

HOME RANGE AND HABITAT USE OF PLAINS SPOTTED SKUNKS IN THE OZARK MOUNTAINS OF ARKANSAS

Project Summary:

The plains spotted skunk (*Spilogale putorius interrupta*), a poorly studied carnivore of central North America, is currently being evaluated by the U.S. Fish and Wildlife Service for potential listing under the Endangered Species Act. Ongoing habitat restoration efforts in the Ozark-St. Francis National Forest seek to reestablish parcels of oak woodlands, but it is unclear if these restoration efforts will be compatible with habitat needs of this secretive mammal. This study seeks to utilize new GPS-based technology to provide unmatched detail on movements, home range, habitat selection, and resource utilization of the species in the Ozark Mountains of Arkansas. Some objectives of this investigation include: determine home range and movement data on male and female spotted skunks within or near oak woodland restoration plots as well as in unaltered habitat; identify characteristics of den sites; determine if oak woodland restoration is compatible with spotted skunks; and generate occupancy models for spotted skunks in the Ozark Mountains.

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Project Budget:

SWG Amount Requested	\$163,390
Tennessee Tech University Match	<u>\$ 87,982</u>
Total Project Costs	\$251,372

Project Statement (pages 2-4)

- a. Need – The plains spotted skunk (*Spilogale putorius interrupta*) is a subspecies of the eastern spotted skunk. Eastern spotted skunks were once relatively common but have suffered range-wide population declines as evidenced by trapping harvest data. The significant population declines coupled with a poor understanding of the life history of the species has led to the inclusion of the species as a species of greatest conservation need in many State Wildlife Action Plans, including in Arkansas. Additionally, enough evidence has been presented regarding the decline of the plains spotted skunk that it has been petitioned to the U.S. Fish and Wildlife Service (USFWS) for listing as threatened or endangered, and the USFWS agreed in its 90-day finding (December 2012) that the species may warrant listing, and it is currently under review for listing. The most extensive modern research with the species was conducted in the Ouachita Mountains of southwestern Arkansas (Ouachita National Forest, hereafter Ouachita NF) and provided a wealth of information about the activity and habitat use of the species in that setting. However, the management priorities of the Ouachita NF includes activities designed to enhance habitat for the federally-endangered red-cockaded woodpecker (RCW). Since the RCW is not present in the more northern sections of the Ozark-St. Francis NF (hereafter Ozark NF), different management priorities exist. Specifically, there is an interest in determining whether large-scale oak woodland restoration projects currently underway in the Ozark NF will be compatible with the needs of the plains spotted skunk.
- b. Purpose and Objectives – The purpose of this investigation will be to describe home range and habitat use of plains spotted skunks in the Ozark NF. The objectives will include: (1) Determine annual and seasonal home range sizes of both male and female plains spotted skunks in typical forest habitat within the Ozark NF, (2) determine annual and seasonal home range sizes of male and female spotted skunks within or near oak woodland restoration areas of the Ozark NF, (3) describe habitat characteristics of areas utilized by spotted skunks and compare those to available habitats to determine if habitat selection is occurring, (4) identify the characteristics of den sites used by spotted skunks, (5) describe movement patterns of spotted skunks relative to seasonality, resource availability, and climatic conditions, (6) determine if oak woodland restoration efforts appear to be compatible with resource needs or preferences of spotted skunks, (7) compare home range and habitat use of spotted skunks in the Ozark NF to existing spotted skunk data from the Ouachita NF, and (8) generate an occupancy model for the plains spotted skunk in the Ozark NF.
- c. Location – Two study locations are proposed. One study location would be within the Ozark NF in the general area of Newton, Searcy, or Pope Counties. The other study location would be within the Ozark NF in Baxter or Stone Counties. Actual study locations would be determined based on consultation with AGFC and personnel of the Ozark NF so that appropriate locations are chosen that will include oak woodland restoration areas as well as non-restoration areas (at least for the duration of the project). All study areas are located within the Boston Mountains or Ozark Highlands ecoregions. Effort would be equally split between the two study sites. The use of two study sites will allow the study of independent populations and will allow one study site to be placed within a habitat context with significant oak woodlands restoration efforts, while the other site will be designed to avoid restoration areas if possible. A map is provided with this proposal showing the approximate location of the proposed study areas (Fig. 1).

d. Approach – This study will rely on the use of GPS collars to gather location information on eastern spotted skunks. Trail cameras will be deployed at the beginning of the study at multiple locations within Ozark NF in an attempt to help identify locations where spotted skunks are present. This information can help improve the placement of live traps to increase trapping effectiveness as well as providing additional locality information which can be used in the construction of occupancy models. Live trapping efforts will commence in November or December 2015. Captured skunks will be fitted with G10 GPS loggers (Advanced Telemetry Systems, Isanti, MN, USA) affixed to collars along with integrated VHF transmitters. These collars utilize a relatively new GPS technology known as GPS Snapshot Positioning. This technology allows much faster satellite detection than traditional techniques and allows for vastly improved battery life. With proper setup the GPS collars will last for the full duration of the study before needing battery replacement. If possible collars will be affixed to equal numbers of male and female skunks and effort will also be split between the two study areas. Because collars must be retrieved for GPS data to be downloaded, some animals may be recaptured near den locations early in the study to verify proper function of GPS loggers. The integrated VHF transmitters will allow relocation of skunks so that collars can be removed or swapped as appropriate. GPS loggers will be set to allow data collection every 30 minutes. This will permit collection of a significant amount of location data points for each animal with greater accuracy than traditional radio-telemetry based triangulation, and with less total effort by field personnel. VHF transmitters will also be used to periodically locate den or resting sites so that characteristics of those habitat features can be measured. A borescope will also be used at den sites to investigate den occupancy, including whether additional uncollared skunks (including kits) are present.

Livetraps will be baited with canned cat food, sardines, or similar, and will be checked daily for the presence of trapped animals. All nontarget species will be immediately released. Captured spotted skunks will be anesthetized with a mixture of ketamine HCl and acepromazine maleate. Upon capture standard demographic data will be collected including gender, age class, size, and mass. GPS collars will be affixed to selected animals. PIT tags will be implanted subcutaneously to serve as permanent markers, thus eliminating problems associated with ear tags.

Newly collared skunks will be located daily for a period of one week, if possible, during daylight hours to ensure that collars have not been lost. Following this initial time period, animals will be located approximately once weekly via standard VHF radiotelemetry techniques to document den selection as well as to look for collars that may have been lost or to document skunk mortality.

Dataloggers will be used to collect ambient temperature data which can be compared to activity patterns based on GPS data from collared animals. Dataloggers may also be placed in selected den sites to gather thermal data inside dens.

Live capture efforts will be focused during the winter months because previous studies have shown the highest detection and trapping probabilities during that time. Summer trapping will only be used to deploy available GPS collars, and traps would then likely be placed at den sites where uncollared skunks are known to be present.

GPS collar data may be periodically downloaded from retrieved collars. As locations become available (from GPS collars or from identified den locations), field work will be conducted to evaluate the habitat conditions (especially the vegetative community) within the animals' home range. Additionally, GIS analyses will enable evaluation of additional features including measures of patch size, elevation, slope, distance to water and to edge, and similar features.

To further improve our understanding of the suitability of oak woodland restoration sites for use by spotted skunks, vegetation data will be collected in restoration sites of various ages. Food availability (see below) will also be examined in these restoration plots.

Because spotted skunks are omnivores with a large proportion of their diet comprised of insect prey, efforts will also be taken to evaluate the relative abundance of prey as well as to determine the diet of skunks. Skunk diets will be evaluated via examination of scats as well as from the stomach contents of any skunks found dead. Prey (insect) availability will be evaluated by using pitfall traps to sample ground-dwelling insects. The relative abundance of small mammals may also be evaluated via live-trapping or with track plates.

The expected timeline is as follows:

October 2015-March 2016: Deploy game cameras

November 2015-March 2016: Capture skunks and deploy collars

November 2015-September 2016: Locate marked skunks weekly during daylight hours

December 2016 – Preliminary report summarizing year 1 research

May 2016-August 2016: Vegetative data collection

November 2016-March 2017: Capture skunks and deploy collars as necessary

May 2017-August 2017: Vegetative data collection

30 September 2017: Cease field data collection

December 2017: Preliminary report summarizing years 1 and 2 research

May 2018: Final report submission

- e. Expected Results and Benefits – The use of GPS loggers will allow collection of more locations and more accurate location data for individual spotted skunks than in any other study. The quality of this data, combined with information about habitat characteristics and food availability within skunks’ home ranges and in control stands and oak woodland restoration stands will help evaluate the potential impacts of oak woodland restoration projects on spotted skunks in the Ozark NF. This study should also provide the most thorough data to date regarding seasonal activity patterns of plains spotted skunks. The generated occupancy model will also help evaluate where spotted skunks may be expected to occur, thus helping inform future management or research activities.
- f. Budget – A summary budget is presented below. A more detailed budget is presented separately.

Category	AGFC	TTU
Personnel	62,798	27,440
Benefits	5,456	263
Tuition and Fees		12,747
Travel	21,150	
Supplies	59,132	
Total Direct Costs	148,536	40,450
Indirect Costs @ 10%	14,854	
Indirect Costs Cost Share @42% - 10%		47,532
Total	163,390	87,982

Qualifications.

Dr. Brian Carver has been studying mid-sized mammalian carnivores for more than 15 years including research for both his master's and doctoral degree programs. He has many years of experience live-trapping mesocarnivores and deploying radio-telemetry collars on animals including raccoons, Virginia opossums, and striped skunks. Dr. Carver's dissertation examined the ecology of co-occurring populations of raccoons and Virginia opossums. Dr. Carver currently has a graduate student studying the distribution and ecology of eastern spotted skunks on portions of the Cumberland Plateau in Tennessee, and this research (which is still in its early stages) has been successful at locating spotted skunks via the use of game cameras.

Dr. Robert Kissell has extensive experience working with a variety of mammal species as well as considerable experience working with GIS. He has experience conducting research on large and medium-sized mammals, directing and conducting distributional surveys, estimating population size using various techniques, and modeling spatial distribution and resource selection. He currently has a project in Arkansas examining the distribution and status of another mustelid, the long-tailed weasel. In Arkansas, he has also directed graduate students in the study of the relative abundance of swamp rabbits, relative abundance of furbearers, and provided habitat modeling for selected species. In addition to final reports and numerous presentations, he has produced peer-reviewed publications in regional, national, and international journals for each study he has undertaken.

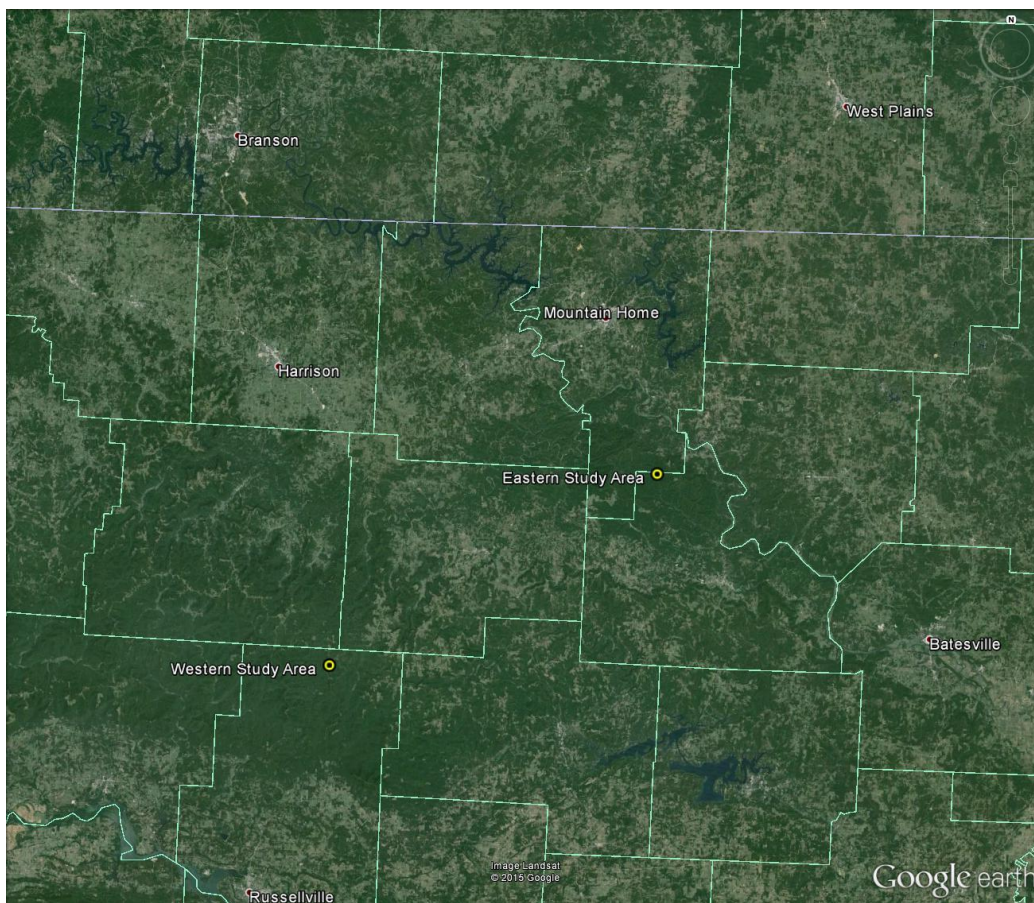


Figure 1. Proposed locations for a study of plains spotted skunk home range and habitat use in the Ozark Mountains of Arkansas, 2015-2017.