

Eastern Massasauga Rattlesnake: Life History, Ecology & Conservation in Michigan



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December 8, 2016

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Forma AD-475-C (revista 9/2006)

MNFI's Mission

“To guide the
conservation of
Michigan's biodiversity
by providing the highest
quality scientific
expertise and
information.”



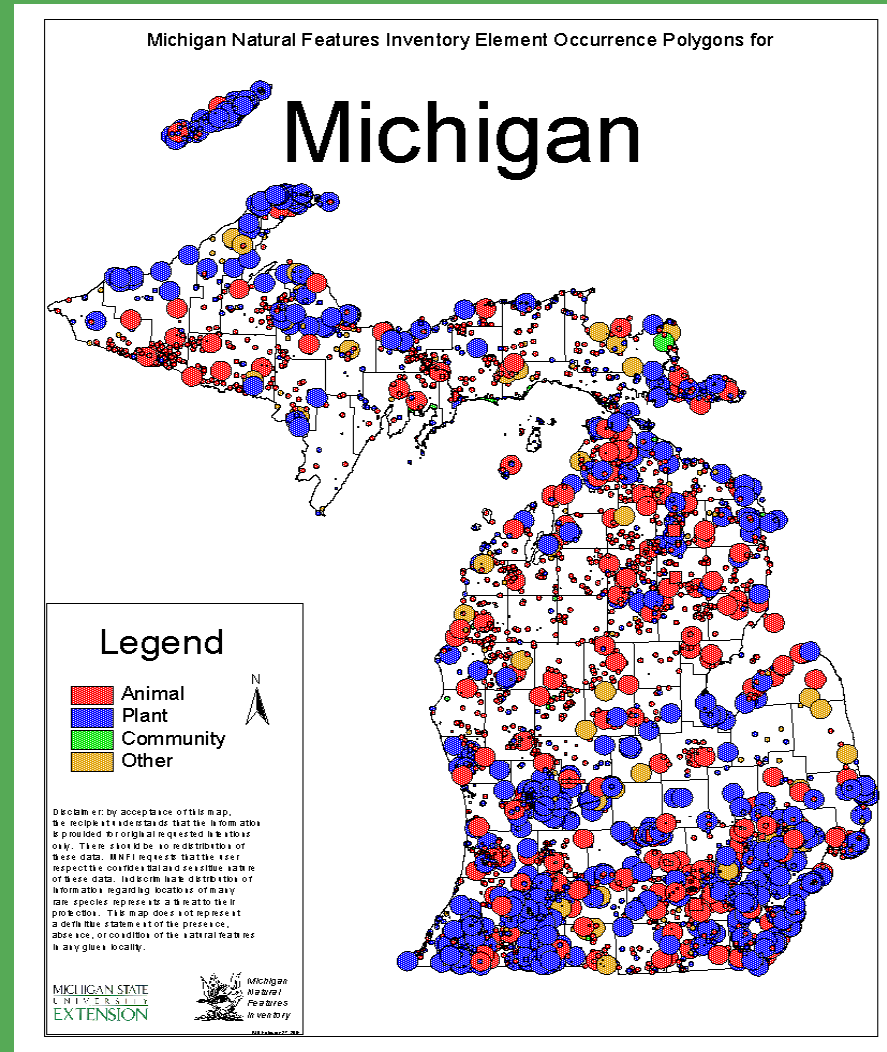
What does MNFI do?

- Collect and provide information on :
 - Rare, T & E plant and animal species and natural communities in MI
 - Status & Distribution
 - Ecology
 - Threats
 - Management / conservation actions



Statewide Natural Heritage Database

- The *single-most comprehensive* GIS-based database of endangered, threatened and special concern species, and rare natural communities in Michigan
- Over 800 elements
- Over 18,000 element occurrences
- Value added analysis and interpretation of data



Eastern Massasauga (EMR) (*Sistrurus catenatus*)



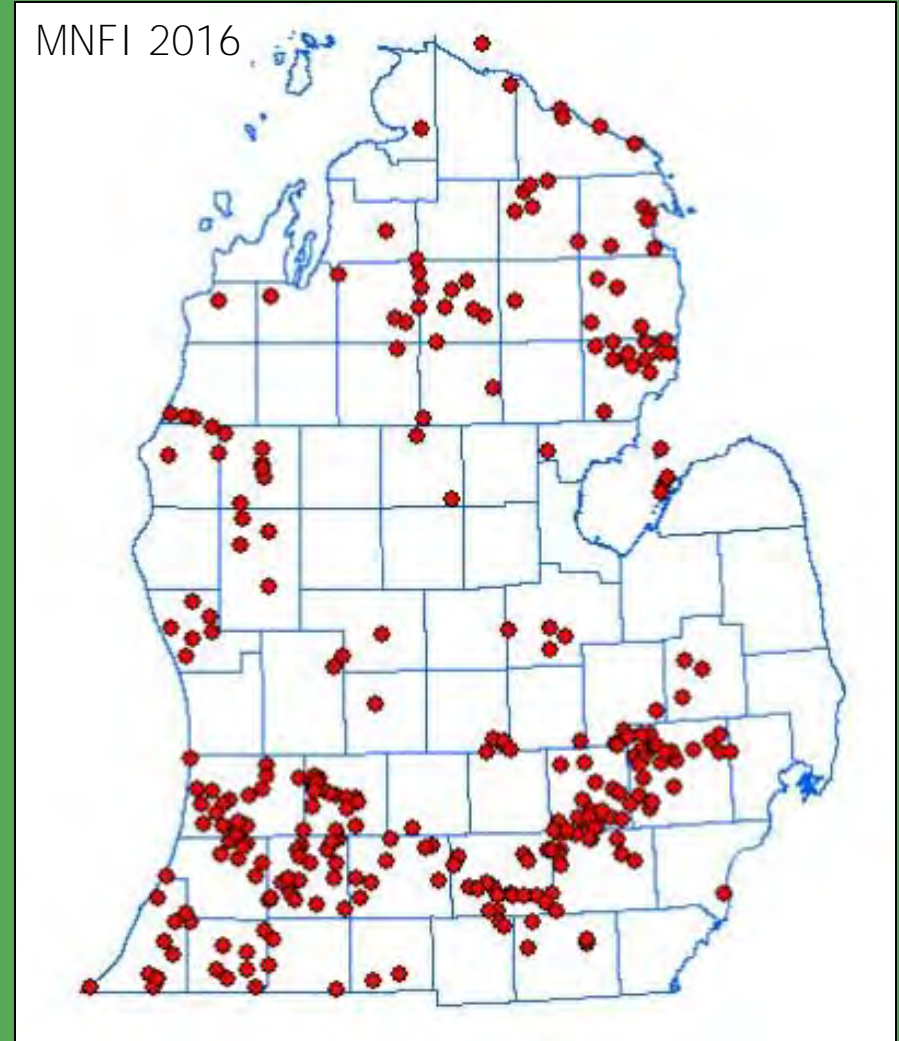
Joseph Sage, IPFW

- 1992 - Special Concern in MI
- 1993 - Protected under DNR Director's Order
- 1999 - Federal Candidate
- 2016 - Federally Threatened



EMR Status & Distribution in MI

- MI Status Assessment 1994-1996:
 - 204 occurrences
 - 40 secure
 - 40-50 extirpated
 - 78 vulnerable
- 2016 – 285 occurrences
 - 65 “secure” (A/B rank)
 - 74 historical / extirpated
 - 116 vulnerable





**** Only
venomous
snake in MI!**



Massasauga Rattle



EMR Look-alike Snakes



Gray [Black] Rat Snake



Wetland Habitats



- Fens
- Wet meadows
- Wet prairies
- Bogs
- Emergent marsh
- Northern shrub thickets
- Forested swamps

Upland Habitats

- Open & forested uplands
- Adjacent to wetlands
- Foraging, gestation/giving birth, dispersal



A Year in the Life of a Massasauga in MI

- Active - April to October
 - Spring emergence
 - April (late March - early May)
 - Soil temp inversion
 - Basking & feeding
 - Disperse/migrate to summer activity areas (200 – 600 m away, Marshall et al. 2006)



Massasauga Diet / Prey



Photo By Michael Redmer

- Small mammals – voles, shrews, mice
- Also small snakes, birds, frogs, lizards



J.N. Stuart / Zipcode Zoo

Reproduction



- Give birth to “live” young in late Jul – early Sept
- Open uplands & wetlands
- In wood, burrows & open
- Brood size – 2-19, average = 9

Massasauga Hunting Strategy



- Ambush predator
- Venom used to kill and digest prey
- Specialized digestive enzymes that disrupt blood flow and prevent clotting

Hibernation / Overwintering



- Oct/Nov to Mar/April
 - Fall migration back to hibernacula – Sept/Oct
 - Burrows, root networks, etc.
 - Upland/wetland transition zone
 - In water / below frost line
 - Hibernates singly, sometimes with other EMRs or species

Home Range / Movements



- S. MI – Avg 3 to 7 acres (1.3 to 2.8 ha) (Sage 2005, Moore & Gillingham 2006, Bissell 2006)
- N. MI – Avg 41 acres (16.7 ha) (DeGregorio et al. 2011)
- Not territorial
- Roads as barriers

Additional Information



- Site fidelity
- Longevity – 20 yrs in captivity, in wild - 10-15 yrs???
- Need high adult (60-70%) & juvenile (50-65%) survival for sustainability (Reinert 1981)
- Cryptic, non-aggressive
- Snakebites do occur, but are rare / infrequent.

Threats in Michigan



- Habitat loss/degradation
- Habitat fragmentation
- Inappropriate management
- Road mortality and barriers
- Intentional killing
- Illegal collection
- Climate change
- Snake fungal disease (2015)



Massasauga Conservation in MI

- Federal ESA protection - 2016
- Eastern Massasauga Candidate Conservation Agreement with Assurances
- Michigan Massasauga Conservation Plan
- Surveys and monitoring
- Research
- Habitat management / restoration
- Education and outreach



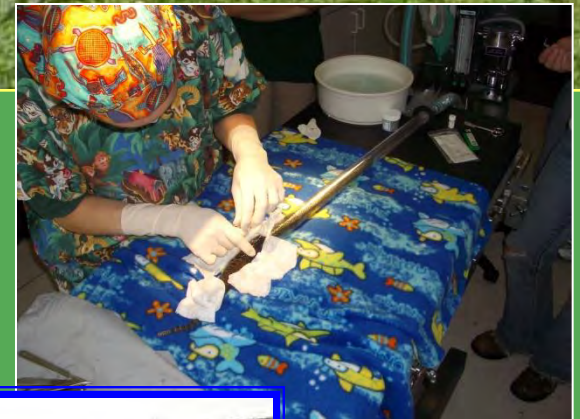
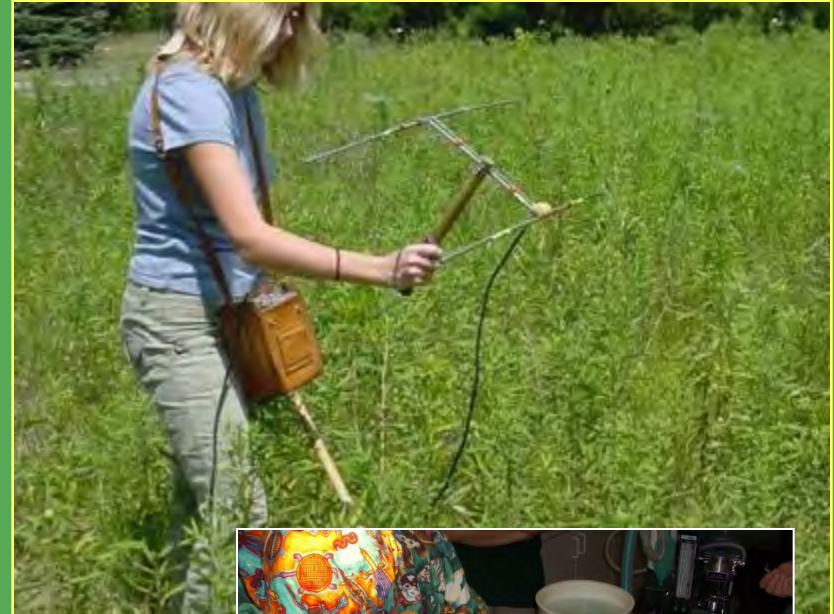
Surveys & Monitoring

- Assess status, distribution, and trends statewide
 - Presence/absence/occupancy, relative abundance?, trend over time – declining, stable, increasing?
 - Report sightings to MNFI/MDNR &/or Herp Atlas!
- Intensively monitor subset of populations
 - ELF, PCCI (IRF, MBG, Grayling?)
- Identify viable/core populations
 - Most important sites to protect and manage
- Evaluate effectiveness of management / conservation actions – still working on this!

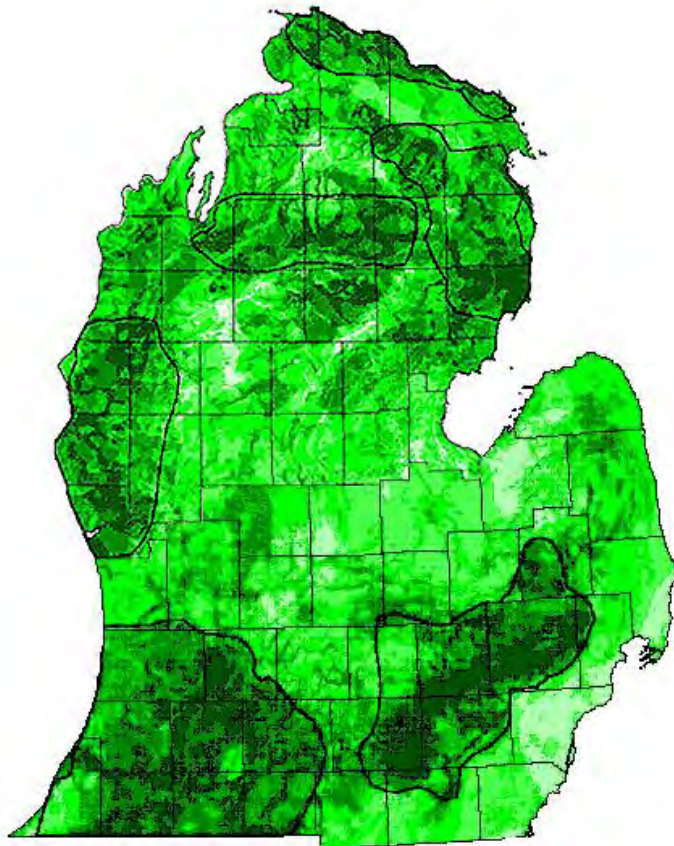


Eastern Massasauga Research

- Habitat use & home range/ movements – IPFW - Kingsbury, MSU - Campa & their students
- Management impacts – CMU - Gillingham, MSU - Campa, IPFW - Kingsbury
- Headstarting - IPFW - Kingsbury
- Overwintering/Emergence – IPFW – Kingsbury
- Survival – MSU – Campa, Bissell & Bailey



GIS-Based Habitat Modelling



- Kingsbury and Standora, IPFW
 - 2001-2002
- Boolean model
 - 290 snake occurrences
 - 7 habitat variables related to climate, geology, hydrology, topography and vegetation (presettlement)
- Eric McCluskey – OSU – 2016, Maxent habitat model

Population Genetics



Julie Oakes/MDNR

- Gibbs et al. 1997 - 5 pops. in ONT, NY, OH
 - Pops. significantly different < 50 km apart (subpops. < 2 km apart)
 - Suggest low gene flow & genetic isolation naturally
- Swanson & Kropiewnicki 2007 - 12 pops. in 10 cos. in MI (3 in NLP, 4 in SW, 5 in SE)
 - Stable, less isolated than Gibbs et al.
 - Larger metapopulations - “stepping stone” migration
 - Regional differences
 - Some inbreeding

Habitat Management / Restoration

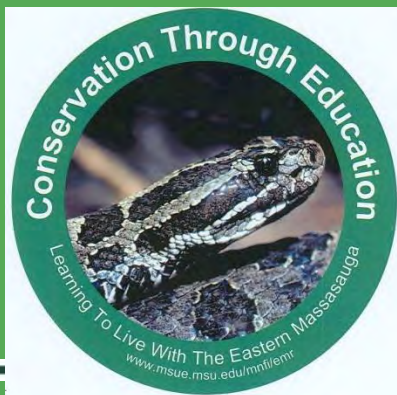
- Maintain suitable habitat for all life stages
 - Maintain open habitat with cover
 - Maintain hydrology
- Maintain connectivity between habitats and populations
- Minimize adverse impacts
- Monitor, evaluate and adapt management



Education and Outreach



- SE and SW MI
- Modelled after Ontario
- Multiple partners
- Multiple objectives
 - Public attitude assessment
 - Education and outreach materials
 - Training DVD



Massasauga Website

www.msue.msu.edu/mnfi/emr

Michigan Natural Features Inventory

Eastern Massasauga Rattlesnake
Sistrurus catenatus catenatus

Introducing the Massasauga

Identification & Look-Alike snakes

Life History & Ecology

Resources

Workshops

Snake Safety Tips & Snake Bite Treatment

Report an Observation

Research & Conservation Efforts

Contacts

Massasauga Links

The eastern massasauga rattlesnake (*Sistrurus catenatus catenatus*) is a unique and fascinating part of Michigan's natural heritage. It is Michigan's only venomous snake, and one of only two rattlesnake species that occur in the Great Lakes region. It is a small to medium-sized snake, with adult lengths averaging 2 to 3 feet. The eastern massasauga is primarily associated with wetland habitats but some populations also utilize adjacent upland habitats for parts of its life history. Although it's venomous, the massasauga is a timid snake. It prefers to avoid detection by hiding under vegetation, woody debris or other cover or remaining motionless and relying on its cryptic coloration. When it is disturbed or encountered in open habitat, the massasauga prefers to move to a more hidden location. Most people in Michigan may never even see a massasauga in the wild because of its secretive behavior. The massasauga also appears to have strong site fidelity, often returning to the same hibernation site or area each year. Studies to date also have found that massasaugas were not able to survive the winter when moved to a new area outside their home range presumably because they were not able to find suitable hibernation sites.

Michigan appears to be the last stronghold for this species with most massasauga populations currently found in one state or province within the species' range. Thus, the eastern massasauga's long-term viability in Michigan has important implications for this species' persistence range-wide. However, Michigan's massasauga population also has declined. The primary reasons for the massasauga's decline in Michigan and range-wide are habitat loss and fragmentation, human persecution or indiscriminate killing, and illegal collection.

The purpose of this website is to help increase public knowledge and awareness of the eastern massasauga in Michigan by providing comprehensive information about this often misunderstood species as well as additional resources and contacts where further assistance can be obtained. This website also is designed to help facilitate and coordinate ongoing massasauga education and outreach efforts in the state by providing educational resources and a forum for disseminating consistent, accurate and up-to-date information about the massasauga. The ultimate goal of this website is to provide people with the knowledge and skills they need to make an informed decision about how they can safely co-exist with the eastern massasauga. We hope that this effort will help keep Michigan's citizens safe and help ensure that the eastern massasauga remains a vital part of Michigan's rich natural heritage for future generations.

STATUS

An assessment of the eastern massasauga's status in Michigan was conducted from 1994 to 1995. At that time, about 200 occurrences of the eastern massasauga had been documented from 50 counties in the state. The status assessment reported that the massasauga population in Michigan had declined with about 20-25% of the known occurrences in the state considered to be extirpated and another 30% of the known occurrences considered to be vulnerable or declining. Only 20% of the known occurrences in the state were considered to be secure, and the status of about 18% of the occurrences was unknown. Recent surveys conducted from 2003-2004 have documented eastern massasaugas from at least 79 sites in 27 counties. However, the current status and long-term viability of most of these populations remain unknown.

As a result of its decline in the state, the eastern massasauga has been designated a species of special concern. Special concern status indicates that the species is sufficiently rare or uncommon or has undergone a serious decline in the state such that it could become threatened in the foreseeable future.

In Michigan, as a species of special concern, the eastern massasauga is protected under a special Director of Natural Resources' order. Director's Order No. 293-366-06, Regulations on the Take of Reptiles and Amphibians (in accordance with sections 3(1) and (2), chapter 1, Act 165 of the Public Acts of 1929, as amended, being sections 302.1(1) and 302.1(2) of the Michigan Consolidated Laws). The Director's Order states that it is unlawful to kill, take, trap, possess, buy, sell, offer to buy or sell, barter, or attempt to take, trap, possess or barter an eastern massasauga from the wild except as authorized under a permit from the director. The Michigan Department of Natural Resources' Fisheries Division can be contacted for more information about this regulation and associated permits.

State Status: Special Concern
Federal Status: Candidate Species

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Identification

- Gray or grayish brown with dark blotches edged in white and spots down back and sides
- 18.5-30 inches long; record 39.5 inches long
- Belly blackish, not patterned
- Heavy-bodied; often found coiled
- Gives birth to live young

• Pit on each side of head between eye and nostril

• Cat-like pupils

• Wide, triangular head

• Distinct segmented rattle

• Tail thick, squarish; does not taper to a point like all other snakes in Michigan

• Does not always rattle a warning; relies on pattern and remaining motionless to go undetected

• Scales keeled; anal scale single

Audio and Video of the Massasauga

Video clip of the eastern massasauga (avi format, 2MB)

Michigan Natural Features Inventory

Look-Alike Snakes

Other snakes found in Michigan look similar to the eastern massasauga. WB snakes and fox snakes do not have a rattle, but imitate the massasauga by vibrating their tails on the ground. Northern water and eastern hognose snakes have a scale pattern similar to that of the massasauga.

Eastern milk snake

- 24-36 in; record 52 in
- Light gray or tan with brown or reddish-brown, black-bordered blotches running down back
- Young similar to adults but blotches brighter red
- Often Y- or A-shaped light marking on top of head
- Belly white with black checkered pattern
- Scales smooth; anal scale single
- Lays eggs

Eastern fox snake

- Western subspecies in SE corner Peninsula only; western subspecies in Upper Peninsula only
- 38-54 in; record 70.5 in
- Yellowish to light brown with black or dark brown blotches; head reddish or orange
- Belly yellow with black checkered pattern
- Scales slightly keeled; anal scale double
- Lays eggs
- Western hybridizes with State Threatened

Eastern hog nose

- 30-55 in; record 45.5 in
- Most have dark spots/blotches on yellowish, reddish or brown background, but some solid black, brown or olive
- When threatened, spreads neck to display two prominent black spots on neck and head; may hum and play dead
- Injury-tolerant
- Flat head with unmarked snout
- Belly yellow-gray with greenish gray pattern
- Scales keeled; anal scale double
- Lays eggs

Northern water snake

- 24-40 in; record 55 in
- Light brown with dark brown or blackish blotches; scale individual gray appears uniformly black
- Belly cream with irregular rows of reddish or blackish half moon patterns
- Usually found in or near water
- Scales keeled; anal scale double
- Gives birth to live young

Take-home Messages

- ❖ Massasaugas and suitable habitat appear to still be relatively abundant in Michigan.
- ❖ Number of populations on public or protected lands.
- ❖ Status and long-term viability of most populations remain unknown. Continued decline?....
- ❖ Continued surveys/monitoring, research, and outreach are warranted.
- ❖ Conservation of Eastern Massasaugas in Michigan is critical to conservation of this species rangewide!



Acknowledgements

Funding provided by:

- U. S. Fish and Wildlife Service
- Michigan Department of Natural Resources
- U. S. Environmental Protection Agency

Field and project assistance generously provided by:

- MNFI: Kristin, Wildman, Eric Tobin, Audrey DeRose-Wilson, Nancy Dickson, Seth Gallagher, Mike Sanders, Matt Smar, Matt Gates, Peter Badra, Mike Monfils, Dave Cuthrell, Jennifer Olson, Edwin Abbey, Nathan Herbert, Ryne Rutherford, Andrea Feldpausch, Vic Bogosian, Kevin Allen, Rebecca Rogers, Kile Kucher, Joe Sage, Sean Zera, Sue Ridge, Lyn Scrimger, Connie Brinson, and volunteers and landowners
- Michigan Department of Natural Resources staff
- U. S. Forest Service Huron-Manistee National Forest staff
- U.S. Fish and Wildlife Service East Lansing Field Office
- IPFW, PCCI, GVSU, and many volunteers and others



Questions?



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