Tennessee Winter Bat Population and White-nose Syndrome Monitoring Report for 2017-2018

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Tennessee Wildlife Resources Agency

Region 2

TWRA Wildlife Technical Report 18-7

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These surveys could not be conducted with such a high level of effort or as geographically widespread without the assistance of numerous partners and volunteers. Because the majority of caves and winter sites occur on private lands in Tennessee, the number of surveys would be greatly reduced without the support, assistance, and willingness of private landowners. Without the partner, volunteer and landowner support, we would not be able to understand the distribution of winter bat populations and effects of white-nose syndrome in Tennessee.

Acronyms

AAFB……..……..Arnold Air Force Base

NPS……...……..National Park Service

TDEC…….Tennessee Department of Environment and Conservation

TNC…….The Nature Conservancy of Tennessee

TTU.....Tennessee Technological University

TVA……..……Tennessee Valley Authority

TWRA…….….Tennessee Wildlife Resources Agency

UoS..... Sewanee: The University of the South

USFWS……..United States Fish and Wildlife Service

USGS .....United States Geological Survey

OSU.....Oregon State University

UTK……University of Tennessee at Knoxville

Species Codes

CORA…….... *Corynorhinus rafinesquii*

EPFU…….. *Eptesicus fuscus*

LANO……..… *Lasionycteris noctivagans*

MYAU……...… *Myotis austroriparius*

MYGR…….. *Myotis grisescens*

MYLE……... *Myotis leibii*

MYLU……...…. *Myotis lucifugus*

MYSE……...…. *Myotis septentrionalis*

MYSO…… *Myotis sodalis*

MYsp……...…..Unknown Myotis

PESU……... *Perimyotis subflavus*

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Executive Summary

During the 2017-2018 monitoring season, field signs of white-nose syndrome (WNS) were observed in 41 of the 132 caves surveyed, but many of the caves surveyed have previously been confirmed WNS positive. No new counties were confirmed positive during the monitoring period. WNS and its casual fungal pathogen *Pd* can now be found in 54 of the 78 (69.2%) counties containing caves and is considered widespread in Tennessee.

The 2017-2018 winter field season was an "off" year for significant bat species and surveys were not performed at priority *Myotis grisescens* (gray bat) and *Myotis sodalis* (Indiana bat) sites. Surveys for these species will be performed during the 2018-2019 winter field season and partners and cooperators will again try to conduct surveys at all priority *M. grisescens* and *M. sodalis* priority sites.

Observations of *Perimyotis subflavus* (tri-colored bat) increased 9.4% between the 2016-2017 and 2017-2018 winter field seasons. Since the 2009-2010 winter survey period, observations of *P. subflavus* have declined 4.6%. *Myotis lucifugus* (little brown bat) observations increased when comparing years non-priority caves are surveyed. Further analyses were not performed since this monitoring period was not a priority cave survey period. *M. septentrionalis* (Northern long-eared bat) observations reached an all-time low during this monitoring period as only 2 individuals were observed across all surveys statewide.

Determining the rates of declines for all bat species in the state has proven difficult because of a lack of consistent survey effort at all sites among all years and surveyor bias during surveys. Despite these difficulties, biologists are still seeking statistical analyses to use with the current dataset. Analyses thus far have be relegated to a comparison of data for individual species between years and across all years. To date, the rate of annual decline in observations for *P. subflavus* is 0.53%, 31.15% for *M. lucifugus*, 34.10% for *M. sodalis*, and 42.52% for *M. septentrionalis*. Biologists have observed increases for some species in the state. Observations of *Eptesicus fuscus* have increased annually by 23.92%, 10.50% for *Corynorhinus rafinesquii*, and 7.85% for *M. grisescens*. These rates of decline or increase simply represent the annual percentage rate of change in observations annually through comparison of 2010 observations to those made in 2018.

Recovery of banded bats took place as biologists made observations during winter surveys and were able to retrieve the bats safely and with minimal disturbance. Biologists recovered 9 bands off live bats during the 2017-2018 winter survey period from five species of bat, *C. rafinesquii*, *M. grisescens*, *M. lucifugus*, *M. sodalis*, and *P. subflavus*. Original banding data for the bands recovered from *C. rafinesquii* was unavailable at the time of this report. The average years from the year a band was placed to the time of recovery was greatest for *M. lucifugus*, 3.0 years (n = 1) followed by *M. grisescens* 0.5 years (n = 1), *M. sodalis* 0.5 years (n = 1), and *P. subflavus* 2.0 years (n = 4). These band recoveries indicate some bats have the ability

to survive multiple years despite the presence of WNS. Banding bats also allows biologists to connect summer roosts to winter roosts or indicate movement of bats between roosts during any season. A previously unknown winter roost was identified for *M. lucifugus* in Franklin County during this winter survey period as this particular bat was banded at a known summer site in the same county 3 years prior to its recovery. The summer roost is approximately 9.1 miles NW of the recently identified winter roost.

Photographs. The Tri-colored Bat (*Perimyotis subflavus*) is commonly encountered during cave surveys that may require extensive training with specialized gear. Photos courtesy of Dustin Thames.

Table of Contents

List of Figures

List of Tables

Introduction

This report summarizes data collected by all cooperating agencies and partners in Tennessee during the winter of 2017-2018. The results of independent research projects are not included.

Historical survey work within the state of Tennessee was conducted to monitor the success of conservation efforts for endangered bats in Tennessee. This was accomplished by state and federal agencies and non-governmental groups conducting winter bat hibernaculum censuses. This work occurred on a bi-annual basis or staggered every three years depending on the species involved and the availability of personnel. At one point, selected sites were monitored annually to establish a dataset that would allow trend analysis of populations. These efforts were disbanded in 2015 because of potential negative impacts as a result of repeated visitation. Historical surveys have generally focused on two of three endangered species of bat found in Tennessee, *Myotis sodalis* (Indiana bats) and *M. grisescens* (gray bats). No winter occurrences of the third species of endangered bat, *Corynorhinus townsendii virginianus* (Virginia big-eared bat), are known from Tennessee.

Beginning in 2009 with the concern of bat population declines due to white-nose syndrome (WNS), there was increased awareness to not only continue monitoring the status of endangered species, but to also assess the numbers and health of the common species of cave hibernating bats. Prior to the occurrence of white-nose syndrome (WNS), there was very limited information available on bat hibernacula and winter population trends for once common species of cave hibernating bats, that include: *M. lucifugus*, (little brown bat[1]), *M. septentrionalis* (Northern long-eared bat[2]), *M. leibii* (Eastern small-footed bat), *Eptesicus fuscus* (big brown bat), *Perimyotis subflavus* (tri-colored bat[1]), and *C. rafinesquii* (Rafinesque's big-eared bat). Because of the paucity of data for these species, assessing trends of winter populations of bats and WNS caused mortality has been difficult.

Initially, a tiered monitoring approach was developed and implemented during early monitoring efforts with each tier having varying levels of effort. This approach allowed survey effort to be adjusted to each cave minimizing potential impacts to hibernating bats, while allowing for the objectives of winter monitoring to be met. A description of the tiered monitoring system can be found in Lamb and Wyckoff (2010) and Flock (2014). As the need to gather data for all species increased, complete censuses of bat populations found within all sites surveyed was implemented in lieu of the tiered monitoring approach.

[1] Both *Myotis lucifugus* and *Perimyotis subflavus* were listed as threatened within Tennessee by TWRA in August 2018.

[2] *Myotis septentrionalis* was listed as threatened by the USFWS April 2, 2015 because of severe declines attributed to WNS (USFWS 2015).

WNS and its causal fungal pathogen *Pseudogymnoascus destructans* (*Pd*) were first recorded in Tennessee in the winter of 2010 (Figure 1). Since 2010, *Pd* has been histopathological confirmed[3] on bats in 50 counties and genetic material of *Pd* has been located on bats in four counties in Tennessee (Figure 2). More than sixty-nine percent of the counties with caves in Tennessee (78) have been confirmed WNS positive or suspect. Appendix A lists all confirmed or suspect sites and the species from which samples were collected in Tennessee. A list of all species in which *Pd* has been diagnostically confirmed or detected can be found at https://www.whitenosesyndrome.org/about/bats-affected-wns.

Figure 1. Progression of WNS has occurred quickly in Tennessee since being discovered in 2010. No caves were designated WNS positive or suspect during the 2017-2018 monitoring period. The monitoring period includes caves surveyed in December (2017 – 2018).

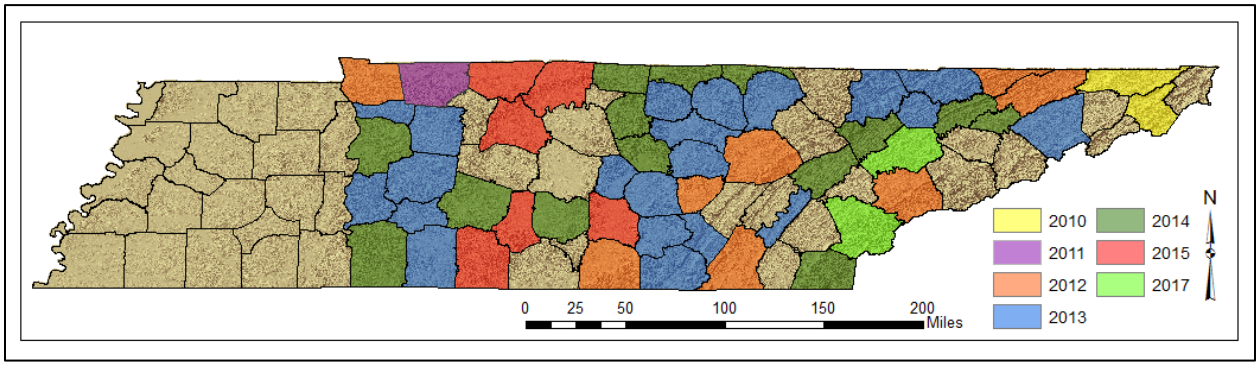
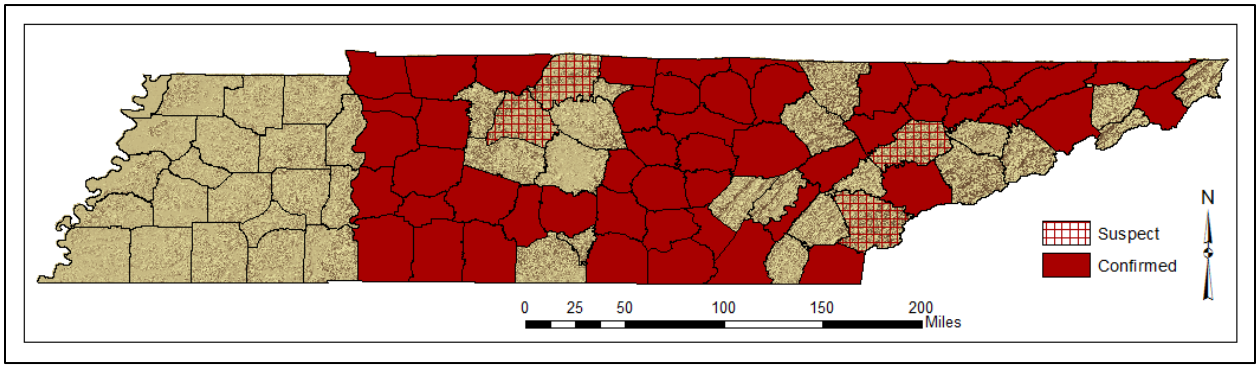


Figure 2. Most cavernous counties in Tennessee have been designated WNS confirmed and currently four counties are WNS



With over 10,000 caves in Tennessee and 20% of the known caves in the United States (The Nature Conservancy of Tennessee n.d.), conducting annual surveys of all caves or of all winter bat populations in Tennessee is not a realistic and feasible approach, and not one considered by the WNS Advisory Council of Tennessee. A significant effort is made each year by all state and federal agencies, non-governmental groups and individuals to perform as many winter surveys as possible. Because of the density of caves throughout the state, less than 1% of

[3] During monitoring efforts, a site cannot be confirmed positive for the presence of WNS until histologic investigations reveal *Pd* has infected the tissues of bats. Suspect sites through 2014 are sites which test PCR positive for the presence of *Pd* and this designation is not removed until histology reports reveal tissue infections. Since 2014, the criteria used to classify WNS suspect sites has changed to minimize the need to euthanize bats and can be found at https://www.whitenosesyndrome.org/resource/revised-case-definitions-white-nose-syndrome-11252014.

the caves are visited each year. As a result of this, any conclusions or predictions concerning the spread of WNS across Tennessee and its effect on the bat population should take survey effort into consideration.

In all years, surveys are conducted in a manner allowing strict adherence to the USFWS WNS Decontamination protocols (https://www.whitenosesyndrome.org/topics/decontamination). Decontamination has been a high priority in all years to minimize the potential of surveys aiding the spread of *Pd* across the state. As a result of this priority, the number of caves visited per day is limited based on geography, personnel, and maintaining adequate supplies of decontaminated equipment. Despite the large number of caves in Tennessee and issues surrounding decontamination, efforts have helped to identify new bat hibernacula and to allow changes of winter bat populations to be tracked.

Methods

The 2017-2018 winter cave surveys were conducted between December 28, 2017 and March 20, 2018. Extending the survey effort through April 1st, as this is typically later in the season for winter surveys, allows for further development of WNS symptoms as observed during 2009-2010 surveys (Holliday 2012). Objectives of surveys conducted during the 2017-2018 field season fell into the following three categories with considerable overlap with the last two.

WNS Surveillance

Although a majority of the cavernous counties are WNS confirmed or suspect, surveys are still conducted to determine the presence of WNS at all sites. There are countless caves across the state that still appear to be WNS negative despite county WNS designations. Surveys are implemented to gauge the presence of WNS on a site level because of the lack of uniformity of its progression across the state, and as a result of this lack of uniformity, to monitor impacts of WNS on winter bat populations on a site by site basis.

Because of the need to increase knowledge of wintering populations of bat species not listed, complete censuses of all bats observed in caves was implemented. This approach was different from the tiered monitoring approach used in previous years. In the event cooperators deemed presence within the cave was creating unnecessary disturbance to wintering bats, estimates of large clusters of bats were made to decrease the length of time surveyors were in the cave.

WNS Mortality Monitoring

Selected caves previously confirmed or suspected WNS positive were visited to assess the level of mortality that may have occurred since prior visits (Samoray 2011). In order to collect the best data possible under survey conditions, a full census of all bats observed within the caves was conducted. Several of the sites selected for mortality monitoring (Lamb and Wyckoff 2010) were visited again during the 2016-2017 field season to continue these efforts.

Two methods have been used at these sites to assess mortality: repeated, annual visits to count all bats or banding of all bats to assess survivorship at sites previously determined to be WNS positive. It should be noted, of the sites previously selected for these efforts in Lamb and Wyckoff (2010), monitoring efforts have been reduced or not occurred annually as a result of manpower concerns, potential impacts from repeated disturbance, eliminating visitation at sites in which severe declines have occurred to the wintering bat populations, or the bat populations declining to critically low levels or levels too low to make these efforts a viable option.

Bat Population Monitoring

Because historic survey efforts were focused on monitoring endangered *M. sodalis* and *M. grisescens*, there is a paucity of data pertaining to other cave hibernating species in Tennessee. A continued goal of the 2017-2018 surveys was to identify new sites which serve as hibernacula for non-listed, but WNS affected bats. These species include: *P. subflavus*, *M. septentrionalis*, *M. lucifugus*, and *M. leibii*. Several of the sites visited during this period have been visited during previous survey years. Despite these repeated visits, full censuses of bats observed in the caves were performed. Several sites not previously surveyed, were visited during this period and, again, complete surveys of all bats were performed. Methods detailed by Holliday (2012) were used to select these new sites to determine if they harbor cave hibernating bats.

2018 Statewide Results

One hundred thirty-two (132) caves were visited across 45 counties during the winter of 2017-2018. This is the highest number of caves visited in Tennessee during any WNS monitoring period since surveys began in 2009-2010. WNS field signs were observed in 43 caves. No new counties were confirmed as WNS positive or suspect. The results of all caves surveyed can be found in Appendix B.

Over 3,200 bat observations were made during the surveys. *P. subflavus* constituted over 64% of the observations and this species was observed in 88% of all caves surveyed. *C. rafinesquii* comprised almost 24% of the total bat observations. Unfortunately, less than 1% of the total observations were of *M. septentrionalis*. Declines in some species were observed yet again during the 2017-2018 winter monitoring period and the most concerning of these declines was for *M. septentrionalis* given only 2 individuals were observed.

The 2017-2018 monitoring period was not a priority count year for *M. grisescens* and *M. sodalis* and no surveys were performed at priority sites for these species. Because surveys were not performed at priority sites, analyses and discussion for *M. grisescens*, and *M. sodalis* were omitted from this report. Surveys at these priority sites will occur during the 2018-2019 field season. Discussion regarding *M. lucifugus* is limited in this report because the majority of observations for this species are made during priority counting years.

Because of the lack of historic data for bat species not typically monitored, the 2009-2010 winter survey period was used as the base for which comparisons of current bat numbers could be made. Although this is not a preferred method for reasons that include equal survey effort between sites and across years, difficulty in observing cryptic species, addition or discovery of significant bat sites, and movement of bats across sites within and between survey years, it is the best dataset to make comparisons for assessing potential declines of these bats as the result of WNS.

Table 1. Percent increase or decrease for species observed between 2010 and 2018.

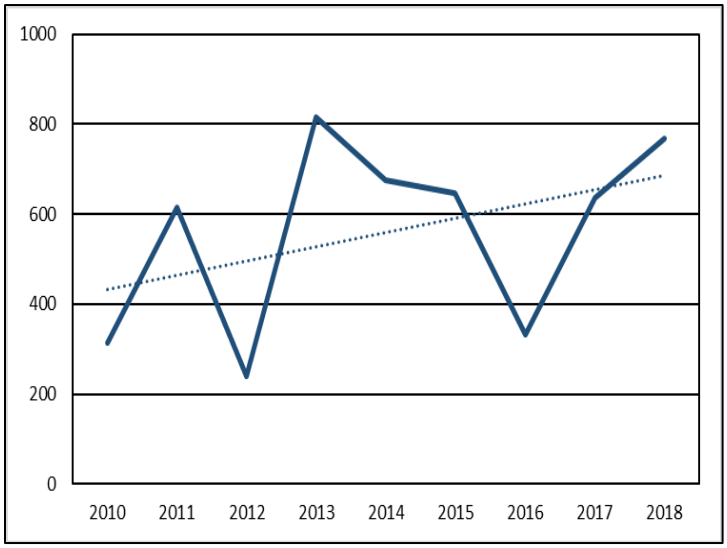
	CORA	EPFU	MYLE	MYLU	MYSE	PESU
2010 (n)	313	28	5	2075	292	2159
2018 (n)	769	193	5	103*	2	2058
% Decline	**140.70%**	**114.51%**	-	**-95.04%**	**-99.32%**	**-4.68%**

* - Priority sites were not surveyed during the 2017-2018 survey period.

Corynorhinus rafinesquii

Winter populations of *C. rafinesquii* appear stable despite the presence of WNS at many sites. Presence of *Pd* has been detected on this species using real-time PCR methods at winter sites in Tennessee (Bernard et al. 2015). Winter counts have exceeded over 600 individuals since 2013 when most priority sites are surveyed. The impact of survey effort has on observations is apparent for this species given the reduced observations made in 2012 and 2016 when only a portion of priority sites were surveyed (Figure 6). Survey effort for this species has not been equal across all years and this is because of the limited number of sites and the sensitivity of the species to repeated visitation increasing the difficulty in assessing trends for the species.

Figure 3. Total annual observations of *C. rafinesquii* since 2010.

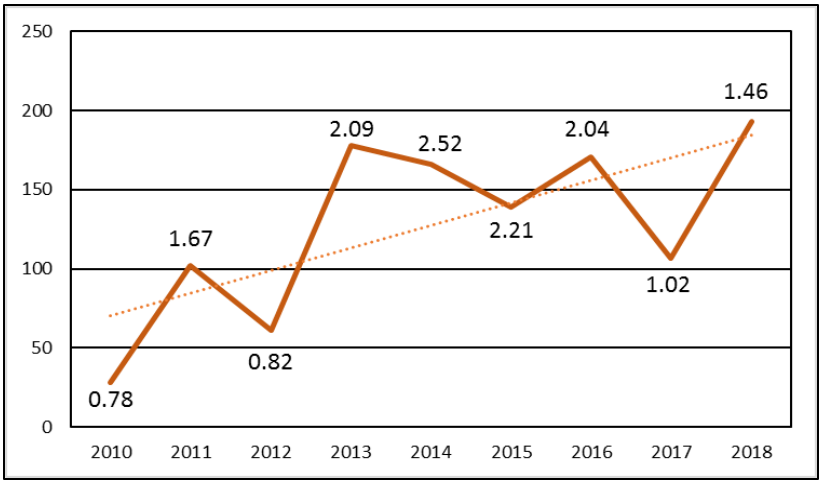


Eptesicus fuscus

The number of *E. fuscus* observed annually has increased since the 2009-2010 winter survey period and this is most likely attributed to increased survey effort. During the 2009-2010 winter monitoring, 36 caves were surveyed compared to the 132 caves surveyed during the 2017-2018 winter. The average number of individual *E. fuscus* observed during each cave surveyed was 1.46 during 2017-2018 compared to just 0.82 individuals per cave surveyed in 2009-2010 (Figure 7).

It appears numbers for this species are trending upward during the winter, but due to the low number of observations through the years it is difficult to determine if the trend is statistically significant. Observations for this species may be difficult to make because of roost preferences or selection during the winter. Many of the observations made during the winter are in plain sight or open areas of caves; however, if *E. fuscus* select roosts such as rock crevices, as observed by Neubaum et al. (2006), observations within caves may become problematic. Also, in other portions of the species range, the use of man-made structures during the winter (Whitaker Jr. and Gummer 2000) may indicate winter surveys should include nontraditional sites. Diagnostic symptoms of WNS have been documented in this species (Blehert et al. 2009).

Figure 4. Annual total observations statewide of *E. fuscus* during annual cave surveys are represented by the line. Annual average individuals observed per cave are indicated along the graph.



Myotis leibii

Observations of this species are extremely limited and have never exceeded 12 in any given year since 2009. The most sites this species has been observed at in any year was 4 (2013), making it difficult to ascertain whether populations of this species are stable, increasing or declining. Similar to *E. fuscus*, it is likely the roosting preferences of this species lead it to be under surveyed each winter. In contrast with other cave-roosting bats, *M. leibii* chooses roosts on the cave floor, under talus, or in cracks or crevices within the substrate (Erdle and Hobson 2001). Admittedly, these roosts are under surveyed during the winter, as assessing these areas would increase the time of surveys, visitation, and increase disturbance to other roosting bats. Despite the lack of survey effort for this species, there is still concern WNS may impact this species given diagnostic symptoms have been observed in *M. leibii* (https://www.whitenosesyndrome.org/about/bats-affected-wns).

Myotis lucifugus

Numbers of *M. lucifugus* have mirrored the cyclical surveys conducted for *M. sodalis*, as these two species are often observed within the same hibernacula; however, there are sites within the state where the two species do not occur together. Only 103 total individuals were observed during cave surveys for this monitoring period, but this was not a priority count year. Total observations for this species are almost double the total observations from the 2015-2016 survey period, the last monitoring period in which priority caves were not surveyed.

Despite this species once occurring in large numbers at winter sites in northern portions of its range (Davis and Hitchcock 1965) and populations in Tennessee constituting a small portion of the overall population (Kunz and Reichard 2010), the decline of *M. lucifugus* within the state resemble those modeled by Frick et al. (2010), in which a 99% chance of regional extinction of the species was possible. Conservation and recovery efforts for *M. lucifugus* will prove both challenging and difficult given the declines observed in Tennessee.

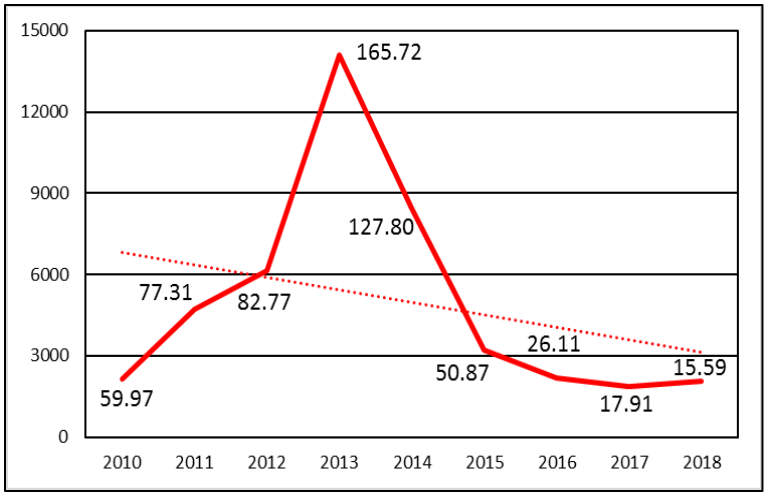
Myotis septentrionalis

Historically, observations of *M. septentrionalis* have been low as it was recorded anecdotally while conducting surveys for species with more significant designations. During 2009-2010, surveyors collected data with increased emphasis on this species. *M. septentrionalis* displays roost preferences similar to those of *E. fuscus* and *M. leibii*, roosting in cracks and crevices of the cave substrate likely leading to it being under surveyed across all years. Since 2012, winter populations of *M. septentrionalis* have declined precipitously; only 2 individuals were observed in 2018 (Table 1). Although the lack of observations can be attributed to roosting preferences of the species, such a drastic decline in the number of observations across multiple winters indicates WNS is having detrimental impacts to *M. septentrionalis*. Given the decrease in observations and known WNS impacts, there is high cause of concern for this species in the state.

Perimyotis subflavus

P. subflavus was one of the most commonly encountered solitary roosters within caves during the winter, being observed in 80% or more caves surveyed annually. Sadly, this is species is no longer observed at historic densities and its numbers at sites have declined significantly over the past three years. As with other species, numbers peaked in 2013, but have declined at an alarming rate since. Observations increased 9.4% from 1,881 (2016-2017) to 2,058 (2017-2018). Despite this increase in observations, the number of *P. subflavus* observed during each cave survey has declined significantly since the 2009-2010 monitoring period. During 2009-2010, the average number of *P. subflavus* observed per cave survey was 59.97, however, the average number of individuals observed during 2017-2018 cave surveys was 15.59.

Figure 5. Annual total observations statewide of *P. subflavus* during annual cave surveys are represented by the line. Annual average individuals observed per cave are indicated along the graph.



WNS Mortality / Bat Population Monitoring

Numerous sites across the state have been visited annually or multiple times since the widespread, multi-species focused survey efforts began in 2009-2010. Table 2 illustrates the observed declines at sites visited a minimum of 4 times between 2009-2010 and 2017-2018. While there were some sites in which increases for *P. subflavus* were observed, observations for this species at the majority of sites are declining, many of which exceed 70%. Although roost switching occurs by bats throughout the winter, it is evident WNS is greatly impacting winter bats in Tennessee, especially *M. lucifugus*, *M. septentrionalis*, and *P. subflavus*. Some bat researchers and biologists believe WNS is causing extirpation of species from sites.

Statistical analysis of the current dataset is difficult for numerous reasons, including differences in observer bias and unequal survey effort between years. Currently, simple statistics are being used to analyze the data until all assumptions associated with more comprehensive analyses can be sufficed. To assess trends in species between years, a simple percent change formula was used to analyze the data. The first observational count for any site is considered the base count to which other observations will be compared. The following formula was used to assess the percent change between the first observational count for a cave or species and the 2017-2018 count.

$$PC = \frac{(y2 - y1)}{y1} * 100$$

y1 = observational count for the first year a count was obtained

y2 = the observational count for 2018

Overall percent change for species statewide are indicated in Table 1. Observations of *P. subflavus* are declining at the majority of sites throughout the state and these declines are significant given many now exceed 90% (Table 2). Sadly, the decline in observations for *M. septentrionalis* has now reached 100% for many sites. Declines observed at sites for some species can be attributed to bat behavior and movement of species between sites throughout the winter. While observations at some sites may appear to be declining, increases in observations are being made at sites within reasonable distances bats may be expected to move during the winter. Positive percent changes are being observed for some species in the state. *C. rafinesquii* and *E. fuscus* are trending upward at the majority of sites. *M. grisescens* observations during priority count years are also trending upward (Campbell 2017).

Table 2. The percent change in observations of 4 species of bats in Tennessee. Percentages in red indicate declines at sites between 2009-2010 and 2017-2018.

	CORA	EPFU	MYSE	PESU
Aunt Beck Simmons Cave	-	100.00%	**-100.00%**	**-34.43%**
Blythe Ferry Cave	-	-	-	**-78.95%**
Bridgewater Cave	-	+	-	**-31.25%**
Camps Gulf Cave	**-18.18%**	0.00%	**-100.00%**	**-90.83%**
Carlton Cave	-	-	-	**-86.50%**
Cooper Creek Cave	-	**-35.29%**	**-100.00%**	**-98.17%**
Coriolis Cave	20.00%	-	**-100.00%**	**-26.92%**
Eve's Cave	-	**-50.00%**	-	**-75.86%**
Foxhole Cave	150.00%	+	-	**-93.55%**
Great Big Bottom Cave	-	-	-	**-92.21%**
Grindstaff Cave	-	50.00%	-	**-96.43%**
Indian Cave	-	**-63.64%**	-	**-55.88%**
Keith Cave	-	-	-	**-95.55%**
Little Bat Cave	12.50%	-	-	-
Marble Bluff Cave	-	-	-	**-76.09%**
Mason Cave	-	**-83.33%**	-	**-95.60%**
Measles Gulf Cave	17.74%	33.33%	-	**-66.67%**
Norris Dam Cave	-	+	-	**-7.14%**
North Spivey Cave	-	0.00%	-	**-77.22%**
Oaks Cave	-	0.00%	-	**-63.33%**
Springhill Cave	-	**-47.06%**	-	**-97.44%**
Whiteside Cave	-	+	-	**-87.48%**
Worley's Cave	-	+	-100.00%	**-88.09%**

+ - Indicates increases in observations from 0 observations during the initial survey.

The percent in change obtained for the above species illustrates the overall decline on observation for these species, but does not illustrate any rate of annual change. To assess the annual rate of decline or increase for all species of bats in the state, the following formula was used to determine the compound periodical growth rate (CPGR) (Sivaprasad 2012):

$$CPGR = \left(\left(\left(\frac{c2}{c1}\right)^{\frac{1}{(n-1)}}\right) - 1\right) * 100$$

c1 = total observations in year 1

c2 = total observations in year 9

n = total number of annual surveys

Table 3 indicates the annual rate of growth or CPGR for the majority of species in Tennessee. Analyses were not performed for *Lasionycteris noctivagans*, *M. leibii*, and *M. austroriparius* because the number of observations for these species is extremely low and were made too infrequently to determine and rates of annual change. The average annual decline for *M. septentrionalis* between 2010 and 2018 exceeds 46% , 42% for *M. sodalis*, and 39% for *M. lucifugus*. Fortunately, similar annual rates of decline have not be observed for all species of bat in the state. Winter observations of *C. rafinesquii*, *E. fuscus*, and *M. grisescens* indicate a small, but positive, periodic growth rate.

Table 3. The average annual percent change for several species of bats in Tennessee between 2010 and 2018. †Percent annual change for *M. grisescens*, *M. lucifugus*, and *M. sodalis* were determined using priority year counts conducted between 2011 and 2017.

	Total Observations		
	2010 (*y1*) *c* 1	**2018** (*y2*) *c* 2	**Pecent of Annual Change**
CORA	313	769	11.89%
EPFU	28	193	27.29%
MYGR†	873,431	1,181,816	10.60%
MYLU†	4,767	1,071	**-39.09%**
MYSE	292	2	**-46.36%**
MYSO†	12,706	2,396	**-42.66%**
PESU	2,159	2,058	**-0.59%**

Conclusions

With each year of survey effort, the impact of WNS to winter bats in Tennessee becomes clearer. During the past three years, large declines of *M. lucifugus*, *M. septentrionalis*, and *P. subflavus* have been made, and these declines are even more apparent when assessing WNS impacts at individual winter sites. Unfortunately, the declines are magnified by the increased effort it now takes researchers, biologists and consultants to captures these species on the landscape during summer months. Despite the widespread declines being observed at many winter sites, there are winter bat populations stable or trending upward at some sites. Biologists are cautiously optimistic populations at these sites will maintain as such given similar increases have been observed at sites prior to declines.

Recovery of banded bats took place as biologists made observations during winter surveys and were able to retrieve the bats safely and with minimal disturbance. Biologists recovered 9 bands off live bats during the 2017-2018 winter survey period from five species of bat, *C. rafinesquii*, *M. grisescens*, *M. lucifugus*, *M. sodalis*, and *P. subflavus*. Original banding data for the bands recovered from *C. rafinesquii* was unavailable at the time of this report. The average years from the year a band was placed to the time of recovery was greatest for *M. lucifugus*, 3.0 years (n = 1) followed by *M. grisescens* 0.5 years (n = 1), *M. sodalis* 0.5 years (n = 1), and *P. subflavus* 2.0 years (n = 4). These band recoveries indicate some bats have the ability to survive multiple years despite the presence of WNS. Banding bats also allows biologists to connect summer roosts to winter roosts or indicate movement of bats between roosts during any season. A previously unknown winter roost was identified for *M. lucifugus* in Franklin County during this winter survey period as this particular bat was banded at a known summer site in the same county 3 years prior to its recovery. The summer roost is approximately 9.1 miles NW of the recently identified winter roost.

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Appendix A

- A list of all WNS confirmed, suspect, or negative counties in Tennessee based on diagnostic reports.

[1]Tapelift sample taken and the bat was not euthanized; [2]Bat submitted was found dead at site; [C]WNS confirmed; [S]WNS suspect; [N]WNS Negative [SW]Only a swab sample was taken from the bat tested and was not euthanized; [N/A]Report not available.

Cave Name or Structure	County	Year	WNS Status	Species	Diagnostic Report Number
Camps Gulf Cave	Van Buren	2010	Suspect	PESU[S], MYSO[1,N]	NWHC-22984
Dunbar Cave	Montgomery	2010	Suspect	MYSE[S]	NWHC Event 15950
East Fork SLP Cave	Fentress	2010	Suspect	MYLU, MYSE[S]	NWHC Event 15979
Grindstaff Cave	Carter	2010	Confirmed	MYSE[C], PESU[C]	NWHC
Hubbards Cave	Warren	2010	Negative	MYGR[N]	NWHC
White Oak Blowhole	Blount	2010	Suspect	N/A	N/A
Worleys Cave	Sullivan	2010	Confirmed	MYSE, PESU	NWHC Event 15948
Bellamy Cave	Montgomery	2011	Negative	MYGR[N]	NWHC-23532
Camps Gulf Cave	Van Buren	2011	Suspect	PESU[S]	NWHC-23481
Cooper Creek Cave	Montgomery	2011	Confirmed	MYLU[C], MYSE[C], PESU[C]	NWHC-23444
East Fork SLP Cave	Fentress	2011	Suspect	MYLU[S]	NWHC-23482
Under a House	Polk	2011	Negative	MYGR[2]	SCWDS CC11-188
White Oak Blowhole	Blount	2011	Suspect	MYLU[N]	NWHC-23466
Austin Peay State University	Montgomery	2012	Suspect	MYLU[S]	SCWDS CC12-235
Bellamy Cave	Montgomery	2012	Confirmed	MYGR, PESU[C]	SCWDS WNS12-54, WNS12-55
Bull Cave	Blount	2012	Negative	PESU[N]	SCWDS WNS12-50
Camps Gulf Cave	Van Buren	2012	Confirmed	N/A	N/A
Cantwell Valley Cave	Hancock	2012	Confirmed	N/A	N/A

[1]Tapelift sample taken and the bat was not euthanized; [2]Bat submitted was found dead at site; [C]WNS confirmed; [S]WNS suspect; [N]WNS Negative [SW]Only a swab sample was taken from the bat tested and was not euthanized; [N/A]Report not available.

Cave Name or Structure	County	Year	WNS Status	Species	Diagnostic Report Number
Carlton Cave	Franklin	2012	Confirmed	PESU[C]	SCWDS WNS12-56
Fort Campbell Nerd Hole	Stewart	2012	Confirmed	PESU[C]	NWHC-23846
Grassy Cove SLP Cave	Cumberland	2012	Confirmed	MYLU[C]	SCWDS WNS12-064 A-B
Gregory Cave	Blount	2012	Negative	PESU[N]	SCWDS WNS12-50
Hubbards Cave	Warren	2012	Negative	MYGR[N]	SCWDS WNS12-067
Hurricane Creek Cave	Humphreys	2012	Negative	PESU[N], MYSO[N]	NWHC-23848
Lookout Mtn. Battlefield Pit #1	Hamilton	2012	Confirmed	PESU[C]	SCWDS WNS12-86
Lost Creek Cave	White	2012	Negative	MYGR[N,SW], MYLU[N, SW], PESU[N,SW]	SCWDS WNS12-41, WNS12-42, WNS12-43
New Mammoth Cave	Campbell	2012	Negative	MYLU[N]	SCWDS WNS12-068
Pearsons Cave	Hawkins	2012	Confirmed	MYGR[C]	SCWDS WNS12-70
Rainbow Cave	Blount	2012	Negative	PESU[N]	SCWDS WNS12-50
Upstream Cave	Hancock	2012	Confirmed	PESU[C]	SCWDS WNS12-072
White Oak Blowhole	Blount	2012	Confirmed	MYLU[C], PESU[C]	SCWDS WNS12-061, WNS12-062
Afton Cave	Greene	2013	Confirmed	PESU[C]	SCWDS WNS13-72 A-C
Big Mouth Cave	Grundy	2013	Confirmed	MYLU[C]	SCWDS WNS13-56

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[SW]Only a swab sample was taken from the bat tested and was not euthanized; [N/A]Report not available.

Cave Name or Structure	County	Year	WNS Status	Species	Diagnostic Report Number
Blowing Cave	Hickman	2013	Confirmed	MYLU[C], MYSE[C], PESU[C]	SCWDS WNS13-38, WNS13-39, WNS13-40
Buggytop Cave	Franklin	2013	Confirmed	PESU[C]	SCWDS WNS13-103
Buis SLP Cave	Claiborne	2013	Confirmed	MYLU[C]	SCWDS WNS13-74 A-B
Cornstarch Cave	Fentress	2013	Confirmed	MYLU[C], PESU[C]	SCWDS WNS13-10, WNS13-11
Depriest Branch Cave	Lewis	2013	Confirmed	MYLU[C], MYSE[C], PESU[C]	SCWDS WNS13-46, WNS13-47, WNS48
Dunbar Cave	Montgomery	2013	Confirmed	PESU[C]	SCWDS WNS13-98, WNS13-101
East Fork SLP Cave	Fentress	2013	Confirmed	MYLU[C]	SCWDS WNS13-12
Espey Cave	Cannon	2013	Confirmed	PESU[C]	SCWDS WNS13-95
Eve's cave	Meigs	2013	Confirmed	PESU[C]	SCWDS WNS13-76
Gunter's Cave	Cannon	2013	Negative	PESU[N]	SCWDS WNS13-91
Herd O' Coons Cave	Union	2013	Confirmed	MYLU[C], PESU[C]	SCWDS WNS13-70 A-B, WNS13-71
Hubbards Cave	Warren	2013	Confirmed	PESU[C]	SCWDS WNS13-13
Hunt Cave	Dickson	2013	Confirmed	PESU[C]	SCWDS WNS13-49 A-C
Jaybird Cave	Perry	2013	Confirmed	MYLU[C]	SCWDS WNS13-44
Knob Creek Cave	Lawrence	2013	Confirmed	PESU[C]	SCWDS WNS13-54

[1]Tapelift sample taken and the bat was not euthanized; [2]Bat submitted was found dead at site; [C]WNS confirmed; [S]WNS suspect; [N]WNS Negative [SW]Only a swab sample was taken from the bat tested and was not euthanized; [N/A]Report not available.

Cave Name or Structure	County	Year	WNS Status	Species	Diagnostic Report Number
Lost Creek Cave	White	2013	Confirmed	PESU[C]	SCWDS WNS13-53 A-B
New Mammoth Cave	Campbell	2013	Confirmed	MYSE[C], MYLU[C]	SCWDS WNS13-25 A-B, WNS13-26
North Spivey Cave	Jackson	2013	Confirmed	MYLU[C]	SCWDS WNS13-94
Private Residence	Sequatchie	2013	Confirmed	PESU[C]	SCWDS WNS13-99
Pearsons Cave	Hawkins	2013	Confirmed	MYGR[2,N]	SCWDS WNS13-45
Richardson Cave	Houston	2013	Confirmed	MYLU[C]	SCWDS WNS13-02
Rose Cave	White	2013	Suspect	MYLU[S]	SCWDS WNS13-14
Sour Kraut Cave	Claiborne	2013	Confirmed	PESU[C]	SCWDS WNS13-75
Three Forks Cave	Overton	2013	Confirmed	PESU[C]	SCWDS WNS13-90
Trussell Cave	Grundy	2013	Confirmed	PESU[C]	SCWDS WNS13-55 A-C
Trussell Downstream Cave	Grundy	2013	Confirmed	PESU[C]	SCWDS WNS13-55 A-C
Virgin Falls Cave	White	2013	Confirmed	PESU[C]	SCWDS WNS13-50
Welch-Blowing Cave	Putnam	2013	Confirmed	PESU[C]	SCWDS WNS13-64
Whiteside Cave	Marion	2013	Confirmed	PESU[C]	SCWDS WNS13-63
Wolf River Cave	Fentress	2013	Confirmed	MYLU[C]	SCWDS WNS13-9
Zarathustrus Cave	Fentress	2013	Confirmed	PESU[C]	SCWDS WNS13-27
Aunt Beck Simmons Cave	Macon	2014	Confirmed	N/A	N/A
Biffle Cave	Wayne	2014	Confirmed	PESU[C]	SCWDS WNS14-10 A-C

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Cave Name or Structure	County	Year	WNS Status	Species	Diagnostic Report Number
Big Jordan Cave	Pickett	2014	Confirmed	PESU[C], MYLU[C]	SCWDS WNS14-32, WNS14-33
Bridgewater Cave	Smith	2014	Confirmed	PESU[C]	SCWDS WNS14-20 A-B
Cave Creek Cave	Roane	2014	Confirmed	PESU[C]	SCWDS WNS14-31 A-B
Corner Store Cave	Hamblen	2014	Confirmed	PESU[C], MYLU[C]	SCWDS WNS14-29, WNS 14-30
Cripps Mill Cave	Dekalb	2014	Confirmed	PESU[C]	SCWDS WNS14-9
Dunbar Cave area	Montgomery	2014	Confirmed	PESU[C]	SCWDS WNS14-13, WNS14-14, WNS14-16, WNS14-16
Gee Cave	Polk	2014	Confirmed	PESU[C]	SCWDS WNS14-53
Hubbards Cave	Warren	2014	Confirmed	MYGR[2,N]	SCWDS WNS14-7
Hurricane Creek Cave	Humphreys	2014	Confirmed	PESU[C]	SCWDS WNS14-12
Indian Cave	Grainger	2014	Confirmed	PESU[C]	SCWDS WNS14-128, WNS14-129
Leonard Cave	Clay	2014	Confirmed	PESU[C]	SCWDS WNS14-130, WNS14-131, WNS14-132
Mason Cave	Sumner	2014	Suspect	PESU[S]	SCWDS WNS14-52 A-B
Rummage Cave	Maury	2014	Confirmed	PESU[C]	SCWDS WNS14-11 A-C
Springhill SLP Cave	Anderson	2014	Confirmed	MYLU[C]	SCWDS WNS14-8 A
Ward Cave	Bedford	2014	Confirmed	PESU[C]	SCWDS WNS14-51 A-C

[1]Tapelift sample taken and the bat was not euthanized; [2]Bat submitted was found dead at site; [C]WNS confirmed; [S]WNS suspect; [N]WNS Negative [SW]Only a swab sample was taken from the bat tested and was not euthanized; [N/A]Report not available.

Cave Name	County	Year	WNS Status	Species	Diagnostic Report Number
Crumpton Creek SLP Cave	Coffee	2015	Confirmed	PESU[C]	SCWDS CC15-124
Hardin's Junkyard Cave	Davidson	2015	Suspect	MYLU[S]	Field Signs Observed, UV positive, Photos Taken
Magnussen Cave	Giles	2015	Confirmed	PESU[C]	SCWDS CC15-26
Mason Cave	Sumner	2015	Suspect	N/A	Field Signs Observed, UV positive
Petty Cave	Marshall	2015	Confirmed	PESU[C]	SCWDS CC15-123 A-C
Silvertooth Cave	Moore	2015	Suspect	PESU[N]	SCWDS CC15-125
Stark Cave	Robertson	2015	Confirmed	PESU[C]	SCWDS CC15-127
Civil War Bunker	Tipton	2016	Negative	EPFU[N], PESU[N]	SCWDS 16-92 A-B
Ball Play Cave	Monroe	2017	Suspect	PESU[SW]	CCB137
Blackmans Cave	Knox	2017	Suspect	PESU[SW]	CCB332

Appendix B

- 2017-2018 Winter Survey Results

County	Survey Date	Cave Name	CORA	EPFU	LANO	MYAU	MYGR	MYLE	MYLU	MYSE	MYSO	Mysp	PESU	Total Bats	Surveyors
Anderson	02/08/18	Springhill Slp Cave		9					5				1	15	TNC
Bedford	01/22/18	Ward Cave		8									28	36	TNC, TWRA
Blount	2/6/2018	Bull Cave		3							36		6	45	NPS, USGS
Blount	2/6/2018	Rich Mountain Blowhole											1	1	NPS, USGS
Blount	2/5/2018	Snakedance											12	12	NPS, USGS
Campbell	1/30/2018	Norris Dam Cave		7									39	0	TVA, TWRA
Cannon	1/26/2018	Cane Sink Cave											8	8	TWRA
Cannon	1/26/2018	Waterweb Cave											-	0	TWRA
Carter	1/12/2018	Grindstaff Cave		12									2	14	TWRA, UTK
Carter	1/12/2018	Sculpture Cave		3									11	14	TWRA, UTK
Claiborne	02/27/18	English Cave											21	21	TNC
Clay	01/31/18	Leonard Cave	5										14	19	TWRA, TNC
Clay	03/16/18	Markham Cave											2	2	TNC
Cocke	3/15/2018	Myers Mine w/ gate											8	8	TWRA, TTU
Cocke	3/8/2018	Williams Mine		8									35	43	TWRA, TTU
Cocke	3/15/2018	Myers Mine w/ cart		3									6	9	TWRA, TTU
Coffee	3/13/2018	Carrol Cave											12	12	TWRA, TVA
Dekalb	02/01/18	Indian Grave Point Cave		1									31	32	TWRA, TNC
Dekalb	02/01/18	Turner Cave											7	7	TWRA, TNC
Dekalb	12/28/2017	Winter Cave		4										4	TWRA
Fentress	01/30/18	Buffalo Cave	1						1		4		43	49	TWRA, TNC
Fentress	01/10/18	Coriolis Cave	12										19	31	TWRA, TNC
Fentress	01/30/18	Fern Camp Cave									1		43	44	TWRA, TNC
Fentress	01/10/18	Frank's Flume Cave											18	18	TWRA, TNC
Fentress	01/05/18	Pygmalion Cave	1						64				30	95	TWRA, TNC
Fentress	1/11/2018	Redbud Dome Cave												0	TWRA, TNC
Fentress	01/11/18	Redbud Sink Cave												0	TWRA, TNC
Fentress	01/11/18	Scooped Day Cave												0	TWRA, TNC

County	Survey Date	Cave Name	CORA	EPFU	LANO	MYAU	MYGR	MYLE	MYLU	MYSE	MYSO	Mysp	PESU	Total Bats	Surveyors
Fentress	01/30/18	Shane Cave											9	9	TWRA, TNC
Fentress	01/11/18	Stinging Nettle Cave							2				8	10	TWRA, TNC
Fentress	01/11/18	Redbud Dome Cave												0	TNC, TWRA
Franklin	3/14/2018	Carlton Cave											54	54	TWRA, TTU
Franklin	3/20/2018	Fort Peebles Cave											23	23	TWRA
Franklin	1/9/2018	Keith Cliff Cave											2	2	TWRA, UTK
Franklin	3/13/2018	Lost Cove Blowhole											1	1	AAFB, UoS
Franklin	2/20/2018	Lost Cove Cave											150	150	TWRA, UoS, TDEC
Franklin	3/13/2018	Turtle Shell Cave							2				14	16	AAFB, UoS
Franklin	1/13/2018	Wet Cave		2									126	128	TNC, TWRA, AAFB, UoS
Franklin	3/13/2018	Wisteria Cave	1										1	2	AAFB, UoS
Franklin	1/15/2018	Floorless Hole											12	12	TWRA, UTK
Franklin	3/19/2018	Fort Peebles Cave											23	23	TWRA
Franklin	1/9/2018	Keith Cove Cave											19	19	TWRA, UTK
Franklin	1/15/2018	Roberson Cave											6	6	TWRA, UTK
Franklin	1/15/2018	Roberson Cove Cave											1	1	TWRA, UTK
Franklin	1/15/2018	Robinson's Fool Day Cave											4	4	TWRA, UTK
Franklin	1/15/2018	Witherspoon Cave											1	1	TWRA, UTK
Grainger	2/9/2018	Indian Cave		8									30	38	TWRA
Grainger	3/15/2018	Neoton #2											6	6	TVA
Grainger	3/15/2018	Neoton #3											2	2	TVA
Greene	02/06/18	Afton Cave		4									11	15	TNC
Greene	02/06/18	Double Mouth Cave		4									1	5	TNC
Greene	02/06/18	Poplar Cave		16			1						24	41	TNC
Grundy	1/13/2018	Big Mouth Cave											p		TNC, TWRA
Grundy	02/13/18	Big Room Cave											31	31	TNC
Hamblen	3/13/2018	Cave on Cherokee Reservoir					11						4	1	TVA, TWRA
Hamilton	2/27/2018	Pan Gap Cave					4						49	53	TWRA, TNC

County	Survey Date	Cave Name	CORA	EPFU	LANO	MYAU	MYGR	MYLE	MYLU	MYSE	MYSO	Mysp	PESU	Total Bats	Surveyors
Hancock	1/16/2018	Dingling Hole	15	1									6	22	TWRA
Hickman	01/23/18	Blowing Cave		4			2		3		8		12	29	TNC, TWRA
Jackson	03/16/18	Dud's Cave											4	4	TNC
Jackson	03/16/18	Haile Cave		4			5						5	14	TNC
Jackson	01/17/18	North Spivey Cave		6				1		1			18	26	TWRA, TNC
Knox	1/4/2018	Blackmans Cave											22	22	TWRA
Lawrence	01/24/18	Knob Creek Cave		8									34	42	TNC, TWRA
Lewis	01/24/18	Unnamed Phosphate Mine											5	5	TNC
Loudon	3/7/2018	Ghost Cave										2	27	29	TVA
Macon	01/19/18	Aunt Beck Simmons Cave		8									40	48	TNC
Marion	2/15/2018	Hole in Wall										1	8	9	TVA
Marion	2/14/2018	Hugden Branch Cave											48	48	TWRA
Marion	2/15/2018	Little Cedar Mtn. Cave											3	3	TVA
Marion	02/27/18	Whiteside Cave		2									67	67	TWRA, TNC
Maury	02/15/18	Cheek's Bend Cave #1											9	9	TNC, TWRA, OSU
Maury	02/15/18	Cheek's Bend Cave #2												0	TNC, TWRA, OSU
Maury	02/15/18	Cheek's Bend Cave #3												0	TNC, TWRA, OSU
Maury	02/15/18	Pompie Cave											26	26	TNC, TWRA, OSU
Maury	3/12/2018	Rummage Cave										2	5	7	TWRA, OSU
Meigs	1/26/2018	Blythe Ferry Cave											4	4	TVA
Meigs	1/31/2018	Eves Cave		1			1						28	30	TVA
Montgomery	01/25/18	Cooper Creek Cave		11					2				4	17	TNC, TDEC, TWRA
Overton	2/22/2018	Hilham Pit													TWRA
Overton	2/22/2018	Wheat Hole													TWRA
Pickett	01/31/18	Bunkum Cave		6				1					73	80	TWRA, TNC
Polk	2/6/2018	Gee Cave											17	17	TWRA, USFWS
Putnam	3/8/2018	Ament Cave					22					1	16	39	TWRA
Putnam	01/29/18	Calfkiller Slp. Cave	1		1				1				6	9	TNC
Putnam	01/03/18	Johnson Cave	105	1									22	128	TWRA, TNC

County	Survey Date	Cave Name	CORA	EPFU	LANO	MYAU	MYGR	MYLE	MYLU	MYSE	MYSO	Mysp	PESU	Total Bats	Surveyors
Roane	2/27/2018	Marble Bluff Cave											22	22	TVA
Robertson	3/14/2018	Whiskey River		2			14		3				24	43	TWRA, TNC
Rutherford	01/22/18	Herring Cave											55	55	TNC, TWRA
Smith	01/18/18	Bridgewater Cave		2					10				11	23	TNC, TWRA
Sullivan	1/12/2018	Worleys Cave		4			2		2				5	13	TWRA, UTK
Sumner	01/18/18	Mason Cave		1									8	9	TNC, TWRA
Union	1/5/2018	Herd O Coons Cave		1									8	9	TWRA, UTK
Union	1/5/2018	Oaks Cave (Jenny Oaks Cave)		1			1						22	24	TWRA, UTK
Union	3/14/2018	Wright Cave											13	13	TWRA, UTK
Van Buren	1/4/2018	Big Bone Cave	53	12									8	73	TWRA, TNC
Van Buren	2/21/2018	Birthday Blowhole													TWRA
Van Buren	2/13/2018	C Between the Caves											15	15	TWRA
Van Buren	2/7/2018	Camps Gulf Cave	9	3				1			12		21	46	TWRA
Van Buren	2/13/2018	Cane Creek SLP Cave	6	1						1			20	28	TWRA
Van Buren	12/28/2017	Case Brothers Cave												0	TWRA
Van Buren	2/21/2018	Cueva Guapa Delnorte											25	25	TWRA
Van Buren	2/8/2018	Foxhole Cave	5	1					6			1	6	19	TWRA, USFWS
Van Buren	1/15/2018	Gastens Moonshine Cave											2	2	TWRA
Van Buren	01/08/18	Measles Gulf Cave	179	4									4	187	TWRA, TNC
Van Buren	12/28/2017	Palliser Cave											3	3	TWRA
Van Buren	12/28/2017	Phineas Finn Cave											2	2	TWRA
Van Buren	2/9/2018	Run to Big Sink Cave	1										5	6	TWRA
Van Buren	2/13/2018	Sandstone Cave											4	4	TWRA
Van Buren	1/4/2018	White's Tater Cave											1	1	TWRA, TNC
Van Buren	2/21/2018	Wonderful Window Cave											10	10	TWRA
VanBuren	01/04/18	Big Bone Cave	62	12									8	82	TNC, TWRA
VanBuren	01/04/18	White's Chimney Cave												0	TNC
VanBuren	01/04/18	White's Tater Cave											1	1	TNC, TWRA

County	Survey Date	Cave Name	CORA	EPFU	LANO	MYAU	MYGR	MYLE	MYLU	MYSE	MYSO	Mysp	PESU	Total Bats	Surveyors
Warren	01/08/18	Hazel Ward											17	17	TWRA, TNC
Warren	01/08/18	Jaco Spring Cave		2			3				1		64	70	TWRA, TNC
Warren	01/09/18	Knowles Ridge Cave											20	20	TWRA, TNC
Warren	01/09/18	Little Bat Cave	72											72	TWRA, TNC
Washington	2/13/2018	Bumpus Cove Mine #1											7	7	TWRA
Washington	2/13/2018	Bumpus Cove Mine #2												0	TWRA
Washington	2/13/2018	Bumpus Cove Mine #3											7	7	TWRA
White	1/25/2018	Beckoning Well											2	2	TWRA
White	1/29/2018	Calfkiller SLP Cave	1		1				1				6	9	TWRA, TNC
White	2/12/2018	Davis Cemetary Cave											1	1	TWRA
White	1/19/2018	El Abismo	209	1				2	1		2		15	230	TWRA
White	3/7/2018	Great Big Bottom Cave											19	19	TWRA
White	01/04/18	Indian Cave											19	19	TWRA, TNC
White	2/16/2018	Lockwood Cave											18	18	TWRA
White	2/9/2018	Mill Hole Bat Cave		1									1	2	TWRA
White	1/23/2018	Mill Hole Cave		1			1						32	34	TWRA
White	1/25/2018	Psycho Booger Drop											-	0	TWRA
White	2/19/2018	Red Forest Cave											8	8	TWRA
White	2/13/2018	Top of Davis Cave	31										1	32	TWRA