

Better Bat Houses

in Wyoming

Bats are unique. They are the world's only true flying mammals. They help control night-flying insect populations, and some help cross-pollinate night blooming desert plants. People across the country are starting to recognize the benefits of bats, and some are trying to attract bats to their neighborhoods by building bat houses. But building a bat house can be a tricky affair. Bats are picky. They like snug, warm houses near water, with an abundant food source and minimal opportunities for predators to invade. Bats typically use manmade houses only as summer roosts, moving to more secure locations for the winter.

Species that most commonly use bat houses are relatively abundant and general in their roosting and foraging needs. In Wyoming, this includes the little brown myotis, which is the species most likely to occupy bat houses, followed by the big brown bat, pallid bat, and long-eared myotis. However, bat houses are unlikely to benefit those species that occupy large cavities and that are at greatest risk. Therefore, bat houses should not be

viewed as adequate substitutes for the conservation of bat habitat, particularly for the most sensitive species. They can provide good data about local bat populations and excellent watchable wildlife

opportunities, but they should only be used as mitigation for the loss of roosting habitat when the loss of that habitat is absolutely unavoidable and when they can be designed, placed, and maintained with great care.

Even those bat houses designed and placed to provide suitable microclimates for roosting bats may never be occupied. In areas where few bats remain, it may simply take a long time for them to find the houses. And in areas where bats are abundant, good houses may not be occupied because ideal natural roosts are readily available.

There are many bat house design plans available and many different kinds of bat houses available for purchase. However, not all plans and houses that

are available are suitable for providing roosts for bats. Although bat houses do not all need to be exactly the same, they should all provide a few basic requirements for bats. Whether you decide to build your own bat



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houses or purchase them already built, use the following guidelines to choose the best design and placement.

First of all, temperature is one of the most important factors in determining whether a bat house will be occupied. Many bat house owners worry that their bat houses will get too warm, but research suggests the opposite. Bat houses that are not specifically designed and placed to maximize temperatures are seldom warm enough and are rarely used. High temperatures are important, especially for maternity roosts, because they minimize energy expenditure and allow fat storage for winter, shorten gestation length, and promote the growth and development of juveniles. However, the temperature requirements of bats vary according to sex, age, season, and weather extremes. The ideal bat house offers at least a 10 to 15 °F range of internal temperatures that are generally higher than the ambient temperature, mainly between 80 and 100 °F. For these reasons, many of the following recommendations for bat houses address ways to provide high daily temperatures and wide temperature gradients.

design

- Large size is a consistent factor in the success of bat houses. Large structures provide the most stable high temperatures, while tall houses provide temperature gradients, allowing bats to move vertically to find suitable temperatures. All bat houses should be at least 2 feet tall and 14 inches wide. Widths of 2 feet or more are likely to be preferred by many bats.
- Bat houses should provide chambers, or crevices, for bats to roost in. In general, bats prefer long, vertical crevices. Most bats that roost in bat houses prefer 3/4- to 1-inch wide crevices, with crevice heights of 25 inches or greater. Although the number of roosting chambers is not critical, houses with three or more chambers are more likely to provide a range of temperatures and accommodate larger numbers of bats.
- Bats can have difficulty landing on bat houses they wish to enter. Therefore, all bat houses should have a 3- to 6-inch vertical landing area extending below the entrance.
- Interior walls and landing areas of bat houses should be roughened to give bats a good surface from which to hang. Wood surfaces can be scratched or grooved horizontally at approximately 1/2-inch intervals, or covered with durable UV-resistant plastic screening (1/8- or 1/4 -inch mesh). Avoid metal screen, which can cause injury to bats,



PHOTO BY BOB LUCE, WYOMING GAME AND FISH DEPARTMENT

Bat houses should provide long vertical crevices with horizontal grooves for bats to roost.

- and “fiberglass” or nylon screen, which deteriorates quickly. Mesh must be securely stapled down and trimmed along all exposed edges and should not cover ventilation slots. Staples used to attach plastic mesh should not protrude from the far sides of panels and will last longer if they are exterior grade or galvanized.
- Ventilation slots in the lower 1/3 of the house are important to prevent overheating and provide a wide range of temperatures, especially in areas of the state where the average high temperatures in July are 85 °F or above. A vent on the front of the house should extend from side to side about 6 inches above the bottom and as long as the house is wide. Vertical vents about 6 inches long should be included on the sides of the house at the ends of the rear chamber. All vents should be 1/2 inch wide to reduce entry of light and other animals, such as birds.
- Although houses with open bottoms have fewer problems with birds, mice, squirrels, parasites, and guano, houses with partially closed bottoms can help retain heat and may be especially beneficial to bats in the colder areas of Wyoming. Occupancy rates for little brown myotis at Ft. Laramie

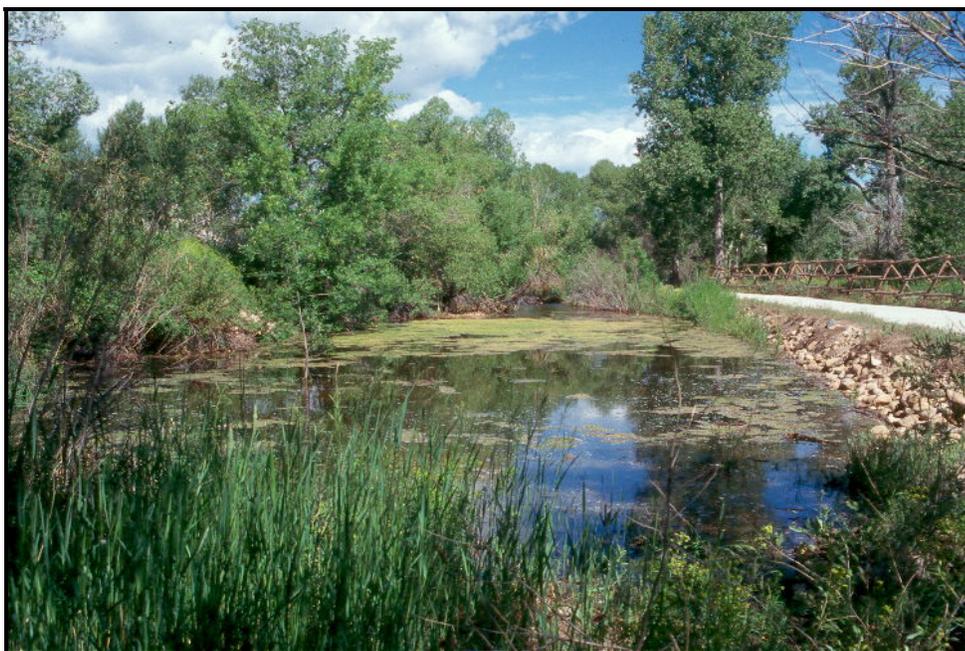
National Park increased in bat houses with partially closed bottoms.

construction

- Bat houses can be constructed of most types of wood, although outdoor grade plywood is best. Avoid using pressure-treated lumber, as it contains chemicals that may be toxic to bats. Also avoid using rough-cut lumber because it is heavy and uneven, making it difficult to work with and difficult to seal.
- Half-inch plywood is ideal for fronts, backs, and roofs, while the sides can be made from any 1-inch boards. Roosting partitions can be made from 3/8-inch plywood to reduce the weight of the house and leave more space for roosting.
- The tops and sides of bat houses should be tight-fitting to reduce heat loss, and all seams should be caulked, especially around the roof. Insulating the upper portions of both front and back chambers and the ceiling helps to stabilize temperatures.

paint

- Paint all outer surfaces, landing, and entry areas of bat houses with one coat of primer followed by two coats of flat exterior, water-based paint or stain to protect against moisture, air leaks, and wood deterioration. Also apply two coats of dark paint or stain to interior surfaces prior to assembly to extend the lifespan of the bat house and provide a darker interior. Avoid oil-based paint products.
- Darker colors help bat houses absorb more heat from less sun. In areas of the state where the average high temperatures in July are 85 °F or less, paint bat houses black. In areas where the average high temperatures in July are between 85 and 95 °F, paint houses a dark color, such as dark brown, gray, or green. Average high temperatures are available from local weather bureaus or from The Weather Channel's website at www.weather.com.



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Bat houses located within 1/4 mile of permanent fresh water, such as a lake, pond, river, stream, or open marsh, are most likely to attract bats.

placement

- Exposure to the sun is an important consideration in the placement of bat houses—too little sun exposure is the major reason that many bat houses remain vacant. In areas where the average high temperatures in July are 80 °F or less, bat houses should receive at least 10 hours of sun each day, and more hours may be better. In the remainder of the state, where average high temperatures in July are less than 100 °F, houses should receive at least six hours of direct sun each day. Houses that are mounted on poles should face east and west to maximize their exposure to the sun.
- The best mounting sites for bat houses are buildings, chimneys, and other heat-retaining structures, such as dams, silos, and bridges. Wood or stone structures with sufficient sun exposure are ideal, and locations under eaves have often been successful. However, bat houses on metal siding are not usually successful.
- Although pole-mounting is more popular than mounting on buildings and other heat-retaining structures, success is slightly lower, especially in Wyoming, where the lower relative humidity allows temperatures to drop dramatically after sundown. Nevertheless, pole-mounting does offer several advantages, including height, back-to-back pairing, and the ability to face houses in any direction in

full sunlight. Pole-mounted houses should be installed back-to-back on sturdy poles or 4 x 4-inch posts. The two houses should be spaced 3/4 inch apart to provide a variety of temperatures and allow bats to move between the houses.

- Bat houses that are mounted on trees are generally less successful than houses that are mounted on either buildings or poles, probably because they usually receive less sun, are too close to obstructions, and are more vulnerable to predators. However, in some cases, mounting houses on standing dead trees that receive ample sunlight may be a viable option.
- Bat houses should be mounted so that the bottom of the house is 12 to 20 feet above ground to provide a clear flight path and discourage predators, although 10 to 12 feet may suffice in some cases.
- Houses mounted at least 20 to 25 feet from the nearest tree on the sides of buildings or high up on poles provide the best protection from predators. In some cases, it may be necessary to place roof flashing 2 feet wide around each pole that supports the bat house to protect against predators.
- Bat houses located within 1/4 mile of permanent fresh water, such as a lake, pond, river, stream, or open marsh, are most likely to attract bats. Large streams and lakes at least 3 acres in size are particularly valuable.
- Bat houses are most successful in areas of diverse habitat, such as a mix of agricultural areas, shelterbelts or tree and shrub stands, native grass meadows, and riparian areas. In addition to open water and suitable habitat, caves, abandoned mines, cliff faces, or buildings, which in combination provide year-round habitat in the immediate vicinity of the bat house, will greatly improve the chances of bat occupancy. Placing the bat house in a natural bat flyway near a stream corridor or in a forest opening will also increase the

chance of bats finding and using the bat house.

- The most successful bat houses are mounted in groups of three or more with slight differences in color, exposure, insulation, or ventilation, so that bats can move from house to house at different times of the season to take advantage of optimum temperatures.

timing

- Bat houses can be installed at any time of the year, but are more likely to be used their first summer if installed before the bats return in spring.
- When using bat houses in conjunction with excluding bats from a building, install the bat houses at least 2 to 6 weeks before exclusion.

patience and experimentation

- Be patient for at least two seasons. An estimated 30% of bat house occupancy does not occur until the second season or later and one determinant of bat house success is the amount of time it has been in place, so bat house locations or treatments should not be changed until at least two seasons have passed without use, unless there are obvious deficiencies.
- If a bat house remains unoccupied for at least two



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Interior walls and landing areas of bat houses should be roughened to give bats a good surface from which to hang.

seasons, begin experimenting with locations or treatments. Many unoccupied houses could quickly become successful if they were moved only a few feet to receive more or less sun, stained or painted to absorb or reflect heat, recaulked, or mounted higher.

- When installing new houses, mount two or more side by side with only one variable between them, such as color, design, insulation, or ventilation. Or place identical houses on opposite sides of a building at the same height or in locations where they receive more or less sun.
- It is best to start with a few pairings of bat houses, testing for local needs, and expanding in numbers only after some have attracted bats. However, successfully attracting bats should be viewed as only the first step and an opportunity to begin testing preferences, one variable at a time.

maintenance

- Although maintenance may not be necessary for the first few years if houses have been carefully sealed and painted, eventual recaulking and painting will be necessary, as bats may abandon drafty houses if they are not repaired. Houses should be checked annually for maintenance needs, and repairs should be made during the off-season when bats are not present.
- If wasp nests accumulate, they should be removed in late winter or early spring before either wasps or bats return.
- It is not necessary to clean bat houses with open bottoms.

monitoring

Careful observation of bat occupancy can provide vital knowledge about 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 of bats' thermal needs and aids in the success of bat house programs.

- One way to monitor day use of bat houses is to shine a strong flashlight or sunlight reflected from a mirror up into the house and count the bats. Bats hit with the light may scurry toward the top of the shelter and bunch up, so count quickly. Make observations as brief as possible at first and do not repeat more than once per week or the bats may

abandon the house. Once a colony is well established, the bats often become tolerant of the disturbance as long as you do not touch the mounting pole or house and do not shine bright lights for more than 10 seconds.

- If there are only a few bats it may be relatively easy to count them by simply looking inside, but when larger colonies become established the only reasonably accurate method is to count them emerging at dusk. Plan to be in place by about 1/2 hour before sunset and remain for about 1 1/2 hours. It may be helpful to have more than one to monitor and compare counts.
- From about June 15 to August 1, be alert for the presence of juvenile bats. The best way to check for them is to shine a light into the house after the adults have emerged at dusk, usually about 45 minutes after sundown.
- To document night roosting, first arrive in the vicinity of the bat house about 8:30 pm to observe bats that are flying and feeding in the area and attempt a rough count of flying bats. Then, after the bats have fed and gone to their night roost, usually from about 10:30 pm until early morning, use a strong flashlight to look up into the house and count the bats.



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contact information

The WGFD uses information about where bats are roosting to learn more about bat populations in Wyoming. Personnel can also help you with ways to share your building with bats, or, if necessary, techniques for excluding bats from the building. **If there are bats roosting in your home or other building, please contact the Nongame Mammal Biologist at the Wyoming Game and Fish Department, at (307) 332-2688 or (800) 654-7862.**

sources

The following sources provide design plans for bat houses:

- “The Bat House Builder’s Handbook” is the bible for anyone interested in installing bat houses in their area. It is available from Bat Conservation International at <http://www.batcon.org>.
- NRCS Wildlife Habitat Management Institute’s leaflet on bats at <http://www.whmi.nrcs.usda.gov/technical/leaflet.htm#A>.
- USGS Northern Prairie Wildlife Research Center’s plans for the Johnson Bat House at <http://www.npwrc.usgs.gov/resource/tools/ndblinds/johnbat.htm>.

If you prefer to purchase a bat house, be sure to visit BCI’s list of companies that have been approved by the Bat House Certification Program at <http://www.batcon.org/bhra/models.html>. BCI also has certified houses available for sale on its online catalog.

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Long-legged myotis

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Yuma myotis