. In addition, the use of ROZOL, and even DDT to a lesser extent, is likely to cause an increase in sick and dying bats in the neighborhood of the treated roost. Thus, the possibility of bat bites and danger to people and animals is actually increased. **Remember if these materials can kill bats - they certainly can harm you, your family, and/or your pets too!**

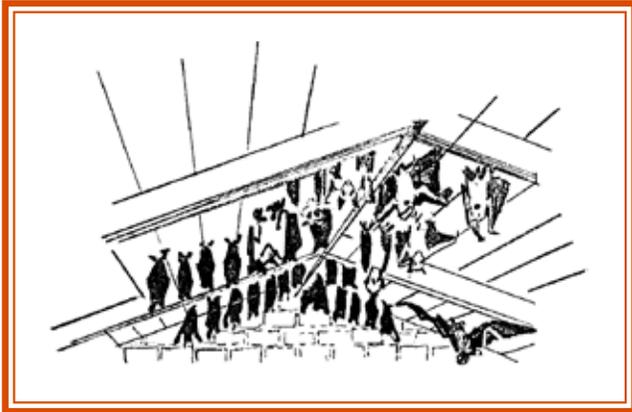
Mere killing of bats may not solve even the bat infestation problem. If bat guano and urine odors and entry points remain open, other bats may shortly move back in and/or exoparasites may move into the living areas. After control has been completed, patch/seal all openings and all deposits of droppings and dead bats should be removed. Great care must be exercised during any cleanup operations regarding personal protection - **be sure to wear all the proper clothing and a respirator equipped with a HEPA filter.** Dead bats never should be handled without using gloves and/or tongs or forceps. After a thorough cleaning, the area can be sprayed with a 10% formalin solution or similar disinfectant, e.g., phenolic, or better still during and after the cleaning - with monthly applications of diluted Safe Solutions Enzyme Cleaner with Peppermint and/or borax.



Healthy bats do not attack people, do not tangle in women's hair and do not transmit tuberculosis. Caves and trees are the natural roosting sites for most bats, but some have adapted to human-created habitats, such as mines and buildings. Solitary bats live alone in trees - never in caves - and may occasionally enter buildings. The biggest problem with these pests is probably psychological or visual annoyance. People often have a mortal fear of bats. They are attracted to musk-scent perfumes, soaps and shampoos and electronic mosquito repellers, so be very careful with their use - often the woman's pillow has the bat lying on it due to her applied fragrance.

Bat droppings and the brown stains from their urine, and glandular body secretions may stain the outside of buildings, particularly beneath eaves, entrance and exit holes, and elsewhere below their roosts. In old buildings where an attic roost or a space between a wall and a chimney exists, excreta may seep through cracks and stain interior surfaces. The guano may occasionally become infested with flies and cockroaches. Migratory species inhabit buildings only during certain times of the year, but other species can be present in the same location year around. Roost locations in buildings include attics, wall voids, hollow floors, chimneys, unused furnaces, belfries and decorative structures. Bats may live for over 30 years and are attracted to musk scents. The bat colony may first announce its presence by squeaking or scratching and/or rustling noises coming from

the ceiling or walls. An opening only 1/4" wide - with a dirty stain below may say to the practiced eye that you have found an exit hole for bats. These stains come from urine, feces, and/or body oils the bats deposit around the openings, but use to enter or leave the roost.



Most species of bats range from 3" to about 5-1/2" in length with an average wing span of 10" to 15" and may be colored various shades of gray or brown. Females of smaller species usually produce a single offspring each year during late spring to early summer. No nests are provided so, when first born, young bats must cling to their mothers. As they grow and become too heavy to carry, they are left at the roosting site while females forage for food; offspring are weaned when they are able to fly and begin to forage for themselves. **Adult bats may each catch and consume more than 500 mosquitoes per hour.** They catch their prey while flying, using their wings, which are really elongated fingers that serve as supports for their gliding membranes, to transfer captured prey to their mouths. Bat droppings (which are brown or black and look like instant rice grains in size and shape) can be distinguished from those of mice because they can be crushed easily into fine, shiny fragments. These fragments are undigested insect parts. By contrast, mouse droppings are firm and do not disintegrate readily. Close inspections will reveal a variety of insect body parts in the feces. **No white color appears in bat feces; if the color white is present, you have birds, not bats.**

EXCLUSION. If you suspect you have bats in your building, the best way to find entry and exit holes as small as 3/8" is to conduct a "bat watch" to look for bats emerging from various openings at dusk. Picture your building as a baseball diamond and station one person (umpire) on each side of the building a half hour before dark when bats begin to leave their roosts, or just before dawn when they return. Generally, they are somewhat easier to see at dawn than at dusk, but it is harder to find *umpires* then. Each bat watcher can see 2 sides of the building and should have a clipboard with a sketched elevation (vertical drawing) all of the particular sides of the building they will be watching. Their job is *simple*; find out where the bat *doors* or openings are! Carefully observe the structure, especially the roof and chimney areas; this should be conducted at dusk as the bats emerge for feeding. This inspection should help reveal the exit and entry points of the bats, structural deficiencies of the building and size of the infesting colony. Remember, if bats are present, they will emerge each evening unless the weather is extremely adverse. Exclusions should be done in the fall and spring as bats give birth in the summer and baby bats may be present. Bats do not fly until they are almost fully grown and/or temperatures are below 45° F. Exclude unwanted bats by placing one-way exit devices on all of the colony's exit points. Returning bats will fly around and even rest by the roost openings, but will usually leave within a day or so. You can exclude and/or repel bats with bird netting, sound, bright lights, and/or fiberglass insulation. Exclusion may be your only legal "control" e.g., in Florida where bats are classified as endangered species.

To make the inspection, situate at least two people at opposite corners home and second or, better yet, all bases or the structure so that each person can view two roof areas at the same time. (If a building has several wings, then use at least two people per wing and/or per angle). Begin the inspection approximately 1/2 hour before dusk and continue for about an hour after the first bat emerges - for at least 3 to 4 successive evenings to properly identify all the active entrance and exit openings the bats are using.

Look closely, especially at common exit points, e.g., chimneys, vents, roof lines, soffits, and or any holes or openings resulting from missing, warped or loose boards or other deterioration. Openings of only 3/8" are

sufficient for most bat entry. In some cases, such as sheds and barns, exit and entry points may be actual doorways. Exit/entry locations can also be determined by pre-emergence noise, droppings below the exit points, odor or smudge marks in the areas of entry.

Close these openings with wood, caulking, hardware cloth or masonry. Close all but one or two openings wherever convenient and close the remaining openings just after sunset when the bats are outside.

Inspection Summary. To make the inspection, picture the building as a baseball diamond, situate at least two people at opposite corners (home and second or all bases) of the structure so that each person can view two roof areas at the same time. (If a building has several wings, then use at least two people per wing.) Begin the inspection approximately one-half hour before dusk and continue for about an hour after the first bat emerges. Look closely, especially at common exit points, e.g., chimneys, vents, roof lines, soffits and/or any holes or openings resulting from loose boards or other deterioration. Openings of only 3/8" are sufficient for bat entry. In some cases, such as sheds and barns, exit and entry points may be the actual doorways. Exit/entry locations can also be determined by pre-emergence noise, droppings below the exit points, odor or smudge marks in the areas of entry. As bats exit or enter the building, the watcher should carefully mark the locations of the holes on the diagram. A count of bats using each hole will help determine how many bats are roosting in the building and which holes are the major access points. Bats frequently enter a building at the ridge cap, gable or roof vents, so pay special attention to the roof. A thorough team watch of an hour or so will normally identify all the major holes/exits/entrances. Bats may enter buildings through any unprotected louvers or vents, broken windows, warped siding, missing bricks or other openings. They may also enter through very small openings in missing or damaged siding or around eaves or cornices. The smaller species of bats can crawl through an opening as narrow as 3/8", so a very careful inspection is necessary in order to find all possible entrances. The larger openings should be covered with sheet metal or with 1/4" mesh hardware cloth if ventilation is desired. Narrow cracks can be plugged with oakum, hydraulic cement, weatherstripping, foam insulation, copper wood, tow or similar packing material, and then permanently covered or sealed with caulking compound. This will save energy and provide useful weather protection as well. The best way to control bats permanently is to prevent their gaining entrance to the building. Another way to do this is to brightly illuminate the inside of the roosting area (attic or crawl) at night and, from the outside, observe where the light can be seen and patch/seal/screen thoroughly. **Always wear a respirator mask and at least gloves when investigating or cleaning a bat roost.**



Still another alternative for detecting their openings is to wear a mask and protective clothing and observe the darkened roosting area from the inside during a bright day for daylight openings.

Repulsion. Sound - Bats are sensitive to high frequency sounds and can be repelled by commercial high-frequency sound devices. An inexpensive device can be made by attaching two or three silent dog whistles to an air pump, such as a large aquarium pump. Place the device in the roosting area and run continually until the bats leave then patch/seal/caulk/screen thoroughly. Try loud, heavy metal music and/or strobe lights.

Light - Bats may also be repelled by brightly illuminating their roosting area at all times. The attic of an average-size house may require a least four or more 100 - 150 watt bulbs or 2 or more strobe lights to drive out the bats. Place the light bulbs to illuminate all potential roosting sites. **Make sure you do not leave any dark "corners"**. The bats usually leave after several days of illumination. Flood lights can also be mounted on the outside of structures pointing directly at the bats' entry area to the building. Thus, they will have to enter and exit into the bright light, something they do not like doing. **Caution:** Lights can attract bats, who come to feed on the flying insects. Bats can sometimes be discouraged from using an area by **tacking coarse fiberglass batting to the specific areas where they hang**. Bright lights will also help dry out or raise the temperature in winter and kill the hibernating bats.

Drafts and Air Conditioning. Drafts of cool air within roosts will also repel bats from a structure. Thus, carefully

directed breezes produced by electric fans may dislodge your unwanted *tenants*. **Air conditioners installed** in bat roosts and turned on during April and May also will help discourage bats from roosting since they prefer high temperatures for rearing their young. Because of their small size and high metabolic rate, bats are very sensitive to extremes of temperature.

The best way to determine the extent of the bat problem is an outdoor inspection of the structure, especially the roof and chimney areas and it should be conducted at dusk when the bats emerge for feeding or at dawn when they return. This inspection should reveal the exit and entry points of the bats, structural deficiencies of the building and size of the infesting colony. Remember, if bats are present they will emerge each evening unless the weather is extremely adverse.

To find bat entry and exit points:

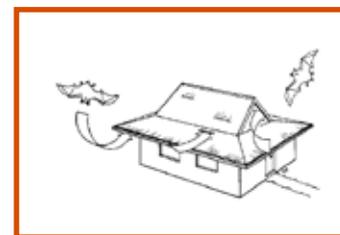
- listen for squeaks;
- inspect walls for brownish oil stains that rub off their coats as bats squeeze through small cracks;
- look for bat droppings (guano) on the ground where they may exit the roost;
- watch the suspected entrance at dusk, which is when bats leave the roost to find food.

You can use a flashlight to find the entries. But be sure to aim the light beam to one side of the suspected hole so only the edge of the light falls on the hole. Bats will enter and exit as long as the light is dim or covered with red cellophane. Therefore, it is also advisable to use a flashlight with a red filter or affix several layers of dark red cellophane over the head of a flashlight with a rubber band. Once the entry/exit points have all been located, you can focus your management control efforts on those locations. Although the job of finding and sealing entrance holes for bats can be tedious, it has the fringe benefit of tightening up the structure and reducing heat loss. Furthermore, the cost of energy-saving improvements may even be tax-deductible in some states.

Simple homemade air leak detection devices can be used to find holes in the outer skin of the building. A piece of thin-film plastic (dry cleaner bag) or bathroom tissue taped to a clothes hanger can serve as a flag whose movement indicates an air leak. On a windy day, slowly move the detector around doors and window frames, attic storage areas and any other place you suspect is not airtight. The flag will move and point out all openings. More formal tools, including air testers, smoke generators and smoke sticks, are available for the same purpose from energy conservation centers. As mentioned earlier, a "bat watch" will usually also pinpoint entry and exit holes.



Seal small openings with a high-quality caulk that resists weathering and responds to house movement without cracking and is long-lasting. You can usually judge the quality of caulk by the length of the manufacturer's guarantee. Buy caulk that matches the background color of the building or that can be painted.



Larger spaces can be filled with self-expanding urethane foams applied from pressurized aerosol containers. Lath, sheet metal, hardware cloth and window screening can also be used to seal holes. Bats will not gnaw their way through barriers, but they can and do push loose barriers out of the way.

HOW TO REMOVE A STRAY BAT FROM YOUR BUILDING - Occasionally, a young bat wanders into a room (most of the time it will be a big brown bat) through an open window, door, (slate) roof or an unscreened and open damper on the fireplace. On hot summer nights, attic bats may venture into your space, seeking the cooler air your air conditioner provides. There is no cause for alarm. When a single bat finds its way into a home, office or store, it will usually find its way out again. When it does not, capture the bat with an insect net, a coffee can, or even with a gloved hand. The bat can be released or destroyed. A glue board attached to a broom handle can be used to reach a bat high in a corner or at the apex of an attic - but they will usually leave on their own if you close the doors to other rooms, turn off the lights and open outside doors and windows. A sleeping bat can be safely picked up by using a pillowcase. Reach through the open end of the pillowcase and grasp the bat gently in the sewn end with leather gloves. Turn the bag inside out to free the bat outdoors. The best way to prevent bats from entering the house is to fill cracks under eaves and around pipes, vents, doors, and windows. If the holes are big enough for bats to enter (they can get through a dime-sized hole), make sure no bats are roosting inside before you plug the gaps. Migratory bats may temporarily enter buildings during both their spring and fall

migrations or in the late summer when young bats have just learned to fly. Bats rest from midnight to about 3 a.m., so most “invasions” occur about 3 a.m. or just after dusk. Young bats can wander in from regular roosts in unused chimneys or elsewhere and make an appearance in rooms that are otherwise screened and closed. Bats may also come into rooms through cracks under doors and similar spaces. If a stray bat should enter a room in your house or apartment, follow this simple procedure: (Note: If you move about this will scare the bats and they will bump into things.)

PASSIVE METHOD

1. Turn off the lights and close the doors to other rooms, confining the bat to just one room.
2. Open all doors and windows to the outdoors. The bat will likely follow the movement and/or smell of fresh air.
3. Reassure those in the room that there is no danger to them as long as they do not touch the bat.
4. Sit down, as near the walls if possible, and wait for the bat to leave. Ask others in the room to remain still and silent so the bat can leave without running into anyone.
5. If the bat is still in the house at nightfall even though you have opened all exterior doors and windows, turn off or keep the lights turned down very low since they frighten and confuse the bat and may cause it to hide behind or in furniture, drapes and/or wall hangings.
6. Remember a torpid (cold or sleepy) bat will need to “warm-up” before it can drop down and fly away.

ACTIVE METHOD

1. If the passive method fails, net the bat or capture it in a small box or juice can, a net, gloved hand or a glue board attached to a broom handle. Place a container over the bat, then slide a stiff piece of cardboard under the bat, enclosing it in the container. Note: I have found that if you use a small fruit juice can to capture a resting/hanging bat, so the bat’s head is at the bottom of the can, all you have to do is hold the can up right and take it outside. The bat will not leave until you shake it out; as it falls it begins to fly. If the bat is on the ground and permits you to walk right up to it, it is probably sick, since healthy bats are not found in this position. **Don’t use your hands to pick it up any bat - only use a shovel or tongs.**
2. Wear thick leather gloves (and use tongs) if the situation requires placing your hands anywhere near the bat. A frightened bat will panic and bite, even if it is not sick.

Identify the bat before planning an IPM control program. Identification provides information on its specific habits and biology. Usually the only (house) bats to infest buildings are these four species: the big brown bat (*Eptesicus fuscus*), the little brown bat (*Myotis lucifugus*) and the Mexican free-tailed bat (*Tadarida brasiliensis*). They can have a life-span of more than 29 years. The little brown bat, the big brown bat and the Yuma myotis are all almost always connected with “our” buildings during their maternity periods.

BIG BROWN BAT, *Eptesicus fuscus* (Beauvois) Family - Vespertilionidae

The big brown bat is relatively large, measuring about 4” - 5” in length and have a wing span between 12” and 14”. It weights only 2/5 - 3/5 of an ounce. The fur and wings are usually dark brown, with the belly paler with hairs dark at the base, but the ears are blackish in color. Big brown bats are the most commonly encountered bats in structures and are found throughout the United States. They need to find a 34-38° F. temperature (zone) to survive the winter.

LITTLE BROWN BAT, *Myotis lucifugus* (LeConte) Family - Vespertilionidae

Little brown bats are about 3” - 3-5/8” long, chocolate brown in color and weigh 1/8 - 1/2 ounce - hairs on back have long, glossy tips. Although the little brown bat is smaller than the big brown bat, the two bats can be easily confused by the layman. Little brown bats are common in most states, although they rarely occur in Nebraska, Kansas, Oklahoma, Texas and the southeastern states. Must hibernate in a cave with high humidity.

MEXICAN FREE-TAILED BAT, *Tadarida brasiliensis* (Geoffroy) formerly *Tadarida mexicana*, Family - Molossidae

The free-tailed bat is identified by its “free-tail” which extends beyond the interfemoral membrane. The free-tailed bat is very common in the South and occasionally in midwestern states; it was formerly called *Tadarida mexicana*. They are probably the most common of the colonial bats found occupying buildings.

Yuma Myotis, *Myotis yumanensis*, Family - Vespertilionidae is common in the West and the Southwest. All *myotis* bats are relatively small, a shade of brown and have simple snouts. This species is one of the most common *myotis*.

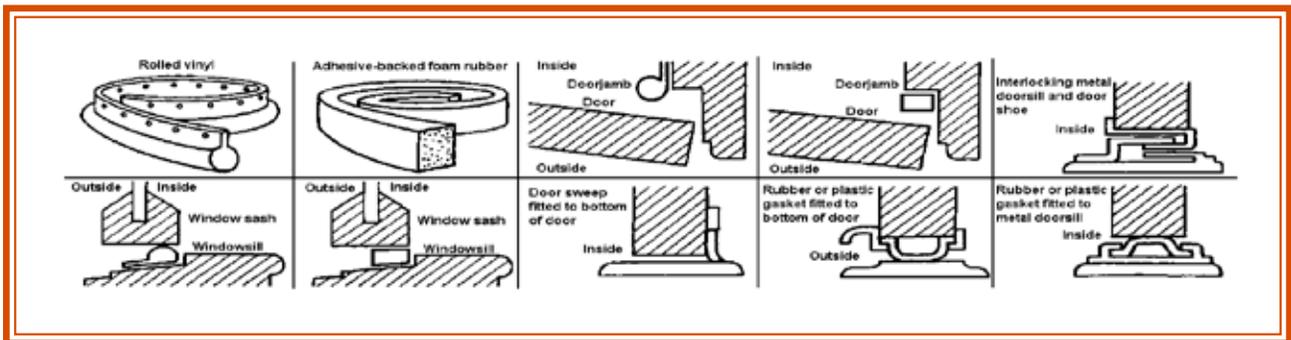
Pallid bat, *Antrozous pallidus*, Family - Vespertilionidae is also common in the west and southwest, but is less frequently found inside buildings. This large-eared (over 1”), bat has a simple muzzle; the ears are not joined. The skull has 28 teeth.

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CONTROL CAUTION. Bats may be protected under various state or local regulations. Check with wildlife authorities before planning any control program to determine what control methods **they believe** are acceptable; killing of bats should only be done if they are sick or are causing damage to property. **The single most important way of controlling bats in structures is to exclude them**, but only attempt to do this before young have been born or after they are old enough to leave the roost to forage; never attempt control between mid-May and mid-August as young will be trapped inside, where they will die of starvation and create subsequent odor/insect problems. Bats can be repelled with strobe lights. Bats simply avoid ultrasonic beams. Bats can be attracted to electronic mosquito repellers that mimic the sound of dragonflies.

Evicting bats is useless unless it is followed by repairs to the building to permanently exclude them. Since the bats don't chew their way in, you can block most entrance and exit points using light building materials such as window screen, caulking, duct tape, weather-stripping, and/or molding.

TYPES OF WEATHER-STRIPPING



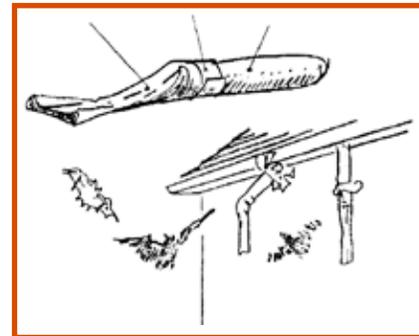
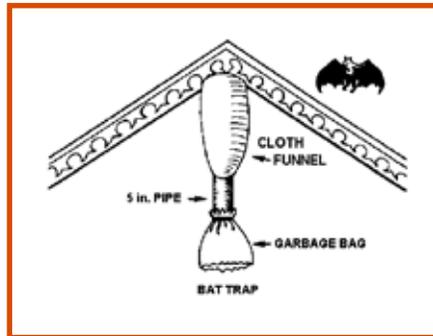
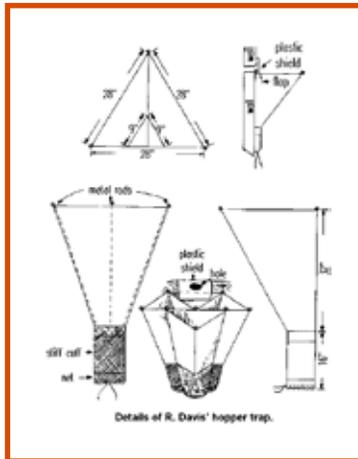
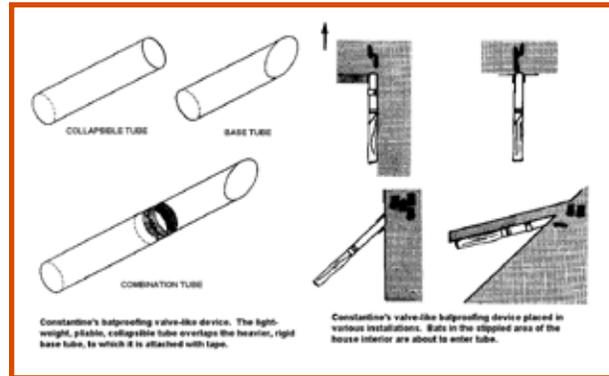
To begin the exclusion, you must first locate all openings into the building used by the bats for their nightly departures. Many species are able to squeeze through openings 1/4" x 1-1/2" and/or a circle as small as 3/8" in diameter. Some openings can be located by looking for smudges or fecal droppings; however, it is usually necessary to observe bats leaving or arriving during the hours after dusk and before dawn to make sure each opening is located. While bats are at roost, close off all but one or two main openings. Use caulking, wood, sheet metal, plaster, cement, or 1/4-inch mesh hardware cloth or netting to close entrances. Bats do not chew, so almost any type of sturdy material can be used. Close all remaining openings during the night when all bats have left roost to forage; be sure no young or adults remain in the roost area. If some bats have been trapped during the first night, reopen a few exit holes the following evening to allow them to escape. A light weight collapsible tube over all entrances will allow bats to leave but prevents their reentry. Another product that shows great promise of providing practical, economical, permanent exclusion even for wide open buildings like barns is plastic bird netting. This netting



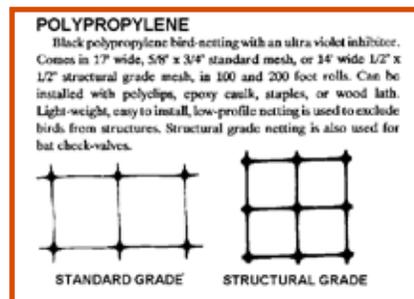
is used primarily to protect high-value agriculture crops from birds, it can also be used to exclude birds and bats from structures. The netting is very light, supple, yet tough and resilient; it is easy to work with and relatively inexpensive. Depending on the situation, it can be draped over entire roof areas, such as buildings with Spanish tile roofs, or cut and applied as needed to cover only certain sections.

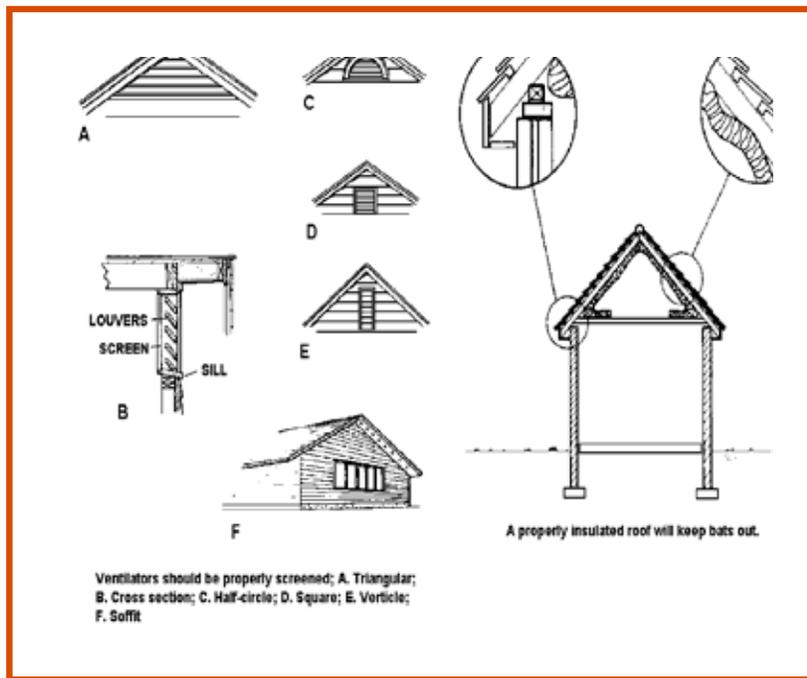
To exclude bats from a building, hang bird netting over entry points, e.g., gables, open soffits or fascia, etc. so that it extends at least 3' below and to each side of each entry. The bottom edge should hang loosely one inch to several inches away from the building. This enables emerging bats to crawl under and out, but returning bats can not find their way back in. Use polypropylene bird netting, the stiff, structural-grade netting with a diagonal hole opening of 5/8" is available in rolls 14' wide and up to 3000' long. It is sold in hardware and garden stores.

Plastic bird netting can also be used to serve as *bat check valves* which allow bats to exit a structure but not re-enter. The bottom portion of the netting can remain unattached and weighted using a few light fishing sinkers, or be attached to the side of the building directly beneath their exit holes so that it lies flat against the building, but is loose enough to provide space for the bats to emerge from their exit holes, crawl down the net cover and escape. The attachment points should be 4' to 6' apart. The netting can be fastened to the structure using duct tape, staples, nails or Velcro strips.



When bats leave the net-covered exit hole, they tumble down to the open bottom and fly off. Upon return, however, they are unable to find their way back through the net into the structure. After flying around the netting for a short period, they usually leave to find a new roosting site. After three to five days when no more bats are seen exiting the building the netting can be removed and the holes permanently sealed. Always perform such work before the young have been born or after all the young can fly to avoid trapping bats inside. In attic areas, floodlights that illuminate roosting sites may cause bats to leave. Drafts produced by powerful fans have also proven effective in repelling bats from established roosts.





Fiberglass insulation is one of the best materials for repelling bats, because it apparently irritates their skin. Blown-in insulation is also effective, but fiberglass batting is easier to use in areas such as between attic rafters.

Rodent glue boards (placed at entry points) and even flypaper strips (hanging in the attic) have been used effectively to capture and kill bats, as have (a fisherman's) dry flies attached to a 1' - 3' piece of thin monofilament and secured to a slowly revolving fan's blades. **Caution: the bats are often found attached to the hook still alive.**

If entrances are successfully blocked, bats are unable to return to their roosting area and will move to another location. Control of migratory species can be accomplished in the same manner except that openings should be

blocked during the period after the bats have migrated; when they return the following year, they will be unable to enter the building. Migratory bats leave for warmer climates during fall and winter months.

Several other management techniques can be used to control bats. However, unless all openings are blocked, there is always the possibility of the same or different individuals returning to the roosting site.

When their numbers are few, bats can sometimes be *hand* caught with protective gloves and the aid of traps or nets, then removed from the building and released. Be careful when *handling* bats because they have ectoparasites and powerful jaws and extremely sharp teeth with which they can inflict a painful bite. Bats may also be infected with the rabies virus, which along with other diseases can be transmitted by their bite. Estimates on the incidence of rabies have ranged from 1 out of every 1000 to 1 out of every 10 bats in a colony. If bitten or scratched by a bat, cleanse the wound thoroughly with soap and water and obtain prompt medical advice. Try to collect the bat that bit so it can be tested for rabies. Do not actually handle bats, even if you are wearing protective gloves. Wear coveralls, gloves, a respirator, a hard hat and a professional beekeeper's veil, especially if you enter a roost, e.g., attic.

Bats may have one or more species of external parasites that build up to large numbers in roosting sites. Parasites include bat bugs, bed bugs, ticks, mites, and fleas. If found, apply desiccant dusts and/or a pyrethrin aerosol throughout the roosting site to kill parasites before they spread and locate human hosts once the bats are gone.

Bat guano dries to form a crumbly, powdery substance that is capable of supporting the growth of a fungal organism that causes a systemic disease (known as histoplasmosis) in people. Effects of this disease range from flu-like symptoms to serious lung abscesses and lesions resembling tuberculosis. Remove this material very carefully and thoroughly; it not only is very dangerous, the odor attracts new bats.

Fresh bat urine also serves as a medium for possible transmission of disease organisms from an infected bat. When working in an area where bats are roosting, wear protective clothing and a cartridge respirator to avoid skin contact with urine or breathing guano dust. Never handle live or dead bats. Thoroughly wash reusable protective clothing to prevent spreading fungal spores, or wear disposable coveralls. Thoroughly fog/mist/spray/clean/wash with copious amounts of diluted Safe Solutions, Inc. Enzyme Cleaner with Peppermint and/or borax.

OUTSIDE CONTROL. Bats are often found at night around lighted outdoor swimming pools, parking areas, or lighted porches because night-flying insects which are food for bats are attracted to the lights. Simply remove the attraction by turning off lights at night or by using lights less attractive to insects.

Inside notes. A bat may enter the building at night through open doors or windows searching for flying insects, or if a chimney is being used by bats for a roost, the young may fall or blunder into the house through the damper when they are learning to fly. Parents may follow, resulting in one or more bats flying around inside your building. Simply allow the bat(s) to find its own way back out again or physical removal of the bat is the best procedure. Inside structures, bats follow fresh air currents. Therefore, leaving a few windows and/or doors open will aid the bat in escape. If a bat refuses to leave, it can be caught with a net, a coffee can or a gloved hand and released outside. Locate openings where bats may have entered and then caulk, seal, close or screen them off.

Old formula. The Author knows of no pesticide poisons currently registered for bat control by the EPA. There is an old bat repellent *formula* that he knows will work, but it is not registered: water - 97%, sponto 221 - 1%, oil of mustard - 1% and oil of sassafras - 1%. Final Note: **Remember to consult state and local laws before beginning any control program.**

TREATMENT - DIRECT CHEMICAL CONTROLS

Naphthalene, or moth flakes, are frequently recommended by the poison applicators as a bat repellent for use in remote areas of the house. Because naphthalene fumes are quite toxic, **use them only if all other methods fail.** Apply 5 lb. for every 2,000 cu. ft. of space to keep bats away, or 10 lb.. to drive existing bats out. The fumes that volatilize repel the bats. However, the naphthalene must be replaced every three to four weeks, so it is at best to use only a temporary measure to force bats from a vacant structure just prior to bat-proofing. **If the fumes repel bats - how safe are they for you? The Author does not recommend their use!**

The *convenience* of naphthalene over the slower procedures recommended under habitat management should be weighed against the likelihood of toxic vapors making their way into your living quarters. Another *trick* I know is to fill the attic with a pyrethrin fog - the bats *scream* and leave, even during the daylight hours.

DDT (highly toxic to bats), now banned but still occasionally used in the United States, has been observed to kill bats for up to six years after a single application to an area. Some pest control *professionals* have attempted to use Rozol tracking powder in place of DDT. Rozol is the trade name for an anticoagulant "tracking powder" used to kill mice and rats. Its active ingredient is diphacinone, a restricted material sold only to pest control professionals. Another rodenticidal material, chlorphacinone, is also used. The powder is applied to roosting areas, which means that bats either get it on their bodies and are killed by contact, or ingest the powder during grooming. **These materials are hazardous to humans and are not registered by the EPA for bat control, although some states have authorized their experimental use. We do not recommend their use! That is what I reported to EPA over 25 years ago!**

If you want bats removed but don't want to deal with the problem yourself, we suggest that you employ an Intelligent Pest Management® control firm and/or construction personnel experienced in bat-proofing without the use of lethal controls. **All personnel engaged in bat control should be immunized against rabies. Anyone bitten or scratched by a bat should seek medical attention, no matter the size of the wound or how you "feel." Wash the wound with soap and water, catch the bat without crushing the skull and bring it with you to the doctor.**



SUMMARY

The mammalian order of bats is second only to rodents in the number of various species. Bats are the only true flying mammals. A thin membrane of skin stretches from the long, modified front legs to the back legs and then to the tail. The bones in the bats "fingers" are greatly elongated "ribs" for the wings.

Bats in the United States are almost always beneficial. Some species are endangered. Many bats feed on insects, and can consume up to 1/2 their body weight in insects in one feeding. Occasionally, however, they become a nuisance inside buildings or pose a public health problem.

The bats that most often become a problem around people are the ones that live in colonies or groups. Ex-

amples from around the country are little brown bats, big brown bats, Mexican free-tailed bats, and occasionally big-eared bats. All of these species sometimes hibernate or roost inside of “our” buildings.

Roosting and hibernating sites may occur in building attics, wall and ceiling voids, belfries, chimneys, unused furnaces, and the like. The bats’ droppings and urine can cause a foul odor and stains on walls and ceilings. Their squeaking and scrambling noises can be intolerable to residents of the building.

Bats and Disease

Bats are associated with a few diseases that affect people. Rabies and histoplasmosis are the most serious. Rabies is a dangerous and fatal disease. However, the bat’s role in transmission has been greatly exaggerated. Although bats are confirmed carriers of the disease (less than 1% are carriers) and only a few human fatalities have been attributed to bat bites. Nevertheless, use care when handling bats.

All bat bites should be considered to be potential rabies exposure.

- Because most bats will try to bite when handled, they should be picked up with a shovel, heavy gloves, forceps, or a stick.
- If a bat has bitten someone, it should be captured without crushing its head.
- Refrigerate it (don’t freeze it).
- Then take it to the local health department for testing.

The incidence of histoplasmosis (discussed in detail in the chapter on birds) being transmitted by the fungus *Histoplasma capsulatum*, from bat droppings to humans (by breathing) is not thought to be high, but-

- When working in a bat roost site with lots of accumulated droppings, wear a respirator and protective clothing and follow the safety procedures outlined in the chapter on birds.
- Be sure to clean and spray the entire area with copious amounts of diluted Safe Solutions Enzyme Cleaners with Peppermint and/or borax.

In addition, bats are also implicated in Chagas’ disease (American trypanosomiasis), endemic relapsing fever and St. Louis encephalitis. They also carry ectoparasites, e.g., bat bugs, mites, ticks and/or fleas.

Habits of Bats

During warm weather, bats feed on flying insects in late afternoon, evening, and early morning. They are not active in bright daylight. If you see a bat at this time it has either been disturbed from its daytime resting place or is sick. When not in flight, they rest in dark hiding and roosting sites (e.g., caves, buildings, hollow trees). Bats are able to enter these places of refuge through holes as small as 3/8”.

Bats capture flying insects by “echo-location.” They emit high-frequency sound, inaudible to humans and similar to sonar. They also make audible squeaking sounds, used for communication between each other. In much of the country, bats migrate or hibernate when the weather turns cold. Sometimes they hibernate in hanging clusters inside buildings. Depending on the species and geographic location, they produce offspring from late spring to midsummer. Young bats grow rapidly and can fly in three to seven weeks.

Inspection

Look for two things:

- entry and exit points of the bats, and
- the location of the roost.

Entry area exit points. A building in poor repair will have seemingly unlimited entry points.

- Look for loose flashing, vents, shingles, or siding that bats can squeeze through.
- Look for damage and openings under eaves and soffits, at cornices, louvers, and doors, next to chimneys, windows, and anywhere pipes or wiring enter.

- Notice droppings under openings, smudges around holes, and odors.

Bats can be observed at twilight as they leave the building to feed. The best time to observe the bats and pinpoint major exit and entry points is usually from just before to an hour after sunset.

- Station one or more observers at each corner of the building, looking up towards the roof and watching both sides.
- Listen for squeaking at the exits just prior to the flight.

If the night is chilly or rainy, the bats may not come out.

Location of roost.

- Large bat populations are often found in mature stands of trees especially cottonwood. The trees serve as shaded, darkened hiding places during the inactive day-time periods.
- Shutters can be an ideal nesting location for bats. The slots and darkness are just about the way you would build a perfect bat house.
- Look inside in attics, vacant buildings, and unused rooms during daylight hours and again watch outside at dusk.
- Check inside the chimney and vents - chimneys and other large openings can be covered with coarse hardware cloth screen - but ask your heating contractor before doing anything with your chimney.
- Bang on the walls and listen for squeaks and scratches as roosting bats are disturbed.
- Check behind shutters and look closely at chimney bricks.
- Look for bat droppings. They will be found below roosting bats. The droppings can be told from mouse droppings, which they look like, but bat droppings contain wings, legs, and other body parts of insects. Bat droppings often accumulate to a depth of several inches or more.
- In large roosts smell for bats. They have a very pungent and penetrating odor, musky and sweet, that comes from rotting droppings and bat urine.
- Power wash and/or clean and mist/spray with diluted or Safe Solutions, Inc. enzyme cleaners and/or borax.

INTELLIGENT PEST MANAGEMENT®

Control of Bats - <http://www.angelo.edu/faculty/lammerma/batphotos.html>

Volatile, synthetic pesticide poisons are unnecessary for bat control. The best way of getting rid of bats roosting in a building is through “bat-proofing”, repelling them, or exclusion! They may be protected in your area so you should check state and local laws before beginning any control activities.

Bat-proofing. Making a building “bat-proof” means sealing or screening all of the openings used by the bats to enter a building. It can be a difficult job because, in many cases, all upper openings 3/8” and larger must be sealed, but this is the only permanent method of ridding a building of bats. Use sheet metal, aluminum flashing or 1/4” hardware cloth to close entrances permanently.

Be sure there are no bats left inside before the building is sealed. Bats trapped inside may create even more of a problem than before. Pay particular attention to chimneys, cornices, louvers, shingle/shake siding, vents, warped siding and locations where the roof joins the sides and around the eaves.

June and July are peak months for bat complaints in much of the country. Unfortunately, this is the worst time of year for control. At this time, bats are rearing young in their colony. The young can not fly and have to remain in the roost. Bat-proofing during this period traps the young bats. They will die and rot and smell. They may also crawl and/or flutter into living areas. **The best time of year to bat-proof a building is either in late fall after bats have left for hibernation or in late winter and early spring before the bats arrive.** If bat-proofing must be done in summer, it should be done after mid-August.

- Seal all but one or two principal openings.
- Wait 3 - 4 days for the bats to adjust to using the remaining openings.

- Then seal those openings some evening just after the bats have left for their nightly feeding.
- “Bat valves” or screens can also be used. These are placed over the remaining openings and allow the bats to leave but not to return.
- Netting (light-weight bird netting) can be used - bats will crawl out but, can not re-enter.

Standard bat-proofing materials include 1/4" hardware cloth, screening, sheet metal, caulking, quick setting hard putty, expanding polyurethane foam, steel wool, duct tape -the same things used for rodent proofing. Copper or large stainless steel scouring pads can be used to temporarily plug openings in tile roofs, then sealed with cement or mortar later. When old, deteriorated buildings have more openings than can be sealed economically, large sections of plastic bird netting can be draped over the roof areas of these buildings to keep out bats at a reasonable cost and thus solving most bat problems immediately.

Bat repellents. If bat-proofing is not possible, or bats need to be forced out of a building before it is bat-proofed, the bats can sometimes be repelled from their roost. At this time, only one chemical is registered as a bat repellent. But we believe it is dangerous and should not be used. Naphthalene crystals or flakes can be spread on attic floors or placed in voids. The crystals are most effective in confined air spaces. Three to five pounds will “treat” an average attic. **But the Author does not recommend their use around people and/or pets. Try strobe lights.**

While naphthalene may repel the bats, it vaporizes and supposedly disappears in a few weeks, and is dangerous to people and pets. The bats often return. Many humans dislike the smell of naphthalene as much as bats and some people are very sensitive and should avoid all contact. Napthalene is 4.4 times heavier than air and will volatilize from the attic into the living area. Blasts of air have been used effectively to drive bats out. Lights left on will drive them away. Turn lights on when they are hibernating, and they will die.

Bright lights, especially strobe lights, have had some success in repelling bats.

- On commercial buildings, flood lights can be pointed at the bats’ entry points to keep them from entering. (Of course, the bright lights may attract insects too, which is the bats’ food.)
- Attics can be illuminated with four or more bulbs or flood lights; ensure that all corners of the attic are illuminated.
- Drafts of cool air from fans and air conditioners have, on occasion, kept bats from roosting in a poorly sealed attic.
- Try using strobe lights and try loud, heavy metal music.

Glue Boards - Denny Young has found that if you must remove a bat or colony because you suspect disease and/or other control methods have failed, you can do so quickly and safely with glue boards. Staple a glue board directly under the entrance hole; replace every morning as needed; when you no longer have bats, seal the entrance hole. Remember, bats are beneficial and may be legally protected in your area.

A single bat. When a single bat finds its way into a home, office, or store, it will usually find its way out again. When it cannot, capture the bat with an insect net, a coffee can, or even (as a last resort) with a gloved hand. The bat can be released and/or destroyed. **Never release a sick bat or one that is not acting normally!**

Did you know? - If you move about you scare bats and they can panic and bump into things. Bats rest from midnight to about 3 a.m., so most “invasions” occur about 3 a.m. or just after dusk.

Trapping bats and releasing them in wetland areas (if local environmental laws allow) 15 or more miles away - totally confuses them and usually will not return to your property - but the odors may cause other bats to enter and establish residence. Bats once established are very territorial and will not usually allow others to enter “their” structure. Bats may temporarily leave your building due to migration, high temperatures or parasites that may drive them out for a time. Between the diseases and parasites they carry it is better to avoid direct contact with them. If someone is bitten or scratched or when you see bats flying during the day time or acting “erratic” - we recommend destroying all the bats in that particular colony. See a doctor with the bat that scratched or bit you immediately. **If you must handle a bat - wear the proper safety equipment - at least, heavy long sleeved gloves - like welders gloves and a respirator.**

Using ½” polynet can strangle and kill bats (like a gill net) so use 1/6” mesh. Bats seldom venture out when

there is a full moon and/or the temperature is less than 50° F. Humidity levels also effect their foraging. In the U. S. most bats have their young in May.

Many bats have an outstanding ability to hear and “see” with their ears. The winged mammal emits 200 bursts of sound (a high-pitched buzz) and can analyze the returning signals in a split second. A bat can distinguish a moth’s shape from a falling leaf the same size and close in no matter how quickly the moth takes evasive action. A bat will swoop down on a wet cotton ball tossed into the air of a pitch black room, but will turn away at the last instant. There are at least 43 bat species in the U. S. Most catch their prey in the air, but the California leaf-nosed bat eats poisonous millipedes and scorpions on the ground and is immune to their stings. Another southwestern species that also pounces on larger insects on the ground, e.g., grasshoppers and crickets is the pallid bat. The bat that has ears shaped like bananas is obviously the Virginia big-eared bat, who will fly up to seven miles for a decent “bug” dinner. The largest bat in the U. S. is the mastiff with a body 5” long and a wingspan of nearly 2’. The spotted bat has black and white spots and long pink ears, almost as long as its body. A red bat that eats even 100 moths may prevent egg laying that could otherwise product 25,000 new caterpillars that could attack crops. One of the most common bats is the little brown bat with a body 1½” - 3” long and a wing span 8” - 12” long. One little brown myotis bat can catch 1200 insects in just one hour, sometimes catching two in a single second. A nursing mother eats more than her own body weight nightly, meaning that colonies can consume vast numbers nightly. A whole colony of brown bats can consume up to 38,000 cucumber beetles in a single season. Another common species, the big brown bat, will consume up to 5000 insects a night. Just 150 big brown bats can eat sufficient cucumber beetles each summer to protect farmers from 33 million of these beetles’ corn rootworm larvae, pests that cost American farmers an estimated one billion dollars annually. The largest concentration of mammals in the world is also the largest colony of bats. About 20 million bats migrate from Mexico each summer to raise their young in Bracken Cave near San Antonio, Texas. Bats normally avoid people and are very shy and secretive. Bats drink on the fly, skimming the water’s surface. Bumblebee bats are the worlds smallest mammals, and they each weigh less than a penny! Bats, in spite of their bad reputation, are really beneficial creatures. For information on how to build bat houses and how to attract bats, contact Bat Conservation International, Box 162603, Austin, TX 78716, website: <http://www.batcon.org>.

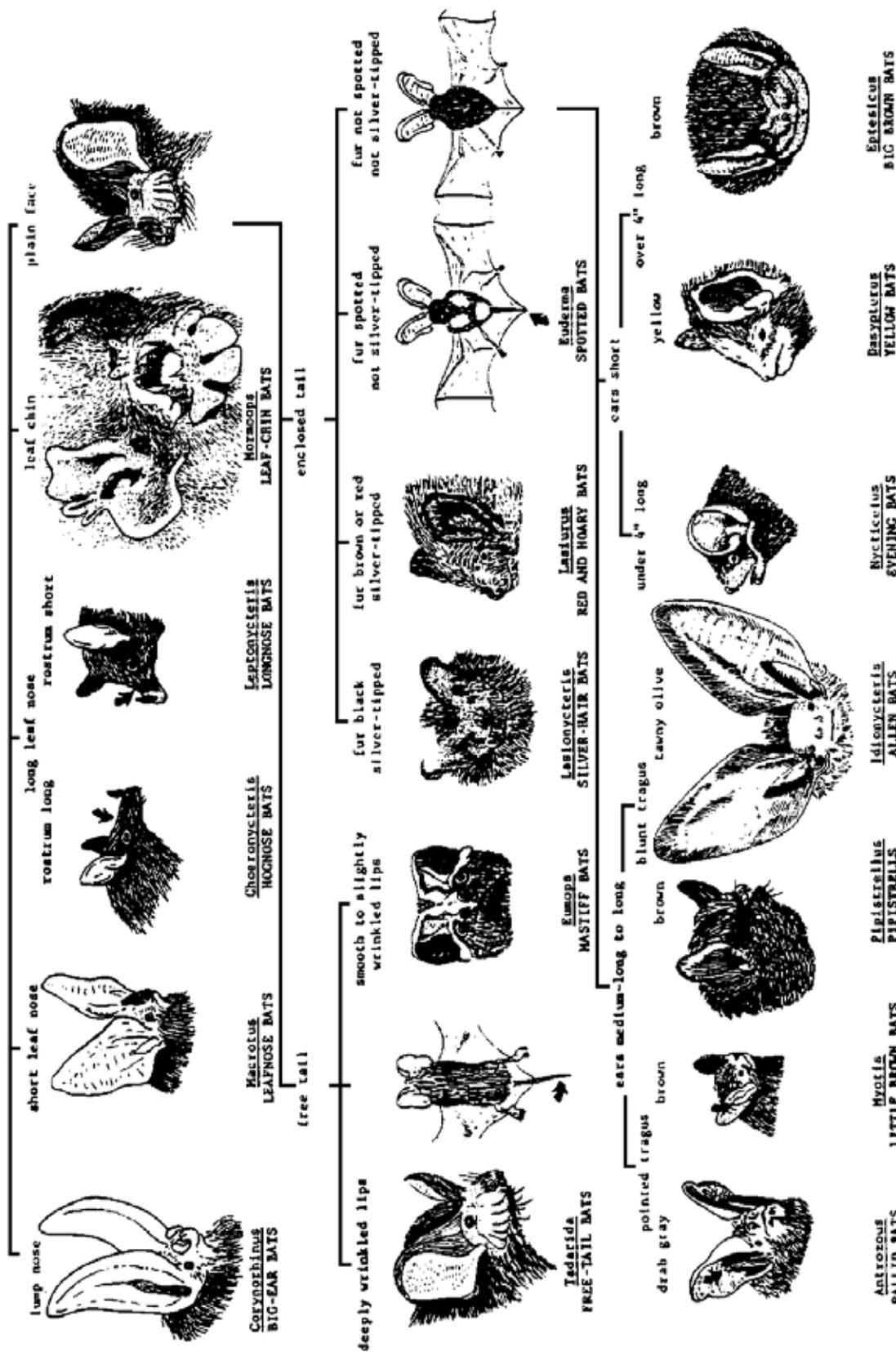
Providing a Bat House

If you want to exclude bats from your house, or just want to attract bats to your yard for mosquito control, you can provide them with a safe and suitable alternate home in a bat house. Used for more than 60 years, bat houses look like bottomless bird houses. Small houses may consist of a single narrow chamber, while large ones have partitions inside to divide the space in narrow, bat-sized hangouts. Build the houses from untreated, rough-sided wood, such as cedar or pine boards. Space any inside partitions 2-4 centimeters apart, and cover one side of each partition with fiberglass window screening (do not use metal mesh) to provide a secure foothold for the bats. In cool areas, paint the box a dark color or cover the outside with tar paper to increase the solar heat absorbed by the box and position it so that it receives at least five hours of sunlight a day.

Bat houses should be installed at least 3 - 4 meters (12 - 15 feet) above the ground, where the entry is unobstructed and out of the reach of predators. Bat houses attract more occupants when they are located near a permanent water source - especially a marsh, lake, or river. A bat house can be hung in a tree, but those attached to the side of a building or mounted on a pole have been most successful. Bat houses should face south or southeast to receive morning sun exposure. In regions with hot summers, they may require shade by mid-day.

Bat Control Caution: State and Federal Regulations. Only 6 of the 45 bat species in the USA are federally protected under the Endangered Species Act, but states may differ: In Georgia it is illegal to capture, kill or harm any bat species. In New York all captured bats need to be taken to the health department for rabies testing. You need to know the various laws that are applicable in your state, county and/or city.

BATS: PICTORIAL KEY TO UNITED STATES GENERA
 Harold George Scott and Chester J. Stajanovich



U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
 PUBLIC HEALTH SERVICE, Communicable Disease Center, Training Branch, Atlanta, Georgia - 1960 - Revised 1962

Bats - Typical First Strikes - Wear all the proper protective clothing.

- Inspect where they are entering/leaving. Seal off all of those areas with bird netting and split shot.
- Install bright lights or, better yet, a strobe light, a fan and good ventilation and a loud radio and/or one-way bat doors, nets or cones.
- Install netting with 1/4" holes or lightweight 1/6" - 1/4" polypropylene mesh or a sheet of heavyweight plastic over the openings and install chimney caps. (Note: Whatever you hang, netting, mesh or plastic, it should hang at least 2' below and to the sides of each entry point. It should be propped open so there is a 1" to 2" space between the entry point and the material. This allows the bats to freely leave, but prevents them from re-entering. Leave the material in place for at least several days before permanently sealing the openings.)
- Use fans to ventilate the infested area. Leave lights and a radio on 24 hours a day.
- Try using dog and cat repellents and/or hang long strips of aluminum foil from the rafters, or place several helium filled mylar balloons in the roost at various heights.
- Remove all guano and urine and clean with 1 - 2 oz. Safe Solutions Enzyme Cleaner with Peppermint* and 1 c. borax per 1 gal. hot water. Call the county public health authorities and ask how to clean up and dispose of these materials **before** you begin.
- Still have problems? Read the rest of the chapter.

Mist Nets - Mist nets come in various sizes and are made of a very fine mesh bats can not detect. Mist nets can be set up in attics or rooms or outside to entangle and trap bats that fly into the net.

<http://www.ecotone.pl/index.php?ens=51> or <http://www.hotfoot.com/mist-pd.html>

One-way Bat Release Devices - There are commercial devices available: <http://www.wildlifecontrolsupplies.com> or you can make your own using bird netting with split shot at the bottom: Securely fasten the net above their entry/exit points. Let the net extend below the opening 2' - 3'. The Bats will crawl down and exit but should not re-enter. Another way to use 1/4" - 1/2" plastic netting and create tapering funnels about 3' long. Leave all devices up until you are sure all of the bats are out **before** you seal all of the potential openings!

Ebola Virus - Researchers working in Gabon and the Democratic Republic of the Congo have identified three species of fruit bats as the long-sought animal reservoir of one of the deadliest human pathogens, the Ebola virus. Ebola hemorrhagic fever first emerged in 1976 in 55 villages near the headwaters of the Ebola River, killing 9 out of every 10 people it infected. There have been 17 outbreaks since then. There is no cure for the disease.

Once control has been reached: Exclusion is the safe solution!

- Caulk or repair with mesh wire or wood sealers all known entry areas including any potential areas, e.g., all cracks, crevices, holes and other openings the size of a dime or larger into the building.
- Keep all previously infested areas well lit, well ventilated, cool and screened/sealed off.
- Continue to monitor at night. Continue to listen for scratching sounds coming from walls or ceilings in the morning and late afternoon.
- Check out the web site at <http://www.batcon.org>.
- **Always check state and local laws regarding any bat control and/or cleanup procedure before you start!**

Good luck with your BATtle!



*Safe Solutions products may be purchased online at:
<http://www.safesolutionsinc.com>
or by telephone at:
1-888-443-8738.