

Design, Installation, and Monitoring Of Successful Bathouses

**By Greg Tatarian
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Are you considering a bat house for the farm? If you are, there are some important points to consider before you spend time and money constructing and installing what could become valuable housing on your farm for one of nature's most interesting creatures - bats. This article assumes you have learned some of the basics about bats, and don't share the fears and misinformation many of us have about them. If so, you may be considering the value of providing bat roosting habitat on your farm.

Why install a bat house at all? There are many good reasons. Bats are strong environmental bio-indicators, since they're very niche-oriented. When niche-oriented species decline, it's a strong indication that the environment has been negatively affected. Bat populations are declining precipitously in most parts of the world, and their distribution is shrinking in many parts of their original range. Bats reproduce very slowly, are very susceptible to predation, and infants suffer high mortality. Because they congregate in large colonies, bats are easily exterminated in massive numbers, often due to ignorance or fear. Bat species and populations are constrained by availability of secure roosts, and roosts are used variably by species, season, and location. Bats utilize roosts during the day for security and also at night to process food, conserve energy and communicate, with many species often roosting together.

Bat houses have provided mixed results until fairly recently – not all bat species will use bat houses. As discussed a moment ago, bats have evolved to fill well-defined niches; worldwide there are over 925 species, and 46 are known to occur in North America. California's bats range in size from 3 grams to 65 grams, though most weigh between 6 and 25 grams. Some forage by chasing insects in air, others by gleaning from foliage, others take ground-dwelling insects. Roosting habitat varies considerably as well; some use the crevices under tree bark, some roost in caves and mines, others in cracks in rock or in buildings. It is this variability in life histories and roosting ecology that makes the creation of effective bat houses so challenging.

Recent and ongoing research is revealing the important roles that bats play in natural ecosystems, as well as in farming systems. I have been conducting radiotelemetry and bioacoustics field research that indicates that bats are heavily foraging in some vineyards where insect life is abundant. A man-made bat house can provide important roosting habitat in close proximity to foraging habitat. In California, all but one species feed on insects (the other feeds on pollen and nectar), many of which are agricultural pests, so there is no competition between bats and farmers. While there are many questions still unanswered about how bats utilize foraging habitat, including

farmlands, we know that California's bats consume vast numbers of insects -most of which are pests. What is clear is that bats have significant impacts on the populations of many insects.

Of course, the logical question is, "will bats eat my beneficial insects?" That's very unlikely; bats feed at night, not during the day when beneficial insects are active. Beneficial insects include predatory and parasitic wasps - very small insects indeed. Bats take prey that can positively offset the energy required for flight and production of ultrasonic vocalizations used for navigating and targeting prey. Both of those activities are hugely consumptive of energy, so insects much larger than most beneficial insects are taken by bats. In fact, many insectivorous bats in California take moths as their primary prey. There's no reason not to want bats in vineyards or orchards, even though the extent of direct benefit is still unknown.

During the past ten years, I have provided a wide range of wildlife consulting services – including wildlife habitat enhancement - to private property owners, farmers (mostly winegrowers and orchardists), as well as agencies, consultants, and developers. In that time, I have found that homeowners seem more likely to purchase mail-order or store-bought bat houses, while farmers are supplementing these sources with the use of custom-built bat houses, or are building bat houses themselves using plans available through an increasing variety of sources.

Unfortunately, occupancy rates with many bat houses tends to be low, because bats are more selective about their roosting habitat than are many insectivorous birds, or barn owls, for example. The primary goal in constructing bat houses is attracting maternal colonies, which with most species, require warm areas for raising their pups. Because the majority of bat houses installed by homeowners and farmers are not usually larger than about 14" x 24" x 4", these bat houses are typically used by small numbers of bats when they are used at all, most often males. It has been unusual to attract maternity colonies to such bat houses. This is probably because small bat houses commonly available through garden shops and mail order companies fail to provide many of the elements important to bat species that adapt to living in man-made structures. A host of environmental factors are critical to bats looking for homes in structures: size, temperature, thermal stability, humidity, accessibility, disturbance levels, and others.

Beginning in 1994, our observations of these factors in building structures have been incorporated into a range of experimental bat house designs, one of which has attracted long-term use by sizeable maternity colonies of pallid bats (*Antrozous pallidus*) and Brazilian free-tailed bats (*Tadarida brasiliensis*). Most of these bat houses have been placed on or near winery buildings, some in vineyards, and some in suburban and rural residential areas. These bat houses have been used both to provide replacement roosting habitat following exclusion, and as new habitat where bat populations are desired.

Incorporated into these designs are vertical box sections, topped by angled roof box sections containing multiple baffles forming shelves, which allow the pups to cling to the substrate more

easily in an attempt to limit mortality resulting from pups falling from the roost. Though this is not a new idea, a variety of internal baffling spacing and entrances are provided to maximize the potential temperature variations within the unit and provide several points of access to and from the roost box. The success of these bat houses has led to the construction of several others of similar design, and others of varying designs, including 4' x 8' pole-barn-style houses adapted from other designs.

How can you build successful bat houses? Probably the most important factor is size; bigger is always better. Beyond that, there are many variations that have been tried regarding exterior color, placement, arrangement of interior panels, and material types. A great place to find information on what other bat house builders are doing is through Bat Conservation International's Bat House Research Project. Contact: Mark Kiser, Coordinator, North American Bat House Research Project BCI, PO Box 162603, Austin, TX 78716, 512-327-9721 mkiser@batcon.org web site: www.batcon.org catalog 1-800-538-BATS.

Cautionary Notes; The Importance of Planning and Monitoring

Are there downside to providing habitat by building bat houses? Yes, there are a few; successful bat houses (those which have attracted bats) can be so popular that overcrowding can result in mortalities during periods of elevated temperatures, especially with infants and juveniles. Careful design and placement of bat houses is absolutely necessary to ensure that the home you are providing does not become a death trap – also known as a population sink.

Some important questions arise from the use of bat houses, especially when located in sites for which no management or monitoring plan exists. For example: A) Can bat houses provide the long-term stability necessary for bat conservation considering their susceptibility to being removed, damaged or disturbed at a rate greater than that for natural roosts? B) Are bat houses being improperly recommended by wildlife consultants and managers to mitigate impacts to sensitive species resulting from development projects, considering some of these species have never been known to use bat houses? C) Could occasional impacts to local bat populations due to mortality as described earlier, accumulate - negatively impacting local populations via gene flow restrictions?

Monitoring of bat houses is just as important as the design criteria. Bat houses are often installed where they can not be monitored regularly, or in situations that do not permit response to casualties or mortality by the property owner. I have observed large numbers of bat houses that have not attracted bats several years after installation, and designs and/or installations that increase risks of predation on resident bats. I've also seen situations where bat houses that successfully attracted colonies were removed after a few years due to negative response to bat fecal matter, bat outflight activity, or change of property ownership.

Also, bat houses will only provide roosting habitat for a fraction of California's bat species; some will never roost in a structure such as a bat house. In fact for the most part, the rarest species will seldom or never occupy a bat house, only using caves, mines, cliffs, or other natural roost sites.

Feedback-generating projects like the Bat Conservation International Bat House Project can help to provide important data on necessary design and installation modifications. Additionally, bat houses should be installed where they can be monitored with minimal disturbance, and where potential for vandalism is minimized. They should be installed only when there is a high likelihood they will remain in place for many years, or indefinitely; removing bat houses after they have become established roosts is no better than destruction or elimination of the original roost.

As bat house designs evolve, they will likely attract a greater number of bat species, so playing a greater role in the conservation of those species. However, bat houses can have negative impacts on bat colonies if they are not properly designed and *regularly monitored*. Long-term viability of breeding populations of bats using bat houses will depend upon good designs, rapid response to problems, and protection from disturbance.

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