A bat house from Bat Conservation and Management provides a leg up in the Chiropteran real estate market by incorporating the latest research on artificial roosts in the United States. All BCM bat houses had been approved by the now inactive Bat House Certification Program at Bat Conservation International, Inc. since 1998. Our more recent models are approved by Merlin Tuttle’s Bat Conservation organization. Our bat houses continue to meet standards for exterior and interior dimensions, design features, construction, quality, and accompanying mounting and maintenance instruction.

**But, a successful bat house requires a little more attention to detail. Read this manual before becoming a bat house owner to learn more about:**

- Choosing Your Style
- Selecting an Appropriate Location
- Finishing Touches & Painting Suggestions
- Mounting & Installation
- Tips & Maintenance
- Public Health Information
ALL ABOUT BAT HOUSES

Introduction

BCM bat houses might accommodate any of at least 14 species of North American bats. However, there are several serious deal-breakers for homeless bats, any one of which will eliminate a potential roost from their consideration:

- Poor design
- Poor construction
- Poor placement

Design and Construction - BCM bat houses are designed and constructed specifically to collect and trap heat to meet key bat roosting needs. A relatively wide, airtight roof is an important solar heat collector. The bat house is tall with ventilation slots 1/3rd from the bottom to create an attractive interior temperature gradient. A landing pad provides a large easy target for bats on approach and recessed baffles form an overhang for some protection. Crevice dimensions average between a snuggly 3/4”, 7/8” and 1.5” depending on the model bat house, and certain models such as the ColonyLodge and Super Rocket Roost include more than one size. This spacing preferred by most common house bats in the U.S. and Canada. Hand roughened interior surfaces are in random directions providing a safe, permanent gripping texture for bats, especially newborn pups. UV resistant plastic exteriors and/or roofs extend the life of the bat house by protecting against sun, water, snow, and ice. All joints are heavily glued during assembly to help the bat house trap heat, and parts are fastened together with screws for longest life. BCM designers take all these points seriously when constructing bat houses, and so should you if this manual accompanies a ready-to-assemble DIY kit.

Your most critical responsibility as a new bat house owner is also where you get to exercise your personal creativity. A finished wood house must be painted, stained, or sealed an appropriate color in order to seal micro-crevices and absorb heat.

The rest comes down to “location, location, location.”

Placement - Your bat house can be installed on an existing building, but only after carefully assessing the amount of daily solar exposure at the site. Most often the best solution is to mount the bat house on a post located in a sunny spot on the property, or perhaps the sunny side of an appropriate building. To securely attach the box to a wood post or wall, a specially designed Mount Kit is available from BCM which includes bolts or screws appropriate for your intended location. Your BCM bat house is modular; we have kits and DIY suggestions on expanding your colony when the time comes using the same 4”x6” post you started with. But, before rushing out to install your new bat house, take a few moments to consider: (1) the best location on your property for your new tenants, and (2) once installed, it is unlikely that you will want to un-install your house to tweak its look or improve its weather-resistance. Read on to learn more about locating and putting key finishing touches on your bat house.
Choosing Your Style

BCM offers a range of bat houses, from the traditional [plywood DayLodge and DayRoost DIY Kits](#) to the larger, rugged, [low maintenance ColonyLodge](#). There is the [DreamRoost and DreamLodge](#) for installation in very showy locations where a beautiful wood exterior is desired. We even have double sized Super Duplex and an artificial tree type called the [Super Rocket Roost](#). Each has a detailed “owner’s manual” available for specific assembly, finishing, and installation information.

The [DayRoost and DayLodge](#) is available assembled (requires paint or stain) or a Kit for DIY’er’s who take pride in a job well done. All pieces are ready to assemble. Comes with all required hardware, caulk, asphalt shingle, and detailed instructions (please follow carefully to insure the best chance of attracting bats).

<table>
<thead>
<tr>
<th>DayRoost (1 chamber)</th>
<th>DayLodge (3 chamber)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Materials:</strong> yellow-pine 1/2” plywood + plastic roof</td>
<td><strong>Materials:</strong> yellow-pine 1/2” plywood</td>
</tr>
<tr>
<td><strong>Roof:</strong> recycled plastic</td>
<td><strong>Roof:</strong> recycled plastic</td>
</tr>
<tr>
<td><strong>Dimensions:</strong> 16.5’H x 16’W x 2.5”D</td>
<td><strong>Dimensions:</strong> 16.75’H x 16’W x 4.5”D</td>
</tr>
<tr>
<td><strong>Weight:</strong> 10.5 lbs</td>
<td><strong>Weight:</strong> 13.5 lbs</td>
</tr>
<tr>
<td><strong>Internal Chambers:</strong> 1 with 7/8” spacing</td>
<td><strong>Internal Chambers:</strong> 2 with 7/8” and 1 with 15/16” spacing</td>
</tr>
<tr>
<td><strong>Capacity:</strong> approx. 26 bats @ 2 per linear inch</td>
<td><strong>Capacity:</strong> approx. 78 bats @ 2 per linear inch</td>
</tr>
</tbody>
</table>

[Available unpainted, either Assembled or DIY Kit](#)

The [ColonyLodge 4-Chamber Bat House](#) is a low-maintenance alternative to our smaller wooden Day houses. Its one-piece plastic outer shell provides a safe, watertight, draft free environment for years to come, and is vented in the front and rear to regulate temperature inside the bat house. No painting is necessary and can be installed upon arrival.

<table>
<thead>
<tr>
<th>ColonyLodge 4-Chamber Bat House</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Materials:</strong> Plastic Roto-molded outer shell with 4-chamber wooden baffle cluster inside.</td>
</tr>
<tr>
<td><strong>Dimensions:</strong> 24’H x 18”W x 5.75”D</td>
</tr>
<tr>
<td><strong>Weight:</strong> 20 lbs</td>
</tr>
<tr>
<td><strong>Capacity:</strong> approx. 210 bats @ 2 per square linear inch of roosting crevice, and double stacking the 1.5” crevice</td>
</tr>
<tr>
<td><strong>Available in:</strong> BLACK, GREEN, DARK BROWN, &amp; TAN</td>
</tr>
<tr>
<td>Fully Assembled, Low Maintenance</td>
</tr>
</tbody>
</table>

The [Dream Roost and DreamLodge](#) are made of beautiful cedar and arrives finished with a coating of clear polyurethane. Featuring a black roof made from recycled plastic and dual rear vents, these bat houses incorporate our latest design elements in a showy package. Arrives ready for installation. The DreamRoost benefits particularly from installing on a building.

<table>
<thead>
<tr>
<th>DayRoost (1 chamber)</th>
<th>DayLodge (3 chamber)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Materials:</strong> Cedar, 1” thick</td>
<td><strong>Materials:</strong> Cedar, 1” thick</td>
</tr>
<tr>
<td><strong>Roof:</strong> recycled plastic</td>
<td><strong>Roof:</strong> recycled plastic</td>
</tr>
<tr>
<td><strong>Dimensions:</strong> 24.5’H x 18.5”W x 2.5”D</td>
<td><strong>Dimensions:</strong> 24.5’H x 18.5”W x 5.5”D</td>
</tr>
<tr>
<td><strong>Weight:</strong> 10.5 lbs</td>
<td><strong>Weight:</strong> 15.5 lbs</td>
</tr>
<tr>
<td><strong>Capacity:</strong> approx. 36 bats @ 2 per square linear inch</td>
<td><strong>Capacity:</strong> approx. 100 bats</td>
</tr>
<tr>
<td>Fully Assembled, Low Maintenance</td>
<td>Fully Assembled, Low Maintenance</td>
</tr>
</tbody>
</table>

The [Super Rocket Roost](#) is an artificial tree that incorporates several shapes of roost crevices simulating a dead tree. Bats can move all around all sides, and the extra tall length provides an unprecedented temperature gradient.

<table>
<thead>
<tr>
<th>Super Rocket Roost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Materials:</strong> Plastic Roto-Molded outer shell with wood core</td>
</tr>
<tr>
<td><strong>Dimensions:</strong> 56’H x 8”D</td>
</tr>
<tr>
<td><strong>Weight:</strong> 35 lbs</td>
</tr>
<tr>
<td><strong>Capacity:</strong> “dozens” - difficult to estimate</td>
</tr>
<tr>
<td><strong>Available in:</strong> dark brown</td>
</tr>
<tr>
<td>Fully Assembled, Low Maintenance</td>
</tr>
</tbody>
</table>
Selecting an Appropriate Location

Your bat house should be installed so that: (1) the bottom is at least 10 or more feet off the ground, (2) in an open area free from obstructions, (3) oriented south-southeast (~140° azimuth), and (4) where it receives at least eight hours of direct sunlight (Figure 1 and 2). If there is an existing roost nearby with bats soon to be excluded, then the new bat house should be placed as close as possible (and ideally a season before the exclusion so bats may find it). However, it is not necessary to place the bat house on the existing roost for the bat house to be successful. If your bat house is occupied and you’ve decided after two seasons that you’d prefer to have your colony in a different location, you may move the house when bats are absent without causing the bats to abandon the bat house, as long as you move it to a location that receives the same daily solar exposure. Unfortunately, any bat house in the best location may go unused if there are many other available roosts nearby.

Bat houses are most attractive to bats if they are located within 1/4 mile of a permanent slow-moving stream, or pond. Bats will seek freshwater at dusk, and will capitalize on the readily available insect supply associated with the water and water-loving vegetation. Bats in some neighborhoods have even adapted to using swimming pools as watering holes while feeding on insects attracted to nearby outdoor lights. The bat house should be placed within 20-50 feet of a tree line or other protective topography to provide quick cover from predators such as owls. Place the bat house as close to trees as possible, but not where it can become shaded by trees (Figure 1 & 2). Take into consideration expected tree growth over the next 15+ years. Habitat diversity will also benefit bat activity in the area. A combination of forests, clearings, agriculture, and wetlands will produce different types of insects at different times throughout the night and over a season to accommodate a resident population of bats. Bats will probably not over-winter in bat houses, except in mild coastal, Gulf Coast, lower elevations of southern California, and other Southwestern states. However, they are quite loyal and will return to a bat house year after year as long as it continues to meet their needs.
Selecting an Appropriate Location

**Bats houses SHOULD be:**

- Receiving 8+ hours of direct sunlight, beginning in the morning.
- Located in a diverse habitat with many vegetation types that support abundant insect prey.
- Situated within 1/4 mile of freshwater (e.g., a still pond or lake, a smooth-flowing stream or river, a man-made pool or tank - even swimming pools).
- Positioned near trees (or other topography that provides “cover” for bats flying to/from foraging grounds), but not shaded by trees.
- Installed near an existing bat roost, especially if bats are soon to be evicted or the existing roost is going to be reclaimed or destroyed.
- Oriented south-southeast to receive morning sun.
- Airtight around the upper 2/3rds, with well-glued seams, especially at the roof.
- Designed with a roughened interior providing secure gripping surfaces, especially for baby bats.
- Placed so the bottom of the bat house is at least 10-feet off the ground. If expecting Mexican-free tail or Florida bonneted bats, consider 12’ or more.

**Bats houses should NOT be:**

- Placed in a shaded location, except in certain warm climate situations, or where experimenting with multiple bat houses is desired.
- Mounted over bright or shiny surfaces that can reflect light directly into the box.
- Located near fires or air exhaust where smoke or strong wind will disturb bats.
- Installed where the box is prone to vandalism. Bats will abandon the roost or young will fall out and perish if the post is shaken repeatedly.
- Set up where it may be repeatedly vibrated or shocked, such as if the mounting post receives regular impact from garden machinery.
- Installed somewhere where light is directly shining on the the roost.
- Situated on exposed hilltops or other windswept areas.
- Positioned directly along or adjacent to roads. Bats swarm roosts at dawn and are vulnerable to automobile traffic.
- Sited around high, thorny vegetation. Bats need room below and in front of the bat house to maneuver.
- Mounted near where cars are parked; guano and urine will damage paint finish.
- Mounted near a high traffic pedestrian area. Passersby may encounter grounded bats leading to unreasonable or sensationalized human health concerns. Consider fencing directly under bat houses at watchable wildlife attractions.
Temperature is a critical factor when bats consider a roost. Common bat house dwellers need temperatures around 95°F. While northern bats often need considerable heating in their roosts, southern bats, especially in lowland desert areas, may need less. Other than installing heaters and thermostats (which, believe it or not, some bat-loving folks have done), painting your house a suitable color to absorb heat and mounting it in direct sun is the best way to ensure a toasty warm roost. The amount of solar exposure needed to obtain the proper temperature range will vary slightly with local climate and elevation. **The best advice when establishing artificial roosts in a new area, is to install several bat houses in different orientations, locations, and colors to learn what**

![Figure 5: Bat house color recommendations based on average daily high temperatures in July from 1981-2010](image)

**ColonyLodge Black, Green, or Brown**
- FL, GA, AL, MS, LA, TX, AZ
- Low elevations southern CA & NM

**ColonyLodge Tan**
- FL, GA, AL, MS, LA, TX, AZ
- Low elevations southern CA & NM
Finishing Touches & Painting Suggestions

In middle and northern latitudes, bat houses should receive a minimum of eight hours (preferably nine or more hours) of direct daily summer sun. Morning sun exposure is very important, especially during cooler days in early spring. Painting or staining the exterior of your bat house will almost always make it last longer. Dark brown or black stain on the exterior of bat houses in cool regions will significantly increase the temperatures inside the bat house. Use a quality exterior paint or stain designed to withstand weather and UV radiation damage. Note: it is still important to carefully caulk all exterior joints to ensure airtight seals, especially around the roof.

Houses intended for warm climates should be colored medium to dark brown, or in exceptionally hot places, light brown, white, or natural wood color of the bat house (Figure 5). Light colors may reflect the majority of solar heating away from bat houses. In all but the hottest desert environments, bat houses should receive at least eight hours of direct, unfiltered, morning sunlight. There’s nothing magic about shades of black and brown. Bat houses can be painted any color and adequate temperature gradients can be achieved with shades of green, blue, red, or your custom tone of choice. The exception is desert environments such as Tucson, AZ, where bat houses have only been successful when mounted on buildings in full shade.
WARNING: Mounting suggestions are only -suggestions- and do not necessarily describe all safety measures, tools, materials, and other details that may be required to complete an installation. Bat houses and/or posts may be heavy and unwieldy necessitating the use of ladders and/or heavy equipment. There may be exposure to heights, risk of falls, and/or risk of being injured by falling material. Consider the actual final lifting and installing of the bat house to be a several-person job. If you are not comfortable with the installation concepts consider seeking help of family, neighbors, or handyman. BCM is not liable for any injury or property damage caused during the installation of any bat house products; it is the sole responsibility of the installer to maintain safety to prevent injury or death resulting from any installation activity.

Tree Mounting - It is quite tempting to mount a bat house on a tree, after all, this is where bats are supposed to be living in the first place. First, be aware that wrapping a metal band around a tree or using anything other than aluminum or stainless steel hardware in a tree may kill it. In cool climates, the tree must not have limbs obstructing the direct morning sun, and this is rarely available (Figure 6). In warm climates, bats may well use shaded bat houses that are on trees during certain times of the year, so in those areas it pays to experiment with multiple bat houses in different locations. Bat houses mounted on trees are always more vulnerable to predation than other mounting sites.

If you happen to have a tree or snag meeting the criteria, then mounting brackets similar to BCM’s Wood Post Mount Kit could be used. For mounting to a live tree, obtain stainless steel lag bolts to replace the galvanized lag bolts that come with the kit. Because trees are round, make a quick jig on a flat surface by laying out the Upper and Lower mounting brackets exactly under the bat house to test the fit. Remove the bat house, then screw scrap lumber to the Mounts to keep them in position. This jig is then placed against the irregular surface of the tree and used the stainless steel lag bolts to fasten the Mounts to the tree. The scrap lumber is discarded, and the mounts should be secure to the tree and still parallel to each other at the proper positioning ready for the bat house to be added.
Mounting & Installation: On Buildings or Other Structures

**Building Mounting** - Mounting a new bat house directly on a wooden or masonry structure where bats are being evicted will almost guarantee a successful occupation. The bottom of the box should be at least 10’ off the ground (as well as 10’ above any obstructions like porch roofs and satellite dishes) and receives enough direct sunlight.

A large colony will produce an appreciable amount of guano that can over-fertilize the ground directly beneath. Be careful not to mount the bat house directly over window boxes, planters, doors, and walkways. In addition, bat guano may stain certain house paints. The daily dawn return of bats is responsible for droppings that inevitably splatter around the bat house and on nearby windows.

Structure mounting might be desired when evicting bats, or if the yard is too small or too shady for a free-standing post mount. It is not critical to mount the box on a structure to ensure a successful eviction project. Bat houses do not take the place of systematically bat-proofing the structure. If other roosts remain available, bat houses may see little use. If mounting on a structure in cool climates, choose a location on the building as high as possible that will NOT be shaded by overhanging eaves or obstructed by split-level architectural elements. If you are in a warm climate, it may be acceptable or preferable to mount with at least the roof will be shaded in the afternoon. Select the southerly side of the structure or chimney. Southeast (140° azimuth) is ideal.

Wooden spacers that are 2”x4” and a few inches shorter than the width of your bat house should be placed on the structure first to simplify mounting and provide an additional roost crevice behind the bat house. Spacers also help attach bat houses to uneven surfaces (e.g., brick walls or home siding). Galvanized lag-bolts, deck screws, or masonry screws can be used depending on the structure material. Masonry screws (2-3/4”) work well on chimneys. Deck screws (3”) are standard for wooden buildings. Pre-drill the spacers, as most long screws are difficult to install without stripping the heads. When installing into older block or wood structures, some trial and error may be required before finding two solid anchors per spacer. Please see BCM’s Mount Kit available with appropriate hardware for posts, siding, and stone.

The method for attaching the bat house to the spacers varies with how large the bat house is and where on the structure it is located. Small boxes may simply be hand carried up a ladder and installed. A more elaborate solution for a larger box involves hauling the bat house up the structure using a rope and pulley rigged through the top of a ladder. As the box hangs under the ladder it can be secured, by someone using a second, shorter or nearby ladder. Expect some trial and error to get ladder(s) and the bat house into correct positions. Take extra time to fine tune the rigging rather than attempt to hold the weight of the heavy box while driving screws.
Mounting & Installation: On a Post

Post Mounting - Post mounting a bat house one summer before planning an exclusion project is ideal. This eliminates the eventual need to move the box off the structure, and bats have plenty of time to investigate the bat house before being excluded from their preferred roost in the structure.

The bottom of any bat house should be at least 10 feet above the ground without large obstructions in front or below. BCM offers a Mount Kit to attach your bat house to the pole, or fashion your own. Pressure treated lumber is commonly used for outdoor applications and is readily available nationwide. Posts are available at most lumber supply yards, marina/dock supply yards, tractor supply/farm stores, though lengths of 16’ (or more) may have to be special ordered at big box stores. Black locust posts will last longer than treated or even metal posts in some cases, but may be more expensive and difficult to find. The brackets and post can be painted with a quality exterior stain or paint, but the treated lumber should be painted ~6 months after being manufactured. Refer to specific bat house instructions for exact mounting suggestions. The size and weight of larger bat houses, or multiple smaller bat houses, may make raising and setting the post cumbersome. If the post and box is to be assembled on the ground then raised in one operation, simplify the job by recruiting family, friends, and neighbors to help.

Using a post-hole tool and digging bar, excavate a hole at least 2.5-3 feet deep and ~8” in diameter, if possible. If the hole is sunk straight and clean only one 80 lb. bag of premixed concrete will be necessary. If more than one bat house is installed on the post, the hole should be closer to 3’ deep and slightly wider to accommodate a second bag of concrete.

When about to set the post, place the digging bar in the hole so that the post will ride down the pole rather than sticking into the side. Three people can -easily- lift the bat house attached to the post and walk it up right (Figure 7). In addition, the post can be pulled with a rope to assist the lifters. If the hole is 2.5’ or more deep and not overly wide, the post will stand in the hole unsupported.
Maintenance, Tips, and Suggestions

Posts with finished bat houses can even be installed by one person, with the aid of a truck or even car with appropriate roof rack used to carefully lever the pole vertical (Figure 8). Use a safety sling attached to the rack to prevent it from sliding off the rack prematurely. Similarly, posts may be picked up or levered vertically using certain tractor attachments, a Bobcat-type machine, or aerial lift.

Center the post in the hole by wiggling it hard to move the bottom of the post into the center. Twist the post so that the front of the bat house is facing about 140°, or southeast. Find the post’s balance point and/or use a level; you may find the post perfectly balanced when leaning back slightly due to the added weight of a single bat house. With the post balanced, use a compass to confirm that the box is facing 140° (southeast) before adding concrete. This allows the bat house to face directly into the sun at 10:00 a.m. on a spring or fall morning. Add concrete following manufacturers directions, or simply alternate dumping 1/3 of the concrete mix and a small amount of water into the hole and mix with the digging bar. Once 1/2 bag or more of concrete is in the hole, the post will be very difficult to adjust further. If the hole is too large and concrete mix is scarce, intersperse softball-sized rocks into the mix to use as fill.

**Predator guard** - On a rare occasion, a snake may climb a post and enter a bat house. Fortunately all BCM bat houses feature an attic space which allows bats to escape into adjoining baffles. We have video of a mouse entering a bat house, though it may have been looking for insects rather than bats. Other predators such as raccoons and cats may cause a problem, less though if the bat house is mounted high and there are no perches provided nearby in the bat exit swoop zone. Nevertheless, consider a predator guard if your bat house attracts a large number of bats, which may in turn attract ground-based predators. You may not be able to prevent all predation, particularly from raptors at dusk. However, be careful not to provide an unfair advantage to predators such as installing bat houses too low, on trees, or near other structures that predators may be able to perch on.
Maintenance, Tips, and Suggestions

**Checking for Bats** - Bat houses can be checked for occupants in two ways. The most direct approach is to stand under the bat house and view the interior using a powerful spotlight. This is best done in morning or late afternoons when the sun is not as blinding. Inspections should be done sparingly throughout the first season of occupation, if bats are present. Bats cannot be easily viewed directly inside some bat houses such as the Rocket Roost and Super Rocket Roost. A less intrusive technique is to watch the evening exit, which begins approximately 15 minutes after local sunset and lasts up to thirty minutes. In addition, certain trail cameras can successfully video bat activity entering a bat house.

**Airtight Seams** - BCM Bat houses require little maintenance once installed. However, they are exposed to the elements (and to other wildlife) so they need periodic attention. Most maintenance is best performed when bats are not present. Look up into the bottom of the bat house, looking carefully for broken seams or other cracks that will cause drafts and prevent the house from holding heat. Weathering from seasonal temperature changes can cause joints to separate after a few years (Figure 9). Daylight entering around the roof is a sure sign of needed repair, but be careful not to mistake broken seals with normal daylight entering through the vent or filtering thru the tan plastic of a ColonyLodge. If left in disrepair, bats may abandon or never utilize a drafty roost. A ladder can be placed against a post-mounted bat house in order to apply fresh sealant over all seams. Re-staining or re-painting the bat house every few years will prolong its life and help to seal micro-crevices in the wood and joints. When bats vacate the box in the fall for their wintering sites, it provides homeowners with the perfect opportunity to perform any needed maintenance. Many temperate species of bats in the U.S. move between warm summer roosts and cold, but not freezing, cave roosts where they hibernate in the winter. Some sub-tropical species live in northern latitudes in the summer and migrate to more southerly locations where they can stay active and find enough insect-food all winter long. Because bats are very loyal to their summer (and winter) roosts, they will happily return to their re-furbished bat houses in the spring. Brazilian free-tail and Southeastern myotis may use bat houses in the Gulf Coast states year-round, so check carefully for occupants even in winter!

**Bat Overcrowding and Overheating** - If bats are constantly seen towards the bottom of the bat house throughout the season or are roosting outside the bat house, the house may be getting too hot (Figure 10). This is best solved by installing a second bat house nearby or on the backside of the first house. Rotating or moving a single bat house is experimental and not recommended. Add a second box first, then experiment later if necessary. Alternately the bat house might need to be “fine-tuned,” perhaps by adding rear vents, adding more vents, repainting the box a lighter shade, adding a sun shade, or moving the box to a different location.
Maintenance, Tips, and Suggestions

**Guano** - Open-bottomed bat houses are self-cleaning. Droppings accumulate on the ground directly under the bat house. This material naturally biodegrades and there is not much need to remove it. Guano is high in nitrogen and makes an excellent fertilizer. It has been mined for centuries from large bat caves for this purpose, prior to the advent of chemical fertilizers. Bat house owners can collect guano from beneath houses and scatter it in gardens or orchards. Too much guano will “burn” plants though, so be careful and be aware that letting large piles sit in one area will kill grass and other plants. Repeated exposure to guano dust possibly can be harmful to certain individuals, so avoid breathing in any particles and consider wearing an appropriate mask.

**Wasps, Yellow Jackets, and Bald-faced Hornets** - Paper wasps form gray honeycomb-shaped nests on the ceilings and in crevices of bat houses. These insects are not aggressive and happily coexist with bats. Unfortunately, if the nests become large they will eventually consume real estate inside the bat house. It is best to remove nests in the winter using a long, thin rod or stick when bats (and wasps) are not present. Check carefully before cleaning, shadows can hide solitary bats in what first appears to be an empty box. Yellow Jackets and Hornets are very aggressive and build conical nests that can be as large as volleyballs (Figure 12). Some may also build nests inside the bat house. If a number of insects are seen routinely entering and exiting the bat house in the summer, chances are it is overrun with yellow jackets. Bats will abandon a bat house if these insects take up residence. Destroy nests early before they become large by carefully knocking them out at night.

**Woodpeckers** - Woodpeckers may drum on wood posts and bat houses creating holes in the roof or front (Figure 13). Repair damage by filling holes with fresh sealant when bats are not present. A more permanent fix is wrapping the bat house with aluminum trim coil stock which can be obtained in various colors at hardware stores.

**Monitoring Bat House Temperatures** - Curious bat enthusiasts can monitor the temperatures inside bat houses in several ways. An inexpensive solution is an outdoor thermometer with an external probe. The probe can be attached to a long, thin pole or stick and inserted up through the baffles and into the top of any bat house. A more elaborate, detailed study can be made using temperature data loggers available as brands such as Kestrel, Ibutton, Onset, and many others. These sensors can be left inside a bat house for months while recording temperatures at user-defined intervals. The data can then be off-loaded to a computer and graphed. Generally, the target temperature for bat houses used by little brown bats (*Myotis lucifugus*) is 95°F. If a bat house consistently does not reach or occasionally exceed this temperature in the summer, the box may not be airtight, may be painted the wrong color, or may be installed in a shady location.
Maintenance, Tips, and Suggestions

**Retro-fitting Houses that are Too Hot** - Our bat house color and sun exposure suggestions are assuming you are starting out with no bat colony. When a large number of bats take over a bat house, it can become too hot. If bats are always seen at the bottom of the baffles, it is possible that the box is receiving too much heat or is simply overcrowded. In extreme cases pup may fall out. The easiest solution is to drill 1/2” holes around the bat house (including the back) 1/3 up from the bottom. Another suggestion is to add a second bat house on the backside of the first. You should cut a pass-through 1/3 up from the bottom of each bat house and perhaps enclose the sides. This will provide bats with a cooler option right around the corner. Another possibility is to install anther bat house nearby, such as around the corner of a structure or up under a shaded eave, or somewhere on the property that is more shaded in the afternoon. In the hottest areas, bat houses can be partially shaded with an overhanging reflective tin roof. This allows the bat house to warm up in the mornings but is shaded at the hottest time of the day. A black roof could be repainted white for chronically hot locations. All this said, when starting out with a single bat house in a new location, it is probably best to install the bat house in the sunniest spot.

**Retro-fitting Houses that are Too Cool** - In most areas of the country, common problems with modern bat houses involve the box not receiving enough direct sunlight. This results in it being too cool. It is much easier to repaint a bat house in a darker color than to move it to a sunnier location to warm up. In cool climates, avoid mounting on trees as the limbs typically provide too much shade.

**Providing Multiple Micro-climates** - It is easier to attract bats throughout the season by using two bat houses back-to-back on a single post. If boxes are oriented southeast and northwest, they will provide a range of temperature options and make it more likely that a particular profile is attractive to bats all season long. Similarly providing several bat houses mounted in various locations with different solar exposures or colors is a great idea for starting colonies in new areas. You may find bats prefer a certain location or color and therefore over time the other bat houses can be modified similarly. The inexpensive DayLodge and DayRoost bat houses are ideal for this experimentation.
Bats and Human Health Concerns

Remember, bats are wild animals and as such, should be treated with the same respect due to other urban or suburban wildlife. People, especially children, should be instructed never to touch bats or other wild animals that are easily approached. Trained wildlife rehabilitators or removal specialists should be called to collect sick or injured wildlife. If immediate action must be taken with a downed bat, wear gloves when handling it, or scoop it into a box or can with a shovel or similar tool. If there is any chance the animal had direct contact with humans, call a local wildlife or public health agency to collect the individual.

Guano, Urine, and Ectoparasites - Bat guano and urine accumulating in attics and wall spaces can attract arthropods, such as roaches, as well as other pests. The accompanying odor from a large bat roost can be pungent, but not dangerous. Bat ectoparasites, such as ticks, mites, fleas, and bugs rarely parasitize humans. They are most likely to cause a nuisance after a house has been bat-proofed (parasites left behind after bats are gone). Parasite problems are unlikely except in very, very large, well-established colonies in buildings. Ectoparasites quickly die without their bat hosts. Sprinkling Diatomaceous Earth in areas of concern will significantly reduce ectoparasites as well as many other crawling insects.

Rabies in Bats - Rabies is the only serious public health hazard associated with bats, but its impact has been vastly exaggerated. Far more people die every year from dog attacks, bee stings, power mower accidents, or even from being struck by lightning. Unfortunately, newspaper reports and television coverage of bat bites are often sensational, exaggerated, and grossly inaccurate, perpetuating misleading information. Such misleading accounts often elicit intense public reactions that generate vociferous demands for complete bat destruction.

Of 1,100+ bat species, only 6 are known to have transmitted the rabies virus to humans. Between 2009-2018, the most wide-ranging bat house bat throughout most of the U.S., the little brown bat (Myotis lucifugus), was implicated in one human rabies case, and the next most common, the big brown bat (Eptesicus fuscus), has not been implicated in any case. Mexican-free tails bats (Tadarida brasiliensis) in warm climates account for five cases. Four other cases stem from non-colonial, tree roosting species (Silver haired bats (Lasionycteris noctivagans) and Tricolored bats (Perimyotis subflavus)) unlikely to ever use bat houses. Airborne transmission of rabies has never been proven and is not a public health hazard with house bats.

Nevertheless, any bite from a wild mammal should always be considered as a potential for rabies exposure. Any bite or scratch wounds should be immediately and thoroughly washed with soap and water. Any bat that has bitten a person or pet should be captured, without destroying the head, and placed in a cloth or plastic bag. Bats should be transported under refrigeration (not frozen) to the nearest health laboratory for examination. Anytime a bat bite is suspected (or if a bat is found in a room with an infant or impaired individual who cannot deny a bite exposure) a doctor or public health department should be contacted in order to obtain the post-exposure rabies series immediately.

Preventing Rabies Exposure - Most rabies exposures could be avoided if people simply refrained from handling any wild or unfamiliar mammals, including bats, but also foxes, coyotes, skunks, raccoons or domestic cats and dogs. Rabies is always prevented when a person has been vaccinated. Because rabies is almost always fatal in humans once symptoms present themselves, bitten persons need to be immediately treated with post-exposure rabies vaccines. The treatment is 100% effective if received prior to the onset of symptoms. Unprovoked bat attacks on humans are extremely rare, despite exaggerated stories. Bat bites are usually defensive, occurring when people handle sick or moribund individuals. Effective ways
to minimize potential human-bat contact include: (1) cautioning the general public not to handle wildlife, (2) exercising care in handling suspected sick wildlife, and (3) supporting mandatory dog and cat rabies vaccinations. Non-vaccinated pets that have been bitten by or happened to consume a rabid animal should be either quarantined or humanely euthanized.

**Histoplasmosis and Bats** - Histoplasmosis is an airborne disease caused by the microscopic spores of soil fungus, *Histoplasma capsulatum*, which affects the lungs of humans. Many infections in humans actually come from inhaling dust from bird droppings, do not produce symptoms or cause distress. Most bat-related transmissions of histoplasmosis occur in tropical or sub-tropical caves or other large bat roosts. There is a small potential risk of infection to anyone intending to remove bat guano, due to spores released by the disturbance. Pest control operators and others proposing to undertake these tasks on a regular basis should avoid stirring up dust from any animal droppings, wear approved respirators that fit properly and are capable of filtering out particles as small as 2μ in diameter. Dry guano can be dampened with water before its removal to further reduce the hazard of dust inhalation.

**FOR MORE INFORMATION ABOUT BATS AND PUBLIC HEALTH**

https://www.merlintuttle.org/resources/