SHORT-TERM RESPONSE OF TIMBER RATTLESNAKES TO TIMBER MANAGEMENT IN INDIANA

Learning how timber rattlesnakes use clear-cuts and other timber harvest treatments can provide information for management prescriptions for this endangered species and potentially other forest reptiles.

Current Status

Third year of a four-year project
(Jan. 1, 2009–Dec. 31, 2012)

Funding Sources and Partners

State Wildlife Grant (T07R08), Purdue University, DNR Nongame Fund

Project Personnel

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Researchers glue a temperature sensor to the tails of rattlesnakes to assess hibernation temperatures in harvested and unharvested units. Even though timber rattlesnakes in Indiana spend more than half of their lives hibernating underground, little is known about their hibernation ecology. The head and portion of the body of each snake fits within a plastic tube (held by technician, Andy Mueller, on the left side of the picture) for safe handling.

Background and Objectives

Timber rattlesnakes *(Crotalus horridus)* are endangered in Indiana. Their distribution is restricted to primarily large forest patches with suitable den sites in the south-central part of the state. Timber harvesting is a common practice on Indiana forestlands that can potentially change timber rattlesnake habitat. The type of harvesting method, the time of year it is done, and its location relative to critical timber rattlesnake areas (e.g., hibernation sites) can affect the practice's level of impact to timber rattlesnakes. Learning how timber harvesting affects rattlesnake behavior and habitat use provides information necessary to minimize or avoid such impacts.

The objectives of this project are to:

1. Measure the home range, movements and habitat use of timber rattlesnakes on managed forests.
2. Assess the short-term impacts of timber harvesting on timber rattlesnakes' movement and habitat use.
3. Estimate timber rattlesnake adult annual survivorship during the active and hibernal seasons.
4. Assess den characteristics during the hibernal period.

Methods

The study sites are located on Morgan-Monroe and Yellowwood state forests and are part of the Hardwood Ecosystem Experiment (HEEForestStudy.org). We randomly assigned one of three treatment control sites: (a) where no timber harvesting takes place, (b) that are uneven-aged, where some trees are harvested, and (c) that are even-aged, where trees are harvested in 10-acre clear cuts. We studied movements and habitat use of timber rattlesnakes to assess how those may change (either positively or negatively) in areas where trees are harvested.

Timber rattlesnakes are hard to find, even in areas where they may be relatively common. They blend with their environment and spend most of their time motion-

less in thick cover. For this project, rattlesnakes were located by actively searching for them or opportunistically finding them while driving or conducting other work. Upon finding a snake, trained technicians marked the location coordinates; measured, weighed, determined its sex; and marked it using a PIT tag, which is a device similar to what veterinarians use to mark dogs and cats.

We used radio telemetry to relocate, three times per week, 40 snakes throughout their active season (April–October). Purdue University veterinarians surgically implanted small transmitters (about the size of an AA battery) within each of these snakes. Habitat measurements for one location (and random point) per week per snake were collected during part of the summer. We organize and analyze the data while the snakes are underground during winter.

Progress

Throughout the 2009 to 2011 field seasons (May through October), we tracked 44 snakes (21 males and 23 females) around seven core units. These totaled more than 5,150 locations. In addition, we measured habitat data at more than 1,100 points during summer. Multiple years of data collection are required to account for environmental variability that occurs from year to year; however, this information will help us map the areas each snake uses during the year and assess what habitat features they use in their environment. Many snakes remained almost exclusively on core units of study; however, many snakes wandered far (1-2 km) from units, which is normal, especially for large males looking for mates during mid- to late summer.

An animal's home range, the space it uses in a given year, is a common metric for estimating and comparing wildlife use among different areas or habitats. If timber harvesting changes how rattlesnakes use their environment, we would expect to see differences in home-range size or a shift in the location of home ranges after harvesting occurs. From before timber harvesting (2007 and 2008) to post-harvest (2009-2010), timber rattlesnake home range did not vary among years or between timber harvest treatment areas and control sites. Home range overlap between years (a measure of home range shift) did not vary between treatments or sex.

How animals survive is ultimately one of the most important aspects of wildlife ecology. The three years of telemetry data we collected will allow us to estimate annual survival of rattlesnakes during both the active season and hibernation. Causes of rattlesnake mortality over the past three years include predation by raptors, vehicles on roads, and human persecution. These data can be compared among units to test if survival of snakes differs in areas that trees are harvested versus unharvested areas.

Timber rattlesnakes spend over half their lives underground in hibernation. In fall 2011 we started assessing den-site use in terms of temperature. We glued small temperature sensors to the tail of each rattlesnake and buried the same devices at known depths at harvested and unharvested sites in the study area to assess how harvesting trees may influence den site suitability in terms of temperature.

A major challenge of the project is working in a large, remote area. A major portion of our expense is vehicle maintenance and gas. For example, our farthest study sites are more than 17 miles away from each other as the crow flies, and vehicle access on most areas is limited. Thus, getting from site to site takes significant time, as does walking around on a site.

Radio telemetry is another costly but necessary aspect to this project. Without the assistance of radio transmitters, it would be impossible to relocate snakes throughout the year. Snakes must be relocated on a regular basis to assess the size of area they use, length of movements, and the type of habitat structure they use within a year or between years. Doing telemetry in hilly, rocky areas with a lot of trees takes a lot of time and money. Each transmitter costs about $300. The battery lasts one to three years, depending on size. There are also costs for the receivers ($900-$2,000 each) used to track the snakes, surgeries to implant the telemetry transmitters, and high-sensitivity GPS units to estimate locations.

The largest expense for the project is labor. A total of 12 undergraduate students and eight recent college graduates have worked on the project during the first three years. This offers each valuable experience in the design and application of wildlife field research while helping them gain full-time employment or admission into graduate school. Timber rattlesnakes are the focus of this project, but it also directly benefits the education and careers of many students.

Cost: $321,924 for total four-year project