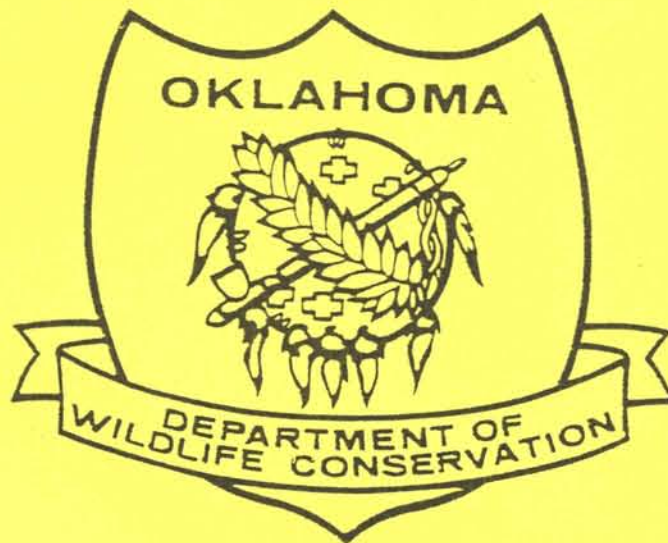


PERFORMANCE REPORT  
SECTION 6  
ENDANGERED SPECIES ACT



FEDERAL AID PROJECT E-22-11  
MANAGEMENT AND CAVE PROTECTION FOR THE  
OZARK BIG-EARED BAT AND GRAY BAT IN OKLAHOMA

OCTOBER 1, 2003 - SEPTEMBER 30, 2004

## PROJECT REPORT

STATE: Oklahoma

PROJECT NUMBER: E-22-11

PROJECT PERIOD: 1 October 2003 – 30 September 2004

PROJECT TITLE: Management and Cave Protection for the Ozark Big-eared Bat (*Corynorhinus townsendii ingens*) and Gray Bat (*Myotis grisescens*) in Oklahoma

### PROJECT OBJECTIVE:

Develop and implement management and protection plans for caves that are important to the conservation of Ozark big-eared bat and gray bat colonies in northeastern Oklahoma. Each cave will be monitored to determine the effectiveness of the management plan and to determine the impact of the structure or other protection measures implemented at the site. As problems are identified with the cave protection plans, they will be corrected.

### INTRODUCTION:

About 18 of the 45 species of bats found in North America rely substantially on caves during at least one part of the year, and 13 occupy caves year-round (McCracken, 1989). All North American bats listed as endangered or threatened by the U.S. Fish and Wildlife Service are cave-dwelling species or subspecies (McCracken, 1989; Harvey et al., 1999; Pierson, 1999). Two cave-dwelling species, the gray bat (*Myotis grisescens*) and Indiana Bat (*Myotis sodalis*), and one subspecies, the Ozark big-eared bat (*Corynorhinus townsendii ingens*), are of particular concern to recovery biologists because each is federally listed as endangered (U.S. Fish and Wildlife Service 1982, 1983, 1995).

Persistent or casual human disturbance at maternity and hibernacula caves has been implicated as a major cause for the decline in population of these and other cave-dwelling bats (Barbour and Davis, 1969; Humphrey and Kunz, 1976; Tuttle, 1979; American Society of Mammalogists, 1992). Conservation efforts concentrating on protecting these caves and the colonies of bats that they harbor are among the most important contemporary issues in bat conservation in the United States (American Society of Mammalogists, 1992).

Management efforts to provide protection for cave-dwelling bats usually are intended to eliminate disturbance resulting from human entry to caves. Typically, protection is accomplished by constructing gates at cave entrances, fencing cave entrances, placing warning signs at entrances, and/or maintaining a close and positive rapport with private landowners. Protection of populations of cave-dwelling bat populations by placing gates in entrances of caves can be an effective, immediate, and long-term method to deter human access to critical bat roosts (Humphrey, 1978; Tuttle, 1977; Tuttle and Stevenson, 1977).

Construction of human-restrictive structures at cave entrances has evolved considerably over the past 25 years. Original designs were constructed in cage-like fashion exterior to the cave entrance. This placement resulted in some caves being abandoned by resident bats (Tuttle, 1977; 1979; Clark et al., 1996). In Delaware County, Oklahoma, such a gate placed over a cave entrance in 1971 resulted in eventual abandonment of the cave by a maternity colony of gray bats

by 1981. In 1980 and 1982, two additional caves inhabited by maternity colonies of gray bats in Adair and Delaware counties, Oklahoma, were gated. Because of exterior features of those cave entrances, gates had to be placed in twilight zones of the cave passages 9 m and 15 m inside their respective entrances. These were the first reported instances of cave-dwelling populations of bats protected by an interior passage gate system in the United States. A third gray bat maternity colony in Cherokee County, Oklahoma, was gated using the same type of placement (15 m inside the cave entrance) in 1991 (Grigsby et al., 1993). The external cage protecting the original gray bat maternity colony installed in 1971, which was subsequently abandoned, was reconstructed in 1997. An internal gate was placed 15 m inside the cave passage, and the external cage was reconstructed to be left open during periods of bat use. Placement of gates within twilight zones of cave passages, such as those in northeastern Oklahoma, is now an accepted protocol for cave gating throughout the United States (White and Seginak, 1987).

Populations of bats presently are protected with internal gate systems at 25 entrances to caves in eastern Oklahoma. Seven of those caves have been inhabited historically by colonies of gray bats. Populations of Ozark big-eared bats, big brown bats (*Eptesicus fuscus*), eastern pipistrelles (*Pipistrellus subflavus*), northern long-eared myotis (*Myotis septentrionalis*), and a single hibernaculum of Indiana bats also are protected (Martin et al., 2003).

Each of the 25 entrances to caves that have been gated in Oklahoma has unique physical characteristics of passage size, location of the nearest bat roost to the entrance, and number of entrances used by bats. Internal gates are placed such as to protect the nearest historical roost area to the cave entrance. Gate distances from cave entrances are 3-17 m. Passage areas where gates are located are 1.4-15 m<sup>2</sup>. Internal gate construction has been of horizontal angle-iron bars since the mid-1980s. This material and design seem to maximize protection from human entry, have nominal effects on airflow, and present limited obstruction to bat flight (White and Seginak, 1987). With the exception of a single cave that was gated before angle-iron gates became popular, all gates in Oklahoma caves are of the angle-iron design (Martin et al., 2000). These essential caves in eastern Oklahoma that serve as habitat for populations of endangered Ozark big-eared bats and gray bats require continued monitoring to ascertain the benefits of long-term protection from human disturbance. Additional caves are targeted for similar management plans to maintain and enhance their respective bat populations.

The objectives of this project are the identification of caves that are considered critical habitat for Ozark big-eared bat and gray bat colonies in northeastern Oklahoma. Management/protection plans for these caves are developed and implemented during the project year as funding and time allow. These management/protection plans are coordinated with the appropriate landowners and may include posting a warning sign at the cave entrance, placing human restrictive structures at or within the cave such as fencing around the cave entrance or constructing a gate/grill structure within the cave. Each cave is monitored to determine the effectiveness of the management plan, particularly gated caves, to determine the impact of the structure or other protection measures implemented at the site. As problems are identified with the cave protection plans, they are corrected.

#### SUMMARY OF PROGRESS:

The following is a description of caves and procedures that were involved in the project during the 2003 - 2004 project year.



- Gate Installation:

Cave DL-8 in Delaware County, Oklahoma, is privately owned by the City of Tulsa and is located on property bordering Eucha Lake. Ceiling stains in the cave indicate historical usage by populations of gray bats. Three species of bats were captured on a trapping effort on 15 August 2003. One northern long-eared myotis (*Myotis septentrionalis*), 7 eastern pipistrelles (*Pipistrellus subflavus*), and a single big brown bat (*Eptesicus fuscus*) were captured. Inspection of the cave interior indicated a small population of gray bats is using the cave as indicated by two guano piles. The size and accumulation of guano suggest the site is used as a pre-maternity or night-roost site, but not as a maternity cave. The cave's location in proximity to a camping area and major thoroughfare (Hwy 10) predispose the site for persistent human entry. Indications of human visitation and entry are excessive. A similar population of gray bats in a limited-use cave in Adair County, also with signs of historical habitation, has responded favorably within a short time after gating the cave passage and subsequently eliminating human entry. Additionally, a startling discovery of a population of >25 Ozark big-eared bats occurred in that cave in August 2003. These observations substantiate the importance of eliminating human disturbance not only at high priority maternity caves, but limited-use caves containing historical evidence of habitation by populations of endangered species of bats. Permission to place a human-restrictive gate within the passage of Cave DL-8 was granted by the City of Tulsa and a preliminary visit to the cave was made to develop plans for placement and construction of the internal gate/grill system in September 2003. The first phase of gate installation was completed on February 28, 2004 and subsequent phases of the gate installation were completed on June 1 and August 6, 2004. The project was completed on September 11, 2004. The internal gate system installed in cave DL-8 was the largest such system constructed since the initiation of this project in 1992.

- Population Estimates/Usage Monitoring: Gray bats

Guano measurements to establish population estimates for gray bats were conducted at six caves in eastern Oklahoma during the project year (Table 1). These caves are inhabited by maternity colonies of gray bats annually from April to November. Colonies in each cave are protected from human disturbance by internally placed gate/grill systems. Measuring guano accumulations for estimation of population sizes has taken place biannually since the gate systems were installed within their respective passages. Such estimates are used to verify continued use and to monitor fluctuations and trends in population sizes.

Table 1. Population estimates at six caves inhabited by gray bats in eastern Oklahoma.

CAVE	2003 POPULATION ESTIMATE
DL-92	17,932
AD-8	11,992
DL-91	30,047
OT-13	7,997
AD-7	18,965
DL-39	11,585

- Gate Repair:

During an annual inspection of the internal gate/grill system at cave DL-38 in Delaware County, Oklahoma it was apparent that the system had been vandalized and the lock had been removed. During a subsequent visit to the cave on December 31 the system was repaired and again locked. During a follow-up inspection of the system in June 2004, the door had been vandalized again and completely removed exposing the cave to human entry. The gate system will be repaired during the 2004-05 project year.

COOPERATORS:

Rogers State University  
1701 W. Will Rogers  
Claremore, OK 74017

Prepared By: \_\_\_\_\_

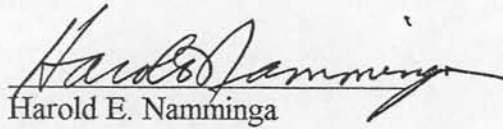
Keith W. Martin  
Assistant Professor of Biology  
Rogers State University

W.L. Puckette  
Instructor of Biology  
Poteau Public Schools

Date: December 3, 2004

Approved: Oklahoma Department of Wildlife Conservation

By: \_\_\_\_\_

  
Harold E. Namminga  
Federal Aid/Research Coordinator

LITERATURE CITED:

- American Society of Mammalogists. 1992. Guidelines for the protection of bat roosts. *Journal of Mammalogy* 73:707-710.
- Barbour, R.W. and W.H. Davis. 1969. *Bats of America*. University of Kentucky Press, Lexington, KY 286 pp.
- Clark, B.K., B.S. Clark, D.M. Leslie, Jr. and M.S. Gregory. 1996. Characteristics of caves used by the endangered Ozark big-eared bat. *Wildlife Society Bulletin* 24:8-14.
- Grigsby E.M., W.L. Puckette, and K.W. Martin. 1993. Comparative numbers of gray bats (*Myotis grisescens*) at six maternity caves in northeastern Oklahoma. *Proceedings of the Oklahoma Academy of Science* 73:35-38.
- Harvey, M.J., J.S. Altenbach, and T.L. Best. 1999. *Bats of the United States*. Arkansas Game and Fish Commission, Little Rock, AR 64 pp.
- Humphrey, S.R. 1978. Status, winter habitat, and management of the endangered Indiana bat (*Myotis sodalis*). *Florida Scientist* 41:65-76.
- Humphrey, S.R. and T.H. Kunz. 1976. Ecology of a Pleistocene Relic, the Western Big-eared Bat (*Plecotus townsendii*), in the Southern Great Plains. *Journal of Mammalogy* 57:470-494.
- Martin, K. W., W.L. Puckette, S.L. Hensley and D.M. Leslie, Jr.. 2000. Internal cave gating as a means of protecting cave-dwelling bat populations in eastern Oklahoma. *Proceedings of the Oklahoma Academy of Science* 80:133-137.
- Martin, K. W., D.M. Leslie, Jr., M. E. Payton, W.L. Puckette, and S.L. Hensley. 2003. Internal cave gating for protection of colonies of the endangered gray bat (*Myotis grisescens*). *Acta Chiropterologica* 5:143-150.
- McCracken, Gary F. 1989. Cave conservation: Special problems of bats. *National Speleological Society Bulletin* 51:49-51.
- Pierson, E.D. 1999. Tall trees, deep holes, and scarred landscapes: conservation biology of North American bats. Kunz T.H., P. Racey, editors. *Bat biology and conservation*. Smithsonian Institution Press, Washington, D.C. p. 309-325.
- Tuttle, M.D. 1977. Gating as a means of protecting cave dwelling bats. *Proceedings of the National Cave Management symposium*. Speleobooks, Albuquerque, NM p.77-82.

- Tuttle, M.D. 1979. Status; Causes of decline and management of endangered gray bats. Journal of Wildlife Management 43(1):1-17.
- Tuttle, M.D., and D.E. Stevenson. 1977. Variation in the cave environment and its biological implications. Proceedings of the National Cave Management Symposium. Speleobooks, Albuquerque, NM p. 108-120.
- U.S. Fish and Wildlife Service. 1983. A recovery plan for the Ozark Big-eared Bat and the Virginia Big-eared Bat. Twin Cities, MN 61 Pp.
- U.S. Fish and Wildlife Service. 1982. Gray Bat recovery plan. U.S. Fish and Wildlife Service, Washington, D.C. 94 Pp.
- U.S. Fish and Wildlife Service. 1995. Ozark Big-eared Bat Recovery Plan, Revised. Albuquerque, NM 80 Pp.
- White, D.H. and J.T. Seginak. 1987. Cave gate designs for use in protecting endangered bats. Wildlife Society Bulletin 15:445-449.

