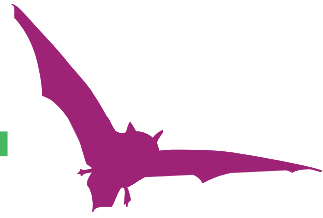


2013

**ROOST
MONITORING
REPORT**



WISCONSIN BAT PROGRAM

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Introduction

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 WDNR staff. With many roosts to monitor and few WDNR staff to conduct counts, we turned to the Citizen-Based Monitoring (CBM) Program within WDNR 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 100 new sites have been added to the existing bat roost database. 2013 was another successful year for locating and counting bat roosts around the state; an additional 30 sites were added to the database and counted at least once over the summer.

Project Need

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% are not uncommon in hibernating bats. WNS is caused by a fungus called *Pseudogymnoascus destructans*. In six years, WNS has spread to 22 different states 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 on the state bat populations. Volunteers that monitor roosting sites over several years may also experience either drastic or no noticeable drops in numbers of bats as they count annually after WNS afflicts an area. As of November 2013, neither white-nose syndrome nor the fungus that causes the disease has been recorded in Wisconsin, however the disease has been found in Illinois, 100 miles from Wisconsin's border.

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.

Background

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. 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. Big brown bats generally prefer cooler temperatures, and tend to prefer 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 290 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 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 over the winter. This occurrence was thought to be quite rare; however The Program continue 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

Background cont.

information about roost sites for the other five species is due to the fact that these bats are cryptically colored, often solitary, 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.

White-nose syndrome creeps closer to Wisconsin's hibernacula every year. Volunteers and monitors can be one of our best assets in early detection of the disease. Those with roost sites can help by taking note of odd bat behavior, especially during the winter months when bats should not be active. Flying during the day and in the middle of winter, and unusual mortality on the landscape are some of the behavioral side effects of WNS. Little is known about summer symptoms of WNS, however if you find three or more dead bats at your roost site during summer please carefully and immediately bag and refrigerate the specimens and submit a dead bat report. You will be contacted on how to transfer the specimens to the wildlife health department. If you find bats at your roost site in the middle of winter, whether dead or alive, please contact the Bat Program to alert the DNR of unusual behavior. More information on WNS and the dead bat report can be found on the Wisconsin Bat Program website: <http://wiatri.net/inventory/bats>.

2013 Results

Since the effort established in 2010, over 400 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 77 sites were monitored over the spring, summer and fall of 2013, up from 57 monitored in 2012 (see Figure 1). Monitors spent an average of 36 minutes per count.

45 of the 77 sites were monitored in previous years. In 2013, 9 (12%) of the 77 monitored roosts were attics, 18 sites (23%) were barns or other buildings, 3 (4%) were bridge roosts or other, and the remaining 42 (54%) sites were bat houses (see page 7). Of 77 sites monitored, 55 (71%) are inhabited by little brown bats, 17 sites are used by big brown bats, and 5 sites house unknown species.

Little brown bats were monitored in bat houses most often at 67% of the sites, followed by attics at 15%. Big brown bats were found most often in barns at 41% of sites, followed by bat houses roosts at 29% of sites (see Figure 2).

In 2013, 17 sites were counted more than twice over the summer, and 12 sites were counted two times. The remaining sites were monitored only once.

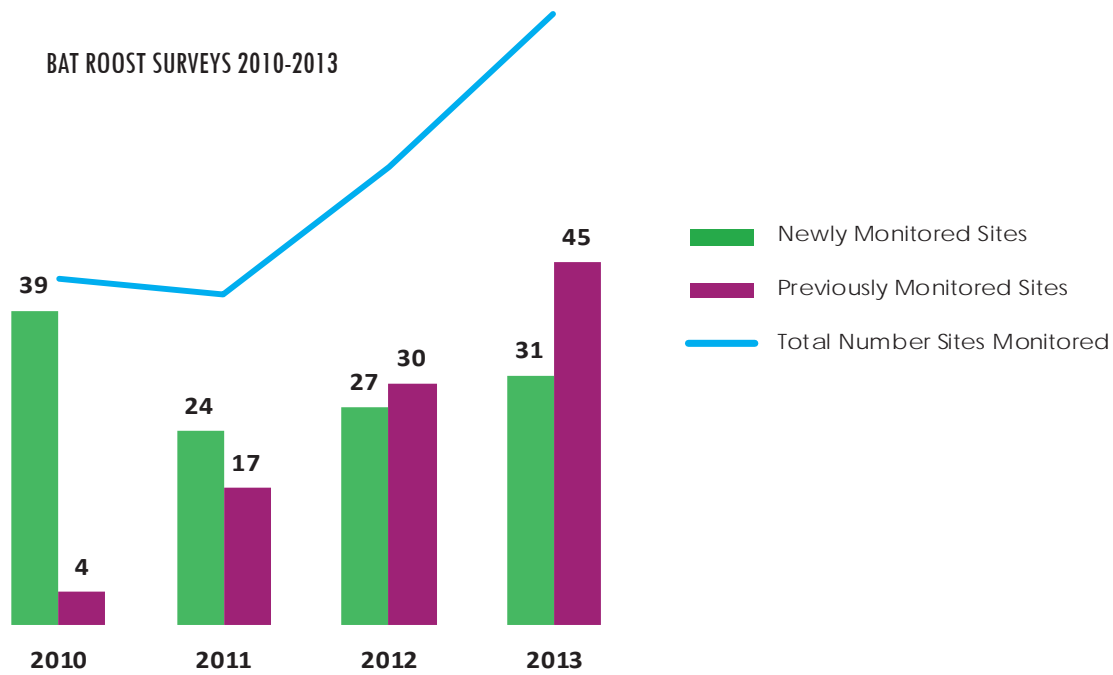
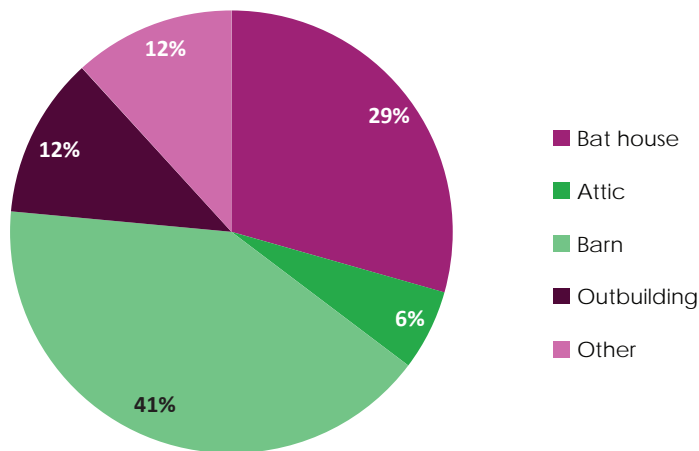


Figure 1. The above graph shows the number of monitored sites in Wisconsin by year, and displays the number of new sites per year as well as the number of sites that have been monitored in previous years. This graph shows how well the effort to gather bat roost information has worked since 2010. After 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.

BIG BROWN SITES 2013 (n=17)



LITTLE BROWN SITES 2013 (n=55)

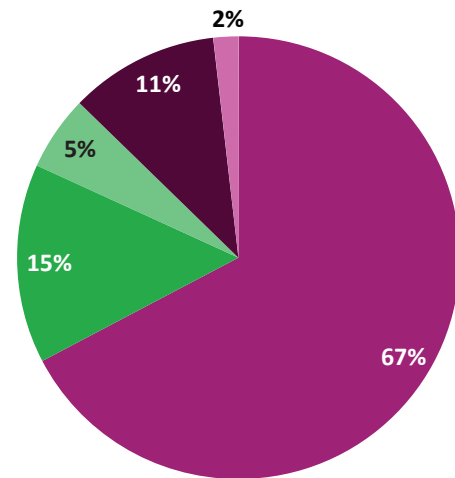
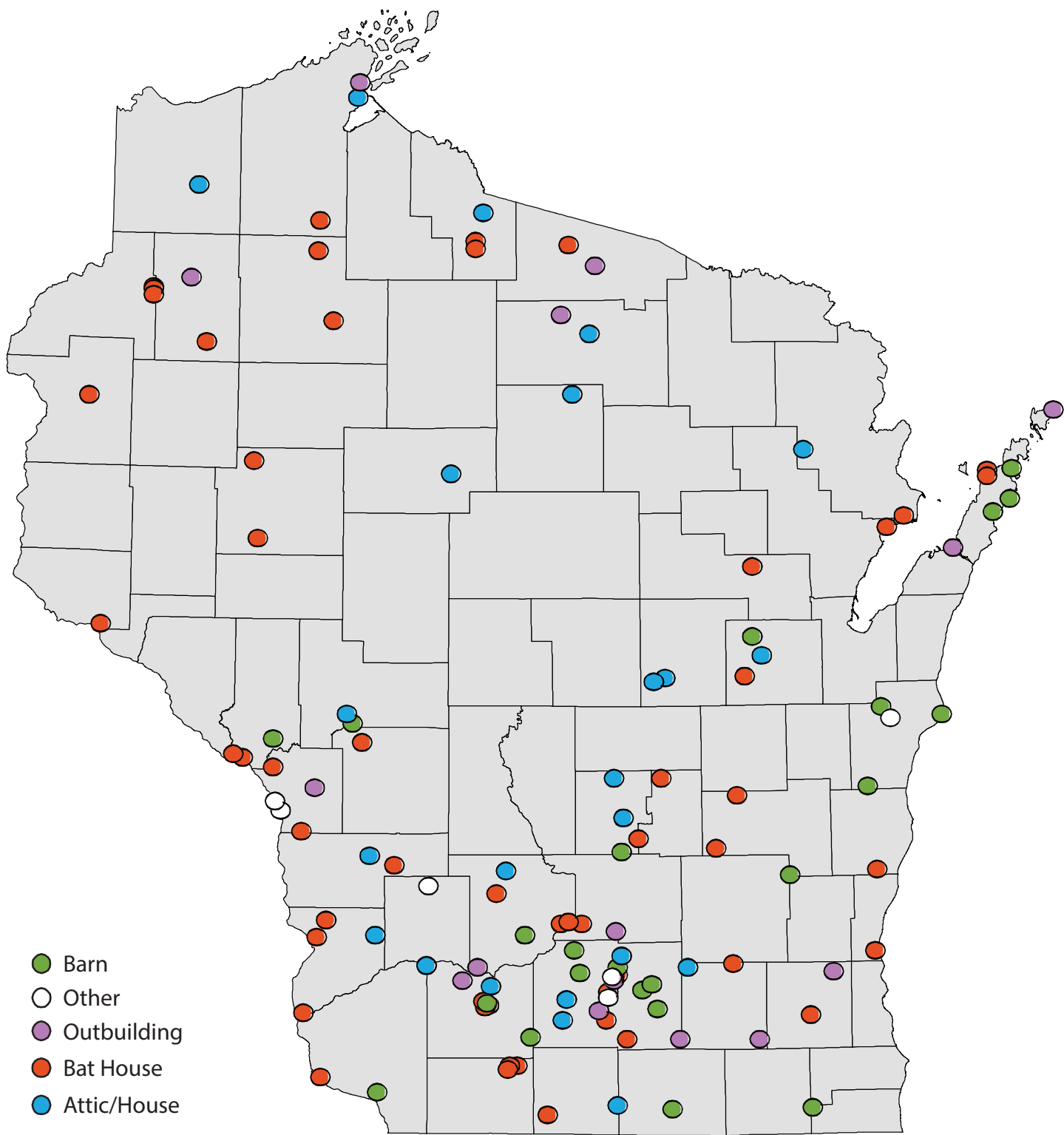


Figure 2. The above graphs display the proportions of roost types that each species uses in Wisconsin. Among monitored sites in the state, little brown bats prefer bat houses, while big brown bats seem to prefer to roost in barns.

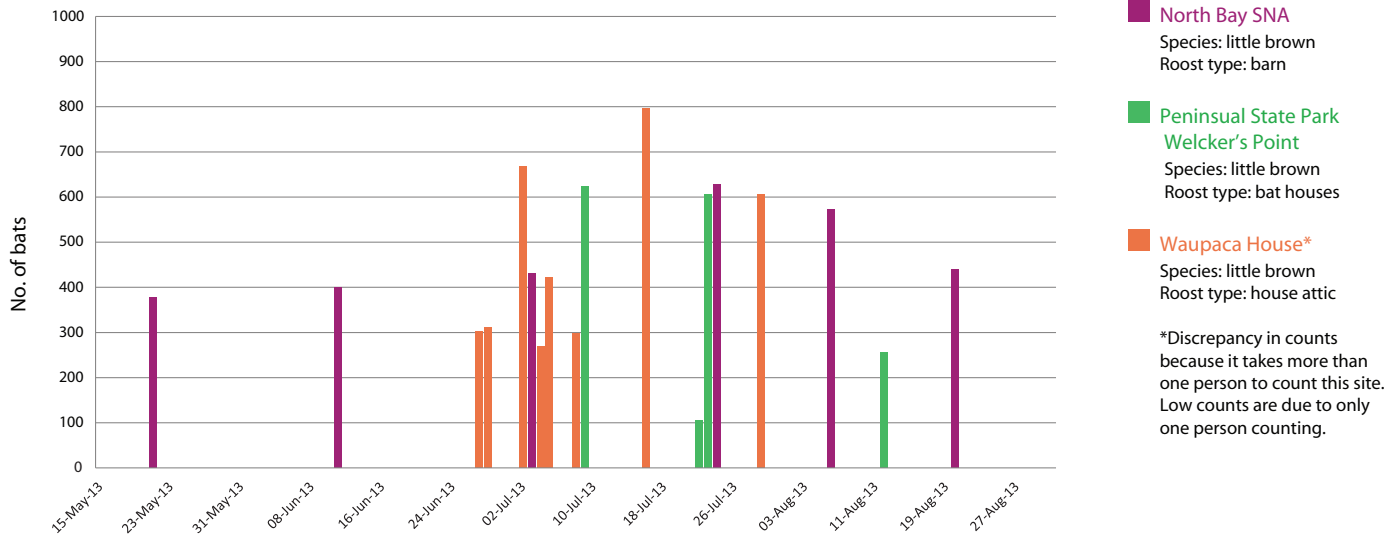
WISCONSIN MONITORED BAT ROOSTS



ROOSTS COUNTED MORE THAN TWICE

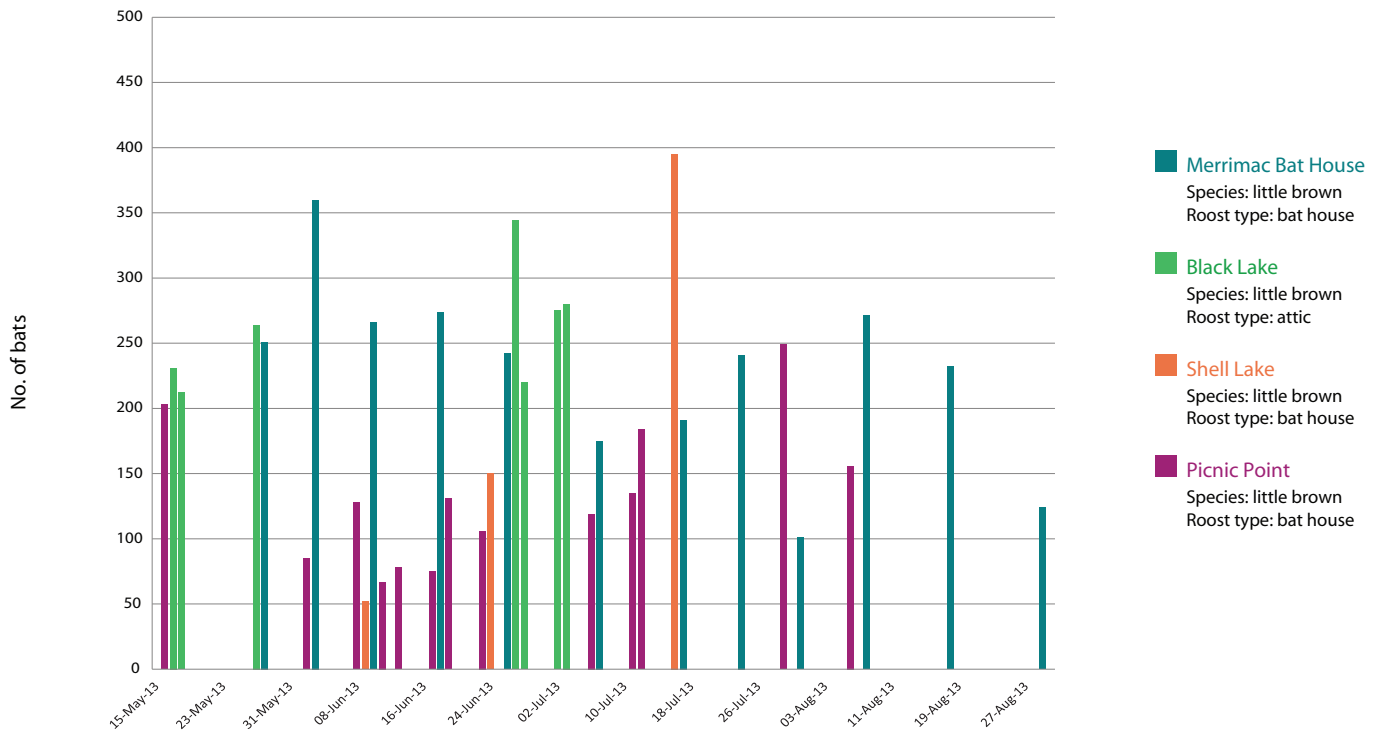
Displayed below are data from multiple counts conducted over the summer. Graphs are split by colony size and data ranges reflect summer residency period - May 15 through August 31.

SUMMER RESIDENCY COUNTS FOR COLONIES >500 BATS



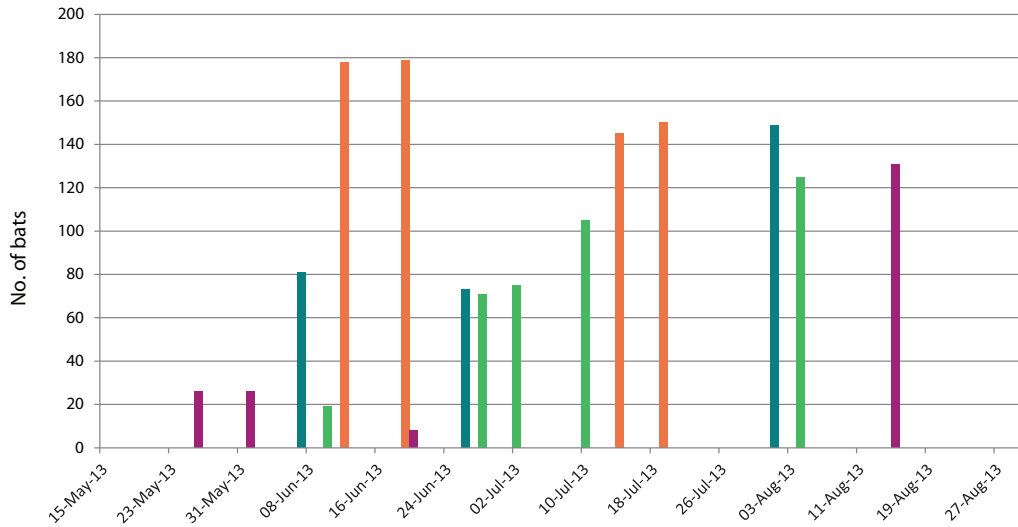
*Discrepancy in counts because it takes more than one person to count this site. Low counts are due to only one person counting.

SUMMER RESIDENCY COUNTS FOR COLONIES OF 200-500 BATS



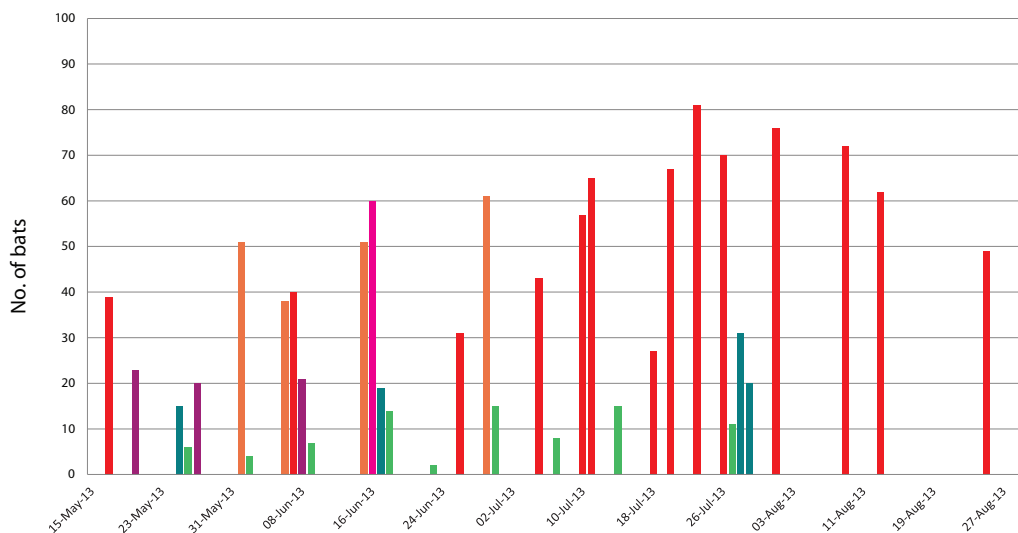
ROOSTS COUNTED MORE THAN TWICE

SUMMER RESIDENCY COUNTS FOR COLONIES <200 BATS



- **Sauk County Barn**
Species: big brown
Roost type: barn
- **Anderson Bat House**
Species: little brown
Roost type: bat house
- **Bayfield House**
Species: little brown
Roost type: attic
- **Kickapoo Valley Reserve Bat House**
Species: little brown
Roost type: bat house

SUMMER RESIDENCY COUNTS FOR COLONIES <100 BATS



- **Glen Oaks Lane**
Species: little brown
Roost type: bat house
- **Sheboygan Bat House**
Species: big brown
Roost type: bat house
- **Restaurant**
Species: big brown
Roost type: outbuilding
- **Monroe County Bat House**
Species: little brown
Roost type: bat house
- **Polk County Bay House***
Species: unknown
Roost type: bat house
- **Wayside Sanctuary**
Species: little brown
Roost type: bat house

*This site is included in multiple counts graph because it was counted several times prior to May 15th.

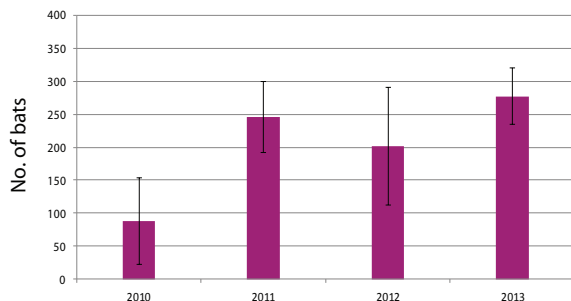
POPULATION ESTIMATES USING PREVOLANT COUNTS

Below are population estimates per site calculated as an average of prevolant counts (before pups begin to fly, May 1 through June 31). Error bars indicate standard deviation from the mean, where the top of the error bar indicates the largest count, and the bottom of the bar, the lowest count. Note the large standard deviation for little brown sites (Black Lake, Merrimac bat house, North Bay and Picnic Point), indicating that a relatively large number of counts, or counts on consecutive nights are required to accurately estimate the population at a site.

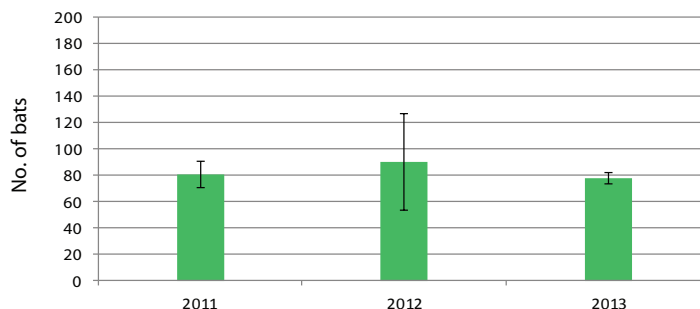
Only sites with 3 or more prevolant counts are included.

To establish intra-colony variation and estimate colony size, Thomas Kunz (2003) established emergence survey protocol of at least three counts on consecutive nights during maximum adult colony size (pregnancy and lactation, late May through June). Those monitors with time and interest may consider three consecutive counts next June to help estimate their colony size.

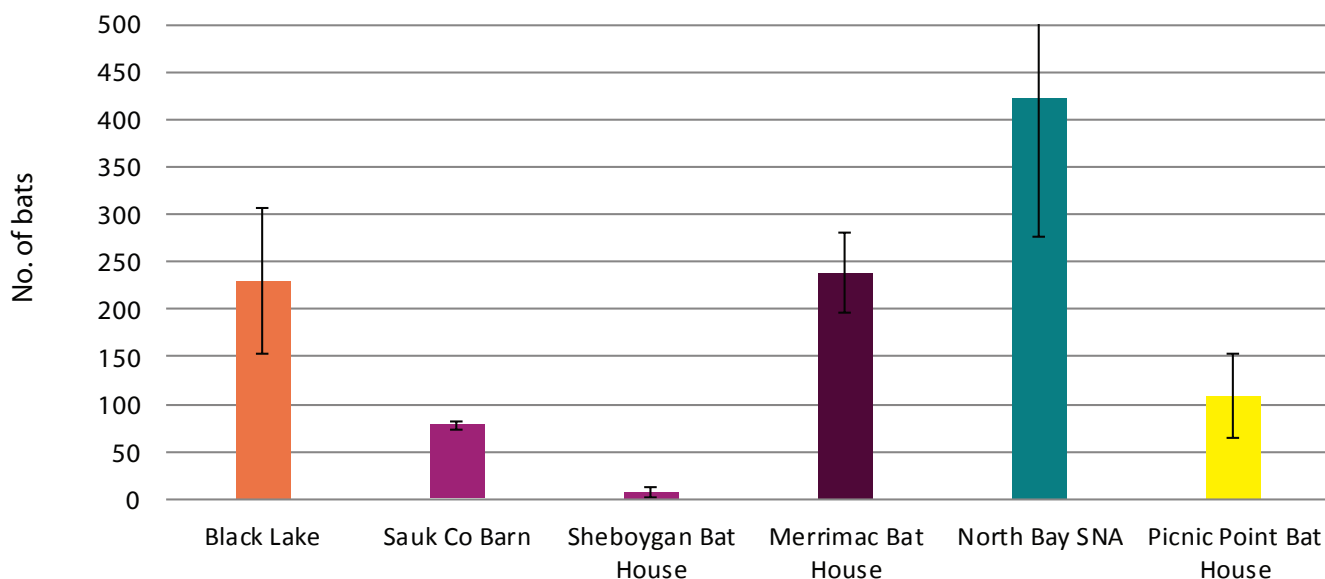
YEARLY MERRIMAC BAT HOUSE POPULATION



YEARLY SAUK CO. BARN POPULATION



AVERAGE POPULATIONS BASED ON PREVOLANT COUNTS



Daily Monitoring

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.

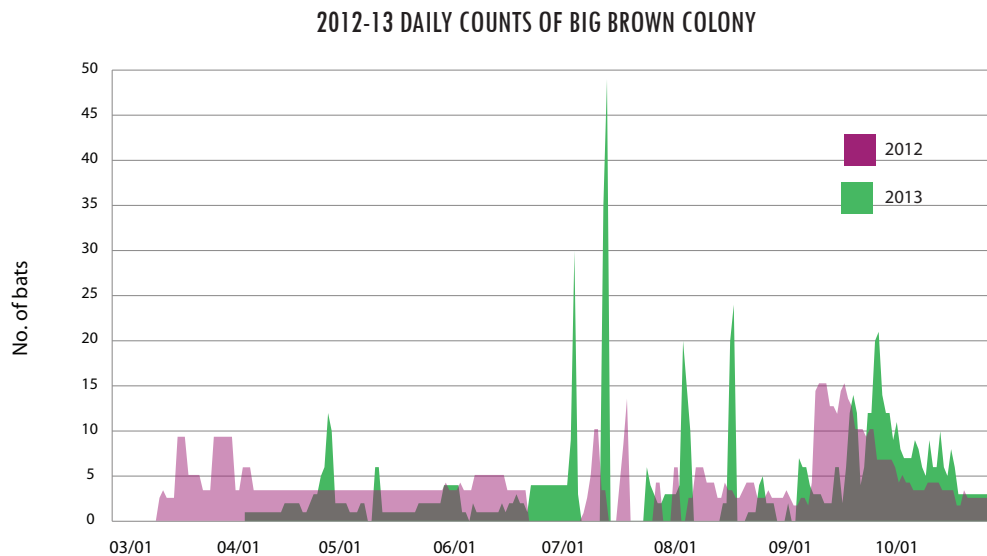
While big brown bats have been known to abandon a roost for no apparent reason, and sometimes return later, daily counts of this colony has given us a glimpse into just how drastically a colony can change over the course of the season. Little brown bats are not known to change in number quite so dramatically,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

The graph on the next page 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 we may install a temperature logger in the bat house to investigate temperature variation. When zero bats are shown, it means that no bats were present in the roost, not that no count was 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 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 is most likely another roost 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.

Daily Monitoring cont.



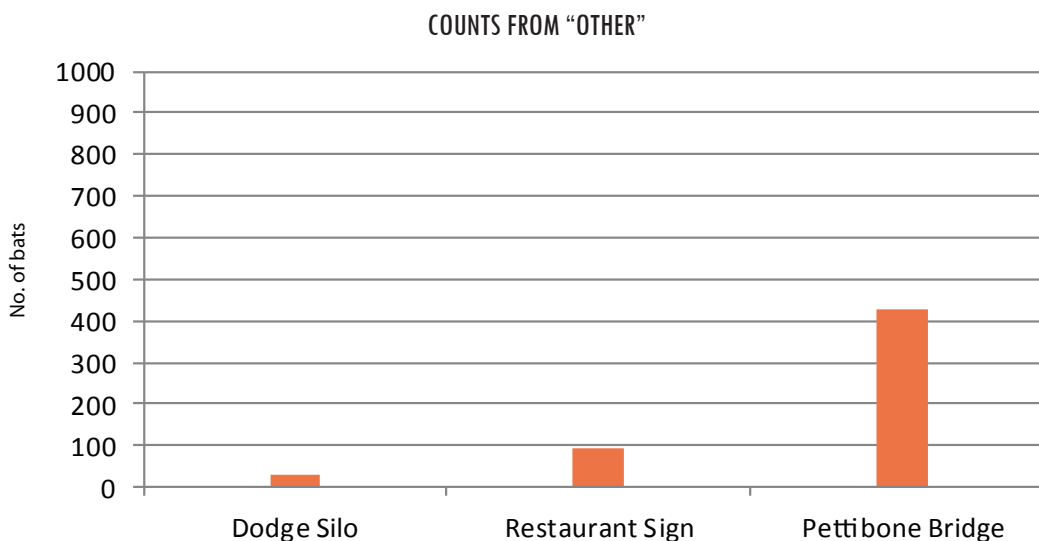
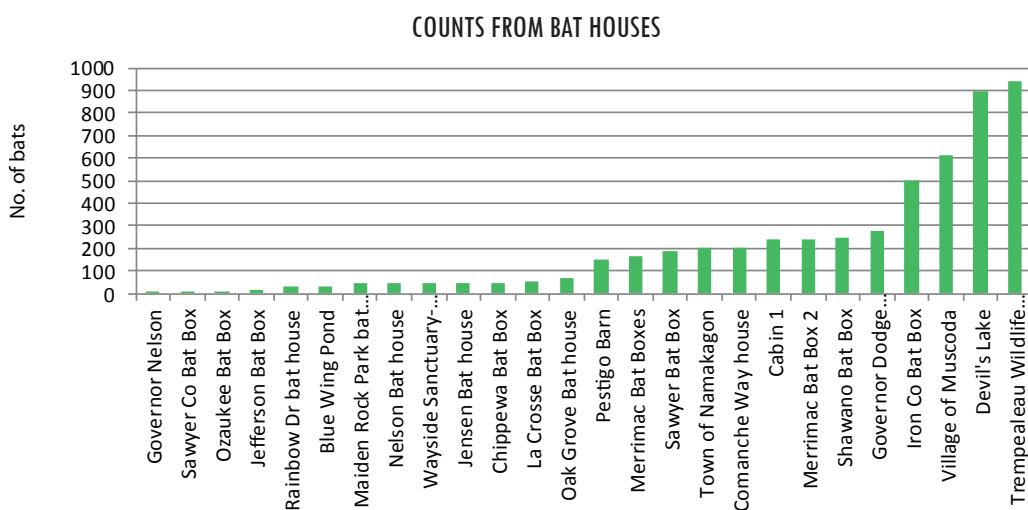
Notice the difference in the time period in which the bats returned in the spring. In 2012, the state experienced a warm, early spring, and big brown bats at this colony returned in mid-March. In 2013, the state had a delayed, cool spring, and the bats did not return until early April.



Jim Edlhuber

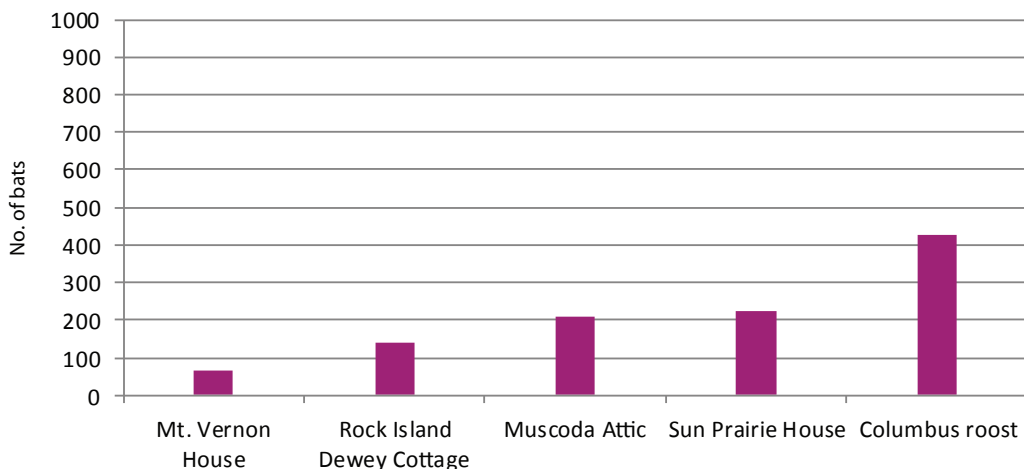
ROOSTS COUNTED ONCE OR TWICE

Colonies counted once or twice over the summer are summarized on the next two pages. For counts conducted twice, the count closest to early June (prior to pups flying) is represented to estimate the number of bats using a site. Yellowstone Lake State Park counts were omitted from the bat house graph due to the large number of bats using the bat houses: over 4000 bats call Yellowstone Lake SP home.

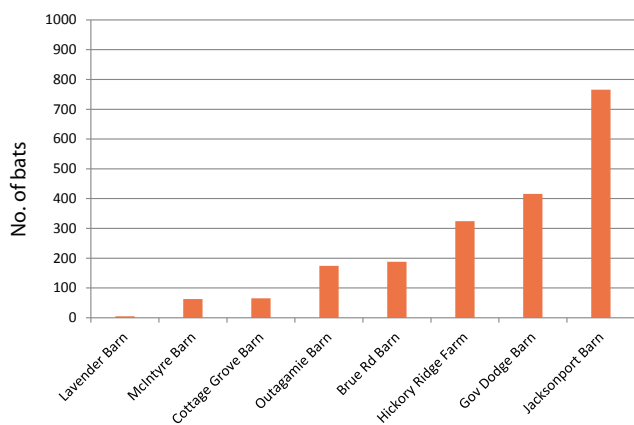


ROOSTS COUNTED ONCE OR TWICE

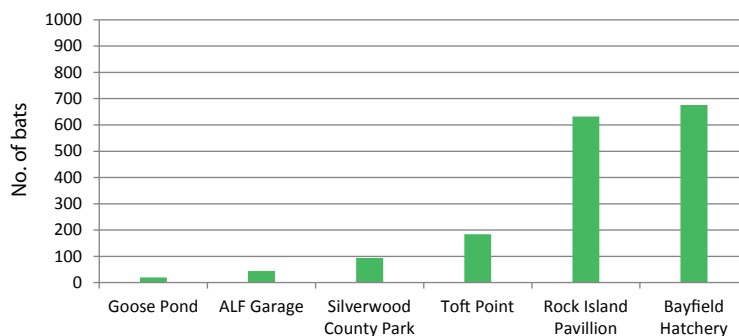
COUNTS FROM ATTICS/HOUSES



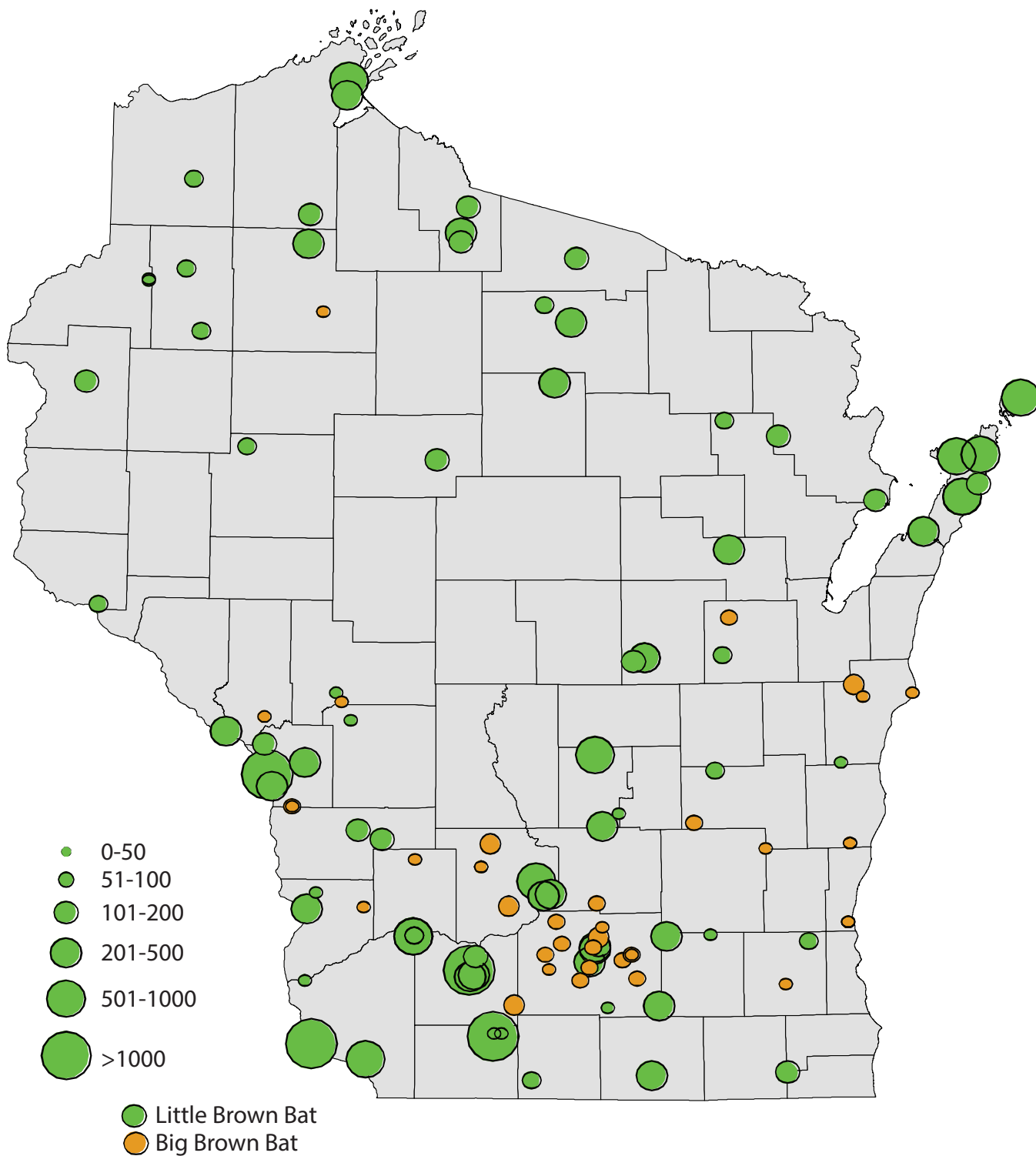
COUNTS FROM BARN



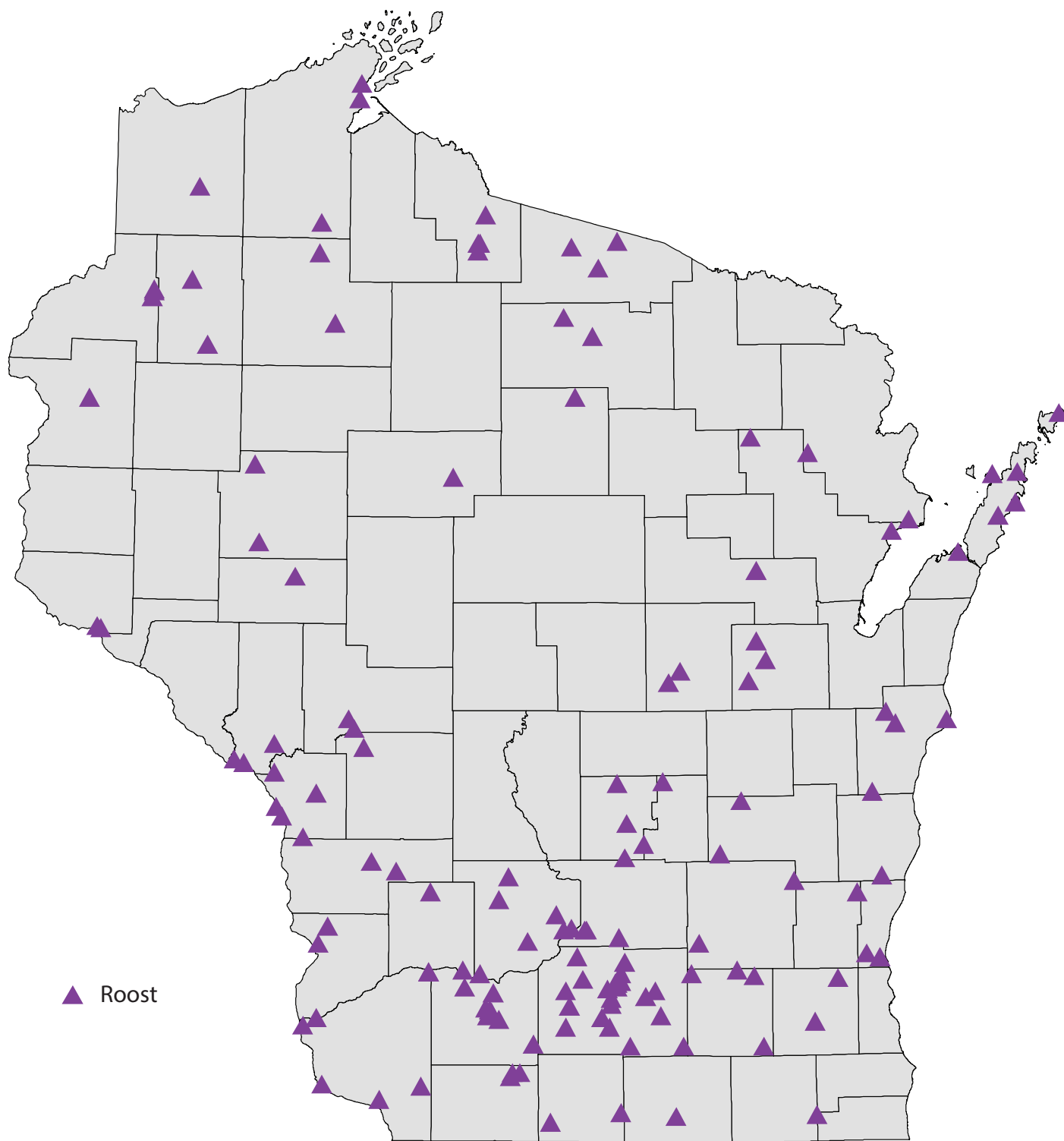
COUNTS FROM OUTBUILDINGS/GARAGES



WISCONSIN BAT ROOST BY COLONY SIZE



WISCONSIN MONITORED BAT ROOSTS



YELLOWSTONE LAKE STATE PARK

Yellowstone Lake State Park is home to more than 4000 bats in the summer. Over 30 bat houses have been built and installed by Kent Borcharding since 1999. Twice a year, the Wisconsin Bat Program coordinates "bat blitzes" to count all of the bat houses in one night.





DEVIL'S LAKE STATE PARK

After the exclusion of bats from the historic chateau building on the north shore of Devil's Lake, the bat program installed 17 bat houses on the side of the building to offer alternate habitat. In 2010, weekly counts were conducted by volunteers in Baraboo, and for the past two summers, "bat blitzes" have been coordinated at Devil's Lake where all bat houses are counted by volunteers. In 2011, a bat condo was built to help shift the population. Due to re-siding of the historical building, the bat houses were removed in fall 2013, but the condo still stands waiting for the returning bats this spring.

Discussion and Next Steps

The late, cold weather into May 2013 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 last year 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 last year and late spring this year, 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 2013, the little brown bats were still at their hibernation sites, but starting to stage near the entrance of the hibernaculum. Most reports from those monitoring the phenology of their colony in 2013 did not record little brown bat activity until mid-to late April. These anecdotal notes show the importance of gathering phenology data from colonies.

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; however, in 2014, the Bat Program aims to have a monitored colony in every county in the state. 25 counties still need recorded and monitored bat 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 on 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

Discussion and Next Steps cont.

wish to report and monitor their roost. Some of these inhabited roost bat houses may be 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 and 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, 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 is planning on daily counts for a colony in Madison to investigate changes in emergence at a little brown bat site.

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 creeps closer, it becomes just as important to gather data from consecutive years as it is to find new roost sites.

Discussion and Next Steps cont.

Already monitoring a roost?

- Confirm species with photos
- Continue to conduct emergence counts over 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 and personnel to create bat monitoring programs
- Introduce bat house 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 2013. 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.

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

For more information about Wisconsin bats and the citizen-based monitoring projects visit:
<http://wiatri.net/inventory/bats>

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- Kunz, T. H. 2003. Censusing bats: Challenges, solutions, and sampling biases, in O'Shea, T.J. and Bogan, M.A., eds., *Monitoring trends in bat populations of the United States and territories: problems and prospects*: U.S. Geological Survey, Information and Technology Report, USGS/BRD/ITR--2003--0003, p. 9–19.

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