



## The Nature of Bats

by Suzanne Petersen

Bats have long been associated with spooky witches, ghosts, and goblins, but the more bats are studied, the more they are viewed as valued members of the natural community. Bats are diverse and interesting, and they have more reason to fear humans than humans have to fear them. They are active at night, but they are definitely not from the "dark side". For bats, truth is far more interesting than fiction, so read on!

### Flying Mammals

Bats are true mammals in that they give birth to live young, produce milk to feed their young, have hair, and they are warm-blooded (they can self-regulate their body temperature). Bats are unique among mammals in that they can fly. (Animals such as flying squirrels do not actually fly: they use a flap of skin connecting their arms and legs to glide from one place to another.) Bats began to appear in the fossil record 52.5 million years ago. They belong to the scientific order of Chiroptera, meaning "hand wing".

The skeleton of bats shows that the bones of the wing are the same bones found in a hand, with four fingers and a thumb. Bats use their wings to fly, and they often use them to catch their prey, mostly flying insects. Even though most bats are small and resemble rodents, they are not rodents. In fact, bats are more closely related to small, tropical primates than to rodents.

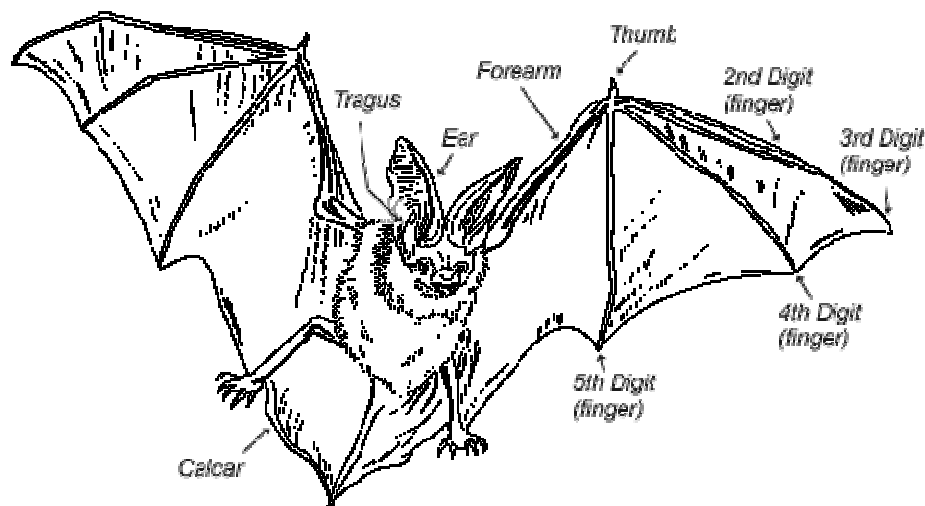


image from [www. ct.gov](http://www.ct.gov)

Although bats fly, they do not fly as birds do. Most of the flight muscles controlling the bat's wing beat are attached to the shoulder blades and only one muscle is attached to

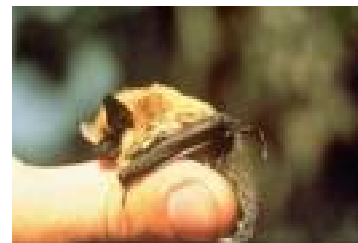
the breast bone that sits amid flattened ribs. These adaptations create a light but sturdy frame and provide bats with their incredible agility in flight. In contrast, birds have flight muscles that are braced against a rounded rib cage and the prominent keel on the breast bone allows many heavy muscles to be attached, giving birds much greater strength and endurance.

Bats are found on every continent except Antarctica, and approximately 1000 different species exist. The United States has 40 species. As a percentage of total mammal species on earth, bats account for about 25%, rodents account for almost 50%, and all other mammals account for the remaining 25%.

Bats give birth to single or occasionally twin pups that are up to 35% adult size at birth and are fed exclusively on milk until they approach 90% adult size (after just a few months). Imagine a human mother giving birth to a 50-pound baby and breast-feeding it until it was in high school! Mother bats often share baby-sitting duties and orphaned baby bats are sometimes adopted. Mortality among pups is high, mostly due to being jostled in the nursery and then falling to the ground. The ground is a hazardous place where predators or disease can kill the vulnerable pups if they are unable to crawl back up to the nursery. Fortunately, bats grow quickly to become independent. Unlike short-lived rodents of the same size whose life span may be only a few years or less, many bats can live 20 years or more.

The largest bat species in the world is the giant golden-crowned flying fox (*Acerodon jubatus*), a rare fruit bat of south central Asia. The maximum size can approach 1.5 kg (3.3 lb), 55 cm (22 in) long, and the wingspan may be almost 1.8 m (6 ft).

The smallest bat (also the smallest mammal) in the world is the bumble bee bat, *Craseonycteris thonglongyai*, also known as the hog-nosed bat. It has an adult body weight between 1.5 and 2.0 grams, and its wingspan is less than 3 inches across. The body is about the size of a large bumblebee. This endangered species was unknown to scientists before 1974. These tiny bats live only in a few limestone caves in Thailand and Myanmar. Another tiny bat is the Philippine bamboo bat, *Tylonycteris pachypus*, and it has a reported weight of just 1.3 grams.



bumble bee bat  
from [www.scienceray.com](http://www.scienceray.com)

## Unusual Mammals

The legs of bats are also special among mammals. Bats are the only mammals whose knees bend backward, not forward. This allows bats to grip with their feet when their knees are bent, a very handy adaptation that allows bats to crawl flat against a surface or to land feet first. In all other mammals, when the knees are bent, the feet face backward. Bats, in this case, are similar to birds.

The feet of bats have additional special traits. In most mammal limbs, gripping is a task that requires the energy of muscles and is a conscious act. In bats, gripping neither requires energy nor conscious thought to be performed. Bat feet grip at rest. To release their grip, bats must make a conscious decision and engage energy-consuming muscles. This adaptation of their feet allows bats to rest safely while hanging upside down. Bat legs are strong for hanging, but not for standing. This hanging adaptation also allows bats to fall into flight, rather than spending a lot of energy building up enough speed for take-off or launching into flight the way birds do. Because bats must be light enough to fly, their bones are very delicate and weak. Birds' bones are stronger than bats' bones, but birds' bones are hollow to reduce weight.

image from [animals.howstuffworks.com](http://animals.howstuffworks.com)









## **Bats at Work**



Most bats eat insects, some eat fruit, a few eat small fish and frogs, and three tropical species sip blood. The bats that eat insects have the ability to find prey using echolocation. First, the bat emits a series of sounds. These sound waves go out and when they hit an object, the waves then bounce back to the bat. Based on the pattern that comes back, the bat can locate its prey.

Bats are the most important predators of night-flying insects. One of New Hampshire's common bats, the little brown bat, can eat 1000 mosquitoes in just one hour. Bats not only help to control the number of pesky insects in our lives, but bats that eat fruit and nectar are essential for pollination and seed dispersal for bananas, cashews, dates, figs, giant cactus plants, and mangoes that grow in warmer climates. Because all bats are nocturnal, meaning they are active at night, fruit-eating bats often locate the area of their food by smell and then use their keen eyesight to locate individual morsels. With the exception of three flower-eating species that migrate from Mexico, all the bats in the United States are insectivores.

## **At Home with Bats in New Hampshire**

New Hampshire has eight species of bats. The table below summarizes some key information:

species	photo	summer habitat	winter survival	notes
little brown bat	 nps.gov	roosts in human buildings	highly vulnerable during winter, survives on stored fat	NH's most common bat
big brown bat	 nps.gov	roosts in human buildings;	highly vulnerable during winter, survives on stored fat	becoming more common in urban areas
eastern pipistrelle	 nps.gov	roosts in trees	hibernates in caves or mines; highly vulnerable during winter, survives on stored fat	species of conservation concern; please do not disturb their winter caves
eastern red bat	 fs.usda.gov	roosts in trees	non-hibernating, migrates to southern states	species of conservation concern; needs more old forest
eastern small footed bat	 wildlife.state.nh.us	roosts in rock crevices and rocky outcrops	hibernates in caves or mines; highly vulnerable during winter, survives on stored fat	NH state endangered; please do not disturb their winter caves; please be careful when doing maintenance to dams and rip-rap
hoary bat	 nps.gov	roosts in trees	non-hibernating, migrates to southern states	species of conservation concern; needs old forest

northern myotis, a.k.a. northern long eared bat	 <small>biokids.umichigan.edu</small>	roosts in human buildings	hibernates in caves or mines; highly vulnerable during winter, survives on stored fat	species of conservation concern; please do not disturb their winter caves; needs more old forests
silver haired bat	 <small>batsaboutourtown.com</small>	roosts in trees	non-hibernating, migrates to southern states	species of conservation concern; needs more old forests

During the summer, bats can be found throughout New Hampshire in almost every habitat. At night, they can be seen and heard hunting insects around street lamps, over bodies of water, or along paths in the woods. By day, they roost in a number of places, including hanging among tree foliage, under tree bark, in rock and tree crevices, and in human structures.

### Bats Under Attack: Disease and Lack of Understanding



Little brown bats with white nose syndrome, image from [www.fws.gov](http://www.fws.gov)

In addition to the habitat loss and disturbance that almost all bats worldwide face, New Hampshire's hibernating little brown bats and other cave hibernating bats are currently facing a deadly fungus called white nose syndrome. This disease has been found throughout New England, as far south as Virginia, and as far north as Canada. New Hampshire has few natural caves, so many of its bats migrate to these other areas to hibernate for the winter. The fungus attacks bats on their noses, wings, and tails and weakens the afflicted bats. In response, bats sometimes come out of hibernation early, try to find food, and are further stressed. In some affected hibernation sites, the death rate has been as high as 100%. More recently, white nose syndrome has started to affect bats in the summer, as well. The cause has not yet been determined, but scientists are actively trying to learn how it is spread and how it can be prevented. No one wants an ecosystem without a healthy population of bats!

Many people are scared of bats and falsely believe that most or all bats are vampires that can suck blood or transmit rabies. Of all the 1000 species of bats worldwide, only three eat blood. These live in the tropics and normally feed on, but do not kill, cattle as they rest in the field. While it is true that some vampire bats transmit rabies to cattle, bats in the United States have a very low incidence of rabies. The rate is barely a fraction of a percent and there is very little danger to humans. Humans are far more likely to get rabies from skunks or foxes. As with all wild mammals, however, bats should be handled with caution. If a bat enters a house, the best way to handle the situation is to close all doors but leave one window completely open to the outside. The bat will usually leave on its own.

## Helping Our Bat Friends

Bats are good neighbors that eat pesky mosquitoes and moths, serve as essential pollinators and seed dispersers, and are very diverse and interesting creatures. In addition to protecting tracts of old forests and not disturbing caves during winter hibernation, everyone can help to provide bats with a good home by providing access to traditional roosts such as barns and attics or by building simple bat houses for the yard.

The Connecticut Dept. of Environmental Services offers these hints for bat houses:

1. Use the roughest sides of the wood on the inner areas of the house. It is also a good idea to horizontally groove inner surfaces for footholds or attach non-metal screening to provide toe holds. This is also important for landing areas below the entrance.
2. Caulk all outside seams to limit air flow. This helps trap the bat's body heat inside the house. Sealants approved for aquarium or kitchen use are best.
3. Place tar paper or dark shingles on the top and 4 to 6 inches down the side to increase inside temperatures. Nursery roosts often require temperatures of 90 degrees F or more. A dark stain also helps increase the temperature.
4. Hang houses 10 to 15 feet above ground. South and southeast exposures are best for providing maximum thermal gain. Bats prefer houses that get at least 6 hours of sunlight a day.
5. If possible, protect the house from prevailing winds and provide an unobstructed approach.

Bat houses attached to the sides of buildings have had the greatest reported success. Free-standing poles in open areas also work, but tree-mounted houses generally remain unused. Bat houses placed near water or wetland areas often are most successful. Installing a bat house before April improves the chance of occupancy. Don't be discouraged if bats do not immediately move into their new home. It is not unusual for a house to stand empty for at least a year before it is used.

## Small Bat House

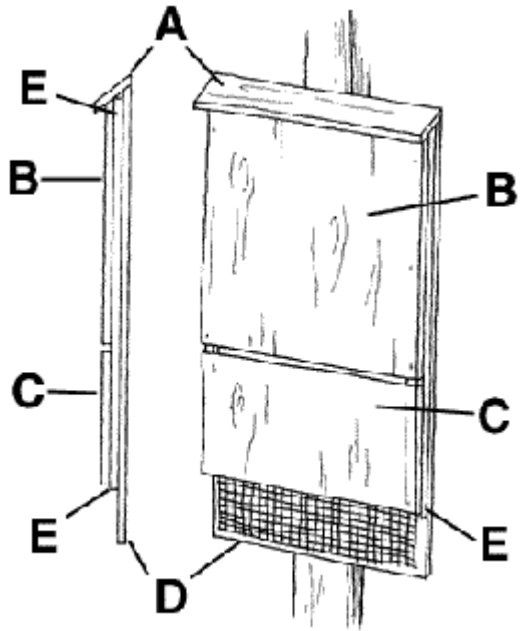
Use rough-cut lumber or exterior grade plywood (1/2" thick minimum). The furring strips (E) should have a finished thickness of approximately 3/4".

Staple 1/8" mesh (HDPE plastic) netting to back and front 2 sections. Make sure mesh extends to bottom of back.

Caulk all pieces and assemble with drywall screws to prevent wood from splitting. Apply additional caulk to outside joints as needed.

Apply dark stain to exterior surfaces and use tar paper or shingles on the roof and the top half of the bat house to increase interior temperatures.

- A Roof 4"x14"
- B Upper front 12"x20"
- C Lower front 12"x10"
- D Back 12"x36"
- E Spacers (1) 2"x12", (2) 2"x30 1/2"



# Large Bat House

Use 1/2" exterior grade plywood for front and back sections; 1/4" for all partitions. Sides are 1"x6" stock.

Staple 1/8" mesh (HDPE plastic) netting to all partitions and the back panel. Apply caulk to all joints.

Begin assembly by screwing the back to the sides. Attach 31" spacers to inside corners.

Place a partition on top of the spacers to within about 1/2" of the roof. Put the next set of spacers (26") on top of the partition and screw into the first spacers.

Repeat for remaining partitions ending with 28 3/4" spacers (flush to roof line). Screw front to sides. Make sure roof angles are aligned.

Screw roof in place and caulk all exterior joints.

Scratch or roughen the front near the vents to provide a toe hold for bats landing on the box.

A dark stain should be applied to all exterior surfaces and tarpaper or shingles to the roof and upper half of the house to increase interior temperatures.

**A** Roof 6"x28"

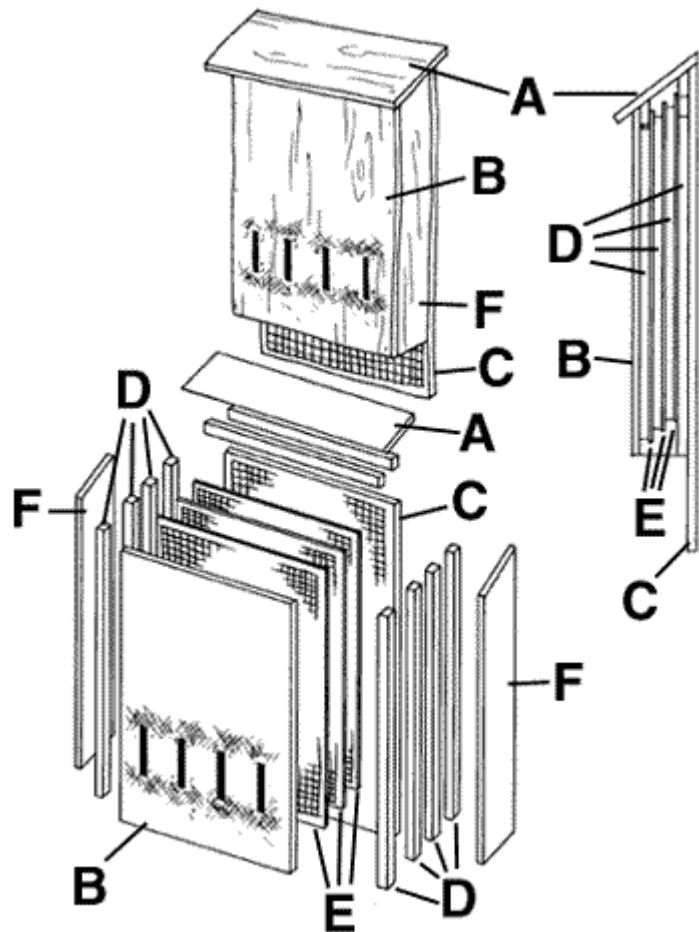
**B** Front 24"x28 3/4" (cut slots for vents, 5" above bottom edge)

**C** Back 24"x36"

**D** Spacers 1"x2" (4) 26" long, (2) 31" long, (2) 28 3/4" long

**E** Partitions 1/4" thick, 3/4" apart, 26" long

**F** Sides 4"x28 3/4"x31" (angle-cut top edges)





For more information on bats, please see the full articles from which information for this article was gathered:

Batting 4,000 (PDF, 928 KB) by bat researcher Dr. Scott Reynolds, from the Sept./Oct. 2007 issue of N.H. Wildlife Journal magazine, pages 8-12.

[wildlife@wildlife.nh.gov](mailto:wildlife@wildlife.nh.gov)

Smithsonian Institute [www.si.edu/Encyclopedia\\_SI/nmnh/batfacts.htm](http://www.si.edu/Encyclopedia_SI/nmnh/batfacts.htm)

Humane Society of US [www.hsus.org/wildlife/a\\_closer\\_look.../bats/bat\\_facts.html](http://www.hsus.org/wildlife/a_closer_look.../bats/bat_facts.html)

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