

# 2013 Tennessee Bat Population Monitoring and White Nose Syndrome Surveillance



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Little brown bats with potential white nose syndrome, New Mammoth Cave, Campbell County, TN, Cory Holiday (TNC)

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### **Landowners**

We thank the many landowners who gave access to their property to conduct surveys of caves in order to better understand bat population distribution and effects of white-nose syndrome on bats.

## **Executive Summary:**

White nose syndrome (WNS) continued to spread across Tennessee. The number of confirmed counties jumped from a total of 11 in 2012 to a total of 31 by the end of the 2013 surveillance period. Of 46 counties surveyed in 2013, 19 counties did not show any signs of WNS. A total of 85 caves were surveyed during 2012-2013 survey period.

The 2013 hibernacula survey period was also an Indiana bat and gray bat hibernacula survey year. Indiana bat numbers appear to be increasing. Gray bat numbers had an overall increase since 2002, but have declined slightly from the high in 2006.

Unfortunately numbers pre-2010 for many bat species, such as little brown, tri-colored, northern long-eared, big brown, and eastern small-footed are sporadic at best. Using caves surveyed in 2011 and again in 2013, survey numbers for tri-colored and northern long-eared bats appear to be up. Little brown bats showed a slight decline but it does not appear to be significant. We assume with the discovery of WNS in Tennessee in 2010 that any hibernacula data post 2009 potentially is being influenced by WNS. This makes it hard to say whether the change in numbers are actual population change, a result of WNS causing bats to shift location within caves or between caves, or just normal geographic shifts in bats. The number of big brown and eastern small-footed observed during hibernacula counts are so small and sporadic that it is impossible to even begin to assess their wintering status in Tennessee.

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## Introduction

Very limited information is available on bat hibernacula and population trends in Tennessee. Only Indiana bat (*Myotis sodalis*) and gray bat (*Myotis grisescens*) hibernacula have been surveyed with any relatively regular frequency. Little brown bat (*Myotis lucifugus*), northern long-eared (*Myotis septentrionalis*), eastern small-footed (*Myotis leibii*), big brown (*Eptesicus fuscus*), tri-colored (*Perimyotis subflavus*), Rafinesque's big-eared bat (*Corynorhinus rafinesquii*) numbers are sporadic at best. After the discovery of white nose syndrome (WNS) caused by *Pseudogymnoascus destructans* (*P. destructans*) (formerly *Geomyces destructans*) in New York, TWRA and partnering Agencies began an extraordinary task to survey caves in Tennessee for hibernating bats. With close to 10,000 caves identified in the state that task has been difficult. Although there are a large number of caves in the state only a small percentage are likely to contain any significant numbers of hibernating bats. Since 2010 TWRA and partnering agencies (see acknowledgements page for list) have worked to survey new caves with potential hibernating bats, monitor known bat hibernacula populations, and look for signs of WNS.

## Methods

Hibernacula were surveyed between December 15<sup>th</sup> and April 1<sup>st</sup>. Typically teams of 2 to 4 biologists conducted surveys of caves that were either known to have bats or based on available information may have contained enough bats to justify surveying.

WNS surveillance followed a tiered approach designed to detect possible WNS infection and to minimize disturbance during surveys.

- Tier 1 surveys: a full hibernaculum count, examination of all accessible bats for signs of WNS, and band placement and/or recovery (where appropriate).
- Tier 2 surveys: a quick population estimate, examination of all accessible bats for signs of WNS, and band recovery (where appropriate).
- Tier 3 surveys: observations made outside of cave entrances to check for unusual winter bat behavior (e.g. daytime activity at the cave entrance).

## WNS Status Terms:

**Field Signs:** A site listed as showing field signs means that at least one bat was observed at the site with what appeared to be a white fungus. The observation may or may not be *Pseudogymnoascus destructans* (*P.d.*) but another fungus or yeast. When a site is listed as having field signs an observation is made, but samples were not available to be sent off for testing. Field sign positive is also used when a county is already positive and submitting additional samples is not warranted.

**Suspect:** In order for a site to be listed as suspect a swab from a bat or other surface is submitted and *P. destructans* spores or genetic material is detected on the swab.

**Confirmed:** In order for a site to be confirmed WNS positive a carcass or tissue sample of a bat must be submitted to a disease testing lab. Histopathology identifies that *P. destructans* hyphae have penetrated cell walls of the bat tissue. PCR is used to confirm identity of the fungus.

## Results

A total of 46 counties with hibernacula were surveyed in 2012-2013 with the number of counties confirmed as WNS jumping to 31 (Figure 1 page7). Surveys were conducted for the biannual Indiana bat hibernacula and gray bat priority 1 hibernacula surveys in 2013. Indiana bat numbers show a 20.6% increase (Figure 2). Gray bats showed a 4% decline from 2010. (Figures 3). With the discovery of WNS, hibernacula surveys now include species of bats other than federally listed species. Three additional species tri-colored, little brown, and northern long-eared bat had enough caves surveyed over multiple years to begin examining early trends. There was a 27.9% decline in little brown bats, 61.6% increase in tri-colored bats, and a 95.7% increase in northern long-eared bats (Figure 4).

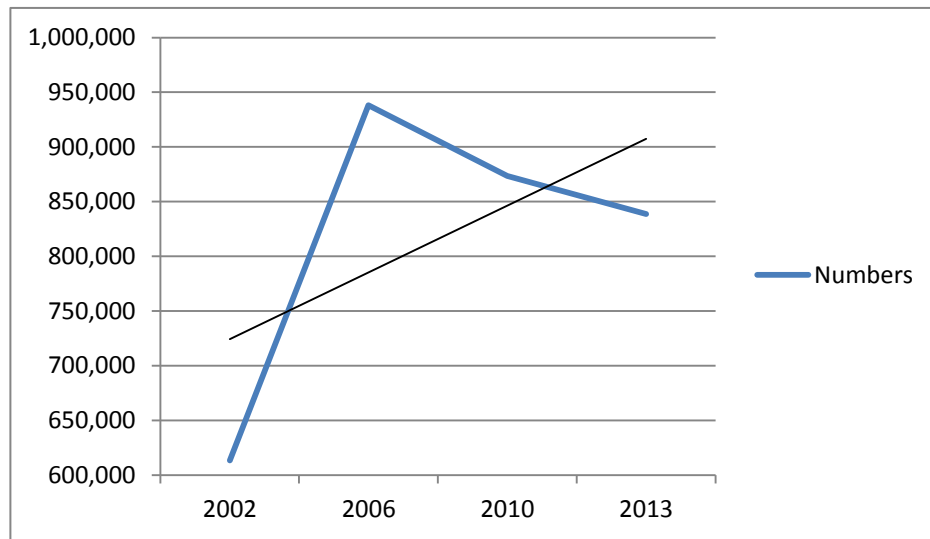


Figure 2. Gray bat hibernacula surveys from 3 priority 1 caves in Tennessee with a positive trend line (2002 to 2013).



Figure 3. Indiana bat count from known hibernacula with positive trend line (2001 to 2013). 2013 data corrected using U.S. Fish and Wildlife Service estimates.







Figure 4. Comparison between 2011 and 2013 bat hibernacula surveys for tri-colored (34 caves), little brown (24 caves), and northern long-eared bat (17 caves). Some caves were not surveyed in 2011 in those cases data is from 2012.

**White Nose Syndrome Cave Status and Observed Mortalities**

White nose syndrome was confirmed in 2 caves and suspect in 1 in 2010. One cave was confirmed in 2011 and 9 caves were confirmed in 2012 with 2 of those moving from suspect in 2011 to confirmed in 2012. A total of 29 caves were confirmed and 1 was suspect in 2013 (Table 1). The number of field sign caves has also increased from 1 in 2011 to 6 in 2013 (Table 2). A total of 19 counties that were surveyed in 2013 did not show signs of WNS (Figure 1).

The highest number of observed mortalities was at Camps Gulf cave in Van Buren County, with close to 100 observed dead bats clinging to the walls or found on the ground. Other caves had mortalities of <6 observed. Tri-color bats were the highest proportion of observed mortalities with little brown and northern long-eared bats having the fewest observed mortalities.

Table 1. Caves that have had bats submitted for testing which came back as suspect or confirmed (2010-2013).

| <b>Cave Name</b>                | <b>County</b>    | <b>Year</b>       | <b>WNS Status</b> |
|---------------------------------|------------------|-------------------|-------------------|
| White Oak Blowhole Cave         | Blount           | 2010              | Suspect           |
| Grindstaff Cave                 | Carter           | 2010              | Confirmed         |
| East Fork Saltpeter Cave        | Fentress         | 2010              | Suspect           |
| Dunbar Cave                     | Montgomery       | 2010              | Suspect           |
| Worleys Cave                    | Sullivan         | 2010              | Confirmed         |
| Camps Gulf Cave                 | Van Buren        | 2010              | Suspect           |
| Cooper Creek Cave               | Montgomery       | 2011              | Confirmed         |
| <b>White Oak Blowhole Cave</b>  | <b>Blount</b>    | <b>2011, 2012</b> | <b>Confirmed</b>  |
| Grassy Cove Saltpeter Cave      | Cumberland       | 2012              | Confirmed         |
| Carlton Cave                    | Franklin         | 2012              | Confirmed         |
| Lookout Mt. Battlefield Pit #1  | Hamilton         | 2012              | Confirmed         |
| Cantwell Valley Cave            | Hancock          | 2012              | Confirmed         |
| Pearsons Cave                   | Hawkins          | 2012              | Confirmed         |
| Bellamy Cave                    | Montgomery       | 2012              | Confirmed         |
| Fort Campbell Nerd Hole Cave    | Stewart          | 2012              | Confirmed         |
| <b>Camps Gulf Cave</b>          | <b>Van Buren</b> | <b>2011, 2012</b> | <b>Confirmed</b>  |
| New Mammoth Cave                | Campbell         | 2013              | Confirmed         |
| Espey Cave                      | Cannon           | 2013              | Confirmed         |
| Buis Saltpeter Cave             | Claiborne        | 2013              | Confirmed         |
| Sour Kraut Cave                 | Claiborne        | 2013              | Confirmed         |
| Hunt Cave                       | Dickson          | 2013              | Confirmed         |
| <b>East Fork Saltpeter Cave</b> | <b>Fentress</b>  | <b>2011, 2013</b> | <b>Confirmed</b>  |
| Zarathustrus Cave               | Fentress         | 2013              | Confirmed         |
| Cornstarch Cave                 | Fentress         | 2013              | Confirmed         |
| Wolf River Cave                 | Fentress         | 2013              | Confirmed         |
| Buggytop (Lost Cove Cave)       | Franklin         | 2013              | Confirmed         |
| Afton Cave                      | Greene           | 2013              | Confirmed         |
| Big Mouth Cave                  | Grundy           | 2013              | Confirmed         |
| Trussell Downstream Cave        | Grundy           | 2013              | Confirmed         |
| Trussell Cave                   | Grundy           | 2013              | Confirmed         |
| Blowing Cave                    | Hickman          | 2013              | Confirmed         |
| Richardson Cave                 | Houston          | 2013              | Confirmed         |

Table 1. continued.

| <b>Cave Name</b>     | <b>County</b> | <b>Year</b> | <b>WNS Status</b> |
|----------------------|---------------|-------------|-------------------|
| Knob Creek Cave      | Lawrence      | 2013        | Confirmed         |
| Depriest Branch Cave | Lewis         | 2013        | Confirmed         |
| Whiteside Cave       | Marion        | 2013        | Confirmed         |
| Eve's Cave           | Meigs         | 2013        | Confirmed         |
| Dunbar Cave          | Montgomery    | 2013        | Confirmed         |
| Three Forks Cave     | Overton       | 2013        | Confirmed         |
| Jaybird Cave         | Perry         | 2013        | Confirmed         |
| Welch-Bowling Cave   | Putnam        | 2013        | Confirmed         |
| Herd O' Coons Cave   | Union         | 2013        | Confirmed         |
| Hubbards Cave        | Warren        | 2013        | Confirmed         |
| Virgin Falls Cave    | White         | 2013        | Confirmed         |
| Lost Creek Cave      | White         | 2013        | Confirmed         |
| Rose Cave            | White         | 2013        | Suspect           |

\* Bold text means that the cave initially was suspect, but then was confirmed WNS positive during the year listed in bold.

Table 2. Observations of caves with what appeared to be field signs of WNS and the year of initial observation. No bats were submitted for testing for various reasons.

| <b>Cave Name</b>            | <b>County</b> | <b>Year</b> |
|-----------------------------|---------------|-------------|
| Bellamy Cave                | Montgomery    | 2011        |
| Salt peter Cave             | Blount        | 2012        |
| Coriolis Cave               | Fentress      | 2012        |
| Dragon's Breath Cave        | Fentress      | 2012        |
| Coleman Cave                | Montgomery    | 2012        |
| Tobaccoport Salt peter Cave | Stewart       | 2012        |
| Springhill Salt peter Cave  | Anderson      | 2013        |
| Redbud Cave                 | Fentress      | 2013        |
| Yggdrasil Cave              | Fentress      | 2013        |
| Eblen Cave                  | Roane         | 2013        |
| Rice Cave                   | Van Buren     | 2013        |
| Great Expectations Cave     | White         | 2013        |

## Conclusions

Caution needs to be observed in drawing any major conclusions from changes in bat numbers due to the limited data available pre-WNS (2009). It is still too early to determine the overall effects of WNS on bats in Tennessee. Continued monitoring of hibernacula will be needed to determine if WNS will have a significant impact on bats in Tennessee as it has in the Northeast.

Our bat numbers from 2011 to 2013 show mixed effects some may be the result of variation in weather between count years, some due to WNS, and others to increased survey efforts. For instance Indiana bats increased 20.6% while little browns decreased 27.9%. The little brown numbers may not actually have decreased as much. We observed more gray bats in the little brown and Indiana bat section of Rose cave this year and very few little browns. Gray bats have been known to push out other bat species from section of caves. If we remove Rose Cave from 2011 the decline in little browns was only 9.3%. Due to the shift in gray bats it is possible that little browns at Rose Cave either shifted to a portion of the cave that was not surveyed or to another cave. For instance there was a large number of little browns (>400) found at Fox Hole cave not very far from Rose Cave. The only way to determine if these trends will continue is to continue long term monitoring of bat hibernacula.

Mortalities are occurring in hibernacula. A higher proportion of observed mortalities appear to be tri-colored bats. Both Grindstaff Cave (Carter County) and Worly's Cave (Sullivan county) in 2010 were the first caves in Tennessee confirmed with WNS. These caves have shown decreases in bats. No surveys were conducted at Grindstaff Cave this year. Worly's Cave in 2011 had >90% loss of bats from 2010, but no pre-WNS survey data is available. Worly's Cave did see an increase in gray bats this year compared to previous years, but other bat numbers remained low.

Unlike the drastic loss of bat numbers after the confirmation of WNS at Grindstaff and Worly's, other caves in Tennessee have fared better. Winter activity has been observed with the most drastic observation having occurred this year in the Great Smoky Mountains National Park where hikers and Park staff observed bats flying around during cold days away from White Oak Blowhole and other known hibernacula. These types of activities have been observed in the northeast, but often result in large number of dead bats being found. However no large number of bats were found dead and the number of Indiana bats was higher than in 2011 for White Oak Blowhole Cave. However, little brown bat and northern long-eared bat numbers were down slightly.

## Recommendations

- 1) Use current data to identify hibernacula for population monitoring which will be completed over a 2 year period similar to Indiana bat surveys to provide a species baseline for Tennessee.
- 2) Shift gray bat hibernacula surveys to a minimum of every other year. Ideally these surveys should be conducted in even years opposite of Indiana bat survey year.
- 3) Continue working to identify new significant hibernacula.
- 4) Continue over the next 3 years to identify new WNS positive caves in currently undocumented counties within the karst region of Tennessee.
- 5) Continue to partner with Universities to study the effects of WNS on bat hibernacula in the Tennessee.



Figure 5. Dead tri-colored bat on cave floor Cannon County.

## Appendix

Survey data from 2013 hibernacula surveys conducted from December 2012 to April 2013. Bat species observed during survey include Rafinesque's big-eared bat (CORA), big brown (EPFU), gray bats (MYGR), eastern small footed (MYLE), little brown bat (MYLU), Indiana bat (MYSO), northern long-eared (MYSE), tri-colored (PESU), and unidentified Myotis sp. (MYsp).

| County     | Cave Name                 | Survey Date | CORA | EPFU | MYGR | MYLE | MYLU | MYSE | MYSO  | PESU | MYsp | Surveyors      |
|------------|---------------------------|-------------|------|------|------|------|------|------|-------|------|------|----------------|
| Anderson   | Toilet Bowl Cave          | 3/21/2013   |      |      |      |      | 1    |      |       | 27   |      | TWRA, TNC      |
| Anderson   | Springhill Saltpeter Cave | 3/21/2013   |      | 17   |      | 1    | 217  |      |       | 39   |      | TWRA, TNC      |
| Blount     | White Oak Blowhole        | 2/8/2013    |      |      |      |      | 487  | 25   | 9,076 | 590  |      | NPS, TWRA, FWS |
| Blount     | Scott Cave                | 2/20/2013   |      |      |      |      | 33   |      | 156   | 293  |      | NPS, UT        |
| Blount     | Saltpeter                 | 2/1/2013    |      | 1    |      |      | 8    | 6    | 2     | 49   |      | NPS, UT        |
| Blount     | Gregory                   | 1/27/2013   |      |      |      |      | 5    | 1    |       | 2016 |      | NPS, UT        |
| Blount     | Kelly Ridge Cave          | 2/9/2013    | 300  | 1    |      |      | 184  | 19   | 1474  | 839  |      | NPS, UT        |
| Campbell   | New Mammoth Cave          | 1/28/2013   |      | 4    |      | 5    | 278  | 125  | 75    | 75   |      | TWRA, TNC      |
| Campbell   | Norris Dam Cave           | 2/1/2013    |      | 1    |      |      | 1    |      |       | 42   |      | TVA, UT        |
| Cannon     | Espey Cave                | 3/28/2013   |      |      | 148  |      | 1    | 13   |       | 174  | 1    | TNC            |
| Cheatham   | Winding Cave              | 2/26/2013   |      |      |      |      |      |      |       | 151  |      | TNC            |
| Claiborne  | Buis Saltpeter Cave       | 3/14/2013   |      | 5    |      |      | 26   | 1    |       | 94   |      | TWRA, TNC      |
| Claiborne  | Sour Kraut Cave           | 3/14/2013   |      | 2    |      |      | 1    | 2    |       | 14   |      | TWRA, TNC      |
| Coffee     | Jarrells Cave             | 12/13/2013  |      |      |      |      |      |      |       | 10   | 4    | TWRA, FWS      |
| Cumberland | Grassy Cove Saltpeter     | 3/15/2013   |      | 1    |      |      | 323  | 2    | 3     | 15   | 1    | TWRA           |
| Dekalb     | Turner Cave               | 3/8/2013    | 1    | 1    |      |      | 6    | 3    |       | 93   |      | TNC            |
| Dickson    | Hunt Cave                 | 2/19/2013   |      |      |      |      |      |      |       | 39   |      | TNC            |
| Fentress   | Cornstarch Cave           | 1/18/2013   |      |      |      | 1    | 505  |      | 236   | 22   |      | TWRA, TNC, FWS |
| Fentress   | Dragon's Breath Cave      | 12/17/2012  |      |      |      |      | 209  | 2    | 74    | 537  | 2    | TWRA, TNC      |
| Fentress   | East Fork Saltpeter Cave  | 1/17/2013   |      |      |      |      | 267  | 1    | 171   | 78   |      | TWRA, TNC, UT  |
| Fentress   | Little Jack Creek Cave    | 1/18/2013   |      | 3    |      |      | 4    |      | 2     | 5    |      | TWRA, TNC, FWS |

| County    | Cave Name                      | Survey Date | CORA | EPFU | MYGR    | MYLE | MYLU | MYS E | MYSO | PESU | MYsp | Surveyors      |
|-----------|--------------------------------|-------------|------|------|---------|------|------|-------|------|------|------|----------------|
| Fentress  | Redbud Cave                    | 1/18/2013   |      |      |         |      | 21   |       | 3    | 18   |      | TWRA, TNC, FWS |
| Fentress  | Wolf River Cave                | 1/15/2013   |      |      | 2       |      | 1193 | 1     | 1048 | 177  |      | TWRA, TNC, FWS |
| Fentress  | Yggdrasil Cave                 | 2/7/2013    |      |      |         |      | 79   | 1     | 60   | 38   |      | TWRA, FWS      |
| Fentress  | Zarathustras Cave              | 1/24/2013   |      | 1    |         |      | 15   | 2     | 32   | 267  | 2    | TWRA, FWS      |
| Fentress  | Blue Crayfish Cave             | 1/17/2013   |      |      |         |      |      |       |      | 13   |      | TWRA, TNC      |
| Franklin  | Carlton Cave                   | 3/21/2013   |      | 1    | 3       |      | 3    |       |      | 1764 |      | TWRA           |
| Franklin  | Signature Cave                 | 1/15/2013   | 2    |      |         |      |      |       | 27   | 22   | 1    | TWRA           |
| Grainger  | Indian Cave                    | 12/20/2012  |      | 22   |         |      |      |       |      | 68   |      | TNC            |
| Grainger  | Indian Cave                    | 3/20/2013   |      | 3    | 416     |      |      |       |      | 80   |      | TWRA, TNC      |
| Greene    | Afton Cave                     | 3/13/2013   |      |      |         |      |      |       |      | 125  |      | TWRA, TNC      |
| Greene    | Cochran Cave                   | 3/11/2013   |      |      | 2       |      |      |       |      | 1    |      | TVA            |
| Grundy    | Big Mouth Cave                 | 2/28/2013   |      |      |         |      | 1    |       |      | 23   |      | TNC            |
| Grundy    | Trussell Cave                  | 2/28/2013   |      |      | 3       |      | 1    |       | 18   | 169  |      | TWRA, TNC      |
| Grundy    | Trussell Downstream Cave       | 2/28/2013   |      |      |         |      |      |       |      | 11   |      | TWRA, TNC      |
| Hamblen   | Soard Cave                     | 1/10/2013   |      | 15   |         |      |      |       |      | 46   |      | TNC            |
| Hamilton  | Raccoon Mt. Caverns            | 3/5/2013    |      |      |         |      | 1    |       |      | 25   |      | TWRA, FWS      |
| Hawkins   | Pearson Cave                   | 1/29/2013   |      |      | 147,265 |      |      |       |      |      |      | TWRA, TNC, FWS |
| Hawkins   | Phipps Bend Nuclear Site (TVA) | 1/7/2013    |      | 3    |         |      | 1    |       |      |      |      | TVA, TNC       |
| Hickman   | Blowing Cave                   | 2/6/2013    |      | 4    | 2       |      | 180  | 33    | 49   | 570  |      | TWRA, TNC      |
| Houston   | Richardson Cave                | 1/3/2013    |      |      |         |      | 8    | 1     |      | 59   |      | TWRA, TNC      |
| Jackson   | Carter Cave                    | 1/23/2013   |      |      |         |      |      |       |      | 8    |      | TNC            |
| Jackson   | North Spivey Cave              | 3/29/2013   | 1    | 6    |         |      | 7    |       |      | 79   | 1    | TNC            |
| Jefferson | Rouse Cave                     | 1/10/2013   |      | 1    | 6       |      |      |       |      | 148  |      | TNC            |
| Jefferson | Tater Cave                     | 3/20/2013   |      | 1    |         |      |      |       |      | 1    |      | TWRA, TNC      |
| Knox      | Blowing Hole Cave              | 1/11/2013   |      | 1    |         |      |      |       |      | 16   |      | TNC            |
| Lawrence  | Knob Creek Cave                | 2/25/2013   |      | 11   |         |      |      |       |      | 309  |      | TNC            |
| Lewis     | Depriest Branch Cave           | 2/18/2013   |      | 2    |         |      | 4    | 26    |      | 390  |      | TNC            |

| County     | Cave Name              | Survey Date | CORA | EPFU | MYGR    | MYLE | MYLU | MYSE | MYSO | PESU | MYsp | Surveyors         |
|------------|------------------------|-------------|------|------|---------|------|------|------|------|------|------|-------------------|
| Macon      | Aunt Beck Simmins Cave | 3/1/2013    |      | 4    |         |      | 9    | 6    |      | 61   |      | TNC               |
| Marion     | Nickajack Cave         | 2/4/2013    |      |      | 18      |      |      |      |      | 4    |      | TWRA TNC,<br>TVA  |
| Marion     | Whiteside Cave         | 3/5/2013    |      |      |         |      |      |      |      | 142  |      | TWRA, TNC,<br>FWS |
| McMinn     | Unknown                | 1/4/2013    |      |      |         |      |      |      |      | 6    |      | TWRA              |
| Meigs      | Eve's Cave             | 3/14/2013   |      |      | 1       |      | 1    |      |      | 57   |      | TWRA, TVA         |
| Monroe     | Luther Cave            | 2/27/2013   |      |      |         |      |      |      |      | 9    |      | TWRA, FWS         |
| Montgomery | Bellamy Cave           | 2/4/2013    |      | 1    | 345,002 |      | 19   |      |      | 86   |      |                   |
| Montgomery | Coleman Cave           | 2/4/2013    |      |      |         |      | 7    | 1    |      | 52   |      | TWRA, TNC         |
| Montgomery | Cooper Creek           | 2/18/2013   |      | 10   |         |      | 30   |      |      | 111  |      | TWRA              |
| Montgomery | Dunbar Cave            | 3/26/2013   |      | 1    |         |      |      |      |      | 61   |      | APSU              |
| Overton    | Mill Hollow Cave       | 3/27/2013   |      |      |         |      | 1    |      |      | 47   |      | TNC               |
| Overton    | Three Forks Cave       | 3/27/2013   |      |      |         |      | 2    | 3    |      | 7    |      | TNC               |
| Overton    | Wilson Cemetery Cave   | 3/7/2013    |      |      |         |      |      |      |      | 31   |      | TWRA, TNC         |
| Perry      | Jaybird Cave           | 2/8/2013    |      |      | 1       |      | 246  | 70   | 19   | 441  |      | TWRA, TNC         |
| Pickett    | Bunkum                 | 3/4/2013    | 2    | 2    |         | 5    |      | 1    |      | 96   | 1    | TWRA, TNC         |
| Pickett    | Frog Cave              | 3/4/2013    |      |      |         |      |      |      |      |      |      | TWRA, TNC         |
| Polk       | Gee Cave               | 2/27/2013   |      |      |         |      |      |      |      | 12   |      | TWRA, FWS         |
| Putnam     | Kuykendall             | 3/12/2013   |      | 1    |         |      |      |      |      | 49   |      | TWRA              |
| Putnam     | Welch-Bowling          | 3/6/2013    |      | 3    |         |      |      |      |      | 254  |      | TWRA, TNC         |
| Roane      | Marble Bluff Cave      | 3/6/2013    |      |      |         |      | 3    |      |      | 100  |      | TVA               |
| Robertson  | Jesse James Cave #1    | 1/4/2013    |      | 1    | 1       |      |      |      |      | 53   |      | TNC               |
| Robertson  | Jesse James Cave #2    | 1/4/2013    |      | 9    |         |      |      |      |      | 1    |      | TNC               |
| Robertson  | Whiskey River Cave     | 1/4/2013    |      | 8    | 1       |      | 3    | 1    |      | 244  | 3    | TNC               |
| Smith      | Bridgewater Cave       | 2/20/2013   |      |      |         |      | 32   |      |      | 34   |      | TNC               |
| Stewart    | Tobaccoport Saltpeter  | 2/5/2013    |      | 10   | 52      |      | 182  |      | 137  | 69   |      | TWRA, TNC         |
| Sullivan   | Worley's/Morrill Cave  | 3/19/2013   |      | 1    | 300     |      |      |      |      | 11   |      | TWRA, TNC         |



| County    | Cave Name               | Survey Date | CORA | EPFU | MYGR    | MYLE | MYLU | MYSE | MYSO | PESU | MYsp | Surveyors       |
|-----------|-------------------------|-------------|------|------|---------|------|------|------|------|------|------|-----------------|
| Sumner    | Escue Cave              | 2/20/2013   |      | 7    | 1       |      | 1    |      |      | 88   |      | TNC             |
| Sumner    | Portland Lake Cave      | 2/20/2013   |      |      |         |      |      |      |      | 4    |      | TNC             |
| Union     | Herd O' Coons Cave      | 3/12/2013   |      | 3    |         |      | 68   | 2    |      | 150  |      | TWRA, TNC       |
| Van Buren | Camps Gulf              | 1/31/2013   | 21   | 2    | 7       |      | 11   | 2    | 71   | 555  | 1    | TWRA, FWS       |
| Van Buren | Fox Hole                | 12/18/2012  | 2    |      |         |      | 400  |      | 15   | 93   |      | TWRA, FWS       |
| Van Buren | Rice                    | 2/28/2013   |      |      | 12      |      | 1    | 1    | 12   | 144  |      | TWRA, TDEC, FWS |
| Warren    | Hubbards Cave           | 1/21/2013   |      | 1    | 346,286 |      | 2    |      | 133  | 38   |      | TWRA, TNC       |
| White     | Virgin Falls Cave       | 2/19/2013   |      |      |         |      | 3    |      | 9    | 293  | 1    | TWRA, TDEC, FWS |
| White     | Great Expectations Cave | 2/21/2013   | 485  | 1    | 1       |      | 1    | 1    |      | 529  |      | TWRA, TDEC, FWS |
| White     | Lost Creek Cave         | 2/21/2013   |      | 2    | 19      |      | 3    |      | 33   | 322  |      | TWRA, TDEC, FWS |
| White     | Rose Cave               | 1/21/2013   |      | 4    | 683     |      | 33   |      | 77   | 203  |      | TWRA, TNC, UT   |