

2014

ROOST MONITORING REPORT



Wisconsin Bat Program

By Heather Kaarakka

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Bat "condo" sketch by Heather Kaarakka.

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A little brown bat emerges from the bat house at Picnic Point on the UW-Madison campus.



Background information on bat roost monitoring in Wisconsin

The Wisconsin Bat Program’s summer roost monitoring project was developed in 2007 to gather data about colony numbers and locations of bat roosts.

The project was based on one created in Pennsylvania to monitor summer roosts in response to white-nose syndrome (WNS). Few counts were conducted in Wisconsin in 2007-2009, and mostly by DNR staff. With many roosts to monitor and few staff to conduct counts, we turned to the Citizen-Based Monitoring (CBM) Program to help gather data state-wide. In the United Kingdom,

using trained citizens to collect long-term bat data has proven a cost-effective solution with successful results for gathering large-scale inventory and monitoring data.

The roost monitoring project has expanded thanks to CBM volunteer efforts, though in spring of 2010, it was decided that additional volunteers were needed to help monitor the increasing number of

known roosts. During this planning period, Bat Program staff set a goal of locating all known bat roosting sites in Wisconsin.

We employed several techniques to raise awareness and describe the need to gather information about bat roosts in the state. A “bats-wanted” poster was created and posted at numerous places across Wisconsin including libraries, gas stations, state parks, and nature centers. The poster explains the threat of white-nose syndrome to bat populations in Wisconsin and describes the need to locate large roosting populations in barns, attics, bat houses, caves and other structures. Several newspaper and magazine articles, newsletter articles and radio and television segments were also used to request assistance from the general public.

The request was successful, and since the 2010 effort, over 150 new sites have been added to the existing bat roost database. 2014 was another successful year for locating and counting bat roosts around the state; an additional 24 sites were added to the database and counted at least once over the summer.

Why we monitor bat roosts

Knowing the location of summer roosting sites helps assess the impact WNS is having on the state bat populations.

In 2006, a deadly disease was discovered in hibernating bats at a cave in New York State. The disease is now known as white-nose syndrome (WNS), and mortality rates of 90-100% from WNS are not uncommon in hibernating bats. WNS is caused by a fungus called *Pseudogymnoascus destructans*. In seven years, WNS has spread to 25 different states, including Wisconsin, and five Canadian provinces.

The threat of WNS and the possibility of the disease occurring in Wisconsin as early as January 2011 expedited the need to gather baseline data about bats in the state over the summers of 2010 and 2011, with the goal of locating all known roosts in Wisconsin. Knowing the location of summer roosting sites helps assess the impact WNS is having

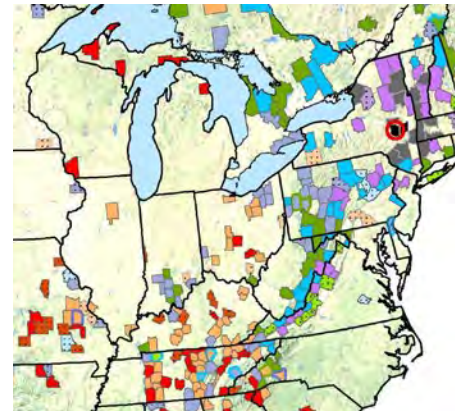


Little brown bat showing visible signs of white-nose syndrome.

Below: Map showing the spread of white-nose syndrome across the United States and Canada. For a complete map visit whitenosesyndrome.org.

on state bat populations. Volunteers that monitor roosting sites over several years may also experience drastic or noticeable drops in numbers of bats as they count annually after WNS afflicts an area. Unfortunately, in April 2014, WNS was confirmed in a single hibernaculum in southwest Wisconsin.

In addition to gathering baseline data about bats in Wisconsin, summer roost monitoring is important because availability of summer roosting habitat is thought to limit populations of bats (Fenton et al 1980). Communicating with landowners who have bats allows us to educate them on the importance of their roosting site for bat populations, as well as to help continue Bat Conservation International's investigation of roosting habitat preference.



Wisconsin has seven species of bats, however only two are likely to use bat houses, attics, barns and other buildings as roosts in the summer: little brown bats and big brown bats. Little brown bats prefer hot temperatures to gestate and mature their young. As a result, these bats roost mostly in south facing bat houses and attics; however they will also use barns and bridges. Big brown bats generally prefer cooler temperatures, and tend to roost in barns, but will also use bat houses and attics.

Bats will usually return to their roost in mid-to-late spring. When exactly they emerge from hibernation depends on the species and on the weather. Big brown bats will return to summer habitat as early as mid-March though typically not until sometime in April, and little brown bats emerge from hibernation beginning in mid-to-late April. Bats begin to leave their summer roost in mid-August after the young have matured. The adults tend to leave earlier to travel to caves and mines where they will swarm and breed. Bats will sometimes visit multiple caves and mines in the fall during swarm.

Both little brown bats and big brown bats hibernate in winter from October through March and April. Both species will make local migrations to suitable hibernacula. Barbour and Davis (1965) found little brown bats may migrate up to 280 miles from summer roosts to suitable overwintering sites, however they theorized that most bats of this species migrate less than 100 miles to hibernacula. Big brown bats are thought to make much shorter migrations to hibernacula. Depending on the

How much do you know about Wisconsin's bats?

Wisconsin has seven species of bats, however only two are likely to use bat houses, attics, barns and other building as roosts in the summer: little brown bats and big brown bats.

summer roosting site conditions during the winter, big brown bats have been known to remain in roosting sites over the winter if a summer roost maintains above-freezing temperatures during winter. This occurrence was thought to be quite rare; however the program continues to receive reports of this occurring as this project continues.

The roost monitoring project currently only obtains information about little brown bats and big brown bats even though there are five other species in the state. Lack of information about roost sites for the other five species is due to the fact that these bats are cryptically colored, often solitary, generally roost in trees and do not usually use the same roost sites year after year. These bats will also change roost sites often over the summer, so locating a roost one day does not mean you will find the bat in that location the next day. Even though roost monitoring of these other bats may not be feasible, people who find solitary bats or small colonies roosting in trees, rock crevices and buildings should still report the

information to the Bat Program. From these reports we can begin to identify and describe roost sites in Wisconsin for these species that lack basic information about summer habitat. A photograph of the bat at its site is very useful as a record and as a tool for accurate identification of species.

In summer 2014, WBP began a project to track and monitor northern long-eared bats which are on the candidate list for federal endangered species status. These bats roost mostly in cracks and crevices in trees. Over the summer, the WBP captured, tagged and followed 12 northern long-eared bats in three areas in the state. From the information gathered as we tracked the bats, WBP can start to describe roost preferences for yet another species in Wisconsin.

Wisconsin's bats: little brown bat; big brown bat; northern long-eared bat; eastern red bat; eastern pipistrelle; hoary bat and silver-haired bat

Big brown bats

roosting in a bridge in St. Croix County. This is one of six new bridge roosts found in Wisconsin and one of the few housing big brown bats.

Below: Researcher waiting for a bat to fly to start an emergence survey.



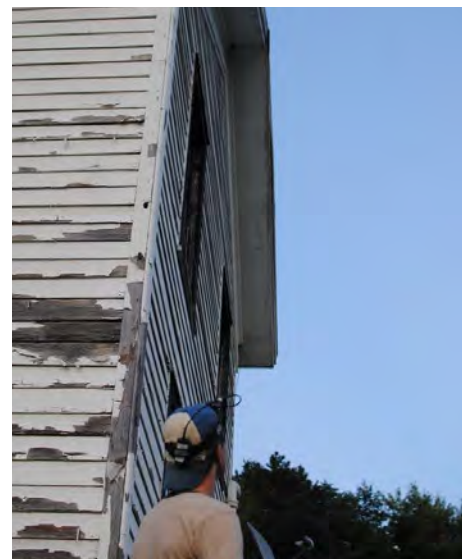
Results from roost monitoring in 2014

Since the effort established in 2010, over 450 people have informed us of roosts on their property, or roost of which they know. More than one quarter of the contacts wished to exclude the bats from their attic or other building.

A total of 75 sites were monitored over the spring, summer and fall of 2014, down from 77 monitored in 2013 (see figure 1). 47 of the 75 (63%) sites were monitored in previous years. In 2014, 12 (16%) of the 75 monitored roosts were attics, 23 sites (30%) were barns or other buildings, 6 (8%) were bridge roosts or other, and the remaining 34 (46%) sites were bat houses.

Of 75 sites monitored, 50 (67%) are inhabited by little brown bats, 21 sites are used by big brown bats, and 4 sites house unknown species. Little brown bats were monitored in bat houses most often at 60% of the sites, followed by barns and outbuildings at 18% (see figure 2). Big brown bats were found most often in barns at 52% of sites, followed by bat houses at 24% of sites (see figure 3).

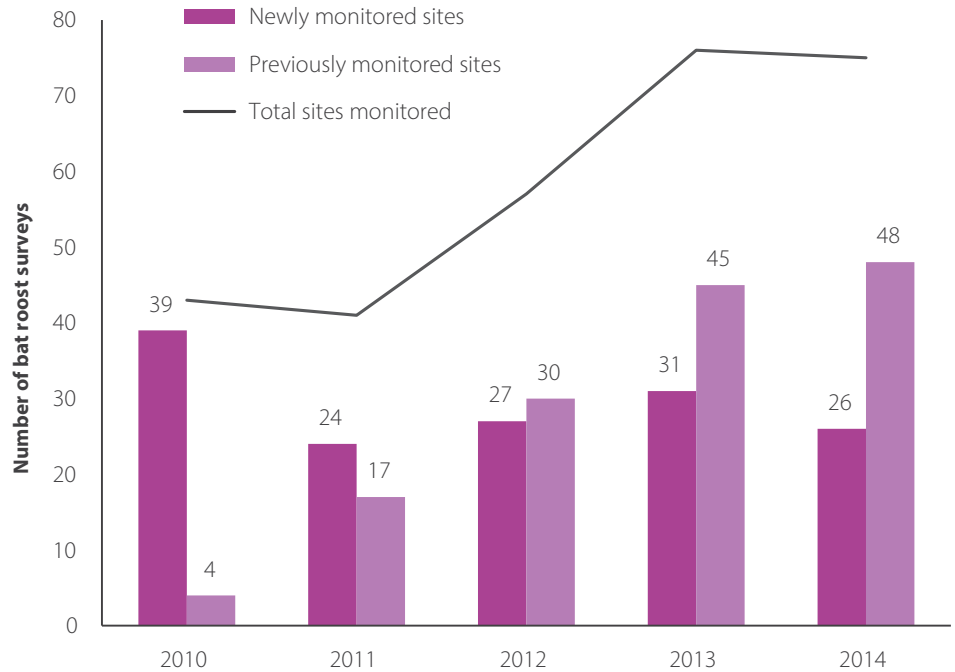
In 2014, 23 sites were counted more than twice over the summer, and 16 sites were counted two times. The remaining sites were monitored only once.



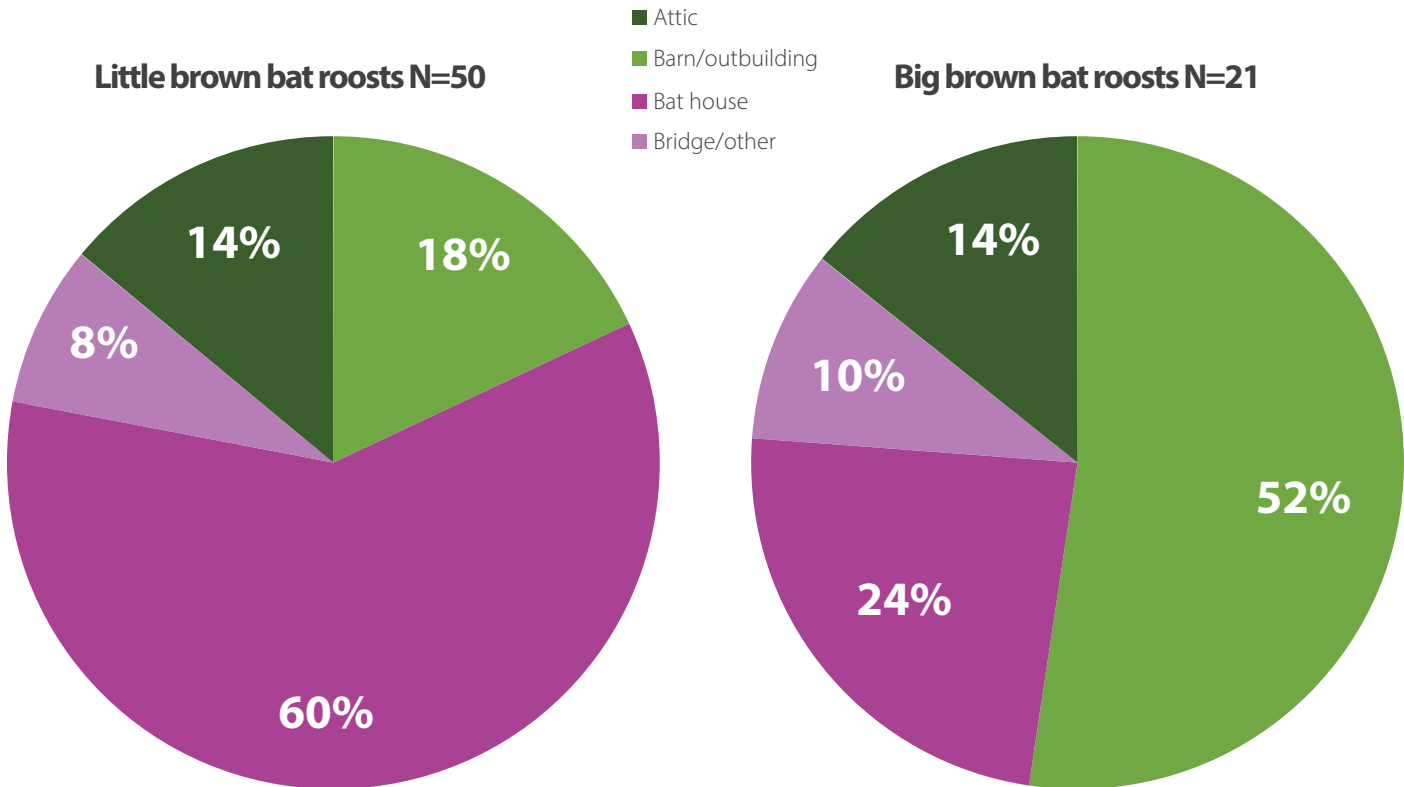
Surveys from 2010 to 2014

Figure 1. The graph to the right shows the number of monitored roost sites in Wisconsin by year, and displays the number of new sites per year as well as the number of sites that have been monitored in previous years. This graph shows how well the effort to gather bat roost information has worked since 2010. After the push in 2010 to locate roost sites, we have had a steady stream of new roost sites added to the database, and an increasing number of sites monitored yearly.

Figures 2 & 3. The graphs below display the proportions of roost types that each species uses in Wisconsin. Among monitored roost sites in the state, little brown bats prefer bat houses, while big brown bats seem to prefer to roost in barns.

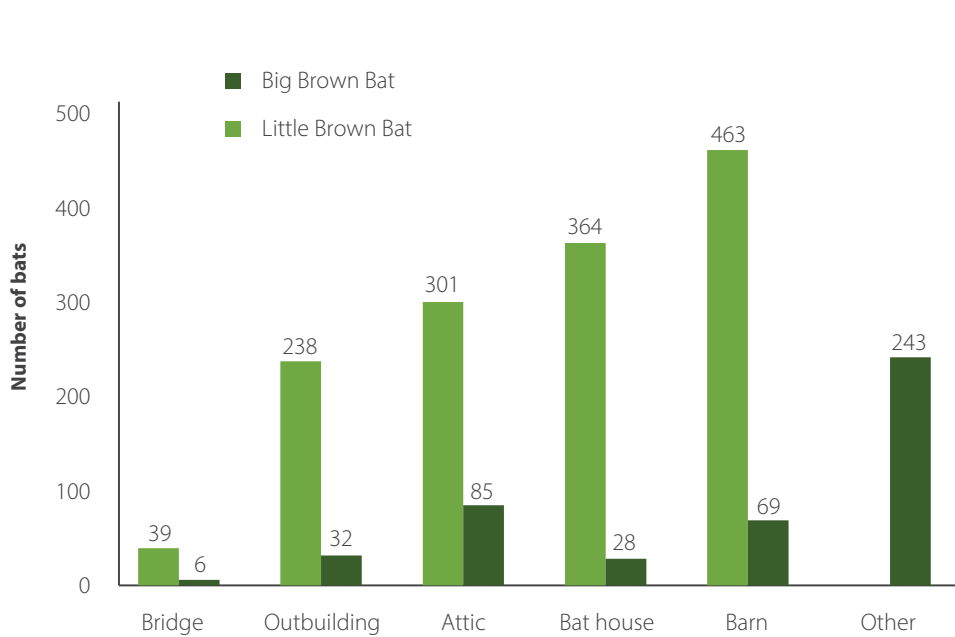


Bat species by roost type





Little brown bats roost temporarily under a bridge in the evening to digest their food.

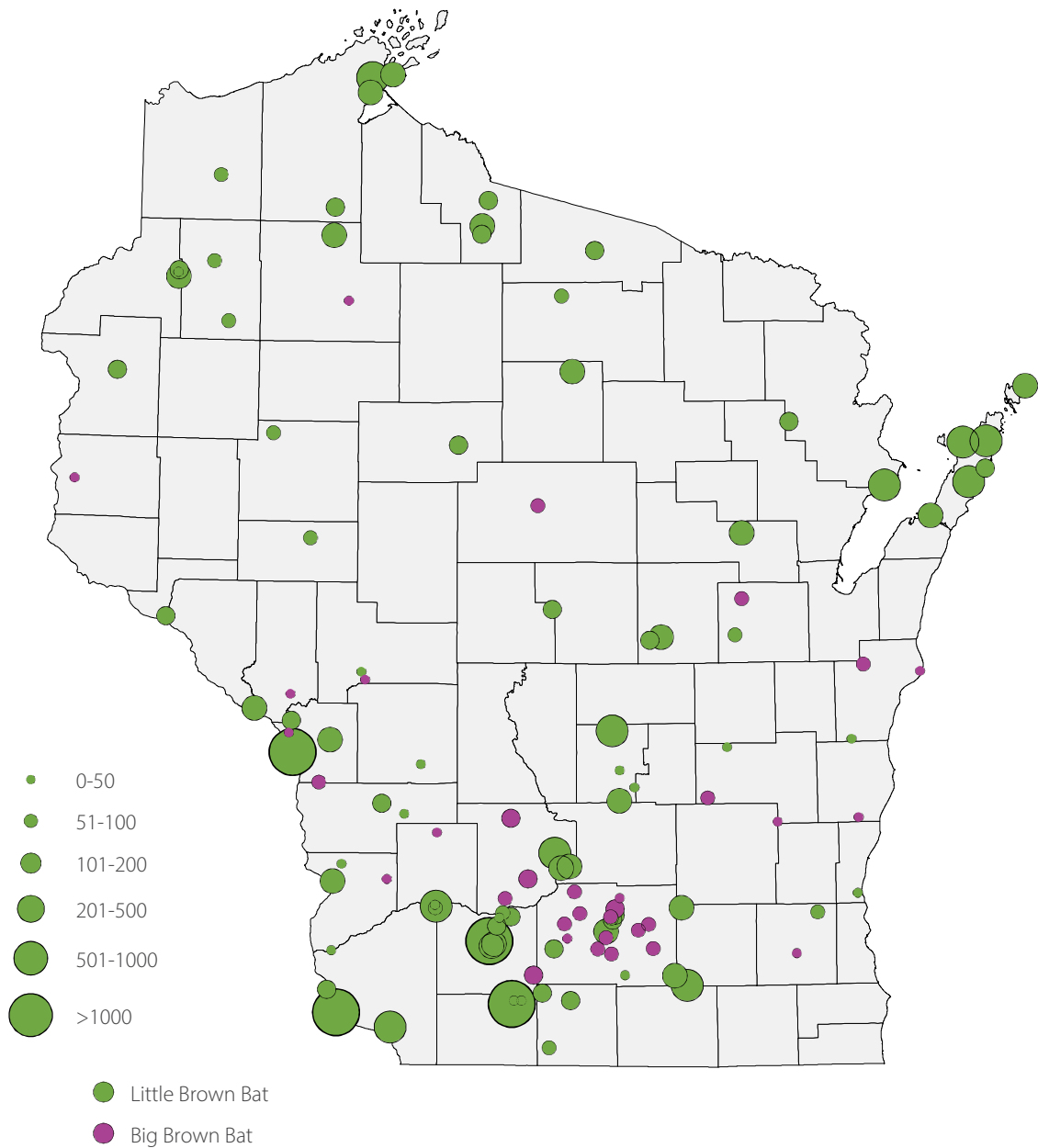


Bat colony sizes

Figure 4. This graph displays average colony sizes based on the type of roost for both little brown bats and big brown bats.

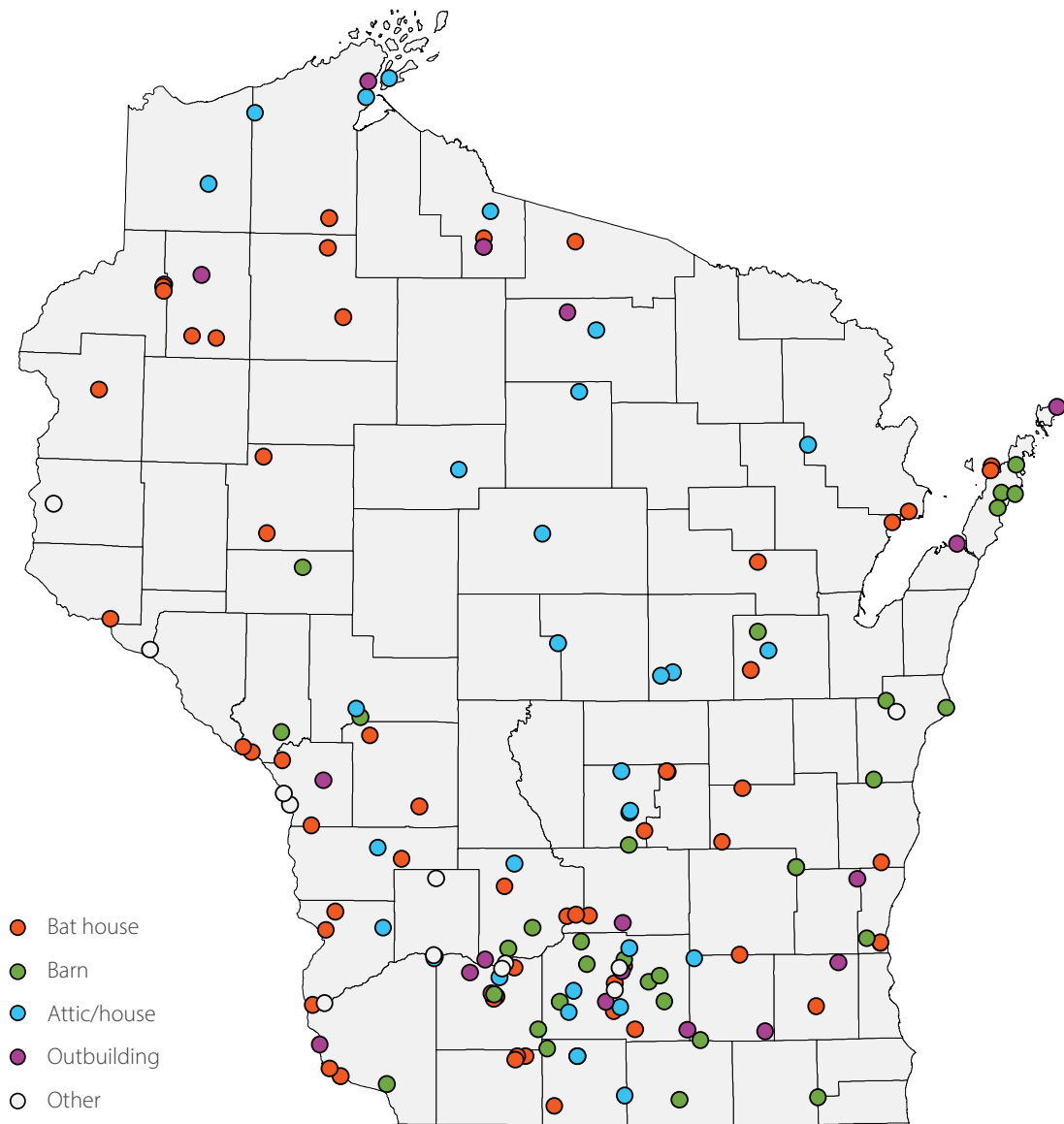
Bat roosts by size

Figure 5. Monitored bat roost by colony sizes. The below map depicts distribution of monitored bat colonies and their sizes in Wisconsin, where purple indicates big brown bat colonies and green, little brown bat colonies. Size of the dot indicates the size of the population at the roost.



Bat roosts by type

Figure 6. Monitored bat roosts by type of roost. This map depicts the distribution of monitored bat colonies by type of roost. Color of the dot indicates whether the bats roost in a bat house, attic, outbuilding, barn or other.



Daily monitoring of a bat house

The following page includes data from a big brown bat colony that gets monitored daily from April through November. The big brown bats inhabit a bat house that is painted to look like a barn window and attached to the side of a shed.

While big brown bats have been known to abandon a roost for no apparent reason, and sometimes return later, daily counts of this colony has given us a glimpse into just how drastically a colony can change over the course of the season. Little brown bats are not known to change in number quite so dramatically, however counts conducted weekly of little brown sites still show differences in numbers emerging.

The graph below displays the number of bats counted each evening. When graphed against daily temperature of the area, there did not appear to be a correlation, however a temperature logger was installed in April 2014 in the bat house to investigate temperature variation. When zero bats are shown, it means that the surveyor counted zero bats, not that a survey was not completed, except for 6 days in late June 2014 when no counts were completed.

Because the number of bats using the site changes so much daily, it is likely that this is not a maternity roost, as mother bats are probably not able to carry

their young and thus will probably not switch roost sites for several weeks after their pup is born. Pups begin to fly roughly three to four weeks after they are born in early June. Volancy (flight) of the pups in mid-July may explain the large jump in colony size for several days in July as juvenile bats explore and find different roosting spots.

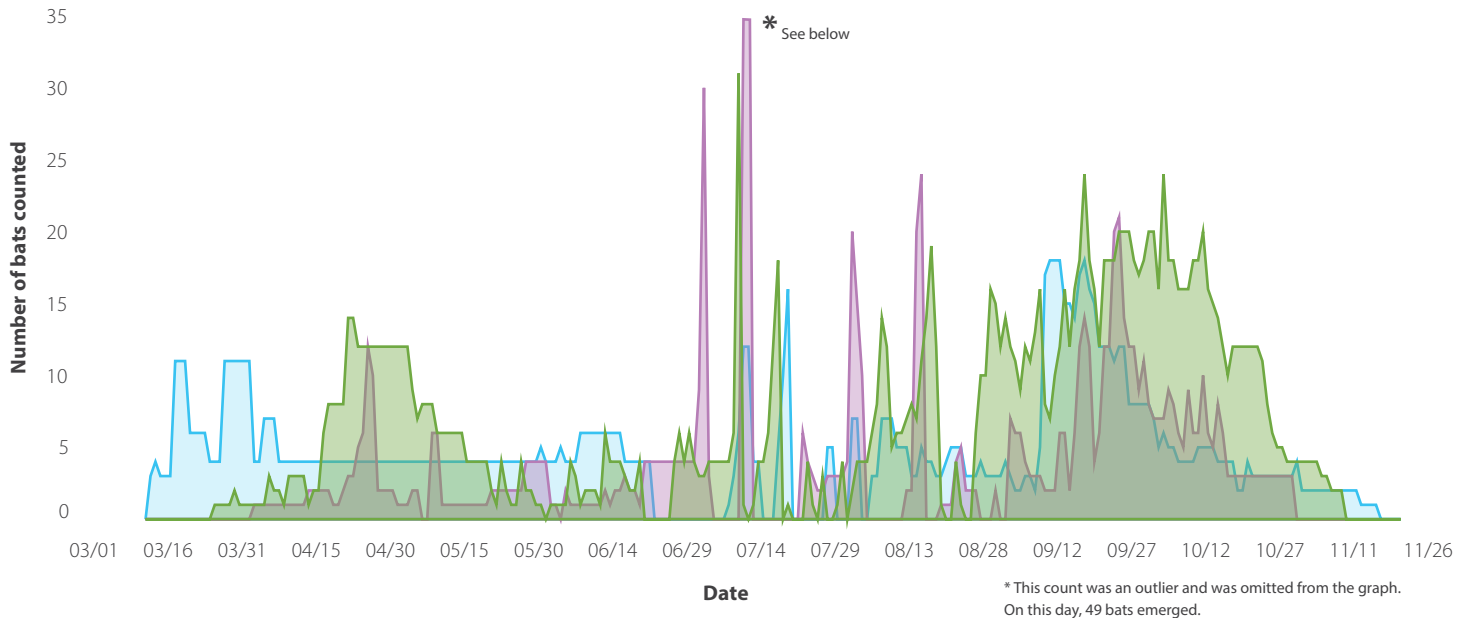
There are likely one or more alternative roosts in the near vicinity to this one and bats are switching between one or more roosts over the summer. Why bats switch roost sites daily still remains under investigation. Abandonment of roost sites may occur when the parasite load in the site gets too high for the bats; however, this doesn't explain why the bats would then return a day or several days later.

Notice the difference in the time period in which the bats returned in the spring. In 2012, the state experienced a warm, early spring, and big brown bats at this colony returned in mid-March. In 2013 and 2014, the state had a delayed, cool spring, and the bats did not return until early April.



2014 2013 2012

Waukesha Bat House Daily Monitoring

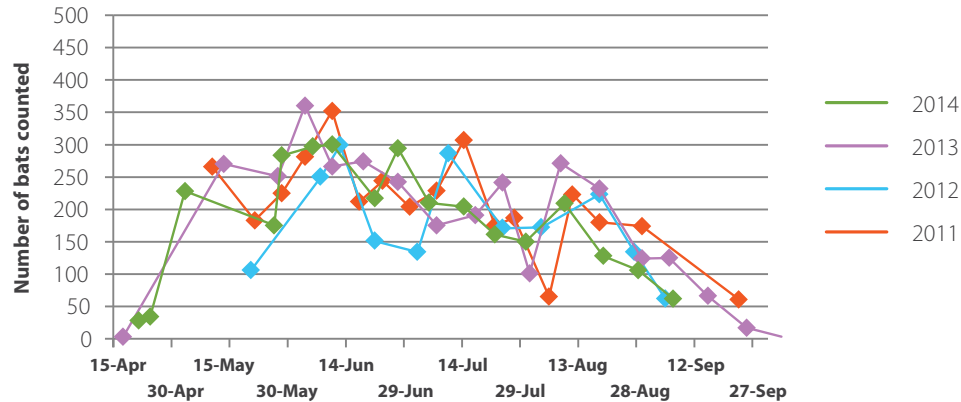


Roosts counted for multiple years

Below are graphs depicting counts conducted multiple times over a season for several years. Year of the counts is indicated by color. Be sure to note the y-axis scale as all sites have differing colony populations.

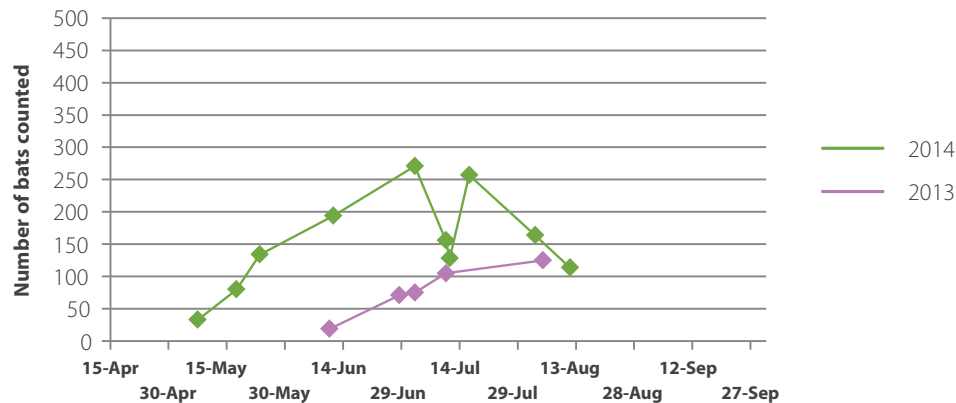
Merrimac Bat Box

Little brown bats



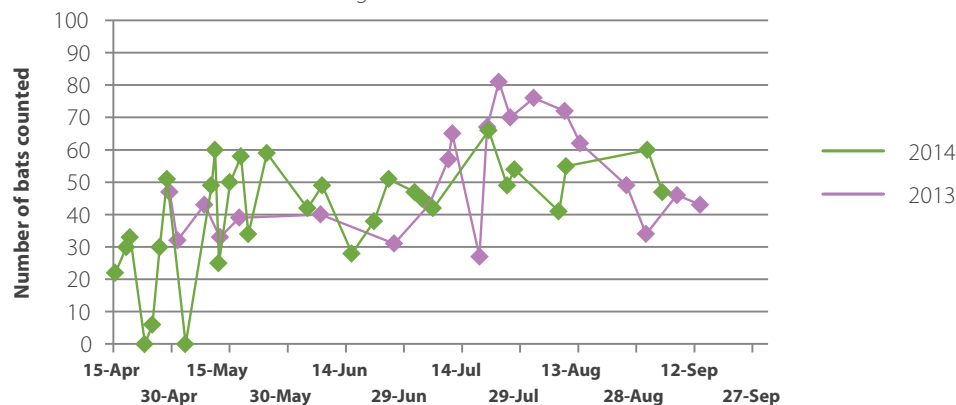
Spoooner Bat Box

Little brown bats



Wayside Sanctuary

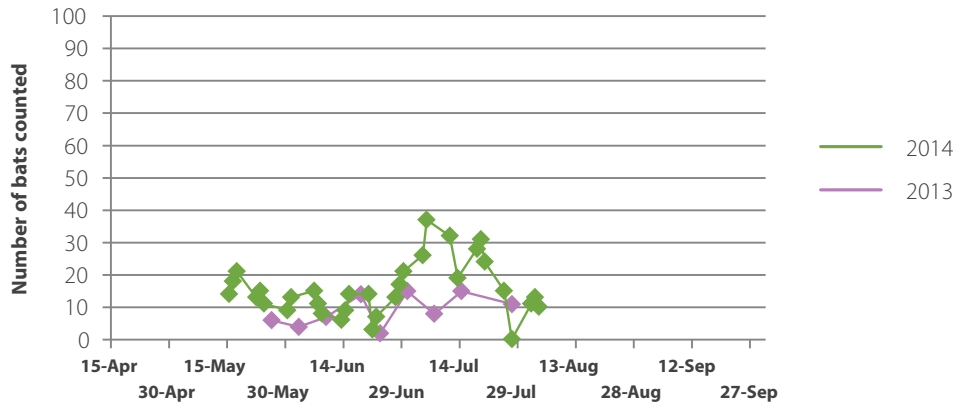
Big brown bats



Roosts counted for multiple years

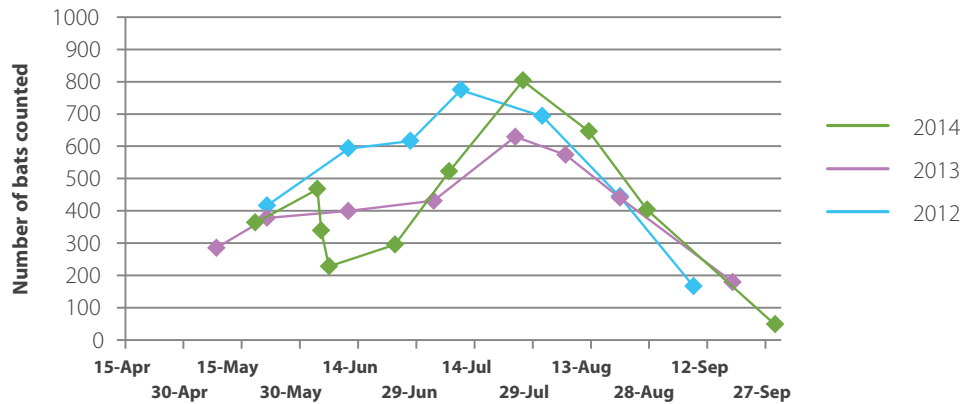
Sheboygan Bat Box

Big brown bats



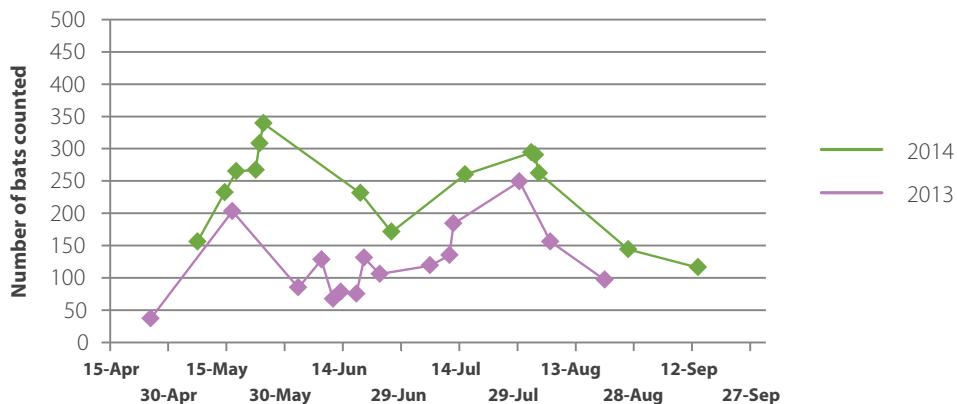
North Bay State Natural Area

Little brown bats



Picnic Point Bat Box

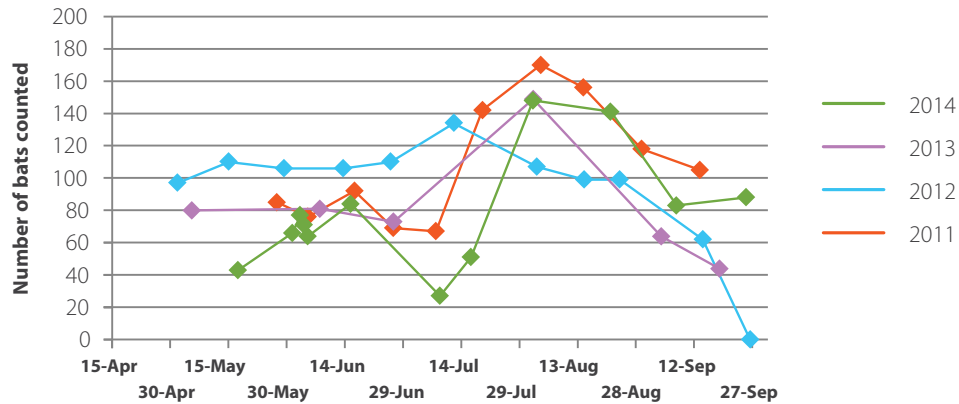
Little brown bats



Roosts counted for multiple years

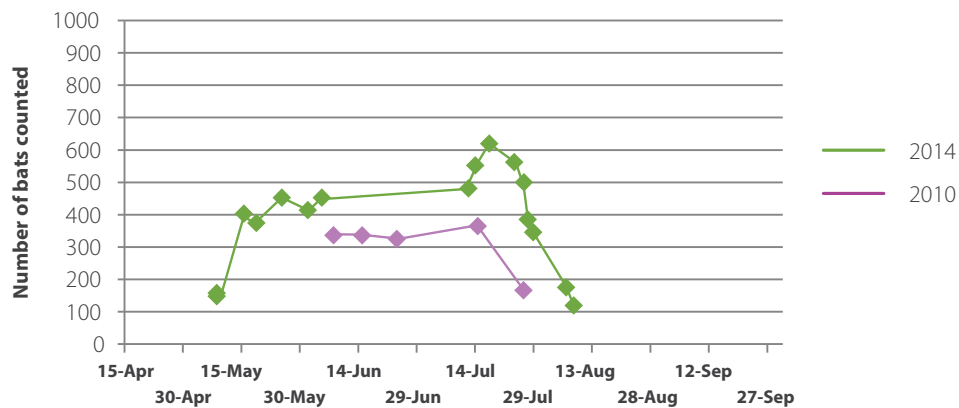
Sauk County Barn

Big brown bats



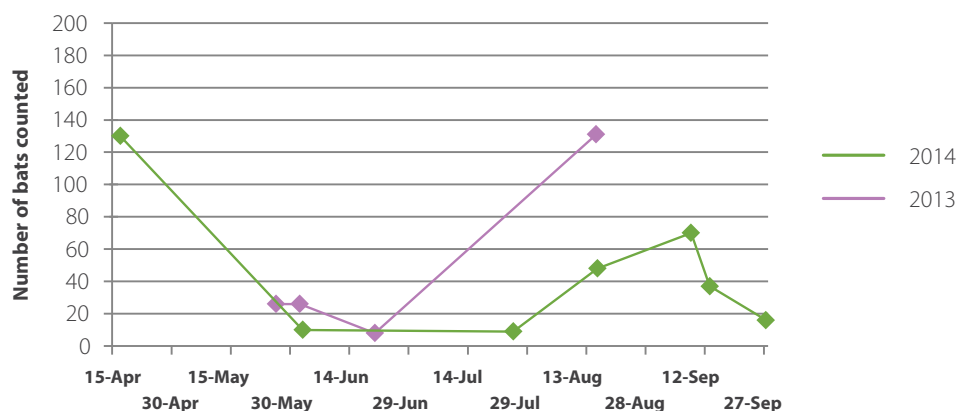
Shawano County Bat Box

Little brown bats



Kickapoo Valley Bat Box

Little brown bats

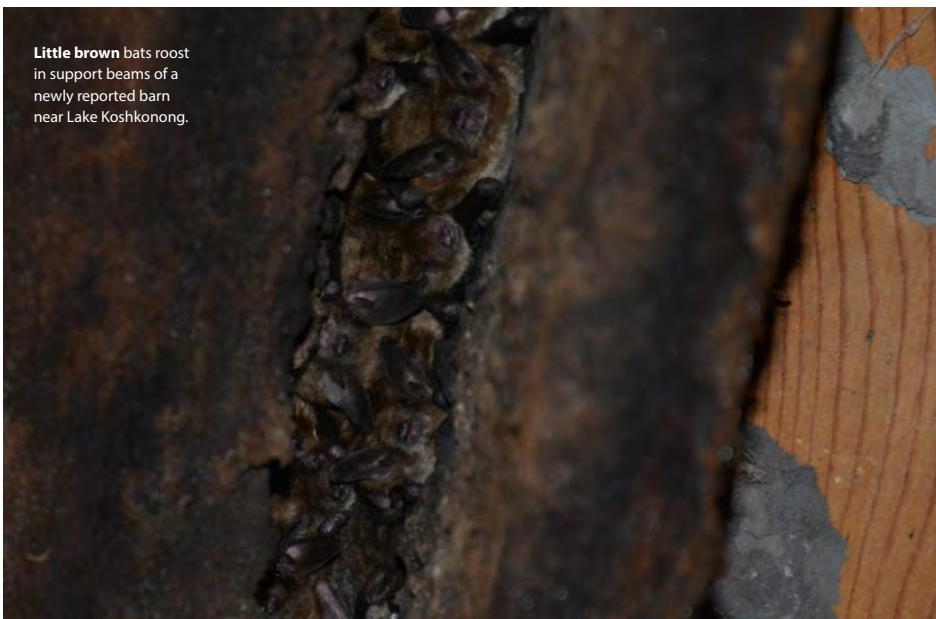
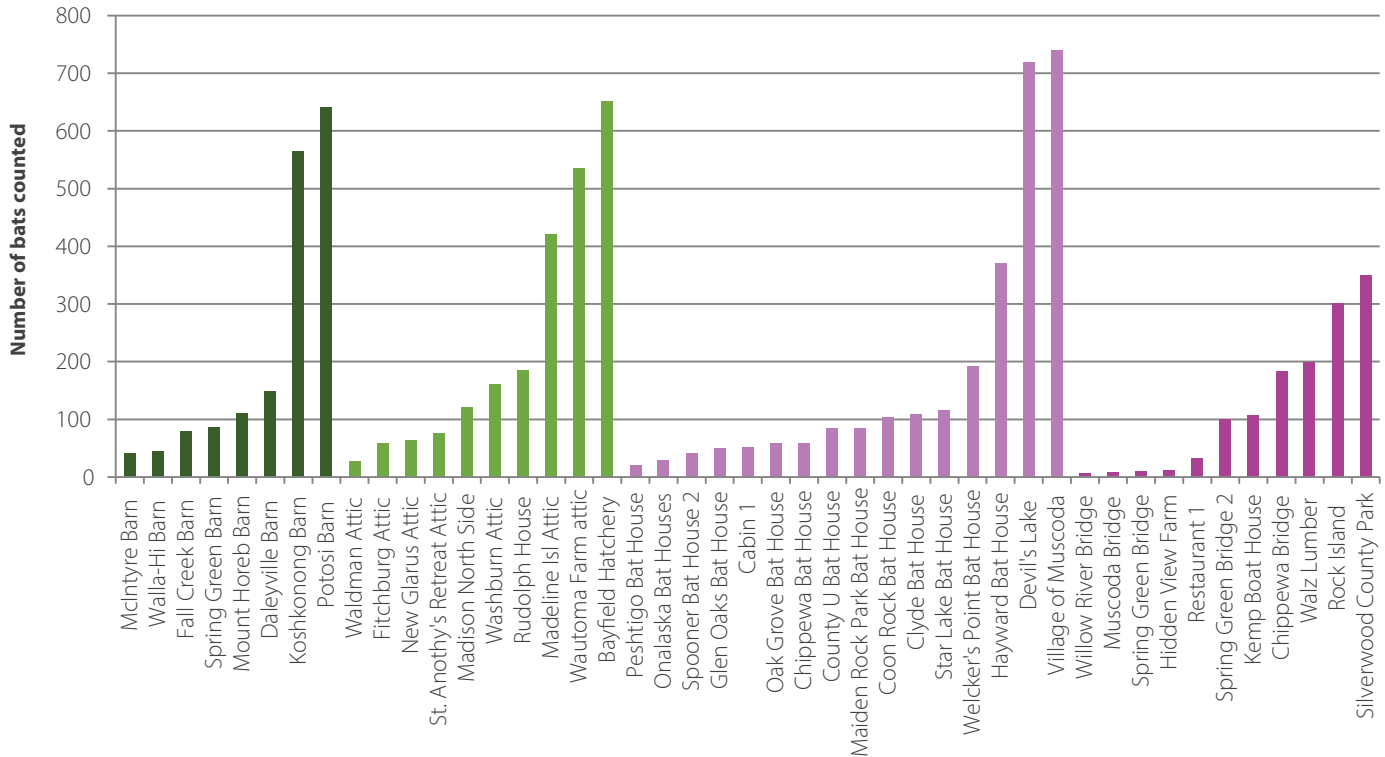


Roosts counted once in 2014

Barns
 Attics
 Bat houses
 Others

* Counts from Yellowstone Lake State Park are omitted because of the size of the population – 4,168 little brown bats were counted during the pre-volancy period in 2014.

Single counts from pre-volancy surveys



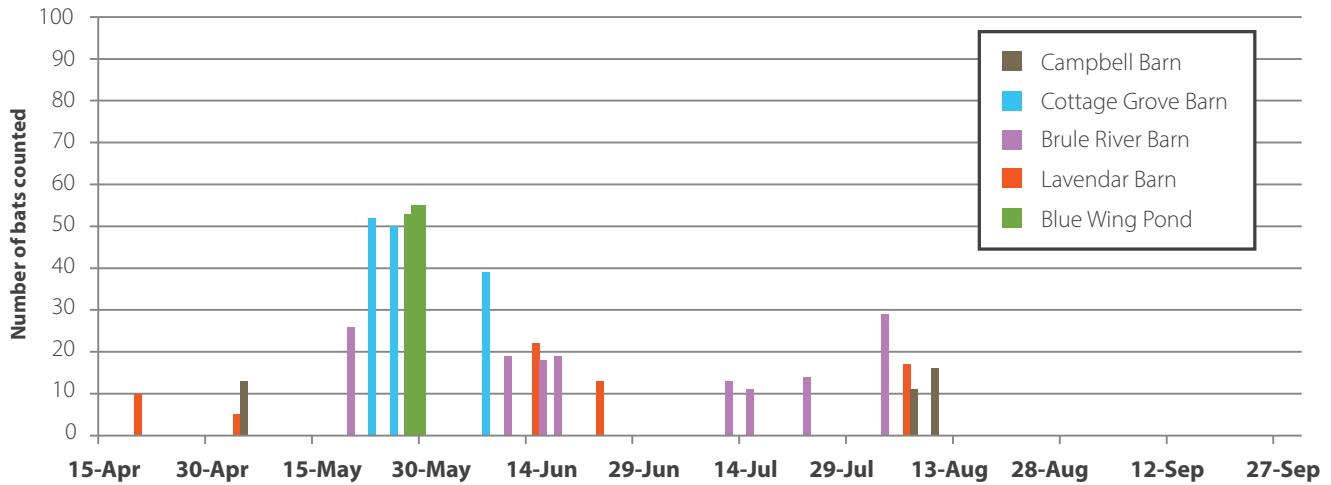
Little brown bats roost in support beams of a newly reported barn near Lake Koshkonong.

What does pre-volancy mean?

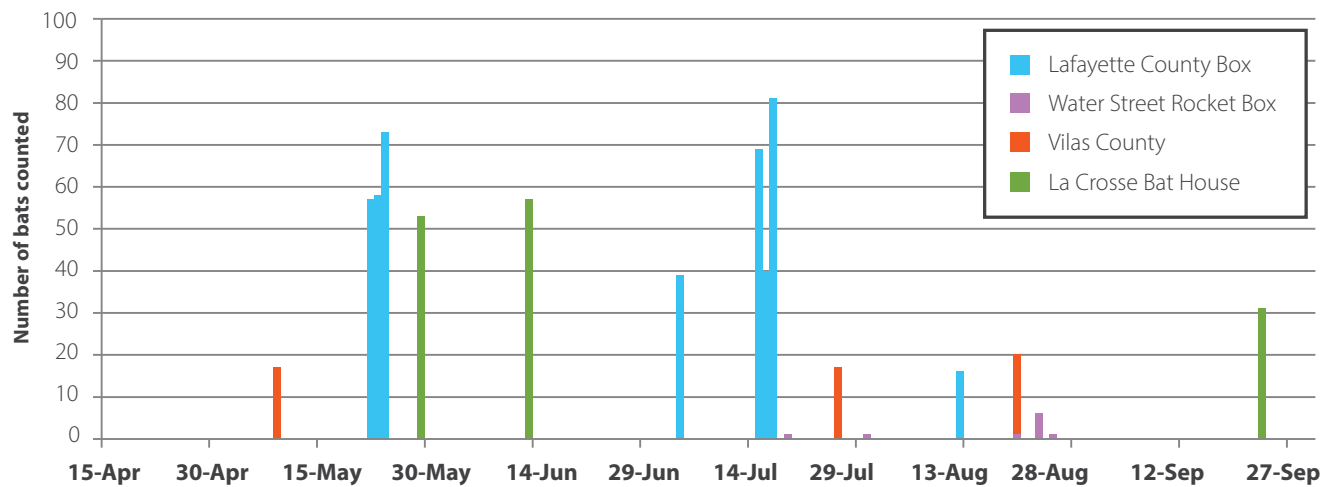
When bats give birth, the young are unable to fly and rely entirely on their mothers for care and nursing. The period before flight is possible for the young bat is referred to as 'pre-volant'. It comes from the french word 'volare' which means to fly. When we monitor a colony, we try to get a pre-volant count and a post-volant count to estimate recruitment, or how many bats gave birth that summer. As evident by weekly counts, the numbers can change drastically for unknown reasons, but these two counts begin to give an idea of how many bats are in the colony.

Roosts counted multiple times this year

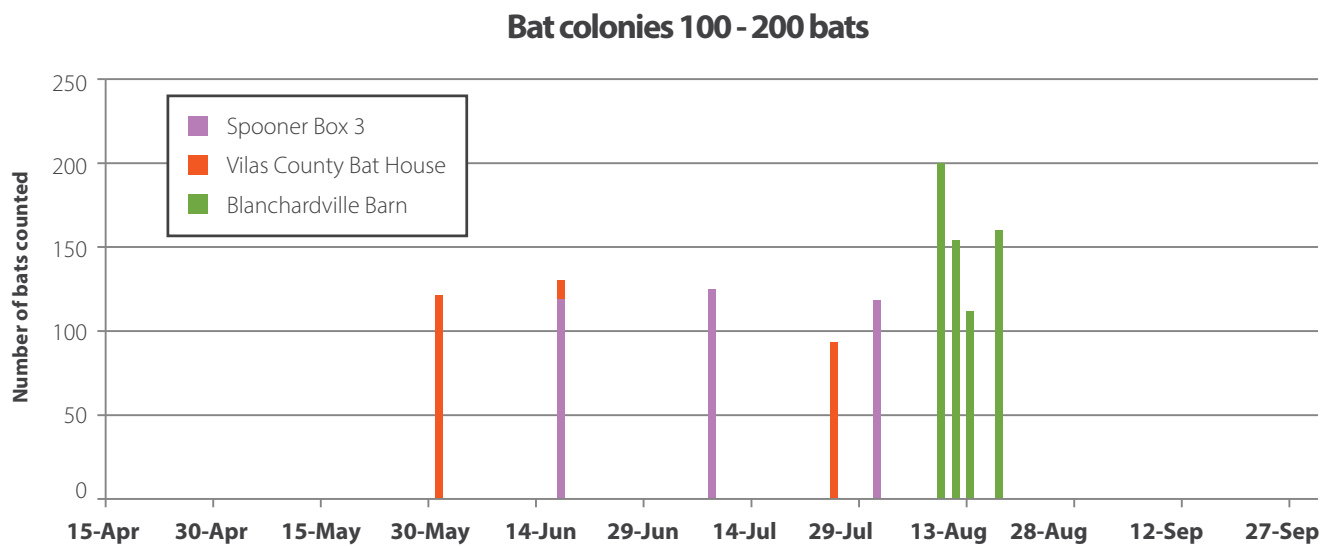
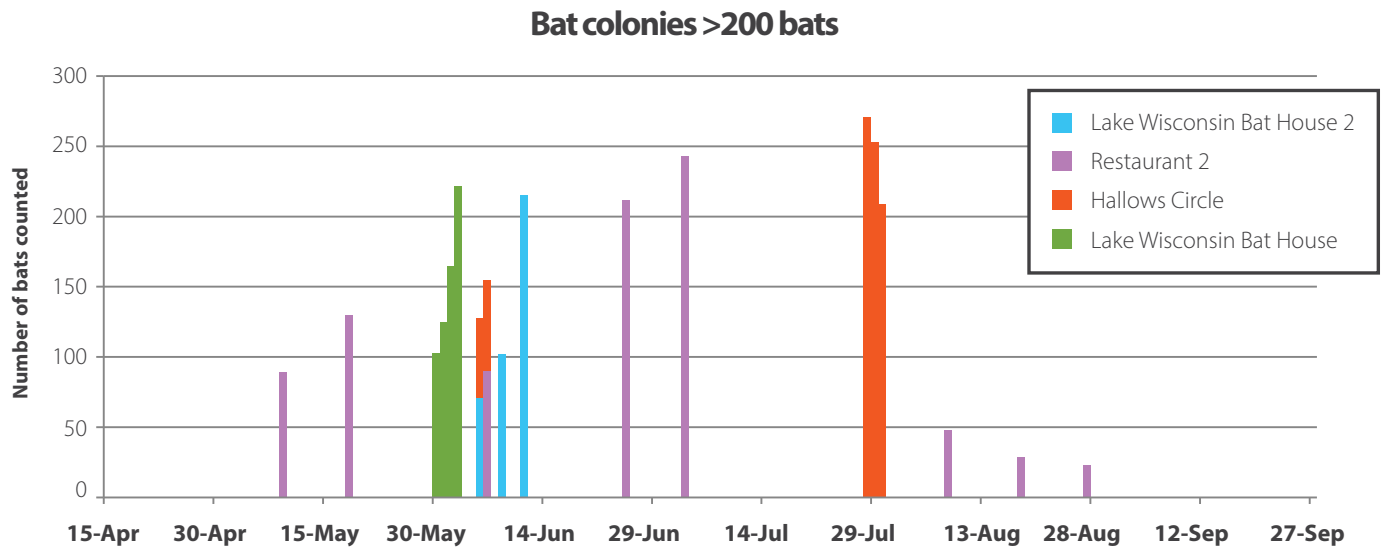
Barn colonies <100 bats



Bat house colonies <100 bats



Roosts counted multiple times this year



Understanding this year's results

An unseasonably cold May resulted in the late arrival of bats to roosts

The late, cold weather again into May 2014 may have affected when the bats began returning to their summer sites. For example, the big brown bats at Waukesha bat house returned in early April this year, but returned in mid-March in 2012 with the warm weather. More research is needed on what cues bats use to emerge from hibernation, but since big brown bats seemed to react to the early warm weather in 2012 and late spring this year and last, we can perhaps infer that temperature plays a role in timing of emergence. Surveillance conducted at a site in mid-March showed big brown bats still hunkered down and hibernating. Little brown bats, however, seemed to return as normal in mid-April. When the Bat Program conducted underground surveillance in late March and early April 2014, the little brown bats were still at their hibernation sites, but starting to stage near the entrances of hibernacula. Most reports from those monitoring the phenology of their colony in 2014 did not record little brown bat activity until mid-to late April.

These anecdotal notes show the importance of gathering phenology data from colonies.

The bats returning in April during a warm spell were faced with several weeks of cold weather into May. Reports from sites in May indicated that bats may have left their roost sites after returning, or entered torpor at their summer roosts to save energy until weather favoring foraging occurred. As the Bat Program trapped bats over the summer, pregnant bats were observed well into June and sometimes July; about a month later than bat birth is expected in Wisconsin. A larger than normal amount of pup mortality was observed at many summer roost sites across the state. We can only speculate as to exact reasons for mortality, but because of late births, mother bats may have abandoned young as they started to “consider” their own condition going into the fall rather than using resources to raise a pup. Pups born late also do not have as much time to forage and gain fat, so survival rate drops when they are born later in the year (Frick et al 2010).

In 2010, the WI bat roost project set out to find all known roosting locations for bats in Wisconsin using posters and articles. This goal is ambitious and will be difficult to complete due to the fact that it is unlikely we will ever locate all known bat roosts in the state. In 2013, the Bat Program aimed to have a monitored colony in every county in the state in 2014. 25 counties still needed recorded and monitored bat roosts as of 2013 and we are happy to report that the Program added 6 counties and now seek 19 more counties with recorded and monitored roosts.

Big brown bat colonies tend to be found most often in the southern portion of the state, while little brown colonies can be found state-wide, but are less common in the southeastern portion of the state. Large colonies of little brown bats tend to be very close, if not directly adjacent to bodies of water.

Based on reported bat colonies, little brown bats prefer bat houses over other roost types, but this may be biased because those with bats in their attic have not, or don't wish to report and monitor their roost. Some of these inhabited bat houses may also be colonies that were excluded from attics or buildings and moved to the new habitat.

Obviously, a certain amount of monitor error occurs as a volunteer conducts emergence counts because of low visibility, speed of emerging bats, etc., however having the same person or persons conducting counts at a site tends to reduce error between counts. While a count may not be completely accurate, monitoring several times over the summer and for several years by the same person standardizes the counts completed.

It should be noted that multiple data points are more useful in determining colony fluctuations within a season and long term trends as shown by the daily counts conducted in Waukesha. While single counts are useful information for getting a general idea of how many bats are at a site especially over several years, multiple counts are required to accurately begin to assess a colony at a site and determine recruitment. It is apparent from the counts conducted on consecutive nights that the number of bats emerging even a night apart can differ quite greatly due to weather, individual behavior and other unknown factors. The Bat Program had planning on daily counts for a colony in Madison to investigate changes in emergence at a little brown bat site, however due to limited time on part of volunteers, the colony was counted on 3 consecutive nights several times over the summer 2014, which still gave us important information.

The United Kingdom's Bat Monitoring Programme has over 10 years of data from roosts which allows them to investigate yearly population trends, and measure how many bats are using a site on an annual basis. As Wisconsin's roost project continues and WNS invades the state, it becomes just as important to gather data from consecutive years as it is to find new roost sites.



A volunteer waits for bats to emerge from a Yellowstone Lake State Park bat house.

Already monitoring a roost?

We can't thank you enough for your help in monitoring Wisconsin's bat population

- If you have not already done so, please verify the species in your roost by submitting photos of guano or the bats themselves.
- Continue monitoring your roost for consecutive years.

There are several roosting sites on public land, including many state parks, which have never been counted, or counted only once. In order to complete surveys at these sites, the program will

- Work with State Park Naturalists to create evening bat monitoring programs
- Introduce bat roost monitoring to campers as a fun evening activity

The Bat Program is also contacted by volunteers who wish to participate but do not know of bat roosts. We had several dedicated volunteers count both public and private roost sites over the summer of 2014. Many landowners do not have the time or interest to put towards monitoring their colony, but interested volunteers have been able to start monitoring of sites these around the state. Unfortunately, interested volunteers tend to be concentrated in populated areas, so roosts in Madison for example, get counted many times over the summer while sites outside of the city still lack basic information other than location

The Bat Program will continue to send out "bats-wanted" posters and articles asking for bat roost locations. In addition, we will offer interested volunteers roost sites available for monitoring. As bat awareness increases for the public because of WNS, we may receive additional reports from landowners who have bats roosting in their buildings and bat houses. The "bats-wanted" poster is available on the roost project page. Please feel free to print it out and post it in your area

Finally, a giant Thank You is required for all the volunteers and landowners who conducted surveys, reported roosts, or built and installed bat houses this year. This project cannot continue without you.

Heather Kaarakka
Roost Monitoring Program Coordinator



Heather Kaarakka using radio telemetry to track a northern long-eared bat in northern Wisconsin. Photo by Amanda McDonald.

References

Davis, W. H. and H. B. Hitchcock. 1965. Biology and migration of the bat, *Myotis lucifugus*, in New England. *Journal of Mammalogy* 46: 296-313.

Fenton, M. B. and R. M. Barclay. 1980. *Myotis lucifugus*. *Mammalian Species* 142: 1-8.

Frick, W. F., D. S. Reynolds and T. H. Kunz. 2010. Influences of climate and reproductive timing on demography of little brown myotis *Myotis lucifugus*. *Journal Animal Ecology* 79:128-136.

Keeley, B. W., and M. D. Tuttle. 1999. Bats in American Bridges. *Bat Conservation International Pub No. 4*. <http://www.batcon.org/pdfs/BatsinBridgesManual.pdf>