Project Title: Distribution of the Eastern Small-footed Bat (*Myotis leibii*) in the Ozark and Ouachita Mountains in Arkansas

Project Summary: The Eastern small-footed bat (*Myotis leibii*) is considered one of the rarest bat species in North America (Barbour and Davis 1969). It is the smallest of the *Myotis* species averaging three to six grams in weight. This species has been documented to roost in cracks and crevices within caves, on cliff faces, and under rocks (Johnson et al 2011, Whitby et al 2013, Confortin 2017). Due to the small size and roosting preferences for this species, *M. leibii* can be difficult to locate and few sizable populations are known. Most occurrence records and the largest populations for this species can be found in New York, Pennsylvania, Virginia, and West Virginia (NatureServe 2016). *M. leibii* is considered imperiled or critically imperiled throughout most of its' range which includes southeastern Canada and the eastern United States. It is listed as critically imperiled in Arkansas by the Arkansas Natural Heritage Commission (2015) and is considered a Species of Greatest Conservation Need by the Arkansas Game and Fish Commission (AGFC) (Anderson 2006). This species has been documented in seventeen out of seventy-five counties located in Arkansas (Saugey et al. 1993, Sasse et al 2013). Additional research is needed to further determine the distribution and relative abundance of this species in the state. The objective of the proposed project is to conduct intensive surveys to determine presence and distribution of *M. leibii* in the Ozark and Ouachita Mountains in western Arkansas, primarily at Ozark and Ouachita National Forests (NFs). The primary survey method will be intensive rock roost surveys conducted at rock outcrops, glades, and talus slope boulder fields within the NFs. Additional survey efforts will be conducted including abandoned building surveys, a minimum of ten bridge surveys, twenty-four mist net surveys, and a minimum of forty-eight acoustic surveys.

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Project Partners: None

Project Budget:
SWG (65%) - $63,373.05
DSEG (35% Match) - $34,123.95
Total - $97,497.00

State Wildlife Grant Proposal 2017

PROJECT STATEMENT

NEED:
The range of the eastern small-footed bat (*Myotis leibii)* includes southeastern Canada and portions of the eastern United States (U.S.). This species appears to be patchy in distribution with the majority of occurrence records and largest populations found in New York, Pennsylvania, Virginia, and West Virginia (Barbour and Davis 1969, Nature Serve 2016). *M. leibii* is considered one of the rarest bats in North America (Barbour and Davis 1969). Conservation status varies from vulnerable (S3) in some states to critically imperiled (S1) in others. It is listed as critically imperiled in Arkansas by the Arkansas Natural Heritage Commission (2015) and considered a Species of Greatest Conservation Need by the Arkansas Game and Fish Commission (AGFC) (Anderson 2006). This species has been documented in seventeen of seventy-five Arkansas counties (Saugey et al. 1993, Sasse et al 2013) and can be found roosting in cracks and crevices within caves, on cliff faces, and under rocks (Johnson et al 2011, Whitby et al 2013, Confortin 2017). Almost half of the occurrence records for this species in Arkansas are from caves (inside or at the entrance) (Sasse et al 2013). Cave surveys in the state are ongoing and provide valuable information regarding species diversity, distribution and relative abundance for many bat species in the state (Saugey, personal communication).

M. leibii is the smallest of the *Myotis* species averaging three to six grams in weight. Due to the small size and roosting preferences for this species, *M. leibii* can be difficult to locate and few sizable populations are known. Additional research is needed to further determine the distribution and relative abundance of this species in Arkansas. Mist net and roost surveys under rocks and bridges targeting *M. leibii,* as suggested in the proposed project, could provide valuable data for this species in Arkansas.

OBJECTIVE:
The objective of the proposed project is to conduct intensive surveys to determine presence and distribution of *M. leibii* in the Ozark and Ouachita Mountains in western Arkansas, primarily at Ozark and Ouachita National Forests (NFs). The primary survey method will be intensive rock roost surveys conducted at rock outcrops, glades, and talus slope boulder fields within the NFs. Additional survey efforts will be conducted including abandoned building surveys, a minimum of ten bridge surveys, twenty-four mist net surveys, and a minimum of forty-eight acoustic surveys.

LOCATION:
The majority of the occurrence records for *M. leibii* in Arkansas are documented in the Ozark Mountains in the northwest corner of the state (sixteen of the seventeen counties where this species has been documented). As a result, survey efforts will be conducted during the proposed project in the Ozark Mountains, primarily at Ozark NF. *M. leibii* has been captured at Mt. Magazine (Saugey, personal communication) which is located in the Ozark NF and will be one of the target sites for survey efforts during the proposed project (particularly during rock roost surveys). One occurrence record in Arkansas is documented in the Ouachita Mountains in Polk County (Saugey 1993). The AGFC has listed survey efforts for *M. leibii* in the Ouachita Mountains as a 2017 State Wildlife Grant (SWG) Funding Priority in the 2017 SWG Request for Proposals. As a result, surveys will also occur in the Ouachita Mountains, primarily at Ouachita

NF in Arkansas. Location modifications can be made to this survey effort based on AGFC priorities and communications.

APPROACH:

Roost Surveys

Rock Outcrops

The primary survey method used to locate *M. leibii* during the proposed project will be rock roost surveys. Utilizing satellite imagery and field surveys, exposed rock outcrops, glades, and talus slope boulder fields within the Ozark and Ouachita Mountains, primarily at Ozark and Ouachita NFs, will be identified and mapped. Rock outcrops, glades and talus slope boulder fields will be surveyed during the day by overturning loose rocks and examining cracks within the exposed bedrock and below boulders from May – September 2018 and 2019. A 1 million candle power spotlight will be used to observe bats. If bats or evidence of bats (i.e. guano) are observed, roost survey forms will be completed documenting roost location (including latitude and longitude coordinates using a GPS personal navigator [Garmin GPS eTrex, Forestry Suppliers]), rock height, length, and width, number of individuals, percent of vegetation around rock, percent of area dry under rock and percent of debris under rock. Surrounding dominant tree species and habitat type will be documented and pictures taken. Habitat type will be determined using descriptions from the Arkansas Wildlife Action Plan.

Attempts will be made to capture bats under rocks by hand. Upon capture, bats will be identified to species and sex. Reproductive status (pregnant, lactating, or scrotal) will be derived using methods described by Kunz (1988). Age class will be estimated by pelage color (Jones and Suttkus 1975) and degree of ossification of epiphyseal caps on phalanges of fingers (Kunz 1988). Weight, using a spring scale (30g. Pesola Micro-Line), and forearm length, using a plastic dial caliper (Forestry Suppliers) will be determined. Protocols outlined by U.S. Fish and Wildlife Service (FWS) to reduce the risk of spreading white-nose syndrome (WNS) (which is a disease that has killed over six million bats since it was documented in 2006 [FWS 2015]) through contaminated survey gear or field clothes will be strictly followed. This includes, but is not limited to, using disposable gloves and discarding after each bat is handled and sterilizing calipers after each use.

Bridge Surveys

Bridge locations on Ozark and Ouachita NFs will be identified and mapped through consultation with the Forest Service (FS) and field surveys. The underside of concrete bridges will be surveyed during the day with particular attention given to guardrail crevices and bridge expansion joints since *M. leibii* has been documented to utilize these areas (Feldhamer et al 2003, Libby 2011). If bats or evidence of bats (i.e. wall staining or guano) are observed, roost survey forms will be filled out documenting roost location (including GPS coordinates), dimensions, species composition, number of individuals, location of bats in roost, and position in relation to one another. Photos will be taken and surrounding habitat type will be documented. FWS WNS decontamination protocols will be strictly followed.

Attempts will be made to capture *M. leibii* individuals under bridges by hand or by using a hand net. If captured, species, sex, reproductive status, weight, and forearm length (standard measurements) utilizing the methods described above in the Rock Outcrop Section will be

recorded.

Abandoned Buildings

Abandoned buildings at Ozark and Ouachita NFs will be located and mapped through consultation with the FS and field surveys. Abandoned buildings located will be surveyed during the day. If bats or evidence of bats are observed, roost survey forms will be filled out including building location (including GPS coordinates), building dimensions, number of rooms, species composition, number of individuals, location of bats in roost, position in relation to one another, and occupied room dimensions. Attempts will be made to capture bats utilizing hand nets and standard measurements as described above in the Rock Outcrop Section will be recorded. Photos will be taken and surrounding habitat will be documented. FWS WNS decontamination protocols will be strictly followed.

Mist Net Surveys

To obtain data regarding presence and distribution of *M. leibii* in the Ozark and Ouachita Mountains in Arkansas, twenty-four mist net surveys will be conducted at a minimum of fifteen different sites (number of sites will be dependent upon the number of suitable sites located) from May – September, 2018 and 2019. Intensive reconnaissance surveys using topographic/aerial maps and field surveys will be conducted from May - September 2018 and 2019 to locate suitable mist net sites. Water bodies, gravel or dirt roads, forested trails or other potential flyways will be surveyed for mist net survey suitability and mapped using a GPS. An emphasis will be placed on upland trails and ridgeline roads since capture success for *M. leibii* will likely be higher in these areas (Saugey, personal communication). Maps of all suitable sites located will be provided to AGFC in the Final Report.

Suitable areas located will be surveyed using mist nets (6 -18 m. length, 30 mm mesh, Avinet) with nets opened fifteen minutes before sunset and remaining open four hours after sunset. A minimum of two to four nets will be used per site and will be placed above waterways, dirt roads/trails, particularly in upland ridgeline sites, or other potential flyways. Nets will be checked every ten minutes for captured bats, or as often as deemed necessary given the capture rate at each site. FWS WNS decontamination protocols will be strictly followed during survey efforts. This includes, but is not limited to, boiling mist nets after use and using disposable gloves and processing bags and discarding both after each bat capture.

Standard measurements as described above will be obtained for each bat captured. Location of capture using a GPS will be recorded. Dominant tree species will be documented and habitat pictures taken. Habitat type will be determined using descriptions from the Arkansas Wildlife Action Plan. Diagrams and pictures of the net set-up will be drawn and taken. The Final Report will provide maps of all mist net sites surveyed in addition to maps of all suitable sites located during reconnaissance surveys at Ozark and Ouachita NFs which can be used for future survey efforts that may occur.

Acoustic Surveys

Acoustic detection will be utilized to obtain additional information regarding presence and distribution of *M. leibii* and other bat species at Ozark and Ouachita NFs. Intensive reconnaissance surveys using topographic/aerial maps and field surveys will be conducted at the

NFs from May – August, 2018 and 2019 to locate suitable acoustic sites. GPS coordinates will be recorded for each suitable site. Maps of all sites surveyed will be provided in the Final Report. Two AnaBat SD2 CF Bat Detectors (Titley Electronics) will be used over twenty-four nights at a minimum of fifteen different locations each (for a total of forty-eight surveys at a minimum of thirty different sites) from May – September, 2018 and 2019.

Each Anabat will be placed in weather-proof housing and strapped to a tree with the microphone facing open water, gravel or dirt road, forested trail or other potential flyway. An emphasis will be placed on sites with upland trails and ridgeline roads. One Anabat will be deployed at the mist net site and the other Anabat will be deployed at a different location. One acoustic survey will consist of one night of recording by one AnaBat. A detailed habitat characterization will be completed at each acoustic site. Acoustic forms will be completed including survey times, habitat data and a diagram of the set-up. Pictures and GPS coordinates will be obtained at each site. Memory cards with acoustic recordings will be downloaded into a laptop computer. Using AnaLook (Titley Electronics) and BCID software (Bat Call Identification, Inc.), sonar calls will be analyzed to identify bat presence or absence, relative activity at each site, and species.

EXPECTED RESULTS OR BENEFITS:

Rock roost surveys have been found to be a very successful method for locating *M. leibii*. For example, surveys conducted at Shawnee NF in southern Illinois in 2011 by Whitby et al (2013) discovered twenty-nine individuals under loose rocks at exposed rock outcrops. Johnson et al (2011) tracked ten *M. leibii* to fifty-seven day roosts utilizing radio telemetry in 2008 in the Appalachian Ridge and Valley in West Virginia with fifty-three of the roosts located under rocks at talus slopes and rock fields. Bridge surveys have also been shown to be a successful survey method for this species. A maternal roost of *M. leibii* containing forty-six individuals was observed by Libby et al (2004) in 2003 in Tennessee. Libby (2011) also found *M. leibii* utilizing eight bridges in West Virginia in 2010. The proposed rock and bridge roost survey efforts should provide valuable data regarding distribution and presence of *M. leibii* in Arkansas.

Mist net surveys and acoustic surveys from the proposed project should also provide important data regarding presence and distribution of *M. leibii* in Arkansas in addition to providing data regarding other bat species in the Ozark and Ouachita Mountains. Deep South Eco Group (DSEG) conducted surveys in the summer of 2016 for AGFC targeting the northern long-eared bat (*M. septentrionalis*) in the northern half of Arkansas. During that study, one *M. septentrionalis,* four individuals of the endangered gray bat (*M. grisescens*), and two silver-haired bats (*Lasionycteris noctivagans*), which are designated as vulnerable (S3) in Arkansas, were captured during mist net surveys. Acoustic surveys yielded calls identified as *M. septentrionalis, M. grisescens, L. noctivagans,* and the Indiana bat (*M. sodalis*). Future mist net and acoustic surveys, like those proposed in this project, could yield substantial distribution results for additional rare bat species in Arkansas.

BUDGET

Total - $97,497 ($79,376 for personnel and $18,121 for travel) ($63,373.05 SWG and $34,123.95 DSEG). A detailed budget break-down will be made available upon request. Project scope including number of surveys can be modified at the request of AGFC for Agency budgetary or other reasons.

KEY PERSONNEL QUALIFICATIONS AND EXPERIENCE

Deep South Eco Group (DSEG) was founded in 2006 however employees have been doing bat work since 2002. DSEG has been contracted to conduct dozens of intensive 1 – 4 year bat surveys involving mist net, acoustic, harp trap, telemetry, and roost surveys for many government agencies and private companies including: Mississippi Army National Guard, Bat Conservation International, U.S. Army Corp of Engineers, U.S. Fish and Wildlife Service (FWS), U.S National Park Service, Mississippi Department of Wildlife, Fisheries, and Parks, Louisiana Department of Wildlife and Fisheries, and Arkansas Game and Fish Commission. DSEG were paid consultants in 2011 for the National Geographic Channel for a three part mini-series on the Mississippi River. Projects conducted by DSEG have involved the capture of thousands of bats at many different locations throughout Mississippi, Louisiana, and Arkansas. DSEG has received State Wildlife Grant (SWG) funding for two projects in Louisiana from the Louisiana Department of Wildlife, Fisheries, and Parks. The first project was titled, "Bat Surveys in Louisiana with an Emphasis on the Big Brown Bat (*Eptesicus fuscus*), Northern Long-eared Bat (*Myotis septentrionalis*), and Silver-haired Bat (*Lasionycteris noctivagans*)" which was conducted from July 2012 – August 2013 and consisted of sixteen mist net surveys, fifty-eight acoustic surveys, fifty-one bridge surveys, and six culvert surveys. The second Louisiana SWG project was titled, "Bat Surveys in Louisiana with an Emphasis on the Northern Long-eared Bat (*Myotis septentrionalis*)" and was conducted from May 2014 – August 2015. Twelve mist net surveys, one-hundred and thirty acoustic surveys, ninety-one bridge surveys, and fours culvert surveys were conducted. Final Reports for these surveys are available upon request. Projects conducted by DSEG in 2016 included completion of a two year project for FWS targeting *M. septentrionalis* and the Indiana bat (*M. sodalis)* in the northern half of Mississippi, completion of a one year project for Arkansas Game and Fish Commission (AGFC) targeting *M. septentrionalis* on six public lands in the northern half of Arkansas, and completion of a one year project for the Mississippi Army National Guard examining bat species diversity, relative abundance and distribution on Camp McCain Training Site. Intensive surveys for all three projects included mist net, acoustic, and bridge surveys. The project for AGFC was titled, "Bat Distribution on State-Owned Land in Arkansas" and consisted of twenty-seven mist net surveys, fifty-four acoustic surveys, and two bridge surveys. The Final Report is available upon request. DSEG employees attended the Southeastern Bat Diversity Network Annual Bat Blitzes which occurred in Ouachita National Forest in both 2003 and 2005. DSEG has Federal Endangered Species Permits for *M. septentrionalis* and *M. sodalis* and Scientific Collection Permits in Mississippi, Louisiana, and Arkansas.

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