NRCS Natural Resources Conservation Service
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WILDLIFE HABITAT COUNCIL℠

Bats

(Order: Chiroptera)

August 1999 *Fish and Wildlife Habitat Management Leaflet* *Number 5*

General Information

Over 920 species of bats exist worldwide, accounting for nearly one-quarter of all known mammal species and distinguishing Chiroptera as the second most specious mammalian order next to rodents. The name Chiroptera means "hand-winged," and bats exist as the only mammals to exhibit true flight using wings adapted from arm, hand, and finger appendages. The use of sonar-like echolocation to navigate and hunt for food during nighttime hours is characteristic to bats. Bats are one of the least studied and most misunderstood mammals, particularly in the United States. They are also considered to be among the most beneficially influential mammal species to humans, plants, and other wildlife.

The global importance of bats in pollination, seed dispersal, and insect control has been proven to be extremely significant. Unfortunately, human ignorance, fear, myth, habitat destruction, and bats' slow reproductive rates continue to contribute to the decline of many bat species worldwide. Forty percent of American bat species are either in severe decline or have already been listed as endangered. Because of bats' role in keeping crop pest insects in check, bat declines in agricultural regions can have negative economic effects for both farmers and consumers as a result of increased annual crop damage. Ecologically, the extirpation of bats from an area can increase the need for use of chemical pesticides, as well as leave plant communities that rely on bats for pollination and seed dispersal without reproductive capabilities - potentially threatening entire ecosystems.

This leaflet is designed to underline the ecological and economic importance of bat species found within the United States, serve as an introduction to the habitat requirements of those species, and assist land managers in the development of comprehensive bat management plans. The success of any species management plan depends on targeting the specific needs of the desired species and analyzing the designated habitat area as a whole to ensure that all required habitat elements are present. This guide also provides monitoring guidelines to document success and to ensure that problems are addressed as they arise.

Distribution and Range

Distribution—Bats have nearly global distribution, absent only from extreme arctic regions, extreme deserts, and remote islands. The greatest diversity in species is found in warmer climates. Bats are divided into two distinct suborders. Megachiropterans, often referred to as flying foxes or fruitbats, feed solely on fruits and other plant materials and are distributed throughout the Old World tropics. Microchiropterans, all other bats, are insectivorous, carnivorous, nectivorous (nectar-eating), and frugivorous (fruit-eating), and are found throughout the world.

Range—Within the United States, the ranges of individual bat species, as well as individual bats within those species, vary with regards to the regions in which the species or individuals live. A species inhabiting a tropical region may likely have a small range, whereas a species inhabiting a region with a winter season may migrate to warmer climates in colder months, thus possessing a much larger range. Migratory species common to the United States that pass through states with seasonal climates can range from northern Canada throughout Central America.

Bats of the United States

There exist 45 species of bats in the United States belonging to four different families. Each of the 50 states support bat species, with the greatest concentrations occurring in the southwestern states of Texas, New Mexico, Arizona, Nevada, and southern California.

Family	Number of species	States found in	Foods eaten	Status
Mormoopidae -Ghost-faced bats	1	AZ, TX	Insects	Common
Phyllostomatida -Leaf-nosed bats	5	AZ, CA, FL, NM, NV, TX	Insects, fruit, pollen, nectar	Common to endangered
Molossidae -Free-tailed bats	7	AL, AR, AZ, CA, CO, FL, GA, IA, IL, KS, LA, MS, MO, NE, NM, NV, OH, OK, OR, SC, SD, TX, UT, WY	Insects	Common to potentially at risk
Vespertilionidae - Plain-nosed bats	32	All states	Insects	Common to endangered

Habitat Requirements

General

In the United States, bats roost, hanging inverted, from tree branches, in natural tree cavities, under exfoliating tree bark, in caves, mines, cliff and rock crevices, in tangled hedgerow thickets, under bridges, and in attics and roofs of barns and other structures that provide an overhang. Common bat foraging habitat includes woodlot canopies and understory, over streams and other bodies of water, in open fields and agricultural croplands, over desert landscapes, and in lighted residential areas in which large insect populations exist. However, because of the order's wide distribution and the wide diversity in the types of foods eaten, bats forage in nearly all habitat types within regions they inhabit. The greatest contributor to the ongoing decline of bat species is the loss of roosting habitat due to cave and mine closure, vandalism and intentional habitat destruction, development and deforestation, and the removal of live trees, snags, and hedgerows from agricultural fields, farmlands, and other rural

landscapes. By selectively preserving roosting trees (such as snags) and hedgerows, as well as managing open field areas to provide diversity in vegetation and insect composition, landowners can assist in the survival of bats and other species that rely on similar habitat.

Food

The diets of the bat species found within the United States vary considerably. Although some bat species are specific in the foods they eat, many species are generalists and display opportunistic feeding behavior. Insectivorous bats feed primarily on night-flying insects such as moths, beetles, fruit flies, mosquitoes, mayflies, caddis flies, and midges. Larger insects such as grasshoppers and cicadas are consumed by some species as well. Insectivorous bats can consume 30-50 percent of their body weight in insects each night with some species potentially eating 600 mosquito-sized insects in just one hour. Nursing females have high metabolic demands and can often eat more than their body weight in insects nightly. Frugivorous and nectivorous bats eat fruit, pollen, or nectar from plants and flowers. Bananas, mangoes, dates, figs, peaches, cashews, guava, avocados, and agaves (from which tequila is made), are a few wild plants that rely on bats for pollination and reproduction. The giant saguaro and organ pipe cacti of the southwestern desert are two important plants within the United States that rely heavily on bat pollination. Carnivorous species, usually tropical, feed on fish, frogs, lizards, small rodents and birds, and occasionally other bats. **Note:** Only three of the more than 900 species feed on the blood of other animals. Contrary to common myth, vampire bats, found only in Latin America, do not suck blood, but make a small, painless incision in the skin of a sleeping mammal and lap up the blood that emerges.

Cover - Roosts

Because bats are nocturnal, they roost during daylight hours in tree branches and leaves, under exfoliating tree bark, in caves, mines, cliff crevices, hedgerow thickets, natural tree cavities, under bridges, and in attics and roofs of barns and other structures that provide an overhang. Artificial roosting structures, or bat houses, are used by at least a dozen of the more common and abundant species as well. Bats use roosts for many different reasons: as hibernacula, maternity (nursery) roosts, bachelor roosts, night roosts, and migratory stopovers.

Hibernacula—Caves and abandoned mines make up the largest hibernacula in the United States. Reduced temperatures and a corresponding lack of insect prey require some bat species to hibernate over winter. The complex microclimates of caves and mines enable bats to select suitable areas within them in order to maintain their desired body temperatures. Caves and mines are also sought because they provide a secure area in which multiple individuals can congregate and hibernate. Some species of overwintering bats hibernate in tree cavities, crevices in tree bark, and buildings as well.

Maternity roosts—Tree bark, leaves, natural tree cavities, caves, mines, attics, roofs, bat houses, barns, and other human-built structures may provide summer daytime roosts for female bats and their young. Nursery colonies require the warmer internal temperature present in the maternity roost as it promotes rapid growth and offspring development and protects the young from predators.

Bachelor roosts—Not all bats need the high temperatures of maternity roosts in the summer. Smaller and less-optimum sites are often selected by males and non-reproductive females. Many types of natural and artificial structures, such as woodpecker holes, tree bark, leaves, natural tree cavities, caves, mines, attics, eaves, shutters, roofs, bat houses, birdhouses, bridges, barns, and other buildings may be used.

Night roosts—Night roosts are used following feeding activities, and may be similar to roosting habitat occupied during daylight hours. Typically these roosts are open and accessible, and may include porches, outbuildings, bridges, caves and mines. They are usually identified by quantities of insect wings and bat guano found below them.

Migratory stopovers—Migrating bats may inhabit an area for a short period of time in which they will establish temporary roosts, or migratory stopovers. Depending on species, these roosts can consist of one or multiple individuals and are located within close proximity to areas providing adequate foraging and water resources. Multiple habitats support migratory stopovers, including many or all of those used as hibernacula, maternity roosts, and night roosts.

Cover - Winter

In areas where bats overwinter, habitat requirements may differ greatly from those in other seasons. Caves and mines comprise the most commonly used hibernacula for bats that hibernate throughout winter months. Efficient cold air traps are critical for hibernacula, particularly in warmer southern areas. Some solitary tree-roosting species may roost in tree cavities or in the open, relying on cryptic coloration for camouflage. Several species may hibernate in cliff faces or in talus, and a few may use unheated buildings and attics. Species that migrate to warmer areas may stay active throughout the winter if adequate food is available. Large areas of open water, mowed fields, desert landscapes, agricultural crop fields, and residential areas lit with street and yard lights are important winter habitat components in warmer regions for the insects they provide.

Bat House Design —Bat houses can be constructed of most types of wood except pressure-treated wood. Exterior-grade plywood is best. Exterior surfaces of bat houses should be painted, caulked, and sealed to provide a dry, draft-free interior. Figure 1 provides one of many successful designs. External bat house dimensions, e.g., height, width, and depth, can be adjusted to accommodate the specific area or structure in which a box is placed, however, larger and taller bat houses are usually more successful. Proper spacing of internal roosting crevices is critical. Most U.S. bats that will roost in bat houses prefer 3/4- to 1-inch wide roosting crevices. Partition surfaces should be roughened with a knife or chisel, or tightly covered with 1/8-inch plastic mesh (not metal), to aid bats in gripping the partitions. Partitions can be held in place by grooves cut into the ceiling and walls of the roosting chamber, or kept properly spaced by using 3/4- to 1-inch wooden spacers. Depending on the region of the country in which boxes are placed, bat house color should be appropriate for solar heating to maintain an internal temperature of 90 to 100 degrees Fahrenheit. This promotes rapid growth of young in nursery colonies. Northern and eastern bat houses will remain warmest when painted black or dark brown, while southern and southwestern houses may be medium to light brown, with vents in the bottom third of the roosting chamber. When bat house design and placement permit, houses located in hotter regions can be constructed with an aluminum roof providing an overhang to shade a portion of the bat house during the hottest daylight hours. This ultimately creates a bat house with a variety of internal temperatures.

Water

Bats require an adequate amount of water daily for survival. Drinking while in flight, bats require open bodies of water large enough to enable them to skim the surface to take in water without disturbance from cattails, bank-side trees, or other vegetation. Brackish, polluted, or heavily chlorinated water is not suitable for bats.

Interspersion of Habitat Components

In order for successful bat reproduction and survival to occur, all required habitat components must be available in relative proximity to one another. Because some bat species migrate, and others remain highly mobile during winter months, the most critical aspect of habitat interspersion, or the mix of different habitat types, is the proximity of suitable foraging habitat to roosting habitat. The highest-quality roosting habitat is of little use if there is not adequate foraging habitat within close proximity, providing a food base. Likewise, the best foraging habitat will not support bat populations if there are no nearby suitable roosting sites. Ideal interspersion of habitat components to support bat species consists of a closely-spaced complex of open water, vegetative diversity, and suitable summer and winter roosts.

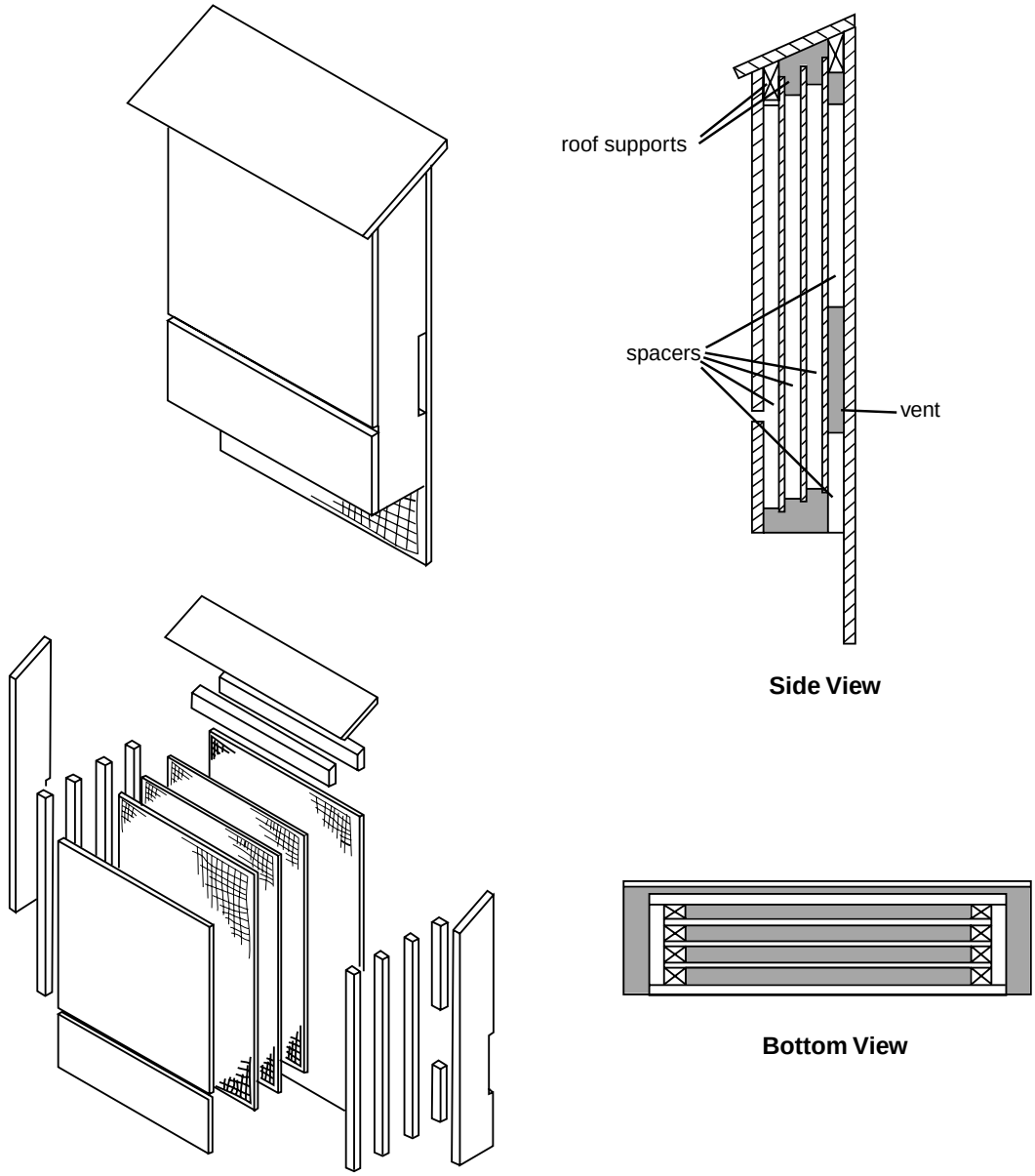
Minimum Habitat Area

Although most bats forage in an area of at least several square kilometers around their roosts, no reasonable estimate of minimum habitat size exists for bats. A species can be found anywhere within its range wherever adequate roosting, foraging, and water resources exist. These ranges vary greatly by species. Also, large colonies of bats need proportionally greater foraging areas than individuals. Behavior may give an indication of the minimum habitat needs of an individual bat species, but one cannot quantify foraging and roosting requirements without considering innumerable habitat variables. Bats with similar environmental requirements may coexist in the same habitat type, but still tend to utilize specific micro-habitats within that habitat type.

Bat House Placement – Bat houses can be placed on poles, the sides of wooden or masonry buildings, dead trees receiving ample sunlight, or other structures. Bat houses should be placed so that the bottom of the bat house is 12 to15 feet above ground in order to provide an adequate flight path and discourage predators. In cooler, northern and eastern regions, bat houses should receive at least eight hours of direct daily sun. They should face south, or southeast to maximize solar heating. Placing bat houses on trees or shady sides of buildings in these areas likely will not yield very high bat use, if any. In hotter southwestern regions, place bat houses to face east or southeast where they will receive between four and six hours of sun daily. Bat houses are designed to attract maternity colonies in summer months, and will not likely have winter occupancy, except in extreme southern areas where the climate is mild and adequate insects are available. Bat houses located within a quarter mile of a lake, pond, river, stream, or open marsh have better chances for occupancy. Areas of mixed vegetation types including woodlots, open fields, pastures, orchards, agricultural areas (especially those with little pesticide use), farmyards, and residential yards and neighborhoods that provide an abundant insect base are good places in which to erect bat houses. These habitat types in close proximity to creeks and wet areas have proven to be especially productive for bats.

Note: The key to conducting a successful bat house program is to provide the appropriate internal bat house temperatures desired by bats for their various roosting needs. This is often accomplished by placing two or more bat houses on the same building or within the same general vicinity (known as pairing) so that bats can move from house to house at different times of the season to take advantage of optimum temperature levels. It is best to start with a few pairings of bat houses, expanding in numbers only after a few have attracted bats. Bat houses that fail to attract bats within two seasons of being erected may not be achieving suitable temperatures. Moving, recaulking, or repainting these boxes may be necessary to attract bats. Annual cleaning and maintenance is required, as with bird houses.

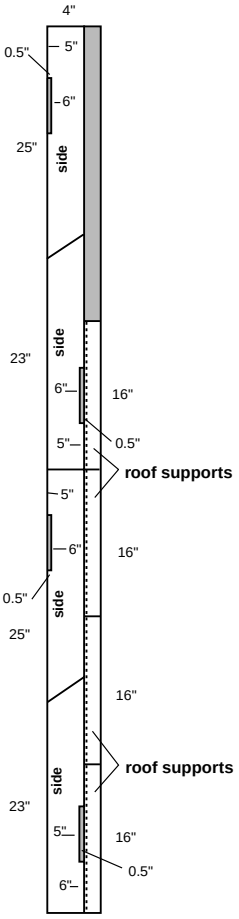
Figure 1. Bat house design



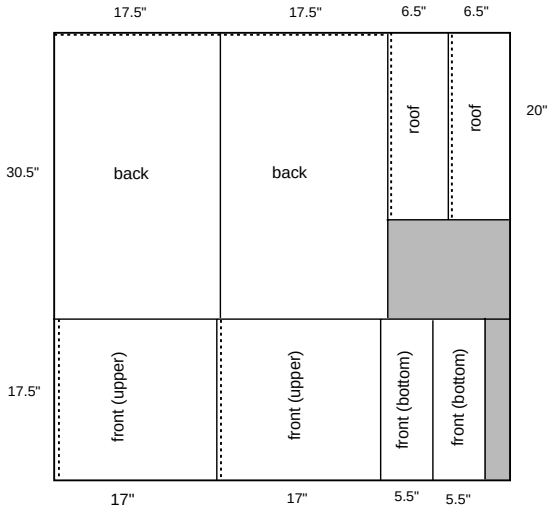
1. Measure and mark all wood as per cutting diagrams on page seven. Cut out all parts.
2. Cut six pieces of netting 14" x 21". Staple to partitions.
3. Screw back to sides, caulking first. Be sure top angles match.
4. Cut a piece of netting 16" x 30" and staple to inside surface of back. Be sure netting lies flat and does not pucker.
5. Construct house as per drawings above. Place spacers on partitions, screw top front piece to sides first then screw bottom front piece to sides to create a 1/2" vent between the two, attach roof supports, attach roof.
6. Caulk between roof and sides, sides and front pieces, and sides and back piece so as to seal house airtight. Do not allow screws to protrude into roosting chamber. Paint exterior at least twice with appropriate color.

(Excerpted from *The Bat House Builder's Handbook*, 1997 Revision. ©1993 Bat Conservation International. Used with permission.)

Nursery house sawing diagrams



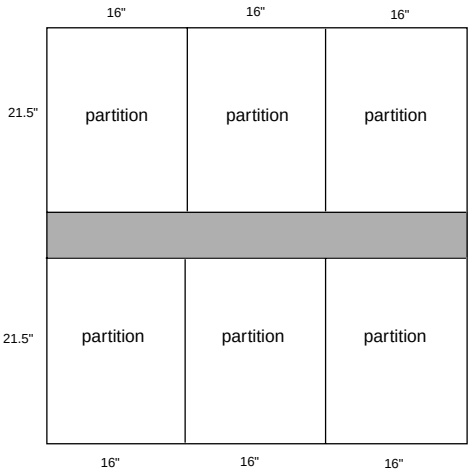
1" x 6" x 8' sheeting



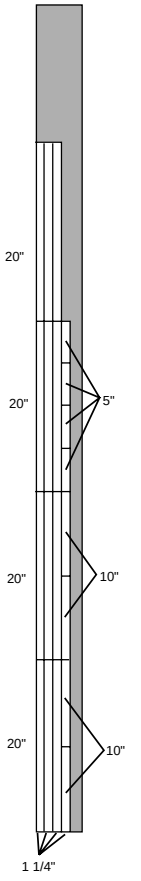
4' x 4' x 1/2" plywood

extra material

25 degree bevel



4' x 4' x 1/4" plywood



Spacers:
5" spacers = back bottom
10" spacers = back top
20" spacers = others

1" x 6" x 8' sheeting

Additional Roosting Options

In addition to bat boxes, sheet metal, plastic and fiberglass tubing, and tarpaper have been used as roosts by a few bat species when wrapped around trees to protect wood duck and bird boxes from predators. Such fixtures provide attractive roosts for species that do not roost in crevices, and thus can potentially create increased habitat diversity in an area and ultimately increase the diversity of bat species there as well. As a guide to providing artificial roosting structures, The Bat House Builder's Handbook by Bat Conservation International (BCI) may be of beneficial assistance in your quest to learn more about bats and how to best provide artificial roosting structures for them on your property. The handbook is available for a donation in any amount to: Bat Conservation International, Post Office Box 162603, Austin, Texas 78716-2603, (512) 327-9721, or ordered through BCI's web site at *http://www.batcon.org*, along with many other useful bat facts and information on bat houses.

Bat House Monitoring. — Before bat houses are erected, a maintenance, monitoring, and data collection plan should be developed to maximize program success. It is essential to erect only as many bat houses as can be monitored, initially erecting a few pairings and expanding in numbers only after a few of the original houses have attracted bats. Bat houses should be checked at least twice a month in summer and once each fall and winter until occupied. After bats are roosting in a bat house, two observations each season are sufficient to avoid disturbing roosting colonies. Flashlights can be used to peer into bat houses during daylight hours to determine how many bats are occupying them. Sunlight reflected from a mirror may be helpful if stronger light is needed. It is important to keep observations brief, as extended periods of bright light may disturb bats and deter them from using a bat house. Determining the number of bats in a large colony requires a bit more time and effort and is best done by counting the bats as they emerge at dusk. This may require more than one monitor, and comparing monitor counts may be helpful in obtaining an accurate count of occupants. To determine if the colony is a nursery colony containing young, look into the bat house about 45 minutes after sundown for the flightless, often pink young that remain during nighttime hours. Many species accustomed to using bat houses bear young in late May or early June, with species in colder regions bearing young up to a month later. Recording findings during monitoring can help to determine which bat houses are successful and which may be candidates for relocation. Also, monitoring the bats' position inside the bat house, their movement between bat houses, and recording the times of day and the seasons in which movement occurs can help provide a greater understanding to bats' thermal needs and aids in the success of an individual bat house program.

Bats most likely to occupy bat houses. – As a general rule, most crevice-roosting bat species can potentially be attracted to bat houses. However, the species contained within this insert have been documented as common species that roost in bat houses. The little brown bat and the big brown bat are the species most likely to use bat houses in the northern two-thirds of the United States, while the Mexican free-tailed bat is most commonly seen in bat houses in southern locales. Note: Bat houses are most often used by species that are both relatively abundant in numbers and non-specific in terms of roosting type, location, and food requirements. Therefore, bat houses should not be viewed as adequate substitutes for the maintenance, preservation, and creation of bat habitat, particularly for rare and endangered species.

- *Antrozous pallidus,* pallid bat – western and southwestern United States
- *Eptesicus fuscus,* big brown bat – most of United States and Canada
- *Myotis austroriparius,* southeastern myotis – southeastern and south-central United States
- *Myotis lucifugus,* little brown bat – most of United States and Canada, except for south-central United States
- *Myotis septentrionalis,* northern bat – midwestern and northeastern United States, eastern Canada
- *Myotis velifer,* cave myotis – southwestern and south-central United States
- *Myotis yumanensis,* Yuma myotis – western United States, western Canada
- *Nycticeius humeralis,* evening bat – central and southeastern United States
- *Pipistrellus subflavus,* eastern pipistrelle – eastern United States, eastern Canada
- *Tadarida brasiliensis,* Mexican free-tailed bat – southern, southwestern, central, and west-central United States

Bat Habitat Requirements Summary Table.

Habitat Component	Habitat Requirements
Food - Young	• Milk from mother. Insects usually within two weeks of birth.
Food - Adult	• Night-flying insects such as moths, beetles, fruit flies, mosquitoes, mayflies, caddis flies, midges, grasshoppers, cicadas, and many others. Insect types may vary by bat species. • Fish, frogs, lizards, small rodents, birds, other bats. United States and Canadian bats are primarily insectivorous, but tropical bats have adapted to many other food sources. • Fruit, pollen, and nectar from plants and flowers such as banana, mango, date, fig, peach, cashew, guava, avocado, agave, giant saguaro and organ pipe cacti, and many others. Only a few southwestern species feed on nectar and pollen from cacti and agaves.
Roosts -Hibernacula	• Caves and mines, occasionally buildings. Many species migrate, and a few overwinter in the open, such as in trees.
-Maternity roosts	• Loose tree bark, leaves, tree cavities, caves, mines, bridges, and buildings.
-Bachelor roosts	• Loose tree bark, leaves, tree cavities, caves, mines, bridges, and buildings.
-Night roosts	• Bridges, porches, barns, other buildings, trees, caves, mines, bat houses, and other structures.
-Transient roosts	• May include all of those listed above.
Winter habitat	• Caves, mines, tree branches, cavities and bark; cliff and rock crevices; tangled hedgerow thickets; attics and roofs of barns and other structures that provide an overhang in close proximity to open water; mowed fields; desert landscapes; agricultural crop fields and residential areas lit with street and yard lights. Varies by species. Many bats migrate from their summer range.
Water	• Open bodies of fresh water large enough to enable drinking on the wing without disturbance from cattails, bank side trees, or other vegetation.
Interspersion	• Prefer a complex of open water, mowed fields, woodlots, streams, desert landscapes, agricultural crop fields, residential areas, trees, cliff and rock crevices, tangled hedgerow thickets, caves, mines, attics and roofs of barns and other structures that provide an overhang. Interspersion of habitat components varies tremendously by bat species.
Minimum habitat size	• No reasonable estimate of minimum habitat size exists for bats, but probably varies by species.

Limiting Factors

For planning purposes, use the table below to inventory the site to determine the availability of each of the basic habitat components, based on the above narrative habitat requirement descriptions. Habitat components that are absent or rated low are limiting habitat quality for bats.

	Availability/Quality			
Habitat Component	**High**	**Medium**	**Low**	**Absent**
Food				
Roosts - hibernacula				
- maternity roosts				
- bachelor roosts				
- night roosts				
- transient roosts				
Winter habitat				
Water				
Interspersion of habitat components				

Management Prescriptions

Management treatments should address the habitat components that are determined to be limiting bat habitat potential. For planning purposes, select among the possible action items listed below to raise the quality or availability of each habitat component determined to be limiting. A list of programs that may provide financial or technical assistance to carry out specific management practices is given, when applicable.

Habitat component	Management options for increasing habitat quality or availability	Assistance programs
Food	* Maintain clearings and edges by conducting rotational mowing, prescribed burning, and managed grazing where appropriate.	WHIP, EQIP, PFW, CRP
	* Preserve hedgerows, maintain field borders and edge vegetation, preserve woodlots and vegetational diversity, and reduce pesticide and herbicide use in agricultural areas when possible.	N/A
	* Protect rivers, streams, lakes, and ponds from siltation and non-point source pollution via fencing of livestock, bank stabilization, and aquatic vegetation plantings.	WHIP, WRP, PFW, CRP
Summer and winter roosts	* Preserve mature trees with exfoliating bark and snags (dead trees conducive to natural cavities) within woodlots, as well as in fencerows and along field borders.	N/A
	* Stabilize old buildings used by bats. Install artificial roosts in conjunction with bat exclusion, or before buildings used as bat roosts are torn down.	WHIP, PFW
	* Have bat inventories performed before closing abandoned mines. Protect bat populations in mines and caves by limiting human disturbance and using gating if necessary.	PFW, WHIP BCI, USFWS (if endangered species), State DNRs
Interspersion and habitat size	* Combine above prescriptions to increase interspersion of habitat components or amount of suitable bat habitat.	N/A

Programs that provide technical and financial assistance to develop fish and wildlife habitat on private lands.

Program	Land Eligibility	Type of Assistance	Contact
Conservation Reserve Program (CRP)	Highly erodible land, wetland, and certain other lands with cropping history. Stream-side areas in pasture land.	50% cost-share for establishing permanent cover and conservation practices, and annual rental payments for land enrolled in 10 to 15-year contracts. Additional financial incentives are available for some practices.	NRCS or FSA State or Local Office
Environmental Quality Incentives Program (EQIP)	Cropland, range, grazing land and other agricultural land in need of treatment.	Up to 75% cost-share for conservation practices in accordance with 5- to 10-year contracts. Incentive payments for certain management practices.	NRCS State or Local Office
Partners for Fish and Wildlife Program (PFW)	Most degraded fish and/or wildlife habitat.	Up to 100% financial and technical assistance to restore wildlife habitat under minimum 10-year cooperative agreements.	Local office of the U.S. Fish and Wildlife Service
Waterways for Wildlife	Private land	Technical and program development assistance to coalesce habitat efforts of corporations and private landowners to meet common watershed level goals.	Wildlife Habitat Council (301-588-8994)
Wetlands Reserve Program (WRP)	Previously degraded wetland and adjacent upland buffer, with limited amount of natural wetland, and existing or restorable riparian areas.	75% cost share for wetland restoration under 10-year contracts, and 30-year easements, and 100% cost-share on restoration under permanent easements. Payments for purchase of 30-year or permanent conservation easements.	NRCS State or Local Office
Wildlife at Work®	Corporate land.	Technical assistance on developing habitat projects into a program that will allow companies to involve employees and the community	Wildlife Habitat Council (301-588-8994)
Wildlife Habitat Incentives Program (WHIP)	High-priority fish and wildlife habitats.	Up to 75% cost-share for conservation practices under 5- to 10-year contracts.	NRCS State or Local Office
State fish and wildlife agencies, private groups such as Bat Conservation International (BCI), and others may have assistance programs or other useful tools in your state.			State or local contacts

References

Books:

Belwood, J.J. 1998. *In* Ohio's Backyard: Bats. Ohio Biological Survey, Columbus, OH. 196 pp.

Fenton, M.B. 1992. Bats. Facts on File, NY. 207 pp.

Merritt, J.F. 1987. Guide to the Mammals of Pennsylvania. University of Pittsburgh Press, Pittsburgh, PA. 408 pp.

Nagorsen, D.W., and R.M. Brigham. Bats of British Columbia. University of Columbia Press, Vancouver. 176 pp.

Schmidley, D.J. 1991. The Bats of Texas. Texas A&M University Press, College Station, TX. 188 pp.

Tuttle, M.D., and D. Hensley. 1993. The Bat House Builder's Handbook (1997 Revision). Bat Conservation International, Austin, TX 35 pp.

Van Zyll de Jong, C.G. 1985. Handbook of Canadian Mammals: Volume 2, Bats. National Museum of Natural Sciences, Ottawa. 212 pp.

Whitaker, J.O., Jr. 1996. National Audubon Society Field Guide to North American Mammals. Alfred A. Knopf, NY. 937 pp.

Wilson, D.E. 1997. Bats in Question: The Smithsonian Answer Book. Smithsonian Institution Press, Washington. DC. 168 pp.

Internet Resources:

Bat Conservation International: http://www.batcon.org

Canadian Wildlife Service: http://www.ec.gc.ca/cws-scf/hww-fap/bats/bats.html

University of Michigan: http://www.oit.itd.umich.edu/bio108/Chordata/Mammalia/Chiroptera.html

Periodicals:

BATS magazine and The Bat House Researcher are published by Bat Conservation International. Ordering information and back issues are on BCI's web site, or write to the address on next page.