WILDLIFE RESTORATION GRANT PROJECT REPORT—INDIANA
Examining Urban and Rural White-tailed Deer: Mortality, Dispersal, and Relatedness

One of our field technicians carefully fastens a radio collar to a 3-year-old doe in the city of Bloomington. The collar allows our team to monitor the location of the doe at any time of the day. (photo by Teddy Fisher)

CURRENT STATUS
First of a three-year project

FUNDING SOURCES AND PARTNERS
Wildlife Restoration Program (W48R1)
Ball State University–Muncie
Western Michigan University

PROJECT PERSONNEL
Dr. Tim Carter, Ball State University–Muncie
Dr. Maarten Vonhof, Western Michigan University–Kalamazoo
M.S. candidate Jonathan Trudeau, Ball State University–Muncie
M.S. candidate Garrett Clevinger, Ball State University–Muncie

BACKGROUND AND OBJECTIVES
State management agencies face challenges in managing growing white-tailed deer (WTD) *(Odocoileus virginianus)* populations in suburban and urban areas, which may serve as sanctuaries due to hunting restrictions, limited access and fragmented land ownership. In these areas, growing WTD populations can elevate conflict levels with the public in areas of cohabitation. In contrast, similar experiences are rarely seen in rural areas where public hunting is available. Previous studies have found deer in suburban landscapes have smaller home ranges and higher survival rates than deer in rural areas. However, little is known of the potential relationship(s) between WTD that occupy adjacent suburban and rural environments and their resulting influence on population dynamics. It is unknown if suburban deer disperse into adjacent rural areas or remain near their natal range. Likewise, it is not known if rural deer move into suburban areas where hunting is greatly reduced. Knowledge of movement patterns and survival of WTD in both environments could allow managers to make policy recommendations

White-tailed deer equipped with GPS collars, like the one on this young buck spotted chasing a doe during mating season, collect a new location approximately every eight hours, giving an in-depth look at how white-tailed deer move across the landscape. (photo by Jonathan Trudeau)

to resolve conflicts and better understand population growth in both rural and suburban settings. As urban deer conflicts become more commonplace, knowledge of potential population growth and dispersal in both urban and rural areas will help establish management priorities and actions in each type of area.

The objectives of this project are to:

1. determine the mortality rates of adult urban and rural deer,
2. determine the cause of mortality of adult urban and rural deer,
3. determine the dispersal rates and distances traveled of adult urban and rural deer,
4. examine the daily movements and habitat selection of adult urban and rural deer,
5. determine home range size of adult urban and rural deer, and
6. evaluate genetic relatedness in urban and rural deer to help understand their long-term movement patterns.

METHODS

We have been using a wide variety of techniques to capture WTD to equip them with a global positioning system (GPS) or very high frequency (VHF) radio collar to monitor their movements and survival. We have used a drop net and dart projectors—in conjunction with a VHF transmitter dart, and clover traps—to capture WTD. We intend to use a suspended net gun during the 2016 field season. We sedate WTD with a compound of butorphanol, azaperone and medetomidine (BAM-2), and use naltrexone and atipamezole to reverse the anesthetic effects once handling and processing is completed. While the deer are sedated, heart rate, respiratory rate and body temperature will be recorded every five minutes from the time full anesthesia is reached. Age will be estimated based on dental characteristics, and small tissue samples will also be collected from each WTD before reversal. All deer caught and anesthetized will be reversed and released at the site of capture. Fawns will be located using foot searches and contact from the public. Fawns in rural areas will be equipped with an expandable VHF collar, but only male fawns in urban areas will be equipped with collars. Fawn collars will be put out to increase searcher efficiency of

adult male WTD in urban areas. The fawns that were collared will be targeted as yearlings the next year and will be recaptured to be fitted with an adult collar. All capture and handling methods will adhere to methods approved by the Institutional Animal Care and Use Committee at Ball State University.

Movements and space use will be monitored using location data collected from the GPS and VHF collars. The GPS collars will collect three locations each day: the first and last will be during peak activity (5 am, 7 pm) whereas the third will be collected during less active periods in the middle of the day (noon). Movements of deer equipped with VHF collars will be monitored using radio-telemetry to estimate locations two to four times a week for two years. Locations will not be estimated fewer than 48 hours apart. When possible, locations will be collected by "homing-in" on the radioed deer using a vehicle mounted with a five-element Yagi antenna and telemetry receiver. When a visual on the deer is established, the location will be recorded using a handheld GPS. If we are unable to confirm a visual location, we will estimate the deer's location using standard radio tracking procedures.

Each collar is equipped with a four-hour movement sensor to determine if a deer is active. If a collar emits an inactive (mortality) signal, a crew member will investigate and locate the deer to determine cause of the specific mortality or to recover the collar, if dropped. The GPS collars are set to eight-hour movement sensors due to software issues that were causing false mortality signals. All GPS-collared WTD are constantly monitored for mortality signals, VHF deer are monitored two to four times a week. Fawns are monitored for survival once every two weeks.

Tissue samples will be collected from captured deer as well as hunter-harvested deer across Indiana to determine relatedness. Genetic markers will be analyzed in each sample to determine how related the WTD are within the city of Bloomington and the surrounding rural areas. This will add another source of information about the movement and breeding patterns of deer across the urban-rural gradient. This will help determine how open or closed a population may be.

PROGRESS TO DATE

A total of 23 adult deer were successfully sedated and collared from April 16, 2015 through July 27, 2015. Additionally, 28 fawns were equipped with expandable VHF collars between May 20, 2015 and June 15, 2015. Fifteen adult WTD were trapped using a drop net (urban=14, rural=1), and nine were sedated remotely using a dart projector (rural=6, urban=3). Two deer were removed from analysis, one due to a capture-related mortality and another because the deer dropped its collar a week after capture. One deer was anesthetized using a combination of telazol, ketamine and xylazine; the remaining 22 deer were anesthetized using BAM-2. All sedatives were administered intramuscularly. Of the 21 deer left from the 2015 field season, 17 were equipped with GPS collars, and four have VHF collars.

Preliminary results indicate a fair amount of home-range overlap between deer in adjacent urban and and rural areas. Yearling males have displayed pre-rut movements of up to 8.5 miles before returning to their natal home range. Our data also show individuals travel among development types (urban, suburban, exurban, rural). This may suggest that the localized population is operating as an open population. Most seasonal movements are still being collected. To date, 5,751 locations have been collected on 17 GPS-collared deer, and 81 locations have been collected on four VHF-collared deer. Six mortalities of radioed WTD have occurred since Sept. 5, 2015. Causes of mortality include vehicle collisions (2), legal harvest (1), entanglement in a fence (1), and undetermined (2).

COST: $873,293 FOR THE COMPLETE THREE-YEAR PROJECT