



Species Action Plan: Eastern Massasauga (*Sistrurus catenatus catenatus*)

Purpose: This plan provides an initial five year blueprint for the actions needed to attain near-term and, ultimately, long-term goals for the conservation and recovery of the eastern massasauga. The action plan is a living document and will be updated as needed to reflect progress toward those goals and to incorporate new information as it becomes available.

Goals: The immediate goal is to maintain the extant populations of eastern massasauaga in the Commonwealth and to protect its remaining habitat. The secondary goal is to enhance extant populations by improving and increasing local habitat. The long-term recovery goal is to increase viable, reproducing populations in extant and historic locations with the possibility of removal of the species from the Pennsylvania list of endangered species (58 Pa. Code §75.1).

Natural History

Taxonomy: Class Reptilia, Order Squamata (lizards and snakes), Family Viperidae (pit vipers), Eastern Massasauga (*Sistrurus catenatus catenatus*) (Figure 1.)



Figure 1. Eastern Massasauga (*Sistrurus catenatus*). Photo-Charlie Eichelberger.

Description: A small, stout-bodied rattlesnake. The body is patterned with a series of large, dark brown, mid-dorsal blotches and two to three rows of lateral blotches set upon a light gray or tan ground color. The tail has three to six dark cross-bands. The venter is typically black. Neonates have the same pattern and coloration as adults, with the exception of the neonate exhibiting a yellow tip at the proximate end of the tail. At birth, *S. c. catenatus* average 23.6 cm in total length (Reinert, 1981) and have a single rattle segment (button) at the tip of their tail. One additional segment is added to the base of the rattle with each molting. It is common for older (posterior) segments of the rattle to break off, and rattles rarely consist of more than 12 segments. The small rattle sounds like the buzz of an insect and is barely audible beyond 5 m. Pennsylvania adult's average 55-60 cm in total length and males average greater lengths than females. The largest of 72



Pennsylvania specimens examined by Reinert (1978) was a male measuring 70.1 cm.

Habitat: Throughout their range, massasaugas are associated with a wide variety of habitats including bedrock, peat forests, wetlands and prairie grasslands. Pennsylvania populations are found in fields of forbs and low-growing grasses having an open canopy and spotty distribution of woody shrubs. Habitat is consistently found in proximity to wetland areas which provide hibernacula habitat where the eastern massasauga overwinters for five to six months annually.

Hibernacula consist of any burrow or fissure that reaches the water table (Reinert, 1978; Reinert and Kodrich, 1982). Crayfish burrows are commonly utilized in areas where these organisms co-inhabit (Maple, 1968; Reinert and Kodrich, 1982; Seigel, 1986).

Life History: Emergence from hibernation occurs between late March and early April. Snakes rapidly move from the wetlands to surrounding old field and prairie habitats during the six to seven month active period. The return to wetland hibernacula occurs in mid to late October (Reinert, 1978; Reinert and Kodrich, 1978). The diet of adult *S. c. catenatus* consists predominantly of rodents (Keenlyne and Beer, 1973), although diets in neonates are made up of amphibians and juvenile snakes (Reinert, pers. comm.).

Massasauga mating has been observed in late July and August (Reinert, 1981; Johnson, 1995). Females store sperm and ovulation occurs after emergence from hibernation the following spring (Aldridge, *et al.*, 2005). Parturition occurs in August or early September. In Pennsylvania and throughout most of the geographic range, females produce broods once every two years (Reinert, 1981; Seigel, 1986; Goldberg and Holycross, 1999). Maturity may be reached in two to three years (Reinert, 1978) in Pennsylvania and the total lifespan may exceed 20 years (Snider and Bowler, 1992).



Distribution and Status

National Distribution: The range of *S. c. catenatus* extends from central New York and western Pennsylvania westward through Ohio, southwestern Ontario, Michigan, Indiana, Illinois, southern Wisconsin, extreme southeastern Minnesota and eastern Iowa to central Missouri (Ernst and Ernst, 2003) (Figure 2).

Pennsylvania Distribution: In Pennsylvania, extant populations are currently known to exist at only four sites in Butler, Venango, and Mercer Counties (Figure 3). The present distribution is significantly reduced from the former range which once extended from Armstrong County northward through Butler, Lawrence, Mercer, Venango, and Crawford Counties (Reinert and Bushar, 1998).

Pennsylvania Legal Status:
Endangered

Federal status: Candidate

Federal / Other States Legal Status: *S. c. catenatus* has apparently been extirpated from Minnesota, and it is listed as endangered, threatened, or as a species of special concern by all states throughout its remaining distribution (Szymanski, 1998). In 1999, it became a Candidate for listing as Threatened by the U.S. Fish and Wildlife Service.

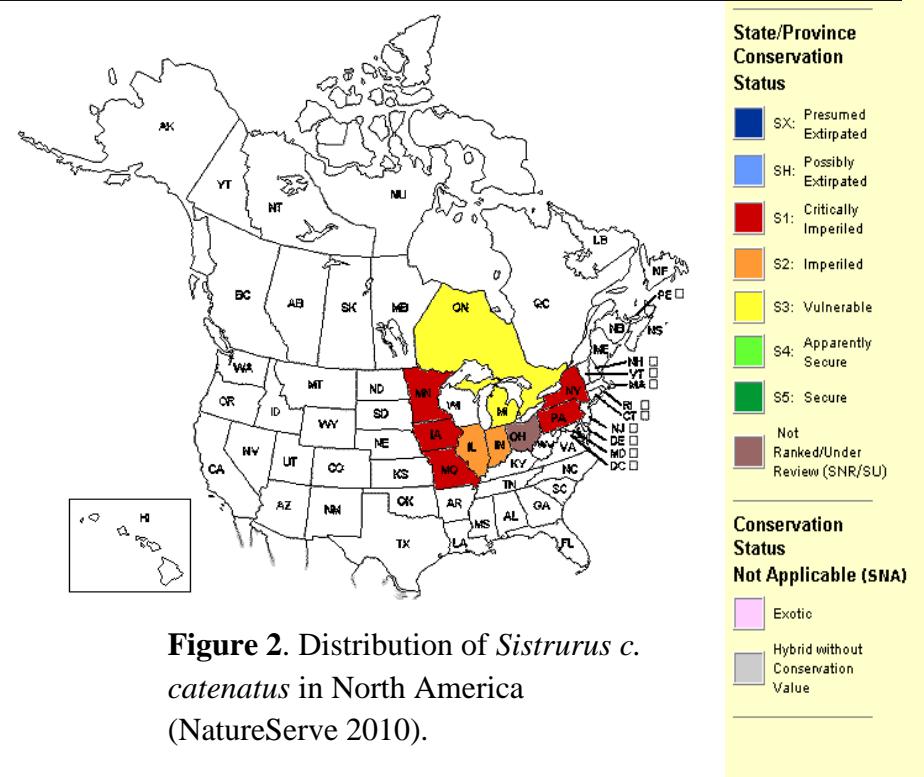


Figure 2. Distribution of *Sistrurus c. catenatus* in North America (NatureServe 2010).

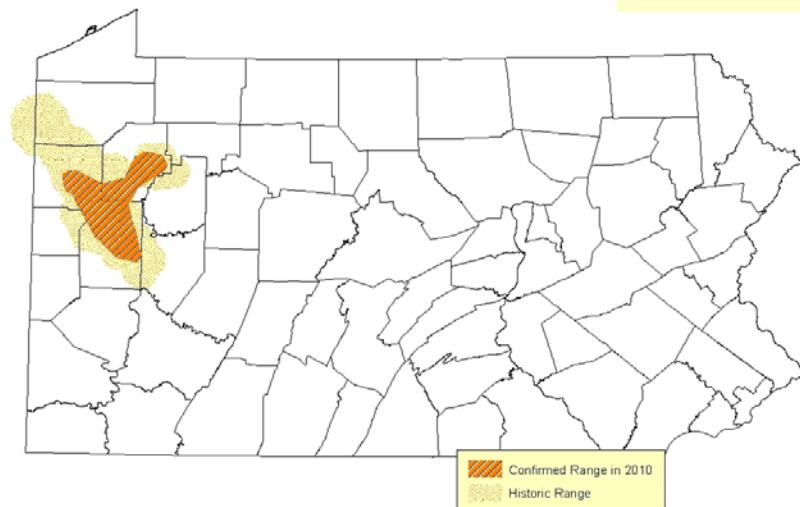


Figure 3. Distribution of Eastern Massasauga (*Sistrurus c. catenatus*) in Pennsylvania (PFBC 2010).



Management Status

Systematic surveys for eastern massasauga within the Pennsylvania historic range were completed in 1978, 1990, and 2005 (Reinert and Kodrich 1978; Reinert 1990; Jellen 2005). Each subsequent survey documented further extirpation from historically occupied sites, leading to the conclusion in 2005 that the current verified distribution has been reduced to four localities in two counties (Jellen 2005) with strong evidence that the population extends into a third county. Two of the four localities verified in 2005 are afforded some level of protection on state managed lands while the other two populations are on privately held lands.

Radio telemetry studies of three of the extant populations identified home range sizes, habitat preferences, and movement patterns of eastern massasauga in Pennsylvania (Reinert and Kodrich 1982; Kowalski 2007a). Recent studies commissioned by the PFBC included a prioritization of massasauga occupied properties, and a habitat manipulation study (currently under review). Inventory for remaining populations has been both ongoing and reactively through environmental review.

The “Protection Plan for the Habitat of the Eastern Massasauga in Pennsylvania” was prepared to provide a prioritized set of actions for preservation of the eastern massasauga, with emphasis on protection of private lands (Kowalski 2008). The

plan identified approximately 260 priority parcels in the areas of the four confirmed eastern massasauga populations in Butler and Venango Counties. In 2009 and 2010, contact was made with all landowners associated with the priority parcels and eight habitat management plans were developed for individual owners of eastern massasauga habitat (Kowalski 2010b).

Threats

- 1) Habitat alteration.
 - a. Natural resource extraction and associated infrastructure development are increasing in the range of the massasauga in Pennsylvania.
 - b. Residential and commercial development.
 - c. Loss of gestation sites due to forest succession resulting from abandonment of historic farming practices.
 - d. Habitat disturbance in the vicinity of hibernacula alters essential surface and subsurface microclimate and hydrology.
 - e. Accidental destruction of undetected hibernacula.
 - f. Intensive human activity causes adverse changes to behavior critical to rattlesnake survival.
- 2) Habitat Fragmentation.
 - a. New road construction
 - b. High vehicular traffic on previously low volume roadways
 - c. Development and natural resource extraction



- 3) Targeted and incidental mortality.
 - a. Mortality from increased presence of earth-moving equipment and increased use of previously low volume roadways
 - b. Wanton killing of and destruction of massasauga habitat.
 - c. Poaching of individual snakes, e.g., eastern massasaugas are sought in the black market trade.
- b. Offer management plans to private landowners who are not currently interested in land protection measures.
- c. Design and implement long-term monitoring program for managed properties.
- d. Offer assistance to private landowners to implement plans that have been written and conduct habitat management.

Conservation and Recovery

Conservation Actions:

- 1) Protect known eastern massasauga populations through land preservation (e.g., fee title acquisition, conservation easements, and conservation agreements).
 - a. Develop conservation package options for approaching landowners (e.g., WRP, CCAA, PFBC Easements, management plan development, and management)
 - b. Follow-up to discuss land protection options with landowners at the highest priority sites, which were established within the Protection Plan and LIP report.
 - c. Work with interested landowners towards the protection of these identified sites.
- 2) Develop management plans addressing habitat maintenance and restoration for all sites harboring eastern massasauga populations.
 - a. Meet with other state agencies and respective landowners to develop these management plans.
- 3) Survey for eastern massasauga populations in historically-occupied areas of Pennsylvania.
- 4) Continue and expand ongoing protection measures for eastern massasauga populations.
 - a. Review and comment on permit applications that involve proposed temporary and/or permanent disturbances to known habitat areas.
 - i. Mitigate for both direct and indirect impacts to the eastern massasauga habitat.
 - ii. Spot check projects to confirm adherence to recommended mitigation actions.
 - b. Develop best management practices and incorporate into the environmental review process.
- 5) Provide outreach to the public to promote tolerance and conservation of the eastern massasauga.
- 6) Plan for the reintroduction of eastern massasauga at suitable sites within their historically-occupied range.
 - a. Develop reintroduction/augmentation protocol to carry out reintroduction.



- b. Determine effective captive propagation procedures
- c. Identify and prioritize potential sites for reintroduction
- d. Conduct habitat enhancement/management where needed at proposed reintroduction sites to maximize success of reintroduction
- e. Implement planned introductions as deemed appropriate
- f. Monitor approved sites pre and post reintroduction of the species.

Johnson, G. 1995. Spatial ecology, habitat preferences, and habitat management of the Eastern Massasauga, *Sistrurus c. catenatus*, in a New York transition peatland. Ph.D. Thesis, State University of New York College of Environmental Science and Forestry, Syracuse, NY.

References

- Aldridge, R. D., M. J. Dresnik, C. A. Phillips, B. C. Jellen, M. Allender, and J. M. Cox. 2005. Reproductive biology of the Massasauga (*Sistrurus catenatus*) from south central Illinois. Program of the Biology of Rattlesnakes Symposium, Loma Linda Univ., CA. (Abstract).
- Ernst, C. H. and E. M. Ernst. 2003. Snakes of the United States and Canada. Smithsonian, Washington, D.C.
- Goldberg, S. R., and A. T. Holycross. 1999. Reproduction in the Desert Massasauga, *Sistrurus catenatus edwardsii*, in Arizona and Colorado. *Southwestern Naturalist* 44:531-535.
- Jellen, B. C. 2005. The continued decline of the Eastern Massasauga (*Sistrurus c. catenatus*) in Pennsylvania. Technical report submitted to the Pennsylvania Fish and Boat Commission.
- Keenlyne K. D. and J. D. Beer. 1973. Food habits of *Sistrurus catenatus catenatus*. *Journal of Herpetology* 4:381-382.
- Kowalski, M. J. 2007a. Movements and habitat usage by the Eastern Massasauga in Pennsylvania. Technical report submitted to the Pennsylvania Fish and Boat Commission.
- Kowalski, M. J. 2007b. Recommendations for land management in Pennsylvania specific to the protection of eastern massasauga habitats and populations. Technical report submitted to the Pennsylvania Fish and Boat Commission.
- Kowalski, M. J. 2008. Protection plan for the habitat of the eastern massasauga in Pennsylvania. Technical report submitted to the Pennsylvania Fish and Boat Commission.
- Kowalski, M. J. 2010a. Conservation and habitat planning for the Eastern Massasauga in Pennsylvania. Technical report submitted to the



Pennsylvania Fish and Boat
Commission.

Museum of Natural History,
Pittsburgh, PA.

Kowalski, M. J. 2010b. Site-based Conservation Planning on Private Lands for Critical Habitats in Pennsylvania -Eastern Massasauga. Technical report submitted to the Pennsylvania Fish and Boat Commission.

Maple, W. T. 1968. The overwintering adaptations of *Sistrurus catenatus catenatus* in northeastern Ohio. M. A. Thesis, Kent State University, Kent, Ohio.

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: April 21, 2011).

Reinert, H. K. 1978. The ecology and morphological variation of the Massasauga rattlesnake, *Sistrurus catenatus*. M.S. Thesis, Clarion State College, Clarion, PA.

Reinert, H. K. 1981. Reproduction by the Massasauga, *Sistrurus catenatus catenatus*. American Midland Naturalist 105(2):393-395.

Reinert, H. K. 1990. The occurrence of the Massasauga Rattlesnake in Pennsylvania: a survey of selected sites in Butler, Mercer, and Venango Counties. Allentown College of St. Francis de Sales, Department of Biology Report to the Carnegie

Reinert, H. K. and L. M. Bushar. 1992. The Massasauga Rattlesnake in Pennsylvania: continuing habitat loss and population isolation. Pps. 55-59 in B. Johnson and V. Menzies (eds.), International Symposium and Workshop on the Conservation of the Eastern Massasauga Rattlesnake, *Sistrurus catenatus catenatus*. Metro Toronto Zoo, Ontario, Canada.

Reinert, H. K. and W. R. Kodrich. 1978. The occurrence of the Massasauga in Pennsylvania. Clarion State College, Department of Biology Report to the Pennsylvania Fish Commission, Harrisburg, PA.

Reinert, H. K. and W. R. Kodrich. 1982. Movements and habitat utilization by the Massasauga, *Sistrurus catenatus catenatus*. Journal of Herpetology 16:162-171.

Seigel, R. A. 1986. Ecology and conservation of an endangered rattlesnake, *Sistrurus catenatus*, in Missouri, USA. Biological Conservation 35:333-346.

Snider, A. T. and J. K. Bowler. 1992. Longevity of reptiles and amphibians in North American collections. Society for the Study of Amphibians and Reptiles Herpetological Circular No. 21, 40 pp.

Szymanski, J. A. 1998. Range-wide status assessment for the Eastern Massasauga (*Sistrurus c. catenatus*). U. S. Fish and



Species Action Plan
Natural Diversity Section

Eastern Massasauga
June 2011

Wildlife Service, Fort Snelling, MN.