PERFORMANCE REPORT

SECTION 6

ENDANGERED SPECIES ACT

OKLAHOMA
DEPARTMENT OF WILDLIFE CONSERVATION

FEDERAL AID PROJECT E-22-10

MANAGEMENT AND CAVE PROTECTION FOR THE
OZARK BIG-EARED BAT AND GRAY BAT IN OKLAHOMA

OCTOBER 1, 2002 - SEPTEMBER 30, 2003

PROJECT REPORT

STATE: Oklahoma PROJECT NUMBER: E-22-10

PROJECT PERIOD: 1 October 2002 – 30 September 2003

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

PROJECT OBJECTIVE:

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 one to three of these caves will be developed and implemented during the year as funding and time allow. These management/protection plans will be 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 will be monitored to determine the effectiveness of the management plan, particularly gated caves, 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:

At least 18 of the 45 species of bats found in North America rely substantially on caves throughout the year, and 13 use 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 in Oklahoma 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 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. Protection typically is accomplished by constructing gates at cave entrances, fencing cave entrances, placing warning signs at

entrances, and 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^2. 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 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 or placing human restrictive structures at or within the cave such as fencing around 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 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 are corrected.

PROCEDURES:

Proposed objectives listed below are designed to accomplish task B 1.6 and 1.7 of the 1993 Revised Ozark Big-eared Bat and Virginia Big-eared Bat Recovery Plan, and objectives 1, 1.2, 1.3.1, 3, and 3.2 of the 1982 Gray Bat recovery plan.

1. The current landowner of each site will be identified, and after determined, proposed plans for the specific site will be discussed and permission to implement those plans will be sought.
2. Determine the projected cost for the implementation of the recommended management plan.
3. Obtain approval of the proposed maintenance plan from all pertinent agencies including the Oklahoma Department of Wildlife Conservation Wildlife Diversity Program, the U.S. Fish and Wildlife Service and individual landowners of each site.
4. Upon approval of the maintenance plan for each site, the plan will then be implemented. Implementation of individual management plans will be determined on a priority basis. This priority will depend on the ability to effectively utilize available funds, in conjunction with the amount of human disturbance each site is receiving and the status of the population of Ozark big-eared bats or gray bats inhabiting the site.
5. Each site where structures are placed for protection will be monitored twice annually after installation. One inspection will be conducted during the uninhabited season to inspect the structure or structures for possible vandalism. An additional monitoring visit will take place while the bats are utilizing the site. These surveys will be conducted as exit counts at maternity sites using infrared lighting and night vision scopes. This type of survey accurately determines the population of Big-eared bats using the site and if the newly constructed structures are inhibiting the flight of the bats into and out of the site.
6. Reports of the progress of each management plan will be submitted to the Oklahoma Department of Wildlife Conservation Wildlife Diversity Program and the U.S. Fish and Wildlife Service. A final report will be submitted after the fifth project year. An annual performance report will be submitted at the end of each segment year.

- The following is a description of caves and procedures that were involved in the project during the 2002 - 2003 project year.

- Entrance Restoration:

Cave AD-14 is an expansive cave system located in Adair County. As many as 15 karst openings and entrances to the system have been identified by researchers. Ownership of

some entrances is private while others comprise a portion of the Ozark Plateau National Wildlife Refuge. Cave-dwelling species of bats that have been either observed, or captured at entrances to the system include Ozark Big-eared bats, Gray bats, Northern Long-eared bats, Eastern Pipistrelles, and even a single Red bat caught in 1997. The most prominent, and well-known entrance to the cave system is privately owned and was covered by a crudely constructed external grill over the entrance. An internal gate system was placed within the cave passage in 1998. Permission was sought to remove the obstructive external gate structure and was received in December 2002. It was suspected that the external gate served to impede flight into and out of the entrance by bats. In January 2003 the external gate system was removed to allow unrestricted flight to resident bat populations.

- Population Estimates/Usage Monitoring: Gray bats

Guano measurements to establish population estimates for gray bats were conducted at various caves in eastern Oklahoma during the project year. Caves AD-8, OT-13, DL-1, DL-91, DL-92 are inhabited my 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.

Cave CZ-9 located in extreme western Cherokee County houses a gray bat maternity colony. The colony is currently protected by an internal gate system and is estimated to number > 20,000 bats. The colony vacates the cave in late July – early August and it is not understood where the large population of female gray bats relocate. Two possible locations are caves CZ-18 and CZ-19 that are located < 2 km north of the maternity cave, but do not exhibit significant guano accumulations indicative of gray colonies. Another possibility are two caves located < 2 km west of the maternity cave in extreme western Wagoner County that have not been monitored since 1975. A monitoring visit was made to each of the caves during the project year. The larger of the two caves was WA-1. The cave has an extensive passage and evidence of historical use by black bears, and substantial guano remains indicating repeated use historically by gray bats. However, there appears to be no recent usage in spite of extensive ceiling stains and remnant accumulations of guano. It is anticipated that netting and trapping will be conducted at alternate sites to determine the status of the maternity colony upon late-summer break-up.

Shirley Springs Cave (AD-137) is located in Adair County, Oklahoma. The cave was monitored to determine present and past bat usage, and to make recommendations as to future management needs of the site. Within the 150-200' passage of cave there are four ceiling stains, two of which are located <75' from the entrance respectively. The largest aggregation of bats was located near the end of the cave passage and indicated past usage of <4000 individuals. The location of the cave within 2 miles of Barron Fork Creek indicates that it may have been an important roost cave within the migratory route that gray bats make from a large maternity cave in central Adair County, Oklahoma, and caves used for winter hibernacula in northern Arkansas. Substantial ceiling stains also give reason to believe that the cave was used throughout the year for extended periods of time by foraging bats, and it is

not impossible that the cave was used as a small maternity or bachelor colony during the summer months.

Two anthropogenic factors presently contribute to the limited use of the cave by bats at the present time. Human entry and disturbance at the site are evident by refuse inside the cave passage. Additionally, long-term maintenance of the county road and adjacent right-of-way has contributed to a slow filling, and subsequent restriction of the cave entrance. Both factors predispose the cave for limited or non-existent bat use at present. It is anticipated, and suggested that enlarging the cave entrance to historical proportions to allow for greater access for bats, and placing an internal gate system inside the cave passage to eliminate human entry will contribute to a more conducive habitat for re-colonization by cave-dwelling species of bats.

- Population Estimates/Usage Monitoring: Ozark big-eared bats

Populations of Ozark big-eared bats were monitored at caves AD-13, AD-14, AD-15, AD-16, and AD-19 in eastern Oklahoma during the project year. Each of these caves is protected by an internal gate system. Such visits are intended to monitor post-gating populations of bats. Additionally, caves AD-17 and AD-18 were monitored as well. These two caves are inhabited by small summer populations of Ozark big-eared bats that are not protected by any management effort, and are candidates for placement of internal gate systems. During winter inspections, all sites maintained small numbers of torpid big-eared bats, including single Ozark big-eared bats in caves AD-15 and AD-19. Substantial guano accumulations in cave AD-19 were indicative of summer gray bat usage (summer 2002) that was not documented prior to gating the cave in 1999. More importantly, a population of more than 200 Ozark big-eared bats was noted in this cave during in the summer 2003. Prior to installation of the gate/grill system in Cave AD-19, indications of human visitation and entry were excessive. It is apparent that populations of both endangered species have responded favorably within a short time after gating the cave passage and subsequently eliminating human entry. 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.

- Trapping Efforts:

Attempts were made to identify additional caves for management efforts that are inhabited by populations of endangered species of bats. Utilizing mist nets at cave entrances researchers can capture, identify, determine gender, reproductive condition, and then release all species of bats using the cave. These trapping efforts assist in prioritizing management procedures and ultimately maximize efforts to appropriately apply project funds. Trapping efforts at cave entrances in northeastern Oklahoma were conducted during summer 2003 at the following caves:

DL-21 is located in Delaware County, Oklahoma. The cave does not have a gated passage, but a fence was erected around the sinkhole entrance in 1991. The lock that was originally on the fence gate has been removed, and the cave is susceptible to human entry at the present

time. There are historical reports of a population of Ozark Big-eared bats at the cave prior to 1990. Mist nets were used to capture 11 Northern Long-eared bats (*Myotis septentrionalis*) and four Eastern Pipistrelles (Pipistrellus *subflavus*). All bats were caught attempting to enter the cave indicating that it is used as a roost site during nocturnal foraging. A combination of historical reports, apparent nocturnal use, and present human disturbance, indicates the cave warrants consideration for installation of an internal passage gate.

DL-3 is located in Delaware County, Oklahoma. The cave does not have a gated passage and is subject to excessive human disturbance at present. There are historical reports of limited use by small populations of endangered gray bats at the cave. Mist nets were used in an attempt to capture bats during the summer, but none were captured. It is suspected that continued recurrence of human disturbance at the cave contributes to the lack of use by bats.

AD-220 is located in Adair County, Oklahoma. The cave was gated with an internal gate system in April 2001 in an attempt to protect a hibernating population of Eastern Pipistrelles, and to encourage re-population by gray bats that have used the cave in the past. Only small numbers of Long-eared bats and Eastern Pipistrelles were trapped during summer mist-netting at the cave entrance, though the cave has housed >200 hibernating Eastern Pipistrelles as recently as the winter of 2002. Such monitoring efforts indicate that the cave is probably more suitable for hibernacula purposes rather than summer use.

AD-221 is located in Adair County, Oklahoma. Cave AD-221 does not have a gated passage and is subject to some human disturbance at present. There are historical reports of limited use by small numbers of endangered Ozark big-eared bats at the cave. Mist nets were used in an attempt to capture bats, but none were captured. It is suspected that continued recurrence of human disturbance at the cave contributes to the lack of use by bats.

AD-29, located in Adiar County, was gated with an internal gate system in February 2002 in an attempt to protect a small population of Ozark big-eared bats. A single big brown bat and two Eastern Pipistrelles were captured by mist nets during the summer of 2003. A single hibernating big-eared bat was noted in the cave passage in January 2003. Such monitoring efforts indicate that this cave is probably more suitable for hibernacula purposes rather than summer use.

DL-8 is located on City of Tulsa property near Lake Eucha. Ceiling stains in the cave indicate historical usage by populations of gray bats. Nine bats of three species were captured during summer mist netting - one northern long-eared myotis, 7 eastern pipistrelles, and a single big brown bat. Inspection of the cave's interior found two guano piles indicating that a small population of gray bats is using the cave. The size and accumulation of guano suggest that 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 and indications of human visitation are excessive.

- Gating Project:

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. A preliminary visit to the cave was made on 6 September to develop plans for placement and construction of the internal gate/grill system.

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