

FINAL PERFORMANCE REPORT



Federal Aid Grant No. F21AP03619 (E-22-R-25)

Oklahoma Department of Wildlife Conservation

**Management and Cave Protection for Federally-listed Bats and Co-
occurring Stygobitic Fauna in Oklahoma**

January 1, 2022 - December 31, 2022

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State: Oklahoma

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Grant Program: Cooperative Endangered Species Conservation Fund, Traditional Conservation Grants Program

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Executive Summary

Human disturbance of maternity caves and hibernacula is a contributor to the historic and present population declines of bats across the United States. Low reproductive rates, long generation times and concentrated populations housed in a relatively small number of caves, make bat populations especially vulnerable to human disturbance and susceptible to slow recovery from these disturbances. Unique characteristics common to North American subterranean fauna render them vulnerable to anthropogenic activities and underscore the importance of monitoring and protecting sensitive populations. Within the United States, subterranean fauna constitutes more than 50% of the G1-G2 species recorded in the Natural Heritage Program; however, less than 4% receive federal protection. Procedures implemented during this project were intended to 1) maintain the bat population in targeted caves by preventing unnecessary human entry and disturbance to critical roosts, and 2) survey stygobitic fauna in Oklahoma and delineating biologically important subterranean systems. Management procedures including gate/grill construction and repair at two caves, and population monitoring efforts were completed at 26 different caves. Surveys conducted under this grant documented over 93,000 Gray Bats (*Myotis*

grisescens) (MYGR) across 8 sites, 164 Ozark Big-eared Bat (*Corynorhinus townsendii ingens*) (COTO) across 3 sites and 26 Tricolored Bats (*Perimyotis subflavus*) (PESU) across 5 sites which have been proposed for federal listing as endangered.

Objectives:

The objectives of this project assist in the recovery of the Gray Bat, Ozark Big-eared Bat, Northern long-eared bat, Ozark Cavefish and two endemic cave crayfish that are species of concern, by working with cave owners and constructing internal gate and grill systems within those caves that support populations of one or more of these species. This project also supports biological inventories of Ozark caves to identify and prioritize caves based upon their importance to federally listed species and other Ozark cave-endemic species that are similarly affected by human disturbance within their cave environments. These biological data improve the effectiveness of the overall cave gating project by ensuring the resources are directed to the most important caves. These data assist in the monitoring and status assessment of cave-dependent species so that future management decisions can be based on better information. The primary objectives of this project are:

- 1) To maintain the bat population in targeted caves by preventing unnecessary human entry and disturbance to critical roosts,
- 2) Survey stygobitic fauna in Oklahoma and delineating biologically important subterranean systems to include historical localities of Ozark Cavefish (*Amblyopsis rosae*) and species of groundwater crayfish endemic to Oklahoma,
- 3) If necessary, participate in baseline survey techniques that will monitor the impact of the causative agent of White-nose Syndrome on targeted cave-dwelling bat species, and
- 4) Initiate presence surveys of caves that have been historically identified as potential roosting habitat for the threatened Northern Long-eared Bat (*Myotis septentrionalis*) (MYSE, NLEB) and, if documented, develop and prioritize plans for management and colony protection measures.

Summary of Progress:

Project Need:

Human disturbance of maternity caves and hibernacula is a substantial contributor to the historic and present population declines of bats across the United States and this appears to be a contributing factor in the population declines for obligate cave-dwelling species like the Ozark Big-eared Bat and Gray Bat. Low reproductive rates, long generation times and concentrated populations inhabiting a relatively small number of caves, make these bat populations especially vulnerable to human disturbance and slow to recover from these disturbances. The majority of caves known to be important to Ozark Big-eared and Gray Bats occur on private property. Some of these are well protected by their owners; however, some are not and experience periodic human entry or disturbance. The development and implementation of cave protection plans are needed for specific caves to protect the remaining maternity colonies and hibernacula. Two protection techniques viewed as efficient methods of deterring human disturbance within caves are 1) the construction of camouflaged fencing around cave entrances and 2) the construction of

internal gates or grills within cave passages.

Over the past 20 years, substantial progress has been made in protecting Gray Bat maternity caves and both maternity caves and hibernacula for the Ozark Big-eared Bat. To date, twenty-four biologically significant caves, some with multiple entrances, have been gated in the Oklahoma Ozarks. All of these caves are monitored periodically to evaluate their use by endangered bat populations. During the early 2000s, six of these caves were intensively monitored for three years to document that gate construction did not interfere with the bats' use of these caves or alter the microclimates within these caves. The results of this project have contributed to both the theory and the methodology that influences the conservation and cave protection efforts for bats in the karst systems throughout the Ozark region and the eastern United States. Even with the documented success of past cave protection/gating efforts, additional hibernacula and maternity caves are still in need of protection.

An equally important aspect of this project is the monitoring of bat colonies after the construction of gate/grill structures in order to maintain the protective systems and to document the population response of the bat colonies within each cave. Additionally, there is a need to conduct biological surveys within other caves in the Oklahoma Ozarks to determine their importance to threatened and endangered bats, the Ozark Cavefish and a diversity of rare cave-dependent species such as cave crayfish, Grotto Salamanders (*Eurycea sp.*), and subterranean amphipods and isopods. These surveys are important to assess and prioritize caves for future protection efforts in order to maximize the conservation benefits for listed species and subterranean biological diversity.

Northern long-eared bats in Oklahoma spend the winter hibernating in caves and abandoned mines; during the summer months they use caves as maternity sites as well as day and night foraging roosts. More than 20 caves in Adair, Cherokee, Delaware, and LeFlore counties house populations or individuals of northern long-eared bats. White-nose syndrome (WNS) is currently the predominant threat to the northern long-eared bat, especially throughout the northeast U.S. where the species has declined by up to 99 percent from pre-white-nose syndrome levels at many hibernation sites. Although the northern long-eared bat has not experienced declines from the disease across its entire range, WNS is currently found in at least 22 of 39 states where the species occurs. The development of cave management plans is important to protecting cave-dwelling populations of the species from human activity, and the management and containment of potential transmission of WNS.

Considerable emphasis by multiple government agencies is being placed on WNS management and monitoring in states where the vector is likely to be expanding in the near future. Oklahoma is considered one of those states. Monitoring torpid populations and surrounding substrate continues to provide important baseline data on the spread of the disease into previously uninfected populations. Additionally, construction of gate/grill systems in cave passages effectively removes the threat of human transmission between caves in emerging WNS areas.

This project provides a significant amount of population status data for federally listed bat species as well as listed aquatic cave species and assists the U.S. Fish and Wildlife Service (FWS) with monitoring those species. The data generated from this project assists both FWS

staff from the local Ecological Services (ES) branch as well as National Wildlife Refuge (NWR) staff that manage these cave systems. This project also assists with the surveillance of WNS in Eastern OK which has been known to be one of the primary causes of rare bat species population declines across the U.S. Maintaining gates on these significant caves in Eastern OK is critical for the protection of bats on both private property as well as government lands.

Results:

Objective 1: Cave Management—Population estimates of bats at caves prior to installation of gates beginning in 1981 and post-installation estimates show that each cave continues to be used by stable, or increasing populations of resident bats (Grigsby et al. 1993, Martin et al. 2000, 2003, 2006; Puckette 2000). Procedures in this project assist in stabilizing sensitive populations of cave fauna in northeastern Oklahoma. The following is a description of caves and management procedures that were conducted during the project.

Cave CZ-9

Cave CZ-9 is privately owned and located in Cherokee County, OK which has historically housed a maternity colony of Gray Bats at times estimated to be 1,000+ bats. Recent estimates have been <7,000. An internal gate/grill system was installed inside the cave in 1993. On a recent visit to the site for routine monitoring of the system it was noted the locking mechanism had been vandalized and breeched. On 21 April 2022 a repair of the mechanism was completed and the system is once again secure from human entry.

Cave ADT-1

Cave ADT-1 is a sandstone-limestone talus opening in southern Adair County, OK and historically serves as a hibernaculum for a small population of Ozark Big-eared Bats. The most recent hibernacula survey at the site in winter 2019 noted 16 Ozark Big-eared Bats. Population surveys in the last 15 years indicate notably higher use than in the previous 15 years of surveys (Figure 1). The site is currently on private property but will soon be incorporated into the Ozark Plateau NWR and future use agreements will potentially enhance walk-in site visitation by the public to nearby Lee Creek. Gating the two passages of talus openings is high priority to protect the hibernaculum from unauthorized human entry into the cave. An initial trip was made to the site on 12 May to complete planning and design of the structure. A subsequent visit to the site was made on 21 September to install pre-fabricated portions of the grill system. However, there were a small number of Ozark Big-eared Bats already roosting in the passages, preventing entry and installation of the grill components. The steel structures were left onsite and will be installed following the 2022-23 hibernation period.

Objective 2: Cave Bioinventories — Due to heavy precipitation in late fall and early winter of 2022 cave entry was deemed unsafe for researchers. Furthermore, high water levels would affect the biological inventories and make them incomparable to prior years. With this, our team has delayed these inventories to the 2023 grant cycle.

Objective 3: White-nose Syndrome Surveys—Per USGS and USFWS guidance, cave entry for recreational and research activities was restricted in the first year of the E-22-24 cycle (2020). No surveys for the causative agent of White-nose Syndrome were conducted at caves during the E-22-25 cycle. Consistent, annual WNS surveillance has essentially been discontinued in caves in eastern Oklahoma given the understanding that surviving, localized populations are persisting, reduced funding for sample analysis, and shifting geographical priorities.

Objective 4: Presence/absence surveys for Northern Long-eared Bat—Surveys were conducted at various historical sites but NLEB's were not detected during any of the survey efforts. This species' population status in Oklahoma has been greatly reduced due to impacts from WNS.

Discussion and Recommendations:

1. ADT-1 is a talus opening in Adair County serving as a hibernaculum for Ozark Big-eared Bats (<10). A monitoring visit to the site in winter 2019 noted 16 Ozark Big-eared Bats. The site is currently on private property but will soon be incorporated into the Ozark Plateau NWR and future use agreements will potentially enhance walk-in site visitation by the public to nearby Lee Creek. Gating the two passages to the talus openings is high priority to protect the hibernaculum from human entry. Installation of a gate/grill system is critical and will begin following the 2022-23 hibernaculum season.
2. Annual monitoring of caves that have received past management and protection efforts will continue. These visits establish continued use by target species, verify the integrity of installed structures intended to eliminate human entry, and are conducted at non-gated caves to determine a ranking hierarchy for need of future consideration of management procedures. The importance of monitoring was accentuated by a count of 4 Tricolored Bats in cave AD-8 on 12 November 2022. Winter counts from previous monitoring visits to the cave from 2015-2017 ranged from 98 to 204. Other caves that have significant pre-WNS numbers of PESU (50+) in the past are: AD-15, AD-17, AD-18, CZ-18, DL-1, SQ-1, and Davis Mtn Caves in Adair County (AD-221, AD-30, AD-54).
3. Biological inventories of caves continues to be key to identifying biologically important sites for future conservation efforts and add to the overall knowledge of the status and distribution of Ozark cave fauna. We will complete a round of surveys in early 2023 during the next grant cycle. These inventories have been delayed during this grant segment due to heavy precipitation and flooding in the cave systems.
4. In Oklahoma, Northern Long-eared Bats spend winter hibernating in caves and abandoned mines, and in the summer, use caves as maternity and day and night foraging roosts (Caire et al. 1979; Caceres and Barclay 2000). More than 20 caves in Adair, Cherokee, Delaware, and LeFlore counties have been documented to house populations or individuals of Northern Long-eared Bats (Stevenson 1986; Martin and Puckett pers. comm.). Identifying caves that are inhabited by populations and developing management efforts to protect the cave-dwelling populations of the species from human activity is becoming very challenging but it should be

a renewed emphasis of this project. We recommend mist netting at caves DL-21, DL-55, DL-32, and DL 102, all in Delaware County in summer 2023 to analyze potential use by the Northern Long-eared Bat. All four sites have historical records of the bat using these caves as night roosts.

Significant Deviations:

Cave bioinventories (objective #2) planned for mid-December 2022 were not conducted due to high water levels in the caves. These surveys are scheduled for the next segment of the grant during 2023.

No surveys for the causative agent of White-nose Syndrome (objective #3) were conducted at caves during the E-22-25 cycle. Consistent, annual WNS surveillance has essentially been discontinued in caves in eastern Oklahoma given the understanding that surviving, localized populations are persisting, reduced funding for sample analysis, and shifting geographical priorities.

Equipment Purchased (Cumulative):

None.

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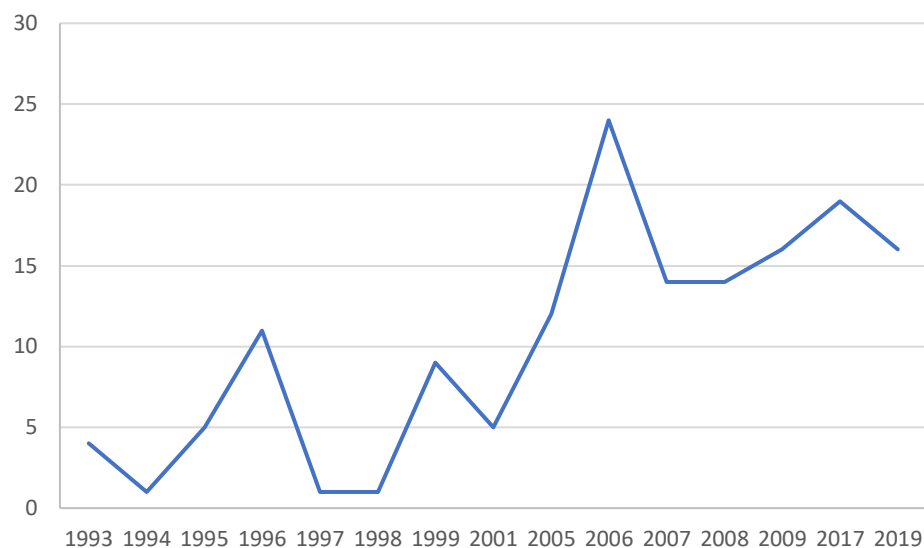


Figure 1. Population of hibernating Ozark Big-eared Bats at cave ADT-1 1993-2019 ranging from a low of 1 in 1994, 1997, and 1998, and a high of 24 in 2006

Table 1. Results of population estimates, and species richness monitored at select caves in eastern Oklahoma during 2022. MYGR: *Myotis grisescens*, COTO: *Corynorhinus townsendii ingens*, PESU: *Perimyotis subflavus*,

Date	County	Cave	Latitude	Longitude	Monitoring Results
16 Feb-22	Adair	AD-29	35.81194	-94.61124	1 PESU
16 Feb-22	Adair	AD-30	35.80827	-94.61195	Unable to enter
16 Feb-22	Adair	AD-54	35.81027	-94.61356	12 PESU
16 Feb-22	Adair	AD-211	35.81505	-94.61664	Unable to enter
16 Feb-22	Adair	AD-221	35.81862	-94.61533	5 COTO; 5 PESU
28 Mar-22	Ottawa	OT-13	36.68052	-94.74713	Guano unmeasurable
11 May-22	Delaware	DL-91	36.46866	-94.90063	20,620 MYGR (Emergence count)
1-Jun-22	Adair	AD-10	35.84344	-95.21771	147 COTO (Emergence count)
6 Jun-22	Adair	AD-17	35.74750	-94.70111	12 COTO (Emergence count)
21-Jun-22	Ottawa	OT-13	36.68052	-94.74713	10,863 MYGR (Emergence count)
22-Jun-22	Delaware	DL-91	36.46866	-94.90063	6,600 MYGR (Emergence count)
27-Jun-22	Delaware	DL-2	36.47550	-94.87499	13,300 MYGR (Emergence count)
30-June 22	Adair	AD-7	35.76403	-94.73253	11,800 MYGR (Emergence count)
7-Jul-22	Cherokee	CZ-9	35.84358	-95.21791	6,107 MYGR (Emergence count)
4-Aug-22	Delaware	DL-91	36.468660	-94.900637	23,887 MYGR (Emergence count)
12-Nov-22	Adair	AD-8	36.143190	-94.790970	4 PESU; 1 MYGR
26 Nov-22	Delaware	DL-38	36.459355	-94.974335	4 PESU