



# Bats

## Integrated Pest Management for Home Gardeners and Landscape Professionals

**B**ats (Figure 1) are small, flying mammals from the order Chiroptera. Of the 25 species found in California, almost all are insectivores that feed on vast numbers of night-flying insects, making them an important part of the ecosystem. In most cases, bats don't cause problems for residents or gardeners, and because of their nocturnal habits, you will rarely see them. Because they eat insects, bats will also provide some control of insect pests in the landscape.

While largely considered beneficial, bats can also be pests and can carry diseases and ectoparasites. Problems often happen when migrating bats roost in buildings, usually during warmer months. Their droppings can accumulate, they can make noise, and some people are uncomfortable with close proximity. Bats can also transmit diseases, with rabies being a special concern. This publication addresses bats as pests around homes and other buildings.



**Figure 1. Pallid bat, *Antrozous pallidus*, in flight with grasshopper**

### IDENTIFICATION AND BIOLOGY

Several of these species—pallid bat (*Antrozous pallidus*), big brown bat (*Eptesicus fuscus*), Yuma myotis bat (*Myotis yumanensis*) and other *Myotis* species (Figure 2), and Mexican free-tailed bat (*Tadarida brasiliensis*) (Figure 3)—frequently use man-made structures such as attics, barns, or bat boxes for roosting sites and are the

species you will most likely find in urban areas.

Bats have relatively long lives—5 to 30 years depending on the species—and are among the slowest reproducers for their size of any mammal. For example, the little brown bat, the most frequent user of artificial bat habitats in the United States, can live for 3 decades with the female giving birth to 1 pup per year.

As mammals, bats have fur, give birth to living young, and provide their young with milk. In spring, female bats form colonies to give birth and rear young. Roosting sites include buildings, bridges, or other structures as well as caves or tree cavities. Adults leave roosts at night to forage for insects. Young bats develop rapidly, and most are able to fly within a month or two after birth. Generally, males and females with young will roost separately, but in late summer or fall, males can join the colony. Bats may



**Figure 2. Two adult bats, *Myotis* species, hang from the peak of a roof truss.**

migrate to warmer areas or hibernation roosts in the winter when insects are scarce.

Bats are excellent flyers and navigate using echolocation to capture insects in flight during the night. Because bats consume large numbers of insects, some people have installed bat houses with the idea that colonizing bats might control mosquitoes or other pest insects.

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## PUBLIC HEALTH CONCERNS

Although bats provide benefits by feeding on insects, they can also carry diseases to humans and other animals. You can greatly minimize the risk of disease transmission by never handling bats, not breathing dust from bat droppings (called guano) (Figure 4), and vaccinating your dogs and cats against rabies. It is very important to educate children never to touch a bat, dead or alive.

Bats also create unsanitary conditions when their droppings and urine accumulate beneath roosts, creating odors and attracting insects. More information regarding bats and disease prevention is available from the Centers for Disease Control and Prevention.

### Rabies

Rabies is a viral infection of the central nervous system that causes inflammation of the brain, and sometimes the spinal cord, in humans and other mammals. Once symptoms appear, the disease is almost always fatal. A rabies exposure requires contact with an open wound, abrasion, or mucous membrane—such as the eyes, nose, or mouth—and a rabid animal's saliva or nervous tissue. Non-bite exposure to the virus is extremely rare, and no evidence exists of transmission through contact with urine or feces.

According to the World Health Organization, it is estimated 59,000 humans die from rabies each year worldwide, and 99% of these deaths are due to contact with rabid dogs (World Health Organization, [www.who.int/rabies/epidemiology/en/](http://www.who.int/rabies/epidemiology/en/)). The threat of rabies is virtually nonexistent for anyone who vaccinates all family dogs and cats, avoids contact with unfamiliar animals, and never handles wild mammals. Any bat or other wild animal that you can catch is likely to be sick, so only an expert should handle them. Laboratory personnel, biologists, or other individuals who have a high probability of contact



**Figure 3. Mexican free-tailed bat, *Tadarida brasiliensis*, in flight.**

with infected animals can receive a series of pre-exposure vaccinations to simplify treatment if exposed.

Like all mammals, bats can contract rabies, but even rabid bats rarely bite except in self-defense. Potentially rabid animals that health department personnel test usually are sick or injured and have had human or pet contact. In tests of randomly selected bats, no more than 0.5% have been rabid, and no evidence exists that rabies from bats ever has triggered an outbreak of rabies in other animals. However, the odds of a rabies infection in a sick bat—those most commonly handled by the public—are higher. Overall, the odds of being harmed by a bat are remote for those who don't handle them.

If you are accidentally bitten while handling a bat, make sure you save the mammal for examination and contact your county health department. Immediately wash the bite with soap and water and seek prompt medical advice. A non-bite exposure should be treated in the same manner as a bite. According to the Centers for Disease Control and Prevention, modern rabies treatment is highly effective and relatively painless. If disease symptoms appear, treatment might no longer be possible which could lead to death, so it is important not to wait to seek medical advice from a physician or health authority.



**Figure 4. Accumulation of bat fecal pellets on a ceiling.**

### Histoplasmosis

The fungus *Histoplasma capsulatum* causes the respiratory illness histoplasmosis. The fungus occurs naturally in the soil in warm, humid areas, and bat and bird droppings enhance its development. Human infection occurs by inhaling the fungal spores that disperse when dry fecal deposits are stirred up. Bird roosts are the most important sources of the infection, and more than 99% of all cases in the United States are found in the Ohio and Mississippi river valleys. This disease rarely has been reported in California.

The fungus normally doesn't survive in hot, dry environments like attics. However, to reduce risk of exposure, persons cleaning up either bat or bird droppings should wear proper personal protective equipment including respirators that filter particles as small as 2 micrometers. In some situations, a wetting solution can help keep dust down.

### Bat Parasites

Ectoparasites are organisms that live on the outside of their host animals. Bat ectoparasites include fleas, flies, chiggers, ticks, mites, and true bugs such as bat bugs. Bat bugs (*Cimex pilosellus*) are closely related to bed bugs (*Cimex lectularius* and others) and the two are so similar in shape, size, and coloring that they are easily mistaken for one another. Examination under a microscope is needed to distinguish

bat bugs from bed bugs. The primary hosts of bed bugs are humans while bat bugs feed on bats. While bat bugs can bite a human, they cannot reproduce without a bat host. For more information on bed bugs, see [Pest Notes: Bed Bugs](#).

Most bat parasites are host specific and cannot survive on other animals. No evidence exists of disease transmission to humans or domestic pets from bat parasites. Parasites that remain after bats have been removed from buildings soon die without their hosts.

## MANAGEMENT

Bats found on the ground or out in the open during the day are not always sick. Sometimes the bat is tired from long migration flights. If they are in an area where they aren't harming anyone and pets and children are unlikely to find them, leave them alone for an hour or two.

If they are in an area where children or animals could find them, gently scoop the bat into an open box, wearing leather gloves to prevent touching the bat with bare hands, and move it to a place where no one can come into contact with it. If the bat has been in contact with pets or people, take it to the county health department so trained professionals can check it for rabies. Once a bat has died, it is too late to check for rabies, because the rabies virus dies shortly after the host does.

Sometimes a colony of bats will show up at a house in the spring or fall. Often this is a migratory colony, and it will move on after a few weeks of rest. If the bats are in an area that can be tolerated, such as an outside eave, wait a few weeks, and once the bats have left, seal the area so they can't return.

Bats roosting in barns or other outdoor buildings probably won't cause any harm. Some people encourage bats by placing bat houses on their property. However, because of the

threat of rabies and other diseases, bats should be discouraged from nesting at locations where people congregate, such as schools, parks, public buildings, or homes. Bats flying inside inhabited buildings should be removed or excluded.

If bats could be roosting in a building, carefully look for signs of them. Bats can squeeze through openings as small as  $\frac{1}{4}$  inch. Cracks around windows, doors, pipes, electrical wiring, or vents can provide access. Being alert to off odors or to droppings beneath openings can help you locate roosts and entry points. Return late in the evening, just before dark, to observe how bats are gaining entry into a building by watching where they fly out. Exclusion is the primary way to manage bats, but be sure all bats have left the structure before sealing it up completely.

Most bats you discover indoors will be flying, but some could be roosting or asleep. During cool weather, bats can become torpid; this reduced activity is due to a lowering of their body temperature. Torpid bats can appear to be sick or dead or might bare their teeth or hiss, a defensive behavior to ward off potential predators. It often takes up to an hour or more for a torpid bat to warm enough to take flight. Gently scrape a torpid bat into a can or box, cover the can, allow the bat to warm up in safety, then release it outside. Never handle bats without wearing leather gloves, since a frightened animal is likely to bite in self-defense.

### Removal from Dwellings

A bat that flies into human living spaces is usually a lost, young one, and its only goal is to escape. A sudden, panicked exit by humans probably is the worst possible action, as it can cause the bat to hide, making it not only difficult to find but almost impossible to notice if it manages to find a way out on its own.

The best action is to keep the flying bat in sight while closing doors to other



**Figure 5. A mesh net is a simple way to exclude bats from a structure.**

parts of the house and isolating the mammal to a single room where no pets or family members are present. If possible, open doors and windows to the outside, so the bat can find its own way of escape. As a further attempt, wait until the bat lands, and approach it slowly. Place a small box or coffee can over the bat, and gently slide a piece of cardboard beneath the container, trapping the bat inside. Then release the bat outdoors. Wear leather gloves to avoid being bitten.

As a last resort, try to catch a bat in flight using a fishing or butterfly net swung from behind. However, it sometimes is difficult to release bats from netted material. If this occurs, turn the net inside out, and let the bat try to work itself free. Avoid handling any bat unless wearing leather gloves.

### Excluding Single Bats

Bats can enter through open doors or windows. Other common entry points include chimneys that don't have grates and doors with loose-fitting screens. Placing  $\frac{1}{2}$ -inch or smaller welded wire mesh (Figure 5) over chimney tops and installing tighter-fitting screen doors can solve these situations. Check with the local fire department for local regulations on spark arresters. Conduct a room-by-room search for other points of entry, and seal holes that are more than  $\frac{1}{2}$  inch in diameter or cracks that are  $\frac{1}{4}$  by 1- $\frac{1}{2}$  inches or larger. Close

openings around plumbing pipes by using steel wool or other suitable material. Bats don't chew holes or gnaw electrical wires.

### Excluding Bat Colonies

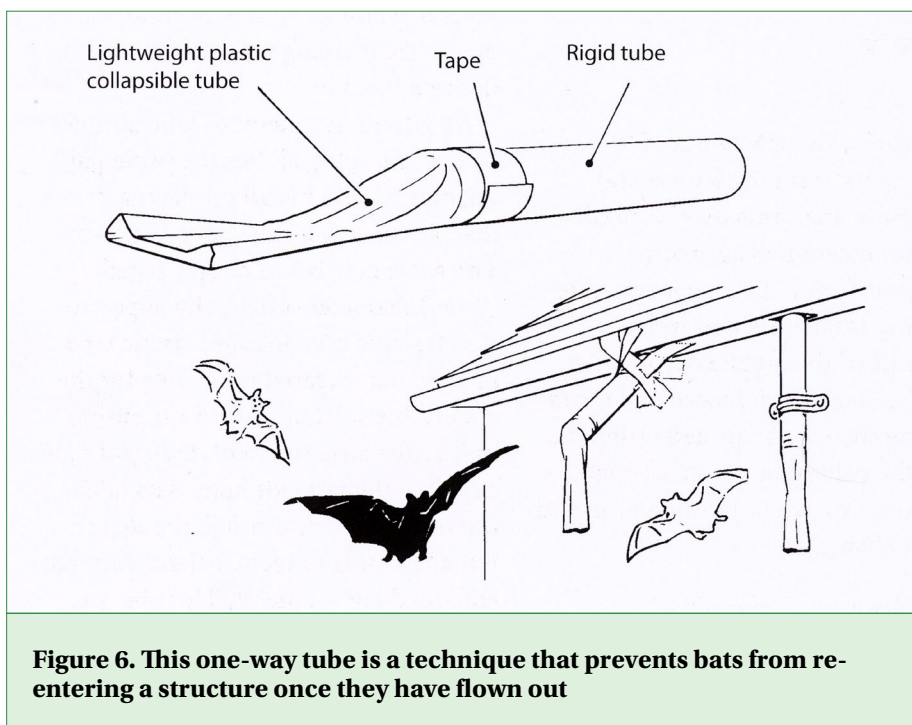
Large numbers of bats living in attics or walls are undesirable. Most bat colonies are small and go unnoticed for years, but when odor or noise increases or bat droppings accumulate, eviction and exclusion are the only safe and permanent remedies.

Entry points of large colonies are usually obvious. When bats start emerging at dusk to feed, watch the building to see where they exit. Daytime inspection should reveal the holes or cracks they are using. Often, these will be beneath eaves, around the chimney, around air and plumbing vents, near loose boards, beneath roof caps, or in openings that squirrels or other animals have made.

Another sign of a bat entry point is the staining caused by body oils (similar to rodent "rub marks"), bat urine, and bat droppings. Bat droppings, known as guano, crush easily, revealing shiny bits of undigested insects. Mouse droppings lack the shiny bits, and bat droppings never are white or chalky as are bird droppings. Seal entryways with caulking, putty, duct tape, self-expanding polyurethane foam, or hardware cloth (¼-inch mesh) after excluding the bats.

Avoid excluding bat colonies when flightless young could be present, usually May through September in California. Excluding the parents will starve the young and create odor problems and an infestation of flies. Most bats leave in late fall in most areas, making winter an ideal time to implement exclusion techniques.

If exclusion needs to be done before bats have moved out of a structure, provide a way for them to leave at night that doesn't allow them to re-enter. A relatively simple technique involves hanging ½-inch polypropylene bird netting, or another



**Figure 6. This one-way tube is a technique that prevents bats from re-entering a structure once they have flown out**

type of fabric that allows light to show through, above the exit using duct tape or staples, so bats can still see their exit hole. One netting vendor is Wildlife Control Technology ([www.wildlife-control.com](http://www.wildlife-control.com)), and bird netting is available at many hardware and garden stores. Attach the netting 12 inches above the exit holes and extend it 12 inches past the sides and bottom. The bottom must hang freely, creating a one-way flap that allows the bats to drop down to leave.

Another method is to insert a 2-inch diameter plastic pipe with a tube of collapsible material, such as plastic tarp, attached to its end (Figure 6). When the bats return, they can't fly back in. Be sure to seal up all other potential entryways.

Bats can be excluded from Spanish tile roofs using bird netting, although the simplest solution is often to install rain gutters. Fill the open ends of the tiles with concrete or tightly fitted bird-stop strips. Mylar strips 2 inches wide by 10 inches long can also deter bats.

Leave the netting or exit tube in place for 7 days to ensure no bats are trapped inside and then make more permanent repairs.

### Chemical Repellents

No pesticides or chemical repellents are registered in California for controlling bats or repelling them from roosting areas.

### Mechanical Repellents

Some mechanical repellents can help discourage bats. Illuminating attic spaces and eaves with electric lights 24 hours a day may be helpful. Cooling an attic with fans can make the temperature unsuitable for roosting, and the increased air movement also can create a less favorable roosting area. All ultrasonic sound generators that have been tested have proven to be ineffective for repelling bats.

## BAT HOUSES

Some people are interested in encouraging bat populations by installing artificial roosting sites or bat boxes. Bat houses aren't likely to discourage bats from roosting in nearby buildings, and there is no clear evidence that their installation will significantly reduce garden insect problems. If you chose to put up a bat house, make sure it is in an area that has minimal

disturbance from people and animals. Sometimes sick bats fall out of the roost where children and household pets can easily pick them up.

Bat houses and bat-house designs are widely available commercially. Follow the guidelines below when constructing and installing a bat house:

- Use rough-sided wood on the interior of the house. Horizontally groove the interior surface for toe holds.
- Roosting chambers should be ½ to 1 inch wide; chambers larger than 1 inch invite wasps.
- Caulk outside seams to limit airflow.

- Use roofing felt (tar paper) or dark roof shingles on top and 6 inches down the sides to increase inside temperatures; a 90°F inside temperature is ideal.
- Install bat houses at least 10 feet above ground with an eastern or northern exposure. Bats prefer houses that get morning sun and afternoon shade.
- Protect the house from prevailing winds, if possible, and provide an unobstructed approach for flying bats.

Bat houses attached to the sides of buildings tend to have the greatest success, but be careful, since bat droppings will accumulate below.

Bat houses on poles in open areas sometimes work, but bats rarely occupy houses placed in trees. Installing bat houses before March improves the chance of occupancy. It is not unusual for bat houses to remain unoccupied for a year or more. Bats prefer houses that are within ¼ mile of water with enough room to drink on the wing. More information on bat boxes is available in the UC ANR publication *Songbird, Bat and Owl Boxes*.



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## WARNING ON THE USE OF PESTICIDES

Pesticides are poisonous. Some pesticides are more toxic than others and present higher risks to people, nontarget organisms, and the environment. A pesticide is any material (natural, organic, or synthetic) used to control, prevent, kill, suppress, or repel pests. "Pesticide" is a broad term that includes insecticides, herbicides (weed or plant killers), fungicides, rodenticides, miticides (mite control), molluscicides (for snails and slugs), and other materials like growth regulators or antimicrobial products such as bleach and sanitary wipes that kill bacteria.

Always read and carefully follow all precautions and directions provided on the container label. The label is the law and failure to follow label instructions is an illegal use of the pesticide. Store all chemicals in the original labeled containers in a locked cabinet or shed, away from food or feeds, and out of the reach of children, unauthorized persons, and animals. Never place pesticides in food or drink containers. Consult the pesticide label to determine active ingredients, correct locations for use, signal words, and personal protective equipment you should wear to protect yourself from exposure when applying the material.

Pesticides applied in your garden and landscape can move through water or with soil away from where they were applied, resulting in contamination of creeks, lakes, rivers, and the ocean. Confine pesticides to the property being treated and never allow them to get into drains or creeks. Avoid getting pesticide onto neighboring properties (called drift), especially onto gardens containing fruits or vegetables ready to be picked.

Do not place containers with pesticide in the trash or pour pesticides down the sink, toilet, or outside drains. Either use all the pesticide according to the label until the container is empty or take unwanted pesticides to your local Household Hazardous Waste Collection site. Contact your county agricultural commissioner for additional information on safe container disposal and for the location of the Hazardous Waste Collection site nearest you. Follow label directions for disposal of empty containers. Never reuse or burn the containers or dispose of them in such a manner that they may contaminate water supplies or natural waterways.

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