

**PART EIGHT:**  
Habitat  
Management  
for Nongame  
Species



## 29. BATS

### SUMMARY

Bats play an important role in Vermont's ecosystem, eating one-half of their weight in insect pests each hour. Many Vermont bat populations, already in decline from habitat loss, have been decimated over the last several years due to a fungus that causes white-nose syndrome. To help bats thrive on your land, leave dead snag trees standing, particularly trees with sloughing bark or cavities. Consider building a bat house for your property or allowing bats to enter any old barns or abandoned buildings on your land. Maintain forest connectivity among forest patches and wetlands, streams, and other bodies of water. If you think bats may be using a cave on your land as a hibernaculum, do not alter or block cave entrances or visit caves during the winter when bats are hibernating.

### NATURAL HISTORY

Bats are one of the most diverse groups of mammals and play a significant role in keeping insect populations in balance with our ecosystems. Bats comprise one-fourth of the world's mammals. Of the nearly fifty species of bats found in the United States, nine occur within Vermont. All of Vermont's bats are insectivorous, meaning they eat insects, primarily beetles, moths, and smaller flying insects such as mosquitoes. Bats' importance in controlling both native and nonnative insect pests has been demonstrated in studies that document feeding rates of more than 1000 insects per hour!

Most of the world's bat species are declining in numbers and many are considered endangered, likely due to the negative effects of deforestation, contaminants, and persecution by humans. Five of Vermont's bat species are now officially designated as endangered, most of which have been severely decimated during the past five years by the spread of white-nose syndrome, a condition caused by an invasive fungus spreading to many bat caves.

Bats are long-lived mammals (i.e., 20 to 30 years) with low reproductive rates; most Vermont bats produce only one pup per year. For this reason, Vermont landowners can play an important role in providing both artificial and natural habitats to enhance survival and productivity of Vermont's bats.

Vermont's nine species of bats can be separated into two groups; the smaller "cave bats," which hibernate in caves and mines during the winter season and congregate in "maternity colonies" during the summer to give birth to young, and the larger "tree bats," which roost (i.e., spend the day) among tree foliage and migrate south for the winter (see **Table 29.1**).

At least 30 caves and mines in Vermont are known to serve as significant winter hibernacula for Vermont's six species of cave bats. Many of these caves have seen precipitous declines in bat numbers due to white-nose syndrome. In some instances, bats found in Vermont during the summer are known to hibernate in mines in New York. Bats travel to their hibernacula in late summer or early fall and "swarm" to breed near cave entrances for a month or more prior to hibernation.

To help bats thrive on your land, leave dead snag trees standing, particularly trees with sloughing bark or cavities.



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Given the variety of habitats used by bats in Vermont, if your property has forestland, streams, or wetlands it likely provides suitable habitat for bats.

**Table 29.1**

Winter and summer roosting habitat of Vermont's bat species.

Species of Bat	Winter Habitat	Summer Roost Type
<b>CAVE BATS</b>		
Little brown bat ( <i>Myotis lucifugus</i> )*	Cave/Mine	House, barn, bat house, dead or dying trees
Big brown bat ( <i>Eptesicus fuscus</i> )	Cave/Mine, House attic or cellar	House, barn, bat house, dead or dying trees
Northern long-eared bat ( <i>Myotis septentrionalis</i> )*	Cave/Mine	Dead or dying trees
Indiana bat ( <i>Myotis sodalis</i> )*	Cave/Mine	Dead or dying trees
Small-footed bat ( <i>Myotis leibii</i> )*	Cave/Mine	Rock ledges and cliffs, dams
Tri-colored bat ( <i>Perimyotis subflavus</i> )*	Cave/Mine	Live and dead foliage
<b>TREE BATS</b>		
Red bat ( <i>Lasiurus borealis</i> )	Migrates south	Live foliage
Hoary bat ( <i>Lasiurus cinereus</i> )	Migrates south	Live foliage
Silver-haired bat ( <i>Lasionycteris noctivagans</i> )	Migrates south	Dead or dying trees
* Threatened or Endangered		

Upon emergence from caves in the spring (usually mid-April through May in Vermont), bats travel to their traditional summer range where the females set up maternity colonies in house attics, barns, large dead or dying trees, or even rock cliffs. Male bats may remain near hibernacula or travel to summer range where they remain solitary or in small bachelor groups. Bats are very sensitive to cool temperatures and need to roost with groups of other bats in places that receive solar radiation in order for their young to develop and survive.

In contrast, the tree bats migrate back to Vermont in the spring, often hanging among the foliage of large live trees that provide optimum cover and thermal conditions.

Given the variety of habitats used by bats in Vermont, if your property has forestland, streams, or wetlands it likely provides suitable habitat for bats. Recent research on Indiana bats indicates that this federally and state-endangered species establishes summer maternity colonies in the southern Champlain Valley of Vermont. If you live within this region, you are strongly encouraged to consider maintaining quality maternity roost trees and foraging habitat so that this species can be maintained and, preferably, recovered.



## HABITAT REQUIREMENTS

The keys to providing quality habitat for Vermont's bats are:

- Protecting caves and mines used by hibernating bats;
- Maintaining a mixture of suitable summer roosting sites such as roost trees, bat houses, and rock ledges;
- Maintaining a diversity of forested habitat conditions that includes a variety of stand structure; and
- Maintaining forest connectivity among roosting sites, foraging habitat, and aquatic features such as streams, rivers, and wetlands.

Vermont's cave bats must hibernate in caves and mines that offer a constant temperature just above freezing. These temperatures allow bats to maintain torpor to reduce energy consumption. Bats are extremely vulnerable to disturbance during this period, with each awakening costing the animals many days of critical energy reserves. Because bats are extremely concentrated during winter, they are vulnerable to disturbance by humans, predators such as raccoons, weasels, and domestic cats, and changes to the cave environment caused by human or natural alteration of the cave entrance or passages. Vermont bat hibernacula range in numbers of bats from as few as 30 to more than 25,000.

It is important for forestland surrounding hibernacula to provide suitable roost trees such as large snags in various stages of decay with loose bark, crevices, and cavities. These trees are particularly used in the fall and spring as the cave bats swarm or emerge, respectively.

As a general rule for Vermont's bats, lands providing a matrix of openings and interconnected forestland composed primarily of saw timber-sized or older stands provide the most suitable habitat for bats. Hardwoods generally provide better forest structure than softwoods for foraging habitat.

Access to sources of water is extremely important as bats do not store much water in their body due to the high-energy cost of flying. Open water also provides a concentrated source of insects. Forest connectivity and riparian corridors along streams, wetlands, vernal pools, and ponds are important in providing access to sources of water. Lastly, forest roads often serve as flight corridors that enable bats to quickly move between roosts and feeding sites.

**Figure 29.1**

Bats hibernate in caves and mines that offer a constant temperature just above freezing.

You can create quality bat habitat by maintaining a mixture of forest age classes available in adequate supply, openings that provide forest edge habitat, and access to forested buffers along streams, wetlands, and water bodies.

## HABITAT MANAGEMENT

In general, bat habitat management is very compatible with most forest management activities, provided there is an adequate supply of current and future roost trees. You can create quality bat habitat by maintaining a mixture of forest age classes available in adequate supply, openings that provide forest edge habitat, and access to forested buffers along streams, wetlands, and water bodies.

Landowners within the southern Champlain Valley of Vermont should pay particular attention to the likelihood that their forestland serves as habitat for a summer maternity colony of federally and state-endangered Indiana bats. More detailed forest management guidelines are available from the Vermont Fish and Wildlife Department when considering this species. (See **Resources** for contact and other information.)

### **Summer Range Habitat**

Summer habitat comprises two components: *maternity roosting sites* where young are born and raised, and *foraging habitats* that provide a plentiful supply of insects upon which to feed.

**Maternity Colonies in Trees.** Bats species across the state use dead and dying trees to roost during the day and raise their young before they are able to fly. To provide this habitat you can do the following:

- Maintain and establish five to seven large roost trees of various stages of decay and size classes per acre. Roost trees should be represented within each of three size classes (less than 10-inches diameter at breast height (DBH), 10- to 18-inches DBH, and greater than 18-inches DBH). These trees should either be live shagbark hickories or dead or dying trees showing signs of cracks, crevices, loose bark, or cavities. These trees should be dominant or co-dominant in the forest stand.
- Enhance the value of roost trees by increasing solar radiation by removing some or all of the adjacent trees. Roost trees should not be isolated, however, from forest cover.
- Limit the dense vegetation directly at cave or mine entrances in order to provide space for swarming activity.
- Where an inadequate supply of dead or dying trees exist, large cull hardwood trees should be girdled to allow for decay to create a roost tree for the coming 3 to 5 years.
- Enhance existing and potential roost trees through selection harvesting or small group selection that opens up the canopy and improves solar exposure of the roost tree. Roost trees should not be isolated from forest cover.
- Maintain or recruit a supply of large-crowned live hardwood trees for tree bat roost sites. These trees should be dominant or co-dominant in the forest stand with an open understory beneath. Trees along forest edges or riparian areas are also most likely to be used by tree bats.

**Maternity Colonies in Building and Barns.** Landowners with bat colonies in their buildings or barns are encouraged to contact the Vermont Fish and Wildlife Department for information how to exclude bats from buildings. Bats should not be killed and entrances in buildings should not be sealed until the young are able to fly. (For more information, refer to the Vermont Fish and Wildlife Department pamphlet “Bats in Your House” at the link in **Resources**.)

**Maternity Colonies in Bat Houses.** Bat houses are valuable structures to establish or enhance maternity colonies of little brown and big brown bats. In Vermont, you should paint bat houses black and place them in a

location that will receive at least 8 hours of direct sunlight. Bat houses may be placed near dwellings, but can also be located on poles near aquatic features such as rivers, streams, and wetlands. (For more information on attracting bats, refer to **Resources**.)

**Maternity Colonies in Rock Cliffs and Ledges.** All rock cliffs and ledges receiving any solar exposure are potential roosting sites for the state threatened small-footed bat. Where these habitats exist on the parcel or within 2 to 3 miles maintain them with contiguous forest cover in saw timber or older stands and with forest connectivity to aquatic features such as streams, rivers, and wetlands.

### ***Foraging Habitat***

In general, both even-aged and uneven-aged forest management are compatible with suitable foraging habitat for bats. Foraging habitat is best provided through maintaining forest patches and connectivity to roosting sites and aquatic features.

You can provide optimum bat foraging habitat through the following land management activities:

- Maintain a matrix of forestland (primarily comprised of saw timber-sized and older forest stands), openings that provide for forest edge, and forest connectivity to sources of water.
- Favor hardwood stands for establishing or enhancing bat foraging habitat.
- Thin forest stands to enhance the site for bat flight and make small group selections to create gaps in forest cover that provide edge habitat.
- Create openings in young stands to develop edge habitat.
- Maintain or establish forest roads as flight corridors between quality roost trees and older forest stands and sources of water.
- Maintain forested buffers along sources of water (e.g., streams, rivers, and wetlands), including forest cover near ponds. Forested buffers large enough to provide instream structure from fallen trees enhance bat habitat by creating slow moving pools of water for drinking and feeding.
- Maintain forest cover surrounding vernal pools.
- Maintain or expand hedgerows between forest patches and aquatic features.

### ***Winter Hibernacula***

If you have a cave or mine on your property, you should contact the Vermont Fish and Wildlife Department to determine if the site serves as a hibernaculum for bats. If so, you should make plans to maintain the cave/mine and minimize human disturbance of the site during the period from September 1 through May 31. Landowners with property within a 5-mile radius of a bat hibernaculum are more likely to have resident bat populations, particularly during the spring and fall. By following the guidelines above for maternity colonies in trees, you will satisfy the roost tree requirements for bats as they congregate around caves/mines during the fall and spring.



## **RESOURCES**

Vermont Fish and Wildlife Department. "Attracting Vermont's Bats." [http://www.vtfishandwildlife.com/library/factsheets/nongame\\_and\\_Natural\\_Heritage/Attracting\\_Vermont's\\_Bats.pdf](http://www.vtfishandwildlife.com/library/factsheets/nongame_and_Natural_Heritage/Attracting_Vermont's_Bats.pdf)

—. "Bats in Your House." [http://www.vtfishandwildlife.com/library/factsheets/nongame\\_and\\_Natural\\_Heritage/Attracting\\_Vermont's\\_Bats.pdf](http://www.vtfishandwildlife.com/library/factsheets/nongame_and_Natural_Heritage/Attracting_Vermont's_Bats.pdf)

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