

# **FINAL PERFORMANCE REPORT**



**Federal Aid Grant No. F17AP01045 (E-89-R-1)**

**Monitoring of Federally-listed and Declining Bats in an Ozark Cave System During Spring Emergence and Fall Swarming Periods**

**Oklahoma Department of Wildlife Conservation**

**January 1, 2018 – December 31, 2018**

## FINAL PERFORMANCE REPORT

**State:** Oklahoma

**Grant Number:** F17AP01045 (E-89-R-1)

**Grant Program:** Endangered Species Act Section 6

**Grant Title:** Monitoring of Federally-listed and Declining Bats in an Ozark Cave System During Spring Emergence and Fall Swarming Periods

**Grant Period:** January 1, 2018 – December 31, 2018

**Report Period:** January 1, 2018 – December 31, 2018

**Principal Investigator(s):** Jason Malaney, Austin Peay State University

### A. ABSTRACT

Environmental Solutions & Innovations, Inc. (ESI) was retained by Austin Peay State University to survey three cave openings as a continuation of surveys previously completed for the U.S. Fish and Wildlife Service (USFWS) at the Ozark Plateau National Wildlife Refuge. These cave openings were surveyed for federally listed bat species during 2018 spring emergence and fall swarming periods.

During spring emergence and fall swarming of 2018, a total of 293 bats were captured including 5 northern long-eared, 68 tri-colored, 197 gray, 16 Ozark big-eared, 5 eastern red, 1 big brown, and 1 silver-haired bat. A total of 232 bats were banded during these surveys. Twelve northern long-eared and ten gray bats were recaptured, including individuals captured from previous survey efforts before this reporting period (2015 - 2018). All bats captured were examined for visible scarring caused by the causative fungus for White-Nose Syndrome (WNS). Minimal wing damage or scarring was observed on a few gray bats during the spring 2018 surveys.

### B. BACKGROUND

Prior to this grant, Environmental Solutions & Innovations, Inc., (ESI) received a request from the U.S. Fish and Wildlife Service (USFWS) to conduct winter and spring surveys to address protected bat populations, specifically northern long-eared bats (*Myotis septentrionalis*, MYSE), at Duncan Field Cave, a large multi-entrance cave system in the Ozarks Plateau National Wildlife Refuge (OPNWR) in Adair County, Oklahoma (Project). This cave is in the Sally Bull Hollow Unit in the OPNWR. The Project scope of work consisted of harp trapping and mist netting at three cave entrances for two nights concurrently during fall swarming in 2015, 2016, and 2017, and spring emergence in 2016 and 2017. Beginning in 2018, Austin Peay State University contracted ESI to continue this survey for the 2018 spring emergence and fall swarming periods.

Unique numbered arm bands were used to facilitate population estimates. Mensural and demographic characteristics for all species encountered during the survey were recorded. Because this site was tested prior to commencement of the study and determined negative for the fungus *Pseudogymnoascus destructans* (Pd), all equipment and supplies used during the fall 2015 survey, including vehicles, were new or had never been used in White-Nose Syndrome (WNS) positive states. Evidence of Pd-positive bats was found at this site during spring emergence in 2016.

The data gathered from the reporting period will be incorporated into a dataset that includes seven total sampling periods (four fall swarming, three spring emergence). These data will then be used to describe demographic changes among the species captured. This cave system has eleven known entrances; three comprise the area of interest for this survey. As part of a study to determine movement and migration patterns, banding efforts included additional species such as gray bats (*Myotis grisescens*, MYGR), Ozark big-eared bats (*Corynorhinus townsendii ingens*, COTO) and tricolored bats (*Perimyotis subflavus*, PESU).

In an effort to provide a broad picture of bat activity over time at OPNWR, data in this report are presented as a continuation of the previous USFWS-funded study.

### **C. OBJECTIVES:**

The objective of this study is to collect information by capturing live bats at the Duncan-Fields cave system during spring emergence and fall swarming periods. While the focal species of this project is the Northern Long-eared Bat, the bat community as a whole will be monitored to determine changes in population demographics and/or relative abundance among species.

### **D. PROCEDURES**

Spring emergence surveys were conducted on the 19<sup>th</sup> and 20<sup>th</sup> of March 2018 and fall swarming surveys were conducted on the 26<sup>th</sup>, 27<sup>th</sup>, and 28<sup>th</sup> of September 2018. Hibernacula entrances (3) were outfitted with harp traps (Appendix A, Fig. 8) and mist-nets to continue analyses of species abundance, relative abundance of the species, and demography of all species through the physical capture of bats exiting the cave. Once bats were captured, unique numbered bands were placed on the forearm of all northern long-eared and gray bats for use in population estimates and migratory patterns. Standard measurements (weight, sex, forearm length) were taken from all captured bats. All captured bats were available for WNS swabbing or wing tissue biopsies upon request from qualified individuals. Fall swarming surveys were conducted during the first week of October. Hibernacula entrances (3) were outfitted with harp traps and mist-nets to continue analyses of species abundance, relative abundance of the species, and demography of all species through the physical capture of bats exiting the cave. After bats were captured, unique numbered bands were placed on the forearm of all northern long-eared and gray bats for use in population estimates and migratory patterns. Standard measurements (weight, sex, forearm length) were taken from all captured bats.

### **E. RESULTS AND DISCUSSION**

#### Results

In spring of 2018, 123 bats were captured including 84 gray, 38 tri-colored, and 1 northern long-eared bat (Appendix A, Table 1). In fall of 2018, 170 bats were captured including 113 gray bats, 30 tri-colored, 16 Ozark big-eared, 5 eastern red, 4 northern long-eared, 1 big brown bat, and 1 silver-haired (*Lasionycteris noctivagans*, LANO) bat.

Continued sampling has shown a decrease in the number of northern long-eared bats and tri-colored bats in the 2018 trapping sessions, while populations of gray bats has remained relatively consistent (Appendix A, Figure 1).

Although northern long-eared bats comprise the primary focus of this study, efforts also include monitoring changes in sex ratios and mensural characteristics of the three most common bat species occurring among sampling periods (Appendix A, Figure 1). Significant variations occurred in average weight for northern long eared bats ( $F=29.267$ ,  $p < 0.0001$ , Appendix A, Figure 2) tri-colored bats ( $F = 131.040$ ,  $p < 0.0001$ , Appendix A, Figure 3), and gray bats ( $F = 84.44$ ,  $p < 0.0001$ , Appendix A, Figure 4) between spring emergence and fall swarming. In addition to banding 914 northern long-eared bats since 2015, 489 gray bats have been banded for ongoing migration studies. All captures occurred within the first three hours after sundown.

### Discussion

Continued surveying has shown a drastic decrease in the number of northern long-eared bats and a decrease in the number of tri-colored bat captures. A graphic summary of bat captures for 2018, as well as for all years, is shown in Figure 1 (Appendix A). The decrease is likely due to WNS, although advanced scarring was only recorded on 9 gray bats.

The relatively even sex ratio of northern long-eared bats (Appendix A, Figure 2) as well as the average weight being significantly higher for fall swarming than spring emergence sessions (Appendix A, Figure 3) indicates continued use of the cave as a hibernacula or fall swarming and use of nearby caves for hibernation. Previous winter survey counts of this cave yielded <50 northern long-eared bats. The male biased sex ratios seen during spring emergence of 2016 and 2017 suggest that females already departed for summer maternity colonies.

Sex ratios for tri-colored bats remain consistently between 70 and 80 percent male for all trapping sessions (Appendix A, Figure 2). Average weight of tricolored bats was also significantly higher during fall swarming periods than spring emergence indicating the use of these caves as winter hibernacula or fall staging and use of nearby caves for hibernation (Appendix A, Figure 4).

A small number of gray bats are known to use the cave during summer and it is likely that gray bats captured in the fall leave this cave for other hibernacula due to the high male biased sex ratio (Appendix A, Figure 2). The average weight of gray bats is also significantly higher during fall swarming than spring emergence (Appendix A, Figure 5), indicating the use of these caves as a fall staging area. No gray bat hibernacula are known to occur in the immediate area.

## **F. RECOMMENDATIONS**

Surveys are expected to continue into 2019 to monitor the changes in species composition likely related to the presence of WNS.

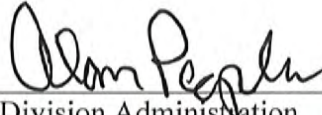
## **G. SIGNIFICANT DEVIATIONS:**

No significant deviations.

**H. Prepared by:** Jason Malaney, Assistant Professor  
Austin Peay State University

**Date:** February 19, 2019

Approved by:



Wildlife Division Administration  
Oklahoma Department of Wildlife Conservation

Approved by:



Andrea Crews, Federal Aid Coordinator  
Oklahoma Department of Wildlife Conservation

## APPENDIX A

Figure 1. Total number of individuals captured across seven trapping sessions, for the three species of interest.

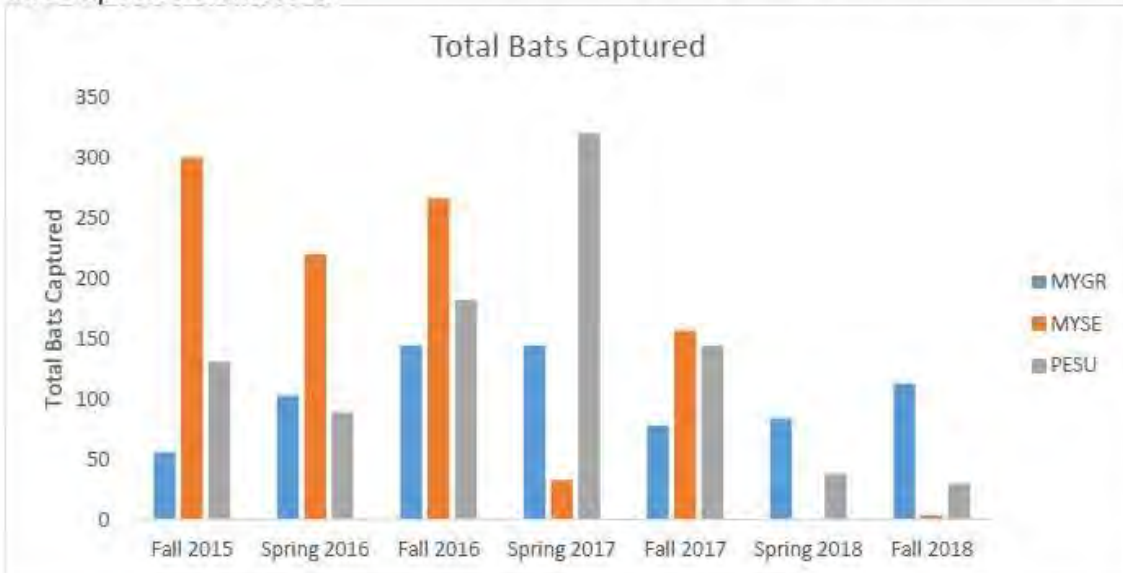


Figure 2. Seasonal sex ratio by species.

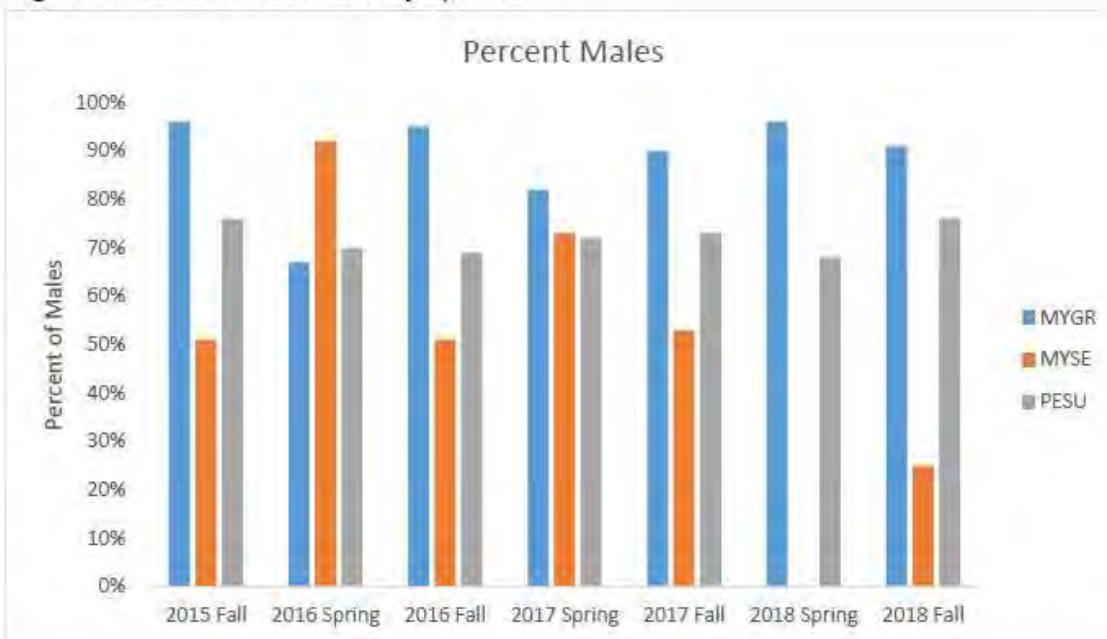


Figure 3. Seasonal body mass of northern long-eared bat with different letters indicating a significant difference among sessions based on post-hoc Tukeys test. Missing error bars from Spring 2018 point are due to only one individual being caught.

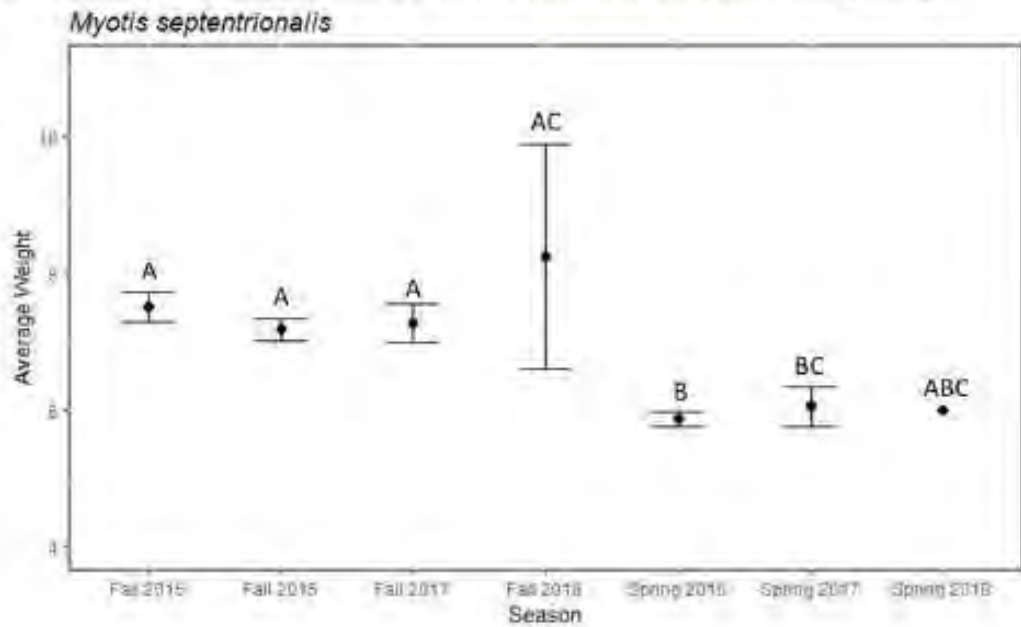


Figure 4. Seasonal body mass of tri-colored bats with different letters indicating a significant difference among sessions based on post-hoc Tukeys test.

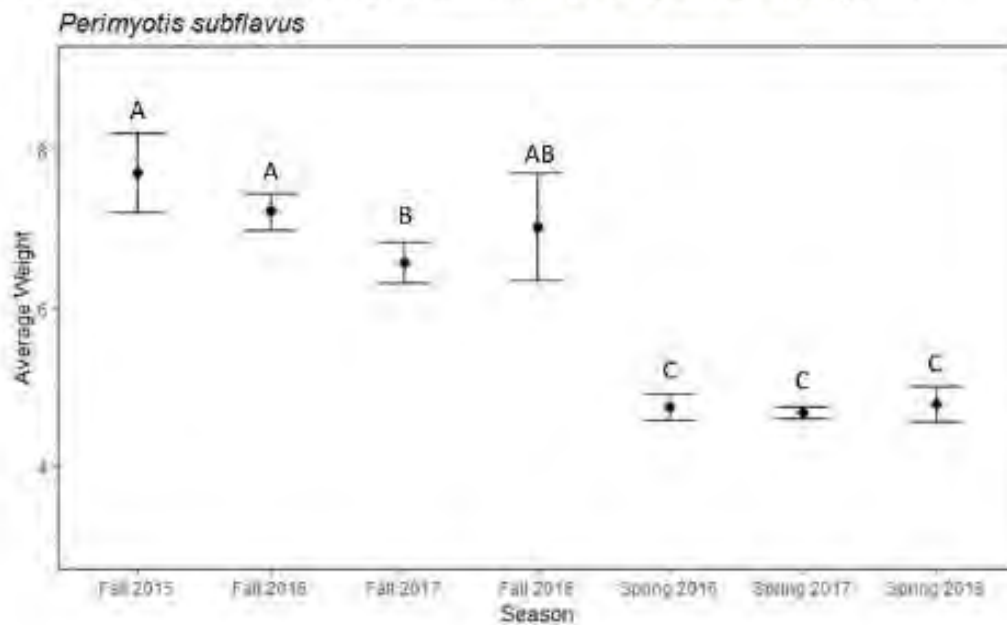
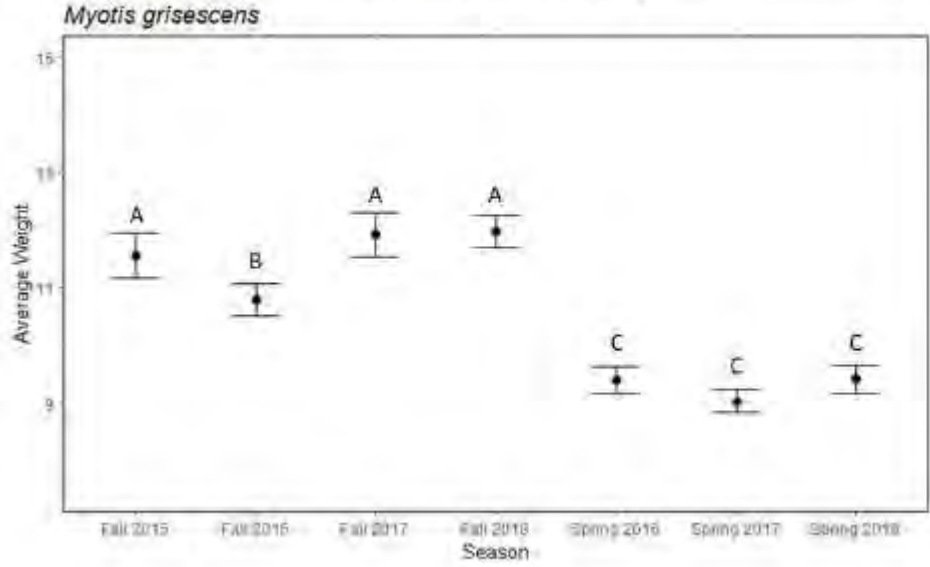


Figure 5. Seasonal body mass of gray bats with different letters indicating a significant difference among sessions based on post-hoc Tukeys test.







**Figure 6.** Northern Long-eared Bats (*Myotis septentrionalis*) captured during the spring emergence and fall swarming surveys (credit: J. Donnell / ODWC).



**Figure 7.** Ozark Big-eared Bat (*Corynorhinus townsendii ingens*) (top) and Tricolored Bat (*Perimyotis subflavus*) (bottom) captured during the surveys (Credit: ESI).



**Figure 8.** Harp trap deployed outside one of the entrances of the Duncan-Field cave system on Ozark Plateau National Wildlife Refuge (Credit: J. Donnell / ODWC).