

Bat House Plans And Tips



For Big Brown Bats



For Little Brown Bats

By Terry Lobdell

Bat House Plans

A three-crevice box designed to accommodate either big brown bats or little brown bats.

My Bat House Experience

My experimentation with bat houses began in August of 2000 when I shined a light up into a bat house I had mounted on a pole earlier that summer. I saw over 20 bat faces looking down at me. I was immediately hooked and have since built and mounted more bat houses each year. By 2012, I probably had around 3,000 bats, (both little browns and big browns) roosting in bat houses I built and monitored in Northwest Pennsylvania. I have no degree in biology or wildlife science. I am simply a back yard experimenter who enjoys wildlife. In the past decade I have experimented with different designs for both big brown bats and little brown bats. The plans in this booklet are designed to accommodate the needs of both species.

The great thing about a bat house building project is that miscellaneous scraps of materials may be used. It is an easy way to use up scrap lumber that may be taking up space in your garage or basement and help wildlife at the same time.

A special thanks to these people:

Kent Borcharding who has been the ultimate pioneer of bat house experimentation and for generously sharing his knowledge with myself and others.

Joe Spencer for hosting the Bat House Forum for all of us to share and learn from each other about bat houses.

Andy Troyer who encouraged me to publish this plan book.

Fellow bat house building enthusiasts, Frank Cloud, Erik Korsten and Nathan Krecji.

Kathy Uglow and everyone else at the Crawford County Conservation District who have always given me the green light for many local projects and helped me network with others to accomplish much more than I could ever do by myself.

Stacey Marendt, Robin Baker, Jake Weiland , Miranda Crotsley and Jen Moore of the PADCNR for working with me on projects for State Parks.

Shane Hoachlander and Kirk Johnson of the Pennsylvania Game Commission

Joe Arnett of the Army Corps of Engineers

Dallas DiLeo for her editing skills.

Bat House Terms

- **Bat house** – This term is used interchangeably with “bat box”.
- **Baffles**- Wood dividers between crevices within the bat house.
- **Crevice**- The interior space within the bat house where bats roost. Also referred to as “chamber”. A 3/4” crevice size is ideal for both big brown and little brown bats. Crevice size should never be more than 7/8” or less than 5/8”.
- **Spacers** – Strips of wood used to maintain the ideal crevice size. Spacers should be about 3/4”.
- **Landing pad** – The section of a bat house at the bottom where bats land as they are about to enter the box. Often times bats don’t even use it but actually fly straight into the crevice. The landing pad is most useful for pups learning to fly and for attaching screws to mount the box.
- **French Cleat** – A strip of wood ripped on a 45 degree angle that interlocks with an opposite matching piece to mount a bat house to a pole.
- **Mounting strips** - Vertical strips of wood used to mount a bat box to a building, typically 7/8” X 1&1/2” with a length extending about 2” above and below the bat box.
- **Internal access gap** - Gaps between the baffle boards which allow the bats to change crevices internally rather than crawl down to the bottom of the bat box.
- **Back Access/Ventilation Gap** – A gap in the back of the bat box which allows the bats to enter/exit. This gap is ideally located about half way or two-thirds down from the top of the box. It also serves as a main ventilation outlet.
- **Ceiling Board** – A 2” thick board works best since it offers much room to attach longer screws. The thicker wood also helps maintain desired temperatures.
- **Maternity Colony** – A group of female bats that roost together in May June and July while they give birth and nurse pups.
- **Guano** – Fecal droppings from bats. Guano underneath a bat box is a tell-tale sign of usage.

Additional Notes

- These plans show rough-sawn one and two inch lumber.
- There is no exact recipe for one best bat house design. A variety of different materials can be used.
- Other good sources of material for bat houses are old pallets, wood scraps from construction sites and even sawmill edgings.
- Generally the larger the bat house the better.
- Larger bat houses retain heat better throughout the night.
- While overall size of a bat house can vary, a 3/4" interior crevice size (thickness) is crucial.
- Plywood can be used but will start to de-laminate when soaked with bat urine.
- A bat house will last longer with a waterproof roof. Aluminum, steel, vinyl siding and shingles can be used as a roof covering.
- Years ago people used plastic mesh and saw kerfs for bat house baffles. Over time we learned that the surface of rough-sawn lumber is all that is needed for bats to grip while roosting.
- Wood lathe can be used for baffles.
- Crevices should have internal access gaps so bats can change crevices internally.
- Crevices should be as close to 3/4" as possible. 1" is too big and 1/2" is too small.
- Ventilation is needed in the lower third of the bat box.

About Little Brown Bats:

- Little brown bats tend to prefer bat houses mounted on poles •
- Little brown bats like temperatures between 90 and 105 degrees during maternity season.
- Little brown bats fly lower to the ground in a fluttering butterfly motion.
- Colonies of little brown bats are commonly found near fresh water sources such as trout streams, rivers and lakes. Large marshes also attract little brown bats.
- Little brown bat colonies commonly number in the hundreds.
- Little brown bats have been the species most affected by the disease white nose syndrome.
- As of summer 2013 the numbers of little brown bats in the colonies I monitor in Northwest Pennsylvania have declined by an estimated two thirds.
- Little brown bats give birth to only one pup per year.

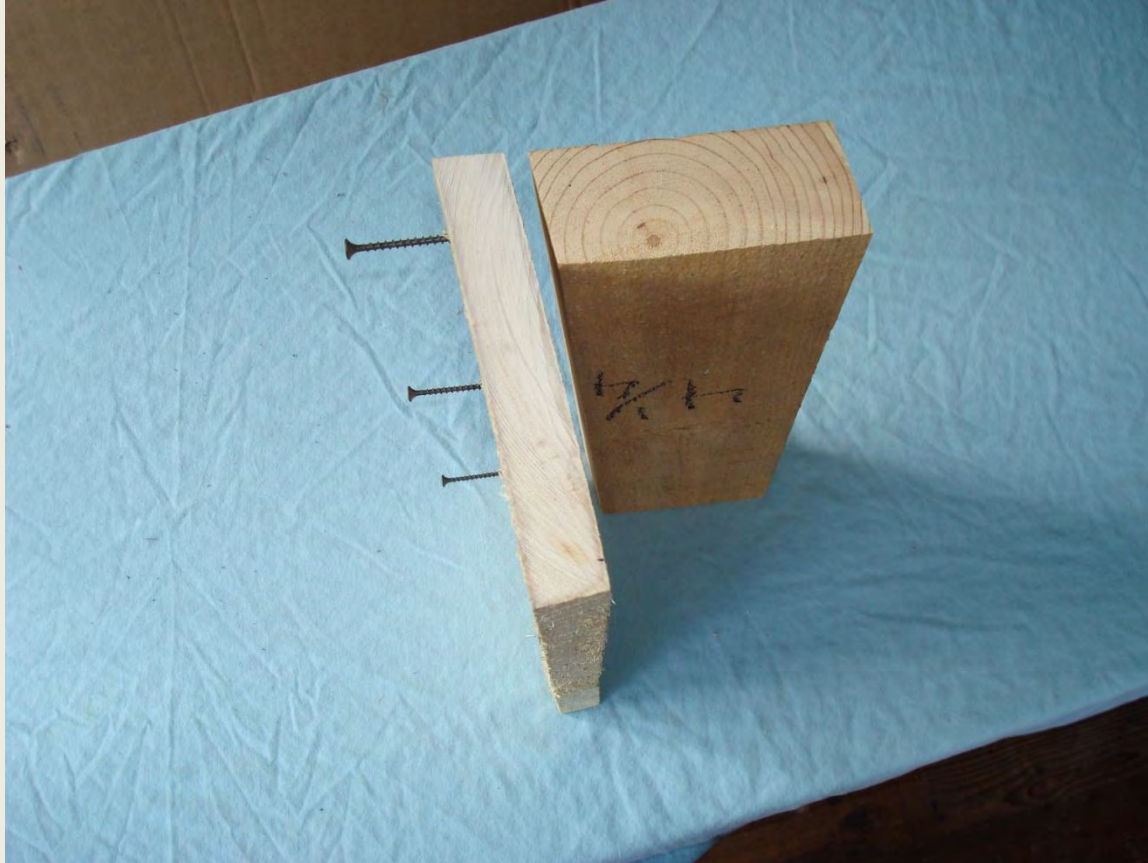
About Big Brown Bats:

- Big brown bats tend to prefer bat boxes mounted on buildings.
- Big brown bats need lots of ventilation especially during hot humid weather.
- Bat boxes with a back access/ventilation gap are a must for big browns.
- Big brown bats change roosts frequently. My colony here at home will move to a different box about every 3 to 5 days.
- Big brown bats fly higher around tree top level with a flight pattern similar to a bird.
- Big brown bats prefer temperatures between 80 and 95 degrees.
- Big brown bat colonies are generally found at higher elevations than little brown bat colonies.
- Big brown bat colonies are much smaller than little brown bat colonies, usually under 100 bats.
- Big brown bats are not as much affected by white nose syndrome as other species are. Big brown bats hibernate in drier areas where the moisture loving fungus is not as prevalent.
- As of 2013 I have observed no decline in the numbers of big brown bats I monitor here in Northwest Pennsylvania.
- Big brown bats give birth to one, sometimes two pups per year. However they have a higher mortality rate and it is common for big brown bat pups to fall from boxes especially when crowded.
- References: Tuttle, Merlin D., and Donna L. Hensley. *The Bat House Builder's Handbook*. Austin, TX: Bat Conservation International, 1993. Print



Three rough sawn one inch boards

These are rough sawn 1"x 6" x 16" long. Rough-sawn wood is a perfect surface for bats to cling to while they roost.



The top board and 2" ceiling board are ripped at a 10 degree angle.

If using one inch rough sawn boards, the 2 inch ceiling board should be about 4 & 1/4 ". Attach the back board to the ceiling board with 2" drywall screws.



There should be a ½" gap between the bottom two boards.

This gap provides ventilation during hot weather and gives the bats another entry/exit point.



Two ½" pieces of plywood spacers work well to maintain the gap.

5/8" will also work. A gap larger than 3/4" would be too big.



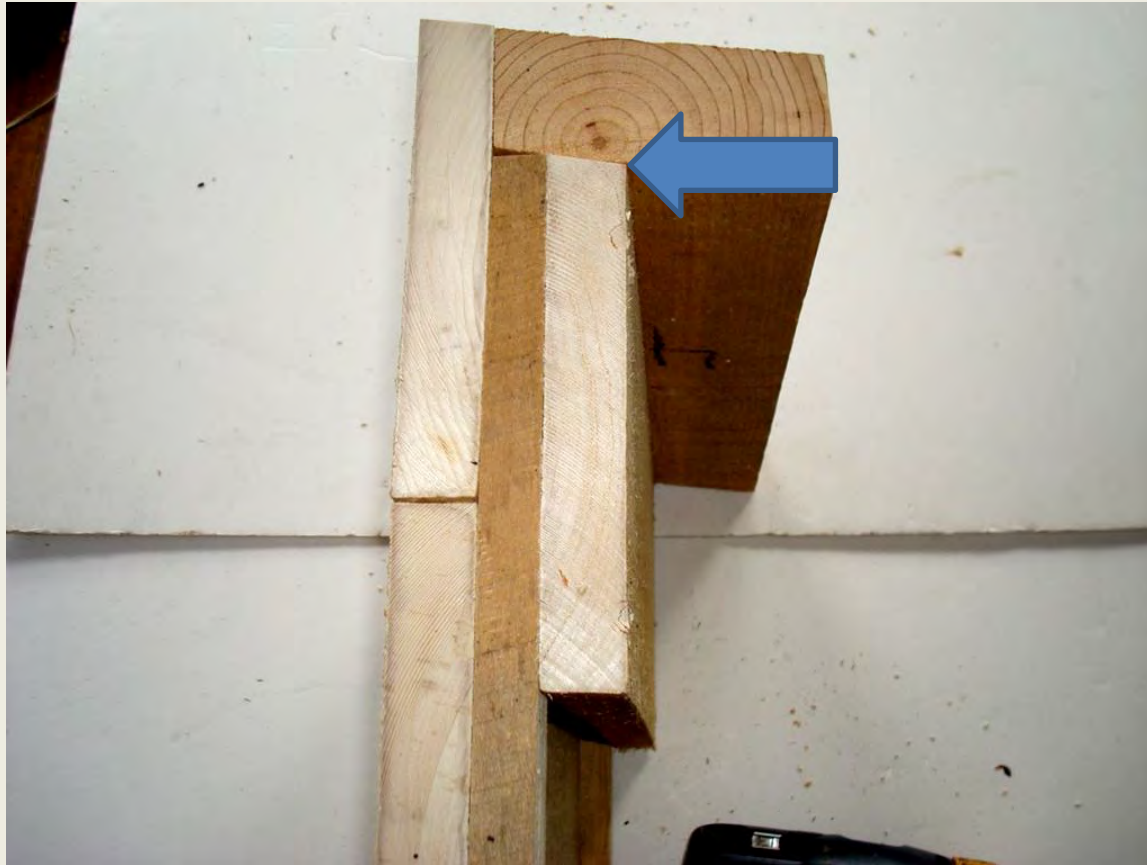
Two 3/4" spacers strips are attached on each side.

Pre-drill the spacer strips and attach with 1 & 5/8" drywall screws. The 3/4" crevice space is very important. Both species, big browns and little browns like the 3/4" crevice size.



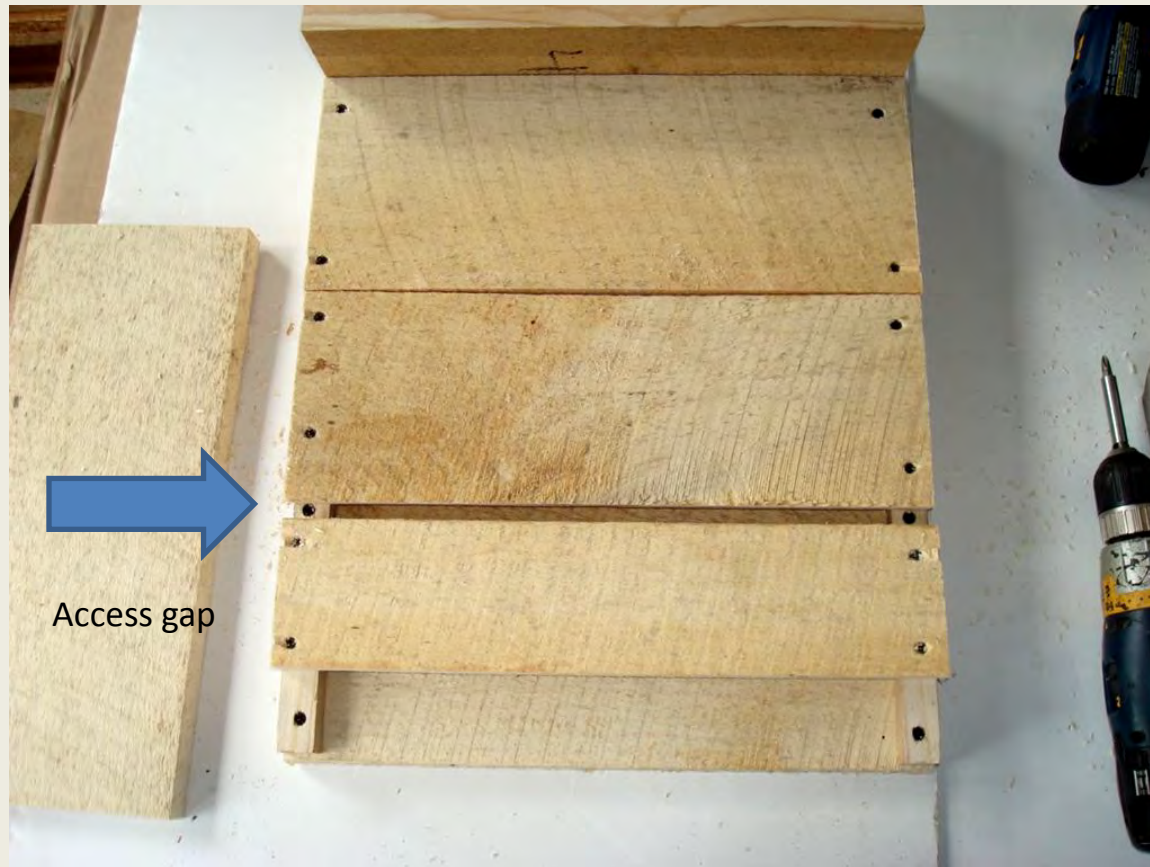
Attach the first interior baffle with 2" drywall screws.

The interior crevices of the box have approximately a 14" finished width.



The top of this one inch board baffle is ripped at a 10 degree angle for a tight fit to the ceiling board.

Tight fitting of joints in the top half of a bat house give greater thermal variation between crevices allowing the bats to find their desired temperature in all kinds of weather conditions.



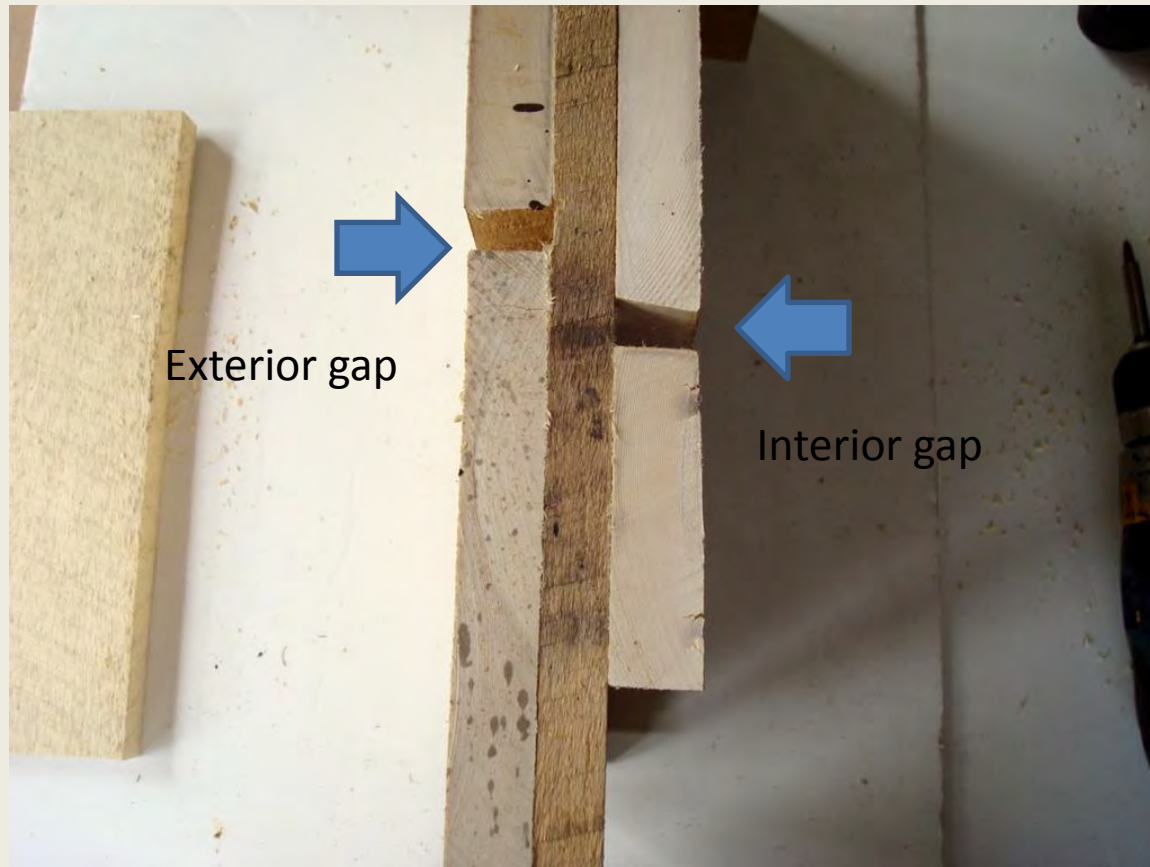
Attach the rest of the baffles leaving a ½" access gap between the bottom two boards.

This gap allows the bats to change crevices internally without crawling down to the bottom of the box.



The back of the box should extend down about 2” lower than the baffle.

The staggered length of the baffles provides easy landing access for bats flying into the bat box. This is especially important for pups just learning to fly.



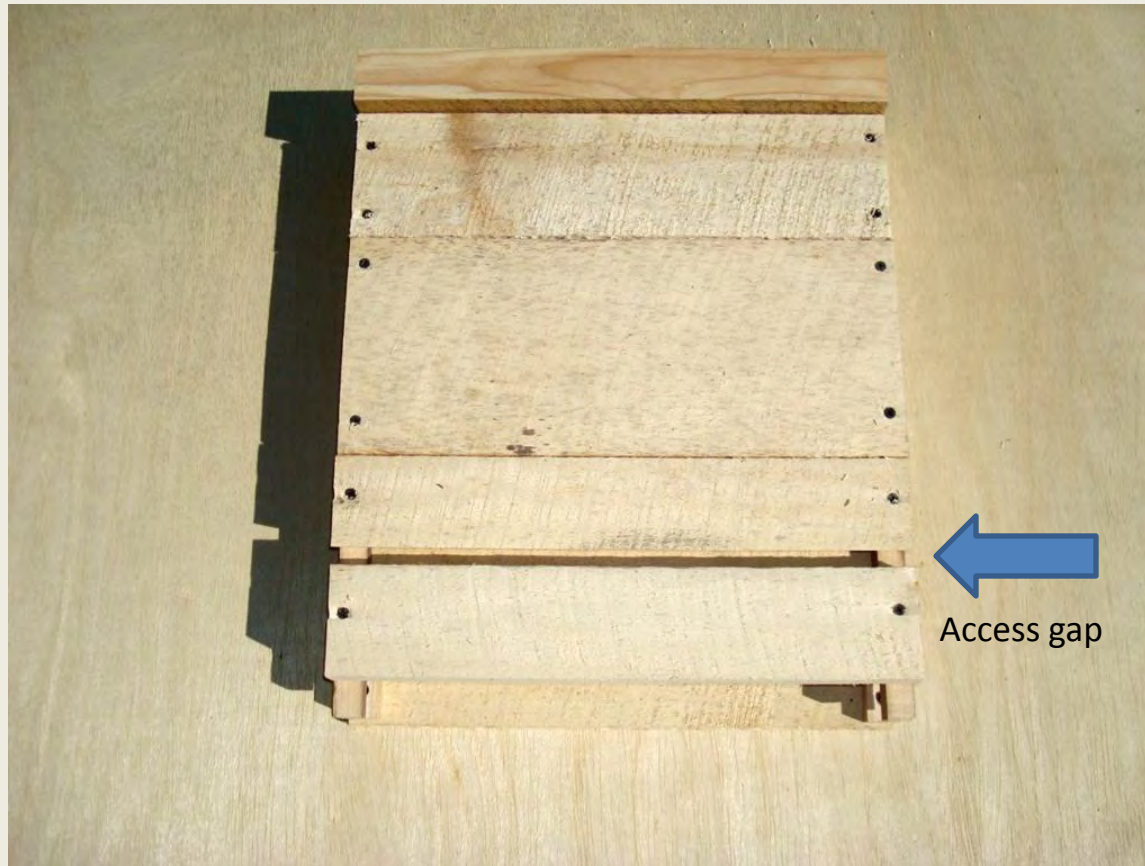
The interior baffle gap is slightly lower than the back exterior gap.

This difference in height allows warm air to move internally from the front of the box to the back of the box and out the back access ventilation gap.



Attach the 2nd row of $\frac{3}{4}$ " spacers with 2" drywall screws.

I usually cut the spacers slightly shorter than the outside dimension of the bat box so they don't stick down below.



Attach the 2nd row of baffles with 2" drywall screws.

Random widths of one inch boards are used in order to locate the internal access/ventilation gap at the correct position.



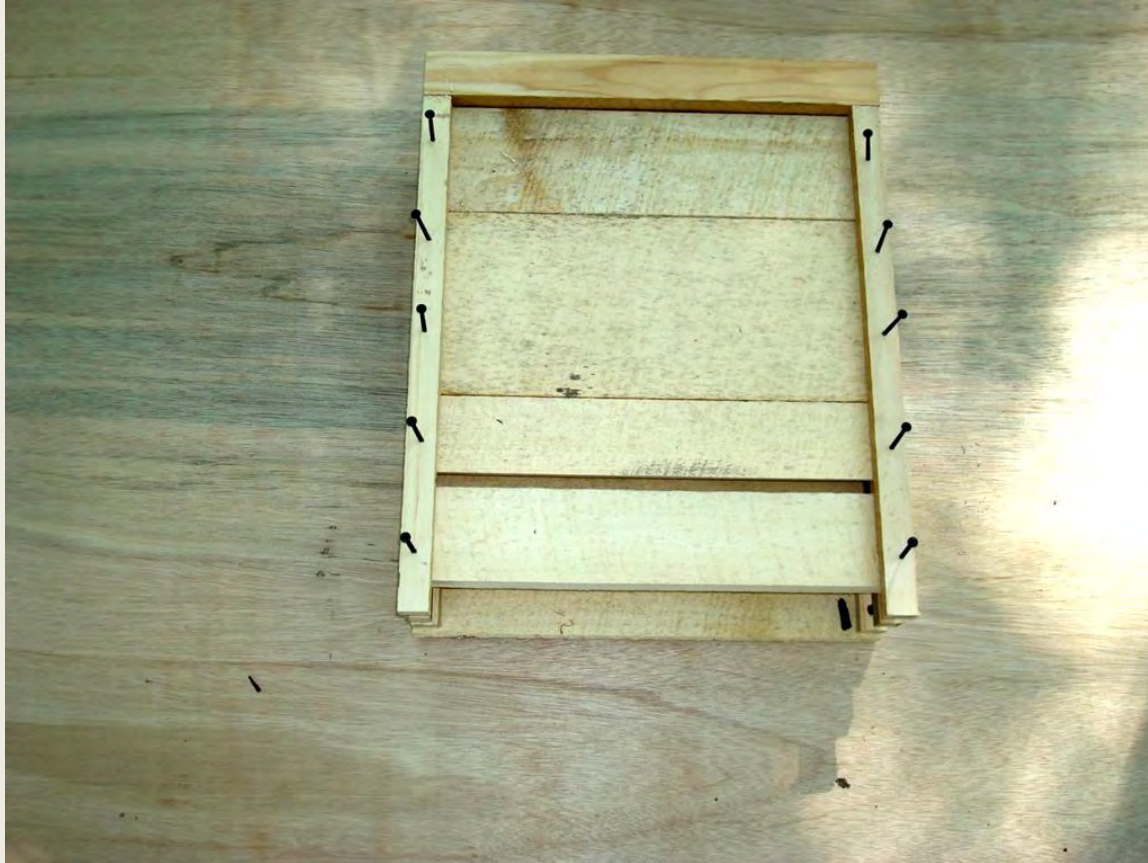
Internal access gaps go upwards from the front to the back of the box.

This ventilation is crucial for big brown bats.



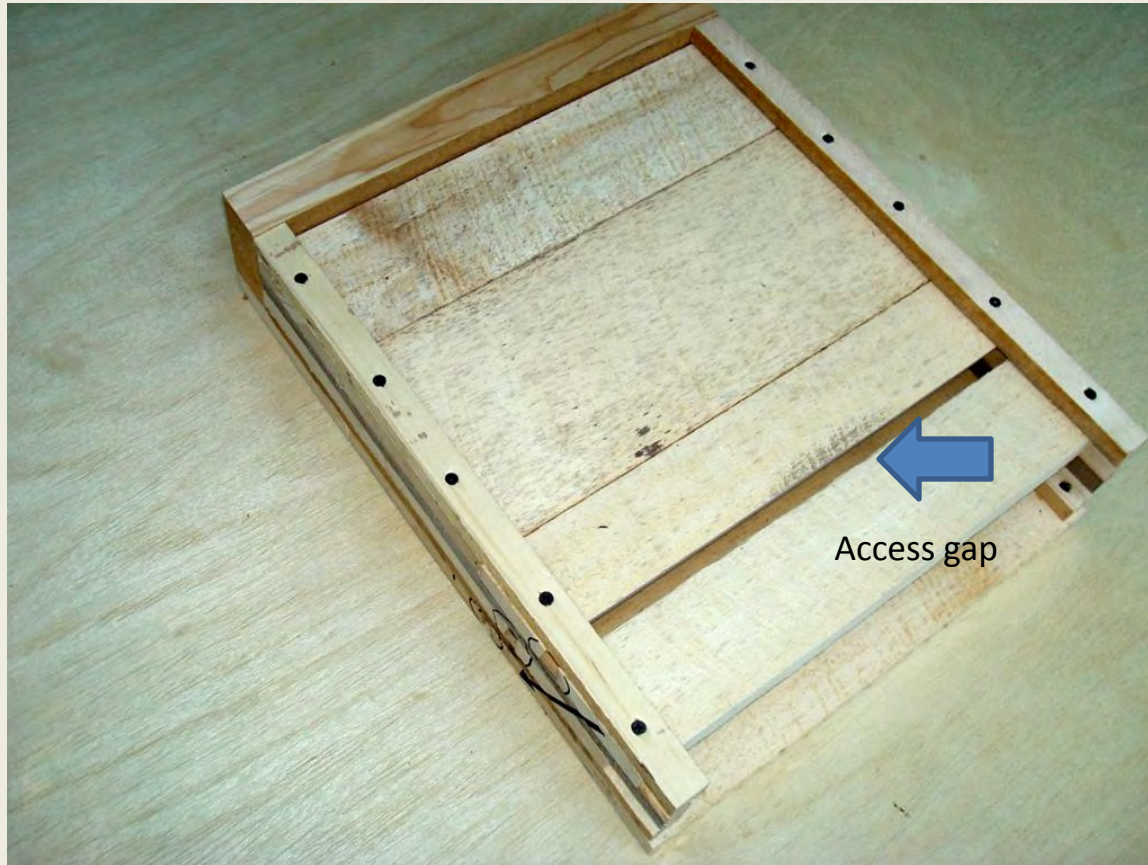
Internal access gaps from front to back.

The internal access/ventilation gaps are positioned so that warm air in the front of the box flows upwards and out through the back access/ventilation gap.



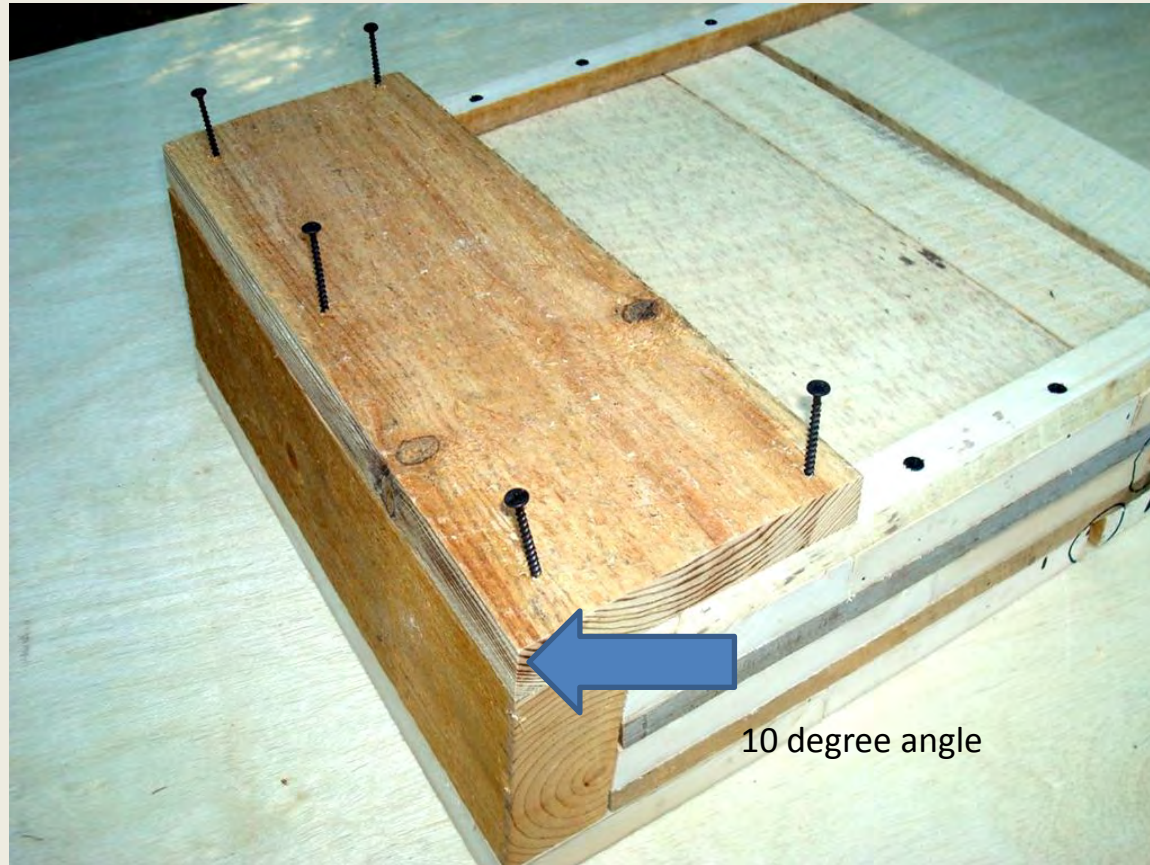
The third and final layer of $\frac{3}{4}$ " spacer strips are pre-drilled and ready to be attached.

2" screws are used and placed wherever necessary, usually about every 6".



The final layer of $\frac{3}{4}$ " spacer strips are attached.

Bats will go back and forth through these access gaps frequently throughout the day and night to find their desired temperature.



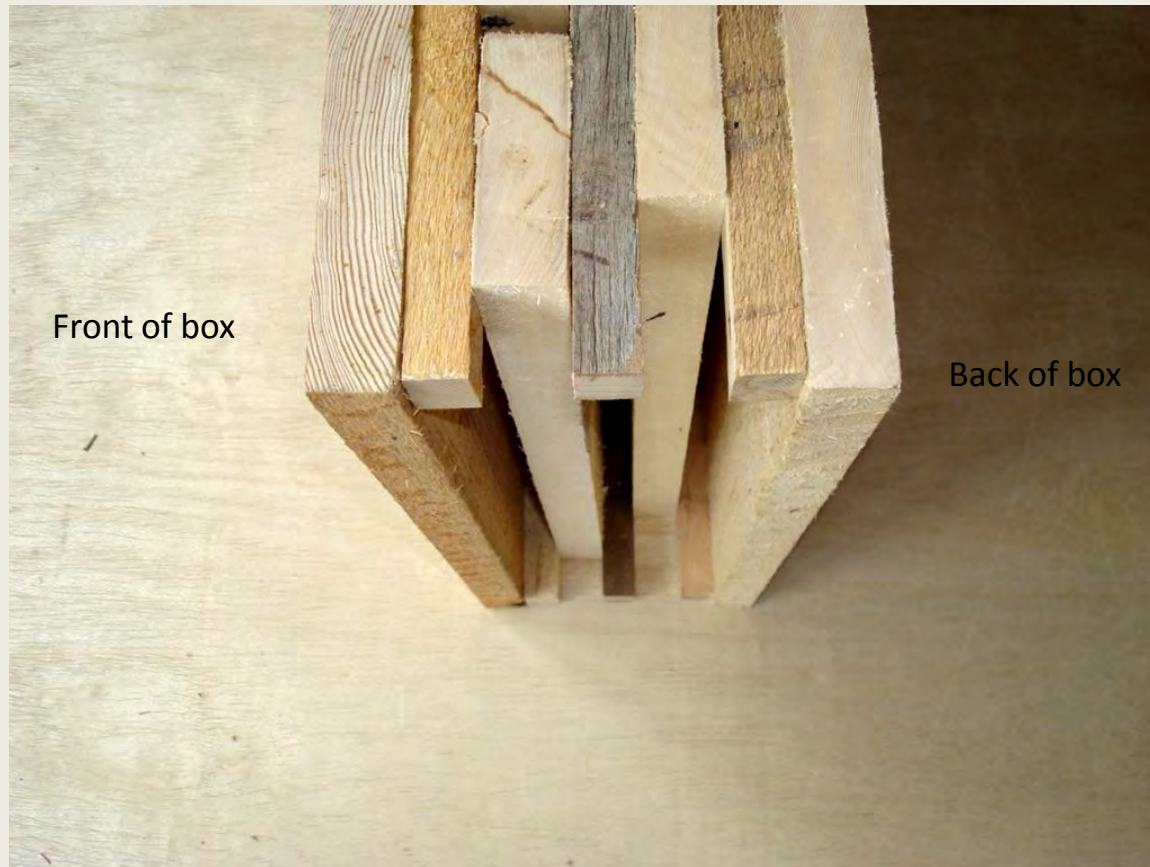
The front/outside board is pre-drilled and attached with 2" drywall screws.

The top of this board is ripped at a 10 degree angle to fit flush against the 2" ceiling board.



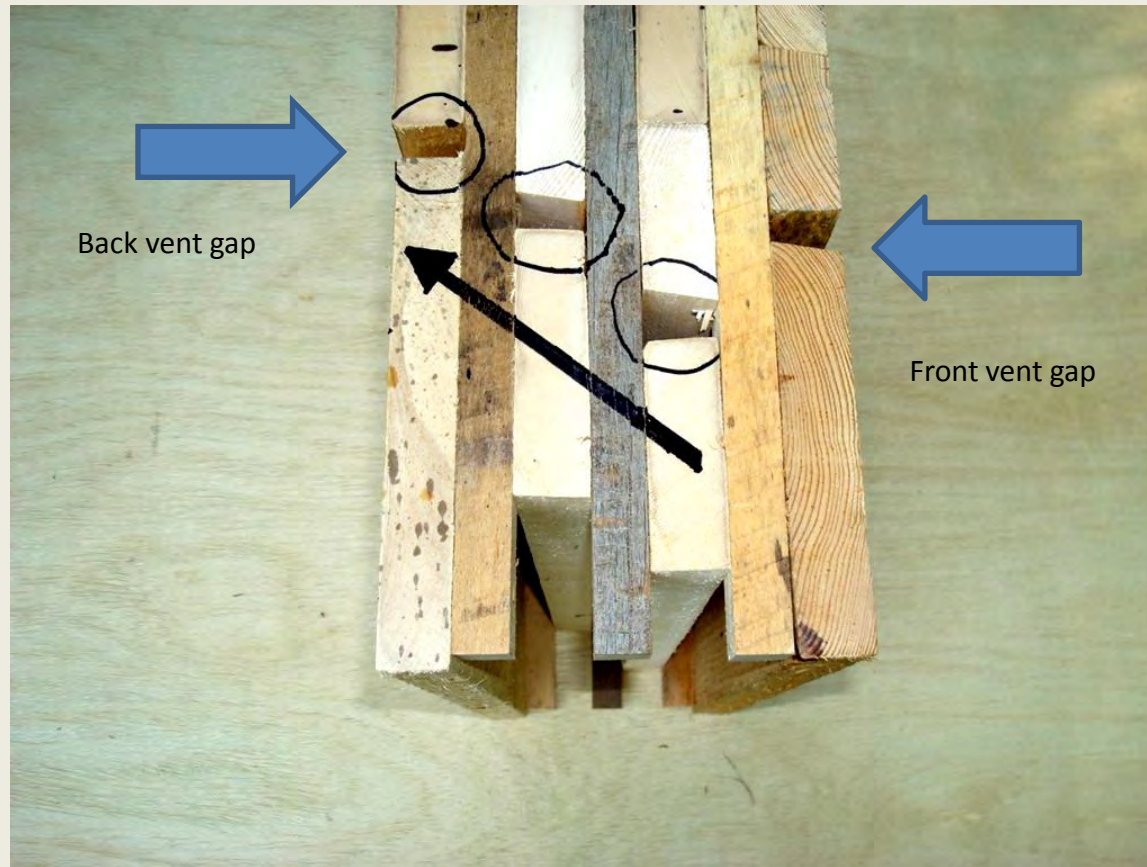
The front is all pre-drilled and attached with 2" drywall screws.

I used red pine for the exterior of this bat box. Softwood/evergreen lumber is the best for exteriors since it holds up better in the weather.



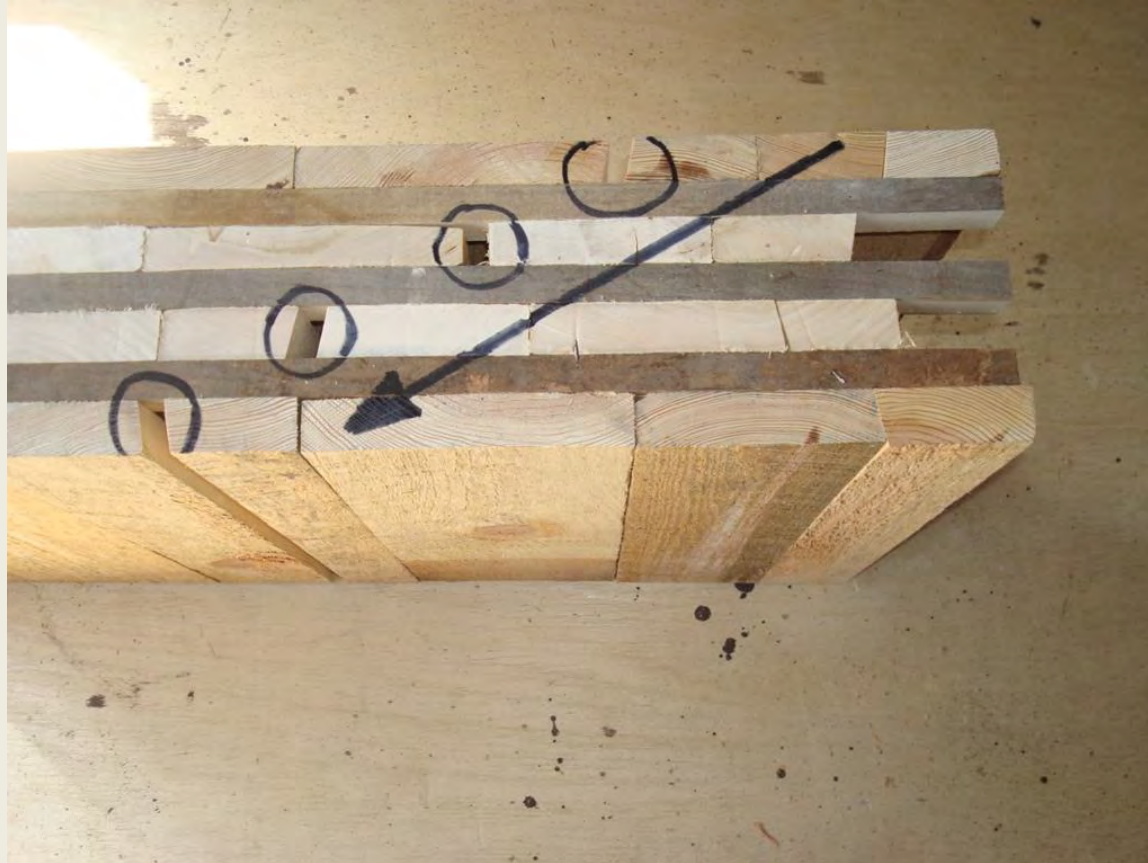
A view of the staggered baffles.

Staggered baffles lengths make it easier for bats to enter the bat box.
1&1/2" to 2" variation works fine.



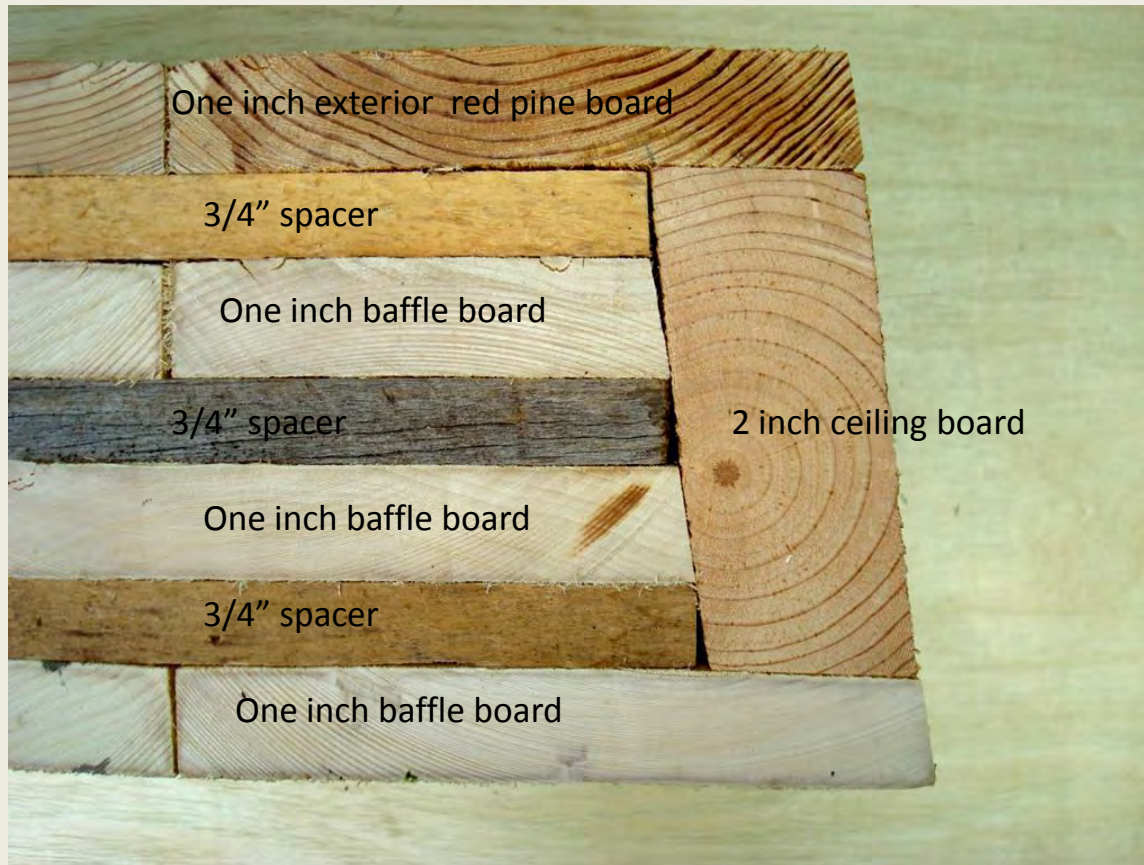
The front access/ventilation gap can vary in location.

A gap lower in front would make for a warmer box. The higher gap provides another entrance/exit point for the bats to use.



A taller box 30" high

A taller box allows for greater temperature ranges. I was able to space the internal access gaps out more in this box. This design would be ideal for big brown bats. Some of the gap edges are ripped at the same 10 degree angle used for the roof. An angle on exterior access gaps helps keep out weather and light. A 45 degree angle would actually be best for the exterior gaps.



One inch exterior red pine board

3/4" spacer

One inch baffle board

3/4" spacer

One inch baffle board

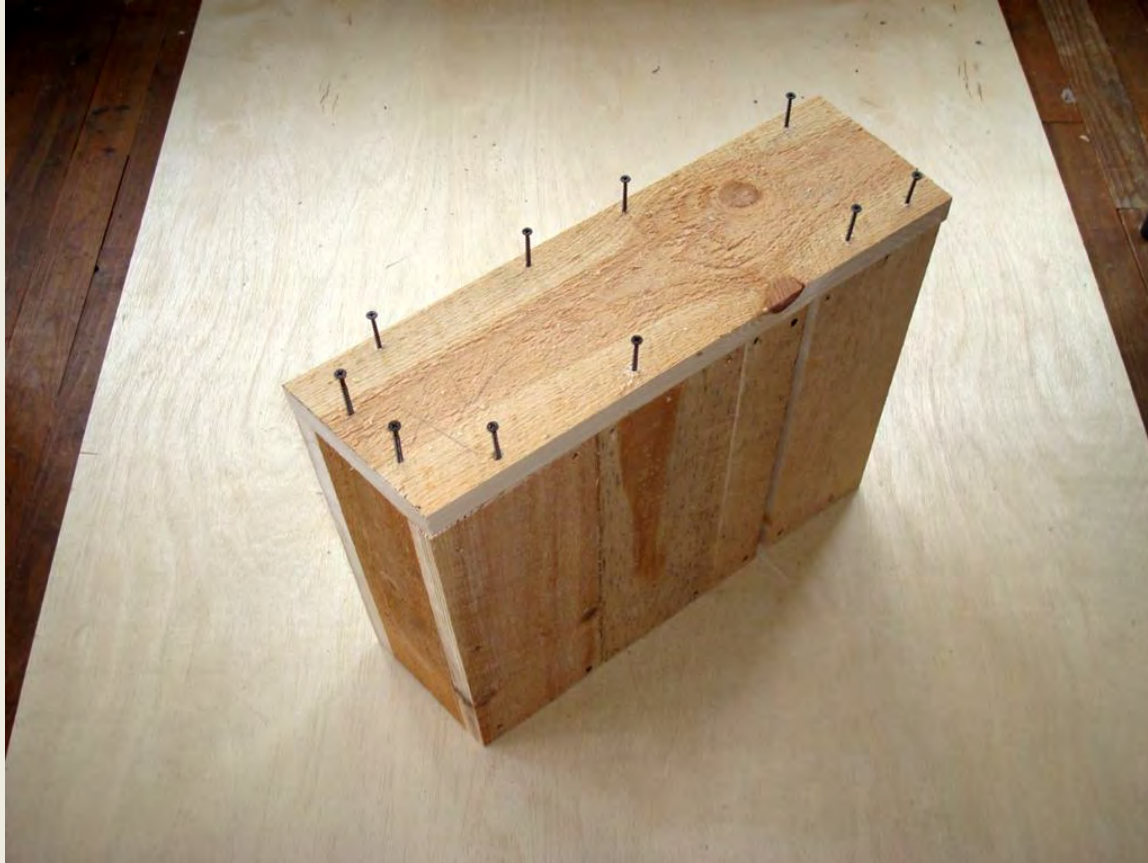
3/4" spacer

One inch baffle board

2 inch ceiling board

Side view of 3 crevice bat box.

Here you can see how the 2" ceiling board is sandwiched in between the back and front 1" boards. The tops of the 3/4" spacer strips are not cut at the 10 degree angle but could be if desired. Caulking can also be used here for a tight seal.



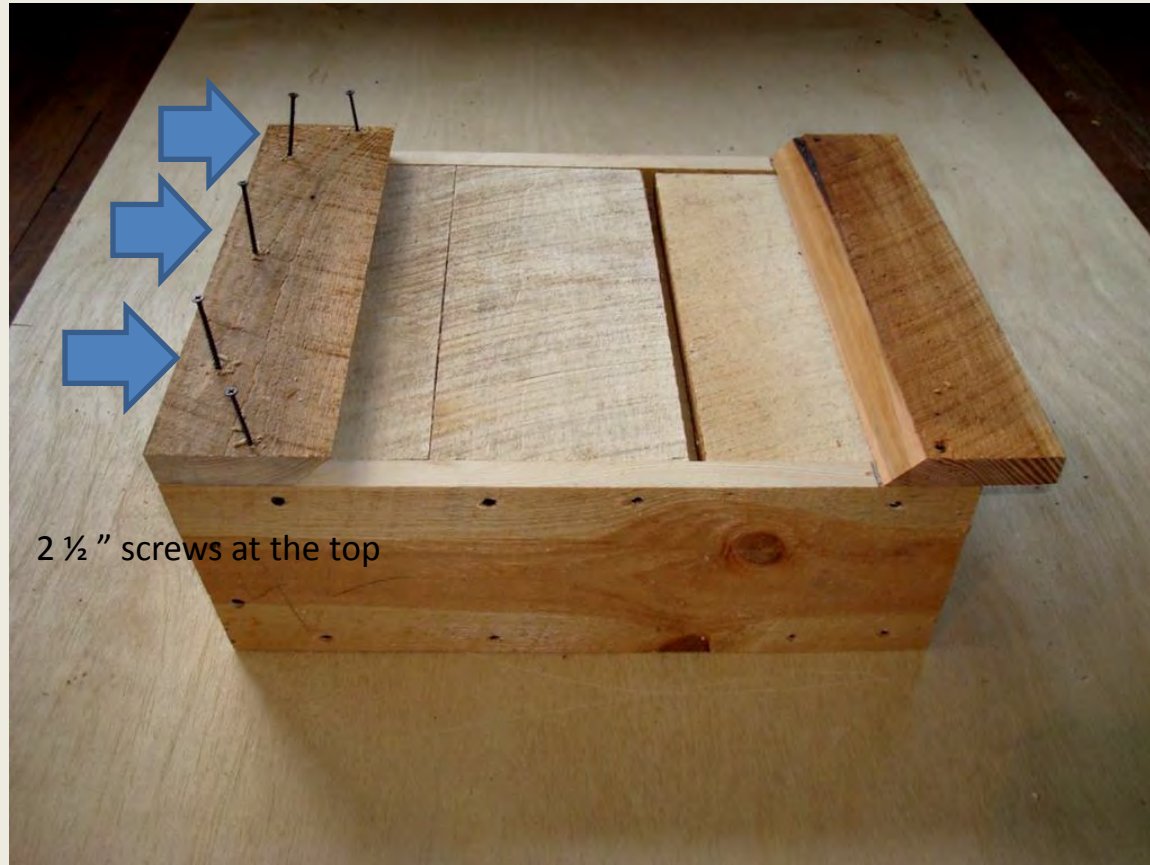
Attaching the side piece with 2" drywall screws.

The side pieces for this box were 6 $\frac{1}{4}$ " wide. Because the thickness of rough sawn lumber varies, the sides usually end up being anywhere from 6" to 6 $\frac{1}{2}$ ". For a 4 crevice box the sides are around 8" wide.



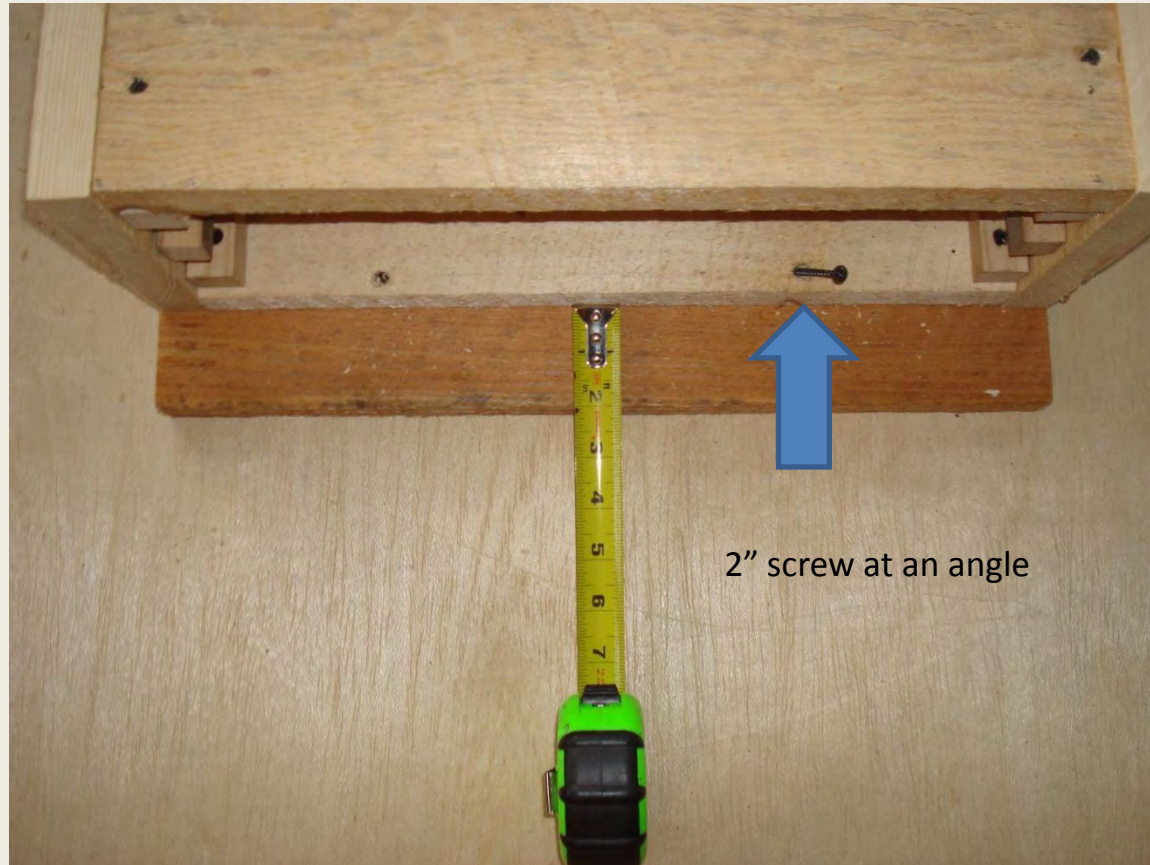
A view from the top with both sides pieces on.

The ceiling board should fit as tight as possible. Caulking or glue can be used if desired.



The french cleats are attached with 2" and 2 1/2" drywall screws.

I use the 2 1/2" screws into the 2" ceiling board. This box will weigh about 35 to 40 pounds when finished and the 2" ceiling board works very well to hold the longer screws needed at the top to carry the weight of the box.



The bottom mounting board extends down 2".

Use either 1 5/8" drywall screws or 2" drywall screws at an angle to attach.



The matching french cleat to be attached to the pole later.

The chocolate colored french cleat is shown simply to demonstrate how the 2 pieces will lock in when mounted on a pole.



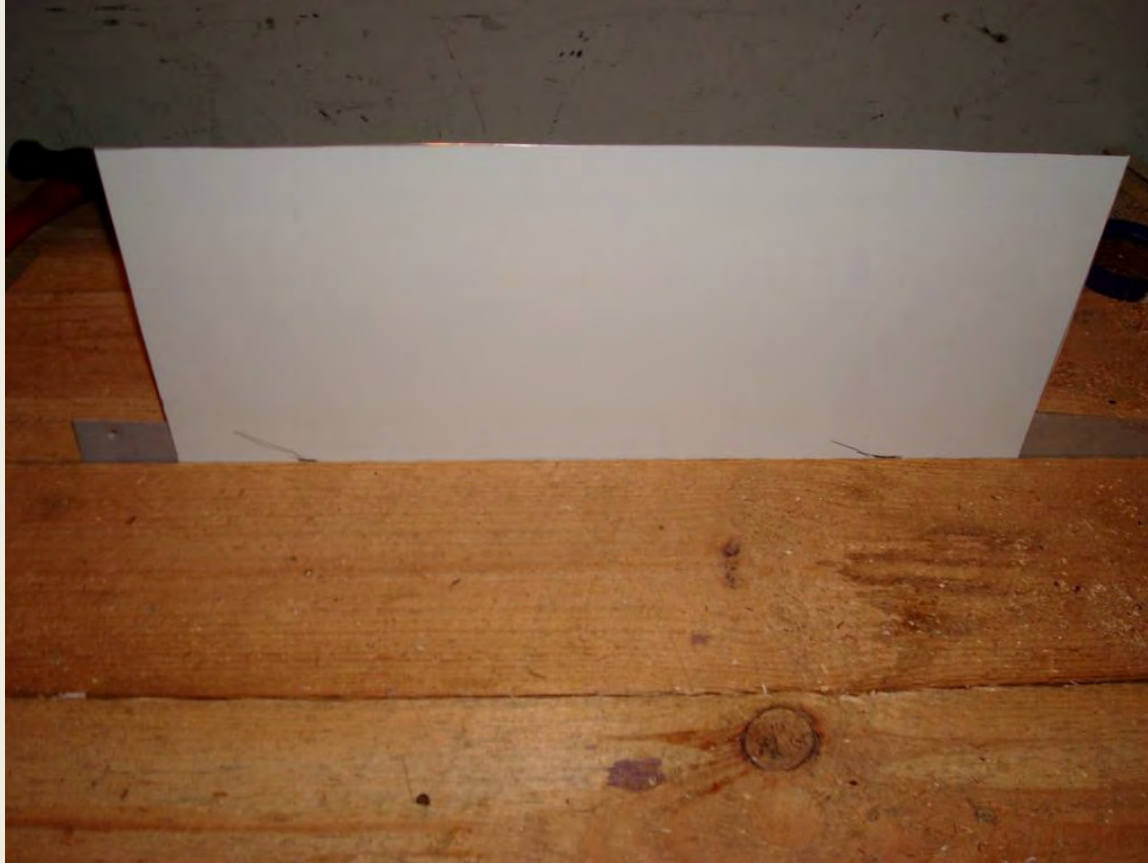
A Surform works well to smooth off rough edges.

I knock off burrs and rough edges before staining the box.



Aluminum coil stock works well for a roof.

This is the underside of brown on white colored coil stock. The front and back are bent down at least one inch.



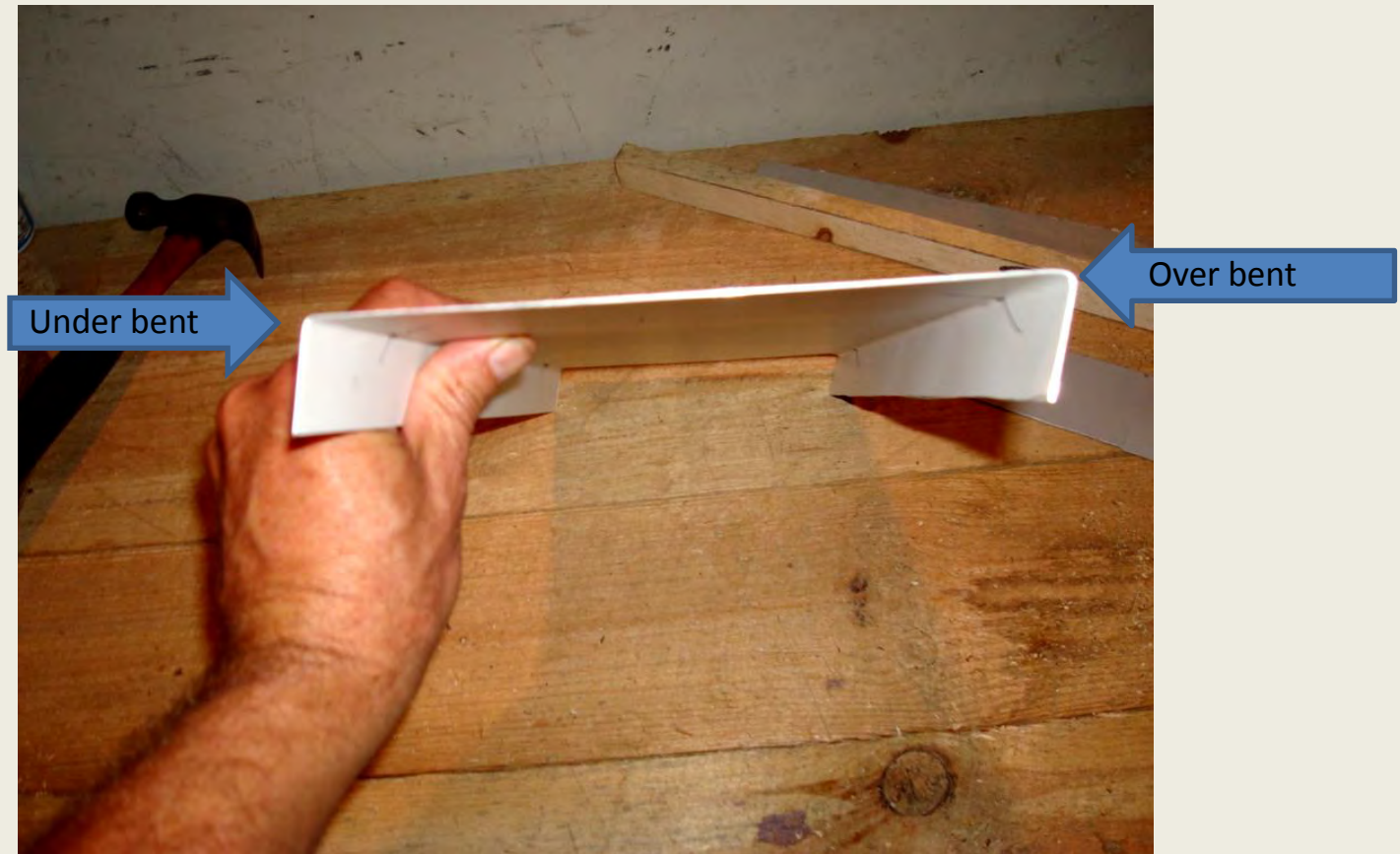
A crack between 2 boards works to bend aluminum

There is a gap of about 1/16" in the 2 " boards of my work bench. I put the aluminum down into the crack and wedge some cardboard or pieces of vinyl siding in tight. It can then be easily bent on a straight line.



I bend it slowly along the corner of the wood

The cardboard wedges inserted into the crack between the boards are visible behind.



Bent for a 10 degree angle

Each side can be crimped by hand to match the angle as close as possible. The back is over bent and the front is under bent. I like a 10 degree angle for bat house roofs because it is easy to do and wastes very little material. Other angles can be used if preferred.



Hex head screws with washers to fasten.

I usually stain the box first, but attached the aluminum here first for demonstration purposes. Caulking the edges of the top is also recommended.



A side view of the aluminum top.

The aluminum top can also be cut longer on the sides and bent down for extra weather proofing protection.



A water based solid stain for the exterior.

I use Behr's latex stain from Home Depot. Most literature recommends flat black for northern latitudes but I have had good results with a chocolate brown color. Lighter colors are usually recommended in hotter climates.



Diluted stain to darken the bottom

Instead of cleaning my brushes I simply store them in a container of water. I then brush on the diluted stain at the bottom of the boxes. This helps keep light from reflecting up into the box.



Spacer mounting strips

These $7/8'' \times 1 \text{ \& } 1/2''$ strips of wood work well to mount a bat box on a building. They are attached with 2" drywall screws. Big brown bats will roost in the space between the box and the building on very hot days.



Front view

The spacer strips stick out about 2" at both the top and bottom of the box. A pre-drilled hole makes for easy mounting.



Silicone caulking applied

Caulking helps glue the roofing material as well as seal any drafts. Any wood edges next to the edge of the roofing material are coated entirely.



The aluminum ready to be attached

These are one inch painted hex head screws with washers.



A close up of the screw

These hex screws can be turned in with a socket if power for a drill is not available.



Loosen spacer strips to attach aluminum

Spacer mounting strip screws must be backed out to fit aluminum in.



Ready to paint a bat silhouette

Craft foam works well for the stencil of the silhouette. The foam must be weighted down at the edges with stacks of pennies or nuts and bolts. Krylon spray paint works very well.



French cleat mounted with one screw

This box will be mounted low to the ground for demonstration purposes only.

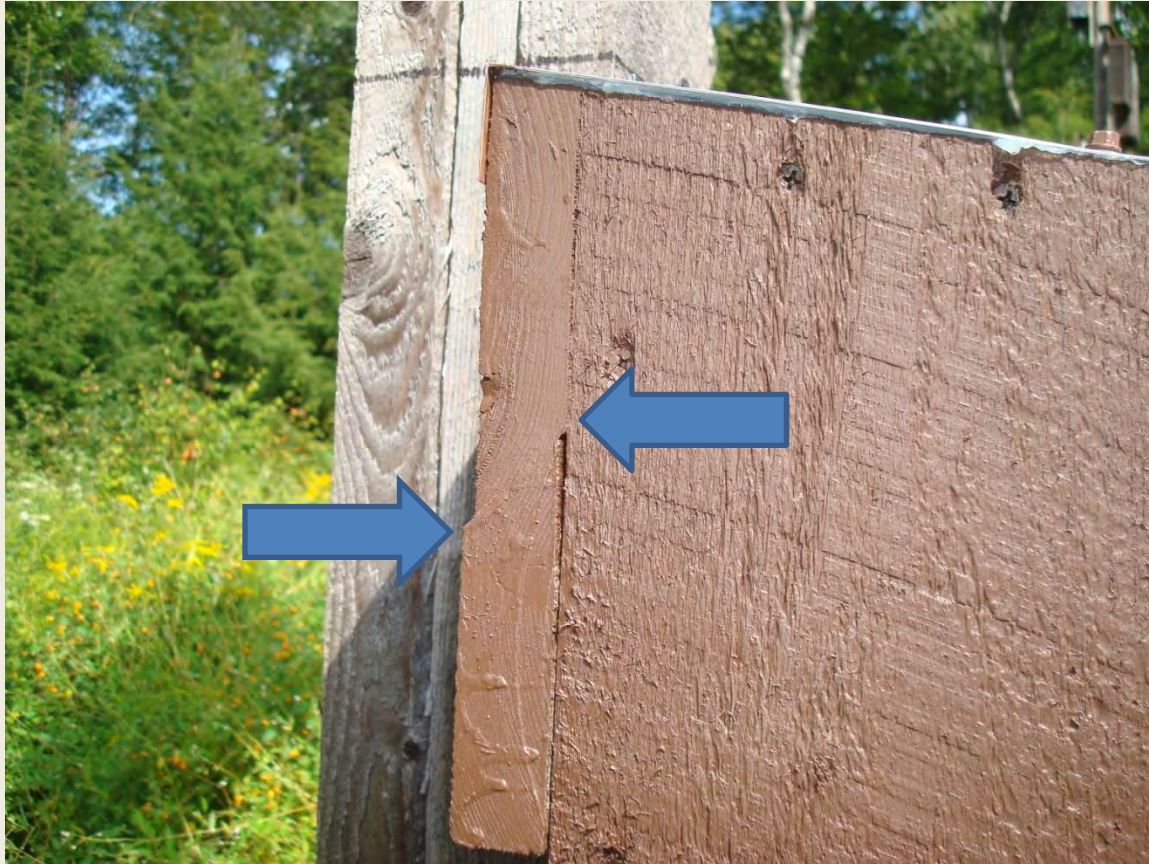


I use a level or a square to position the french cleat

Four other holes are pre-drilled for 2 ½" drywall screws.



The box is mounted by setting it on the french cleat.



The 45 degree joint is hard to see here.

The top french cleat sets down on the bottom piece and locks in tight.



At least 2 screws into the bottom

I usually use 2 & ½" screws at the bottom



An angle bracket at the top

The black line indicates the hypothetical top if this were mounted at the top of a pole. The angle bracket makes the box more secure to the pole.



Two L-brackets is another mounting option

Lag screws or exterior painted screws into the post and painted hex head screws with rubber washers into the roof. Inch and a half hex screws can be used since there is a 2 inch ceiling board.



Mounted and ready for bats!

In an actual mounting this box would be between 10 and 14 feet above the ground. Less height is needed if the box is on a hillside or slope.



Mounting to a wall

This box is mounted lower on the wall for illustration purposes. It is setting on a mini french cleat for ease of leveling before permanently attaching to the wall.



Attach a mini french cleat to the building wall.

The mini french cleats should be small enough to allow movement of the box for leveling purposes.



Attach a matching cleat to the bat box.

This works great to initially set the box on before leveling.



Two screws at the top of each mounting strip.

Having the french cleats to set the box on before attaching makes it easy to position the box. Some bats will even enter and exit from behind the box at the top with this design.



Last screw in the bottom mounting strips.

Big brown bats love to roost behind the box on the wood siding of buildings on very hot days with this design.



Big brown bats on a hot day!

There are about 60 big brown bats in the single crevice box on my chimney. Two are visible roosting behind the box on the chimney. This design is now obsolete other than for use as a first time starter box, but shows the effectiveness of the mounting spacer strips behind the box.



Other material options:

These are cedar fencing boards at Home Depot. My friend Frank Cloud from Lithia Springs Georgia has used them successfully building his bat houses. They come 9/16" thick by about 6" wide and about 6 feet long. The rough-sawn texture of the wood is perfect for bats to roost from.



Guano size comparisons

On the left is big brown bat guano. In the middle is little brown bat guano. On the right are mouse droppings.

Ten Rules for Successful Bat Houses in NW PA

- 1. **A dark exterior.** The outside of a bat house must be stained or painted a dark flat color for proper heat absorption. Black is best, but dark brown, blue or green will work also. I mainly use a chocolate brown for NWPA.
- 2. **Mount in full sun.** The more direct sun the house gets the better. Maternity colonies especially need high temperatures to raise their young.
- 3. **Mount at least 12 feet off the ground.** Bats need adequate room when exiting to take full flight.
- 4. **Do not mount bat houses in trees!** Bat houses mounted in the shade do not achieve high enough temperatures to attract bats. An exception would be a dead tree with no foliage.
- 5. **A clear exit flight path.** High weeds, tree limbs and wires can interfere with and be a hazard to bats as they exit the house.
- 6. **Waterproof and draft free.** A dry, draft free interior is a must especially for mothers raising pups.
- 7. **Ventilation in the lower 1/3 of the house.** Ventilation provides a wider temperature range so bats can move around to their desired temperature and fresh air supply.
- 8. **At least 3 crevices.** Boxes must have at least 3 crevices to provide enough temperature variation and to hold temperatures throughout the night.
- 9. **Crevice size. No less than 3/4" and no more than 7/8"** crevice size. 3/4" crevices attract fewer wasps. Both little and big browns love 3/4 inch crevices. I use all 3/4 inch crevices in my bat boxes.
- 10. **Interiors free of splinters & metal.** Certain types of wood can be a hazard developing splinters as it dries out. Metals other than stainless steel corrode rapidly when exposed to bat urine. Aluminum becomes toxic!
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- Good websites: www.bathouseforum.org www.batcon.org www.batmanagement.com
-
- Questions? Call or e-mail Terry Lobdell, Home- 814-967-2587 Cell- 814-547-1625
- Tracker59@hotmail.com