**Bats and Pecans: A Growing Partnership**

*Mark Kiser*

In southern Georgia, Research Associates testify to the benefits of bats...

Pecans are big business in the southern United States, but as with most commercial crops, insect pests can pose costly problems. Georgia produces more pecans than any other state, harvesting about $80 million worth annually. However, pecan pests cost Georgia growers $25 to $30 million per year. Most growers use conventional methods of pest control, relying heavily on chemical pesticides. Many farmers, however, are concerned about risks to personal safety and environmental health from pesticides, and are looking for alternatives. One Georgia family believes they've found a better, more natural way to fight pests in their pecan orchard.

Frank and Teresa Bibin own Pebble Hill Grove, a 27-acre (10.8 ha) organic pecan orchard in southern Georgia. Each year, more than 30% of their crop suffered damage from the hickory shuckworm (*Cydia caryana*), a major insect pest of pecan trees. Shuckworm moths lay eggs on developing pecans and the larvae burrow inside, destroying the nuts. Conventional growers typically spray pesticides six times per year just to control shuckworm outbreaks. To comply with organic standards, the Bibins sought another approach.

"When we decided to cut chemicals in our orchard, we realized that we were going to need some alternatives for insect control," said Frank Bibin. By chance, they had picked up a BCI brochure at a state park and noticed that bats were helpful to farmers. They joined the North American Bat House Research Project and built their first nursery house in July 1996. They painted the bat house medium brown and mounted it in their orchard facing east. Bordered by woodlands, a wetland and multiple creeks and ponds, the orchard seemed like an ideal place to attract bats.

"We saw only an occasional bat before installing our first bat house," remarked Bibin. Nevertheless, freetail bats (*Tadarida brasiliensis*) and evening bats (*Nycticeius humeralis*) began moving into the bat house in March 1998. By summer, 100 to 120 bats were present, which remained throughout the following winter. Not only did the Bibins see fewer moths that year, they also observed less damage from the shuckworm larvae than in years past. Were the bats really making that much of an impact? Or was there another explanation?

Excited by this apparent progress, the Bibins added a back-to-back pair of nursery houses beside the first house in March 1999. To test bats' preferences, they painted the houses beige and oriented them east/west. Bats occupied the new houses within two weeks, and the population grew rapidly that summer. By September, the Bibins counted about 600 resident bats, with 400 to 500 using the new pair. On many evenings, they watched bats emerge and noticed that they returned several hours later to feed in the orchard. Their inspections revealed virtually no shuckworm larvae or damage in 1999.

**The More The Merrier**

The Bibins decided that winter to add larger homes to accommodate their growing colony. BCI assisted with two grants (see page 7) to help expand their experimentation. In March 2000, they built a back-to-back pair of 4-foot (1.2 m) "triple-wide" nursery houses [The Bat House Researcher, Spring 1998], oriented to face north/south. These large, dark brown houses attracted bats within three months, and have been their most successful to date. By July, 570 bats were using the north-facing house, and 880 occupied both houses by September. Their next addition, also in March, was an experimental 4-foot...
(1.2 m) house constructed by Maberry Centre Bat Homes of stucco-covered insulation board. This roost appeared to be too cool for maternity use, but it sheltered 300 to 350 bats occasionally from August to November. The Bibins were also granted a pair of BCI nursery houses and a Maberry plastic stucco house, all of which were occupied within one week of installation this past summer. In November 2000, the Bibins counted more than 1,700 bats in their bat houses. Having a variety of designs, exterior colors and orientations has allowed their colony to expand rapidly, and provides many options for bats when weather changes.

While no form of insect control is absolute, Bibin believes bats can play an integral role in pest reduction for pecan growers. “Before the bats arrived, if we left the light on in our punthouse by the orchard at night, the room would fill with moths. Now, we see only a few moths,” said Bibin. Having found no shuckworm damage again in 2000, the Bibins are thrilled with their results, and are already building another pair of triple-wide nursery houses. Their problems with other pecan pests, including twig girdlers (Oncideres cingulata), stinkbugs (Nezara sp.) and fall webworms (Hyphantria cunea) have also decreased dramatically since attracting bats.

“We’ve spent far less on the bat houses than we would have spent on pesticides in just one year,” added Bibin. Considering that the annual cost of spraying for shuckworms alone would amount to $1,260 (a sizable investment for a small orchard), when multiplied over numerous pests the savings are significant. “I am convinced our decrease in damage from hickory shuckworms and other pests is because of the bats’ presence here. I think every grower needs to consider bats as an alternative to pesticides.”

COLD CLIMATE MODIFICATION FOR NURSERY HOUSES
Mark and Selena Kiser

Temperature is one of the most important factors in determining whether a bat house will become occupied. To find the most appropriate temperatures for bats, BCI and Research Associates continually experiment with various designs, colors and placement. Thanks to research sponsor John Scanlan, our bat house test facility in Austin [TBIH, Fall 1998] was busy again this summer.

In cold climates, bats may benefit from houses with a partial bottom to help retain heat. Although not a new idea, we wanted to know how much warmer a house with this modification would be. We performed a side-by-side comparison with a standard open-bottom nursery house versus an identical house with a partially closed bottom. For the latter, a 3/4-inch (19 mm) strip was kept open for bats to enter and the bottom was angled to allow guano to fall out. Six positions were tested inside each house: top, middle and bottom in the front and back chambers. Our results indicated that the closed-bottom house was indeed warmer (Figure 1). By afternoon, the closed-bottom house maintained temperatures 5° to 7° F (2.8° to 3.9° C) warmer throughout the interior, except at the bottom of the back chamber (where the bottom was left open for access to bats). This area was only 2.5° to 3°F (1.4° to 1.7°C) warmer.

These results indicate that a bat house with a partial bottom could be beneficial to bats in cold climates. We encourage Research Associates in these areas to conduct their own side-by-side preference tests with open versus partially closed-bottom (see below) houses to see which bats like best. Please write to us with your results!
If you would like to try the cold climate modification mentioned on page 2, here’s how:

Begin with the nursery house plans on pages 12 to 15 of *The Bat House Builder’s Handbook*. Extend the back edge of the sides to 29 inches (73.7 cm), and cut the bottom of each side board at a 45° angle to create a downward slope from front to back (for steeper angles, lengthen the back of the side pieces accordingly). You will also need to extend the length of the backboard by four inches (10.2 cm) to create an adequate landing area. Cut a 5 x 17⅛-inch (12.7 x 44.5 cm) piece of ½-inch (13 mm) plywood for the bottom. Bevel both of the long edges inward at a 45° angle. One beveled edge will fit against the front of the house. Partitions must be recessed at least ¾ inches (19 mm) from the bottom so that bats can access all of the roosting chambers.

The bottom should be attached to the front piece with hinges to facilitate inspection and cleaning. Take care that the hinge screws do not protrude into the roosting chambers. A thin piece of weatherstripping can be attached between the front and bottom to guard against leaks and drafts. Secure the bottom in place with eye hooks, a latch or screws. Remember that these houses may require more frequent cleaning to remove guano deposits.

**Figure 1**

**Open- vs. Closed-Bottom Bat Houses**

*Front Chamber, Bottom*

*Back Chamber, Middle*

**Graph Key:**

<table>
<thead>
<tr>
<th>Closed-bottom house</th>
<th>Open-bottom house</th>
<th>Ambient Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
</tbody>
</table>

Graphs by Selena Kiser
POLE-MOUNTING TIPS

Mark Kiser

"What type of pole should I use?"
"Does my bat house sway too much?"
Not surprisingly, BCI receives many questions like these. Pole-mounting can sometimes be challenging, but offers several advantages, including back-to-back pairing and the ability to face houses in any direction in full sunlight. Before setting up your next bat house, consider the following suggestions.

Many kinds of wooden and metal poles are available. Pole size, strength, weight and cost are important considerations, as are available labor and equipment. Wind affects all poles, even utility poles, to some degree. A few inches of sway is to be expected and is not a concern for bats. Most single bat houses can be installed on one pole and will not require additional support. If in doubt, use two poles for extra stability.

METAL POLES

Metal poles are generally stronger and longer-lasting than wooden poles. For most applications, 2-inch (5.1 cm) or larger inside diameter steel poles are best. With few exceptions, smaller steel poles are not recommended due to their lower strength and stability. The thicker the wall (measured by its Schedule rating number), and the larger the diameter, the stronger (and heavier) the metal pole will be. Lance Wood, a purple martin landlord, reported that during a storm, 90-mile (144 km) per hour winds snapped an inexpensive, thin-walled steel pipe, resulting in the house’s destruction, while a ½-inch (6 mm) thick, Schedule 80 steel pipe was not damaged. A slightly thinner Schedule 40 steel pole bent, but did not break, sparing the houses (Purple Martin Update, vol. 7 (2), 1996).

Plumbing or pipe supply companies are good sources for steel poles. Bat houses can be attached with hex or carriage bolts, which requires cutting or drilling holes into metal. U-bolts, however, can be used and require no special tools, but remember to substitute 2 x 6-inch (5.1 x 15.2 cm) lumber for the vertical mounting boards to avoid splitting the wood.

WOODEN POLES

Wooden 4 x 4-inch (10.2 x 10.2 cm) posts are economical choices for many homeowners. However, even pressure-treated posts often warp. For this reason, 4 x 6-inch (10.2 x 15.2 cm) posts are better. Round wooden poles (use 6-inch [15.2 cm] or larger diameter) are also available at specialty lumber stores and farm supply centers. Unused utility poles make great mounting sites, although back-to-back pairing is difficult. Attaching bat houses to wooden poles is typically easier than for metal poles, as no special equipment is necessary. Lag screws, hex bolts or carriage bolts can be used to secure houses to poles.

LENGTH

The length of the pole is another important factor. A good rule of thumb is that poles should be five to six feet (1.5 to 1.8 m) longer than the desired installation height, depending on the size of the bat house. Remember, the distance from the ground to the bottom of the bat house (not the top) is what’s important. Don’t forget to factor in the depth of the hole. Metal poles are available in 20- and 21-foot (6.1 and 6.4 m) lengths, making them excellent choices. Sixteen-foot (4.9 m) poles are the longest wooden poles that most home improvement and hardware centers carry, and these usually provide finished installation heights less than
BCI's 12-foot (3.7 m) minimum recommendation. However, extra height can be gained by the use of pivot mounts [TBHR, Fall 1997]. Bolting a long pole to a pivot point on a stationary base anchored in the ground allows the full length of the pole to be utilized.

**Installation**

For most single and paired houses, pivot-pole systems are the easiest method of raising and lowering for maintenance. If pivot mounts are not used, it's generally easier to attach bat houses to poles first and then raise them together. Use mounting hardware appropriate for the type of pole and for the size and weight of the bat house (see above for suggestions).

Your soil type will determine how deep the hole can be dug, but three feet (0.9 m) or more is recommended for stability. Make the hole wide enough to allow several inches of clearance around the pole. This will enable you to pour and mix the concrete in the hole. After digging, line the bottom of the hole with several inches of gravel to allow drainage, which reduces deterioration. Depending on your skill, equipment, and the type of house(s) you wish to install, you will probably need the help of three or more people to raise the pole. Once poles are set in place and are vertical (check with a level), secure them with several bags of concrete mix, depending on the size of the hole. Always brace poles with boards and stakes to keep them straight while the concrete cures.

**Multiple Houses**

When using two or more poles to mount back-to-back pairs or extra-large bat houses, some builders attach braces between poles to add stability. Temporary braces between poles are useful when erecting houses, as they provide rigidity, making installation easier. Permanent braces can cause problems, however, including increased difficulty for bats when entering and exiting. In addition, bats are most vulnerable to aerial predators at this time, when flight speed is slowest. Braces underneath or adjacent to bat houses make convenient perches from which hawks and owls can grab an easy meal. When attaching multiple houses side by side on pole frameworks, minimize spaces between houses to discourage perching by raptors. If braces must be used, place them at least 10 feet (3 m) below bat house entrances. Guy wires or cables are unnecessary and should not be attached to poles, as young bats may strike the wires and be injured or killed. Avoid hanging bat houses from chains or cables, as they tend to sway too much, potentially scaring bats away.

If you wish to share any of your installation tips with other Research Associates, please write to us so that we may include them in a future issue of The Bat House Researcher.
BATS, MAN-MADE ROOSTS, AND MOSQUITO CONTROL

Merlin D. Tuttle

Bats are primary predators of vast numbers of insects that fly at night, and some species consume large numbers of mosquitoes. However, mosquito control is a complex problem that rarely can be solved by a single approach, be it bat houses or pesticides.

A variety of options should be considered, though existing chemical pesticides typically cause more long-term problems than they solve. Chemical poisons kill natural mosquito predators more effectively than mosquitoes. Over time, predators such as fish, mosquito-eating insects and bats die out, while mosquitoes develop resistance, enabling them to multiply in ever-larger numbers in a losing battle often referred to as “the pesticide treadmill.”

Individuals of some bat species can capture from 500 to 1,000 mosquitoes in a single hour and large colonies can consume enormous quantities. For example, a Florida colony of 30,000 southeastern bats (Myotis austroriparius) was estimated to consume 50 tons (45 t) of insects annually, including over 15 tons (13.5 t) of mosquitoes, and from 77.4% to 84.6% of little brown bats (M. lucifugus) living in the northern U.S. and Canada eat mosquitoes. Nursing mothers of these species eat up to their body weight in insects nightly, and often are attracted to live in bat houses.

However, despite the numbers of mosquitoes that bats eat, simple provision of additional roosts should not be promoted as more than one step in the right direction toward solving mosquito problems. In some cases bat houses may help and in others, they may not. Bats are just one of several groups of animals that naturally prey on mosquitoes. Their relative importance appears to vary from none to high in different locations. In some areas, such as in the far northern tundra or in the Florida Keys, habitats are relatively simple and cannot support more than a few bats or other insectivorous animals, largely precluding natural control. In other locations human activities have converted once-diverse biological communities into much simpler farm and yard conditions. Such simple habitats may produce huge hatches of mosquitoes and other insect pests on an occasional basis, while providing insufficient other insect species (such as harmless mayflies) to feed insectivorous animals between hatches of pests. As a result, once-abundant predators that help keep nature in balance are lost. Additional roosts alone may not bring them back.

In some areas, bats may never have been significant predators of mosquitoes, while in others they may have been important. Certainly, in areas like Chautauqua, New York, where bats apparently still play an essential role, all possible precautions should be taken to ensure their continued presence. And where bats are known to have declined, their recovery should be encouraged. Providing additional bat roosts is just one aspect of bat conservation, and saving bats is just one aspect of enhancing natural control of mosquitoes.

It is impossible in most cases, either chemically or naturally, to completely eliminate mosquitoes, though their numbers can be substantially reduced, and in the long run, this is best done by non-chemical means, especially by draining unnatural sources of standing water. Putting up bat houses may help in places where bats can be attracted, but even successful bat houses do not always attract a species that feeds on mosquitoes. Bat houses are most likely to succeed where bats are already known to use old buildings, barns or bridges. Such roosting habitats typically is being replaced by structures that are unsuitable for bats, forcing them to find new roosts or die. Participants in the North American Bat House Research Project have attracted many thousands of bats to new locations using bat houses, but success is not certain in all areas. In some, simply using bat-friendly bridge designs can attract tens or hundreds of thousands of bats. In other places, loss of hibernation caves hundreds of miles away may preclude further use of an area by a bat species that feeds on mosquitoes. Other species that eat primarily beetles or moths, but do not require caves for hibernation, may still be abundant, with little impact on mosquitoes.

All American bats are beneficial, though their diets vary considerably. While mosquitoes may bother us most directly, many beetles, moths and other insects consumed by bats are important pests of yards and gardens. Building bat houses can help in many ways, though not always in mosquito control.

Although no single approach to mosquito control is appropriate for all locations, encouraging natural predators should be an important element in long-term planning wherever possible. Anything that can be done to encourage predation from aquatic insects, fish or bats may be important in reducing mosquito numbers.

**News And Notes**  
*Mark and Selena Kiser*

**Maberry Stucco Bat Houses and Accessories**
Honorary Research Associate Marvin Maberry of Daingerfield, Texas, is never one to stop experimenting. Maberry Centre Bat Houses has grown, and now offers five new bat house designs made from stucco-covered insulation board. Initial tests have been encouraging, with bats quickly occupying these houses in New Hampshire, Pennsylvania, Georgia, Louisiana and Texas. Maberry’s Plastic Insulated nursery house is now available in BCI’s online catalog at www.batcon.org. Through January 31, Maberry is offering a discount to Research Associates on this house ($89.95 plus S&H). To order at this special rate, contact Mark Kiser at mkiser@batcon.org or 512-327-9721.

Maberry Centre Bat Houses also offers two helpful bat house accessories to make pole-mounting easier. Two steel pivot-pole bases [TBHR, Fall 1997] are available, which simplify raising and lowering of bat houses. One model, suitable for most bat houses, accepts 2-inch (5.1 cm) inside diameter steel poles. A larger version accepts 4-inch (10.2 cm) inside diameter steel poles. Maberry also manufactures mounting brackets for most types of houses that allow back-to-back pairing on one pole. For more information, contact Marvin at 903-645-2028, marvin@maberrybat.com or www.maberrybat.com.

**Small Grants Awarded**
The North American Bat House Research Project’s small grants program rewards Research Associates who have attracted bats and wish to expand their experimentation [TBHR, Fall 1993 and Spring 2000]. Grant awards are now given in June and December. In 2000, cash awards for materials and experimental bat houses were given to Tom Haraden (UT), Annie Band (WY) and to Frank and Teresa Bibin (GA). Experimental houses were also awarded to Research Associates Cal Butchkoski (PA), Barry Genzlinger (VT), Bill Holloway (LA), Kinney and Tyra Kane (TX) and Rachael Long (CA).

**Bats and Organic Farmers**
In 1999, BCI initiated a “Bats and Organic Farming” initiative with help from long-time supporters and trustees Jeff and Helen Acopian. Ten leading organic growers from across the U.S., including Frank and Teresa Bibin, were selected to participate. All 10 growers received two BCI nursery houses, and five also received experimental, 4-foot (1.2 m) houses built by Maberry Centre Bat Houses. This project is intended as a first step toward documenting the impact of bats on crop pests, paving the way for future research efforts. The Acopian’s grant also enabled development of a traveling bat house exhibit, which has already appeared at several organic farming conferences.

**Data Report Forms Due**
We extend our thanks to all the Research Associates who have already submitted their 2000 Data Report Forms. Your information-sharing enables us to determine what works best in each region. Please let us know how your bat houses are doing each year, whether bats used them or not. To make reporting easier, those who completed a 1999 form in full need only submit the first page (and last page for occupied houses) of the 2000 form for each reported bat house, provided there have been no changes. Please contact Selena Kiser at skiser@batcon.org if you need a new report form. Forms are also available online at BCI’s Web site at www.batcon.org/bhrform/dataform.html, which must be completed in full, in order for the computer to download information properly. The deadline for submitting forms has been extended to December 31, 2000.

**Frequently Asked Questions**

Q. Where can I purchase bats for my bat house?

A. In the United States and Canada, there are federal and state/provincial laws that regulate the purchase of wildlife. Unlike domestic animals, bats are wild and free-ranging, and it is typically illegal to buy or sell them. Permits to possess bats are normally limited to researchers, zoos, wildlife rehabilitators and certain educational organizations. Relocating bats to new areas is, in any case, highly unlikely to succeed. Bats have good homing instincts, and once released, will attempt to return to their former homes. Although it sometimes takes two years or more for bats to move into a bat house, providing one that is well designed and properly installed is the best way to attract them.
NEW BAT HOUSE VIDEO
Lights! Camera! Action!

The secrets of bat house success will soon be available in a new video, Building Homes for Bats. Some of the most successful bat house builders in America are featured, from eight states coast to coast. This first-of-its kind video addresses bat roosting needs, proper bat house construction and placement techniques, experimentation, public health issues and more. It includes interviews with leading Research Associates and a bat house building demonstration.

Watch for it in BCI’s Spring 2001 catalog!