

# RESEARCH SPOTLIGHT

## Project Information

**REPORT NAME:** Eastern Massasauga Rattlesnake (*Sistrurus catenatus*) Detection and Space Use Near Roads in the Southern Lower Peninsula of Michigan, USA

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**COST SHARING:** 20% MDOT, 80% FHWA through the SPR, Part II, Program

## MDOT Project Manager

### Jeff Grabarkiewicz

Wildlife Ecologist  
MDOT Environmental Services  
Section

[GrabarkiewiczJ@Michigan.gov](mailto:GrabarkiewiczJ@Michigan.gov)  
517-335-2633

### RESEARCH ADVISORY PANEL MEMBERS:

Carla Ahlschwede, Kelsey Alvarado, Bob Batt, Amy Bleisch, Keith Brown, André Clover, Shaughn Galloway, Kim Hill, Michelle Kane, Dean Kanitz, Rachael LaTourneau, Mike O'Malley, Jason Pittman, Dave Schuen, Kristin Wildman, and Harold Zweng.

## Eastern massasauga rattlesnake's use of roadside space in southern Michigan

The eastern massasauga rattlesnake (EMR) is a rare species protected under the federal Endangered Species Act. Its behavior and space use within major road corridors are essentially unknown. Maintenance activities in the right of way (ROW) could potentially harm the species, but identifying the presence of snakes in roadside areas can be challenging. New survey methods and a better understanding of EMR behavior within the ROW can help manage and conserve the species while saving considerable effort toward environmental compliance.

### PROBLEM

The Michigan Department of Transportation (MDOT) works to protect threatened and endangered species, including the EMR, which the U.S. Fish and Wildlife Service (USFWS) listed as threatened under the federal Endangered Species Act in 2016. Although Michigan's Lower Peninsula is a stronghold for the species nationally, habitat loss and road-related harm are persistent threats. Local, state and federal roads intersect a substantial portion of the snake's Michigan habitat. The combination of low amounts of tree shade, abundant sun exposure and ground vegetation typical of some ROW areas creates habitat suitable for EMR.

An agreement between MDOT, USFWS and the Federal Highway Administration

(FHWA) outlines EMR conservation and management goals, including minimizing ROW construction and maintenance impacts on the species. Certain avoidance or mitigation measures are required before MDOT can



New survey techniques will support conservation of a threatened snake species and maintenance scheduling.

*“We understand far more about EMR behavior, which will improve our ability to search for the snake during surveys and refine MDOT’s right of way practices in southern Michigan. These results will support the conservation of a rare species and target our efforts where they are needed most.”*

**Jeff Grabarkiewicz**  
Wildlife Ecologist

perform work in an area unless the agency can document that an EMR population does not occupy the site or that individuals receive adequate protection.

Pinpointing where EMR exist and how they behave can be difficult as they are cryptic, relatively sedentary for most of the year, well camouflaged, and use burrows under the ground or hide in dense vegetation. To avoid impacts on EMR from construction, mowing, herbicide application, and water management projects, MDOT needed reliable, cost-effective and easily implemented survey methods and a better understanding of EMR behavior in roadside areas.

## RESEARCH

To devise a survey method that MDOT could use to confidently determine whether EMR occupy ROW areas, researchers sought to identify environmental and temporal conditions that would result in a greater probability of EMR being visible. Two ROW sites were chosen for this effort based on favorable habitat characteristics and anecdotal reports of EMR. Detailed surveys conducted over three summers gathered air temperature recordings and other information, and also captured snakes to examine and tag them with high frequency radio

transmitters. After releasing the snakes, researchers recaptured them and monitored snake behavior, including body exposure when visible and burrow use.

Next, hypothesizing that EMR are not vulnerable year-round because they hibernate near marshy areas, researchers explored the snake’s seasonal use of roadsides and conditions that impacted use. Two sites contained known EMR habitat and were regularly maintained by mowing and herbicide application. Surveys conducted within 300 meters of the road’s edge included identifying vegetation and canopy cover, and measuring air and ground temperatures. Snakes were again captured, tagged and released, and their behavior in the ROW was monitored.

## RESULTS

The most predictive condition that EMR would be visible during a survey was an ambient temperature of 30 degrees Celsius (86 degrees Fahrenheit). However, the most effective time to survey is April through early June, when temperatures may not be optimal but vegetation is less developed. Multiple repeat surveys of an area are recommended to reliably determine that the species is not occupying a site.

Vegetation types, continuous habitat from roadsides to wetlands and soil temperatures are important variables to consider when evaluating the snake’s ROW space use. Higher ground temperatures near roads indicated a likely reason EMR use ROW space.

At one site with continuous habitat between the ROW and adjacent wetlands, female EMR were found in the roadside during gestation and birthing. Documenting a nursery site adjacent to the road was a significant finding. The other site had less EMR ROW activity, potentially due to thicker brush along the ROW edge, more shade and lower ground temperatures.

## IMPLEMENTATION

Project results are already informing MDOT ROW mowing activities. Understanding

how seasons, temperatures and vegetation impact the species’ use of roadsides can support both maintenance scheduling and species conservation. In addition, the research results are being incorporated into best management practices that are part of a statewide programmatic agreement between MDOT, USFWS and FHWA.

Regional differences in EMR behavior have been documented in other studies, thus these project results only apply to southern Michigan. Future research could explore Michigan’s northern EMR population and behavior. Also, additional research could determine how EMR behave where roads transect bodies of water or streams to inform MDOT management of culverts or other infrastructure.

## Research Administration

### Principal Investigators

**Gary Roloff, Ph.D., and Henry (Rique) Campa, Ph.D.**

Professors  
Department of Fisheries and Wildlife  
Michigan State University  
480 Wilson Road, Room 13  
East Lansing, MI 48824

[roloff@msu.edu](mailto:roloff@msu.edu), 517-525-3461  
[campa@msu.edu](mailto:campa@msu.edu)

### Contact Us

PHONE: 517-281-4004

E-MAIL: [MDOT-Research@Michigan.gov](mailto:MDOT-Research@Michigan.gov)

WEBSITE: [Michigan.gov/MDOTResearch](http://Michigan.gov/MDOTResearch)

**The final report is available online at**

[MDOTjboss.state.mi.us/TSSD/tssdResearchAdminDetails.htm?keyword=SPR-1726](http://MDOTjboss.state.mi.us/TSSD/tssdResearchAdminDetails.htm?keyword=SPR-1726).

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