Learning to Live with the Eastern Massasauga Rattlesnake: Expanding Outreach and Education in Southern Michigan

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Cover photo identification and credits:
Top left: Rebecca Christoffel presenting Eastern Massasauga workshop and showing live massasauga to general public at Kalamazoo Nature Center in southwest Michigan, photo by Yu Man Lee
Top right: Rebecca Christoffel presenting Eastern Massasauga workshop to general public and professionals at Edward Lowe Foundation's Big Rock Valley, photo by Yu Man Lee
Center: Eastern Massasauga, photo by Matthew Heumann
Bottom left: Volunteer snake responder practicing moving a massasauga, photo by Yu Man Lee
Bottom right: Rebecca Christoffel presenting Eastern Massasauga workshop to general public and professionals at Edward Lowe Foundation's Big Rock Valley, photo by Yu Man Lee

Executive Summary

The Eastern Massasauga (*Sistrurus catenatus catenatus*) has declined throughout its range, primarily due to habitat loss and fragmentation, human persecution, and illegal collection. As a result, it has been afforded some level of legal protection in every state/province within its range, and in 1999, it was listed as a federal candidate species in the United States. Michigan appears to be the last stronghold for this snake, and its viability in Michigan has important implications for conservation of this species across its range. Because the Eastern Massasauga is venomous, most people have strong negative reactions to this snake and believe that it poses a major threat to human health and the well-being of their livestock and pets. These attitudes and beliefs often have resulted in indiscriminant killing and relocation or removal of these snakes, which also can result in snake mortality if it is moved out of its home range. Much of the fear and negative response to this snake is based on lack of information or misinformation.

The purpose of this project was to expand and build upon a massasauga education and outreach program that was initiated in southeast Michigan in 2005 and initiate a similar program in southwest Michigan. The ultimate goal of these education and outreach efforts was to raise public awareness and help promote and foster stewardship of the massasauga by providing people with scientific information, resources, and critical thinking skills to help them make informed decisions about how they can safely co-exist with this snake. This project specifically targeted a four-county area in southeast Michigan (i.e., Jackson, Washtenaw, Livingston and Oakland counties) and seven counties in southwest Michigan (i.e., Berrien, Cass, Van Buren, Kalamazoo, Barry, Allegan, and Kent). The project consisted of the following components: (1) identification of target audiences, stakeholders, and partners; (2) evaluation of existing educational materials on the Eastern Massasauga for use in Michigan, and revision or development of materials as needed; (3) development and coordination of a network of resource people to respond to massasauga reports, and development and presentation of twelve training workshops for the local resource network; (4) development and presentation of eight educational workshops for target public audiences; and (5) promotion of balanced media coverage on the massasauga in Michigan. This project also included a component to evaluate the effectiveness of our education and outreach efforts.

We were able to successfully develop and initiate a massasauga education and outreach program in southwest Michigan. We identified and compiled over 90 different target audiences, stakeholders, and/or partners in southwest Michigan. These consisted of individuals who likely respond to massasauga reports, conduct public education and outreach in some manner, and/or have encountered massasaugas or have the potential to encounter and impact massasaugas and their habitats. We identified over 30 potential partners in the study area, and established working relationships with over 15 organizations or agencies. We conducted 21 massasauga training or educational workshops in southwest and southeast Michigan in 2008 and 2009. These included seven workshops for natural resource and other professionals, nine workshops for the general public, three workshops for both professionals and the public, and two workshops for volunteer snake responders. Over 711 individuals participated in these workshops, including individuals from at least 31 different public or private agencies or organizations. Workshops presented information on the following topics: ecosystem, social and cultural values of snakes; general snake biology and ecology in Michigan; the biology, ecology and identifying characteristics of the Eastern Massasauga and look-alike snakes in Michigan; massasauga status and distribution in Michigan; conservation threats to the species and snakes in general; massasauga research and

conservation efforts; snake safety tips; treatment of rattlesnake bites; how landowners can encourage or discourage snakes on their property; and how to communicate with the general public regarding rattlesnakes. The workshops also provided participants with opportunities to ask questions, see live examples of the massasauga and look-alike snakes, view massasaugas and/or their habitat in the wild in some cases, observe a demonstration on how to safely move a massasauga if necessary, and actually try moving a massasauga in a safe, controlled and supervised setting.

Education and outreach materials on the massasauga also were revised, updated, and/or distributed during the project. We refined and revised existing massasauga education and outreach materials with updated information including the Michigan Eastern Massasauga Web site (www.msue.msu.edu/mnfi/emr) which can serve as a central repository for information about massasaugas in Michigan. We developed an Eastern Massasauga training DVD based on our workshops, which will provide a useful reference tool for people who have attended our massasauga workshops and help us reach new, additional target audiences. We also promoted balanced media coverage to disseminate accurate and consistent information on the massasauga to the public by developing two press releases, distributing press packets, providing information to the media, and promoting media coverage of our massasauga workshops and outreach efforts.

Overall, our massasauga education and outreach efforts were well-received and appeared to be effective, particularly the training or educational workshops. Evaluation results from the workshops indicated an increase in participants' knowledge about massasaugas and non-venomous snakes after attending a workshop for all target audience groups. Participants in all audience groups also expressed increased interest in snakes and more positive feelings and decreased negative feelings toward snakes after attending a workshop. Workshop participants self-attributed these changes in feelings toward snakes to participation at a workshop. Participants' perceived risk due to massasaugas did not change much after attending a workshop, but perceived risk was already fairly low prior. Behavioral intention scores also did not change much after attending a workshop. Prior to and after attending a workshop, average behavioral intention scores indicated that most encounters with rattlesnakes would result in either asking for more information about what a person should do or no action at all.

Most importantly, this project laid the groundwork for continuing Eastern Massasauga education and outreach efforts in southern Michigan in the future. The partnerships that were developed will be instrumental in helping to continue massasauga outreach efforts in the future. The natural resource and other professionals that participated in our workshops will serve as local contacts or resources for information about massasaugas and will continue to provide outreach on this species. We were able to establish volunteer snake responder networks and identify regional network coordinators in southwest and southeast Michigan. The volunteer snake responder networks will provide ongoing, local resources for information and assistance with massasauga encounters. These local resource networks and available outreach materials will help ensure that accurate and consistent information about massasaugas are disseminated so that individuals can make informed decisions about how they can safely coexist with this rare and fascinating species. Massasauga education and outreach efforts in the future should focus on continuing to develop and strengthen local resource networks and partnerships, reaching new target audiences such as law enforcement and medical personnel, addressing information gaps, and expanding to additional areas within the species' range in the state such as northern Michigan.

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A) Overview of project's goals and objectives and how they were executed. Please discuss any modifications, changes, or substitutions made to the original workplan and how they affected the outcomes.

Introduction

Eastern Massasauga (*Sistrurus catenatus catenatus*) populations have declined throughout their range from western New York and southern Ontario to Iowa and southward to Missouri (Szymanski 1998). Habitat loss and fragmentation, human persecution and illegal collection are the primary causes of this species' decline. As a result, it has been afforded some level of legal protection in every state/province within its range. In 1999, the Eastern Massasauga was listed as a federal candidate species in the United States.

Because the Eastern Massasauga is venomous, most people have strong negative reactions to this snake and believe that it poses a major threat to human health and the well-being of their pets and livestock. Thus, some people feel that killing this snake is justifiable and consider this to be a service for the common good. Much of the fear and negative response to this snake is based on lack of information or misinformation. Also, several massasauga bites are reported each year, typically resulting from lack of awareness or inappropriate handling of the snake. In some cases, massasauga bites are incorrectly reported due to snake misidentifications. Snakebites often result in removal or death of the snake and perpetuate public fear and misconceptions. Medical facilities also may not be adequately prepared or trained to handle venomous snakebites. Finally, the general public and natural resource professionals often relocate or remove massasaugas from their habitat which can lead to the demise of these snakes if they are moved out of their home range or to unsuitable habitat.

Michigan is home to more extant populations of Eastern Massasaugas than any other state or province within its range, and is believed to be the last stronghold for this snake. Thus, massasauga conservation and recovery efforts in Michigan are critical for ensuring the long-term viability of this species within its range, and will have both regional and national implications for this species. Michigan and other states in the massasauga's range are developing Eastern Massasauga Candidate Conservation Agreements with the U. S. Fish and Wildlife Service (USFWS) to voluntarily implement specific actions to remove or reduce threats to this species. The goal of these conservation agreements is to slow down or prevent further decline of the species, thereby precluding the need for federal listing. These represent a pro-active approach to massasauga conservation by addressing threats to the species without waiting for federal listing. Public education and outreach is a vital component of Michigan's Eastern Massasauga Candidate Conservation Agreement.

Massasauga education and outreach efforts have been implemented in Ontario, Canada, since 1988. These efforts have had a great deal of success with the general public. Efforts have focused on providing people with factual information, resources and skills to help them understand the role of this snake in the environment and make informed decisions about how they can co-exist with this species. Public outreach activities should be coordinated across the species' range to ensure that a consistent message is being delivered to the public. Coordination of conservation efforts between the U. S. and Canada is essential to the recovery of the species across its range.

A public education and outreach program on the Eastern Massasauga was developed and initiated in southeast Michigan from 2003-2005 with funding from a U.S. EPA environmental education grant. This program was modeled after Canada's success. Although some massasauga outreach had occurred at local and state levels, this project developed and implemented an integrated approach to ensure a consistent and coordinated effort. This project had multiple components which included identification of target audiences, stakeholders and partners; an assessment of public perceptions and attitudes toward the massasauga and snakes in general; development and distribution of education and outreach materials; evaluation, establishment and training of a local resource network; development and presentation of educational workshops for the general public; and promotion of balanced media coverage on the massasauga. Overall, the project was well-received by target audiences and collaborators, and appeared to be effective in increasing the various target audiences' affinity for and knowledge of the massasauga (Lee and Christoffel 2005).

Project Goals

The goal of this project was to expand and build upon the previous EPA massasauga education and outreach project we conducted in southeast Michigan by continuing outreach efforts, especially targeting new audiences, in southeast Michigan and initiating similar efforts in southwest Michigan. As is true in southeast Michigan, southwest Michigan contains a number of extant massasauga populations in areas that are densely populated and experiencing rapid development. This region also has had a number of reported human-massasauga encounters, including reports of massasauga bites to people and dogs and massasauga encounters in people's homes or on their properties which often resulted in snake mortality or injury. Thus, initiating a massasauga education and outreach program in southwest Michigan appeared to be a logical next step towards efforts to develop a statewide massasauga education and outreach program. Overall goals of this project were to raise public awareness and help promote and foster stewardship for the massasauga by providing people with scientific information about the species' biology and ecology and the role it plays in natural ecosystems. This project also was envisioned to help foster stewardship for this species by teaching critical thinking skills for assessing the level of threat posed by the massasauga and making informed decisions about how to safely co-exist with this snake.

Project Objectives

This project had the following objectives according to the workplan:

1) **Identification of target audiences, stakeholders and partners.** Identify major stakeholders, target audiences and additional partners in the project area. Compile list of the target audiences and their contact information. Identify information needs for specific audiences.
2) **Evaluate existing educational materials, and revise or develop new materials as needed**. Use and distribute previously developed materials. Work with partners to develop, produce and/or distribute additional educational materials specific to Michigan and the project area as needed. Materials to be revised or developed will include completion of a laminated snake identification guide; a video of the educational workshop; a handout on resources and protocol for treatment of snakebites for health professionals and veterinarians; further

development and maintenance of a Michigan massasauga web site; and outdoor educational exhibits for state parks and other nature centers as well as a traveling exhibit on the massasauga.

3) **Develop and coordinate a network of resource people to respond to massasauga reports, and develop and conduct twelve training workshops for the local resource network**. Identify and recruit volunteers and natural resource professionals from the project area to participate in the local resource network to respond to massasauga reports and conduct on-site public education. Identify a regional coordinator for the volunteer snake responder network to refer calls to appropriate resource persons. Training workshops will range from one to four hours. These workshops will include a brief introduction to Michigan snakes; information on the identification, natural histories, distributions, habitat uses and conservation threats faced by the eastern massasauga and several non-venomous, look-alike snakes; training on how to communicate effectively with concerned citizens, how to safely handle and move snakes, if necessary, and how to avoid and treat a venomous snakebite. Workshops will include a field component to encounter snakes in their habitats when possible. Volunteers may potentially provide information and assistance to landowners on site and may also relocate or remove snakes if necessary.

4) **Develop and conduct eight educational workshops for the target public audience**. Workshops will range from one to four hours and will cover information on massasauga biology, its role in nature, identification of massasaugas and look-alike snakes, and human safety issues such as the risk, prevention, and treatment of snakebites. Participants will learn about massasauga needs and stewardship opportunities. They will see a live massasauga and look-alike snakes on display during the workshop and will observe safe handling of live snakes with a broom, garden implements and a snake stick. Participants will be given the opportunity for personal interactions with snakes used in the workshop and the opportunity to safely move a snake using a garbage can and a broom. Educational materials will be distributed at these workshops.

5) **Promote balanced media coverage of the eastern massasauga, especially in response to reports of snakebites.** Provide the local media with informational packets on the massasauga. Publicize the project, workshops and the resource network through press releases, public service announcements and articles to existing outreach tools, such as the MDNR's Spotting Scope Newsletter and newsletters of local nature centers, zoos, and environmental education centers in the project area.

Methods and Results

Project Area

The project area consisted of four counties in southeast Michigan (i.e., Jackson, Washtenaw, Livingston and Oakland counties) and seven counties in southwest Michigan (i.e., Berrien, Cass, Van Buren, Kalamazoo, Barry, Allegan and Kent counties) (Figure 1). A number of massasauga occurrences have been documented in the project area (Figure 1). These counties were specifically targeted for this project because these areas have the greatest potential for human conflict with the Eastern Massasauga due to dense human populations, substantial development pressure, and/or historically high reported rates of massasauga encounters.

Residential development in these counties includes rural, suburban and urban areas. Although these counties were specifically targeted for this project, the education and outreach materials and efforts that were developed and conducted as part of this project could also be applicable and used in other parts of southern Michigan as well.

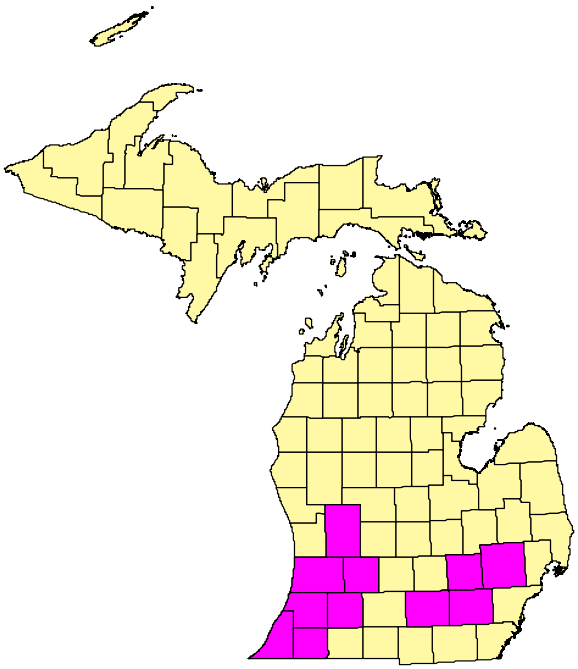

Figure 1. Counties highlighted in pink indicate counties in southeast and southwest Michigan that were included in the project area.

Objective 1: Identification of target audiences, stakeholders and partners.

Identification of target audiences, stakeholders, and potential partners in southwest Michigan was conducted by project team members based on the target audiences that had been compiled during the previous project in southeast Michigan and in consultation with project partners. Target audiences, stakeholders, and partners were divided into several main categories or groups, and consisted of individuals who respond to massasauga reports from the public, conduct public education and outreach in some manner, and/or have the potential to encounter and impact massasaugas and their habitats. Over 90 different target audiences, stakeholders, and/or potential partners in southwest Michigan were identified and compiled (Appendix 1). The list of target audiences, stakeholders, and partners in southeast Michigan that had been identified and compiled for the previous EPA massasauga education and outreach project was used for this project as well (Appendix 2). Target audiences, stakeholders, and partners included state and local natural resource agencies and professionals (e.g., Michigan Department of Natural Resources, Michigan Department of Environmental Quality, local conservation districts), animal damage control offices or organizations, environmental organizations (e.g., local Audubon

chapters, botanical clubs), county extension offices, developers, hospitals and health departments, veterinarians, law enforcement agencies/personnel (e.g., conservation officers, county sheriff departments), land conservancies, state and local parks, nature centers, zoos, formal and informal educators, volunteer natural resource stewardship groups (e.g., The Stewardship Network, Michigan State University Extension's Conservation Stewards Program), outdoor writers, Native American tribes, utility companies, other public and private organizations, school groups, and the general public (Appendices 1 and 2). We will add target audiences and further refine this list in the future as resources permit. Landowners and residents who live in the vicinity of known massasauga populations and have potential for encountering and impacting massasaugas were specifically targeted for this project.

Forty-two individuals representing over 30 agencies or organizations were identified as potential partners for this project and invited to a meeting to help plan and implement the massasauga education and outreach effort in southwest Michigan (Appendix 3). An invitation letter and meeting agenda were sent to targeted potential partners (Appendix 3). The meeting was held at the Kalamazoo Nature Center in southwest Michigan in December 2007. Eighteen people attended the meeting, and an additional six people expressed an interest in the project but were unable to attend the meeting. Partners that were represented at this meeting include the John Ball Zoo, Binder Park Zoo, Detroit Zoo, Kalamazoo Nature Center, Pierce Cedar Creek Institute, Sarett Nature Center, Barry County Conservation District, Cass County Conservation District, Michigan Department of Natural Resources (Parks Division, Wildlife Division Landowner Incentive Program and Fort Custer Recreation Area), and the Michigan Audubon Society. Meeting notes were distributed to participants, and participants were asked to fill out a form that indicated what specific actions/roles that they would be willing to take in the massasauga education and outreach effort (Appendix 3). Additional project partners that collaborated with us and provided assistance with this project in 2008 and 2009 include the Edward Lowe Foundation, Michigan Poison Control Center, The Stewardship Network, Michigan Society of Herpetologists, and Michigan State University College of Agriculture and Natural Resources' (ANR) Communications Office.

For each target audience group, we identified the most relevant or pertinent massasauga-related information to help inform the group's decision-making or help group members provide assistance to others about co-existing with this species. These specific information needs guided the structure and content of the training and educational workshops and distribution of appropriate resource materials to the different target audiences.

Objective 2: Evaluate existing educational materials, and revise or develop new materials as needed.

Eastern Massasauga education and outreach materials that were developed for the previous project in southeast Michigan were reviewed and updated as needed for the current project targeting southwest Michigan. The Powerpoint presentation on Eastern Massasaugas that was developed for the workshops in southeast Michigan was modified slightly for targeted audiences in southwest Michigan (Appendix 4). For example, the Black Ratsnake which is a species of special concern that occurs in southwest Michigan was added to the presentation for target audiences in southwest Michigan. We decided to have two different Powerpoint presentations for public audiences and professional audiences (Appendices 4 and 5). Revisions were made, and

these two presentations were used for the 2008 and 2009 workshops. The associated script for the presentation that was developed and utilized during the earlier massasauga education and outreach project in southeast Michigan was reviewed and updated (Appendix 6). We modified the presentation and outreach materials (e.g., Eastern Massasauga Fact Sheet, Appendix 7) based on information we obtained from medical staff at the Michigan Poison Control Center regarding massasauga bites and their treatment. We also updated the handouts on avoiding and treating rattlesnake bites, contacts and resources for more information about the Eastern Massasauga in Michigan, and the volunteer snake responder network protocol to reflect changes in project partners and/or affiliations (Appendices 7 and 8). We continued to develop the Michigan massasauga Web site (www.msue.msu.edu/mnfi/emr) with additional information about massasauga identification, habitat and ecology, and massasauga workshops that were offered during the project period. We would like to see this Web site serve as a central repository for massasauga information and resources in Michigan, similar to the Canadian Eastern Massasauga Rattlesnake Recovery Team's Web site.

Other massasauga education and outreach materials that were developed and distributed as part of the previous project in southeast Michigan were distributed as part of the southwest Michigan project. These include the Eastern Massasauga "Born to be Wild" poster, "Living with Snakes" brochure and guide for landowners, Eastern Massasauga MNFI Species Abstract, U.S. Fish and Wildlife Service "Live and Let Live" brochure, Snakes of Michigan Identifier, and Snake Safety and Snakebite Treatment fact sheet (Appendix 9, see Lee and Christoffel 2005 for additional materials). We partnered with several organizations to reprint additional copies of several of these outreach materials. The U. S. Fish and Wildlife Service contributed $1,000 to help cover a portion of the cost of reprinting additional copies of their brochure entitled "Live and Let Live: People and the Eastern Massasauga Rattlesnake." This brochure is very informative, does a great job of covering the major issues of concern regarding this snake, and has great photos. Oakland County Parks contributed $400 toward the cost of reprinting additional copies of our massasauga sticker entitled "Conservation through Education Learning to Live with the Eastern Massasauga" (Appendix 9). The Detroit Zoo contributed funds to cover the cost of reprinting additional copies of the "Born to be Wild" massasauga poster (Appendix 9).

Accurate information pertaining to the frequency of confirmed massasauga bites, demographics of individuals who are bitten, and the treatment and outcomes of such bites is important for helping people understand and accurately assess the risk or threat to human safety posed by massasaugas. We contacted and/or met with medical professionals from the Grand Rapids Regional Poison Control Center in southwest Michigan and the Detroit Poison Control Center in southeast Michigan to obtain this information. The information that we have obtained to date has been compiled and incorporated into our education and outreach program and materials. Additional and more comprehensive information on massasauga bites in Michigan is being constructed, with the aid of the two regional poison control centers in southwest and southeast Michigan. Information on snake bites also has been compiled by other researchers or interested individuals. Once this information has been compiled and finalized, it will be incorporated in educational outreach programs and materials and shared as appropriate.

Project team members and partners identified the need to develop an Eastern Massasauga Training DVD. The DVD is based on the massasauga training workshop that we have developed and presented as part of this project. The training DVD could be used to help us reach additional or particular target audiences such as law enforcement personnel who have not been able to

attend the massasauga training workshops. The DVD also could be used by workshop participants and partner agencies/organizations to review information presented at the training workshops and/or train additional staff. A meeting was held with Michigan State University (MSU) Agriculture and Natural Resource (ANR) Communications' Senior Television Producer-Director, Stephen Evans, in December 2007 to discuss the logistics and feasibility of producing such a DVD. Estimated cost to produce such a DVD is $2,000. Project team members partnered with Dan Malone of John Ball Zoo to develop and submit a proposal to the John Ball Zoological Society's Wildlife Conservation Fund to apply for funds to produce this DVD. The proposal was submitted in April 2008 and was selected for partial funding. An award of $1,000 was granted to the project team to produce the training DVD. Grant applications were developed and submitted to the Michigan Society of Herpetologists' Massasauga Conservation Fund and General Herp Conservation Fund to seek additional funding to complete development of the DVD. Both grant applications were selected for funding, awarding a total of $1,000 to complete the DVD. A massasauga workshop for natural resource professionals conducted in June 2008 was filmed by MSU ANR Communications for the training DVD. However, upon review of the video footage of the workshop, we decided to use a different approach for the training DVD. The training DVD now presents the Powerpoint presentation that we use for our massasauga training workshop with some additional footage of live snakes and the Eastern Massasauga in its natural habitat. A near-final draft of the training DVD is now available (Appendix 10). We want to re-tape and revise a couple of sections and anticipate completion of the DVD this winter. We have included a copy of the draft training DVD. We will provide a copy of the final training DVD upon its completion. The DVD will be distributed to natural resource and other professionals who have attended our workshops, project partners, law enforcement personnel, utility workers, and other targeted audiences who have not been able to attend the massasauga training workshops.

We have discussed the idea of producing a short documentary or video on the Eastern Massasauga in Michigan. The Toronto Zoo has developed a short video on the Eastern Massasauga in Ontario that has been used for education and outreach and has helped raise awareness of the ecology and conservation of this species in Ontario. This video has been used for massasauga education and outreach efforts in Michigan (e.g., this video has been distributed to all state parks with massasaugas). We critiqued the Toronto Zoo video for purposes of planning for the training DVD and a potential documentary DVD. We discussed the potential of developing a documentary on massasaugas in Michigan with ANR Communications and obtained a preliminary estimate for production costs. We will continue our investigation, but this was not developed as part of this project.

We proposed in our original workplan/proposal the idea of working with the Michigan DNR to produce an outdoor kiosk or indoor traveling exhibit that would feature the Eastern Massasauga. The Michigan DNR has already developed and installed outdoor kiosks featuring the Eastern Massasauga at several state parks and nature centers that contain massasaugas on their properties and/or have high visitor use. The Michigan DNR also has developed an indoor traveling exhibit featuring other wildlife species that can be rented from them for display by a variety of organizations and businesses. This effort would have added one more outdoor kiosk and/or developed an additional indoor traveling exhibit featuring the Eastern Massasauga and other rare amphibians and reptiles (also known as herpetofauna or herps) in Michigan to help increase awareness and understanding of the ecology and conservation of these rare herps. We met with Earl Wolf of the Michigan DNR regarding the production of an outdoor kiosk or indoor traveling exhibit that would feature the Eastern Massasauga. Working with Earl, we determined

the estimated costs for these two products. We had planned to develop and submit two small grant proposals to the Michigan Society of Herpetologists (MSH) to obtain additional funding to develop an indoor traveling exhibit. We decided to pursue additional funding from MSH for the massasauga training DVD instead of the indoor traveling exhibit, and we did not have enough time during the project period to pursue additional funding from MSH or other sources for the indoor traveling exhibit. While the indoor traveling exhibit has potential to increase general public awareness of the massasauga in Michigan, the training DVD will allow us to reach additional partners who respond to massasauga reports from the public and can significantly impact massasaugas as well as additional targeted professional and public audiences and stakeholders in the future. We anticipate continuing to work with the MDNR to look for additional funding to develop the indoor traveling exhibit and/or the outdoor kiosk.

We also convened a group of partners interested in developing K-12 curriculum and educational materials to raise awareness, understanding and appreciation of snakes in general, particularly the Eastern Massasauga. Representatives from the Kalamazoo Nature Center, Michigan DNR, Cass Conservation District, Barry Conservation District, and Pierce Cedar Creek Institute attended this meeting. The group identified additional potential partners, goal and scope of work for this effort at least initially, and next steps, including the pursuit of funding for this effort. The group compiled and evaluated several examples of snake-related curricula that have been developed and are available from other states or efforts. A MSUE web portal has been developed for this group to communicate and continue working on efforts identified during this meeting. Although efforts to develop these products are outside the scope of work and timeline for this project, these efforts will certainly complement this project's efforts. We intend to continue to work with these and other partners to investigate and pursue opportunities to incorporate education about snakes into K-12 curriculum and seek funding for this effort.

Objective 3: Develop and coordinate a network of resource people to respond to massasauga reports, and develop and conduct twelve training workshops for the local resource network.

Local resource network - Natural resource and other professionals

A network of local resource people who can safely and appropriately respond to massasauga reports was developed as part of this project. Two main groups were targeted to comprise this network. One group consisted of natural resource and other professionals in the project area who currently receive or would likely receive massasauga reports from the general public. These professionals currently respond or have the potential to respond to massasauga reports by communicating with the general public, conducting on-site visits and/or relocating or removing snakes. These professionals also can potentially conduct additional education and outreach regarding the Eastern Massasauga with the general public and other targeted audiences. These include natural resource professionals such as wildlife biologists, land managers, park personnel, naturalists/nature center staff, and other natural resource or field staff associated with state, county and local government agencies as well as animal control, volunteer conservation stewards, Michigan Poison Control, and law enforcement personnel such as conservation officers and local police departments (invited). Given limited time, funding and personnel, we also focused on training target audience groups that could potentially continue massasauga education and outreach beyond this project and help us ultimately reach a broader audience (i.e., "train the

trainers" approach). As a result, natural resource professionals were considered high priority for the local resource network. Natural resource professionals associated with wildlife areas, parks, recreation areas, nature centers, environmental education centers and other natural areas that have massasaugas on their properties or are located in the vicinity of known massasauga populations were specifically targeted. These areas were identified based on information from Michigan's Natural Heritage Database (Michigan Natural Features Inventory (MNFI) 2009) and other massasauga reports.

We conducted training workshops for the natural resource and other professionals that were targeted for the local resource network to help ensure accurate and consistent information is provided to the public through this network. Workshops were modeled after the massasauga workshops that had been developed and conducted as part of the earlier project in southeast Michigan, which in turn were modeled after massasauga workshops in Ontario and timber rattlesnake workshops in Wisconsin and Minnesota. Content of the workshops was based on information needs identified for each target audience and was modified for different target audiences and workshop durations (Appendix 11). Workshops for natural resource professionals varied in duration from one to three hours but were usually two to two and a half hours long. Workshops presented information on the ecological, cultural and social values of snakes; general snake biology and ecology, particularly in Michigan; the biology, ecology and identifying characteristics of the Eastern Massasauga and the look-alike snakes in Michigan; the status and distribution of the massasauga in Michigan; threats to the species; research and conservation efforts; snake safety tips; avoidance and treatment of rattlesnake bites; land management practices that encourage and discourage snakes; and how to communicate with the general public regarding rattlesnakes (Appendix 5). We showed people live examples of the Eastern Massasauga (Figure 2) and the look-alike snakes and provided opportunities to view the snakes up close and touch the look-alike, non-venomous snakes. We answered questions and distributed educational and outreach materials that could be shared with their constituents. We discussed how to respond to massasauga reports or sightings, and demonstrated how to safely move a massasauga with a broom and a garbage can as a last resort, if necessary (Figure 2). We also provided workshop participants with an opportunity to try to move a live massasauga using this method to begin to feel comfortable and familiar with this technique in a safe, controlled and supervised setting. A field component was included as part of the training workshops whenever possible so that workshop participants could become familiar with suitable massasauga habitat and potentially view massasaugas in the wild (e.g., at Pierce Cedar Creek Institute where a massasauga field research project was being conducted) (Figure 2).

Training workshops for professionals were held immediately prior to or during the snakes' active period so that these individuals would be trained and ready to respond to massasauga reports. Workshops were generally held in late winter, spring, and/or early summer prior to, during, or soon after snakes emerged from hibernation. This is when snakes are most active and more likely to be encountered and reported by people. Workshops were held as part of already scheduled meetings, conferences, or lengthier workshops whenever possible (e.g., annual training workshops or meetings for park staff, MDNR quarterly district meetings) in order to facilitate and increase participation in the workshops. We organized and scheduled specific workshops for certain target groups in the study area such as docents from the John Ball Zoo and the Oakland County Land Conservancy volunteer land stewards and friends. Workshops were generally held during the work week to accommodate the work schedules of our target

Figure 2. Photographs showing components of the Eastern Massasauga workshops for natural resource professionals and the general public.

audiences. Natural resource and other professionals were invited and allowed to attend these workshops by coordinating with the meeting organizers or supervisors (e.g., district wildlife biologist or park supervisor). Flyers to advertise the workshops and workshop agendas (see Appendix 12 for examples) were developed and sent to targeted natural resource professionals prior to the workshops. Workshops were held at several nature centers or environmental education centers located in different parts of the project area to minimize travel distances for workshop participants. We identified and selected workshop locations that were handicap accessible and were able to accommodate an Eastern Massasauga and other live snakes that were part of the workshop.

We conducted nine massasauga training workshops for natural resource and other professionals in the study area during the spring and summer of 2008 and 2009 (i.e., primarily March through June) (Table 1). Three of these workshops also were open to the general public. Workshops were held primarily in southwest Michigan but one was also held in southeast Michigan. In addition to these workshops, we delivered a short presentation and talked with medical and health care professionals at an information table on the Eastern Massasauga at a toxicology conference on natural born toxins including poisonous plants and venomous animals organized by the Helen DeVos Children's Hospital Regional Poison Center in southwest Michigan in April 2008. We were able to provide information, distribute outreach materials, and address questions about the massasauga to medical and health care professionals at this conference.

Over 279 individuals participated in the nine training workshops for professionals and/or general public. At least 179 participants represented natural resource or other professionals from at least 31 different public or private agencies, offices, or organizations. In addition, over 100 medical and health care professionals participated in the short massasauga presentation and/or stopped by our information table at the toxicology conference on poisonous plants and venomous animals. Natural resource and other professionals who participated in these workshops include biologists, managers, formal and informal educators, researchers, and other personnel from the following public or private agencies and organizations: Michigan DNR Wildlife Division, DNR Parks and Recreation Division, DNR Office and Land and Facilities, Michigan Department of Environmental Quality Land and Water Management Division, USDA Natural Resources Conservation Service, county conservation district offices (Cass, Barry, and Allegan/Ottawa counties), Kensington Nature Center/Huron-Clinton Metropolitan Authority (HCMA metroparks), Kalamazoo Nature Center, Sarett Nature Center, Love Creek Nature Center, Calvin College Bunker Interpretive Center, Pierce Cedar Creek Institute, Michigan State University Kellogg Biological Station, Oakland University, Edward Lowe Foundation, King & McGregor Environmental, Geum Services, Herpetological Resource Management, Rose Township Office in Oakland County, City of Ann Arbor, Livingston Land Conservancy, Michigan Nature Association, Washtenaw County Parks, John Ball Zoo (zoo staff and volunteer zoo docents), Cass County Road Commission, The Stewardship Network's Southwest Corner Stewardship Cluster (volunteer conservation stewards), Mehne Animal Clinic, and Michigan Animal Damage Control Association. These individuals and agencies or organizations interact, work with, and/or educate the general public to some degree, and have been contacted or have the potential to be contacted for massasauga reports. Some of these individuals also conduct work that directly impacts the massasauga and its habitat.

Table 1. Summary of Eastern Massasauga workshops for professionals conducted in the study area in 2008 and 2009. Workshops highlighted in yellow targeted professionals and the general public.

Date	Target Audience	Region	County	Location	Duration	Number of Participants
3/10/2008	Natural Resource Professionals	SW MI	Barry	Pierce Cedar Creek Institute	3 hours	11
3/11/2008	Natural Resource Professionals and General Public - Sarett Nature Center staff and volunteers	SW MI	Berrien	Sarett Nature Center	2 hours	16
3/20/2008	Natural Resource Professionals and General Public - Oakland Land Conservancy and friends	SE MI	Oakland	Indian Springs Metro Park	2 hours	52
4/12/2008	Natural Resource Professionals - John Ball Zoo Docents	SW MI	Kent	John Ball Zoo	2 hours	46
4/24/2008	Medical/Health Care Professionals - Michigan Poison Control Poisonous Plants and Animals Conference (short presentation and information table)	SW MI	Kent	Meijer Gardens, Grand Rapids	6 hours	>100
5/20/2008	Natural Resource Professionals - Seasonal Park Interpreters Training (statewide)	SW MI	Roscommon	MDNR Ralph A. MacMullan Conference Center, Higgins Lake	1.5 hours	44
6/14/2008	Natural Resource Professionals and General Public	SW MI	Kalamazoo	Kalamazoo Nature Center	2.5 hours	~30
6/26/2008	Natural Resource Professionals - Michigan DNR Wildlife Biologists	SW MI	Barry	Pierce Cedar Creek Institute	2.5 hours	21
3/6/2009	Professionals - Michigan Animal Damage Control Association (statewide)	SE MI	Ingham	Kellogg Conference Center	1.5 hours	~50
7/11/2009	Natural Resource Professionals - SW MI Stewardship Cluster Volunteers	SW MI	Barry	Pierce Cedar Creek Institute	3 hours	7
9/19/2009	SW Michigan Volunteer Snake Responder Training	SW MI	Kalamazoo	Binder Park Zoo	2.5 hours	5
9/25/2009	SW Michigan Volunteer Snake Responder Training	SW MI	Barry	Pierce Cedar Creek Institute	2.5 hours	6

Local resource network - Volunteer snake responder network

In addition to targeting natural resource and other professionals for the local resource network, we developed regional networks of volunteer snake responders in southwest and southeast Michigan to help respond to and provide assistance with massasauga reports from the public. The volunteer snake responder network is based on similar networks that have been established and implemented in Wisconsin and Minnesota. In Michigan, the volunteer snake responder network is comprised of a statewide network coordinator, regional network coordinators, and volunteer snake responders within local communities throughout the study area. Ideally, the regional network coordinators receive and respond to massasauga calls or reports first. They screen and filter the reports and refer calls/reports to volunteer snake responders as needed. The regional network coordinators are responsible for providing assistance to maintain the volunteer network, to provide ongoing support and assistance to snake responders, and to help recruit and train new snake responders (Appendix 8). Volunteer snake responders talk to landowners on the phone and may potentially visit the property and provide information and assistance to landowners on site. They also would potentially relocate or remove snakes, if necessary, as a last resort. The statewide network coordinator helps to oversee the network in general, provides support and assistance to regional network coordinators and volunteer snake responders to help maintain and enhance the volunteer network, and acts as a liaison between the volunteer snake responder network and state, federal and local government agencies such as the Michigan DNR. We talked with several partners about serving as regional coordinators for the volunteer snake responder network in southeast and southwest Michigan. We targeted zoos primarily because of their extensive experience with massasaugas and herps in general, and their reliability, accessibility and experience working with volunteers and the general public.

The Eastern Massasauga response protocol that we had developed for our previous project in southeast Michigan was updated and used with the snake responder network in southwest Michigan (Appendix 8). The massasauga response protocol provides a standard protocol for responding to Eastern Massasauga reports with information on how to communicate with landowners and when and how to safely move a snake if necessary (Appendix 8). This protocol can assist other local resource people who receive and respond to snake reports to ensure that consistent and accurate information is disseminated to the general public and consistent and appropriate actions are taken. The protocol is comprised of six steps which include the following: 1) identifying the snake; 2) asking the landowner to leave the snake alone; 3) moving the snake a short distance into closest natural habitat on or near the property; 4) moving the snake off the property to suitable habitat within the same wetland complex within 250 m or 800 feet from where it was found; 5) contacting the volunteer coordinator and/or species experts to discuss remaining options if all other options have been exhausted or not available including moving the snake up to 500 m or potentially removing the snake from the wild; and 6) documenting the snake observation, volunteer effort and outcome of the snake call or visit. This protocol was based on a timber rattlesnake protocol that has been developed and used in Minnesota. The Eastern Massasauga response protocol had been reviewed and approved by local species experts and project collaborators within the Michigan DNR for our previous project in southeast Michigan. The revised protocol and approach for how it would be utilized by the volunteer snake responder network in southwest Michigan was sent to personnel within the Michigan DNR for comment.

Participants at the massasauga workshops for natural resource and other professionals and the general public were solicited for their interest in serving in the volunteer snake responder network. Individuals interested in serving as volunteer snake responders were invited to attend a volunteer training workshop before they could be authorized to respond to snake calls. The volunteer training workshop was generally two to three hours long, and consisted of the following components: an overview of the volunteer snake responder network and the massasauga response protocol; a review of the massasauga status, identification, and ecology; discussion and role play on how to communicate with people regarding rattlesnakes on their property; and a demonstration and opportunity to practice moving a snake with a broom and garbage can (Appendix 13). At the volunteer training workshop, volunteers were asked to identify counties or areas in which they were willing to respond to massasauga calls and conduct on-site visits. They were asked to complete and sign a volunteer authorization/ liability waiver form and an emergency contact form (Appendix 13). Participants were asked to complete a volunteer time log to document the amount of time spent responding to massasauga reports and to complete an Eastern Massasauga observation and relocation data sheet whenever they responded to a massasauga report (Appendix 13). Volunteers were provided with a Michigan snake identification/field guide, a snake stick or hook, garbage can and broom for moving snakes, and massasauga education and outreach materials that could be provided to landowners.

One of the major challenges and accomplishments of this project was establishing or re-establishing the volunteer snake responder networks in southwest and southeast Michigan, respectively. We were able to identify and establish a regional volunteer snake responder network coordinator and a volunteer network in southwest Michigan. We met with Binder Park Zoo in southwest Michigan, and they have agreed to serve as the regional coordinator for the volunteer snake responder network in southwest Michigan. Chris Gertiser and Lisa Duke, who are zookeepers for the Education Center and Department at Binder Park Zoo, will serve as the primary contacts and coordinators for the volunteer snake responder network at the Zoo. We worked with Binder Park Zoo staff to develop a protocol or system for receiving and responding to massasauga reports within the Zoo and with the volunteer snake responders and MNFI, who will continue to serve as the statewide snake responder network coordinator at least for now. We also worked with Binder Park Zoo to train their staff and volunteer snake responders on how to respond to massasauga reports and how the volunteer snake responder network ideally functions. We provided them with the appropriate documentation and resources for coordinating the volunteer network. For the volunteer snake responder network in southeast Michigan, we had to identify a new regional coordinator because Andy Snider, the former Curator of Reptiles at the Detroit Zoo who had served as the coordinator of the network in southeast Michigan during our previous project, had left the Detroit Zoo. The Detroit Zoo hired a new Curator of Reptiles, Jeff Jundt, in 2008. We discussed the volunteer snake responder network with Jeff Jundt and the Detroit Zoo, and they have agreed to serve as the regional coordinator for the snake responder network in southeast Michigan. Because Jeff is new to Michigan and this project and because we were not able to set this up until late in the project, we still need to provide training to Jeff on the volunteer snake responder network and the massasauga response protocol and help him reestablish and maintain the volunteer network in southeast Michigan. We will provide a training workshop for Jeff and potential volunteers in southeast Michigan during winter or spring 2010.

Another significant issue or challenge related to establishing or maintaining the volunteer snake responder network was how to address permitting (because the massasauga is protected and regulated under a special Director of Natural Resources' Order in Michigan) and liability

issues related to the volunteers. To address these issues now, the volunteer snake responders are currently authorized as volunteers under MNFI but are overseen and coordinated by MNFI and the regional coordinators. As a result, MNFI is currently covering the permitting and liability issues related to the volunteer snake responders. We will continue our discussions with the regional network coordinators about how to adequately address these issues, and the current arrangement may change in the future.

In addition to identifying regional network coordinators for the southwest and southeast, we were able to identify over 60 individuals who expressed an interest in potentially serving as volunteer snake responders from the massasauga workshops that were conducted for professionals and the general public in 2008 and 2009. In collaboration with Binder Park Zoo, the regional network coordinator in southwest Michigan, we offered and conducted two volunteer snake responder training workshops in southwest Michigan in early fall 2009. We had hoped to offer volunteer training workshops earlier in the year but we needed to identify and establish the regional network coordinators before we could train and authorize volunteers. We were able to train and authorize 11 volunteers for the snake responder network in southwest Michigan. The goal was to identify at least one to two volunteers to cover and respond to massasauga reports in each county in the study area. For the seven-county targeted study area in southwest Michigan, we were able to identify at least three volunteer snake responders for each county in the study area and also for two additional counties in the vicinity (i.e., Calhoun and St. Joseph counties). For the volunteer snake responder network in southeast Michigan, 13 volunteers had been trained and authorized in 2006. These volunteers need to be contacted to see if they are still interested in serving as snake responders. We will work with Jeff Jundt and the Detroit Zoo, the regional coordinator for the snake responder network in southeast Michigan, to reconnect with these volunteers. Additional individuals expressed an interest in serving as volunteer snake responders in southwest and southeast Michigan who were not able to receive training during this project in 2008 or 2009. We will work with the regional coordinators in southwest and southeast Michigan to provide training to additional potential snake responders in 2010.

Overall, under this objective, we were able to conduct 11 Eastern Massasauga training workshops for natural resource and other professionals and volunteer snake responders to develop or continue to develop local resource networks in southwest and southeast Michigan to respond to massasauga reports. In addition to these workshops, we provided information on Eastern Massasaugas to medical and health care professionals at a conference in 2008. Over 396 professionals and volunteer snake responders participated in these workshops and the poisonous plants and animals conference. Although we had specified that we would conduct 12 workshops for the local resource network in the workplan, we feel that we were able to successfully meet this objective in terms of training and developing a local resource network in the study area. At a minimum, we have raised the awareness of the Eastern Massasauga among a number of natural resource and other professionals in the study area and have given them adequate resources to help them provide accurate and consistent information on massasaugas to the general public. This project also has led to the identification of a number of agencies and organizations who are interested and willing to collaborate and provide assistance with massasauga education, outreach, and conservation efforts. Examples of these impacts include the group of partners that met and are interested in developing snake- and massasauga-related K-12 curriculum; partners whom we trained who have requested copies of the massasauga training workshop presentation and are interested in conducting or have been conducting their own massasauga education and outreach

efforts (e.g., Oakland County Parks); and partners who have accurately responded to massasauga reports and encounters (e.g., Kalamazoo Nature Center who responded to a media story about an incident in which a massasauga was encountered and killed in a home, Appendix 14). Although we were able to establish regional network coordinators and volunteer snake responder networks in the study area, the networks have not yet been utilized to respond to any massasauga reports during the project period. This was due to a delay in identification of regional network coordinators, which delayed responder training until late summer/early fall 2009. The networks were not fully functional prior to the onset of cold weather and the subsequent brumation (overwintering) of snakes. We will work with the regional network coordinators to have fully functional networks ready to respond to the first onset of calls from concerned residents next spring when the snakes emerge from hibernation. We will work with the regional coordinators to publicize and promote the volunteer snake responder network so that the public is aware of and utilizes this resource for massasauga encounters.

Objective 4: Develop and conduct eight educational workshops for the target public audience.

Workshops for the targeted general public audiences were modeled after massasauga workshops in Ontario and timber rattlesnake workshops in Wisconsin and Minnesota, and were similar to the training workshops for the local resource network. General public workshops also were modeled after work done by Morgan and Gramann (1989) regarding the elaboration-likelihood model as presented by Petty and Cacioppo (1981). Morgan and Gramann found that educational programs that included an individual modeling a safe interaction with a snake, a slide show, and live snakes were more effective than a slide show alone or just having live snakes present in the room when conducting an educational program (Bandura 1969). Petty and Cacioppo developed a model of persuasion called the "elaboration-likelihood model," in which people's attitudes are changed via a central or peripheral route. Changes that occur along the peripheral route tend to be made faster but are not enduring, while attitude changes that are made through the central route, where consideration of the arguments made takes place, tend to be long lasting and less resistant to future change. We modeled our programs to draw on the findings of these two studies. We presented information using a variety of educational and persuasive channels and methods to help participants retain and better utilize this information to make informed decisions about co-existing with the Eastern Massasauga. We used a live massasauga for demonstration purposes in the workshops to provide people with an opportunity to observe a live snake in a safe and controlled setting.

Content of the workshops for the targeted general public was largely the same as that of the workshops for the natural resource professionals (Appendices 4 and 12). We presented information on the ecological, cultural and social values of snakes; general snake biology and ecology particularly in Michigan; the biology, ecology and identifying characteristics of the Eastern Massasauga and look-alike snakes in Michigan; the status and distribution of the massasauga in Michigan; threats to the species; research and conservation efforts; safety tips for how to avoid a snake bite; the number, demographics and treatment of rattlesnake bites; and management practices that would encourage or discourage snakes on people's property (Appendix 4). We showed people live examples of the Eastern Massasauga and the look-alike snakes, and provided opportunities to view the snakes up close and touch the look-alike snakes (Figure 2). We answered questions and distributed educational and outreach materials including

a list of contacts and resources for massasauga reports and additional information on the massasauga. We reviewed and discussed what to do if a massasauga is encountered and demonstrated how to safely move a massasauga with a broom and a garbage can, if necessary, as a last resort (Figure 2). We also provided workshop participants with an opportunity to try to move a live massasauga using this method in a safe, controlled and supervised setting.

Educational workshops on the Eastern Massasauga for the general public were held throughout the study area, particularly in areas where massasaugas have been found or reported. Workshops were held in different counties within the study area and at locations centrally located within the study area to make it easier for people to attend the workshops. Workshops were generally held at nature centers, zoos, or other public outreach facilities and as part of ongoing or scheduled public events or workshop series at these facilities whenever possible to increase attendance at the workshops. We worked with the facilities hosting the workshops to publicize and promote these workshops to the general public through flyers, press releases, and the massasauga Web site that we have developed as part of this project (Appendix 12). Workshops for the public were generally held in late winter, spring or early summer prior to or during the massasaugas' active season. Workshops for the general public were usually held in the evening or on the weekend to accommodate people's schedules and increase public participation and attendance. Workshops ranged from one to two and a half hours long, and were generally two hours long.

In 2008 and 2009, we organized and conducted 12 educational workshops on the Eastern Massasauga for the general public (Table 2). We conducted four more workshops for the general public than was proposed in the original workplan. Three of these workshops were held in southeast Michigan in Oakland and Jackson/Washtenaw counties, and the remaining nine workshops were held in southwest Michigan in Berrien, Cass, Kalamazoo, Kent, and Van Buren counties (Table 2). Three of these workshops targeted the general public and natural resource and other professionals (i.e., in Berrien, Kalamazoo, and Oakland counties, Table 2). Over 432 people participated in these workshops, with at least 334 general public participants (Table 2). The number of participants at each workshop ranged from about 16 to 72 people, and averaged about 35 to 40 people, which was a desired number of participants per workshop. Five of these workshops were requested by project partners and other agencies or organizations. These included an abridged massasauga workshop to members of the School for Outdoor Leadership, Adventure and Recreation (SOLAR) in southeast Michigan; a workshop for natural resource professionals, volunteer land stewards, and the general public that was jointly sponsored by the Oakland Land Conservancy, The Stewardship Network, and Indian Springs Metropark in Oakland County in southeast Michigan; a workshop for the general public and a workshop for 5th grade students that were requested by the Cass County Conservation District in southwest Michigan; and a workshop requested by the Calvin College Bunker Interpretive Center/ Ecosystem Preserve in Kent County in southwest Michigan. Workshop participants included people who were familiar with the massasauga and/or familiar and comfortable with snakes in general as well as individuals who were not familiar with the snake and/or were generally unfamiliar or fearful of snakes. Workshop participants included adults and children. Workshop participants were generally very attentive and actively participated in the workshops in a number of ways. This included looking at and/or touching the live snakes that were part of the workshop, asking and answering questions during the program, picking up education and outreach materials, filling out the pre- and post-program surveys (see the evaluation section), signing up to be potential volunteer snake responders, and/or talking to program presenters after the workshop.

Table 2. Summary of Eastern Massasauga workshops for the general public conducted in the study area in 2008 and 2009. Workshops highlighted in yellow targeted professionals and the general public.

Date	Target Audience	Region	County	Location	Duration	Number of Participants
2/5/2008	General Public - School for Outdoor Leadership, Adventure and Recreation (SOLAR) members	SE MI	Oakland	Colony Hall, Southfield	1.5 hours	40-50
3/11/2008	Natural Resource Professionals and General Public - Sarett Nature Center staff and volunteers	SW MI	Berrien	Sarett Nature Center	2 hours	16
3/20/2008	Natural Resource Professionals and General Public - Oakland Land Conservancy and friends	SE MI	Oakland	Indian Springs Metro Park	2 hours	52
4/24/2008	General Public	SW MI	Kent	Howard Christensen Nature Center	1.5 hours	33
5/3/2008	General Public	SW MI	Van Buren	Wolf Lake Fish Hatchery	2 hours	72
5/4/2008	General Public	SE MI	Jackson and Washtenaw	Eddy Discovery Center	2.5 hours	24
5/17/2008	General Public	SW MI	Cass	Edward Lowe Foundation, Big Rock Valley	2.5 hours	16
5/19/2008	General Public - 5th Grade Students	SW MI	Cass	Fred Russ Research Forest	1.25 hours x 2	~70
6/14/2008	Natural Resource Professionals and General Public	SW MI	Kalamazoo	Kalamazoo Nature Center	2.5 hours	~30
6/26/2008	General Public	SW MI	Berrien	Love Creek Nature Center	1.5 hours	12
3/7/2009	General Public	SW MI	Kent	Calvin College, Bunker Interpretive Center	2 hours	~50-60
5/30/2009	General Public	SW MI	Van Buren	Wolf Lake Fish Hatchery	2 hours	17

Objective 5: Promote balanced media coverage of the Eastern Massasauga, especially in response to reports of snakebites.

Providing factual and balanced information about the Eastern Massasauga will help increase public awareness and understanding of this species and will help people more accurately assess the level of threat posed by this species. This will help people be able to make informed decisions about how they can share the environment with this species. To promote balanced media coverage of the Eastern Massasauga and reach a wider audience for our education and outreach, we identified and/or responded to a variety of media opportunities to provide factual information about the massasauga. Media opportunities that were identified for promoting balanced coverage of the massasauga in Michigan included contacting and/or providing information to outdoor writers and other reporters, writing and submitting articles on the massasauga and associated conservation and stewardship efforts to regional or local newsletters, promoting and publicizing the workshops conducted as part of this project, distributing the press packet on the massasauga that was developed as part of the earlier massasauga education and outreach project in southeast Michigan, and working with individuals who work in the media or communication field. We promoted and shared information about this project with educators and others interested in massasauga education and outreach through presentations at professional conferences and meetings and publications.

An article or press release with information and photos on how to properly identify an Eastern Massasauga as well as several look-alike snakes in Michigan was produced and distributed to partner organizations such as the John Ball Zoo, Kalamazoo Nature Center, Pierce Cedar Creek Institute, Sarett Nature Center, and Binder Park Zoo for use in their newsletters (Appendix 15). This article or press release was entitled "Michigan's Season of the Snake," and was produced and intended for publication primarily in the spring when snakes emerge from their overwintering sites and move to habitats they use during the active season. People have increased potential for encountering massasaugas and other snakes during this spring emergence period when snakes tend to more active and/or visible. An article or press release about fall snake migration and the potential for people to encounter snakes, including massasaugas, in the fall during this period also was developed (Appendix 15). This press release also included information about the volunteer snake responder network in southwest and southeast Michigan to let people know about this resource in case they encountered snakes in the fall. This press release was entitled "Fall Snake Migration and Humans," and was distributed to Binder Park Zoo and Detroit Zoo, the regional snake responder network coordinators, for publication or distribution. We also had planned to distribute this press release more broadly through the Michigan DNR and MSU ANR Communications, but were not able to do this prior to the onset of cold weather and snakes entering hibernation in the fall. We will work with partner agencies and organizations and other media sources or outlets to distribute and publish both of these press releases in the future (i.e., in 2010).

To help promote and publicize the massasauga workshops that were offered as part of this project, hosting organizations and facilities were provided flyers which they could post and distribute to advertise the workshops (see Appendix 12 for a sample flyers). Some host organizations publicized workshops in local newspapers or issued press releases about upcoming workshops. For example, the Michigan DNR issued a press release promoting a massasauga workshop at the Wolf Lake Fish Hatchery Visitor Center, and a press release was released and printed about the massasauga workshop at Calvin College (Appendix 12). Additionally, several

massasauga workshops were covered by local press, and articles about these workshops were printed in local newspapers. A massasauga workshop for the public held on March 11, 2008 at Sarett Nature Center in Berrien County in southwest Michigan was covered by the local newspaper, and Rebecca Christoffel, who presented the workshop, was interviewed about Michigan snakes. A nice article about the massasauga workshop for the public held on March 7, 2009 at Calvin College in Kent County in southwest Michigan was published in the Grand Rapids Press after the workshop (Appendix 14). The article did a good job of providing some of the information about massasaugas that was presented during the workshop, allowing us to share the information with a larger audience.

In addition to articles about the massasauga workshops, our project team and partners provided information about massasaugas to reporters who contacted us for articles they were writing. One example is an article that was published in the Kalamazoo Gazette on July 31, 2009 about a massasauga found in the basement of a house in southwest Michigan that was killed by police and the specimen was given to the Kalamazoo Nature Center (Appendix 14). We, along with staff from the Kalamazoo Nature Center and the Michigan DNR (who had attended our massasauga training workshops), provided information about massasaugas to the journalist who wrote this article. Information provided by the partners included information that had been presented during our workshops. This article provides a good example of the local massasauga resource network providing accurate and consistent information about this species. This article also represents an example of balanced media coverage providing accurate information about massasaugas to the general public.

We intended to develop a list of outdoor writers or journalists in the study area and to distribute the press packet on the Eastern Massasauga that we have compiled to these writers to promote balanced media coverage of the massasauga. Press packets were distributed to participants of the Michigan Outdoor Writers' Association at their semi-annual meeting in February 2006 as part of our earlier massasauga education and outreach project in southeast Michigan. We hoped to reach additional outdoor writers or journalists who had not attended our massasauga presentation at that meeting or our other massasauga workshops in the past and/or have not contacted us specifically to get information about massasaugas. However, we were unable to complete this task during the project period. The press packet was modeled after a press kit developed by the Toronto Zoo and the Canadian Eastern Massasauga Rattlesnake Recovery Team. The press packet contains all the educational materials or resources that were developed or utilized as part of this project. We will try to develop this list and continue to distribute the press packet and provide information about massasaugas to outdoor writers and other journalists upon request. Information provided in the press packet also will be available on the massasauga Web site that we have developed (www.msue.msu.edu/mnfi/emr).

We identified additional opportunities to promote or provide balanced media coverage of the Eastern Massasauga in Michigan that we were not able to fully address or pursue as part of this project due to limited time and resources. These include the following: 1) development of a documentary on the Eastern Massasauga in Michigan that could be made available on a DVD for education and outreach purposes, as mentioned earlier, and also broadcast on public television; 2) development of a short public service announcement (PSA) or something similar for public television and for viewing in theaters in visitor centers in state parks and recreation centers; 3) coverage of massasaugas on outdoor-related television shows in Michigan; and 4) coverage of Eastern Massasaugas by National Public Radio and/or the Great Lakes Radio Consortium. We

were contacted in the fall of 2008 by Outdoor Elements, a nature show on WNIT public television that airs weekly in 22 counties in southwest Michigan and north central Indiana. They were interested in potentially taping a segment on the Eastern Massasauga and our work on this species for the show's 2009 season. This would have provided a good opportunity to highlight this species and present accurate and balanced information about Eastern Massasaugas to the general public in the study area. However, we were not contacted by the show in 2009. We will contact the show about the inclusion of a segment on Eastern Massasaugas and some of the current conservation efforts in southwestern Michigan in 2010. We will continue to work with partners such as the Michigan DNR Office of Communications and the MSU ANR Communications Office in the future to increase and promote balanced media coverage of the Eastern Massasauga in Michigan.

B) Description of target audience and total number of people reached.

This project had a number of different target audiences comprised of two main groups or types. The first main group or type of target audience consisted of natural resource professionals and other professionals who respond to or have potential to respond to massasauga reports from the public, conduct public education and outreach in some manner, and/or have the potential to encounter and impact massasaugas and/or their habitats. Over 90 different professional target audiences in southwest Michigan were identified and compiled (Appendix 1). Eighty-six different professional target audiences in southeast Michigan were identified and compiled during the previous EPA massasauga education and outreach project (Appendix 2). These professional target audiences included state and local natural resource agencies and professionals (e.g., Michigan Department of Natural Resources, Michigan Department of Environmental Quality, local conservation districts), animal damage control offices or organizations, environmental organizations (e.g., local Audubon chapters, botanical clubs), county extension offices, developers, hospitals and health departments, veterinarians, law enforcement agencies/personnel (e.g., conservation officers, local police departments), land conservancies, state and local parks, nature centers, zoos, formal and informal educators, volunteer natural resource stewardship groups (e.g., The Stewardship Network, Michigan State University Extension's Conservation Stewards Program), outdoor writers, Native American tribes, and utility companies (Appendices 1 and 2). Given limited time, funding and personnel, we focused on training target audience groups that could potentially continue massasauga education and outreach beyond this project and help us ultimately reach a broader audience (i.e., "train the trainers" approach). As a result, natural resource-related professionals were considered high priority target audiences. The other main group or type of target audience was the general public, particularly landowners and other individuals who had encountered massasaugas or had high potential for encountering massasaugas on their properties or in their vicinity based on areas where massasaugas have been documented. General public target audiences included adults and children including a workshop for 5th grade students.

This project had multiple components for reaching the various target audiences. One of the main components of the project was the conduct of training or educational workshops for the professional and public target audiences. We conducted 18 massasauga training or educational workshops total for professional and general public target audiences in the study area in 2008 and 2009 (Tables 1 and 2). These included six workshops that were specifically targeted for natural resource and other professionals, nine workshops for the general public, and three

workshops that targeted both professional and public target audiences. In addition to these workshops, we also delivered a short presentation and had an information table on the Eastern Massasauga at a poisonous plants and animals conference for medical and health care professionals in April 2008. Over 711 individuals participated in and were reached through these workshops and meetings or conferences, with at least 279 professional participants in the workshops and meetings that targeted professionals, at least 334 individuals in the workshops specifically for the general public, and at least 98 individuals in the three workshops that targeted professionals and the general public. More detailed information about the target audiences that were reached through the workshops and meetings is provided in the methods and results for Objectives 3 and 4. The number of individuals who participated in and were reached through the massasauga workshops is very likely an underestimate since the numbers of participants for several workshops were estimated (e.g., April 24 and May 19, 2008 and March 6, 2009).

Additional, but unquantifiable numbers of people were reached through other components of this project such as the massasauga Web site and other education and outreach resources or materials that were revised and/or distributed, education and outreach efforts conducted by our partners, and balanced media coverage (e.g., newspaper articles). Unfortunately, we were unable to track the number of people who were reached through these project components. As a result, we cannot provide an estimate of the number of people who were reached through these project components other than to indicate that local readership of some of the newspapers in which articles appeared as a result of this project number in the tens of thousands on a daily basis. We can safely assume that the number of people who were reached through the workshops is a gross underestimate of the number of people who were reached through this project.

C) Plans for dissemination of the project results.

We plan to disseminate information about the project and project results primarily through presentations at professional meetings and conferences and publications. We have already presented information about the project and some of its results at the Kansas Herpetological Society Annual Meeting that was held in November 2009. Other potential meetings at which this project and its results can be presented include the Michigan Eastern Massasauga Workgroup Annual Meeting, the National Interpreters Workshop/Annual Meeting, American Zoological Association's (AZA) Eastern Massasauga Species Survival Plan meeting, Michigan State University Extension Annual Meeting, national or regional natural resource-related Extension meetings, and annual meetings of the Midwest and/or Michigan Chapter of Partners in Amphibian and Reptile Conservation (PARC). Project results may be presented at additional meetings as they are identified and as opportunities arise.

Project results also will be disseminated through publications in peer-reviewed journals and other professional publications or newsletters. We have been invited to write a feature article for *Reptiles and Amphibians*, the journal of the International Reptile Conservation Foundation (IRCF). This article will appear in the June or September 2010 issue of the journal. We are writing a manuscript based on the assessment of this project for publication in the Journal of Extension. We may develop and submit additional publications on this project to massasauga and other herp- or natural resource-related journals or newsletters, and newsletters of our partner organizations.

In addition to presentations and publications, project results will be shared with project partners and key stakeholders including the Michigan DNR, Detroit Zoo, Binder Park Zoo, Toronto Zoo, Lincoln Park Zoo (i.e., coordinator of the AZA's Eastern Massasauga Species Survival Plan), U.S. Fish and Wildlife Service, MSU Extension, U.S. and Michigan Eastern Massasauga Workgroups, Illinois Eastern Massasauga Recovery Team, and other local, state, regional, and national partners. Project results also will be made available on the MNFI and Eastern Massasauga Web sites and potentially through the Michigan DNR Web site and Web sites of other partner organizations.

D) Problems and/or challenges encountered while executing the project.

Several problems or challenges were encountered while executing the project. One major problem or challenge was our inability to reach certain professional target audiences through our massasauga workshops such as law enforcement personnel, medical or health care professionals, veterinarians, county extension educators, and utility workers. We are particularly interested in providing information and training to law enforcement personnel because they frequently respond to massasauga encounters in people's homes or on their properties because of safety concerns. These encounters often result in law enforcement personnel killing the snake. We also particularly want to provide information about massasaugas and snakebites to health care professionals. We want to make sure that health care professionals are aware of the potential for massasauga bites, can recognize and properly treat snakebites, and know of available information resources. It is important to reach these groups because human-snake encounters, particularly in people's homes, and snakebites can impact human and snake safety. Also, these types of encounters or situations often are highly publicized and can significantly impact people's perceptions and attitudes toward the massasauga, particularly if information is out of context or inaccurate. We invited law enforcement personnel to some of our workshops, but none were able to attend. We plan to send the massasauga training DVD, outreach materials that we have developed, and information about the volunteer snake responder network and the massasauga response protocol to law enforcement personnel and/or agencies in the study area. We would like to investigate and identify potential partners or opportunities for working with law enforcement personnel to see if we can provide follow-up training and answer any questions they might have after they receive the DVD and other materials. We want to further our work with the Michigan Poison Control and other potential partners to provide some information about massasaugas and snakebites to medical and/or health care professionals. Some of these professionals may not be aware or fully understand how to identify and treat massasauga bites because they occur so infrequently. We would like to provide information and training to veterinarians regarding massasauga bites to pets, particularly dogs, since snakebites to pets occur fairly infrequently and veterinarians may have little or no experience treating such bites.

Getting adequate attendance or participation at massasauga workshops was challenging at times. Some workshops were very well-attended while others were not. Generally, workshops held earlier in the spring and before summer (i.e., before early to mid-May) were better attended than workshops held during summer or later in the year. Also, as expected, workshops that were better publicized or were part of existing or organized meetings or ongoing speaker series had higher attendance.

Establishing and maintaining a volunteer snake responder network in southwest Michigan and southeast Michigan, respectively, presented major challenges for the project. Identifying a regional coordinator for the volunteer snake responder networks in both the southwest and southeast Michigan was particularly challenging due to personnel changes in partner organizations, such as the Binder Park Zoo and Detroit Zoo, as well as liability issues related to volunteers working with a venomous species. We had to work with the regional network coordinators, other partners in the study area, and the Michigan DNR to determine how the snake responder network would work best in each of the regions given the regional coordinators' capabilities and limitations. A more detailed summary of the challenges and issues related to the volunteer snake responder network encountered during the project and how these issues were addressed is provided in the report under Objective 3.

Several changes in project personnel and staff in partner organizations also occurred and presented some challenges during the project. Tom Funke was the Director of Conservation Education at Binder Park Zoo and was identified as a project partner when the project proposal was submitted. Tom left this position in the fall of 2007 just as the project was initiated. Binder Park Zoo eventually filled this position in 2008, but Tom's replacement also has since left this position, and the Zoo has not refilled this position yet. However, we were able to contact Binder Park Zoo and identify other staff at the Zoo to work with us on this project in 2009 and serve as regional coordinator of the volunteer snake responder network in southwest Michigan. Additionally, Andrew/Andy Snider was the Curator of Reptiles at the Detroit Zoo and a key partner and the regional coordinator of the volunteer snake responder network in southeast Michigan during the previous massasauga education and outreach project in southeast Michigan. He was no longer with the Detroit Zoo when the project proposal was submitted. The Detroit Zoo hired a replacement for this position, Jeff Jundt, in the fall of 2007. We talked with Jeff Jundt, and he was interested in working with us on this project, but he was still new to his position, and he was not familiar with massasaugas or our project. Jeff and the Detroit Zoo have agreed to provide assistance with this project and massasauga education and outreach efforts in southeast Michigan including serving as the regional coordinator for the volunteer snake responder network in southeast Michigan. Also, key project team member, Rebecca Christoffel, who served as a volunteer and provided cost share for this project, changed positions several times during the course of the project. Yu Man Lee, the project's principal investigator and key project team member, also had her position at MNFI change in which she served as the Interim Director for MNFI during the project period (i.e., October 2007 - February 2009). Rebecca and Yu Man were able to continue to work on this project, but changes in their positions and work responsibilities resulted in some delays in completing project tasks.

E) Description of evaluation measures and results.

Evaluation Methods

To evaluate the effectiveness of the workshop in terms of attitude changes and knowledge gains, pre- and post-workshop questionnaires (Appendices 16 and 17) were administered to some workshop participants, i.e. those that were adults and at venues where this was possible. A long-term assessment questionnaire (Appendix 18) was developed and sent six to ten months post-workshop attendance to participants for whom we knew the date of the workshop attended and had current contact information. Questionnaires were designed to test basic knowledge of

Michigan snakes and their protection, and to assess the attitudes and behavioral intentions of participants toward Eastern Massasaugas. Long-term assessments were designed to give us insights about the impact that participating in a workshop had on participants' feelings toward snakes and to examine long-term retention of attitudes and behavioral intentions.

The impact of attending the workshop on respondents' knowledge was assessed by comparing pre-workshop knowledge scores to post-workshop knowledge scores. Three pieces of information were used to test for knowledge. These three facts were used because we felt that they were basic to understanding and supporting snake conservation efforts in Michigan. Information tested included: 1) knowledge of the approximate number of non-venomous snake species found in Michigan, 2) knowledge of the number of different kinds of rattlesnakes found in Michigan, and 3) knowledge that laws exist to protect snakes in Michigan. Knowledge scores ranged from 0 to 3.

The impact of attending the workshop on respondents' attitudes was assessed in two ways. First, a comparison of pre-workshop, post-workshop and long-term questionnaire attitude scores was made. Second, respondents were asked a series of questions in which they attributed how attending the workshop had influenced their feelings toward snakes. Rattlesnake attitude scores were constructed from a series of items on pre-workshop, post-workshop and long-term questionnaires which asked respondents to select whether they Strongly Agreed, Agreed, Unsure, Disagreed or Strongly Disagreed with a series of statements (Table 3). Rattlesnake attitude scores ranged from -24 to +24, with a score of -24 indicating very negative attitudes toward rattlesnakes and a score of +24 indicating very positive attitudes toward rattlesnakes. Respondents who marked an "unsure" to any statement were excluded from our analysis because of the uncertainty in how they felt about any particular statement. A score near "0" indicated neutral feelings toward rattlesnakes. Attribution scores from respondents ranged from 7 to 35, with a score of 7 indicating that participation in the workshop had caused the respondent to feel much more negatively toward rattlesnakes and a score of 35 indicating that participation in the workshop had caused the respondent to feel much more positively toward rattlesnakes. An overall score of 21 indicated that participation in the workshop had not influenced a respondent's feelings toward rattlesnakes. Respondents were asked directly how participation in the program had influenced their feelings about snakes in our long-term questionnaires. Seven items were used to measure this (Table 4). In addition to constructing attitude scores, we also assessed how attending the workshop affected participants' levels of interest in snakes, participants' support for protecting non-venomous snakes and rattlesnakes, and participants' beliefs of the personal risks that rattlesnakes presented to them.

The impact of attending the workshop on respondents' behavioral intentions was measured by comparing pre-workshop, post-workshop and long-term questionnaire scores on responses to seven hypothetical scenarios presented in questionnaires. Four possible responses to the scenarios and an "unsure" option were given (Table 5). Scores ranged from 7 to 28. Respondents who marked "unsure" for any of the seven hypothetical scenarios were excluded from our analyses.

Table 3. Twelve statements used to construct a rattlesnake attitude score for participants at a series of Eastern Massasauga workshops held in southwestern Michigan in 2008.

I enjoy seeing rattlesnakes in the wild in Michigan.
Rattlesnakes help to control mice, rats and other pests in Michigan.
Whether or not I see one, I get some benefit from just knowing that rattlesnakes live in Michigan.
Rattlesnakes are important to the balance of nature in Michigan.
Rattlesnakes pose a threat to people by their presence in Michigan.
Rattlesnakes are likely to spread disease to humans in Michigan.
In Michigan, rattlesnakes pose an unacceptable threat to dogs and cats.
Rattlesnake bites cause deaths to Michigan residents each year.
In Michigan, the risk of a person being ***injured*** by a rattlesnake is acceptably low.
In Michigan, the risk of a person being ***killed*** by a rattlesnake is acceptably low.
I would be ***less*** likely to have a rattlesnake moved off my property if I knew that it probably would not survive as a result.
If I knew a rattlesnake lived within a mile of my home, it would decrease my enjoyment of living there.

Table 4. Seven items from long-term questionnaires used to measure how participation in a snake program had influenced respondents' feelings toward snakes. *(Responses included: Greatly increase, Somewhat increase, Has not affected this, Somewhat decrease and Greatly decrease).*

Participating in a program about snakes has caused….
….my interest in learning about snakes to…..
…my negative feelings toward snakes to….
…the time I spend looking for opportunities to learn about snakes to….
…my fear of snakes to…
…my feelings of being at personal risk of being bitten by a rattlesnake to…
…my positive feelings toward snakes to….
…the attention I pay to information about snakes to…

Table 5. Seven items used to construct a behavioral intention score toward rattlesnakes by participants attending a series of workshops held in 2008 in Michigan.(*Responses included, "I would not do anything" (4), "I would ask someone what I should do" (3), "I would tell someone to remove the rattlesnake" (2), and "I would kill the rattlesnake" (1). An "unsure" option was also included, but individuals who chose it for any of the seven scenarios were excluded from analysis.)*

You see a rattlesnake near your home once.
You hear about *one* time when a rattlesnake strikes at a neighbor's dog or cat.
You see a rattlesnake near your home *more than once* in a week.
Pets near your home are *repeatedly* threatened by a rattlesnake.
A rattlesnake bites a pet near your home *once*.
A rattlesnake bites *several* pets over a summer near your home.
You see a rattlesnake on your porch *once*.

We compared average knowledge scores, attitude scores, and behavioral intention scores among four different audience types. These included: 1) Public only (May 17 audience); Mixed, i.e. professionals and the public (March 20 and June 14 audiences); docents, i.e. John Ball Zoo docents and Michigan State Parks seasonal interpretive staff (April 12 and May 20 audiences); and professionals only (March 10 and June 26 audiences).

Informal measures were also used to assess the impact of our educational efforts. These included the number of workshop participants, the kinds of targeted audiences who attended, the number of people who signed up to become a part of the volunteer snake responder network, and the number of requests we received for educational materials and workshops. Feedback from workshop participants and collaborators are consistently used to both evaluate the usefulness and effectiveness of the workshops and to improve our future efforts.

SPSS (version 17.0) was used to analyze results of the pre-, post- and long-term assessment questionnaire. No tests for significance were conducted due to a dearth of sampling units (we had to use each workshop cohort as a unit due to restrictions on collecting personal information from participants) and because of a dwindling sample size, i.e. n=154 at pre-test, n=124 at post-test and n=90 at long-term assessment.

Evaluation Results

Participants' knowledge of snakes in Michigan increased after attending the workshops presented in 2008 (Figure 3). Overall, participants came to workshops with very positive attitudes toward snakes, with an average attitude score of 19 (Figure 4). Post-attitude scores averaged 17.6 and long-term attitude scores were 19.7 (Figure 4). Participants' self-assessed changes in feelings toward snakes also positive (Figure 5). On average, participants at each workshop felt that the workshop was responsible for somewhat increasing their positive feelings toward snakes and somewhat decreasing their negative feelings toward snakes (Figure 5). This was especially true for docents and volunteers at the John Ball Zoo who attended the April 12 workshop; they averaged >27 on the self-attribution scale (Figure 6). Participants were at least somewhat interested in snakes prior to attending a workshop and, on average, were very intrerested in snakes post-workshop and even when asked 6-10 months later (Figure 7).

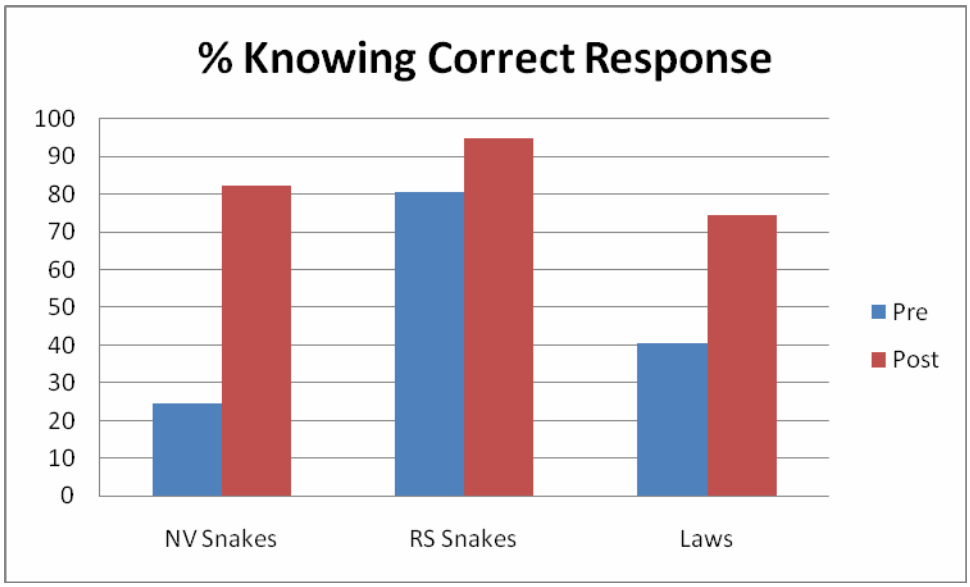

Figure 3. Percentage of participants attending a series of snake workshops held in southwestern Michigan in 2008 who knew a) the approximate number of non-venomous (NV) snake species that are found in Michigan, b) the exact number of rattlesnake (RS) species that reside in Michigan and c) laws exist that protect snakes in Michigan.

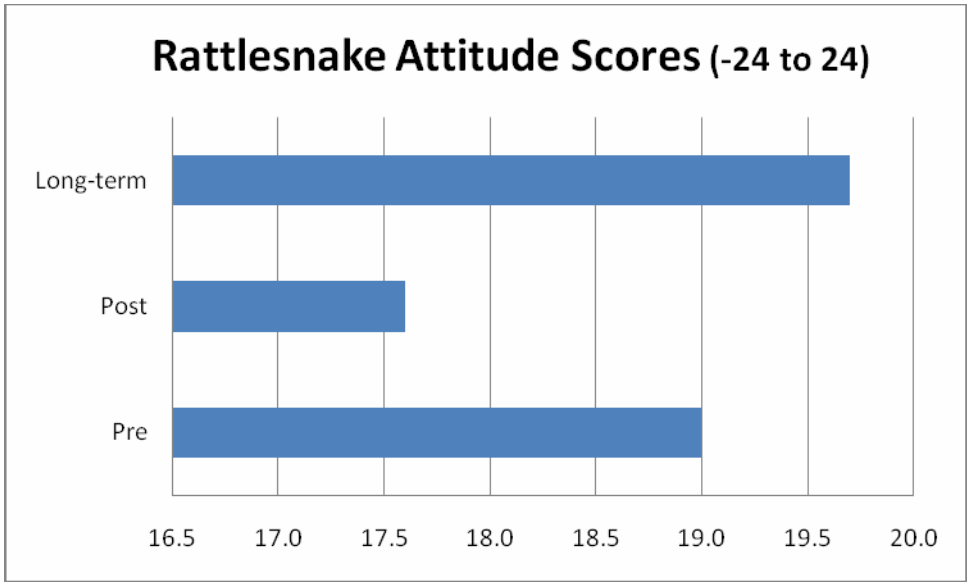

Figure 4. Pre-workshop, post-workshop and long-term questionnaire "rattlesnake attitude" scores for participants at a series of snake workshops held in southwestern Michigan in 2008.

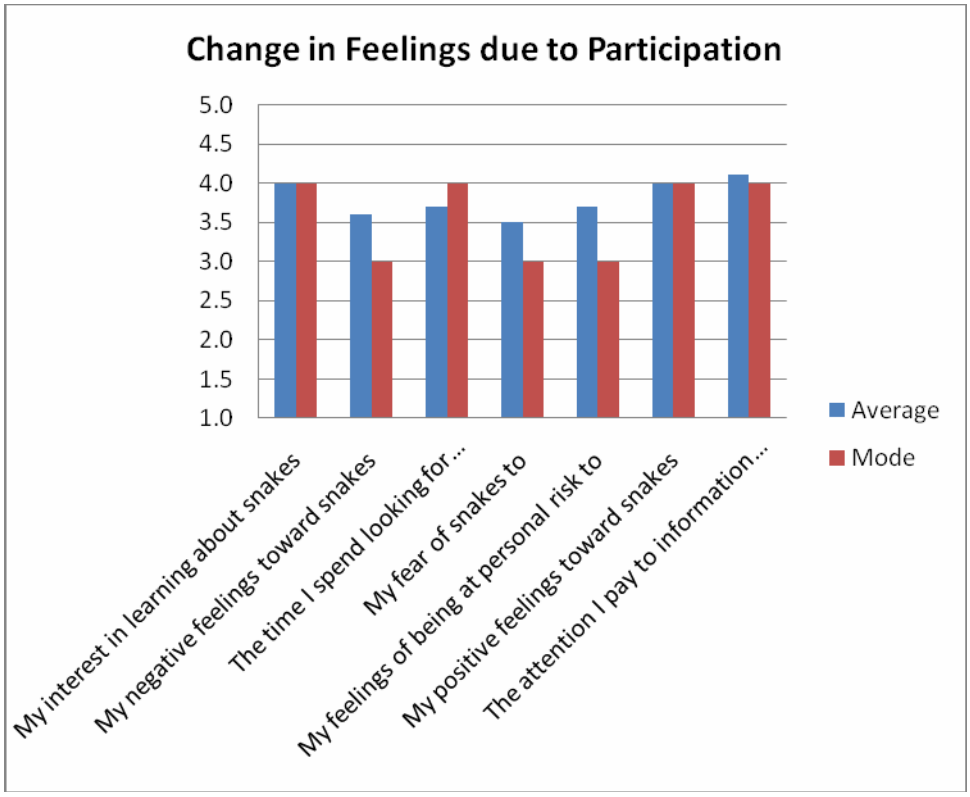

Figure 5. Average and mode scores for changes in feelings toward snakes, as assessed by participants at a series of snake workshops held in southwestern Michigan in 2008. *(Responses were scored with a 1 indicating that a respondent's feeling about an item having become much more negative, a 2 indicating that a respondent's feeling had become somewhat more negative, 3 indicating that a respondent's feeling had not been affected, 4 indicating that a respondent's feeling had become somewhat more positive, and 5 indicating that a respondent's feeling had become much more positive.)*

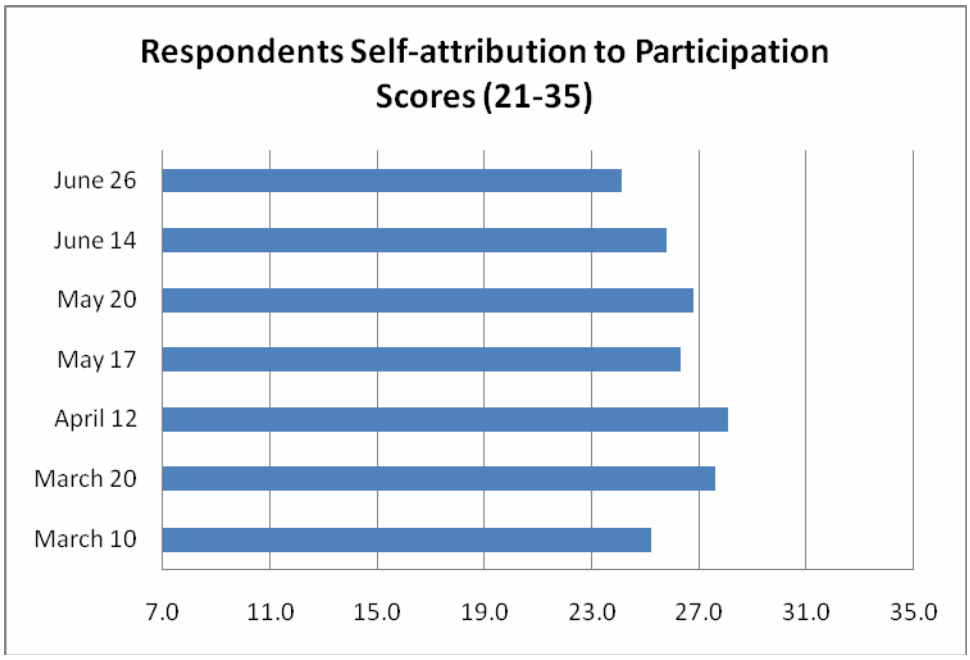

Figure 6. Respondents' average self-assessment score of how participation in a snake workshop held in southwestern Michigan in 2008 had affected their feelings toward snakes. *(Scores ranged from 7 to 35, with a score of 7-13 indicating that their feelings had become more negative, a score of 14-20 indicating a somewhat negative change, a score of 21 indicating that there had been no change in feelings due to attendance at a workshop, a score of 22-29 indicating that their feelings were somewhat more positive since attending the workshop, and a score of 30-35 indicating that a respondent's feelings had become much more positive since attending the workshop.)*

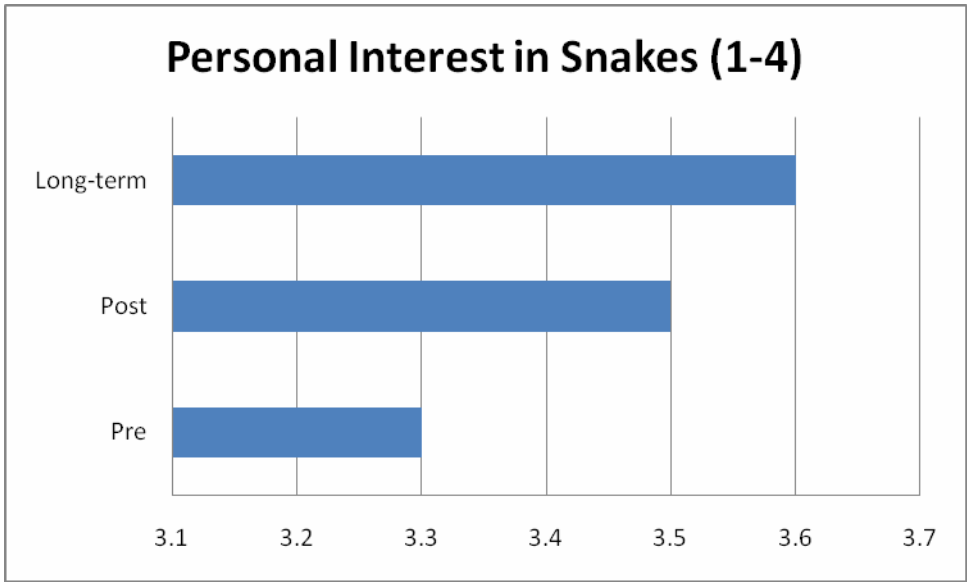

Figure 7. Mean interest in snakes as reported by participants in a series of snake workshops held in southwestern Michigan in 2008. *(Responses included: Very disinterested (1), Somewhat disinterested (2), Somewhat interested (3), and Very interested (4).)*

Workshop participants' perceived risk due to massasaugas, support for protection of snakes, and behavioral intentions toward snakes did not appear to change much after attending the workshops. On average, snake workshop audiences felt that they were at only very slight risk due to rattlesnakes prior to attending the workshops, and on average, their perception of risk was only slightly increased after attending the workshop (Figure 8). Responses to long-term questionnaires indicated that audiences felt at almost "no risk" due to rattlesnakes. The vast majority of audiences were supportive of both non-venomous (NV) snakes and rattlesnake (RS) protection prior to attending the workshops (Figure 9). The proportion of audience members that supported protection of snakes increased immediately after attending workshops, but fell to lower levels in the long-term follow-up (Figure 9). Average audience behavioral intention scores indicated that most encounters with rattlesnakes would result in either a phone call asking what the person should do or in no action at all (Figure 10). Average scores for participants were slightly higher immediately after attending a workshop but had returned to pre-workshop levels when participants were queried six to ten months later (Figure 10).

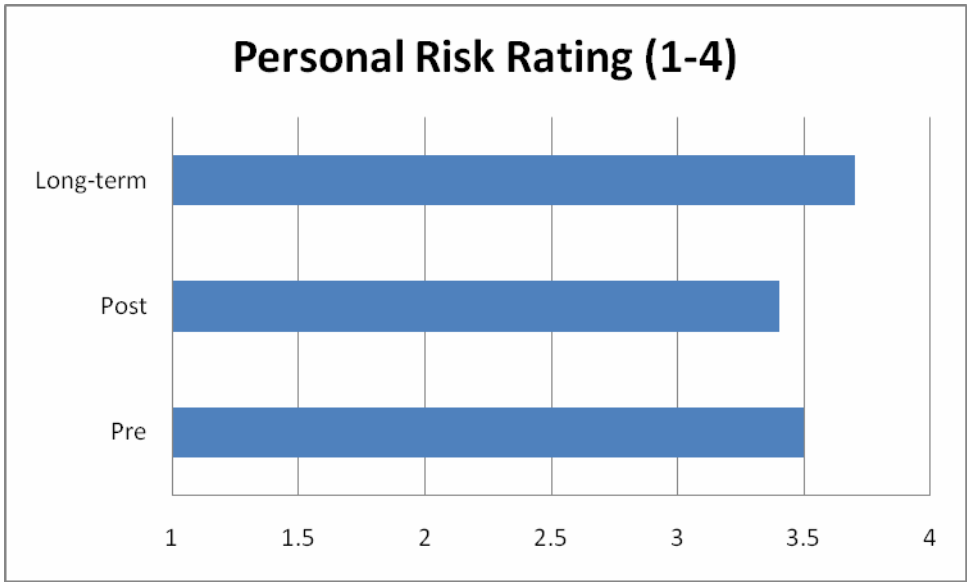

Figure 8. Average personal risk ratings due to rattlesnakes for audiences who attended a series of snake workshops held in southwestern Michigan in 2008. *Responses included: I am at great risk (1), I am at some risk (2), I am at slight risk (3) and I am at no risk (4).)*

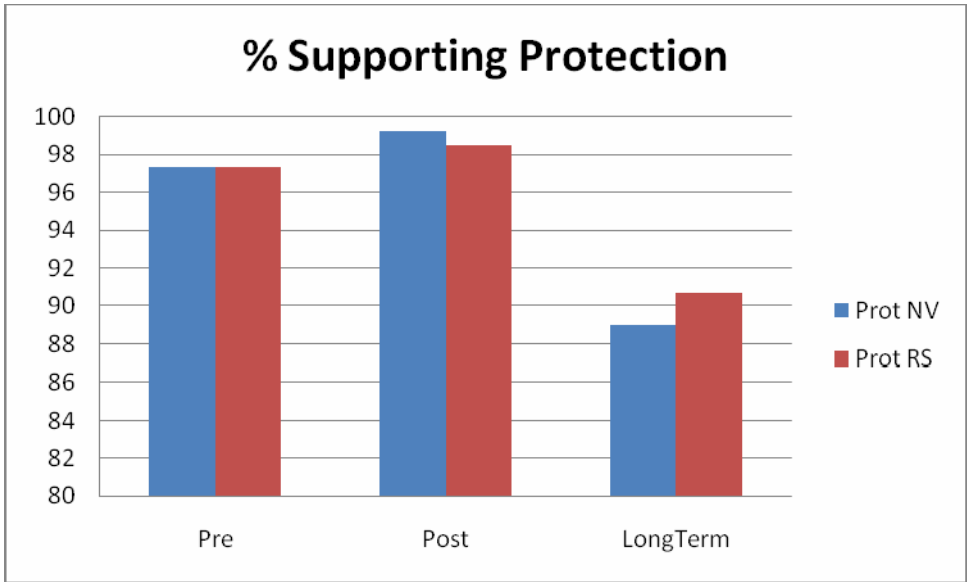

Figure 9. Proportion of audience members who felt that non-venomous snakes (NV) and rattlesnakes (RS) were in need of protection prior to attending a workshop, immediately following workshop attendance and 6-10 months later.

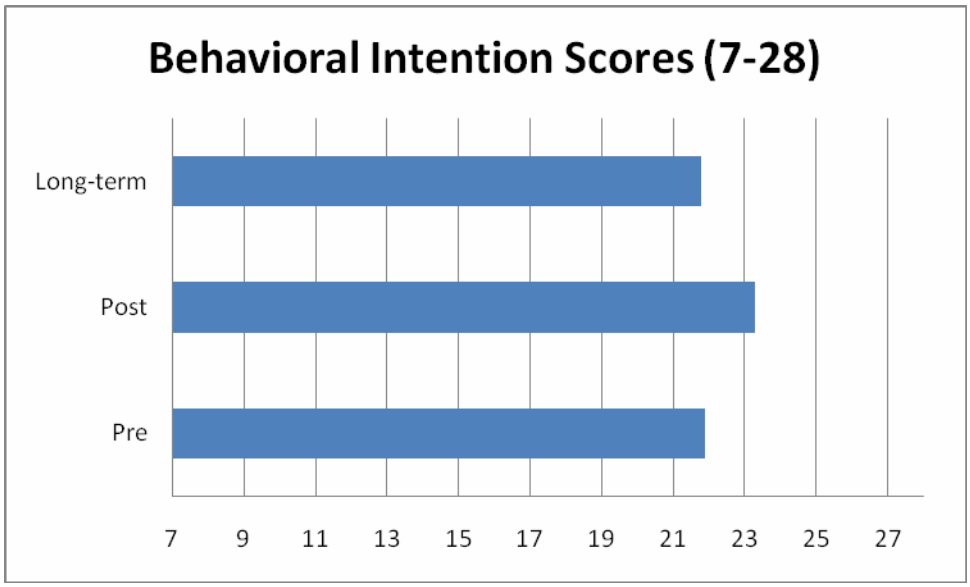

Figure 10. Average behavioral intentions scores toward rattlesnakes in seven hypothetical scenarios as reported by audiences at a series of snake workshops in southwestern Michigan in 2008. *(Responses included: I would kill the rattlesnake (1), I would tell someone to remove the rattlesnake (2), I would ask someone what I should do (3) and I would not do anything (4). Behavioral intention scores ranged from 7 to 28, with a score of 7 indicating that the individual would kill the rattlesnake in each of the seven situations, and a score of 28 indicating that the individual would not do anything in each of the seven situations.)*

Average knowledge scores appeared to differ among audience types and prior to and after attending massasauga workshops, while rattlesnake attitude scores, changes in feelings toward rattlesnakes due to participation, and personal interest in snakes were generally more similar across audience types and prior to and after attending workshops. Average knowledge scores prior to attending a snake workshop was lowest for the general public audience and greatest among the professional and mixed audiences (Figure 11). Differences in pre- and post-knowledge scores were greatest for docents and the public. Average rattlesnake attitude scores were great for each audience type prior to attending a workshop and remained high immediately following workshop attendance and six to ten months later (Figure 12). Only the public audience's long-term rattlesnake attitude score was lower both immediately following the workshop and six to ten months later. On average, each audience type indicated that overall, their positive feelings toward snakes had increased and that their negative feelings toward snakes had decreased due to participation at a snake workshop (Figure 13). This was particularly true for our docent audiences, who had an average score of 27.8 on a scale of 7-35. All audience types were at least somewhat personally interested in snakes prior to attending a workshop, and personal interest level increased over the long-term for all but the public audience (Figure 14).

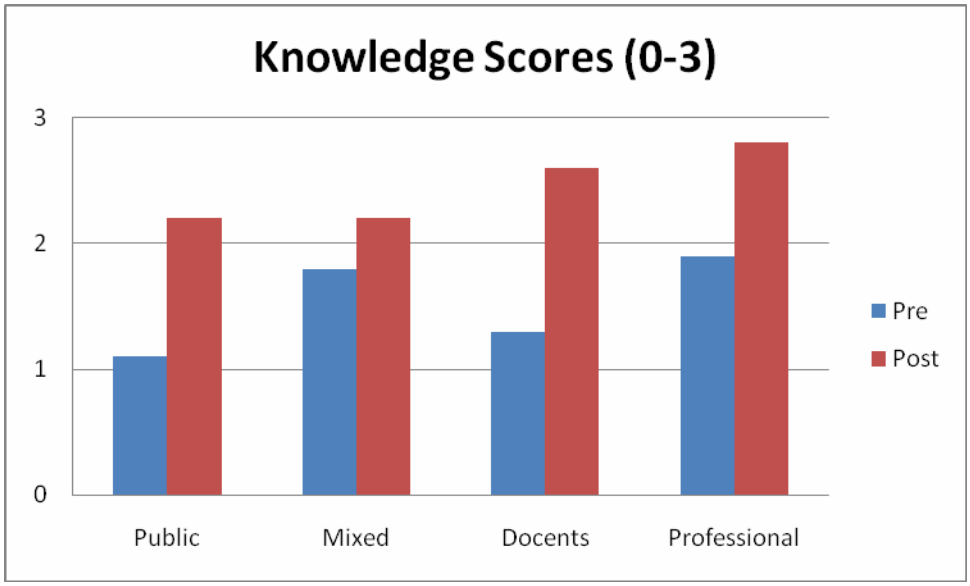

Figure 11. Average knowledge scores for four audience types who attended a series of snake workshops presented in southwestern Michigan in 2008. *(Pre-workshop scores for each audience type included: Public =1.1, Mixed=1.8, Docents=1.3, and Professionals=1.9. Post-workshop scores and net gain in knowledge scores for each audience type included: Public =2.2 (a 1.1 point gain); Mixed = 2.2 (a 0.4 point gain); Docents =2.6 (a 1.3 point gain) and Professional=2.8 (a 0.9 point gain).)*

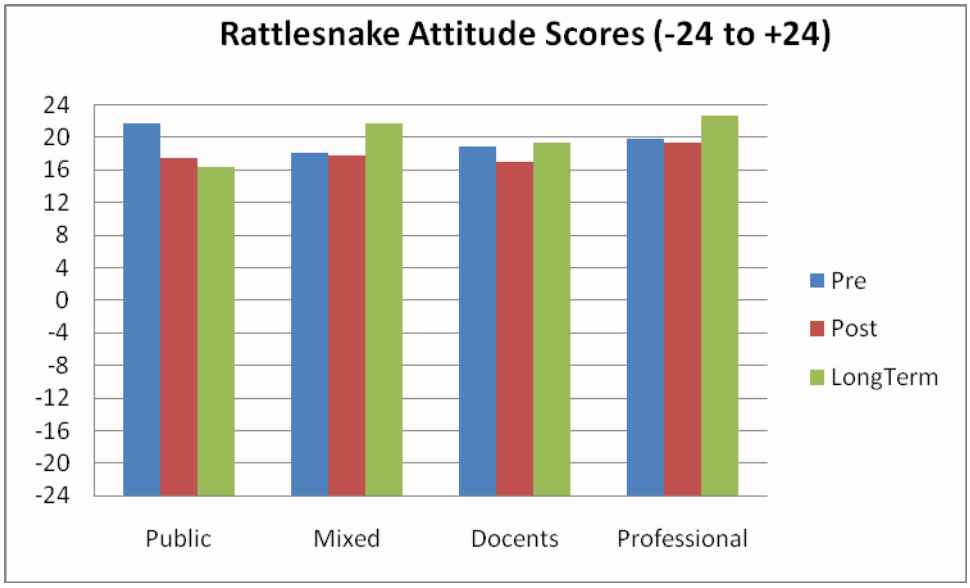

Figure 12. Average rattlesnake attitude scores for four audience types immediately prior to attending a snake workshop, immediately following attendance at the workshop, and six to ten months later. *(Rattlesnake attitude scores range (-24) indicating the most negative attitudes toward rattlesnakes to (+24) indicating the most positive attitudes toward rattlesnakes).*

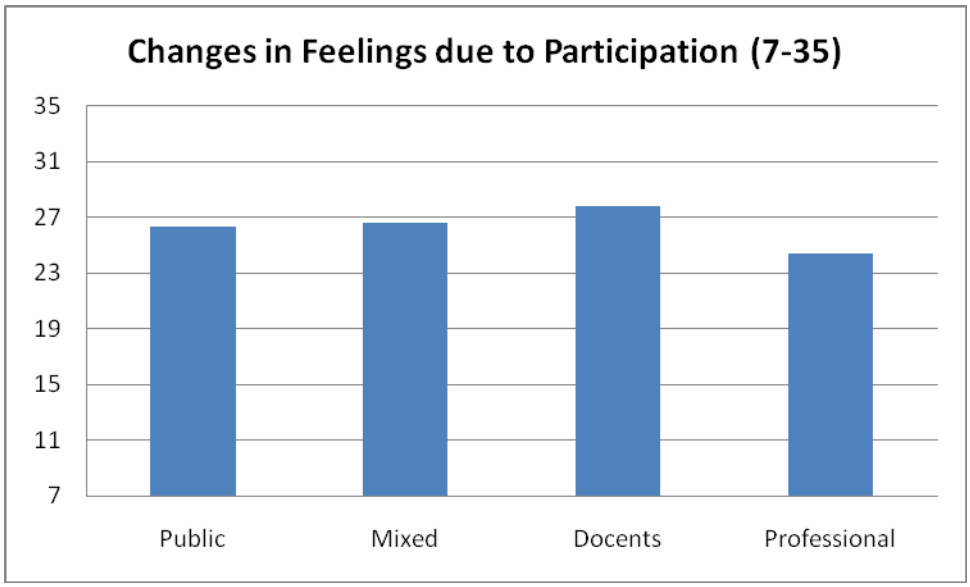

Figure 13. Average scores regarding how participation in a snake workshop had changed the feelings of four audience types toward snakes. *(Scores ranged from 7 to 35 with 7 indicating that participation had greatly decreased positive feelings and greatly increased negative feelings toward snakes, 21 indicating no change in feelings toward snakes due to participation in a workshop and 35 indicating that participation had greatly increased positive feelings and greatly decreased negative feelings toward snakes.)*

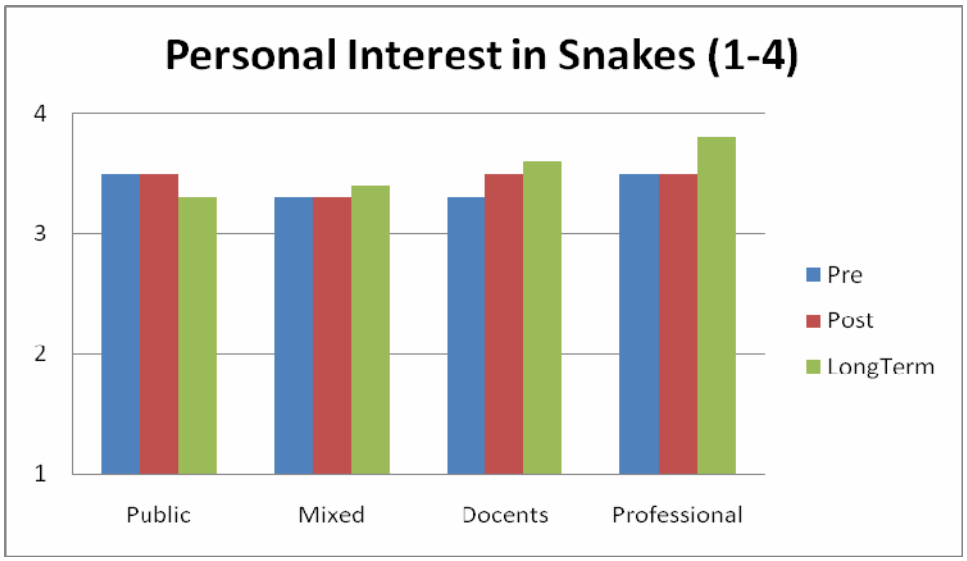

Figure 14. Average personal interest in snakes for four audience types prior to attending a snake workshop in southwest Michigan, immediately after the workshop, and six to ten months later. *(Responses included: Very disinterested (1), Somewhat disinterested (2), Somewhat interested (3) and Very interested (4).)*

All audience types indicated that they felt at only slight risk due to rattlesnakes prior to attending a workshop, and all but the docent audiences experienced a slight increase in their perceptions of personal risk immediately following attendance at such a workshop (Figure 15). Personal risk ratings were about the same as pre-workshop ratings when remeasured six to ten months later for the public and professional audiences. Mixed audiences and docent audiences felt at even less risk due to rattlesnakes when queried six to ten months later. Average behavioral intention scores for each audience type increased after attending a workshop but had dropped for all but the professional audiences when remeasured six to ten months later (Figure 16).

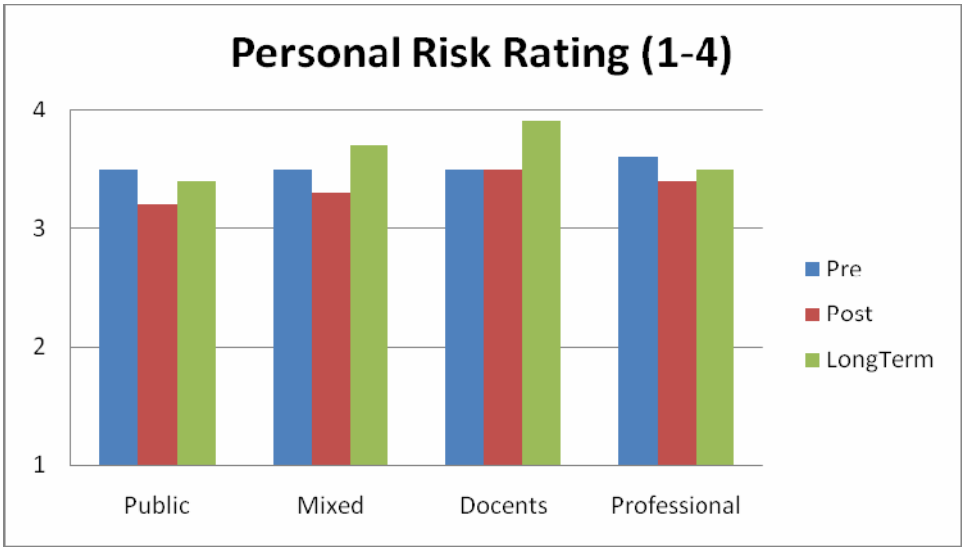

Figure 15. Personal risk ratings due to rattlesnakes as reported by four audience types who attended a series of snake workshops held in southwest Michigan in 2008. *(Responses included: I am at great risk (1), I am at some risk (2), I am at a slight risk (3) and I am at no risk (4))*

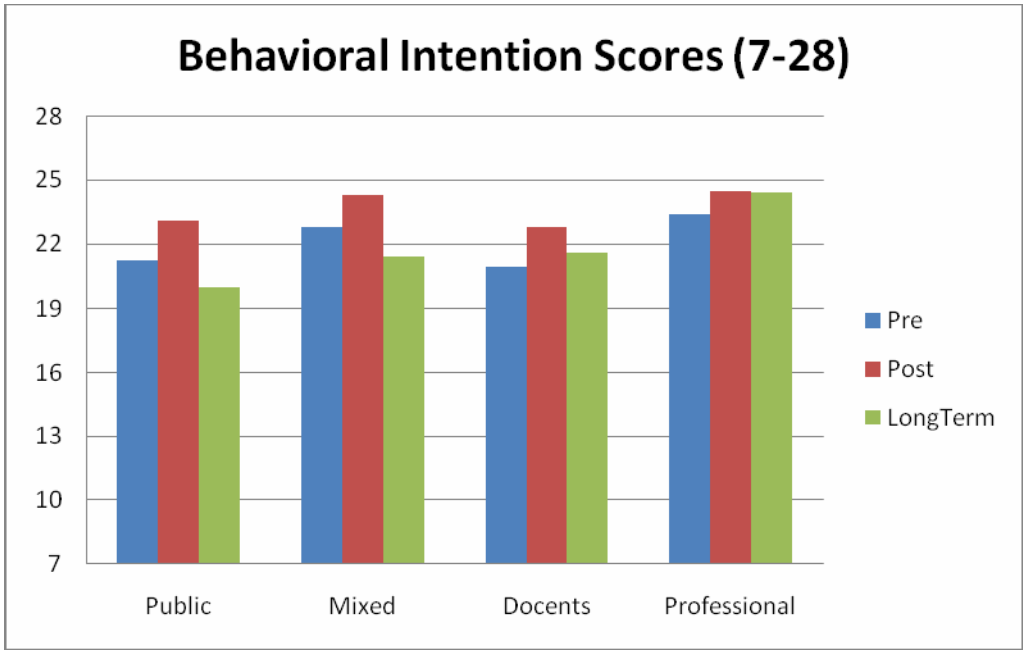

Figure 16. Average behavioral intention scores toward rattlesnakes in seven hypothetical scenarios as reported by four audience types who attended a series of snake workshops in southwestern Michigan in 2008. (*Behavioral intention scores ranged from 7 to 28, with a score of 7 indicating that the individual would kill the rattlesnake in each of the seven situations, and a score of 28 indicating that the individual would not do anything in each of the seven situations.)*

Informal measures were also used to assess the impact of our educational efforts. As mentioned earlier, over 711 individuals participated in our massasauga training or educational workshops or presentations. These include at least 279 professional participants in the workshops or presentations that targeted professionals, at least 334 individuals in the workshops specifically for the general public, and at least 98 individuals in the three workshops that targeted professionals and the general public. Natural resource and other professionals who participated in the workshops represented at least 31 different public or private agencies, offices, or organizations. This number doesn't include the agencies or facilities represented by the medical and health care professionals who participated in the presentation and/or information table at the toxicology conference on poisonous plants and venomous animals. Additionally, from these workshops, we were able to identify over 60 individuals who were interested in potentially serving as a volunteer snake responder. We were able to train and authorize 11 volunteers, and identify at least three volunteer snake responders for each county in the seven-county study area in southwest Michigan. Feedback from workshop participants and collaborators also were used to both evaluate the usefulness and effectiveness of the workshops and to improve our future efforts. Our massasauga training or educational workshops were very well-received by both professional and general public audiences based on comments and feedback that we received from participants after the workshops. We also were invited or requested to present our massasauga workshop in a few instances. For example, the Calvin College Bunker Interpretive Center had hosted a massasauga workshop for the general public prior to this project. The previous workshop had gotten such a good response that they were very excited about hosting another massasauga workshop in 2009 which also was well-attended and well-received.

Project Discussion

We were able to accomplish the goal of this project which was to expand and build upon our previous EPA massasauga education and outreach project in southeast Michigan by continuing outreach efforts in southeast Michigan and initiating similar efforts in southwest Michigan. We identified and compiled over 90 different target audiences, stakeholders, and/or partners in southwest Michigan. We identified over 30 potential partners who could help with our education and outreach efforts in the study area, and established working relationships or partnerships with over 15 different organizations or agencies. We conducted 21 massasauga training or educational workshops or presentations in southwest and southeast Michigan which included 7 workshops specifically for natural resource and other professionals, 9 workshops for the general public, 3 workshops for both professionals and the public, and 2 workshops to train volunteer snake responders. Over 711 individuals participated in these workshops and received information about massasaugas. Through these workshops and presentations, we also developed working relationships with additional key target audiences and/or partners including several nature centers, medical and health care professionals, and the Michigan Animal Damage Control Association. We continued to refine and revise existing massasauga education and outreach materials with current and updated information including the Michigan Eastern Massasauga Web site which can serve as a central, ongoing repository for information about massasaugas in Michigan. We developed an Eastern Massasauga training DVD which will provide a helpful reference tool for people who have attended our massasauga workshops and help us reach new, additional target audiences. We also promoted balanced media coverage to ensure accurate and consistent information on the massasauga was provided to the general public by developing press releases and packets, providing information to the media, and promoting media coverage of our massasauga workshops and outreach efforts.

Evaluation results from the training or educational workshops indicate that participants' knowledge about massasaugas and non-venomous snakes increased after attending the workshops for all target audience groups. Participants in all audience groups also demonstrated slight increases in personal interest and more positive feelings toward snakes after attending the workshops. During our previous project in southeast Michigan, we also documented increases in knowledge of and affinity toward massasaugas and snakes in general among workshop participants after attending the workshops. Surprisingly, post-workshop attitude scores were lower on average than pre-workshop scores for our audiences, though the number of individuals included in pre-workshop measures was quite low due to the high percentage of participants who had marked at least one of twelve items as "unsure." Because of this, we have no idea of how these individuals felt prior to attending the workshop, though their responses were included in the post-workshop measures and in some cases, the long-term questionnaire measures. The inclusion of a "self assessment" (i.e. measure of attitude change due to participation at a snake workshop) provided a measure of how participants felt that their participation in the workshops had affected their feelings toward snakes. These self assessments confirmed that our workshops helped to increase participants' positive feelings toward snakes and helped to decrease their negative feelings toward snakes. This was especially true for docent audiences, which was very encouraging. Docents are responsible for a great deal of the outreach/interpretation of snakes at both zoos and state parks.

Evaluation results indicate that we were able to contribute to meeting the ultimate goals of this project which were to raise public awareness and help promote and foster stewardship for the massasauga by providing people with scientific information about the species' biology and ecology and the role it plays in natural ecosystems. This project also was envisioned to help foster stewardship for this species by teaching critical thinking skills for assessing the level of threat posed by the massasauga and making informed decisions about how to safely co-exist with this snake. Increased knowledge and interest and more positive feelings toward massasaugas and snakes in general should help promote and foster stewardship and help participants make informed decisions about if and how they can safely co-exist with this species. Although workshop participants' perceived personal risk due to massasaugas did not appear to change much after attending the workshops, average perceived risk for all target audiences was already fairly low (i.e., slight to no risk). Average behavioral intention scores also did not appear to change much after participants attended the workshops, but these scores prior to and after the workshops indicated that most encounters with massasaugas would result in seeking more information or assistance or no action at all. These two results also suggest that workshop participants have the information and skills for accurately assessing the level of threat posed by the massasauga and making informed decisions about how to safely co-exist with this species.

Our unit of analysis for this assessment was "audience", which hampered our ability to look at how the workshop affected individuals rather than the entire group present at the workshop. Christoffel (2007) was able to track individuals over time with an outreach experiment which indicated that attendance at such programs resulted in greater retention of knowledge over time and greater retention of positive attitude changes over time than for individuals who received a mailing of written materials containing the same information as presented at a program.

It's not surprising that our audiences, particularly the public audiences and mixed audiences, were at least somewhat interested in snakes prior to attending the workshops. These were self-selected audiences rather than individuals required to attend a workshop. However, even individuals who were required to attend the workshop (i.e. docents and at least some of the attending professionals) came to the workshop with at least a slight interest in snakes.

Given the gains in knowledge and positive attitudes toward snakes as reported by our docent audiences, it is highly recommended that docents/interpreters attend a snake workshop prior to interpreting snakes to their audiences. Such training can assure that accurate and "snake friendly" information is presented to the public by these individuals. In addition, such individuals should be equipped with guidelines or recommendations for interpreting venomous reptiles to the public (Appendix 9). This will help to ensure that docents/interpreters are successful in communicating their intended messages and that unintended messages are kept to a minimum.

Finally, this project not only successfully initiated targeted massasauga education and outreach efforts in southwest Michigan but also laid the groundwork for continuing such efforts in southern Michigan in the future. The partnerships that we developed as part of this project will be instrumental in helping to continue massasauga education and outreach efforts into the future. The natural resource and other professionals that participated in our workshops will serve as local contacts or resources for information about massasaugas and will continue to provide outreach on this species to the general public. We were able to establish volunteer snake responder networks and identify regional network coordinators in southwest and southeast

Michigan as part of this project. The volunteer snake responder networks will provide ongoing, local resources for information and assistance with massasauga encounters. The education and outreach materials and resources that we developed as part of this project and our previous project in southeast Michigan will continue to be available and accessible to these local resource networks, other partners and stakeholders, and the general public. These local resource networks and available outreach materials will help ensure that accurate and consistent information about massasaugas are provided so that individuals can make informed decisions about if and how they can safely coexist with this rare and unique species. Massasauga education and outreach efforts in the future should focus on continuing to develop, refine, and strengthen existing local resource networks and partnerships, reaching new target audiences such as law enforcement and medical personnel, addressing information gaps, and expanding to additional areas within the species' range or distribution in the state such as the Northern Lower Peninsula of Michigan.

References

Bandura, A. 1969. Principles of behavior modification. Holt, Rinehart & Winston, New York, NY.

Christoffel, R. A. 2007. Using human dimensions insights to improve conservation efforts for the eastern massasauga rattlesnake (*Sistrurus catenatus catenatus*) in Michigan and the timber rattlesnake (*Crotalus horridus horridus*) in Minnesota. PhD dissertation, Michigan State University Department of Fisheries and Wildlife, East Lansing, MI. 286 pp.

Lee, Y. and R. A. Christoffel. 2005. Learning to live with the Eastern Massasauga rattlesnake: Initiating a public education and outreach program in southeast Michigan. Final report to the U. S. Environmental Protection Agency, Office of Environmental Education, Washington, D.C. Michigan Natural Features Inventory (MNFI) Report No. 2005-20. Lansing, Michigan. 34 pp + appendices.

Morgan, J.M. and J.H. Gramann. 1989. Predicting effectiveness of wildlife education programs: a study of students' attitudes and knowledge toward snakes. Wildlife Society Bulletin 17:501-509.

Petty, R.E. and J.T. Cacioppo. 1981. Attitudes and persuasion: classic and contemporary approaches. W.C. Brown Publishers, Dubuque, Iowa.

Szymanski, J. 1998. Status Assessment for the Eastern Massasauga (*Sistrurus c. catenatus*). U.S. Fish and Wildlife Service, Fort Snelling, Minnesota. 30 pp + appendices.

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support, patience and understanding throughout the project. We would like to acknowledge Michigan Natural Features Inventory (MNFI) and project team member and MNFI volunteer, Rebecca Christoffel, for providing cost share for this project. We also would like to very gratefully acknowledge the John Ball Zoological Society and the Michigan Society of Herpetologists for providing funding to support development of a massasauga training DVD. The U.S. Fish and Wildlife Service, Oakland County Parks, and the Detroit Zoo also provided funding to help cover the costs of reprinting massasauga outreach materials for this project.

We would like to gratefully acknowledge a number of individuals and organizations who collaborated with us and provided support, input and assistance with this project. Andrew Lentini and Bob Johnson with the Toronto Zoo and the Canadian Eastern Massasauga Rattlesnake Recovery Team provided guidance and assistance with development of massasauga education and outreach efforts and materials. Earl Wolf, Lori Sargent, and Tom Goniea with the Michigan DNR provided assistance with efforts to develop an indoor traveling exhibit or outdoor kiosk on the massasauga and/or development of the volunteer snake responder network and massasauga response protocol. We would like to thank Joanne Barnard, Barry Conservation District; Diane Braybrook, Mike Mahler, Mindy Walker, and Chuck Nelson, Sarett Nature Center; Sarah Redding, Ryan Colliton, Jen Wright and other staff, Kalamazoo Nature Center; Amy Druskovich, Cass County Conservation District; Matt Dykstra and Doug Wright, Pierce Cedar Creek Institute; Tom Funke, Michigan Audobon; Lisa Gamero, Chris Hoving, Shana McMillan, and Tony Trojanowski, MDNR; Jeff Jundt, Detroit Zoo; Dan Malone, John Ball Zoo; Mike McCustion, Edward Lowe Foundation; Nate Fuller, Southwest Michigan Land Conservancy; Paul MacNellis, Western Michigan University and SW Michigan Stewardship Cluster; and Lisa Brush, Stewardship Network for partnering and providing assistance with this project, participating in massasauga training workshops, helping to organize and host massasauga workshops, and/or serving as a volunteer snake responder. We would like to especially acknowledge Jeff Jundt and the Detroit Zoo and Chris Gertiser, Lisa Duke and Binder Park Zoo for agreeing to serve as regional coordinators for the volunteer snake responder networks in southwest and southeast Michigan. We also would like to especially thank the Pierce Cedar Creek Institute, Sarett Nature Center, Indian Springs Metropark, John Ball Zoo, Howard Christensen Nature Center, Wolf Lake Fish Hatchery, Edward Lowe Foundation, Kalamazoo Nature Center, Love Creek Nature Center, Calvin College Bunker Interpretive Center/Ecosystem Preserve, and Binder Park Zoo and their staff for their assistance and use of their facilities for the workshops. We are grateful to the Kensington Metropark Nature Center, Love Creek Nature Center, Nature Discovery, and the Michigan DNR South Central Management Unit and their staff for letting us borrow their massasaugas or look-alike snakes for use in our workshops. We also would like to thank Robyn Bailey, master's student in the Fisheries and Wildlife Department at Michigan State University (MSU) studying massasauga ecology, and Stephanie Zimmer, her field assistant, for sharing information about her massasauga research project and taking workshop participants into the field to see massasaugas and their habitats firsthand. We would like to thank personnel at the Regional Poison Center in Grand Rapids for meeting with us, sharing information about massasauga bites and their treatment, and letting us participate in the toxicology conference on poisonous plants and venomous animals. We would like to acknowledge and are very grateful to Steve Evans with MSU College of Agriculture and Natural Resources (CANR) Communications Office for his work, assistance, guidance, and patience helping us develop a massasauga training DVD. We also would like to thank Barbara Barton and Kraig Korroch with MNFI for their assistance with the continued development of the

massasauga web site. We also would like to acknowledge Nancy Toben and Sue Ridge at MNFI and personnel at MSU Contracts and Grants Administration for administrative support and assistance with this project.

Finally, we would like to sincerely thank all the workshop participants, and especially those who completed and submitted the pre- and post-program questionnaires and long-term assessment surveys and those who provided us with feedback on the workshops. We thank these individuals for their time, participation and input. We especially would like to thank the MDNR Wildlife and Parks and Recreation divisions for allowing us to conduct massasauga workshops as part of their already scheduled meetings or trainings and for encouraging and allowing their staff to attend the workshops. We also would like to thank the volunteer snake responders for their interest and willingness to help respond to massasauga reports and provide on-site assistance and massasauga outreach to landowners.

APPENDICES

Appendix 1. Target audiences, stakeholders, and/or partners for Eastern Massasauga education and outreach efforts in southwest Michigan. (Partners highlighted in light green.)

Organization	Contact Individual	Phone	Address	Email
Animal Control Officers/ Organizations				
Michigan Animal Damage Control Association (MADCA)	Mark Melchoir	(517) 651-9504		
Michigan Association of Animal Control Officers	Thomas Miller- President	(269) 467-6475		
Allegan County A.C.		269-673-0500	112 Walnut St., Allegan, MI 49010	
Barry County A.C.		269-948-4885	825 W. Apple Street, Hastings, MI 49058	
Cass County A. C.		269-445-1238	323 N. M-62, Cassopolis, MI. 49031	mikeg@cassco.org
Kalamazoo County A. C.		269-383-8771	2500 Lake St. Kalamazoo, MI 49048	
Kent County A. C.	Matt Pepper- District 2- Representative	616-336-3208	711 N. Ball Ave. NE., Grand Rapids, MI 49442	
Van Buren A. C.		269-621-4624	58040 CR 681, Hartford, MI 49057	vbcac@cybersol.com
Private Consultant	Mike Fitzgerald	(269) 382-3943	1812 Ackner Drive, Portage, MI. 49002	
Audubon Clubs/Societies				
Cass County Audubon Society			Cassopolis, MI	
Grand Rapids Audubon Club	James Bradley- President	(616) 974-0136	7064 Thomcrest Dr. S.E., Grand Rapids, MI 49546	
Holland Audubon Society			Holland, MI	
Audubon Society of Kalamazoo		269-375-7210	P.O. Box 19333, Kalamazoo, MI 49019-0333	
Conservation Districts				
Allegan Conservation District		269-673-8965 ext. 3	1668 Lincoln Road (M-40 North), Allegan, MI 49010	tina.clemons@mi.nacdnet.net
Barry Conservation District	Joanne Barnard	269.948.8056 Ext. 3	1611 South Hanover, Suite 105, Hastings, MI 49058-2579	joanne.barnard@macd.org
Berrien County Conservation District			PO Box 129, Rural Economic Development, Berrien Springs, MI. 49103-0129	
Cass County Conservation District	Amy Druscovich	(269) 445-8643	1127 E. State Street, Cassopolis, MI.49031	casscd@casscd.org
Kalamazoo County Conservation District	Kathy Buckham- Executive Director	269-327-1258	1911 W. Centre Avenue, Portage, MI 49204	kathy.buckham@mi.nacdnet.net
Kent County Conservation District		616.942.4111 ext. 100	3260 Eagle Park Dr NE, Suite 111, Grand Rapids, MI 49525	administrator@kentconservation.org
Van Buren County Conservation District	Amy Lockhart- Administrator	(269) 657-4030 ext. 5	1035 E. Michigan Avenue, Paw Paw, MI. 49079	amy.lockhart@mi.nacd.net
Conservation Officers				
MDNR Law Enforcement Division	Vacant- Plainwell Operations Service Center- District 12	621 N 10th Street, Plainwell, MI 49080	**Phone:** (269) 685-6851	vansumed@michigan.gov
Michigan Conservation Officers Association			Joh Bezotte, 2602 S. Sandusky Rd, Sandusky,MI., 48471-9468	
County Extension Offices				
Allegan County Extension Office	Steve Nelson- MSU Extension Director, Agriculture & Natural Res.: Paul Wylie	269-673-0370	Human Services Building, 3255 122nd Avenue, Allegan, Michigan 49010-9511	msue.Allegan@county.msu.edu

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Organization	Contact Individual	Phone	Address	Email
Barry County Extension Office	Dennis Pennington- Interim C.E. D and Ag and Nat Res Educator	(269) 945-1388	206 West Court Street, Hastings, MI.,49058-1824	msue08@msu.edu or pennin34@msu.edu
Berrien County Extension Office	Joanne Davidhizar- C.E.D.	(269) 944-4126	County Building, 1737 Hillandale Road, Benton Harbor, MI 49022-9630	msue11@msu.edu or davidhiz@msu.edu
Cass County Extension Office	Dan Rajzer- C.E.D.	269-445-4438	120 N. Broadway, Suite 209, Cassopolis, Michigan, 49031	msue14@msu.edu
Kalamazoo County Extension Office	Ann Nieuwenhuis- C.E.D., Linda Whitlock, Consumer Horticulture and Master Gardener Coordinator	(269) 383-8830	Nazareth Complex, 3299 Gull Road, 4th Floor, 2nd Wing	nieuwen1@msu.edu, whitlo13@msu.edu
Kent County Extension Office	Betty Blasé- C.E.D., John Choals Master Gardener Coordinator	(616) 336-3265	775 Ball Avenue NE, Grand Rapids, MI.,49503	blasé@msu.edu
State Master Gardener Program	Master Gardener Coordinator- Mary McLellan	517-355-5191x1409	A426 PLANT AND SOIL SCI EAST LANSING MI 48824-1325	mclella3@msu.edu
Van Buren County Extension Office	Julie Pioch- C.E.D., Beth Clawson - Natural Resources/Resource Recovery Ext. Educator	269-657-8213	219 E Paw Paw St., Suite 201, Paw Paw, Michigan	msue80@msu.edu or piochi@msu.edu
Developers				
Home and Building Association of Greater Grand Rapids		(616) 281-2021, (800) 305-2021	1633 East Beltline Ave, N.E. Grand Rapids, MI 49525-4509	
Southwestern Michigan Home Builders Association			107 W. Ferry Street, Berrien Springs, MI	
Environmental Organizations				
Michigan Botanical Club-Southwest Chapter				http://www.michbotclub.org/chapters/swc/swc_home.htm
Michigan Natural Areas Council	Phyllis Higman-Chair, Bill Brodovich- Director	(517) 373-6983,	c/o Matthei Botanical Gardens, 1800 North Dixboro, Ann Arbor, MI 48109-9741	higman@state.mi.us, 102215.45@compuserve.com
Sierra Club- Kalamazoo Valley Group	Paul Haas- Chair	616-664-5416		paul.haas@michigan.sierraclub.org
The Stewardship Network	Lisa Brush	734/996-3190	416 Longshore Drive, Ann Arbor, MI 48105	lbrush@stewardshipnetwork.org
West Michigan Environmental Action Council	Rachel Hood- Exec. Director	616-451-3051	1007 Lake Dr SE, Grand Rapids, MI 49506	info@wmeac.org
Health Departments				

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Organization	Contact Individual	Phone	Address	Email
Regional Poison Center	Brad Riley, Assistant Medical Director	(toll-free at (800) 222-1222	Helen De Vos Children's Hospital, Regional Poison Center	
Michigan College of Emergency Physicians	Raymond R. Rudoni, MD, FACEP, President and Diane Kay Bollman, Exec. Dir.	517-327-5700	6647 W. St. Joseph Hwy. Lansing, MI 48917	
Hospitals				
Blodgett Campus - Spectrum Health		(616) 774-7444	1840 Wealthy Street SE, Grand Rapids, MI 49506	
Borgess-Lee Memorial Hospital		(269) 782-8681	420 West High Street, Dowagiac, MI 49047	
Borgess Medical Center		269.226.7000	1521 Gull Rd, Kalamazoo, MI 49048	
Borgess-Pipp Hospital		(269) 685-0700	411 Naomi Street, Plainwell, MI 49080	
Butterworth Campus- Spectrum Health		Emergency- (616) 391-1680 Main- (616) 391-1774	100 Michigan St. NE, Grand Rapids, MI 49503	
Community Hospital Watervliet	Emergency Dept-Joyce Kalinowski	Main- 269.463.3111 Emergency dept-269.463.2458	400 Medical Park Drive, Watervliet, MI 49098	
Helen DeVos Children's Hospital- Spectrum Health		(616) 391-9000	100 Michigan Street, NE, Grand Rapids, MI 49503	ContactUs@spectrum-health.org
Kent Community Campus		(616) 486-3000	750 Fuller Ave. NE, Grand Rapids, 49503	
Lakeland Regional Health System		1-800-968-0115	1234 Napier Avenue, St. Joseph, MI 49085	
LakeView Community Hospital		269.657.3141	408 Hazen St., Paw Paw, MI 49079-0209	info@lakeviewcares.com
Metro Health Hospital		(616) 252-7200	P.O. Box 916,Wyoming, MI 49509-0916	
Saint Mary's Health Care		Main- (616) 752-6090, Emergency- (616)752-6789	200 Jefferson Street, SE, Grand Rapids, MI 49503	
South Haven Community Hospital		(269) 637-5271	955 South Bailey Avenue, South Haven, MI 49090	
Land Conservancies				
Southwest Michigan Land Conservancy	Peter TerLouw	(269) 324-1600	Hastings, MI 49058.2579	terlouw@swmlc.org
The Nature Conservancy-West Michigan Office	John Legge- W. MI Conservation Director	(616) 785-7055 X12	3728 W. River Drive, Comstock Park, MI 49321	jlegge@tnc.org
Land Conservancy of West Michigan		(616) 451-9476	1345 Monroe Ave. NW, Ste. 324, Grand Rapids, MI 49505	lcwm@naturenearby.org
Michigan Nature Association	Jeremy Emi- Director	(517) 655-5655	326 E. Grand River, Williamston, MI 48895	michigannature@michigannature.org
Michigan Department of Natural Resources Public Outreach and Communication				
MDNR Public Outreach Unit	Kelly Carter, Communications Coordinator	(517) 241-5431	MDNR Lansing Office	CARTERKS@michigan.gov

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Organization	Contact Individual	Phone	Address	Email
MDNR- Communications(?)	Earl Wolf- Senior Interpreter/Design	(517) 373-9904	MDNR Lansing Office	wolfe@michigan.gov
Michigan State Parks and Recreation Areas				
Yankee Springs State Recreation Area		(269) 795-9081	2104 S. Briggs Road, Middleville, MI	
Fort Custer Recreation Area		(269) 731-4200	5163 Fort Custer Drive, Augusta, MI. 49012	
Saugatuck Dunes State Park		(269) 637-2788		
Van Buren State Park	Grand Haven	(269) 637-2788	23960 Ruggles Road, S. Haven, MI 49090	
Kal-Haven Trail State Park		(269) 637-2788		
Grand Mere State Park		(269) 426-4013		
Warren Dunes State Park		(269) 426-4013	12032 Red Arrow Highway, Sawyer, MI 49125	
MDNR- Parks Division- Stewardship Unit	Lisa Gamero	517-241-4789	Stevens T. Mason Building, Lansing, MI 48909	gamerol@michigan.gov
Migrant Community Organizations				
Southwest Michigan Migrant Resource Council	Araceli Diaz- Co Chairperson	(269) 657-7014 X 1255	32849 Red Arrow Highway, Suite 200, Paw Paw, MI 49079	diaza@michigan.gov
Native American Tribes (Federally Recognized)				
MSU Extension Native American Liason-	Nick Reo	(517) 432-7605	11G Agriculture Hall, East Lansing, MI 48824	
Pokagaon Band of Potawatomi-	Tribal Chairman- John Miller	(269)782-6323	58620 Sink Road, Dowagiac, MI 49047	John.Miller @ pokagon.com
Match-E-Be-Nash-She-Wish (Gun Lake) Band of Potawatomi-	Tribal Administrator- Dawn Krauss	(616) 681-9510 ext. 343	PO Box 218, Dorr, MI 49323	ddkrauss@mbpi.org
Nature Centers/Environmental Education				
Blandford Nature Center	Lisa Rose Stamer- Exec. Dir.	616.735.6240	1715 Hillburn NW, Grand Rapids, MI 49504	lisa.rose@blandfordnaturecenter.org
Camp Friedenswald	Brad Cogdell- Outdoor Learning Director	(269) 476-9744		brad@friedenswald.org
DeGraaf Nature Center		616-355-1057	600 Graafschap Road, Holland, Michigan 49423	degraafnaturecenter@cityofholland.com
Fernwood Botanical Garden & Nature Preserve			13988 Range Line Road, Niles, MI 49120	
Frederick Meijer Gardens	Heidi Holst-Education Director	(616) 957-1580	1000 East Beltline NE, Grand Rapids, MI 49525	hleestma@meijergardens.org
Howard Christensen Nature Center		(616)675-3158	PO Box 42, Kent City, MI 49330	hcnc@kentconservation.org
Kalamazoo Nature Center	Outreach Program Coordinator		P.O. Box 127, 7000 N. Westnedge Avenue, Kalamazoo, MI 49004-0127	
Love Creek Nature Center		269.471.2617	9292 Huckleberry Road, Berrien Center, MI 49102	
Maher Sanctuary	Melanie Good-Maher Chairperson			melanie@naturenearby.org
Outdoor Discovery Center of Wildlife Unlimited	Travis Williams- Executive Director	616.393.9453	A-4214 56th Street, Holland, MI 49423	odc@oaisd.org or twillaim@oaisd.org
Pierce Cedar Creek Institute	Matt Dykstra- Education Director	269) 721-4473	701 West Cloverdale Rd, Hastings, MI 49058	dykestram@cedarcreekinstitute.org

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Organization	Contact Individual	Phone	Address	Email
Sarett Nature Center	Chuck Nelson-Director	(269) 927-4832	2300 Benton Center Road, Benton Harbor, MI 49022	sarett@sarett.com
Outdoor Writers/Journalists				
Michigan Outdoor Writers Association	Contact person?			
Private Organizations/Foundations				
Ed Lowe Foundation/Big Rock Valley Preserve	Mike McCustion, Director of Physical Resources	1-800-232-5693	58220 Decatur Road, P.O. Box 8, Cassopolis, MI 49031-0008	mike@lowe.org
Utility Companies				
Consumers Energy	Margaret Parker-Environmental Liason	517-788-1957		mfparker@cmsenergy.com
Veterinarians				
ASPCA Animal Poison Control		(888) 426-4435.		
Michigan Veterinary Medical Association	Karlene Belyea			mvma@michvma.org
Volunteer Organizations				
Volunteer Organization of Southwest Michgian		269-683-5464	210 E. Main St, Suite 237 Niles, MI 49120	info@volunteerswmi.org
Wildlife Biologists/Technicians				
MDNR-Southwest Management Unit	Sara Schaefer, Wildlife Mgt Unit Supervisor	(269) 685-6851	621 North 10th Street, Plainwwell, MI. 49080-1004	
Allegan State Game Area	John Lerg- Wildlife Biologist	(269) 673-2430	4590 118th Avenue, Route 3, Allegan, MI 49010	
Barry State Game Area	Christine Hanaburgh-Wildlife Biologist	(269) 795-3280	1805 S. Yankee Springs Road, Middleville, MI 49333	
Crane Pond State Game Area	Steve Chadwick-Wildlife Biologist	(269) 244-5928	P.O. Box 158, 60887 M-40, Jones, MI 49061	
Kent County	Guntis Kalejs	(231) 788-5055	7600 E. Messinger Rd, Twin Lake, MI 49457	
Private Lands Unit	Mark Sargent-Wildlife Biology Specialist,	(517) 241-0666, (517) 241-1153	MDNR Lansing Office	SARGENTM@michigan.gov
MDNR LIP Program	Chris Hoving- MDNR Wildlife Biologist- LIP Program	(269) 685-6851 X 142	621 N. 10th St., Plainwell, MI 49080	HOVINGC@michigan.gov
Zoos				
Binder Park Zoo	Tom Funke	(269) 979-1351	7400 Division Drive, Battle Creek, MI 49014-9500	Tfunke@binderparkzoo.org
Detroit Zoo	Jeff Jundt	(248) 541- 5717 X 3159	8450 W. 10 Mile Rd., Royal Oak, MI> 48067	jjundt@dzs.org
John Ball Zoo	Dan Malone- Curator of Reptiles and Amphibians	616-336-8443	PO Box 2506, 1300 W Fulton St., Grand Rapids, MI 49504	Dan.malone@kentcountymi.gov

Appendix 2. Target audiences, stakeholders and/or partners for Eastern Massasauga education and outreach efforts in southeast Michigan compiled in 2003-2005.

Organization	Contact Individual	Phone	Address	Email
Wildlife Biologists/Technicians				
Southeastern Michigan District Office	Tim Payne, WLD- MGT Unit Supervisor	(734) 953-0241	38989 Seven Mile Road, Livonia, MI 48152	
Holly Wildlife Area	Jon Curtis, Wildlife Tech., James Pulling, Wildlife Asst.	(248) 634-0240	8100 Grange Hall Rd. Holly, MI 48442	
Waterloo Wildlife Office	Shelli Dubay-Wildlife Biologist, Shannon Hanna-Wildlife Tech,	(517) 522-4097	Route 3, 13578 Seymour Road, Grass Lake, MI 49240	
Seven Lakes State Park	Julie Oakes, Wildlife Biologist	(248) 328-8113	2220 Tinsman Road, Fenton, MI 48430	
Rose Lake Wildlife Office	Earl Flegler-Wildlife Biologist, Tammy Giroux-Wildlife Tech, Gregory Bragdon-Wildlife Tech,	(517) 373-9358	8562 East Stoll Road, East Lansing, MI 48823	
MDNR Public Outreach Unit	Kelly Carter, Communications Coordinator	(517) 241-5431	MDNR Lansing Office	
Private Lands Unit	Mark Sargent-Wildlife Biology Specialist, Sue Tangora- LIP Biologist	(517) 241-0666, (517) 241-1153	MDNR Lansing Office	
	Dan Kennedy-SE MI LIP Biologist	(517) 641-4903	Rose Lake Field Office, 8562 East Stoll Road, East Lansing, MI 48823	
Conservation Officers				
MDNR Law Enforcement Division				
Michigan Conservation Officers Association	John Bezotte-Secretary/Treasurer		Joh Bezotte, 2602 S. Sandusky Rd, Sandusky,MI., 48471-9468	
Sherrifs Departments				
Jackson County Sheriff	Sheriff Dan Heyns	(517) 768-7924-sheriff, (517) 768-7900-business number	212 W. Wesley St., Jackson, MI 49201	DHeyns@co.jackson.mi.us
Livingston County Sheriff	Sheriff Don Homan	517.546.2440	Livingston County Jail Building, 150 S. Highlander Way, Howell, MI 48843	sheriff@co.livingston.mi.us
Washtenaw County Sheriff	Sheriff Daniel Minzey	734-971-8400	Sheriff, 2201 Hogback Rd., Ann Arbor, MI, 48105	minzeyd@ewashtenaw.org
Park/Nature Center/Environmental Education Centers				
Michigan State Parks				
Bald Mountain Recreation Area		(248)-693-6767	1330 E. Greenshield Road, Lake Orian, MI. 48360-2307	
Brighton Recreation Area		(810) 229-6566	6360 Chilson Road, Howell, MI. 48843	
Dodge #4 State Park		(248) 682-7323	4250 Parkway Drive, Waterford, MI 48327	

Appendix 2. Target audiences, stakeholders and/or partners for Eastern Massasauga education and outreach efforts in southeast Michigan compiled in 2003-2005.

Organization	Contact Individual	Phone	Address	Email
Highland Recreation Area		(248) 889-3750	5200 E. Highland Rd. White Lake, MI 48383	
Holly Recreation Area		(248) 634-8811	8100 Grange Hall Rd. Holly, MI. 48442	
Island Lake State Recreation Area		(810) 229-7067	12950 E. Grand River Ave. Brighton, MI 48116	
Maybury State Park		(248) 349-8390	20145 Beck Rd. Northville, MI 48167	
Metamora Hadley Recreation Area		(810) 797-4439	3871 Herd Rd. Metamora, MI 48455	
Ortonville Recreation Area		(248) 627-3828	5779 Hadley Rd. Ortonville, MI 48462	
Pinckney Recreation Area		(734) 426-4913	8555 Silver Hill Rd.,Pinckney, MI. 48169	
Proud Lake Recreation Area		(248)-685-2433	3500 Wixom Rd. Commerce Twp. MI 48382	
Seven Lakes State Park		(248) 634-7271	2220 Tinsman Road, Fenton,MI. 48430	
Waterloo State Recreation Area		(734) 475-8307	16345 McClure Road. Chelsea, MI. 48118	
Huron Clinton Metro Authority	Dave Moilanen-Chief of Interpretive Services and Public Relations	1-800-477-2757, 1-810-227-2757	Administrative Office, 13000 High Ridge Drive, Brighton, MI 48114-9058	david.moilanen@metroparks.com
Hudson Mills Metro Park	Kimberly Jarvis- Park Superintendent	(800) 477-3191	8801 N. Territorial Road, Dexter, MI 48130	
Delhi Metro Park	Kimberly Jarvis- Park Superintendent	(734) 426-8211, (800) 477-3191	3902 E. Delhi, Ann Arbor, MI 48105	
Dexter huron Metro Park	Kimberly Jarvis- Park Superintendent	(734) 426-8211, (800) 477-3191	6535 Huron River Drive, Dexter, MI 48130	
Huron Meadows Metro Park	Kimberly Jarvis- Park Superintendent	(810) 231-4084, (800) 477-3193	8765 Hammel Road, Brighton, MI 48116	
Indian Springs Metro Park	Kimberly Jarvis- Park Superintendent	248) 625-7280, (800) 477-3192	5200 Indian Trail, White Lake, MI 48386	
Kensington Metro Park	Dick Shafer- Park Superintendent - Bob Hoetaling, Head Naturalist	(248) 685-1561, (800) 477-3178	2240 W. Buno Road, Milford, MI 48380-4410	
Lower Huron Metro Park	Richard Sobecki- Park Superintendent	734) 697-9181, (800) 477-3182	17845 Savage Road, Belleville, MI 48111	
Oakwoods Metro Park	Richard Sobecki- Park Superintendent	(734) 782-3956, (800) 477-3182	17845 Savage Road, Belleville, MI 48111	
Stony Creek Metro Park	Donald Potter- Park Superintendent	(586) 781-4242, (800) 477-7756	4300 Main Park Road, Shelby Township, MI 48316-4907	
Willow Metro Park	Richard Sobecki- Park Superintendent	(734) 697-9181, (800) 477-3182	17845 Savage Road, Belleville, MI 48111	

Appendix 2. Target audiences, stakeholders and/or partners for Eastern Massasauga education and outreach efforts in southeast Michigan compiled in 2003-2005.

Organization	Contact Individual	Phone	Address	Email
Oakland County Parks and Recreation	Ralph Richard-Executive Officer	1-888-OCPARKS	2800 Watkins Lake Road, Waterford, MI 48328	
Lyon Oaks Nature Center at Lyon Oaks County Park	Tim Nowicki- Head Naturalist	248.437.7345	52252 Pontiac Trail, Wixom, MI 48393	
Wint Nature Center at Independence Oaks County Park	Raymond Delasko- Park Supervisor, Kathleen Dougherty-Head Naturalist	248- 625-6473	9501 Sashabaw Road, Clarkston, MI. 48348	
Addison Oaks County Park	Rob Coffey- Park Supervisor	248.693.2432	1480 West Romeo Road, Leonard 48367	
Groveland Oaks County Park	Brad Baker- Park Supervisor	248.634.9811	14555 Dixie Highway, Holly 48442	
Orion Oaks County Park		248.858.0906	Clarkston Road, Orion	
Rose Oaks County Park		248.858.0906	1132 Fish Lake Road, Rose Township, MI	
Springfield Oaks County Park		248.625.8133	12451 Andersonville, Davisburg, MI 48350	
Waterford Oaks County Park	Jim Dunleavy- Park Supervisor	248.858.0913	2800 Watkins Lake Road, Waterford, MI 48328	
Nature Centers/Environmental Education				
Drayton Plains Nature Center	Sonia Huhl	(248) 674-2119	2125 Denby Drive, Drayton Plains, 48830	
Dahlem Environmental Education Center	Tom Blodgett	(517) 782-3453	7117 S. Jackson Road, Jackson, MI 49201	
Howell Conference and Nature Center	Randy Mannor-Env.Ed. Coordinator	(517) 546-0249	1005 Triangel Lake Road, Howell, MI 48843	randym@howellnaturecenter.org
Rouge River Bird Obervatory, Environmental Interpretive Center	Orin Gelderloos-Director	(313) 593-5338	Univ.of Michigan, Dearborn, MI 48128	
Environmental Education Network of Washtenaw County	Tawny Gapinski	734-761-3186	117 N. Division St. / Ann Arbor, MI 48104	info@ecocenter.org
The Ecology Center	Tawny Gapinski	(734) 995-5888 X111	117 N. Division St. / Ann Arbor, MI 48104	GEE-WOW@ecocenter.org, www.ecocenter.org
City of Ann Arbor, Leslie Science Center	Kirsten Levinsohn	(734) 662-7802	City of Ann Arbor, Leslie Science Center, 1831 Traver Road, Ann Arbor, MI 48105	www.ci.ann-arbor.mi.us
Livingston-Washtenaw Mathematics and Science Center	Jennifer Nimtz	(517) 546-5550 X-228	1425 W. Grand River Avenue, Howell, MI 48843-1916	www.lawmasc.org
Great Lakes Natural Resource Center-NWF		(734) 769-3351	506 E. Liberty St. 2nd Floor, Ann Arbor, MI 48104-2210	greatlakes@nwf.org, www.nwf.org/greatlakes
Audubon Societies				
Huron Valley Audubon Society		(810) 229-7303	205 W. Main St., Brighton, Michigan 48116	
Jackson Audubon Society	Connie Spotts- President	(517)529-9031	P.O. Box 6453, Jackson, MI 49204	BFLYLADY@aol.com

Appendix 2. Target audiences, stakeholders and/or partners for Eastern Massasauga education and outreach efforts in southeast Michigan compiled in 2003-2005.

Organization	Contact Individual	Phone	Address	Email
Oakland Audubon Society	Nancy Tar- Acting President	(248) 647-BIRD		chipout@sbcglobal.net
Washtenaw Audubon Society	Mary Ann Bryant- President	734) 994-3569	1733 Jackson Ave, Ann Arbor, MI 48103	www.audubon.org/chapter/mi/Washtenaw
Land Conservancies				
Southeast Michigan Land Conservancy	Heather Rorer	(734) 997-0942		smlcaa@ameritech.net
Washtenaw Land Trust	William Hanson	(734) 302-LAND		Email: info@washtenawlandtrust.org
The Livingston Land Conservancy	Sara Thomas-Board President	(810) 229-3290		Earth007@aol.com
Raisin Valley Land Trust	Laura Sutton			info@rvlt.org
North Oakland Headwaters Land Conservancy	Sue Topping, Executive Director	248-846-6547		nohlc@hotmail.com
Environmental Organizations				
Michigan Nature Association		(517) 655-5655	326 E. Grand River, Williamston, MI 48895	michigannature@michigannature.org
Michigan Natural Areas Council	Phyllis Higman-Chair, Bill Brodovich-Director	(517) 373-6983,	c/o Matthei Botanical Gardens, 1800 North Dixboro, Ann Arbor, MI 48109-9741	higman@state.mi.us, 102215.45@compuserve.com
The Nature Conservancy	Helen Taylor-Director	(517)316-0300	101 E. Grand River, Lansing, MI 48906	
Animal Control Officers				
Michigan Animal Damage Control Association (MADCA)	Mark Melchoir	(517) 651-9504		
Jackson County Animal Control	Kimberlee Luce- Chief Animal Control:Officer/Director	(517) 788-4464	2004 Blackstone, Jackson, MI 49203	http://www.co.jackson.mi.us/Agencies/animalShel/index.Asp
Livingston County Animal Control	Anne Burns-Director	(517) 546-2154	418 S. Highlander Way, Howell, MI 48843	lcac@co.livingston.mi.us
Oakland County Animal Control		248- 391-4100, 248-381-4102	1700 Brown Road, Auburn Hills, MI 48236	
Washtenaw County Animal Control		734-662-5585		
Washtenaw County Animal Removal and Nuisance Control Services- 14 businesses listed	see attachment			http://www.washtenawcd.org/ps/animalremoval.pdf
Medical Community				
Health Departments				
Jackson County Health Department		(517) 788-4420	1697 Lansing Avenue, Jackson, MI	JCHD@co.jackson.mi.us
Livingston County Health Department	Ted Westmeier-Director	517.546.9858	East Complex - 2300 E. Grand River Avenue, Suite 102, Howell, MI 48843-7578	http://co.livingston.mi.us/health/
Oakland County Health Division- North		248-858-1280	County Service Center, 1200 North Telegraph, Building 36 East, Pontiac, MI 48341	

Appendix 2. Target audiences, stakeholders and/or partners for Eastern Massasauga education and outreach efforts in southeast Michigan compiled in 2003-2005.

Organization	Contact Individual	Phone	Address	Email
Oakland County Health Division- South		248-424-7000	27725 Greenfield Road, Southfield, MI 48076	
Oakland County Health Division-Oakland Pointe		248-858-1280	250 Elizabeth Lake Road, Suite 1520, Pontiac, MI 48341 0421	
Oakland County Health Division- West		248-926-3300	1010 East West Maple, Walled Lake, MI 48390-3588	
Washtenaw County Health Department		734-544-6700	555 Towner Ave., P.O. Box 915, Ypsilanti, MI 48197-0915	www.ewashtenaw.org/government/departments/public_health/ph_index.html
Hospitals				
Oakland County Hospitals				
Oakland County Hospitals:see attached handout from webpage- 40 hospitals and clinics listed				http://www.oaklandweb.com/organizations/hospitals.htm
Livingston County Hospitals				
Brighton Hospital		1-888-215-2700	12851 East Grand River Avenue, Brighton MI 48116	http://brightonhospital.org/
Jackson County Hospitals				
Washtenaw County Hospitals				
Veterinarians				
County Extension Offices				
Jackson County Extension Unit	Janet Seitz	(517) 788-4292	1699 Lansing Ave. Jackson, MI 49202-2296	jackson@msue.msu.edu
Livingston County Extension Unit	Roy Hayes	(517) 546-3950	820 East Grand River Avenue, Howell, MI 48843-2432	livingst@msue.msu.edu
MSU Southeast Region Office	Henry Allen-Regional Director	(248) 380-9104	28115 Meadowbrook Road, Novi, MI 48377-3128	msuse@msue.msu.edu
Oakland County Extension Unit	Lois Thielke-Acting Director	(248) 858-0885	Dept. 416, Pontiac, MI 48341-1032	oakland@msue.msu.edu
Washtenaw County Extension Unit	Nancy Thelen	(734) 997-1678	705 N. Zeeb Road, Ann Arbor, MI 48107-8645	washtena@msue.msu.edu
Natural Resource Agents				
Outdoor Writers/Journalists				
Michigan Outdoor Writer's Association				
First Nation People's				
	Nick Reo			
Utility Companies				
Developers				

Appendix 3. List of potential partners in southwest Michigan and invitation letter, agenda, and notes from meeting with partners in southwest Michigan in December 2008.

Joanne Barnard
Barry Conservation District
1611 South Hanover, Suite 105
Hastings, MI 49058-2579

Dennis Pennington
Barry County Extension Office
206 West Court Street
Hastings, MI 49058-1824

Dan Rajzer
Cass County Extension Office
120 N. Broadway
Suite 209
Cassopolis, MI 49031

Betty Blase
Kent County Extension Office
775 Ball Avenue, NE,
Grand Rapids, Mi 49503

Julie Ploch
Van Buren County Extension Office
219 E. Paw Paw St.
Suite 201
Paw Paw, MI 49079-1077

Peter TerLouw
Southwest Michigan Land Conservancy
6851 S. Sprinkle Road
Portage, MI 49002

Heidi Holst
Frederick Meijer Gardens, Education Director
1000 East Beltline NE,
Grand Rapids, MI 49525

Jen Wright
Kalamazoo Nature Center
7000 N. Westnedge Ave.
Kalamazoo, MI 49009

Chuck Nelson
Sarett Nature Center
2300 Benton Center Road
Benton Harbor, MI 49022

Sara Schaefer
MDNR Southwest Management Unit
621 North 10th Street
Plainwell, MI 49080-1004

Steve Nelson
Allegan County Extension Office
Human Services Building
3255 122nd Ave
Allegan, MI 49010-9511

Joanne Davidhizar
Berrien County Extension Office
County Building
1737 Hillandale Road
Benton Harbor, MI 49022-9630

Ann Nieuwenhuis
Kalamazoo County Extension Office
Nazareth Complex
3299 Gull Road, 4th Floor, 2nd Wing
Kalamazoo MI 49048

Mary McLellan
State Master Gardener Program
A426 Plant and Soil Science Building
Michigan State University
East Lansing, MI 48824-1325

Lisa Brush
The Stewardship Network
416 Longshore Drive
Ann Arbor MI 48105

Melanie Good
Land Conservancy of West Michigan
1345 Monroe Ave. NW,
Suite 324
Grand Rapids, MI 49505

Education Director
Howard Christenson Nature Center
P.O. Box 42
Kent City, MI 49330

Matt Dykstra
Pierce Cedar Creek Institute
701 West Cloverdale Rd.
Hastings, MI 49058

Director
Volunteer Organization of Southwest MI
210 E. Main St.
Suite 237
Niles, MI 49120

Christoper Hoving
MDNR, Southwest Mgt UNit- LIP Program
621 North 10th Street
Plainwell, MI 49080-1004

Appendix 3. List of potential partners in southwest Michigan and invitation letter, agenda, and notes from meeting with partners in southwest Michigan in December 2008.

Tom Funke
Binder Park Zoo
7400 Division Drive
Battle Creek, MI 49014-9500

Shari Dann
Conservation Stewards Program
147 B Natural Resources Building
Michigan State University
East Lansing MI 48824

Ray Fahlsing
MDNR Parks Division
P.O. Box 30257
Mason Building, 3rd Floor
Lansing, MI 48909-7757

Kathy Buckham
Kalamazoo County Conservation District
1911 W. Centre Ave.
Portage, MI 49204

Director
Cass County Conservation District
1127 E. State Street
Cassopolis, MI 49031

Director
Berrien County Conservation District
P.O. Box 129
Rural Economic Development
Berrien Springs, MI 49103-0129

Tina Clemons
Allegan Conservation District
1668 Lincoln Road
Allegan, MI 49010

Kim Sneden
Detroit Zoo-Curator of Education
8450 West 10 Mile Road
Royal Oak MI 48067

Lori Sargent
MDNR-Wildlife Division
4th Floor Mason Building
P.O. Box 30444
Lansing MI 48909-7944

Beth Tillman
Gillette Sand Dune Visitor Center
Hoffmaster State Park
6585 Lake Harbor Road
Muskegon MI 49441

Dan Malone
John Ball Zoo
P.O. Box 2506
1300 Fulton St.
Grand Rapids, MI 49504

Mark Parish
Pokagon Band of Potawatomi
P.O. Box 180
58620 Sink Road
Dowagiac MI 49047

John Legge
The Nature Conservancy-West MI. Office
3728 W. River DRive
Comstock Park, MI 49321

Amy Lockhart
Van Buren County Conservation District
1035 E. Michigan Ave.
Paw Paw, MI 49079

Liz Binoniemi
Match-E-Be-Nash-She-Wish (Gun Lake) Band of Potawatomi
P.O. Box 218
1743 142nd Avenue
Dorr MI 49323

Director
Kent County Conservation District
3260 Eagle Park Dr. NE
Suite 111
Grand Rapids, MI 49525

Jeff Jundt
Detroit Zoo-Curator of Reptiles
8450 West 10 Mile Road
Royal Oak MI 48067

Earl Wolf
MDNR Office of Communications
Mason Building
P.O. Box 30745
Lansing MI 48909-7944

Kevin Frailey
MDNR Office of Communications
Mason Building
P.O. Box 30745
Lansing MI 48909-7944

Rollie Johnson
MDNR Parks Division-District Supervisor
621 North 10th Street
Plainwell MI 49080

Appendix 3. List of potential partners in southwest Michigan and invitation letter, agenda, and notes from meeting with partners in southwest Michigan in December 2008.

Shana McMillan
DNR Wolf Lake State Fish Hatchery Visitor Center
34270 County Road 652
Mattawan MI 49071

Eric Tobin
Michigan Society of Herpetologists
P. O. Box 4201
Battle Creek, MI 49016

Appendix 3. List of potential partners in southwest Michigan and invitation letter, agenda, and notes from meeting with partners in southwest Michigan in December 2008.

MICHIGAN STATE UNIVERSITY EXTENSION

November 20, 2007

«First_Name» «Last_Name»
«Company_Name»
«Address_Line_1»
«Address_Line_2»
«City» «State» «ZIP_Code»

Dear «First_Name»,

We are writing to share some good news with you. We recently received a small grant from the U. S. Environmental Protection Agency to expand our public education and outreach initiative on "Learning to Live with the Eastern Massasauga Rattlesnake" to southwest Michigan. Two years ago, with the assistance of a number of organizations, we initiated a similar effort in southeast Michigan, and were very pleased with the positive response of professionals and the public who participated in the effort. We are writing to invite individuals and organizations working in southwest Michigan to join us in planning and implementing this education effort in your area.

The Eastern Massasauga (*Sistrurus catenatus catenatus*) became a candidate for federal listing under the Endangered Species Act in 1999. It has declined throughout its range, primarily due to habitat loss and human persecution. Michigan appears to be the last U.S. stronghold for this snake, and its viability in Michigan has implications for conservation of this species across its range. The public's fear and negative response to this snake are largely based on lack of information or misinformation.

The goal of this outreach initiative is to raise awareness of and appreciation for Michigan's diverse snake fauna and to empower citizens to co-exist with these animals. Workshops, educational materials and personal consultations provide professionals and targeted members of the public with comprehensive and accessible information and the necessary skills to make informed decisions about how to safely co-exist with the massasauga and snakes in general. These workshops provide experiential learning opportunities focused on snake identification, ecology, and conservation and management. Participants are given outreach materials that include information on managing snakes on private property, avoiding and treating rattlesnake bites, and snake identification. We also plan to establish a network of local resource people comprised of trained volunteers and professionals who can respond to massasauga reports and provide landowner education.

Michigan Natural Features Inventory
P.O. Box 30444
Lansing, MI
48909-7944
(517) 373-1552
FAX: (517) 373-9566

Please join us on **December 14, from 1:00-3:00 pm at the Kalamazoo Nature Center** to learn more about this educational program and to share your ideas on how to implement this outreach effort successfully in your area. Attached is an agenda for the meeting. Please contact Daria Hyde, (517) 373-4815, hyded@michigan.gov to provide an R.S.V.P. or to obtain additional information about this meeting.

Sincerely,

Daria Hyde- Conservation Planner
Yu Man Lee- Conservation Scientist, Zoology
Michigan Natural Features Inventory
P.O. Box 30444, Stevens T. Mason Bldg.
Lansing, MI 48909-7944

Rebecca Christoffel – Wildlife Ecologist
1164 Emerald Street, #2
Madison, Wisconsin 53715

Appendix 3. List of potential partners in southwest Michigan and invitation letter, agenda, and notes from meeting with partners in southwest Michigan in December 2008.

MICHIGAN STATE UNIVERSITY EXTENSION

Implementing an Education and Outreach Program:
"Learning to Live with the Eastern Massasauga Rattlesnake"
In Southwest Michigan

December 12, 2007
1:30-3:30 pm

Location: Kalamazoo Nature Center, X Conference Room

Agenda

1:30-2:00 Introductions by meeting hosts and attendees.
-Update on current education efforts and resources available on the eastern massasauga in SW MI.

2:00-2:30 Overview of project.
-The "Canadian model"
-Summary of program implementation in SE MI.
-Educational resources developed
-Development and delivery of workshops
- Volunteer resource network
-Goals of project in SW MI.
-Massasauga reports/public perception
-Identify needs and objectives

2:30-3:00 Identification of target audiences -
-Distribute draft list of target groups
-Update list with additional suggestions
Identify resources still needed
-Assistance with hosting and/or delivery of educational workshops
-Development of a volunteer resource network
-Working with the local media
-Development of a DVD
-Development of interpretive exhibits
-Other ideas?

3:00-3:30 Identification of interested partners and action items
-Coordinate resources
Schedule a future planning meeting

Michigan Natural Features Inventory
P.O. Box 30444
Lansing, MI
48909-7944
(517) 373-1552
FAX: (517) 373-9566

Eastern Massasauga Outreach and Education Program in Southwest Michigan

Name of Organization_____

Contact Name/Title_____

Contact email _____ Contact Phone _____

I am interested in participating in this effort in southwest MI in the following ways:

___ I would like to attend a "Train the Trainer Workshop" so that I may deliver educational programs.

___ I would like to provide a facility for hosting an educational workshop.

___ I would like to assist with organizing and publicizing one or more educational workshops.

___ I would like to attend a "Volunteer Snake Responder Workshop" and become a part of a snake responder network in SW MI.

___ I would like to help recruit volunteers for the snake responder network.

___ I would be willing to help coordinate the snake responder network.

___ I would like to assist with the making of an educational DVD.

___ I would like to help by working with the local media to provide a balanced coverage of the eastern massasauga in the press articles.

___ I would like to help in writing grants to sustain additional resources for things such as interpretive displays, and other outreach materials.

___ I would be willing to assist with development of educational materials/curriculum for school- age children (K-12).

___ I would be willing to assist with the delivery of educational workshops/classes for school age children.

___ I would be willing to assist in _____
_____
_____

Southwest Michigan Massasauga Outreach and Education Meeting

December 14, 2007, 1:00-3:00 pm.

Kalamazoo Nature Center Auditorium

Participants:

Joanne Barnard - Barry County Conservation District	(Joanne.barnard@mi.nacdnet.net)
Diane Braybrook - Sarett Nature Center	(sarett@sarett.com)
Rebecca Christofell – Wildlife Ecologist, Madison, WI	(chris317@msu.edu)
Ryan Colliton – Kalamazoo Nature Center	(rcolliton@naturecenter.org)
Amy Druskovich - Cass County Conservation District	(casscd@casscd.org)
Matthew Dykstra – Pierce Cedar Creek Institute	(dykstram@cedarcreekinstitute.org)
Tom Funke – Michigan Audubon and Binder Park Zoo	(tfunke@binderparkzoo.org)
Lisa Gamero - DNR-PRD- Stewardship Unit	(gamerol@michigan.gov)
Chris Hoving – DNR Wildlife- LIP	(hovingc@michigan.gov)
Daria Hyde – Michigan Natural Features Inventory (MNFI)	(hyded@michigan.gov)
Jeff Jundt – Detroit Zoo	(jjundt@dzs.org)
Yu Man Lee - Michigan Natural Features Inventory (MNFI)	(leeyu@michigan.gov)
Mike Mahler – Sarett Nature Center	(sarett@sarett.com)
Dan Malone - John Ball Zoo	(dan.malone@kentcountymi.gov)
Chuck Nelson – Sarett Nature Center	(sarett@sarett.com)
Sarah Reding – Kalamazoo Nature Center (Meeting Host)	(sreding@naturecenter.org)
Tony Trojanowski – DNR PRD- Ft. Custer Rec. Area	(trojanot@michigan.gov)
Mindy Walker – Sarett Nature Center	(sarett@sarett.com)

Unable to attend (but interested):
Edwin Almodovar - District Conservationist, Kalamazoo County
Lisa Brush – Stewardship Network
Nate Fuller – Southwest Michigan Land Conservancy
Shana Mcmillan – DNR, Wolf Lake Fish Hatchery Visitor Center
Heather Y. Medina Sauceda - USDA NRCS, Allegan Field Office
Elizabeth Tillman – DNR PRD, Gillette Sand Dune Visitor Center

1:00-1:30 Sarah Reding, Kalamazoo Nature Center, welcomed everyone to the meeting and expressed commitment to assisting with an outreach effort in SW MI. Daria Hyde, MNFI, thanked everyone for coming and provided a brief description about this project and identified the counties that we would like to target because of the distribution of eastern massasauga or the occurrence of large urban centers, including, Allegan, Barry, Berrien, Cass, Kalamazoo, Kent and Van Buren. She asked folks to introduce themselves and to share information about ongoing education; outreach and research activities that they were aware of in SW MI. Participants introduced themselves and shared some of their organization's experiences with responding to reports and questions by the public about the eastern massasauga. Many naturalists' routinely encounter the massasagua on nature center trails and encourage their visitors to understand and respect this reptile. Some have sponsored research activities on their property. Participants from the three zoos, shared information about their exhibits and educational efforts with the group.

1:30-2:00 Yu Man Lee, MNFI presented an overview of the eastern massasauga education and outreach initiative that MNFI spearheaded in SE MI two years ago. She described how this project was inspired by the efforts of staff at the Toronto Zoo who have a very successful education and outreach program in Canada. She provided an overview of the the EPA Environmental Education Grants Program which funded this project. She outlined the goals and objectives of this initial project:

Goals:

- Develop and initiate an Eastern Massasauga Rattlesnake (EMR) education and outreach in MI modeled after Toronto Zoo/Canadian Recovery Team's success
- Provide accurate and consistent information
- Identify and develop strategies or mechanisms for sustaining EMR education and outreach for the long-term
- Provide people with knowledge and skills to make informed decision about how to safely co-exist with EMR

Objectives:

- Assess public attitudes
- Develop/revise educational materials
- Develop local resource network
- Develop/conduct educational workshops
- Promote balanced media coverage
- Evaluate effectiveness

Yu Man provided a list of key partner's that were involved in the SE MI pilot project as well as an overview of the target audiences that we targeted with this effort. There were between 85 and 200 groups that were identified.

- ✓ Natural resource managers
- ✓ Naturalists
- ✓ Outdoor writers
- ✓ Landowners living in rattlesnake habitat
- ✓ Wildlife damage operators/animal control
- ✓ Educators and schoolchildren
- ✓ Future "snake responders"
- Veterinarians
- Local hospitals / health departments
- Utility workers

Each meeting participant was provided with a packet of educational materials that were collected, revised and created through this initial project, including brochures, handouts, posters, and stickers. Yu Man also shared information about the website that was created through this project. www.msue.msu.edu/mnfi/emr

Yu Man discussed the development and coordination of a snake-responder network that was initiated in SE MI. Finally, she stressed the need to provide balanced media coverage on the EMR and provided examples of how this was approached in SE MI.

Rebecca Christofell, Wildlife Ecologist, provided more detailed information about the topics covered in the 23 educational workshops that were presented to over 700 participants including:

- Snake values
- Snake natural history in MI
- Massasauga ID & look-alikes
- Massasauga ecology, status and threats
- Research and conservation efforts
- How to encourage / discourage snakes
- Snake deterrents
- Avoiding and treating rattlesnake bites
- Communicating with the public about rattlesnakes
- How to safely move a snake if necessary

She then described how presenters would walk around and show workshop participants some of the snakes, native to Michigan so they could identify and distinguish key characteristics. These snakes were also displayed in clear tanks in the meeting room. She described how at the end of each workshop, participants were shown how to safely move a massasauga, only if necessary, by using a broom and trash container. Participants witnessed how non-aggressive these snakes are and how they just want to get away from people.

Rebecca provided an overview of the doctoral research she conducted regarding public attitudes about snakes. She conducted a pre- workshop, post workshop and long-term post workshop surveys to identify if respondents average "like" and "fear" scores changed and to determine whether knowledge levels about the EMR had increased. She found that right after and 6 months after the workshop that people's "like" scores increased as they had a greater appreciation of the massasauga and that their knowledge and ability to answer question about this snake increased. Not surprisingly, "fear" scores did not change significantly. Research demonstrates that it would take more than exposure to one workshop to have an impact on people's fear reactions that are formed very early in life.

2:00-2:30 Daria provided a handout of potential target audiences that she compiled. She asked participants to provide her with additional suggestions to add to this list. Suggestions provided at the meeting include:

Scout councils, 4H groups, hunters and fishers, conservation clubs, DNR Operation Service Center secretaries, private landowners identified by the MDNR Landowner Incentive Program, campground hosts, DNR Parks Explorer Guides, schoolteachers, Fisheries Division, turtle trappers. (Daria will update this list and email a copy to all)

The group then brainstormed additional resources that are needed:

- Assistance with hosting and/or delivering workshops
- Development of a volunteer training network
- Working with the local media
- Development of a DVD
- Writing grants to obtain funding (i.e. Disney, Busch Gardens)
- Marketing
- Develop curriculum and lesson plans for teachers

- Develop pod cast, blogs, “You-tube” videos, “My space” postings, etc.
- Seek out environmental reporting opportunities through NPR
- Distribute press-packets to media
- Provide media with “already written” articles that reporters can cut and paste
- Develop a list of local reporter contact information
- Provide information to nature centers for weekly columns in their newsletter
- Communicate with reporters of small newspapers
- Contact staff at cable TV. Stations that are looking for programming.

2:30-3:00pm We then identified interested partners and discussed how individuals and the various organizations they represent could become involved.

An initial list of organizations that would be willing to host/and or deliver workshops or to train volunteers include:

- Kalamazoo Nature Center
- John Ball Zoo
- Binder Park Zoo
- Gillette Visitor Center- Hoffmaster State Park
- Pierce Cedar Creek Institute
- Sarett Nature Center

The group also brainstormed on ideas to help promote more appreciation of snakes and their habitats including things such as “Snake Days” (annual activity at Binder Park Zoo), or “Herp Hikes”, or perhaps “Fen Days” to teach folks more about the unique plants and animals that occur in fens (i.e. the Mitchell’s satyr, turtles, massasaugas, orchids, etc.).

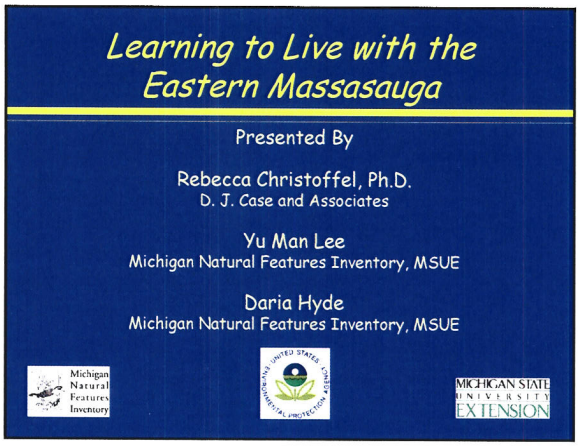
Participants filled out a short questionnaire outlining their interest in participating in this effort in SW Michigan. I have attached this questionnaire for folks that were not able to attend this meeting.

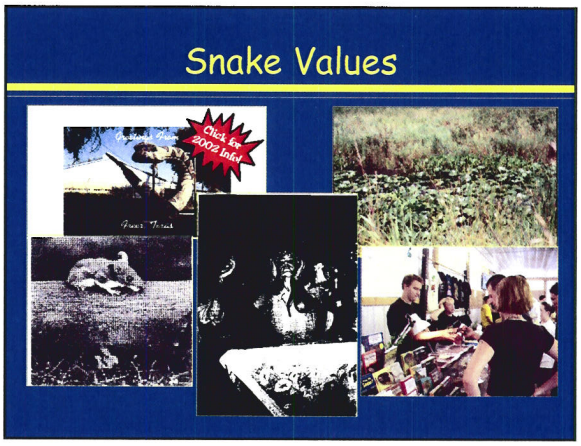
Next steps: Daria will compile information from the questionnaires and will begin to coordinate with interested partners. She will assist in organizing some initial workshops to “train the trainer” as well as workshops for the public. In addition, she will work with partners to plan training for volunteers interested in being a part of a snake responder network and explore various possibilities for coordinating such an effort. Yu Man and Rebecca will be available to conduct the trainings and assist with the workshops for the public.

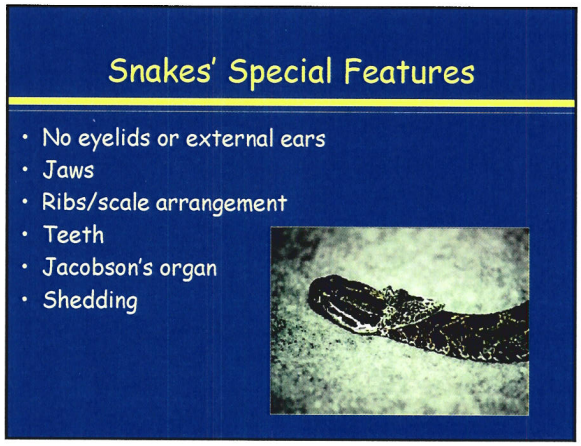
Please let me know if you have any additions or corrections to these notes or if you have any questions.

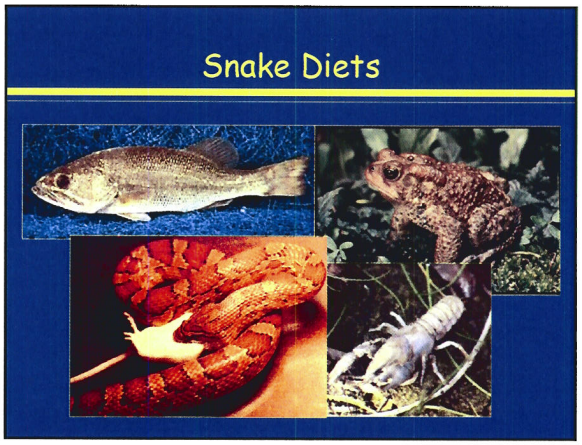
Thanks for your interest and participation. I am excited to get started!

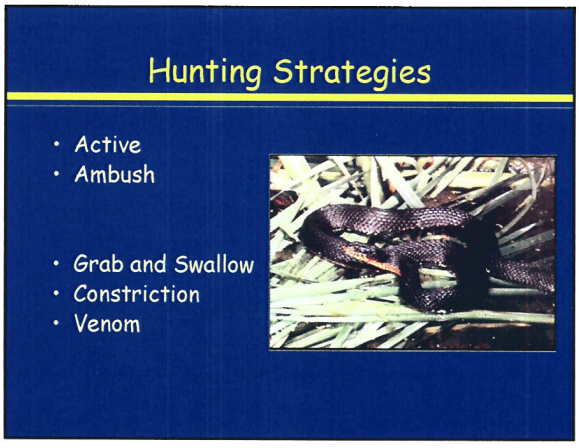
Appendix 4. Powerpoint presentation for Eastern Massasauga educational workshops for the general public in 2008. (Note: Slides are in order from left to right.)

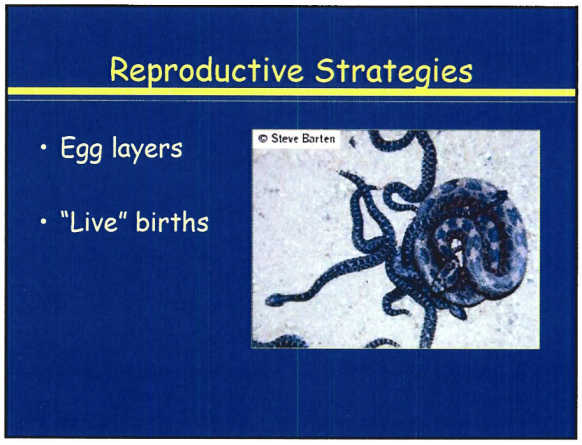












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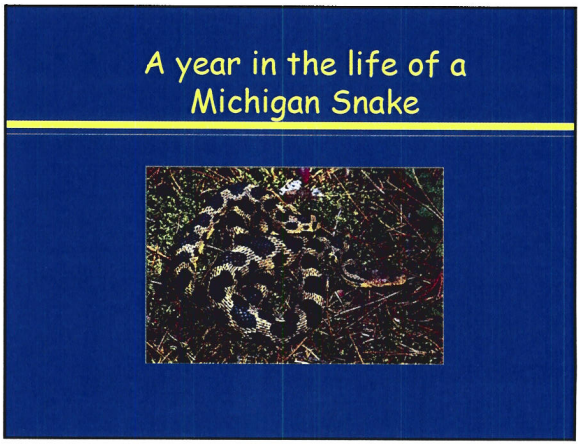

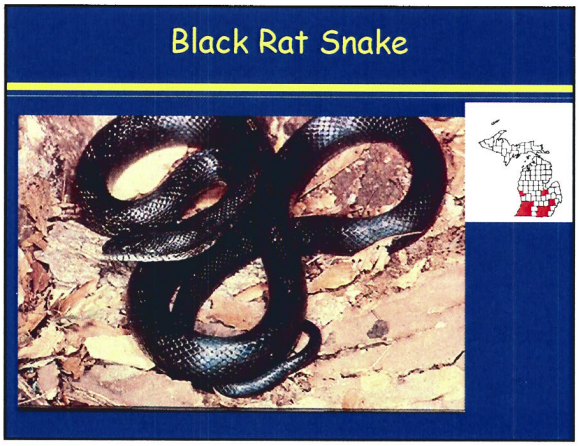

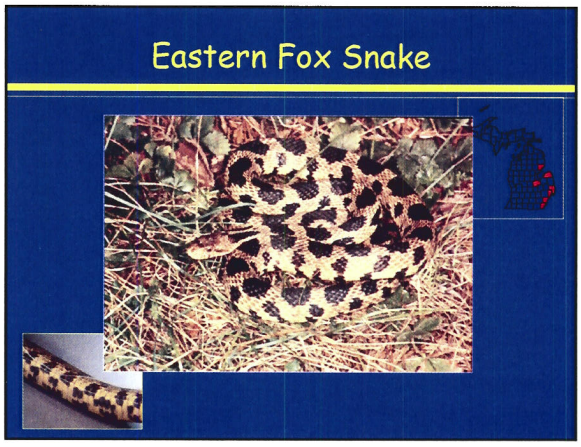

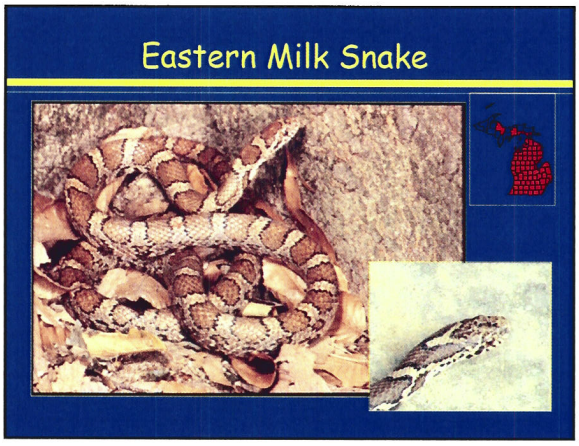

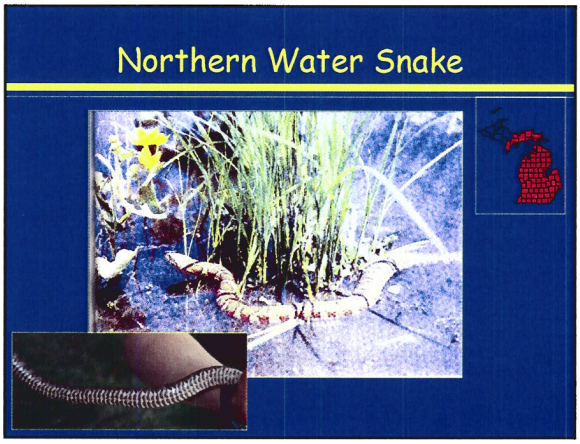

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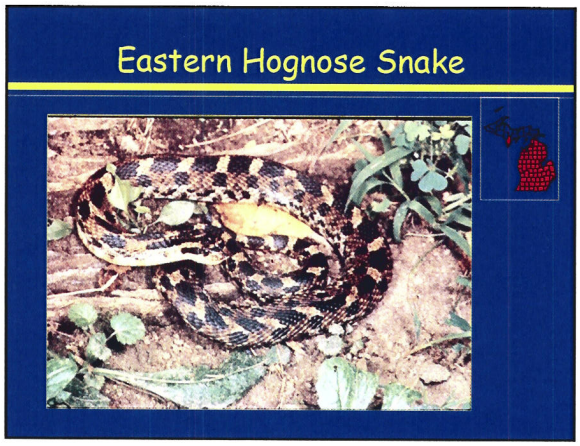

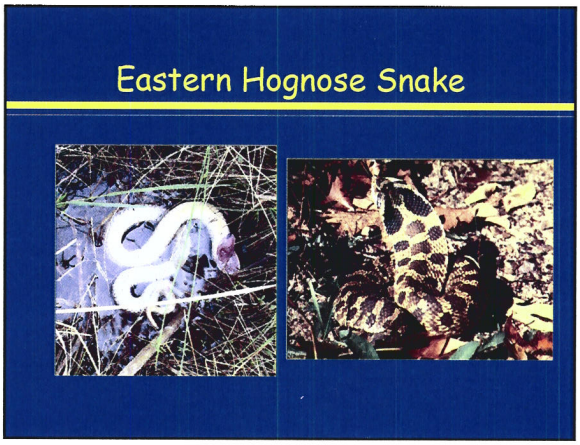

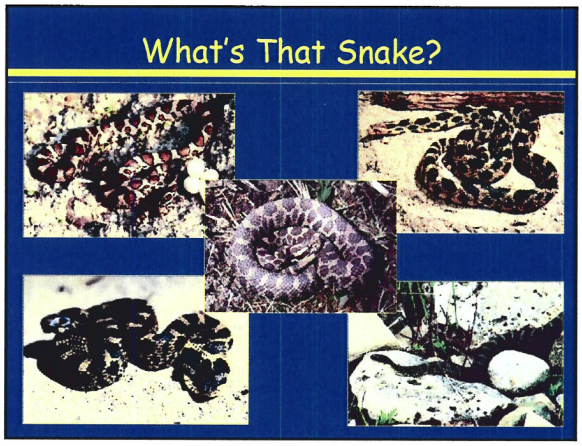

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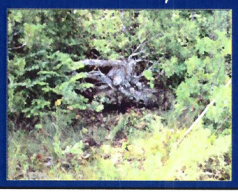
Eastern Massasauga Habitat Use

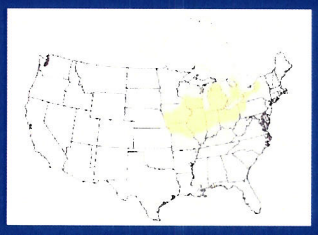
- Upland use
  - variety of uplands
  - foraging
  - gestation
  - site fidelity?



Eastern Massasauga Habitat Use

- Hibernacula
  - wetlands & uplands
  - burrows
  - in water/below frost line
  - outside activity area
  - site fidelity & communal

Eastern Massasauga Range & Status



*Map from USFWS Eastern Massasauga Status Assessment (Szymanski 1998)

- USFWS Status Assessment in 1998
- Eastern Distinct Population Segment (EDPS)
- Federal Candidate in 1999
- Listed as E/T in all states/province except MI

Eastern Massasaugas in MI

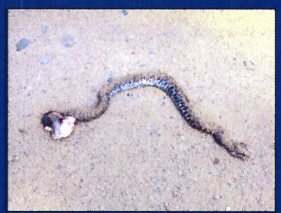
- Historically 50 of 68 cos.
- 1992 – State Special Concern
- 1993 – Protected by DNR Director's Order

Eastern Massasaugas in MI

- MI Status Assessment 1994-1996:
  204 occurrences – 40-50 extirpated, 40 secure, 78 vulnerable/ declining, 36 unknown
- 2001-2006: 90+ extant occurrences in 28 cos. (33+ new, 52+ updates)
- Size, condition, & long-term viability unknown

Snake Conservation Threats

- Habitat loss and degradation
- Habitat fragmentation
- Roadkill
- Human killing
- Illegal collection



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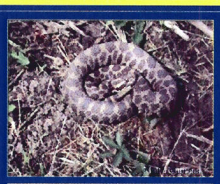
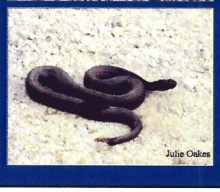
Conservation Efforts

- Eastern Massasauga Candidate Conservation Agreement with Assurances (CCAA)
  - protected lands
  - minimize threats
  - management guidelines
- Surveys and monitoring
- Massasauga reports
- Education and outreach





Research Efforts

- Radio-telemetry
- Habitat modelling using GIS
- Genetic diversity
- Population size and viability
- Human dimensions

Living with Snakes

- Creating a space for snakes
  - Food
  - Shelter
  - Thermoregulation
  - Hibernacula

"Okay. . . On the count of three everybody rattles."

Living with Snakes

How to discourage snakes from hanging out around your buildings

- food
- shelter
- thermoregulation
- hibernacula

Snake Deterrents

Avoiding Rattlesnake Bites

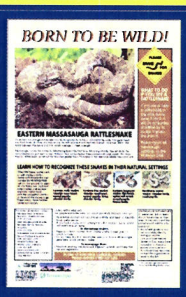
- Learn how to identify local snakes
- Protective footwear, night hikes
- Pets - leashes
- What if I hear a rattler?
- Handling
- Reaching into brush
- Giving snakes a wide berth

Appendix 4. Powerpoint presentation for Eastern Massasauga educational workshops for the general public in 2008. (Note: Slides are in order from left to right.)

Treating Rattlesnake Bites

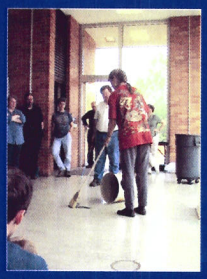
Do's	Don'ts
- Move away from snake	- Cut bite site
- Remain calm	- Apply ice
- Remove jewelry	- Attempt to suck venom out with mouth
- Seek prompt medical attention	- Administer alcohol or drugs
	- Apply tourniquet

Information Contacts & Resources



www.msue.msu.edu/mnfi/emr

Relocating Snakes



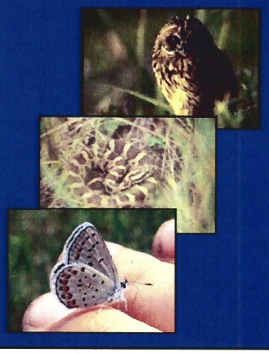
- Last option
- Leave alone
- Move short distance to nearest habitat
- Nearest habitat within same wetland complex within max. of 800 feet (250 m) without barriers
- Contact volunteer coordinator, MNFI, or DNR
- Safe snake relocation demo

Questions?

Thank you!!

Habitat on Private Land

- DNR Landowner Incentive Program
  - For rare species
  - To enhance, restore, or protect habitat
- Technical and financial assistance
- 12 acre minimum
- Contact Chris Hoving 269-685-6851 x142 for more information



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Learning to Live with the Eastern Massasauga

Presented By

Rebecca Christoffel, Ph.D.
D. J. Case and Associates

Yu Man Lee
Michigan Natural Features Inventory, MSUE

Daria Hyde
Michigan Natural Features Inventory, MSUE

Michigan Natural Features Inventory | MICHIGAN STATE UNIVERSITY EXTENSION

Snake Ecological Values

•Important prey for other animals (birds of prey, raccoons, etc.)

•Habitats provide benefits to humans and wildlife

•Helps to control rodent populations

Snake Economic Values

•Reptile pet trade and shows are very popular

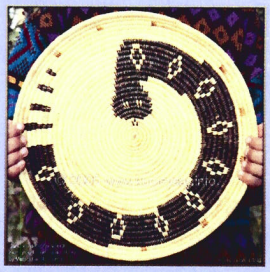
•Venom is used for medications

Snake Social/Cultural Values

•Many people from First Nations view snakes as medicine provider and plant guardian

•Some groups use snakes in religious ceremonies

•Many view snakes as aesthetically pleasing and beautiful animals

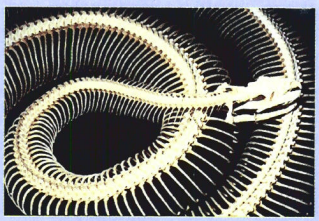


Snakes' Special Features

- **No eyelids or external ears**
  - Eyes covered by scales called brille.
  - Snakes sense vibration through lower jaw bone
- **Jaws**
  - Ability to open jaws wide enough to accommodate large prey items.

Snakes' Special Features

- **Ribs/scale arrangement**
- **Teeth**



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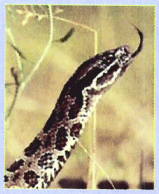
Snakes' Special Features



- **Shedding**
  - -Behavior changes
  - -Can identify specimen

- **Jacobson's organ**
  - Tongue flicking collects chemical molecules on tongue and transports to Jacobson's organ

Snake Diets

- **Many prey items including:**
  - **Invertebrates**
  - **Fish**
  - **Frogs and toads**

Snake Diets

- **Birds and bird eggs**

- **Small mammals**

Hunting Strategies

- **Active**
- **Ambush**

Hunting Strategies

- **Grab and Swallow**
- **Constriction**
- **Venom**

Reproductive Strategies

- **"Live" births**

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Reproductive Strategies

- Egg layers

Michigan Snakes

Eastern Massasauga – C, SC

- 18 MI snake species
- 5 species are E, T, or SC, and protected from take by law

Eastern Fox Snake- T

Kirtland's Snake - E

Northern Copperbelly Water Snake – LT, E

Gray Rat Snake- SC

Michigan Snakes

- MI Wildlife Action Plan

- 6 additional Species of Greatest Conservation Need (SGCN)

- Blue Racer
- Eastern Hognose Snake
- Northern Ringneck
- Queen Snake
- Smooth Green Snake
- Western Fox Snake

A Year in the Life of a Michigan Snake

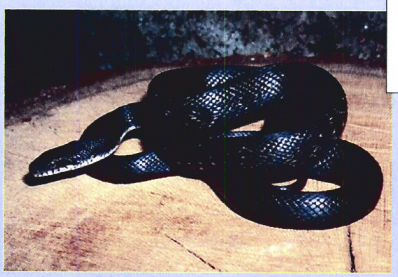
A Year in the Life of a Michigan Snake

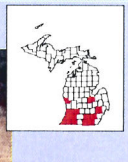
- Hibernation

- Survival Strategies

- Breeding Strategies
  - -Communal
  - -Territorial

Gray Rat Snake





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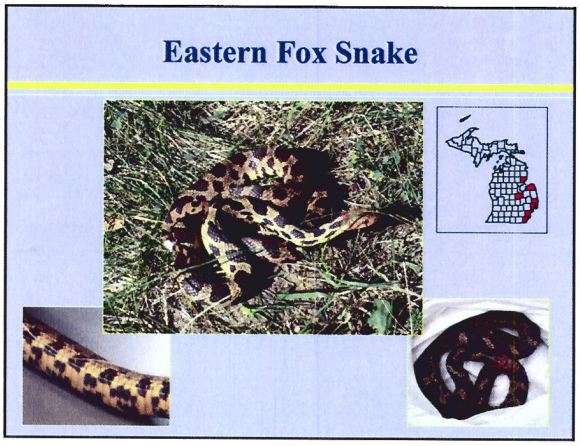

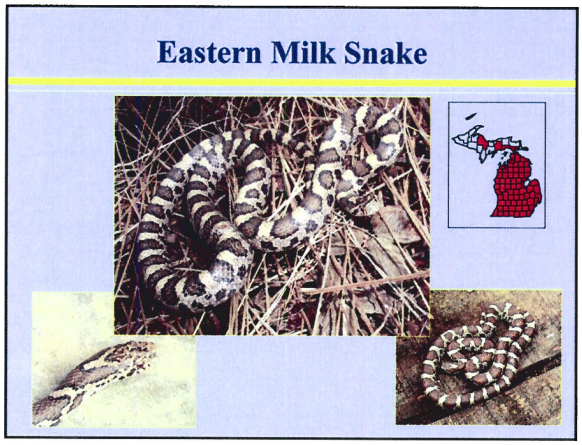

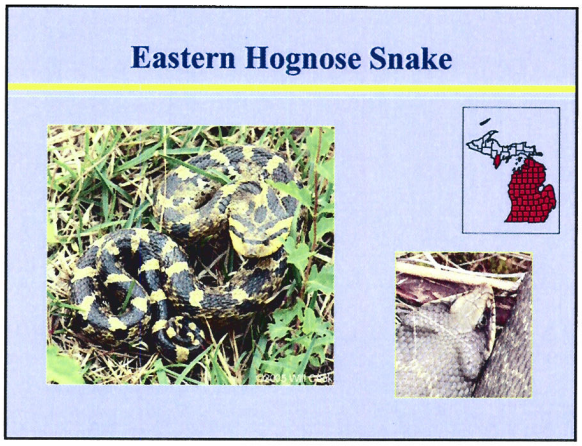

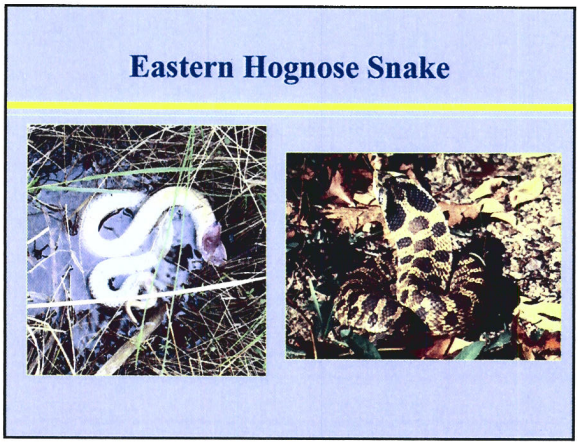

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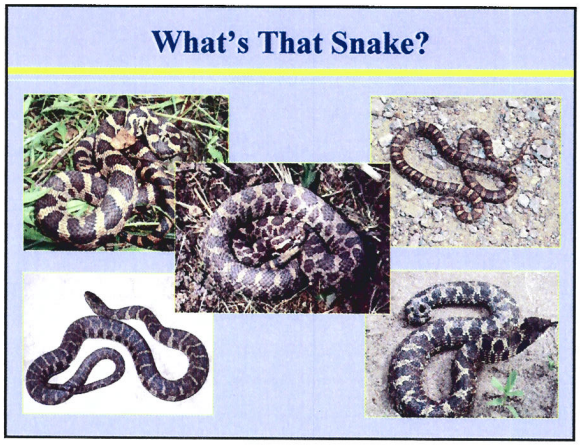

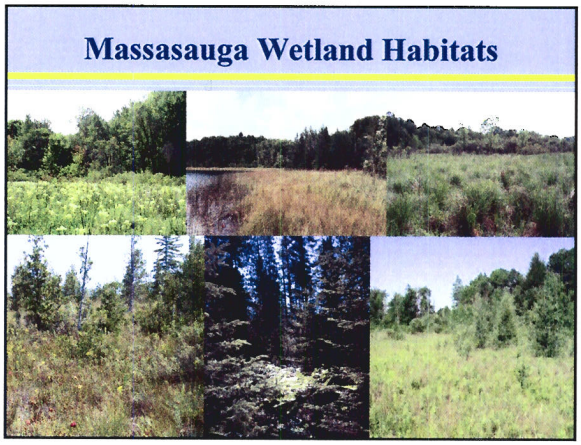

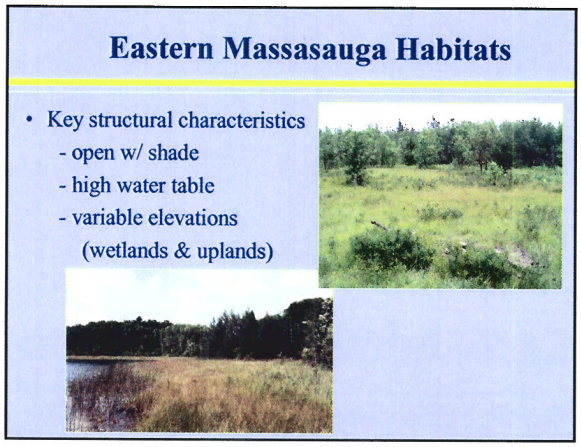

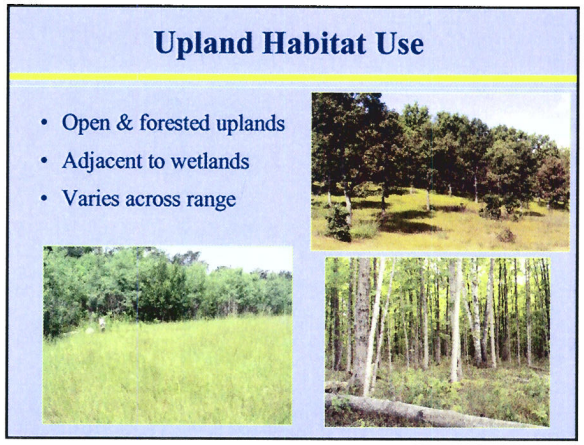

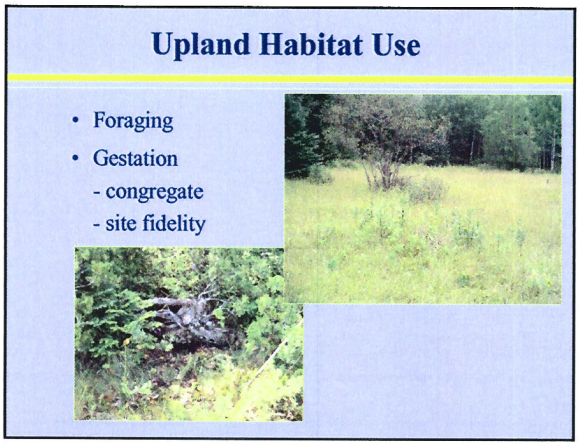

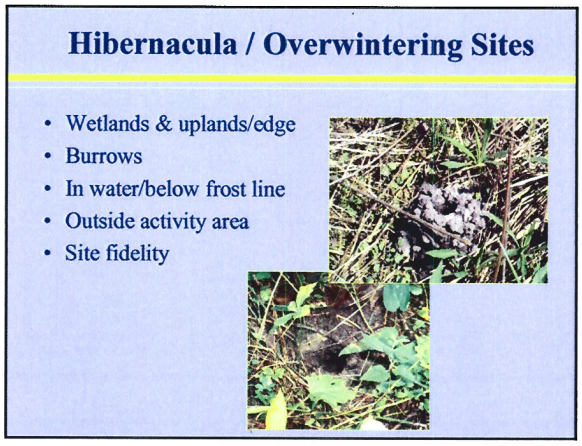

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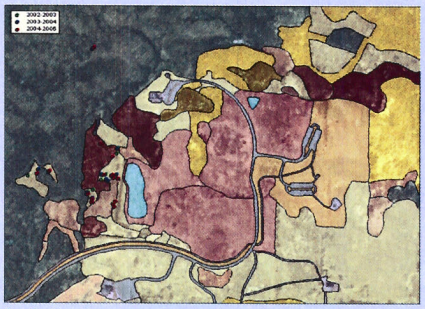
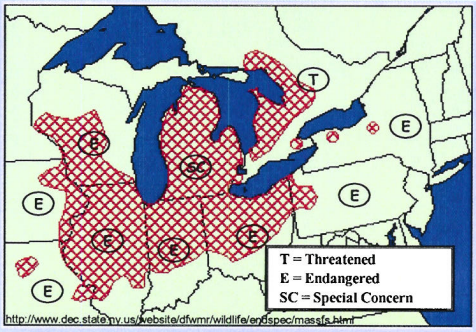
Hibernacula



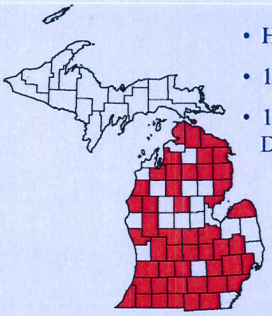
Map from Dr. Bruce Kingsbury and Joseph Sage, Indiana-Purdue University, Ft. Wayne, Indiana

Eastern Massasauga Range & Status



*Slide from Kristen Bissell, Michigan DNR

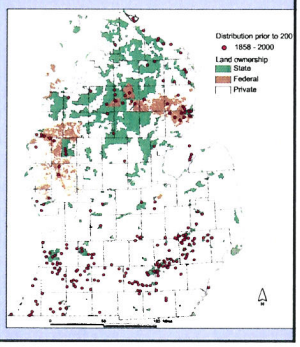
Eastern Massasaugas in MI



- Historically 50 of 68 cos.
- 1992 – State Special Concern
- 1993 – Protected by DNR Director's Order

Eastern Massasaugas in MI

- **MI Status Assessment 1994-1996:**
  - 204 occurrences
    - 40-50 extirpated
    - 40 secure
    - 78 vulnerable/ declining
    - 36 unknown
- **2001-2008:**
  - 93+ extant occurrences in 31 cos.
  - 33+ new, 57+ updates
- **Long-term viability unknown**

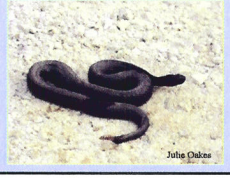


Snake Conservation Threats

- Habitat loss and degradation
- Habitat fragmentation
- Road kill
- Human killing
- Illegal collection

Conservation Efforts

- Massasauga CCAA
- Surveys and reports
- Research & monitoring
- Education & outreach



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Eastern Massasauga Efforts

- Research
  - Radio-telemetry - ecology
  - Management impacts
  - Habitat modeling
  - Genetic diversity
  - Population size/viability

Living with Snakes

- **Creating a space for snakes**
  - Food
  - Shelter
  - Thermoregulation
  - Hibernacula

"Okay. . . On the count of three everybody rattles."

Living with Snakes

How to discourage snakes from hanging out around your buildings

- food
- shelter
- thermoregulation
- hibernacula

Snake Deterrents

They don't work!

Avoiding Rattlesnake Bites

- **Learn how to identify local snakes**
- **Protective footwear, night hikes**
- **Keep pets on leashes**
- **Avoid reaching into brush**
- **Avoid handling snakes**

Avoiding Rattlesnake Bites

- **What if I hear a rattler?**
- **Give snakes a wide berth**

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Treating Rattlesnake Bites

Don't

- Cut bite site
- Apply ice
- Attempt to suck venom out with mouth
- Administer alcohol or drugs
- Apply tourniquet

Treating Rattlesnake Bites

Do

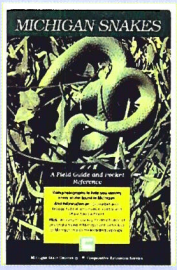
- Move away from snake
- Remain calm
- Remove jewelry
- Seek prompt medical attention
- Use Sawyer extractor

Information Contacts & Resources

www.msue.msu.edu/mnfi/emr

Interpreting Rattlesnakes to the Public

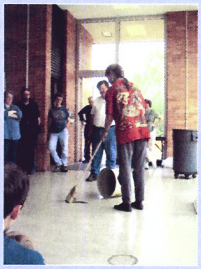
- **Snake identification**
- **Familiarize yourself with locally held misconceptions about snakes**
- **Problem phone calls are opportunities**
- **Instilling respect and appreciation**



Interpreting Rattlesnakes to the Public

- **Use "natural hazards" to help people put risk perceptions in line with risk reality**
- **Empower people to co-exist with rattlesnakes**

Relocating Snakes



- **Last option**
- **Leave alone**
- **Move short distance to nearest habitat**
- **Nearest habitat within same wetland complex within max. of 800 feet (250 m) without barriers**
- **Contact volunteer coordinator, MNFI, or DNR**

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Questions?

Call:
• Michigan Natural Features Inventory (517) 373-1552

•Michigan DNR (517) 373-1263

Acknowledgements

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- The presentation was developed and presented by Rebecca Christoffel, Ph.D., with D. J. Case and Associates and Yu Man Lee and Daria Hyde with MNFI, a program of Michigan State University Extension.
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Massasauga/Snake Workshop (March 2004)

I. Introduction – Why are we doing this? T, P, N, L, I

II. General introduction to snakes T, P, N, I

A. Snake values:

1. Ecological values
   a. Pest / rodent control
   b. Habitats provide tremendous benefits to humans (e.g., wetlands)
   c. Important prey for other animals (birds of prey, raccoons, etc.)
2. Economic values
   a. Venom – drugs, medications
   b. Reptile pet trade – booming industry
   c. Rattlesnake round-ups – provide substantial revenue for some communities
3. Social/cultural/religious values
   a. First Nations view snakes as medicine provider and plant guardian.
   b. Some groups use snakes in religious ceremonies
   c. Pest / rodent control
4. Aesthetic value
   a. Some snakes are beautiful animals.

B. Brief review of reptiles – what make a reptile a reptile?

1. Scales
2. Ectothermic – how this differs from endothermy. Benefits to reptiles.
3. Little or no parental care
4. Constant growth – what this means for reptile longevity.

C. Special features of snakes

1. No eyelids – eyes covered by scales called “brille.” No external ear openings. Snakes sense vibration through dentary or lower jaw bone.
2. Jaws – cartilage between two halves of lower jaw. Ability to open jaws wide enough to accommodate large prey items. Use jaws to “walk over” prey item.
3. Ribs/belly scales arrangement – may have 130 to 400 ribs. Each set of ribs associated with strong musculature used in movement. Ribs accommodate large prey items. Reduced organs also.
4. Tooth replacement – not like us. Can keep replacing teeth throughout life.
5. Tongue flicking and Jacobson’s organs – way of sensing environment. Collects chemical molecules on tongue. When saturated, brings tongue into mouth and places tongue in spaces on roof of mouth = Jacobson’s organ. Transmits chemosensory information to snake’s brain regarding environment.
6. Ecdysis – shedding and how sheds can be used to identify specimens. Frequency, what happens to a snake’s sight before shedding. Variation in behavior when getting ready to shed.

D. Diet

1. Strictly carnivorous – go through variety of prey items.

E. Hunting strategies
    1. Grab and swallow
    2. Constrictors
    3. Venom
    4. Active
    5. Sit and wait ambush

F. Reproductive strategies
    1. Oviparity – egg layers.
    2. Ovoviparity – young develop internally. Are delivered live to outside world after hatching from internal membranous (thin tissue) sacks.
    3. Viviparous – young develop internally and are born live.

G. Snakes in Michigan
    1. Species richness – how it compares to the tropics. Eighteen species in MI. Much more diverse in tropical areas. World wide close to 2400 species.
    2. Five snake species listed as endangered, threatened, or state special concern.
        a. Protected from take by law, including the species listed as special concern. Special concern species are protected by special Director of Natural Resources' Order.
        b. Listed species include the following:
            i. Kirtland's Snake – State Endangered
            ii. Black Rat Snake – State Special Concern
            iii. Eastern Fox Snake – State Threatened
            iv. Copperbelly Watersnake – Federally Threatened, State Endangered
            v. Eastern Massasauga – Federal Candidate, State Special Concern
    3. Six additional snake species has been identified as Species of Greatest Conservation Need (SGCN) by Michigan's Wildlife Action Plan (WAP)
        a. These include the following:
            i. Blue Racer
            ii. Northern Ringneck Snake
            iii. Western Fox Snake
            iv. Smooth Green Snake
            v. Queen Snake
            vi. Eastern Hognose Snake

H. A year in the life of snake in Michigan
    1. Special needs due to northern latitude
        a. Hibernacula – must find a way to survive cold season.
        b. Short active season – must complete all necessary life cycle operations in 5-6 months.
    2. A year in the life
        a. Hibernate – generally October/November until sometime in April or May. Many animals migrate to communal overwintering sites; others hibernate singly in small mammal burrows, etc.
        b. Upon emergence, spend a lot of time basking to perk up metabolism; often shed shortly after emergence before going to feed. May need to migrate to home range during active season.
        c. Feeding – delay between hibernacula and emergence, and typically fast for a time before entering hibernaculum to free body of undigested food, wastes

d. Breeding – typically, upon emergence from hibernacula or shortly thereafter. Some mate later in summer.
e. Diurnal - active during warmest parts of the day in spring and fall; some species become nocturnal during warmest months of summer
f. Egg laying – typically annual and in June; black rat in July
g. Ovoviparous and live-bearing species – typically August/September
h. Re-enter hibernation sometime in September or October.

III. Identification and natural history of Michigan rattlesnake look-alikes and behavioral mimics T, P, N, L, I

A. Black Rat Snake / Gray Rat Snake (new name)

1. Description: Largest snake in MI, attains lengths of 3 to 8 + feet; back is black or dark brown overlain on their juvenile blotched pattern, which may or may not be obvious. Chin is very white and grades into a yellowish to grey belly. There are dark checkerboard markings on the forward part of the body. Scales are weakly keeled and anal scale is divided. Youngsters are yellow, white or pale gray and heavily blotched with dark gray or brown on their backs alternating with smaller blotches on the sides. Adult coloration is attained in about 3 years.

2. Distribution: Found in southern lower peninsula of Michigan. Most documented occurrences have been in the southwestern quarter of MI.

3. Habitat(s): Black rat snakes are very arboreal in their habits. Rather than seeking them at ground level, you are likelier to see them on rafters in barns, attics or outhouses, or up in a hollowed-out tree. They typically occur in or near woodlands but also use adjacent open habitats such as shrubby fields, pastures, hedgerows, and marsh and bog edges. These animals will hibernate in mammal burrows, root networks, rock crevices or other areas such as stone foundations that provide refuge from freezing temperatures. They often hibernate in the company of other snakes such as racers.

4. Feeding: Small mammals make up the largest part of the snake's diet, followed by birds and birds' eggs. Mammals are constricted prior to consumption. Youngsters may eat small frogs, reptiles and reptile eggs.

5. Reproduction: Black rat snakes reach sexual maturity in 4 years. Males perform combat dances when vying for females. Mating occurs in spring, primarily in May and early June. Females lay their adherent eggs (5-44, but average is 12) in late June or July. Nesting sites include rotted stumps, shallow burrows, under logs or boards, and in manure or sawdust piles. A nest site is often shared with $\geq$ 1 females. Incubation takes from 60-75 days.

6. Hibernation: October – late April. Known to use

7. MI status: Special concern in Michigan.

8. Factoids: Can live >20 years in captivity. Another rattlesnake mimic, it will often vibrate its tail rapidly when it feels threatened. This snake is often referred to as the "pilot black snake" in parts of its range due to the mistaken belief that they lead timber rattlesnakes and copperheads to winter dens.

B. Eastern Milk Snake

1. Description: 24-52 inches, 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 V shaped light marking on top of neck. Belly white with black checkerboard pattern. Scales are smooth and anal plate is undivided.

2. Distribution: Throughout Michigan's Lower Peninsula. County records on UP in Mackinac and Marquette.

3. Habitat(s): Found in woodlands, fields, marshes, and farmlands. Secretive – often hiding under boards, trash, etc. near barns. Can be found in suburban parks and gardens. Often found in or near farm outbuildings, barns, sheds – attracted to piles. Largely nocturnal, especially during warmer summer months.

4. Feeding: Eats rodents as well as other snakes. Is a member of the kingsnake family. May also consume lizards, birds, and reptile and bird eggs. Constrictors generally. Simply grab and swallow helpless prey.

5. Reproduction: Lay 6-24 eggs in rotted wood or under debris in June. Young are very brightly colored. Mate in early spring, prior to dispersal from winter den areas, also later in May and June. Males locate females using pheromone trails. Eggs are adherent and take 6-9 weeks to hatch.

6. Hibernation: Late October through mid-April. Often communal. Use rodent burrows, rock or soil crevices, old wells and root cellars, house foundations and crawl spaces.

7. MI status: Common.

8. Factoids: Tail vibrator = rattlesnake mimic. Was mistakenly believed to "steal" milk from cows on farms. Why it was named milk snake. Actually, just interested in rodents farm in barns, and in the great nesting sites afforded in stored hay bales. Zoo captive lived to be 21, but 7-10 years more typical in wild.

C. Northern Water Snake

1. Description: 24-55 inches long, light brown with dark brown or blackish blotches; older individuals may appear uniformly black. Belly is cream-colored with irregular rows of reddish half moon crescents. Scales are keeled and anal plate is divided.

2. Distribution: Found throughout lower peninsula and eastern half of UP. Some islands, such as Beaver Island in northern Lake Michigan, support large populations.

3. Habitat(s): Usually found in or near ponds, lakes, streams or rivers. Fairly open, sunny locations with ample cover and basking sites are preferred. Most active during the day in spring and fall, but may be nocturnal in warmer summer months.

4. Feeding: Mostly eats cold-blooded prey. Primarily fish, but also frogs and carrion. Small mammals are rarely taken.

5. Reproduction: Viviparous. Female give birth to (15-40) youngsters in late summer or fall. Courtship and mating occurs in the spring from mid-April to mid-June. Males will often compete for mating rights with a female.

6. Hibernation: October – April. Months are passed in presence of other snakes in mammal or crayfish burrows, rock crevices, overbank root systems, or other sheltered sites near their summer habitats.

7. MI status: Common.

8. Factoids: Frequently misidentified as “water moccasins” and assumed to be venomous. Like many other snakes, releases foul smelling fluid from cloaca when threatened.

D. **Eastern Hognose Snake**

1. Description: 20-45 inches long, most have dark blotches on a yellowish, reddish or brown background but some are solid black brown or olive. Heavy-bodied with a flat head and upturned snout. Belly is yellow-gray with a greenish-gray pattern. The underside of the tail is lighter in color than the body. Scales are keeled and the anal plate is divided. Field mark: Two large black eyespots on the back of the head or neck.

2. Distribution: Occurs over most of Michigan's lower peninsula. Documented in Menominee County on UP.

3. Habitat(s): Found in various habitats including woods, savannahs, prairie, but favors sandy areas. Largely diurnal but tend to be most active in morning and early evening during warm summer months. They spend a good part of their time underground.

4. Feeding: Toad-eating specialist! Uses upturned snout to dig for toads. Will also eat some other food items but heavily prefers toads. Has special salivary glands (Durvernoy's) that produce a substance that is toxic to some amphibians.

5. Reproduction: Mate in April and May primarily, but mating does also occur late in summer. Four – 61 eggs are laid in June or July in a shallow burrow in sand or soil or under a log or rock. Incubation period runs 50-65 days, and the young hatch out in August or September. Eastern hognose snakes reach sexual maturity in years 2 or 3.

6. Hibernation: October – April. Typically, a deep burrow or under a rotted stump or similar shelter is used.

7. MI status: Still common, but is thought to be declining over much of its range in the Great Lakes basin.

8. Factoids: The eastern hognose is a great actor. Nicknames for this snake include "puff adder" and "spreading viper." These nicknames have to do with the snake's defensive display. When approached, a hognose will often flatten the skin on the back of its head and neck and hiss loudly. If the threat is maintained, the snake will take to emitting a foul-smelling fluid or feces from its cloaca, loll its tongue, and may even vomit its most recent meal. Then it will flip over on its back and play dead. Often, if you pick the snake up and put it right side up, the snake will again quickly turn over on its back and resume its stance of "playing dead." These are excellent burrowers, with a known longevity of 11 years in captivity. Longevity is unknown for wild specimens.

E. **Eastern Fox Snake** (Only found in SE MI; also because workshops are being held in S. MI, western fox snake is not included)

1. Description: 3-5 feet long, yellowish to light brown with black or dark brown blotches; head reddish or orangish, sometimes referred to as “copperhead” though not closely related to the venomous more southerly species. Belly yellow with checkerboard pattern. Scales are weakly keeled and anal scale is divided.

2. Distribution: Ranges from Saginaw Bay south along coastal Great Lakes area to western Lake Erie. This animal is ONLY found within the Great Lakes Basin.

3. Habitat(s): Eastern fox snakes frequent flat, marshy or partially drained marshy areas. They can also be found on vegetated dunes and beaches, and nearby farm fields, pastures and woodlots. They will use raised dikes, muskrat houses and road embankments for foraging and as basking sites, but will rarely climb into shrubbery or trees.

4. Feeding: Eat small mammals, birds, frogs, birds’ eggs. They are constrictors. Youngsters may eat cold-blooded prey such as earthworms and frogs.

5. Reproduction: Eastern fox snakes reach sexual maturity in 3-4 years. Mating occurs in spring, and 7-29 eggs are laid in June or July. Nesting sites include rotted stumps, shallow burrows, under logs or boards, etc. Eggs are adherent. Often a nest site will be shared with 1 or more other females.

6. Hibernation: October – April. Known to use abandoned mammal burrows. Also other frost-free shelters.

7. MI status: Threatened in MI.

8. Factoids: Often called “copperhead” because of its head coloration. Tail vibrator – rattlesnake mimic. Great swimmers! How the fox snake got its name – musk that it will emit when threatened, as is often when handled by a human!

IV. Eastern massasauga rattlesnake identification, ecology, distribution and status — T, P, N, L, I

A. **Eastern Massasauga Rattlesnake**

1. Description: 2-3 feet long, typically 2-2.5 feet. Gray or grayish brown with dark saddle-shaped blotches edged in white. Blotches run down back and sides. Heavy-bodied like eastern hognose; often found coiled. Belly is blackish. Scales are keeled, and the anal plate is undivided. Tail is thick and squarish, and does **NOT** taper to a point like all others. **Heat-sensing pit on each side of head between eye and nostril. Wedge-shaped head instead of elliptical-shaped head, Distinct segmented rattle at end of tail. Pupils are elliptical/cat-like rather than round as in other snakes (but should not get close enough to snake to see and use this to identify snake).**

2. Habitat(s): Primarily associated with wetlands. Found in a variety of wetlands - fens, bogs, wet prairies, sedge meadows, and marshes, particularly in southern Michigan, and similar wetlands as well as forested swamps such as cedar swamps in northern Michigan. Although massasaugas use a variety of wetlands in Michigan and across the species' range, all habitats seem to have three similar characteristics – 1) open (generally <50% canopy cover), sunny areas intermixed with shaded areas (e.g., shrubs, tall vegetation, trees, woody debris, etc.); 2) proximity to water and presence of the water table near the surface for hibernation; and 3) variable elevations between adjoining lowland and upland habitats. Ground cover should be dominated by grasses, sedges or sphagnum. Massasaugas tend to avoid heavily wooded areas. Massasaugas also utilize adjacent uplands, usually open uplands (e.g., meadows, old fields, prairies, barrens, savannas) but also will use forested uplands (e.g., forest openings, open canopy, partial canopy). The uplands are utilized for foraging, basking and gestation/birthing sites, typically from June – September. However, the use of uplands appears to vary among populations in Michigan and across the species' range. Eastern massasaugas are diurnal and active during warmest parts of the day in the spring and fall but most active in the afternoon, evening and morning hours in the summer.

3. Feeding: Feeds largely on rodents, but will also eat frogs, other snakes, lizards and birds. Diet influenced by availability of prey in an area. Uses heat sensing pits on face to track prey after envenomating it. Sit and wait ambush predator. Youngsters use tail-luring to coax prey items, such as frogs to a near approach.

4. Reproduction: Females give birth to litters of 3-20 live young in late summer (late July, August or early September) in mammal burrows or in/under woody debris. Ovoviviparous. Youngsters have "button" on end of tail. Newborn snakes remain beneath protective cover at the birthing site for 4-5 days. The young are on their own as they begin life on their own in the wild. Mating occurs in spring, summer and early fall. Youngsters generally reach sexual maturity at 3-4 years of age although this varies across the species' range (e.g., up to 8 years in Ontario). Reproduces annually, biennially (i.e., every two years, believed to be the case in Michigan), or every three years (e.g., in Ontario) in different parts of its range.

5. Hibernation: Eastern massasaugas typically hibernate in wetlands but also hibernate in uplands in some populations/parts of its range. Massasauga hibernate in crayfish or rodent burrows, rock fissures, rootwad networks and other openings which extend below the frost line often close to groundwater level. Massasaugas can hibernate partially submerged in water to prevent freezing. Typically hibernate singly but also have been found to hibernate communally with other massasaugas and other snake species and frogs/toads. They emerge in April as water levels rise. Hibernacula appear to be located outside of or on the edge of summer activity area. Massasaugas appear to exhibit a high degree of site fidelity and often return to the same hibernation sites (and gestation sites) year after year. Maintaining suitable hibernation sites is crucial for population survival.

6. Range: Occurs from southern Ontario, western New York and northwestern Pennsylvania west through Michigan, northern Ohio, northern Indiana, northern Illinois, and southern Wisconsin to the southeastern tip of Minnesota, eastern Iowa and northeastern Missouri (see map).

7. Distribution: Found throughout the Lower Peninsula and on Bois Blanc Island. There are no records of eastern massasaugas in the mainland UP. Historically known from 50 of 68 counties in the Lower Peninsula and 1 island population in the Upper Peninsula (Mackinac County).

8. MI status: Special Concern. It is illegal to collect or kill this animal. Michigan is considered to be the stronghold for the eastern massasauga. During 1994-1996 status assessment, 204 massasauga occurrences of which 40-50 were considered extirpated; 40 secure; 78 vulnerable or declining and 36 unknown status. Recent surveys and reports from 2001-2006 documented 90+ extant massasauga occurrences in 28 counties of which at least 33 were new occurrences and at least 52 were updates of previously known occurrences. Although there are a number of sites at which massasaugas have been found in Michigan, the exact number of populations is unknown, and the size, condition, and long-term viability of most populations in Michigan are unknown as well.

9. Factoids: Rattlesnakes add a segment to their rattle each time they shed. But this is not a good way to age a rattler. Shedding frequency is related to growth, which is tied to feeding frequency. In addition, rattle segments are often broken off. You can tell a younger animal from an older animal by checking to see if the segments end in a taper or not. If tapered, the snake is fairly young, as those are the oldest segments and correspond to a smaller body size. The word “massasauga” means “great river mouth” in the Chippewa language. Captive massasaugas have lived for more than 20 years. Lifespan in the wild is unknown.

V. Snake conservation threats in Michigan T, P, N, L, I

A. Habitat loss and degradation – This is a primary threat to most wildlife species. The eastern massasauga rattlesnake depends on a complex of wetlands for food and shelter, and nearby upland areas during a part of the year. Draining wetlands for farms, roads, homes, and urban development has eliminated much of their habitat.

B. Overexploitation – collection for personal, commercial (e.g., pet trade, products made with snake skins) or scientific use.

C. Roadkill – Especially for snakes that travel between several different habitats such as eastern massasaugas. Human developments such as roads, towns, and large farm fields create barriers to movements or make movements very risky. These barriers also separate and isolate remaining populations, and small, isolated populations are at greater risk of extirpation/extinction.

D. Human fear and dislike of snakes – countless snakes of all types are unnecessarily killed by humans each year.

E. Exotic/invasive species – causes compositional and structural changes in habitat which can lead to habitat loss and/or degradation

VI. Legal status of snakes in Michigan N, L, I

A. Of the 18 snake species in Michigan, two are listed as state endangered (Kirtland's snake and copperbellied water snake), one is listed as state threatened (eastern fox snake), and two are listed as state special concern (black rat snake and eastern massasauga).

B. Eastern Massasauga is listed as species of special concern in MI and threatened or endangered in all other states within the species' range. It was listed as a federal candidate species by the U.S. Fish and Wildlife Service (USFWS) in 1999.
    1. Amphibians and reptiles listed as special concern in Michigan are protected from take under a special Director of Natural Resources' Order. This special Director's Order is administered by the Michigan DNR Fisheries Division. This means that the massasauga is protected from take under this Director's Order and that it is illegal to kill, harm or collect a massasauga in MI.
    2. Federal candidate species means that the species warrants federal listing but has not yet gone through the process of being proposed as a threatened or endangered species due to other listing priorities or constraints. Federal candidates receive no legal protection.

VII. Eastern massasauga conservation efforts in Michigan T, P, N, L, I

A. Michigan's Eastern Massasauga Candidate Conservation Agreement with Assurances (CCAA) – The Michigan DNR is in the process of developing an Eastern Massasauga CCAA which is an agreement with the U.S. Fish and Wildlife Service to voluntarily implement specific conservation measures for massasauga populations primarily on protected properties (i.e., publicly owned sites or sites owned or managed primarily for conservation purposes) to minimize or remove threats to the species in order to preclude the need to federally list the species. In exchange for voluntarily implementing these conservation measures, if the species is federally

listed, the participant(s) in the CCAA would not be held to additional regulatory obligations and would be issued a permit to continue conducting agreed upon conservation measures/management activities. For the CCAA, the Michigan DNR has identified a number of core massasauga populations on protected properties and has developed management guidelines that would maintain or protect massasaugas and their habitats at these sites and ultimately in the state for the foreseeable future.

B. Surveys and monitoring – The Michigan DNR and the USFWS have funded recent surveys and monitoring of massasauga populations in Michigan to determine the species' current status, distribution and potential long-term viability in the state. Surveys have been conducted throughout the species' range from 2002-2004 by Michigan Natural Features Inventory (MNFI) and Indiana-Purdue University at Fort Wayne (IPFW). In 2004 and 2006, repeated, mark-recapture surveys were conducted at a subset of sites to try to begin to assess the abundance and potential viability of massasauga populations in the state. Tissue and blood samples also were collected in 2004 and 2006 for genetic analysis of massasauga populations in MI.

C. Massasauga reports – In addition to field surveys, the Michigan DNR and the MNFI have been collecting and compiling reports of massasauga observations or encounters from natural resource professionals and the general public to help determine the species' current status and distribution. So please send in your reports. Reports must be documented with a photograph, verification by a species expert and/or a specimen if one is available (e.g., roadkill).

D. Education – Education and outreach about the eastern massasauga are essential to conservation efforts for this species. This workshop and education and outreach project are efforts to begin to address this need.

E. Research – Prior to the listing of the eastern massasauga as a federal candidate species, little was known about this species' life history and ecology in Michigan. Since 2002, several research projects have been conducted in MI which have greatly increased our understanding of this species' life history and ecology in MI and have helped better inform conservation and management efforts for this species in MI.
    1. These have included several radio-telemetry projects (3 in SE MI, 1 in SW MI and 1 in north central MI) in which radio-transmitters are surgically implanted into snakes. These transmitters emit a signal which allows the snakes to be tracked throughout the active season and during hibernation to determine habitat use and other aspects of the species' life history and ecology.
    2. A GIS-based, landscape-level habitat model also has been developed for this species in Michigan by researchers from IPFW.
    3. Efforts have been initiated to investigate the genetic diversity of massasauga populations in Michigan. These efforts involve researchers from Central Michigan University and MNFI. In other parts of the species' range, studies to date have found that massasauga populations and sub-populations, even those that are fairly close together (i.e., within a few km), are genetically distinct from one another. This suggests that gene flow between populations is very restricted and populations are genetically isolated and that this isolation occurred prior to European settlement. Conservation implications of these findings include (1) massasaugas may be pre-adapted to inhabiting isolated patches, lack of gene flow may be the norm, and populations may be significantly impacted genetically by human-induced gene flow or population transfers; (2) if low gene flow indicates low dispersal, then if a local

population is eliminated, natural repatriation to that area is unlikely to occur quickly; (3) large regional populations are probably composed of genetically distinct sub-populations which should be treated as separate management units; and (4) each extant geographically separated massasauga population should be protected because of unique genetic diversity found within them.

4. Although we know a lot more about massasaugas in Michigan, we still have a lot more to learn. For example, although we have found a number of extant massasauga populations in the state, we know very little about the size and long-term viability of most of these populations.

VIII. Land management activities and snakes N

A. Timing – Most land management activities including mowing, burning, etc., are not detrimental if they are applied when snakes are hibernating or less active or less likely to be on the surface. However, there are some notable exceptions.
    1. Drawdowns for waterfowl - lowering the water table during hibernation can cause mortality by exposing massasaugas to sub-freezing temperatures or causing dehydration or dessication.
    2. Restorations that utilize heavy equipment for planting - can disturb and harm snakes that are hibernating underground.

B. Extent
    1. A good rule of thumb, always: Never apply a land management technique on the whole patch of habitat at once. You probably want to restrict yourself to about 30-40% of the area, and you will want to provide refugia within the area that is either being burned, mowed, etc.

C. Specifics – Massasauga habitat use and ecology vary regionally and within the state. Thus, managers should work with local species experts to ensure appropriate management strategies are employed. Can consult “The Eastern Massasauga Rattlesnake: A Handbook for Land Managers” by Johnson et al. (2000) (available from USFWS Region 3) for more information.

    1. Burning
        a. For spring and fall burns, particularly in wetlands, burn before snakes emerge from hibernation in the spring, after snakes enter hibernation in the fall, or on days when snakes are less active or less likely to be on the surface (e.g., cool (<50^{o}F) and cloudy)
        b. Use back burns or slow burns which may allow snakes to find refugia; avoid head fires or fast burns if possible as snakes have been killed during these types of burns on several occasions.
    2. Mowing, disking or clearing
        a. Avoid mowing, disking or clearing, particularly w/ heavy equipment, during periods when massasaugas are active if at all possible.
        b. If necessary, raise mowers or other equipment 4-6 inches above the ground. Certain mowers also have been found to create suction which can lead to snake mortality or injury; avoid using these mowers if possible.
    3. Water level manipulations
        a. Avoid lowering the water table during hibernation; doing so can have devastating effects on massasaugas.

b. Temporary increases in water levels during hibernation do not appear to be problematic; however, permanent increases may be.
c. Sudden increases in water levels during the active season can cause adverse impacts.

4. Treating exotics with herbicides
   a. Little is known about the effects of herbicide use on snakes, other vertebrates and on plant community dynamics, esp. in wetlands. Recommend caution in using herbicides.
   b. Broadcast spraying may be most effective but perhaps least desirable; wick application to cut stems works reasonably well and spread of the herbicide can be controlled better.

IX. Living with snakes T, P, N, I

A. What to do if you DO want to encourage snakes on your property – how to create "snake space"

1. Food – providing plenty of it in the form of rodents, insects, amphibians and other reptiles. It is important to refrain from using chemicals on your lawn to kill insects or weeds. You can directly or indirectly kill a great source of insect and rodent population control – i.e., snakes! Yard ponds may attract snakes because of the frogs that they attract.

2. Shelter – may include rock walls, shrubbery, woodpiles, keeping your grass long.

3. Thermoregulation – includes all of the above shelter sources, but also includes basking sites such as rocks in sunny areas, or compost piles – additionally, this is an ideal place for snakes to lay their eggs. Can also put out large pieces of plywood around property as shelter from sun, predators, places to encourage rodent nests and provide food for snakes.

5. Hibernacula – may include old stone foundations where snakes can spend the winter, old wells, old silo foundations. May also include building your own snake hibernaculum. Plans are available on the web.

NOTE: One important caveat is to AVOID creating your massasauga snake space in an area that will leave your house between a wetland and the snake space; otherwise, snakes will have to pass your house to reach the habitat.

B. What to do if you DON'T want to encourage snakes on your property

1. Food – Primarily, this is an issue of rodent control. One activity that encourages rodents is bird feeding. Often people provide cover for birds which also provides cover for rodents and snakes. One idea is to discontinue feeding birds from May – September when there should be plenty of natural food available to them, and this will discourage rodents from your yard, which should, in turn, discourage snakes. A second idea is to move the bird feeders from near your buildings during the snake active season, and this may keep snakes from coming near your buildings.

2. Shelter – keep lawn short, and you will reduce available cover for both rodents and snakes. This will discourage their presence. You can also discourage rodent populations by getting rid of debris piles in your yard. By placing your wood pile away from your buildings, you will discourage rodents and snakes from being found in or near your buildings. Keep landscape plantings away from your buildings to discourage rodents and thus, snakes. Rock walls are probably NOT a good idea. Rodents can create access points for snakes into homes by their chewing activities. Additionally, garage doors should be closed tightly and garages should be kept clutter free to discourage rodents, and thus, snakes.

3. Thermoregulation – to eliminate thermoregulatory resources, you want to keep your property as homogenous and unstructured as possible. For example, a short, well-manicured lawn with no landscape plantings, rock walls, debris piles, etc.

4. Hibernacula – If you have an old stone foundation, you will want to check for cracks, etc., every spring and seal up those cracks after May 15 - you do not want to trap hibernating snakes in your foundation! You will want to get rid of any old stone foundations or wells on the property.

5. General deterrents- walls can be erected to discourage snakes from enclosed areas, provided they are high enough and maintained to prevent entry through gates or by passing under the structure. Snake walls should be solid, four feet high and have a four-inch lip at the top that projects away from the area you are trying to protect. Gates must be fitted tightly, sitting against the side walls and the ground (no more than 1/8" clearance). Several products are available that claim to be snake repellents. Though fashionably marketed and high priced, there is currently NO SNAKE REPELLENT known to be effective. Be skeptical.

NOTE: Eastern massasauga rattlesnakes travel between habitats throughout their active seasons, so even if you do see one on your land, it is likely just passing through. Please allow it to peaceably do so!

X. Avoiding and treating snakebite T, P, N, L, I

A. Avoiding

1. Learn how to identify the snakes in your area (what we've been doing today).
2. When hiking, wear boots and long pants, especially near swampy and marshy areas. When hiking at night in known rattlesnake habitat, carry a flashlight.
3. Keep pets on leashes at all times. Dogs love to nose around; rattlesnakes don't appreciate it and may bite in self-defense.
4. If you hear a rattle or buzzing sound, STOP! Look, but don't move – the snake may be close to you. Slowly move away after the snake has been located. Do not pick it up or kill it.
5. Do not pick up any snake that you cannot positively identify. More snakebites are due to human carelessness than any other reason.
6. Do not reach into brush, rocks or dark places where snakes may be hiding.

7. If you come across a rattlesnake in the wild, simply give it a wide berth and continue on your way. (Rattlesnakes are unable to strike more than 2/3 of their body length which is about 2 feet at most for a massasauga).

B. Anti-venom – what it is, how it works, but first, what is venom? Venom consists of toxic proteins and digestive enzymes that kill prey and begin to break down tissue for easy digestion.
   1. Anti-venom is a serum that contains antibodies that will neutralize a snake's venom.
   2. The average venomous snakebite requires 10-15 vials of anti-venom to treat. It is usually administered 5 vials at a time in a hospital by intravenous drip.

C. Do's and Don'ts of first aid
   1. **DO NOT**:
      a. Cut the bite site
      b. Apply ice
      c. Attempt to suck the venom out with your mouth
      d. Administer alcohol or drugs
      e. Apply a tourniquet

   2. **DO**:
      a. Move away from the snake to avoid sustaining further possible bites.
      b. Remain calm.
      c. If possible, sit down and wait for help to arrive. Try to move as little as possible because venom will spread more rapidly if you walk fast or run.
      d. Remove rings, bracelets, watches, and wash and cleanse wound if possible.
      e. Go to the nearest hospital immediately. Give the doctors a detailed description of the snake if possible so that they can accurately identify it. The doctors will decide if antivenom or other treatments are needed.
      f. There have been NO recorded fatalities from massasauga bites in the State of Michigan (at least in the last 50 years or so).

   3. Bite Response Measures:
      a. Step 1: Reassure the victim and do not allow unnecessary movement. Lie flat and place bitten limb in a comfortable position at a level slightly lower than the victim's heart.
      b. Step 2: Look for the exact site of the bite (identify fang punctures).
      c. Step 3: Wrap a wide constriction band (elastic bandage-type) around the bitten limb just above the bite site with the tightness being similar to that used to wrap a sprained ankle. **Do not wrap tightly.** Leave the constriction band in place until the victim has arrived at a medical facility and anti-venom therapy has been initiated if deemed necessary.
      d. Step 4: Get to hospital as soon as possible, preferably within one hour of the bite. Call ahead, if possible, to alert them that you are coming, or call your local emergency medical facility if you need assistance. Verify that they have the appropriate anti-venom available.

D. Emergency contacts
   1. Michigan Poison Control Center – 1-800-222-1222

E. Treatment of pets, livestock bitten by snakes
    1. If a pet or livestock has been bitten by a massasauga, he/she may exhibit swelling, pain, or signs of discomfort. Watch for these signs.
    2. It is important to keep the animal calm and restrict his/her movement.
    3. If possible, splint the bitten extremity and keep the limb below heart level. DO NOT let the animal walk. DO NOT apply tourniquets, ice or suction.
    4. Take the animal IMMEDIATELY to a veterinarian or have it checked by a veterinarian. Do not delay seeking treatment. With prompt treatment, few deaths have occurred and full recovery is likely in most cases.
    5. The vet must first determine if the animal has been envenomated and the degree of envenomation. In mild cases, only painkillers may be given. In serious cases, fluids and epinephrine or corticosteroids and antihistamines may be administered to treat allergic reaction and swelling, particularly for nose and head bites because swelling can cut off nasal or tracheal passages. Antivenom is seldom administered to pets or livestock except in very serious cases because there is a good chance of recovery without it, the antivenom is very expensive ($200 a vial and up to 5 vials may be required in most cases) and risk of allergic reaction to the antivenom.

XI. Relocating or translocating massasaugas T, P, N, L, I

A. Guidelines for relocating or translocating massasaugas
    1. Relocating or moving snakes should be considered last possible option, only if absolutely necessary.
    2. Studies have found that relocating snakes outside of their home range usually result in death of the snakes. Snakes were able to survive during the active season but were unable to survive hibernation – either died in the hibernacula or shortly after emergence from hibernacula the following spring.

B. Eastern massasauga response protocol – approved by species experts and MI DNR
    1. First option is simply to leave it alone and let the snake move away on its own. This is the safest option for the person and the snake.
    2. Second option is to move it a short distance to closest natural habitat on the property away from frequently used areas and buildings.
    3. Third option is to move the snake to the closest suitable habitat within the same wetland complex without crossing any barriers (e.g., roads, parking lot, large area of unsuitable habitat) within a maximum of 800 feet (~250 m) from where it was found.
    4. If unable to release the snake to a safe place within same wetland complex without crossing any barriers within 800 feet from where the snake was found, please contact the regional volunteer snake responder network coordinator, Lori Sargent or Thomas Goniea of the MDNR, or Yu Man Lee with the Michigan Natural Features Inventory for assistance.

XII. Sharing snakes with the public I

A. Guidelines for presenting venomous reptiles to the public

1. When interpreting venomous reptiles, be sure to respect your audience's risk perceptions. Often people overestimate the risk of an uncommon but highly consequential risk (such as being bitten and dying from a rattlesnake bite). On the other hand, "experts" have a tendency to underestimate risk. It is important that balanced information be presented to your audience, to protect the resource and to protect human health and safety.

2. Most people know little about rattlesnakes or gila monsters (or other reptiles for that matter). There are many misconceptions commonly held by stakeholders. It is helpful to become acquainted with commonly held misconceptions about the animal(s) you are interpreting, and to present factual information. This information should lead to more informed decisions on the part of stakeholders regarding their associated behaviors.

3. People that attend interpretive programs do so voluntarily, and so are a self-selected audience. This indicates a sincere interest on the part of the audience in learning more about the interpretation object. This means that your audience is apt to pay attention and actually process the information that they receive in your program.

4. Preliminary results from our interviews suggest that people do not feel comfortable judging a dangerous snake from a harmless snake. It is helpful to provide easy ways for individuals in your area to recognize a potential hazard from a non-hazard. This issue can be addressed by bringing harmless snakes in addition to a rattlesnake. Each animal is described, on display in a tank during a program, and is modeled (held and brought through the audience) as information and personal vignettes regarding the animal are presented. "Easy" ways to tell a venomous snake from a non-venomous snake also are presented, and associated written materials are distributed.

5. When trying to help individuals get an elevated risk perception in line with reality, it is best to use other "natural" hazards as comparisons, rather than traffic accidents or some other "man-made" hazards. Examples that could be used include dog attacks, bee stings and associated annual death rates.

6. Venomous reptiles should not be handled when being interpreted. When presenting a program, presenters should be cognizant of non-verbal messages as well as the verbal ones. The reptile should be handled with a stick when brought out for the audience to observe. Actions and behaviors that minimize the presenter's risk as well as the snake and audience's risks should be emphasized. Prior to bringing the animal out on display, information on its natural history, status, ecosystem roles, human values, and conservation threats is presented.

7. One important aspect of these programs is to empower people to co-exist with venomous reptiles. This is accomplished by reviewing safety issues and giving a demonstration on how a snake can be safely moved (if absolutely necessary) using a broom or garden implements and a trash barrel.

8. One important aspect of interpretive programs is their ephemerality. When working with stakeholders that may be living in close proximity to venomous reptiles, it is very important to provide individuals with outreach materials that will empower them to successfully co-exist with these animals on a continual basis. Outreach materials should include handouts on avoiding and treating rattlesnake bites (including a map of the hospitals with trained personnel and anti-venom if available), living with snakes, facts about the animal of interest, how to identify a venomous snake from a non-venomous one, and a list of contacts and resources to report and get more information on massasaugas.

9. While people should not overestimate risk, people also should not underestimate risk. Recent examples of black bears and alligators attacking and killing people due to a reduced fear of humans by the animals, due to human activities such as feeding, indicate that it is essential that humans understand that wild animals do pose a potential risk. Therefore, the risk that venomous reptiles pose should be acknowledged, and actions that stakeholders can take to stay safe should be discussed. Rather than trying to get people to think of venomous reptiles in a "warm and fuzzy" fashion, an attempt should be made to instill respect and appreciation for this resource.

10. Lastly, our role as interpreters does not end with imparting information. As interpreters, we are charged with helping individuals to forge emotional connections with the resource. However, it is important to present balanced information when attempting to forge these connections. This includes sharing human values associated with venomous reptiles, such as aesthetics and utility (e.g. pharmaceuticals, ecosystem functions), as well as risks associated with co-existing with them (potential for snakebites).

XIII. Demonstration on safe removal of snakes T, P, N, L, I

A. Supplies needed: (1) long-handled broom or garden implement (e.g., rake or shovel) with handle at least 4 feet long; (2) large garbage can, pail or bucket at least 3 feet tall or deep, ideally rectangular shaped with overhanging lip along the opening, with lid; and (3) safe clothing (i.e., rubber or other boots, sneakers, long pants).

B. Lay garbage can on its side on the ground with opening facing the snake. Position the opening of the garbage can near the snake. Stand along the side of the garbage can at least 3 feet away from snake. Use broom/rake/shovel to gently but firmly "sweep," guide or herd the snake into the garbage can, being careful not to get too close. When the snake is at the bottom of the container, stand along the side or behind the opening of the garbage can and tip the garbage can up either by holding onto the top of the trash can under the overhanging lip along the top if available or using the broom to slowly lift the trash can upright. Place lid securely on the garbage can, with tape if necessary. Carefully bring the covered garbage can to where you are going to release the snake. To release snake, remove lid by lifting it toward you, keeping lid between you and the snake. Stand by or behind the bottom of the garbage can and slowly lower the garbage can on its side to the ground. The snake will leave the garbage can on its own, or you can gently slide the snake out from the bottom or use the broom to help the snake out of the trash can as long as you stay at least 3 feet from the snake. Never try to handle or tease the snake.

XIV. Question/Answer Period T, P, N, L, I

Michigan Natural Features Inventory

EASTERN MASSASAUGA RATTLESNAKE
Sistrurus catenatus catenatus

MICHIGAN STATE UNIVERSITY EXTENSION


Matthew Heumann

FACT SHEET

What is an eastern massasauga rattlesnake?

- The eastern massasauga rattlesnake is a relatively small (18.5 - 30 in), thick-bodied snake. It is gray or light brown with large, light-edged, chocolate-brown, often saddle-shaped blotches on the back and smaller dark spots along the sides of its body. It has a blunt-tipped tail with a segmented rattle at the end.
- The eastern massasauga is a member of the pit viper family of snakes, so called because of the heat sensing pits between their eyes and nostrils.
- The eastern massasauga rattlesnake is Michigan's only venomous snake.

Where are eastern massasauga rattlesnakes found in Michigan?

- Eastern massasaugas are found throughout Michigan's Lower Peninsula and on one island in northern Lake Huron.

What habitats does the eastern massasauga rattlesnake use?

- Eastern massasaugas use a variety of wetlands including fens, bogs, marshes, wet prairies, sedge meadows, swamps and forested wetlands. They also use adjacent uplands including prairies, meadows, old fields, savannas and forest openings.

How many snakes are there?

- Due to the snake's ecology, it is not possible for biologists to know exactly how many snakes there are. Populations fluctuate from periods when there are higher numbers to those of lower numbers depending on births, mortality, food sources, etc.
- A status assessment conducted from 1994-1996 compiled over 200 massasauga occurrence records from 50 counties in the state although 40-50 occurrences were considered extirpated. These occurrences ranged from observations of single, live or dead individuals to populations, and included historical and recent records. Recent surveys and reports from 2001-2004 have confirmed over 70 extant occurrences in 27 counties. However, the status and viability of most populations remain unknown.

What legal protection does the eastern massasauga rattlesnake have?

- The eastern massasauga is listed as a species of special concern in Michigan and is protected under a special Director of Natural Resources' Order. It is unlawful to kill, harm, or take an eastern massasauga from the wild in Michigan.
- The eastern massasauga also has been designated a federal candidate species. This designation means that the species warrants federal listing but has not yet gone through the listing process. Federal candidates receive no legal federal protection.

When are snakes active?

- Massasaugas generally are active from April through October. Although massasaugas can be seen or encountered anytime during their active season, they are often seen in the spring (April-May) when they spend a lot of time basking after emerging from hibernation and late summer (late July-August) when snakes are mating and gravid females are basking and having their young. Massasaugas also are seen on warm, sunny days in the fall when snakes are moving back and basking near their hibernation sites. However, encounters with massasaugas are generally infrequent due to their elusive and secretive nature and cryptic coloration.

Is this an aggressive snake?

- No. The massasauga is relatively shy and will often hide from view to avoid being detected. They generally will only strike when threatened.

What does the rattle do?

- Massasauga rattlesnakes often shake their rattle in alarm to warn others of their presence. When they rattle their tails, they are saying "I am here, don't step on me, let me get away." If they feel secure, they will not rattle but wait for danger to pass.

What is venom?

- Venom consists of toxic proteins and digestive enzymes that kill prey and begin to break down tissue for easy digestion.
- Although people can become ill if envenomated, the purpose of the venom is to kill small prey – not humans.
- It is important to note that venom is not always injected when a rattlesnake bites. An estimated 25% (possibly up to 50%) of snakebites do not result in envenomation.

What is anti-venom?

- Anti-venom is a serum that contains antibodies that will neutralize a snake's venom.
- The average venomous snakebite requires 10-15 vials of anti-venom to treat.

How often are people bitten by rattlesnakes?

- MI Poison Control reports, on average, 1 confirmed massasauga bite per year.
- Rattlesnake bites often occur as a result of people engaging in risky behavior such as attempting to capture or pick up the snake.

How can I avoid a snakebite?

- Stay on the trail or beaten path when walking in rattlesnake habitat.
- When walking in rattlesnake habitat, always wear close-toed boots or shoes and long pants. Use a flashlight at night.
- Always watch where you are putting your hands and feet. Do not reach into brush, rocks or dark places where you cannot see and where snakes may be hiding.
- If you hear a rattle or buzzing sound of a rattlesnake, stop moving and determine the snake's location. Slowly step away after the snake has been located and give the snake room to move away. Do not pick it up or kill it.
- Do not pick up massasaugas or other snakes that you cannot positively identify. This is the most common cause of snakebites.
- Do not harass, chase or threaten a snake. This is the second most common cause of snakebites and is illegal due to its protected status.
- If you come across a rattlesnake in the wild, simply give it a wide berth and continue on your way. (Rattlesnakes are unable to strike more than 2/3 of their body length which is about 2 feet at most for a massasauga.)
- Keep pets on leashes at all times. Dogs love to nose around; rattlesnakes don't appreciate it and may bite in self-defense.

What do I do if I get bitten?

- Don't panic! Not all bites result in venom being injected. About 25% of all rattlesnake bites are "dry" bites. If envenomated, within 15 minutes, most bites will develop discoloration, swelling and pain at the site of the bite.
- Move away from the snake and do not attempt to pick up, chase or threaten the snake to avoid sustaining further possible bites.
- Stay calm and reduce movement. If possible, sit down and wait for help to arrive. Try to move as little as possible because venom will spread more rapidly if you walk fast or run. The spread of venom, development of shock and other medical reactions will be slower if the person stays calm.
- Wash and cleanse the wound if possible.
- Remove any jewelry (rings, bracelets, watches) from the bitten limb in case of swelling.
- Splint the limb to reduce movement.
- Go to the nearest hospital immediately. Give the doctors a detailed description of the snake if possible so that they can accurately identify it. The doctors will decide if antivenom or other treatments are needed.
- DO NOT apply ice.
- DO NOT apply a tourniquet; DO NOT cut or apply suction to the bite area.

Snakebites are a medical emergency and should be taken seriously. Call an ambulance or emergency services to request transportation to the hospital. Remember, there is time. Although a medical emergency, a doctor may opt for one or two hours of observation before deciding on a treatment. Most individuals who are bitten are discharged from the hospital within several days and show no permanent ill effects. Bites from massasaugas are both uncommon and rarely life threatening in humans; a full recovery is the common outcome if treated appropriately and promptly. There have been NO recorded fatalities from massasauga bites in the last 40 years. In comparison, many more people are injured or die from dog bites or bee stings.

What do I do if my pet gets bitten?

- If your pet is bitten by a rattlesnake, he/she may exhibit swelling, pain, or signs of discomfort. Watch for these signs, which may occur immediately or may not be visible for up to two hours.
- It is important to keep your pet calm and restrict his/her movement.
- If possible, splint the bitten extremity, and keep the limb below heart level. DO NOT let the pet walk.
- DO NOT apply tourniquets, ice or suction to the site of the bite.
- Take your pet IMMEDIATELY to a veterinarian, by transporting it in a basket or by carrying it. DO NOT DELAY SEEKING TREATMENT. WITH IMMEDIATE TREATMENT, FEW DEATHS HAVE OCCURRED.
- Anti-venom is seldom administered to dogs except in very serious cases, mainly because there is a good chance of recovery without it and because use of anti-venom is cost-prohibitive. The veterinarian may only administer pain medication in mild cases, and fluid therapy and epinephrine or corticosteroids and antihistamines in serious cases.

Additional information on the eastern massasauga rattlesnake can be found on the Michigan Massasauga Web Site at www.msue.msu.edu/mnfi/emr.

Seeing an eastern massasauga in the wild is a unique and special experience! Enjoy this unique encounter from a safe distance and try not to disturb the snake.

Avoiding and Treating Rattlesnake Bites

Eastern massasauga rattlesnakes are shy creatures that will avoid humans whenever possible. If the snake doesn't feel threatened, it will let you pass without revealing its location. If you do get too close without realizing it, a rattlesnake will generally warn you of its presence by rattling its tail while you are still several feet away. If given room, the snake will slither away into nearby brush. Snakebite can be avoided by following basic safety precautions. ***However, snakebites can and do occur.*** This is primarily the result of careless behavior, handling of snakes, or provocation. But this can also occur when an unseen snake strikes because it feels cornered or threatened.

Due to its small size, and limited striking distance, the massasauga cannot strike very high above the ground unless it is in an elevated position on a log or boulder. The most common strikes tend to occur at the boot top level when a person steps over or on a snake. Bites may also occur to the hands, when reaching into areas where vision is obscured.

Unsafe/risky acitivities commonly associated with those few bites that do occur:

- Walking barefoot in rattlesnake country.
- Looking for firewood at night.
- Excessive consumption of alcohol in conjunction with snake handling; the linkage between alcohol consumption and the incidence of snakebite represents a proportionally high percentage of reported snakebite cases.
- Illegal collection of rattlesnakes; in the United States, 50% of snakebites are associated with illegal collecting!

What to do if you or someone with you gets bit:

- Remain calm. Move away from the snake to avoid sustaining further possible bites.
- If possible, sit down and wait for help to arrive. Try to move as little as possible because venom spreads more rapidly if you walk fast or run.
- Remove rings, watches, bracelets.
- Go to the nearest hospital immediately. Doctors will decide if antivenom or other treatments are needed.
- DO NOT cut or use ice on the wounds.
- DO NOT place a tight-fitting tourniquet around the affected arm or leg.
- Remember that there have been no recorded fatalities in Michigan from massasauga bites in over 50 years.

For more information about snakebite contact:

Michigan Poison Control Center	(800) 222-1222
Detroit Zoo- Jeff Jundt	(248) 541-5717 X3159

Eight Essential Snake Safety Tips!!

1. Learn to identify Michigan snakes. Distinguish rattlesnakes from other snakes which may resemble them. Children can also be taught to identify the massasauga.

2. Wear protective footwear when walking in snake country, especially at night. It is advisable to wear ankle high hiking boots or rubber boots, thick socks and long pants – especially when hiking in open rocky areas or where vision may be obscured.

3. DO NOT pick up snakes or other wild animals. This is the most common cause of bites!

4. DO NOT harass, chase or threaten a snake. This is the second most common cause of bites. Most importantly, never kill a rattlesnake – it's unnecessary, dangerous and AGAINST THE LAW.

5. Always watch where you are putting your feet and hands. Poke around with a stick before reaching into brush, under rocks, or into dark places where snakes may be hiding.

6. If you hear a rattlesnake, STAY CALM! Stop walking and determine the snake's location, slowly move away from the snake and give it room to slither away. Never make sudden moves. A fast motion can easily be mis-interpreted by the snake as a threat.

7. Keep pets on leashes; curious pets at large are more often the victims of snakebite than people are. If you suspect that your pet has been bitten, you should take it immediately to the veterinarian.

8. If you come across a snake, the best advice is to simply leave it alone!

Eastern Massasauga Rattlesnake Contacts and Resources

Contacts for general information:

Yu Man Lee
Associate Program Leader - Zoology
Michigan Natural Features Inventory
Michigan State University Extension
P.O. Box 30444
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(517) 373-3751
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Rebecca Christoffel
Assistant Professor / Extension Wildlife Specialist
NREM Dept., Iowa State University
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Curator of Reptiles
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(248) 541-5717 X 3159
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Lori Sargent
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John Ball Zoo
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Professor and Chair, Department of Biology
Indiana-Purdue University Ft. Wayne
2101 E. Coliseum Blvd.
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Thomas Goniea
Fisheries Division
Michigan Department of Natural Resources
Lansing, Michigan 48909
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(517) 373-7341
gonieat@michigan.gov

Chris Gertiser
Lisa Duke
Binder Park Zoo
7400 Division Drive
Battle Creek, Michigan 49014
(269) 979 - 1351
Chris - gertise1@msu.edu
Lisa - lisa.l.duke@gmail.com

For more information about snake bites:

Poison Control Center
1-800-222-1222

01/12/2010

Websites

Michigan Natural Features Inventory Eastern Massasauga Website
http://www.msue.msu.edu/mnfi/emr

Michigan Department of Natural Resources Eastern Massasauga Web Page and Observation Form
http://www.michigan.gov/dnr/ (under Wildlife & Habitat; Wildlife Species; Amphibians & Reptiles; Snakes; Eastern Massasauga)
http://www.dnr.state.mi.us/wildlife/pubs/massasauga_obsreport.asp

Michigan Society of Herpetologists
http://www.michherp.org/massasauga.html

The Center for Reptile and Amphibian Conservation and Management
http://herpcenter.ipfw.edu/index.htm?http://herpcenter.ipfw.edu/outreach/MWsnakes.htm&2

U. S. Fish and Wildlife Service Region 3
http://midwest.fws.gov/Endangered/lists/candidat.html

NatureServe Explorer
http://www.natureserve.org/explorer/

Ontario Eastern Massasauga Recovery Team
http://www.massasauga.ca/

Ojibway Nature Center
http://www.ojibway.ca/rattler.htm

Environment Canada Species at Risk
http://www.speciesatrisk.gc.ca/search/speciesDetails_e.cfm?SpeciesID=277

Publications

Amphibians and Reptiles of the Great Lakes Region. 1996. Harding, J.H. University of Michigan Press.

Michigan Snakes. 1999. Holman, J.A. and J.H. Harding. Michigan State University Extension, Extension Bulletin E-2000.

International Symposium and Workshop on the Conservation of the Eastern Massasauga Rattlesnake *Sistrurus catenatus catenatus.* 1993. Johnson, B. and V. Menzies, eds. Toronto Zoo.

Second International Symposium and Workshop on the Conservation of the Eastern Massasauga Rattlesnake, *Sistrurus catenatus catenatus:* population and habitat management issues in urban, bog, prairie and forested ecosystems. 1998. Johnson, B. and M. Wright, editors. Toronto Zoo.

The Eastern Massasauga Rattlesnake: a Handbook for Land Managers. 2000. Johnson, G., B. Kingsbury, R. King, C. Parent, R. Seigel and J. Szymanski. U.S. Fish and Wildlife Service, Fort Snelling, MN.

Status Assessment for Eastern Massasauga (*Sistrurus catenatus catenatus)*. 1998. Szymanski, J. U.S. Fish and Wildlife Service, Fort Snelling, MN.

Eastern Massasauga Response Protocol

Protocol for Volunteer Coordinators/Dispatchers:

1) Please get the following information from the person reporting a potential rattlesnake:
    - Name
    - Phone number
    - Location/Address
    - Date and time of call

2) Assess likelihood of person having a potential rattlesnake based on description and habitat

3) Determine if a volunteer snake responder needs to be contacted and if an on-site visit is needed
    - High likelihood snake is a massasauga and landowner needs on-site confirmation and consultation, is adamant about having snake removed and/or threatens to kill the snake

4) What to tell the caller:
    Stay away from the snake – keep pets and kids away from the snake
    Let others on the property know so they won't accidentally get too close
    Leave the snake alone – don't throw anything at the snake, don't try to catch it or harass it
    Watch it from a distance (i.e., 3+ feet away)
    Wait for a responder to call and/or come to the site

5) Contact the appropriate snake responder and provide caller and snake information

6) Follow up with snake responder after on-site visit to get update and results of visit

7) Collect massasauga observation and relocation data sheet and attached photos if available. Compile and send copies of data sheets and summary of snake calls responded to either on the phone or with volunteer on-site visit to Yu Man Lee at MNFI (see address in protocol later).

Volunteer Coordinators:

SE Michigan
Jeff Jundt
Curator of Reptiles
Detroit Zoological Society
8450 West Ten Mile Rd.
P.O. Box 39
Royal Oak, MI 48068-0039
Phone: 248-541-5717 ext. 3159
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SW Michigan
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Lisa Duke
Binder Park Zoo
7400 Division Drive
Battle Creek, MI 49014
Phone: 269-979-1351
Fax: 269-979-8834
E-mail: Chris – cgertiser@binderparkzoo.org
E-mail: Lisa - lisa.l.duke@gmail.com

Eastern Massasauga Response Protocol

Protocol for Person Responding to a Snake Call:

1) Try to determine if the snake is truly an Eastern Massasauga. Have the person describe it first, then follow up with questions to help determine the species.

People commonly mistake "look alike" snakes such as the Eastern Milk Snake, Eastern Hognose Snake, Eastern Fox Snake and Northern Water Snake for the Eastern Massasauga in Michigan. Key identifying characteristics for the massasauga and look-alike snakes are as follows:

Eastern Massasauga

- segmented rattle at end of tail/blunt-tipped tail
- triangular or diamond-shaped head distinctively broader than narrow neck
- tan, brown or gray body with dark-brown, saddle-, figure 8-, or bowtie shaped blotches outlined in white along top of body; smaller spots along the sides
- belly blackish/not patterned
- thick body
- adult - 18.5-30 inches average
- pupils vertical/elliptical (like cats)
- deep facial pits between eyes and nostrils
- dark stripe from eye along side of face
- alternating dark- and light-brown rings along tail before the rattle ("coon tail")

Eastern Hognose Snake

- no rattle at end of tail/pointed tail
- flat head with upturned snout
- when threatened, will spread neck to display two prominent black "eyespots" on neck and hisses; also may turn over and play dead
- yellowish, reddish, brown, black or olive body with dark brown or black blotches
- thick body
- adult - 20-33 inches average

Eastern Milk Snake

- no rattle at end of tail/slender, pointed tail
- light gray or tan body with brown or reddish-brown blotches outlined in black
- often Y- or V-shaped light marking on top of the neck and head
- belly white with black checkerboard pattern
- slender body
- adult - 24-36 inches average
- will shake tail to mimic sound of rattle

Eastern Fox Snake

- no rattle at end of tail/slender, pointed tail
- yellowish to light brown body with black or dark brown blotches
- head reddish or orangish, not patterned
- belly yellowish with black checkerboard pattern
- slender body
- adult - 36-60 inches average
- will shake tail to mimic sound of rattle
- only occurs in SE MI

Northern Water Snake

- no rattle at end of tail/slender, pointed tail
- light brown body with dark brown or black blotches; older individuals may appear uniformly black
- belly cream with irregular rows of reddish, orangish or blackish half moon crescents
- usually found in or near water
- slender body
- adult - 24-42 inches average

2) Try to encourage the landowner to simply leave the snake alone and let the snake move away on its own. This is the safest option for the person as well as the snake. Don't move the massasauga unless absolutely necessary. Try to reassure the landowner about the nature of snakes and the unlikelihood of being bitten if the animal is left alone, regardless of what kind of snake it is.

Generally, massasaugas are very cryptic and secretive and often go unnoticed. Landowners may never or rarely see a massasauga even if the snakes occur on their property or nearby. When a snake is encountered, it may be using the area for basking or may only be passing through to reach a preferred area for hibernation or foraging. Massasaugas are animals of habit; interruptions to their daily routine or habitat use may have a negative, potentially fatal effect.

Also, snakes are creatures loyal to their landscapes. If you move a snake out of its home range to a distant and unfamiliar area, it may die. A massasauga might be taken by a predator if unable to find a place to hide in its new area, may starve if unable to locate prey, or could freeze to death if unable to find a suitable overwintering site or hibernaculum.

For these reasons, the best option is to give the snake a wide berth and leave it alone. The massasauga is generally a secretive, docile snake that strikes humans only when it feels threatened or cornered or if handled. A massasauga will rely on its camouflage coloration to hide or will try to escape rather than strike a person. If left alone, the snake will likely continue on within a few hours or a day or two and will probably not be seen again. In some cases, a property may provide preferred habitat for basking, gestation or foraging. As a result, snakes may occasionally or regularly be seen on the property. Again, the best option is to leave the snakes alone, and the snakes will go on with their daily activities and depart on their own. You may want to refer the landowner to information in the "Living with Snakes" brochure.

3) If the snake is in an area of the property that is frequently used (e.g., driveway, front lawn, porch, etc.) and/or if the landowner is not willing to let the snake leave on its own and has to have the snake moved, then see if the landowner is open to having the snake moved a short distance or absolute minimum distance to the closest natural habitat on the property and away from heavily used areas and any buildings.

The snake should be moved to a safe place away from roads and other threats. There should be no barriers (i.e., roads, parking lot, or large area of unsuitable habitat) between where it was found and where it is being relocated. Landowners in Ontario who had massasaugas moved a short distance to another part of their property reported not seeing massasaugas on their property again.

4) If the landowner is not responsive to leaving the snake alone and does not want to have the snake relocated a short distance to the closest natural habitat on their property, then try to move the snake to the closest suitable habitat within the same wetland complex without crossing any barriers within a maximum of 800 feet (~0.15 mi or 250 m) from where it was found.

The snake should be moved to a safe place away from roads and other threats. There should be no barriers (i.e., roads, parking lot, or large area of unsuitable habitat) between where it was found and where it is being relocated.

5) **If you are unable to relocate the snake to a safe place within the same wetland complex without crossing any barriers within 800 feet from where the snake was found, please contact the volunteer coordinator or one of the other individuals listed below for assistance in determining the appropriate course of action.**

In some cases, a snake may be moved greater than 800 feet from where it was found (e.g., may be able to move snake further such as up to ~1,600 feet/500 meters as long as a suitable location is available within the same wetland complex and there are no barriers between where the snake is relocated and where it was found). If the snake can not be relocated in suitable habitat within the same wetland complex with no barriers within an acceptable distance from where the snake was found, the snake may need to be removed from the wild. Please note that both these options, particularly removal from the wild, are considered last resorts to keep the animal from being killed. The decision to pursue either of these two options should only be made in consultation with the individuals listed below. The DNR Fisheries Division should be consulted when removal of the snake from the wild is being considered. Snakes cannot be removed from the wild without explicit approval from the DNR.

Lori Sargent
Michigan Department of Natural Resources
Wildlife Division, Natural Heritage Program
(517) 373-9418
sargentl@michigan.gov

Thomas (Tom) Goniea
Michigan Department of Natural Resources
Fisheries Division
(517) 373-7341
gonieat@michigan.gov

Yu Man Lee
Conservation Scientist – Zoology
Michigan Natural Features Inventory
Michigan State University Extension
(517) 373-3751
leey@michigan.gov

Dr. Bruce Kingsbury
Department of Biology Chair
Indiana-Purdue University at Ft. Wayne
(260) 481-5755
kingsbur@ipfw.edu

6) **For volunteer snake responders conducting site visits, please fill out a massasauga observation and relocation data sheet with the landowner's assistance. Please take a photo of the snake and habitat, if possible, and please submit photos with the observation form. Please keep track of the dates and number of visits and hours spent responding to snake calls using the volunteer activity log. Please send observation and relocation data forms and volunteer activity logs to the regional volunteer coordinator or to Michigan Natural Features Inventory, P.O. Box 30444, Lansing, MI 48909-7944, Attn: Yu Man Lee.**

(Parts of this protocol were adapted from the Canadian Eastern Massasauga Rattlesnake Stewardship Guide and Minnesota's Timber Rattlesnake Protocol.)

Appendix 9. Subset of Eastern Massasauga education and outreach materials developed during previous project in southeast Michigan in 2003-2005 that were used for this project in southwest Michigan. These include the following:

- Eastern Massasauga "Born to be Wild" poster
- "Living with Snakes" brochure/guide for landowners for managing snakes on property
- MNFI species abstract on Eastern Massasauga
- USFWS "Live and Let Live" brochure
- "Snakes of Michigan Identifier" handout
- "Conservation through Education" sticker
- "Communicating with the Public" informational handout

BORN TO BE WILD!

PHOTO BY JOSEPH SAGE

PLEASE BRAKE FOR SNAKES

WHAT TO DO IF YOU SEE A RATTLESNAKE

If you see or hear a rattlesnake in the wild, move away from it. It will lie motionless and then try to escape if given the chance.

Please report all massasauga sightings to the Michigan DNR.

EASTERN MASSASAUGA RATTLESNAKE

An eastern massasauga rattlesnake may be recognized by its blunt tail and rattle, wide, triangular head, and thick body. Up close, you may notice the vertical pupils and heat-sensitive pits on either side of the head, between the eye and nostril. Adults average 2-3 feet in length.

Massasaugas survive the winter by hibernating below the frost line. More importantly, they return to the same hibernation spot each winter. Without their winter shelter, these animals will surely perish. For these reasons, rattlesnakes should not be relocated greater than 250 meters or 800 feet from where they are found.

LEARN HOW TO RECOGNIZE THESE SNAKES IN THEIR NATURAL SETTINGS

Other Michigan snakes such as milk snakes and fox snakes will imitate the massasauga by vibrating their tails on the ground. In addition to these two, northern water snakes and eastern hognose snakes have blotches somewhat similar to those of the massasauga. These mimics have neither rattles nor venom.

Eastern milk snake: slender oval head, round pupils, slender body.

Eastern fox snake: slender oval head, round pupils, long slender body.

PHOTO BY KIM HARDING

Eastern hognose snake: flat head, upturned snout, round pupils, heavy body.

Northern water snake: slender body, oval pupils.

For more information, contact:

- Michigan Dept. of Natural Resources, Wildlife Division (517) 373-1263 www.michigan.gov/dnrwildlife
- Michigan Natural Features Inventory (517) 373-1552 http://web4.msue.msu.edu/mnfi/
- Detroit Zoological Institute (248) 398-0903 x3159 www.detroitzoo.org
- Toronto Zoo (CANADA) (416) 392-5968 www.torontozoo.com
- Ojibway Nature Centre (CANADA) (519) 966-5852

LIVING WITH WILDLIFE

Yes, people and rattlesnakes can coexist peacefully. Here are some tips:

- Familiarize yourself with your local wildlife, and learn to identify local snake species.
- If you find a snake, don't attempt to kill it. Leave it alone, and it will eventually go away.

To discourage snakes,

- Keep your lawn mowed short. Snakes prefer longer grass in which to hide.
- Do not keep brush or wood piles near your house. Mice congregate here, which attracts snakes.

To encourage them,

- Maintain existing wetlands and adjacent uplands, and keep the natural vegetation.

In case of venomous snakebite, contact: Poison Control 1-800-222-1222

LEARNING ABOUT WILDLIFE

It's everyone's job to learn about the animals in their area. Conservation and the protection of wildlife is for everyone!

- Buy a field guide so you can accurately identify Michigan wildlife.
- Visit your local Nature Center or Zoo. Many have naturalists on hand to answer your questions.
- For educational resources, contact the organizations listed to the left.

You can also get information from the following local contact:

Funding provided by U.S Environmental Protection Agency

Michigan Natural Features Inventory

General Deterrents

Walls can be erected to discourage snakes from enclosed areas, provided they are high enough and maintained to prevent entry through gates or by passing under the structure. Snake walls should be solid, four feet high and have a four-inch lip at the top that projects away from the area you are trying to protect.

Gates must be fitted tightly, sitting tightly against the side walls and the ground (no more than 1/8" clearance). Please keep in mind that there is no 100% snake proof fence. However, this design will keep most snakes out of the area.

Several products that claim to be snake repellents are on the market. Though fashionably marketed and high-priced, there is currently NO SNAKE REPELLENT known to be effective. Be skeptical.

About Snakes

Michigan is home to 18 kinds of snakes. Only one is venomous, the eastern massasauga rattlesnake, also known as the swamp rattler. Michigan is the last stronghold for this species, an important piece of our natural heritage.

How to distinguish the massasauga from Michigan's non-venomous snakes

- the massasauga's tail does not come to a point like other Michigan snakes, but instead terminates with one or more rattle segments
- the massasauga has vertical eye pupils rather than round as in Michigan's other snakes
- the massasauga has a set of heat pits located between its nostril and eye on each side of its face. No other Michigan snake has pits.

Snakes, like all other wildlife, are extremely valuable in nature as predator and prey, consuming rodents, amphibians and insects, and providing food for a variety of birds and mammals.

Fear of snakes has often led to snake deaths. By following the guidance in this brochure, you and snakes can co-exist. You can be a powerful force in helping conserve this important part of Michigan's natural heritage.

Living With Snakes

A guide to help you manage snakes around your property

This brochure is designed to provide landowners and tenants with guidance to help manage snakes around their properties. There are practical steps that can be taken to discourage or encourage snakes on your property, depending on what you desire.

Thanks to Bob Hay for permission to modify WI DNR PUB-ER-084 98 for use in MI.

Snakes are drawn to homesites to seek:

1. **Food (*primarily rodents)***
2. **Shelter *(hiding and resting places for snakes and their prey*)**
3. **Hibernating sites *(foundations, cisterns, dug wells)***

The primary way to minimize having snakes around the home is to eliminate these three necessities, and the primary way to manage your property to encourage snakes is to provide and maximize these.

Food

Rodents are the primary food sources that attract snakes into yards. Rodents are attracted by food and shelter. Bird feeders close to the house supply a ready seed source for mice, chipmunks, and ground squirrels, especially if they are kept stocked during the warmer months. Moving bird feeders away from buildings and not feeding during the late spring and summer (when birds have plenty of natural foods available) can deter rodents from yards.

For snakes that feed on frogs, like garter snakes, yard ponds may attract snakes because frogs use the ponds to feed and breed.

Generally speaking, if you provide a ready food supply, wildlife has a way of finding it.

Shelter

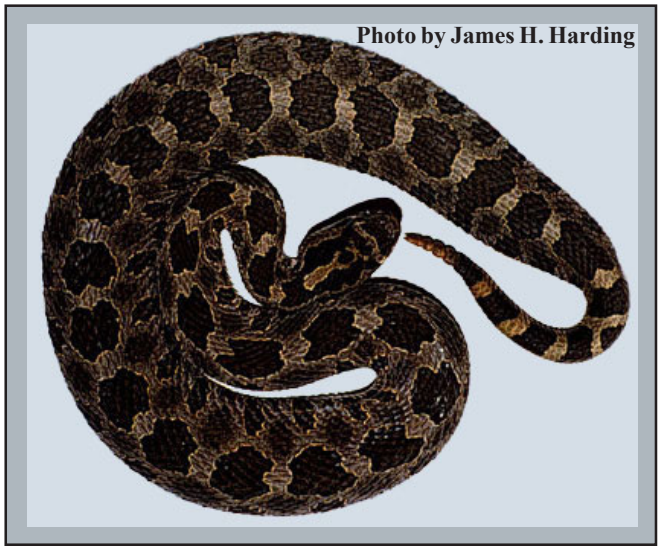
All wildlife require shelter from the elements. Most rural landowners are well aware of mice in and around their homes, particularly in the winter. Rodents are attracted to the home for shelter and available food in and around it. Rodents not only supply food for snakes, but they may create, by chewing, access points for snakes into homes. Snakes may initially be attracted to your yard and home by the scent of rodents. A key to keeping snakes away is to eliminate rodents in house and yard. This is not easy task! It requires that yard landscaping be simplified to eliminate shelter in close proximity to building foundations: removing dense bushes and flower gardens (keeping them out in the open lawn as opposed to up against the house), keeping firewood well away from buildings or indoors, and keeping clutter to an absolute minimum. Rock retaining walls and rock structure used in landscaping offer ready homes for rodents and snakes. Snap trapping and the filling of rodent burrows may also reduce rodent numbers. In addition, mowing must be kept up, and junk piles eliminated or at least moved a good distance from your buildings. Keeping garage doors closed tightly and/or clutter free, particularly on the garage floor, can also reduce rodent numbers significantly.

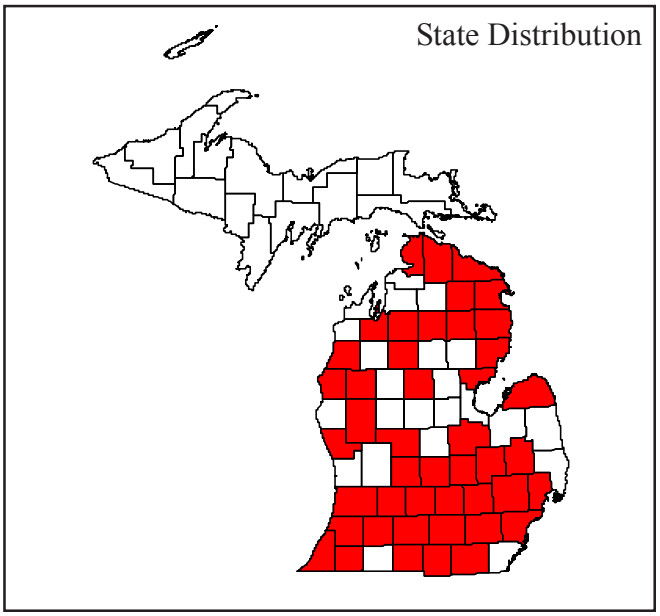
On the other hand, if you wish to encourage snakes on your property, you would want to encourage rodents, and provide shelter for both them and snakes. You might want to set aside an area of your property specifically managed for snakes and rodents, with a lot of structure (no need to mow!!) and with a multitude of shelter objects such as downed logs, rock walls, and brush piles. When choosing this area, be sure that you are not placing your house in the path of snake migration from an overwintering area to a summer foraging area.

Hibernation

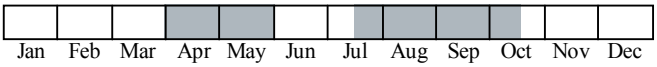
Snakes are drawn to homes as hibernating sites when there is access to a basement, crawl space or cistern, through cracks in rock foundations. Hibernating sites are likely found by snakes when seeking food or shelter. Maintaining the mortar in old foundations will usually eliminate the “hibernacula.” In some cases, rodent-chewed holes or rotting outer floor joists will allow entry between the house ring and the foundation which creates an opening for snakes. Patching these holes will eliminate entry. Periodic inspections of the foundation and house ring can help prevent problems in the future. We advise not doing mortar patching until after mid-May, which allows time for the snakes to naturally disperse from their hibernating site after emerging in spring. If you close up the openings earlier in the year, you risk trapping the snakes in your home.

Sistrurus catenatus catenatus Rafinesque — eastern massasauga





Best Survey Period



Status: Federal candidate species, State special concern

Global and state rank: G3G4T3T4/S3S4

Family: Viperidae (pit vipers and vipers)

Range: The eastern massasauga occurs from southeastern Minnesota, eastern Iowa, and northeastern Missouri east to southern Ontario, western New York, and northwestern Pennsylvania (Harding 1997). This species was once common across its range, but has declined drastically since the mid-1970s (Szymanski 1998). Massasaugas now mainly occur in disjunct, isolated populations, and have been afforded some level of legal protection in every state or province in which this subspecies occurs (Szymanski 1998).

State distribution: Michigan appears to be the last U.S. stronghold for this species relative to other states within its range. Historically, eastern massasaugas were found throughout the Lower Peninsula and on Bois Blanc Island. Within the last decade, eastern massasaugas have been reported from about 150 sites in 50 counties. These sightings appear to cluster in several regions across the Lower Peninsula, indicating areas where massasaugas may be concentrated (Legge and Rabe 1994). These include Oakland, Livingston, Jackson and Washtenaw counties in southeast Michigan, Allegan, Barry and Kalamazoo counties in southwest Michigan, and Iosco, Crawford and Kalkaska counties in northern Michigan. Nearly one-third of the historical occurrences in the state has not been reconfirmed in the past ten years (Legge 1996). Massasaugas have not been reported from Branch, Ingham, Shiawassee, Macomb, Huron, Clare, Oscoda, Montmorency and Emmet counties since prior to 1980 (some since the early 1900's) (Legge and Rabe 1994, Legge 1996). It is important to note, however, that a statewide, systematic field survey for this species has not been conducted. Also, massasaugas are highly cryptic and difficult to observe in its natural habitat. Therefore, massasaugas may still be present in areas that lack recent, as well as historical, records.

Recognition: Several characteristics readily identify this species from all other snakes in Michigan. The massasauga is a medium-sized (18.5 to 39.5 inches in length), thick-bodied snake (Harding 1997). It has a distinctive color pattern of **dark brown rectangular blotches** down the back with two or three additional rows of **dark spots along the sides**, and **alternating dark and light bands along the tail**. The **background color is gray, gray-brown or brown**. The belly or underside of the snake is usually black with gray, white or yellowish mottling (Harding 1997). The massasauga is a rattlesnake, and therefore has a **segmented rattle** at the end of its tail. It also has a **triangular-shaped head** (i.e., widens at the back of the head and narrows at the neck), **vertical slit-shaped pupils**, and **large, heat-sensing pits or openings** between the nostrils and the eyes. The scales are keeled (i.e., have a raised ridge), and the anal plate (i.e., enlarged scale partly covering the anal opening) is divided into two parts. It is the only **venomous** snake found in the state. Newborn massasaugas range

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in length from 7 to 10 inches and look similar to adults except are lighter in color (Harding 1997). They have only a single button at the end of their tails, and are unable to produce the sound of a rattle.

Several snakes in Michigan are frequently mistaken for eastern massasaugas. These include the eastern fox snake (*Elaphe vulpina gloydi*, State threatened), northern water snake (*Nerodia sipedon*), eastern milk snake (*Lampropeltis triangulum triangulum*), and eastern hog-nosed snake (*Heterodon platirhinos*). Although these snakes have a similar pattern of dark blotches on the back, these snakes usually have a lighter background color. They also lack the rattle, head shape, and pupil shape of the massasauga. Eastern fox snakes generally have a more slender and longer body than the massasauga (total adult lengths of 35 – 67 inches) (Harding 1997). The eastern hog-nosed snake has an upturned snout and is able to flatten and spread its neck out when threatened. Also, several of these snakes often will mimic the eastern massasauga and vibrate their tails rhythmically when threatened. If the snake is located in dry leaf litter, it can produce a buzzing sound similar to the massasauga's rattle.

Best survey time: Massasaugas typically are active between April and late October (Seigel 1986), and can be seen anytime during the active period. However, the best times to survey for this species are during spring emergence (i.e., April and May) for all age classes and during the basking and birthing period in mid- to late summer (i.e., late July, August and early September) for gravid females (Szymanski 1998, Casper et al. *in prep.*). Massasaugas are presumed to be most active during these time periods. Another survey window for this species is during fall ingress (i.e., mid-September through October) when snakes are moving to hibernacula (Seigel 1986, Johnson 1995, Szymanski 1998).

The recommended survey method currently is visual searches (Casper et al**.** *in prep*.). Optimal weather conditions for visual surveys include greater than 50% cloud cover, less than 15 mph wind speed, and air temperatures between 50 and 80° F (Casper et al. *in prep.*). Casper et al. (*in prep*.) recommend morning and evening surveys. However, although daily activity cycles vary among populations, Seigel (1986) found that during the spring and fall, massasaugas tend to be most active during the warmest parts of the day (e.g., 1200 – 1600 h). During the summer, they tend to be more active in late afternoon during cooler temperatures and may even become nocturnal.

Habitat: Eastern massasaugas have been found in a variety of wetland habitats, including bogs, fens, shrub swamps, wet meadows, marshes, moist grasslands, wet prairies, and floodplain forests (Hallock 1990, Harding 1997). Populations in southern Michigan are typically associated with open wetlands, particularly prairie fens, while those in northern Michigan are better known from lowland coniferous forests, such as cedar swamps (Legge and Rabe 1996). Massasaugas also generally occupy wetland habitats in the spring, fall, and winter, but in the summer, snakes migrate to drier, upland sites, ranging from forest openings to old fields, agricultural lands and prairies. In general, structural characteristics of a site appear to be more important than vegetative characteristics for determining habitat suitability (Beltz 1992). Specifically, all known sites appear to be characterized by the following: (1) open, sunny areas intermixed with shaded areas, presumably for thermoregulation; (2) presence of the water table near the surface for hibernation; and (3) variable elevations between adjoining lowland and upland habitats (Beltz 1992).

Ecology: Massasaugas usually are active between April and late October. Spring emergence typically starts in late March and early April as groundwater levels rise and ground temperature approaches air temperature (Harding 1997, Szymanski 1998). Massasaugas spend most of the time in the spring basking on elevated sites such as sedge and grass hummocks, muskrat and beaver lodges, or dikes and other embankments. Individuals may spend up to several weeks in the wetlands near their hibernation sites before moving to their summer habitats (Johnson 1995). This seasonal shift in habitat use appears to vary regionally and among populations (Szymanski 1998). In Wisconsin, King (1997) documented only gravid females dispersing to the drier uplands to have their young, while the males and non-gravid females remained in the wetlands.

Mating occurs in the spring, summer and fall (Reinert 1981, Vogt 1981, Harding 1997). The females give birth to litters of 5 to 20 live young in August or early September in mammal burrows or fallen logs in the uplands (Vogt 1981, Harding 1997). Female massasaugas reach sexual maturity at three or four years of age, after which they have been reported to reproduce both annually and biennially in different parts of their range (Reinert 1981, Seigel 1986, Harding 1997).

Massasaugas usually hibernate in the wetlands in crayfish or small mammal burrows. They also have been known to hibernate in tree roots and rock crevices as well as submerged trash, barn floors, and basements (Johnson and Menzies 1993). Hibernation sites are located below the frost line, often close to groundwater level. The presence of water that does not freeze is critical to hibernaculum suitability (Johnson 1995). Individuals tend to return to the same hibernation site each year (Prior 1991) and tend to hibernate singly or in small groups of two or three (Johnson and Menzies 1993).

Massasauga home ranges and movement distances can be quite variable. King (1997) reported mean home ranges of approximately 5 to 7 acres for neonates and gravid females, 17 acres for non-gravid females and 398 acres for males. Other studies have reported mean home ranges of less than 2.5 acres (Reinert and Kodrich 1982) to 64 acres (Johnson 1995). Reported maximum movements range from 0.1 mile in Michigan (Hallock 1990) to 2 miles in Wisconsin (King 1997). King (1997) recorded average movement distances of 0.03 mile for neonates, 0.2 mile for non-gravid females, 0.4 mile for gravid females, and 0.8 mile for males.

Massasaugas feed primarily on small mammals such as voles, moles, jumping mice, and shrews. They also will consume other snake species and occasionally birds and frogs. Natural predators for the massasauga, particularly the eggs and young, include hawks, skunks, raccoons, and foxes (Vogt 1981).

When they are threatened, eastern massasaugas will typically remain motionless, relying on their cryptic coloration to blend into their surroundings. They sound their rattle when alarmed but will occasionally strike without rattling when surprised. This species is generally considered unaggressive; it is unusual for the species to strike unless it is directly disturbed (Johnson and Menzies 1993). Although the venom is highly toxic, fatalities are very uncommon because the species' short fangs can inject only a small volume (Klauber 1972). Small children and people in poor health are thought to be at greatest risk.

Conservation/management: The greatest threats to eastern massasauga populations are habitat loss and degradation due to human activities, including the draining of wetlands for agriculture, residential development, roads and pollution (Szymanski 1998). In addition to the loss of wetlands, essential upland habitat has been destroyed and fragmented. Vegetative succession also has reduced habitat availability (Beltz 1992, Johnson 1995). Current land use practices, hydrological changes and fire suppression have altered or eliminated the natural disturbance regimes necessary for maintaining the early successional structure with which massasaugas are associated (Szymanski 1998). Vehicle-caused mortality and injury also pose a significant threat to populations as suitable habitat becomes fragmented by roads (Szymanski 1998).

Overcollection for commercial, recreational, scientific, or educational purposes has greatly reduced massasauga numbers at many sites, particularly collection for the pet trade and bounty hunting in states other than Michigan (Szymanski 1998). The lack of uniform protection for the massasauga across its range can create loopholes for illegal take and trade (Szymanski 1998), and lead to increased collecting pressure in states where take is not prohibited. Indiscriminant persecution by humans also has contributed to this species' decline. In Michigan, the eastern massasauga is protected under the Director's Order No. DFI-166.98, Regulations on the Take of Reptiles and Amphibians, which is administered by the Michigan Department of Natural Resources' Fisheries Bureau. It is unlawful to take an eastern massasauga from the wild except as authorized under a permit from the Director (legislated by Act 165 of the Public Acts of 1929, as amended, Sec.302.1c (1) and 302.1c (2) of the Michigan Compiled Laws). Public land managers and the general public should be informed that this species is protected and should not be collected or harmed. Any suspected illegal collection of eastern massasaugas should be reported to local authorities, conservation officers or wildlife biologists. The eastern massasauga also was listed as a federal candidate species by the U.S. Fish and Wildlife Service in 1999, and may be proposed for listing as threatened or endangered under the Endangered Species Act in the future.

Habitat protection of suitable wetlands and associated uplands is crucial for successful conservation of the eastern massasauga. Where populations are concentrated on public lands, land management practices need to be sensitive to protecting massasauga habitat. For instance, potential adverse impacts of land management practices such as timber harvesting, mowing, or prescribed burning can be avoided or minimized if these activities are conducted in late fall, winter, or early spring (i.e., November through early March) when the snakes are hibernating. Hydrological alterations such as winter drawdowns should be conducted prior to the initiation of hibernation to reduce the potential for causing winter mortality due to desiccation or freezing (Szymanski 1998). Viable massasauga populations in the state should be identified and targeted for long-term conservation and management efforts. Finally, people need to be educated about the biology and ecology of the eastern massasauga in order to reduce direct harassment and harm to individual snakes. This is especially important in areas where human-massasauga interactions are frequent (e.g. state and local parks).

Research needs: Currently, the greatest obstacle to effective conservation and management of the eastern massasauga in Michigan is incomplete knowledge of the distribution and abundance of the species. While recent sightings have been summarized (Legge and Rabe 1994), additional and systematic field surveys are needed. Additional work is needed to obtain long-term data on selected populations to identify healthy or viable massasauga populations. A reliable and efficient protocol or methodology for surveying and monitoring this species and estimating population size needs to be developed. Continued research is needed to improve our understanding of the specific biology

and ecology of Michigan massasaugas as well as potential impacts of various management practices. The genetic diversity of extant populations needs to be examined. Effective methods to educate the public about how to co-exist with massasaugas also need to be researched and implemented.

Related abstracts: prairie fen, rich conifer swamp, Mitchell's satyr butterfly, spotted turtle, Blanchard's cricket frog, eastern fox snake, wood turtle, Blanding's turtle, small white lady's-slipper, mat muhly, prairie dropseed, prairie Indian-plantain, red-legged spittlebug.

Selected references

Beltz, E. 1992. Final report on the status and distribution of the eastern massasauga, *Sistrurus catenatus catenatus* (Rafinesque 1818), in Illinois. Unpub. report to the Ill. Dept. of Conservation, Div. Natural Heritage, Springfield, IL. 36 pp.

Casper, G.S., T.G. Anton, R.W. Hay, A.T. Holycross, R.S. King, B.A. Kingsbury, D. Mauger, C. Parent, C.A. Phillips, A. Resetar, and R.A. Seigel. In prep. Recommended standard survey protocol for the eastern massasauga, *Sistrurus catenatus catenatus*. Draft sub. to Herp Review, February 2000. 10 pp.

Hallock, L.A. 1990. Habitat utilization, diet and behavior of the eastern massasauga (*S. c. catenatus*) in southern Michigan. Master's Thesis. Mich. State Univ., E. Lansing, MI. 31 pp.

Harding, J.H. 1997. Amphibians and Reptiles of the Great Lakes Region. Univ. of Mich. Press, Ann Arbor, MI. 378 pp.

Johnson, B. and V. Menzies, eds. 1993. Proceedings of the International Symposium and Workshop on the Conservation of the Eastern Massasauga Rattlesnake *Sistrurus catenatus catenatus*, May 8-9, 1992. Metro Toronto Zoo, Ontario, Canada. 136 pp.

Johnson, G. 1995. Spatial ecology, habitat preference, and habitat management of the eastern massasauga, *Sistrurus c. catenatus*, in a New York weakly-minerotrophic peatland. Dissertation. SUNY, College of Environ. Science and Forestry, Syracuse, NY. 222 pp.

King, R.S. 1997. Preliminary findings of a habitat use and movement patterns study of the eastern massasauga rattlesnake in Wisconsin. Unpub. report to the U.S. Fish and Wildlife Service, Green Bay, WI. 32 pp.

Klauber, L.M. 1972. Rattlesnakes: Their Habits, Life Histories, and Influence on Mankind. 2nd ed. Univ. of Calif. Press, Berkeley, CA. 1533 pp.

Legge, J.T. 1996. Final report on the status and distribution of the eastern massasauga rattlesnake (*Sistrurus catenatus catenatus*) in Michigan. Unpub. report to U.S. Fish and Wildlife Service - Region 3 Office, Fort Snelling, MN. 17 pp. + app.

_____ and M.R. Rabe. 1994. Summary of recent sightings of the eastern massasauga rattlesnake (*S. c. catenatus*) in Michigan and identification of significant population clusters. Unpub. report to U.S. Fish and Wildlife Service - Region 3 Office, Fort Snelling, MN. 8 pp.

_____ and M.R. Rabe. 1999. "Habitat changes and trends affecting selected populations *of Sistrurus catenatus catenatus* (eastern massasauga) in Michigan." In, 15th North American Prairie Conference Proceedings. C. Warwick (ed.). Natural Areas Association, Oregon. pp. 155-164.

Prior, K.A. 1991. Eastern massasauga rattlesnake (*Sistrurus catenatus*) biology, status, and management: A Guide for recovery. Unpub. discussion paper for Canadian Parks Service. 40 pp.

Reinert, H.K. 1981. Reproduction by the massasauga (*S. c. catenatus*). Amer. Midl. Nat. 105:393-395.

Reinert, H.K. and W.R. Kodrich. 1982. Movements and habitat utilization by the massasauga, *S. c. catenatus*. J. Herpetol. 16:162-171.

Seigel, R.A. 1986. Ecology and conservation of an endangered rattlesnake, *S. catenatus*, in Missouri, U.S.A. Biol. Conserv. 35:333-346.

Szymanski, J.A. 1998. Status assessment for the eastern massasauga (*Sistrurus c. catenatus*). U.S. Fish and Wildlife Service, Fort Snelling, MN. 19 pp + apps.

Vogt, R.C. 1981. Natural history of amphibians and reptiles of Wisconsin. Milwaukee Public Museum, Milwaukee, WI. 205 pp.

Abstract citation

Lee, Y. and J.T. Legge. 2000. Special animal abstract for *Sistrurus catenatus catenatus* (eastern massasauga). Michigan Natural Features Inventory, Lansing, MI. 4 pp.

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Live and Let Live:

People and the Eastern Massasauga Rattlesnake

R.A. Seigel/Towson University

Bill Peterson/USFWS

Bill Peterson/USFWS

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Live and Let Live

The eastern massasauga rattlesnake (sometimes called the swamp rattler) is a rare and unique snake that lives in the upper Midwest. By learning a little bit about these shy, docile snakes and following some simple guidelines, people and massasaugas can live in the same areas without causing problems for each other. This brochure contains everything you need to know!

Massasauga Habitat and Diet

Massasaugas live in shallow wetland areas that have grassy upland areas nearby. They use the grassy areas (with few trees and shrubs) to hunt and to bask in the sun. They eat mostly mice and small rodents, which is a benefit to people. During winter, they hibernate inside crayfish burrows or beneath vegetation in the wetland area.

Bill Peterson/USFWS

Massasaugas use crayfish burrows for cover and for hibernating

When they are not hibernating, massasaugas are often traveling. They do not spend the entire year in one wetland habitat. Instead, they prefer to move from one wetland complex to another. This is one of the reasons they are so rare–many are killed crossing roads and many die because of habitat destruction. To learn more about the biology and natural history of massasaugas, visit these web sites:

http://herpcenter.ipfw.edu/outreach/accounts/index.htm

http://www.dnr.state.wi.us/org/land/er/factsh

http://www.dnr.state.oh.us/wildlife/resources/reptiles/reptiles.html

The wetlands that massasaugas need to survive are also excellent habitat for ducks and other wildlife.

Benefits To People

Massasaugas provide direct benefits to people by eating mice and other small rodent pests, and their venom is being studied by doctors and medical researchers for use in drugs and medicines. In addition, the wetland habitats that massasaugas prefer provide tremendous benefits to people–purifying the water we drink, preventing flooding, recharging wells and groundwater systems, and providing a home for ducks, songbirds, otters, and many other wildlife species that people love.

Preventing Negative Encounters

If you walk in massasauga habitat, wearing hiking boots practically eliminates your chance of being injured. Snakes can't bite through boots. Massasaugas are shy and secretive, and always prefer to retreat from a threat (you) if at all possible. They like to hide under leaves, rocks, and logs, so if you stay on trails and don't root around under these objects, you will likely never even see one. Check the area before you sit on the ground or reach down to the ground for something. If you get too close and the snake can't escape, it will buzz its rattle as a warning (because of its small size, the rattle isn't very loud, but sounds like a bee buzzing). If you hear rattling, be very still until you can determine where the snake is; then move away slowly and leave the snake alone. They rarely strike unless they are cornered or are being attacked. Very few people are bitten by massasaugas each year, and most of these bites occur when people try to handle or harass snakes.

Keeping Massasaugas Away From Your Home

Massasaugas live in areas that have good habitat. If you're concerned that they might be living too close to you for comfort, here are a few tips that will help keep the snakes where you want them–away from your home and yard.

No Vacancy

In areas where you do NOT want snakes:

- *cut the grass often and cut it short*
- *remove any structures that a snake might view as nice habitat: leaf litter, brush piles, dead logs, rocks, stacks of firewood, etc.*
- *remove any structures that provide food or habitat for small rodents (a snake's food)*
- *if a structure cannot be removed, you might try to make it snake-proof (call your state wildlife agency for more information*

Bill Peterson/USFWS

Snake Space

Create a separate area where you will tolerate snakes. Providing good habitat here will help keep them out of other areas. To provide space for snakes:

- *allow grass to grow long*
- *create or leave brush and leaf piles, dead logs, and rocky areas*
- *if you are near a wetland, provide snake habitat between your house and the wet land. Snakes then won't have any reason to leave the good habitat to wander up around your house.*

Remember, massasaugas like to travel, so even if you see one, it is likely just passing through. Leave it alone and it will probably move on, and you may never see it again.

Is That a Massasauga?

In most parts of the Midwest, it is very unlikely that you will ever see or encounter a massasauga. But if you see a snake, how can you tell if it is a massasauga or not?

Dick Dickenson/USFWS

Eastern massasauga rattlesnake

The massasauga is small for a rattlesnake–most are less than two feet long. It has a thick, gray or brown body with large, dark spots running down the middle of its back, and smaller spots on each side. The spots in the middle are shaped something like little bowties. The head is triangular in shape and has black and white stripes running from the face toward the neck. The eyes have vertical pupils (not round). There are two heat-sensing pits (one on each side of the head between the eye and the nostril), and rattle segments at the tip of the tail.

Look-Alikes

There are several snakes in the Midwest that look similar to the massasauga, but none of them is venomous, and all of them play an important role in the ecosystem.

Gary M. Stolz/USFWS

Northern water snake

© John White

Eastern hognose snake

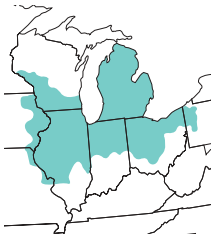
If you do see a massasauga on your property, consider yourself lucky! This unique animal is providing you free rodent control and contributing to the ecological health of the ecosystem.

Eastern milk snake

Eastern massasauga rattlesnake

Eastern fox snake

Massasaugas in the Midwest



Massasaugas are rare or endangered throughout most of their range. Your support is critical in saving this unique and fascinating species from extinction.

Endangered		Special Concern
Indiana	Missouri	Michigan
Illinois	Ohio	
Wisconsin	Pennsylvania	
Minnesota	New York	
Iowa	Ontario, Canada	

Because it is so rare over such a large area, the U.S. Fish & Wildlife Service is currently considering adding the eastern massasauga rattlesnake to the national Threatened Species List.

Why is the Massasauga So Rare?

Habitat loss is one of the primary factors in the decline of the eastern massasauga rattlesnake. Massasaugas depend on wetlands for food and shelter, but also use nearby upland areas during part of the year. Draining wetlands for farms, roads, homes, and urban development has eliminated much of the massasauga's habitat. And because massasaugas like to travel between several different habitat areas, human developments such as roads, towns, and large farm fields create barriers to their movements or make these movements very risky. These barriers also separate and isolate remaining populations, and small, isolated populations often die out easily.

Another big factor in the decline of this species is human fear and dislike of snakes. Countless snakes of all types are killed by humans each year for no good reason.

Bill Peterson/USFWS

Massasauga in wetland.

USFWS photo

The loss of wetland habitat is the primary reason massasaugas are rare.

The Real Scoop on Snake Bites

Massasaugas rarely bite humans, and even when they do it rarely causes serious problems. Snakes don't always inject venom when they bite because venom is "expensive" for them to produce, and they will try to save it for use on prey. In fact, up to 60% of all snakebites to humans contain no venom. However, if you are bitten, remain calm, move as little as possible, and seek medical help immediately. Being bitten by a rattlesnake is considered a medical emergency, but there is no need to panic. Doctors will sometimes even wait one or two hours to observe a patient before beginning any treatment.

If you have a pet that has been bitten by a rattlesnake, keep it calm, restrict its movement as much as possible, and seek help from a veterinarian immediately. Snakebites to the head or neck can be serious because the venom can hinder breathing. However, if the pet is transported to a veterinarian right away, its chances of survival are good.

Larger domestic livestock such as horses, cattle, and hogs are at no serious risk from massasauga bites due to their size.

Bill Peterson/USFWS

The massasauga is a shy, docile snake. With a few precautions, you can safely move one away from your home or yard.

Moving a Massasauga

If you find a massasauga in an area where you don't want it, *don't kill it!* Instead, move it a short distance into an acceptable area. Here's a safe and easy technique for moving a massasauga to a different location:

Use a trash can or pail at least 3 feet deep and a long-handled broom/rake/shovel. Wear rubber or leather boots and long pants. Always try to stay about 3 feet away from the snake. Use the broom to position the pail near the snake; gently guide or herd the snake into the pail; tip the pail up with the broom, put the lid on, and move the snake to a new area. Lay the pail on its side, remove the lid with the broom, and let the snake leave on its own. Try not to move a snake more than 275 yards or so (massasaugas transported out of their usual habitat almost always die).

SNAKES OF MICHIGAN IDENTIFIER

An identification guide to the eastern massasauga rattlesnake and other Michigan snakes

This guide will help you identify the eastern massasauga rattlesnake and other snakes in Michigan. The massasauga is one of six Michigan snakes with blotches. Snakes on this identifier are grouped by appearance (blotched, striped and no pattern). When you see a snake, look at its size and pattern. Does it have blotches, stripes or no pattern?

Eastern milk snake

Lampropeltis triangulum triangulum

- 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 –V-shaped light marking on top of neck
- belly white with black checkerboard pattern
- scales smooth; anal scale single
- lays eggs

Eastern hognose snake

Heterodon platirhinos

- 20-33 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 eyespots on neck and hisses; may turn over and play dead
- heavy-bodied
- flat head with upturned snout
- belly yellow-gray with greenish gray pattern
- scales keeled; anal scale divided
- lays eggs

Northern water snake

Nerodia sipedon sipedon

- 24-42 in; record 55 in
- light brown with dark brown or blackish blotches; older individuals may appear uniformly black
- belly cream with irregular rows of reddish or blackish half moon crescents
- usually found in or near water
- scales keeled; anal scale divided
- gives birth to live young

Eastern fox snake Western Fox snake

Elaphe vulpina gloydi *Elaphe vulpine vulpina*

- eastern subspecies in SE Lower Peninsula only; western subspecies in Upper Peninsula only
- 36-54 in; record 70.5 in
- yellowish to light brown with black or dark brown blotches; head reddish or orangish
- belly yellow with black checkboard pattern
- scales weakly keeled; anal scale divided
- lays eggs
- eastern subspecies is ***State Threatened***

Eastern Massasauga Rattlesnake

Sistrurus catenatus catenatus

- Michigan's only venomous snake
- 18.5-30 in; record 39.5 in
- gray or grayish brown with dark blotches edged in white and spots down back and sides
- belly blackish, not patterned
- pit on each side of head between eye and nostril; cat-like pupils
- distinct segmented rattle
- tail thick, squarish; does not taper to a point like all other snakes in Michigan
- heavy-bodied; often found coiled
- scales keeled; anal scale single
- gives birth to live young
- does not always rattle a warning; relies on pattern and remaining motionless to go undetected
- ***State Special Concern; Federal Candidate***

Appendix 9. "Conservation through Education" sticker

Communicating with the public regarding rattlesnakes

1) When explaining to a stakeholder or stakeholders about the potential risk from a snake or rattlesnake specifically, be sure to respect your audience's risk perceptions. Often people overestimate the risk of an uncommon but highly consequential risk (such as being bitten and dying from a rattlesnake bite). On the other hand, "experts" have a tendency to underestimate risk. It is important that balanced information be presented to your audience, to protect the resource and to protect human health and safety.

2) Most people know little about rattlesnakes or other reptiles for that matter. There are many misconceptions commonly held by stakeholders. It is helpful to become acquainted with commonly held misconceptions about the animal(s) in your area and to present factual information. This information should lead to more informed decisions on the part of stakeholders regarding their associated behaviors toward these animals.

3) People that call an agency with a wildlife concern do so voluntarily. This indicates a sincere interest on the part of the stakeholder(s) in learning more about snakes. This means that they are apt to pay attention and actually process the information that they receive from you.

4) Preliminary results from interviews suggest that people do not feel comfortable judging a dangerous snake from a harmless snake. It is helpful to provide easy ways for individuals in your area to recognize a potential hazard from a non-hazard. The way that I address this issue is to help people recognize harmless snakes in addition to the eastern massasauga rattlesnake. I emphasize the "easy" ways to tell a venomous snake from a non-venomous snake in my area, and distribute associated written materials to stakeholders.

5) When trying to help individuals get an elevated risk perception in line with reality, it is best to use other "natural" hazards as comparisons, rather than traffic accidents or some other "man-made" hazards. Examples that I use include dog attacks and annual death rates from such, bee stings and lightning strikes, and the associated annual death rates.

6) I do not handle rattlesnakes when interpreting them or giving a demonstration of how to safely remove one from an area. When presenting information or giving a demonstration, I try to be cognizant of the non-verbal messages that I send as well as the verbal ones. The reptile is handled with a stick, and is brought out for the stakeholder(s) to observe. As I work with the animal, I emphasize the actions that I take to minimize my risk, and the behaviors that I ask from them in order to minimize their risk. I use a broom or potato rake in my demonstration of how to safely move a rattlesnake from an area. I also emphasize the risk to the snake in moving it, and try my best to get a landowner to allow the snake to move along on its own, rather than having a person move it. When a person insists on moving a snake, the shorter the distance it is moved, the better. When snakes are moved out of their home ranges, they are apt to die.

7) The role that I feel we play is to empower people to co-exist with snakes, both venomous and non-venomous. I go over a number of safety issues, and do my best to build stakeholder confidence in their abilities to co-exist with wildlife, and to handle any potential human-wildlife encounter.

8) When working with stakeholders that may be living in close proximity to rattlesnakes, I feel that it is very important to provide individuals with outreach materials that will empower them to successfully co-exist with these animals on a continual basis. Outreach materials include handouts on avoiding and treating rattlesnake bite, living with snakes, a fact sheet about the animal of interest, how to identify a venomous snake from a non-venomous one, and a rattlesnake resources contact card.

9) While I do not want people to overestimate risk, I also do not want them to underestimate risk. Recent examples of black bears and alligators attacking and killing people due to a reduced fear of humans by the animals, because of human activities such as feeding, have led me to believe that it is essential that humans understand that wild animals do pose a potential risk. Therefore, I acknowledge the risk that rattlesnakes pose, and actions that stakeholders can take to stay safe. Rather than trying to get people to think of rattlesnakes in a “warm and fuzzy” fashion, I attempt to instill respect and appreciation for them.

10) Lastly, it is important to present balanced information when attempting to facilitate the co-existence of stakeholders and potentially dangerous wildlife. This includes sharing human values associated with rattlesnakes, such as aesthetics and utility (e.g. pharmaceuticals, ecosystem functions), as well as risks associated with co-existing with them (potential for snakebites).

Appendix 10. Eastern Massasauga training DVD developed in 2009 - see enclosed DVD.

Appendix 11. Eastern Massasauga workshop agenda topics by target audience in 2008-2009.

Massasauga/Snake Workshop Agenda (March 2008)

I. Introduction	T, P, N, L, I
II. General introduction to snakes A. Snake values B. Reptile review C. Snake's special features D. Snake diets E. Snake hunting strategies F. Snake reproductive strategies G. Michigan snakes H. A year in the life of a Michigan snake	T, P, N, I
III. Identification and natural history of Michigan rattlesnake look-alikes and behavioral mimics A. Eastern fox snake B. Eastern milk snake C. Northern water snake D. Eastern hognose snake E. Black rat snake	T, P, N, L, I
IV. Eastern massasauga rattlesnake identification, ecology, distribution and status	T, P, N, L, I
V. Snake conservation threats in Michigan	T, P, N, L, I
VI. Legal status of snakes in Michigan	N, L, I
VII. Eastern massasauga conservation efforts in Michigan	T, P, N, L, I
VIII. Land management activities and snakes	N
IX. Living with snakes	T, P, N, I
X. Avoiding and treating snakebite A. Avoiding snakebite B. Anti-venom – what it is, how it works C. Do's and Don'ts of first aid D. Emergency contacts E. Treatment of pets, livestock bitten by snakes	T, P, N, L, I
XI. Relocating or translocating snakes	T, P, N, L, I
XII. Sharing snakes with the public	I
XIII. Demonstration on safe removal of snakes	T, N, L, I
XIV. Question/Answer Period	T, P, N, L, I

Target audiences: T = targeted landowners, P = public, N = natural resource managers, L = law enforcement personnel, and I = informal educators or interpreters.

Living with the Eastern Massasauga Rattlesnake

A Workshop for Natural Resource Professionals

Monday, March 10th
1 pm - 4 pm
Pierce Cedar Creek Institute
Hastings, MI

Photo by Matthew Heumann

The workshop will include:

- Identification, life history, status and conservation of the massasauga in Michigan
- Guidelines for presenting information about venomous reptiles to the public
- Opportunities to observe a live massasauga and other "look-alike" snakes
- Land management activities and snakes
- Avoiding and treating snakebites
- How to demonstrate to the public the safe removal of snakes
- A short hike (weather permitting) to explore typical massasauga habitat.

Registration and Questions: Daria Hyde (517) 373-4815 (hyded@michigan.gov). Directions on back.

Sponsored by: Michigan Natural Features Inventory, Pierce Cedar Creek Institute and MSU.
Website: **www.msue.msu.edu/mnfi/emr** Funds provided by EPA Environmental Education Grants Program.

Accommodations for persons with disabilities may be requested by contacting Daria Hyde at (517) 373-4815 by March 3, 2008 to ensure sufficient time to make arrangements. Requests received after this date will be met when possible.

Michigan Natural Features Inventory

MICHIGAN STATE UNIVERSITY EXTENSION

Pierce Cedar Creek Institute for environmental education

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

MSU Extension is an affirmative-action, equal opportunity organization

Learning to Live with the Eastern Massasauga Rattlesnake

Saturday, May 3rd
1 pm - 3 pm
Wolf Lake State Fish Hatchery Visitor Center
Mattawan, MI

Photo by Matthew Heumann

The workshop will include:

- ❖ Identification, life history, status and conservation of the massasauga in Michigan
- ❖ Opportunities to observe a live massasauga and other "look-alike" snakes
- ❖ Avoiding and treating snakebites
- ❖ Land management activities and snakes
- ❖ How to safely move a snake (only if absolutely necessary!)
- ❖ A short hike (weather permitting) on trails to explore typical massasauga habitat.

Registration (recommended) and Questions: Shana McMillan (269) 668-2876 (mcmillsk@michigan.gov) or Daria Hyde (517) 373-4815 (hyded@michigan.gov). Directions on back.

Sponsored by: Michigan Natural Features Inventory and MDNR Wolf Lake State Fish Hatchery

Website: **www.msue.msu.edu/mnfi/emr** Funds provided by EPA Environmental Education Grants Program.

Accommodations for persons with disabilities may be requested by contacting Daria Hyde at (517) 373-4815 by April 25, 2008 to ensure sufficient time to make arrangements. Requests received after this date will be met when possible.

Michigan Natural Features Inventory

Michigan DNR

MICHIGAN STATE UNIVERSITY EXTENSION

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

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From: Mary Dettloff
To: Mary Dettloff
Date: 03/25/2008 12:16:52 PM
Subject: Wolf Lake State Fish Hatchery Visitor Center Hosts Special Programs This Spring

FOR IMMEDIATE RELEASE
March 25, 2008

Contacts: Shana McMillan 269-668-2876 or Mary Dettloff 517-335-3014

Wolf Lake Fish Hatchery Visitor Center Hosts Special Programs This Spring

The Department of Natural Resources today announced special programs being offered this spring at the Wolf Lake Fish Hatchery Visitor Center near Kalamazoo.

The programs include:

§Spring Gardening- Who's That Growing in Your Backyard? Saturday, March 29, 10 a.m. and 12 Noon. Part I, Michigan Trees and Shrubs, will be presented by Mary Ann Menck of Mary Ann's Trees and Shrubs at 10 a.m. Join Victoria Larke of Glorious Gardens for Part II at 12 Noon for Michigan Flowers and Herbs. Participants will learn how to attract wildlife, bring shape and form to their landscape and reconnect with nature by growing vegetables, berries, fruits and herbs. They will also be given the tools to help identify the native and non-native plants on their property. Each program is approximately 90 minutes in length. All ages welcome.

§Monarchs, Milkweeds and More! Saturday, April 5, 10 a.m. Ilse Gebhard of the Audubon Society of Kalamazoo will help participants learn about the monarch life cycle, its habitat, how to attract them to your garden and their remarkable annual migration to Mexico. All ages welcome.

§Spring Beginner's Birding- Saturday, April 19, 10 a.m. The Wolf Lake Fish Hatchery grounds are one of the best places in the area to see waterfowl and other birds. Check out what species are headed north during the spring migration. If you have them, bring your binoculars, scopes and field guides. There will be a limited supply of binoculars on hand for those who do not have them.

§Wolf Lake Discovery Walk- Saturday, April 26, 10 a.m. Explore the hatchery's nature trails and see a variety of plants and wildlife including birds, frogs, turtles and more. The program is for all ages and will last approximately one hour.

§Learning to Live with the Eastern Massasauga Rattlesnake- Saturday, May 3, 1 p.m. Join experts in learning the life history, conservation and how to identify Michigan's only venomous snake. Participants will learn how to identify the massasauga and have an opportunity to observe a live massasauga and other "look-alike" snakes. A short hike to explore typical massasauga habitat will take place on trails, weather permitting. Pre-registration is recommended.

Living With the Eastern Massasauga Rattlesnake: Workshop Agenda

Pierce Cedar Creek Institute
March 10, 2008
1:00 – 4:00 PM

This workshop is made possible with funds from the U. S. Environmental Protection Agency.

1:00 – Introductions/Pre-Workshop Survey

1. Pre-workshop survey
2. Introduction of presenters- Yu Man Lee and Rebecca Christoffel
   - ❖ Introduction of workshop participants
   - ❖ Questions you must have answered!
3. Snake values
4. General snake biology
5. A year in the life of a snake in Michigan
6. Rattlesnake look-alikes and mimics (meet some snakes!)
7. Eastern massasauga rattlesnake
   - Identification
   - Status and distribution
   - Life history and ecology
8. Michigan snake conservation threats
9. Massasauga conservation efforts in Michigan
10. Living with snakes
11. Avoiding and treating rattlesnake bites
12. Relocating or moving snakes
13. Sharing venomous reptiles with the public
14. Demonstration on how to safely move a massasauga (if necessary)
15. Questions????
16. Post-Workshop Survey

3:00/3:30 - Field trip to see and learn about massasauga habitat

- Hibernation sites
- Gestation sites
- Foraging sites

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Additional collaborators:

- ➢ Indiana-Purdue University, Fort Wayne
- ➢ Pierce Cedar Creek Institute for hosting workshop

Eastern Massasauga Volunteer Snake Responder Training Workshop Agenda

Pierce Cedar Creek Institute
Friday, September 25, 2009
1:00 – 3:30 pm

1:00 – 1:15: Introduction
- Presenters
  - ❖ Rebecca Christoffel, Iowa State University
- Volunteer Network Coordinator – SW Michigan
  - ❖ Binder Park Zoo – Chris Gertiser and Lisa Duke
- Workshop participants

1:15 – 2:00: Overview of volunteer snake responder network
- Roles of volunteer coordinator & volunteers
- Massasauga response protocol & reporting form
- Volunteer authorization/waiver and emergency forms and time log
- Distribute and review supplies and materials
- Volunteers identify response areas on maps

2:00 – 2:30: Review of massasauga status, identification and ecology; identification of look-alike snakes; and a brief review of other parts of the massasauga workshop
- Opportunities to view live animals up-close

2:30 – 3:00: Discussion and role play on communicating with people regarding rattlesnakes on their property

3:00 – 3:30: Demonstration and practice moving snakes

3:30: Questions or suggestions?

This workshop is sponsored by Michigan Natural Features Inventory, Michigan State University Extension. This workshop was developed with funds from the U. S. Environmental Protection Agency.

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Role Playing Scenarios

Scenario 1: You are sent out to respond to a snake-human conflict call via the volunteer snake coordinator. It is likely a rattlesnake. When you arrive at the property, you find an eastern milk snake. The petrified landowner insists that it's a rattlesnake, and doesn't seem able to hear you as you explain why it is NOT a rattlesnake and is instead a harmless snake.

Scenario 2: You are sent out to respond to a call via the volunteer coordinator. It is likely a rattlesnake. When you arrive at the property, you find a rattlesnake coiled on the front porch of the landowner's home. The snake is visibly irritated and is quick to strike at anyone who ventures too near. The landowner, who is visibly angry himself, wants you to kill the snake. He also wants to know what you or he can do about other rattlesnakes that may be on his property, especially since he has young children and a dog.

Scenario 3: You are in the office when the rattlesnake call comes in and the volunteer coordinator has momentarily stepped out. When you pick up the phone, you are met with the near hysterics of a person who claims that their property is being over-run by rattlesnakes. You need to determine whether or not there are likely rattlesnakes on the property before you dispatch a volunteer to the property.

****Six elements of defusing anger** (from www.ewu.edu/x6755.xml)

1) Communicate respect
2) Cooperating
3) Effective listening
4) Reframing
5) Asserting
6) Disengaging

Suggestions for Dealing with Difficult Calls

Scenario 1: First, acknowledge to the landowner that it can be scary to be taken by surprise by a snake.
Second, acknowledge that it could be easy to mistake the sound of the milk snake's tail vibrating in the grass or dry leaf litter as a rattlesnake.
Third, see if the landowner would like to get a glass of water or sit down while you talk (try to relax the person).
Fourth, calmly point out how one can tell that this is a harmless snake versus a rattlesnake and extol the virtues of the snake in terms of rodent control and as a part of the ecosystem.
Fifth, if person is really agitated, could offer to move the milk snake if really necessary, or better yet, have the landowner walk away from the snake.
DO NOT minimize the fear, ridicule or in any way embarrass the landowner for feeling frightened.

Scenario 2: First, acknowledge that yes indeed, the landowner has an eastern massasauga rattlesnake on the porch.
Second, try to find out what has transpired since the landowner came across the snake – did he or she or anyone else poke at the snake, yell at it, any pet come up to it and annoy it, etc.
Third, explain that you will not be killing the snake and why. Explain that the snake is just likely passing through on its way to another foraging area or its hibernaculum (depending on time of year).
Fourth, if you can't convince the landowner to leave the snake alone until it moves on, then it's time to consider moving it. If you must move the snake, move it as short a distance as possible into suitable habitat. Explain to the landowner why you are hesitant to relocate the snake especially a large distance.
Fifth, you can talk to him about other massasaugas on his property by acknowledging that this is likely if he has suitable habitat on or adjacent to his property but also talk to him about massasauga general ecology and behavior and how massasaugas are generally very secretive and cryptic and ask him how many times has he seen massasaugas on his property or so close to his house. You also can provide suggestions for how to make parts of his property, esp. those areas frequently used by people/the kids, less attractive to snakes and also suggest talking to the kids about massasaugas and not picking snakes up. You also can provide suggestions and information about avoiding and treating snake bites in dogs.

Scenario 3: Ask the person to calm down and let them know that you're listening and are here to help. Next, ask the person how many snakes they have seen and for as detailed a description of the animals as possible. Try to ask as many questions as you can with each bit of information that you can obtain from the landowner to try to be able to make a positive identification of the animals. Next, if you can confirm identification of the snakes through the caller's description, assure them that these snakes are not rattlesnakes (most likely these will be garter snakes) and that they're perfectly harmless. In a case like this, it may do a world of good for someone to go out and assure the landowner of the safety of the snakes, simply because some people are very uncomfortable around snakes whether they're rattlesnakes or not.

MNFI Volunteer Snake Responder Authorization and Waiver

Michigan Natural Features Inventory (MNFI) authorizes _____ to act as a volunteer snake responder (hereafter referred to as "Volunteer") and, as such, to engage in the following activities on MNFI's behalf: to respond to snake calls, reports and inquiries, conduct on-site visits and consultations as needed, identify species of reported snakes, and, if necessary as a last resort, temporarily capture, move, and release reported snakes to nearest suitable habitat on site or as close as possible following approved protocols.

Volunteer agrees that he or she will follow the Eastern Massasauga Response Protocol that has been developed by MNFI, and that he or she has received appropriate training for using the Protocol. Volunteer agrees to coordinate his or her volunteer snake responder activities with the regional volunteer snake responder network coordinator and MNFI by responding to snake calls and conducting on-site consultations that are forwarded or requested by the regional snake responder network coordinator and/or MNFI, if Volunteer is available and agrees to respond to request. If Volunteer receives a snake call or a request for on-site assistance from another institution or individual, he or she agrees to notify and forward the request to the regional network coordinator for initial screening and approval prior to responding to snake report and providing on-site assistance. Volunteer may contact MNFI if the regional snake responder network coordinator is not available. Volunteer agrees to provide a volunteer time log and at least annual updates of his or her snake responder activities. Volunteer also agrees to complete Eastern Massasauga Observation and Relocation Data Sheets and submit them to the regional snake responder network coordinator and/or MNFI for each snake report or on-site consultation.

Volunteer understands that handling snakes entails a risk of injury. Volunteer desires snake responder experience, and he or she forever waives the right to bring a claim against the landowner where volunteer activity is undertaken, the regional volunteer network coordinator, Michigan State University, and MNFI, including their agents, for any loss or injury that Volunteer may experience while acting as a volunteer snake responder.

The subject activities will be conducted under the authority of MNFI's Scientific Collector's Permit for Fish, Reptile, Amphibian, Crustacean and Mollusk (under Part 487, Act 451, P.A. 1994, as amended, being section 324.48735) issued by the MDNR Fisheries Division on April 3, 2009, to MNFI Director Brian Klatt. This permit only covers volunteer snake responders authorized by MNFI and only the activities specified in this document and in the Eastern Massasauga Response Protocol. This permit does not cover removal of snakes from the wild without prior explicit approval and documentation from the DNR. This authorization is valid for one year from the date of signature.

Date:_____ _____
Volunteer Signature

Date:_____ _____
MNFI Director Signature

MNFI Volunteer Snake Responder Emergency Form

Date: _____

Volunteer's name: _____

Mailing address: _____

_____

Phone number(s): _____

Email address: _____

Availability: _____

Geographic area(s) willing to work: _____

_____

Emergency contact information:

Name _____

Relationship _____

Phone _____

Do you have any allergies and/or medical conditions that we should be aware of? Other special concerns?

_____

_____

_____

_____

6/23/05

Eastern Massasauga Observation and Relocation Data Sheet

Observer/Landowner Information:

Name: _____ Phone: _____ E-mail: _____

Address: _____City: _____ State: ____ Zip: _____

Rattlesnake Information:

Date of sighting: _____ Time:_____ Number observed: _____

Location where snake was found (site, address, etc.): _____

County: _____ Township: _____ Town: _____ Range: _____ Section: _____

Weather conditions: _____ Photo taken? (circle one) Yes No

Condition of snake: (circle one) Alive Dead (If dead, please complete "dead snake" section.)

Approximate length: _____ Approximate # of rattles: _____ General condition: _____

Habitat snake was found (i.e., driveway, yard, wood pile, field): _____

Have rattlesnakes been seen here before? (circle one) No Yes

If yes, year of last sighting: _____ Year of first sighting: _____ Total # seen: _____

How often are rattlesnakes seen? (circle one) 1-2/yr 3-4/yr More than 4/yr

What time of year are snakes seen? (circle all that apply) April May June August Sept Oct

Relocation Information:

Was the snake relocated? (circle one) Yes No If yes, answer questions below.

Name of relocator: _____ Date relocated: _____

Was the snake relocated on or near property where found? (circle one) Yes No

If yes, what direction? _____ What distance? _____

If relocated off-site, where was the snake relocated? _____

Township: _____ Range: _____ Section: _____

Distance moved: _____ Habitat: _____

If possible, please include a map showing location where snake was found and where snake was relocated.

Dead Snakes:

What was done with the dead snake? (circle one) Left where found Collected and turned in

Person turned in to: _____ Institution: _____

Date deposited: _____ Phone: _____

Name of snake responder: _____ Contact Information: _____

When complete, please return to Regional Volunteer Snake Network Coordinator or Michigan Natural Features Inventory, P.O. Box 30444, Lansing, MI 48909-7944. Thank you!!

01/12/2010

Appendix 14. Examples of media coverage of Eastern Massasauga workshops conducted in 2008 and 2009. The following is a newspaper article about the workshop at Sarett Nature Center in Berrien Co. on 3/11/2008. Also enclosed is a newspaper article about the workshop at Calvin College Bunker Interpretive Center in Kent Co. on 3/7/2009.

State's native rattler rarely seen

By RALPH HEIBUTZKI, Herald-Palladium Correspondent

Published: Friday, March 21, 2008 3:00 AM EDT

BENTON TOWNSHIP — Michigan's only venomous snake certainly stands in a class by itself, but that status often carries a heavy price tag of misunderstanding.The Eastern massasauga rattlesnake hasn't been linked to a single death in Michigan, yet the top question posed to snake educator and conservationist Rebecca Christoffel is, "How can I avoid getting bitten?"As Christoffel informed a dozen listeners recently at Sarett Nature Center, the answer is pretty simple: If you're not sure whether a snake is harmful, leave it alone."A lot of times, people think they are protecting themselves by killing the snake, but what they are doing is putting themselves at greater risk of a bite," Christoffel said. "I'm trying to work with people to build their capacity to live with these snakes."Christoffel has been spreading that message through live reptile demonstrations since 1992. She has a Ph.D. in fisheries and wildlife from Michigan State University, and works for D.J. Case & Associates, a natural resources PR firm based in Mishawaka, Ind.The Eastern massasauga is the only venomous snake among 18 species to call Michigan home. So far, in all her research, Christoffel has only come across one confirmed death from a massasauga bite, and that occurred in the 1950s. In that case, a 47-year-old Ontario woman delayed medical treatment for three days after the bite and died from the resulting complications, Christoffel said."They (massasaugas) basically are very, very cryptic," Christoffel said. "They just want to stay away from you. They don't want to have anything to do with you."The massasauga is distinguished by its "cat's eye" pupils, versus the round ones seen in other snakes, Christoffel said. The massasauga's stout body and saddle-shaped blotches also set it apart from the crowd, she added.Yet enough confusion persists to result in the wrongful killings of fox, Eastern milk and hognose snakes — whose own appearance and behavior are frequently mistaken for those of the massasauga, Christoffel said.Ironically, Eastern milk and fox snakes are most frequently killed for their ability to mimic rattlesnakes, which both species do to scare intruders, Christoffel said. The Eastern milk snake is the one "that most often comes in headless to nature centers, and that's really unfortunate, because it's such a great little snake," she said.Basic information about the shy, secretive massasauga has been hard to come by, because populations are tiny in most states. In Minnesota, the snake's presence hasn't been documented since 1944, Christoffel said.Michigan is the major exception, with sightings reported in 50 of the 68 Lower Peninsula counties, Christoffel said. Concerns about the Eastern massasauga's viability led to its eligibility for inclusion on the federal endangered species list in 1999, Christoffel said. But nothing has happened due to other priorities taking precedence, "or the funding isn't available to go through the listing process."In Michigan, the massasauga is considered a species of special concern, and is protected by Department of Natural Resources order, Christoffel said. "Therefore, it's illegal to take any part of the animal as a trophy, such as the rattle, or the fangs," she said.Unless people are willing to fund the management of non-game species, pinning down massasauga numbers will be difficult to impossible, Christoffel believes."This is not whitetail deer," Christoffel said. "There are not hunting revenues being generated to manage these species, so the information we have on them is much less than perfect."However, the continuing encroachment of residential and urban developments into rural areas makes snake-human contact more likely than ever before, Christoffel said. Knowing how to identify local snakes and getting acquainted with their habits is the key to staying safe, she said.Most snakes are active at night, "so you just want to wear protective footwear and take a flashlight with you," Christoffel said. "That's pretty simple."If you're unlucky enough to hear a rattler, look around to see if you can identify the snake, Christoffel said. Avoid sudden movement, and walk away slowly from the animal if possible.According to Christoffel, the average bite victim is a white male aged 19-40 who tried to handle the snake. Alcohol is involved in about a quarter of all incidents, "so there is a lot of the ☐stupid factor,'" she said.For those who need it, antivenin costs roughly $3,000 a vial, with a typical bite requiring 12 vials, "so it's going to cost between $36,000 and $45,000 for that little rattlesnake bite," Christoffel said. "So most facilities do not stock it."Similarly, Christoffel doesn't recommend making pets out of venomous snakes, or aggressive species like Burmese pythons and boa constrictors. "This is very `cool,' if you want to call it that, to have `hot, exotic' snakes," Christoffel said. "Unfortunately, a lot of the people who keep hot snakes are more likely to get bitten, because they become, at some point, complacent (saying): "Oh, I know this animal.'"

Michigan's Season of the Snake

By Rebecca Christoffel

Late spring heralds the emergence of Michigan's snakes from old stone foundations, wells, rock outcroppings, and other winter hibernation sites. Prepare for the season of the snake!

Michigan is home to eighteen kinds of snakes, including one venomous species, the eastern massasauga rattlesnake *(Sistrurus catenatus catenatus)*. Though venomous, the eastern massasauga is reluctant to strike and rather uses its cryptic coloration to hide from potential predators and will flee an area to avoid potential interactions with humans. It is readily identified by its short (~24-30 inches) stout body, wedge-shaped head and rattle. Three dark stripes run down from the snake's head onto its neck. Eastern massasaugas usually have a gray, tan or light brown background color with dark blotches along their backs and sides, though some individuals are entirely black (melanistic).

Several other harmless snake species are often mistaken for eastern massasauga rattlesnakes by Michiganders. These include the northern water snake *(Nerodia sipedon sipedon)*, eastern hognose snake *(Heterodon platirhinos)*, eastern milk snake *(Lampropeltis triangulum triangulum)* and eastern and western fox snakes *(Pantherophis gloydi and Pantherophis vulpina,* formerly *Elaphe gloydi* and *Elaphe vulpina)*. Though these species are all blotched, it is easy to learn a few distinct characteristics that will aid in field identification and spare yourself the stress associated with perceived encounters with venomous snakes.

The northern water snake is commonly found in and around water bodies. It is most easily distinguished from the eastern massasauga by its behaviors. Northern water snakes are not at all shy around people, and feed primarily on cold-blooded prey items, such as the minnows that anglers use as bait. A northern water snake will gladly help itself to untended minnows in buckets or

fish on a stringer. Additionally, northern water snakes do not possess a rattle and do not have three stripes running from their head down onto the back of their necks. While eastern massasauga rattlesnakes may reach up to three feet in length, northern water snakes may achieve lengths greater than four feet.

Eastern hognose snakes are the Academy Award winners of the snake world. Like the eastern massasauga, an eastern hognose snake is short, stout-bodied and usually has blotches running along its body. However, no other snake engages in the defensive behaviors of eastern hognose snakes. On approach, a hognose will flare out the skin on the back of its head to display two big black eye spots. It's this behavior that has earned the snake its common nickname of "puff adder." If you do not take the hint, and continue to approach the snake, it may decide to "play dead" like a possum. It will roll over on its back, emit a stinky fluid from its body, and loll out its tongue. If you turn the snake back on its belly, it will immediately flip back over to convince you that it is indeed, dead! Eastern hognose snakes are found primarily in very sandy soil, where they feed upon American toads and other frogs.

The eastern milk snake is the species that is most commonly mistaken for an eastern massasauga. This snake is easy to differentiate from the eastern massasauga once you know what to look for. The eastern milk snake is a very narrow-bodied animal with a grayish background color and brick-red to maroon blotches, though its coloring is highly variable. It has a light colored "Y" or "V" shaped marking on the back of its head and is quite tolerant of humans. Milk snakes feed primarily on mice and often hibernate in the company of other snakes in old stone foundations of people's homes. Both eastern milk snakes and fox snakes are rattlesnake mimics. When they feel threatened, they will vibrate their tails rapidly in leaf litter or dried grass. This is often the sound that people mistake for a "rattle" and unfortunately, results in the death of many beneficial rodent-eating snakes. Eastern milk snakes are habitat generalists and are found throughout Michigan's Lower Peninsula.

The eastern fox snake in southeastern Michigan and western fox snake on the upper peninsula of Michigan are almost identical in appearance but are geographically isolated from one another. These rodent-eating constrictors can reach lengths of up to five feet. Their solid copper-colored heads have earned them the common name of “copperhead” by many. However, these snakes are harmless and are not even closely related to copperheads. The eastern fox snake is found in marshy areas along the Great Lakes and is listed as threatened by the Michigan Department of Natural Resources. Any sightings of this snake should be reported to the Wildlife Division in Lansing, Michigan. The western fox snake is found only on Michigan’s Upper Peninsula.

Now that you have information for identifying these snakes, you might wonder what you should do if you encounter an eastern massasauga rattlesnake on your property or while out recreating. The safest action you can take for yourself and the snake is to simply give the snake a wide berth and leave it alone. Nationally, most rattlesnake bites are inflicted on people that purposefully handle rattlesnakes or are attempting to kill one. If the animal is on your private property, it may help to know that eastern massasaugas often move from one area to another and the animal is probably just “passing through” your property during its regular seasonal movements. The eastern massasauga rattlesnake is listed as a species of special concern in Michigan and is protected by a Director’s Order through the Michigan Department of Natural Resources. The eastern massasauga is listed as threatened or endangered by every other state and province in which it resides and is a candidate for listing under the federal Endangered Species Act. Michigan is the stronghold for this species (with more known populations than any other state within its range).

The Michigan Department of Natural Resources and Michigan Natural Features Inventory are both interested in eastern massasauga rattlesnake sightings. Please report your sightings (and please include a photograph for documentation to them at

http://www.dnr.state.mi.us/wildlife/pubs/massasauga_obsreport.asp. There is an online form that can easily be submitted that will help in monitoring Michigan's eastern massasauga populations. To learn more about Michigan's eastern massasaugas, go to http://www.msue.msu.edu/mnfi/emr. If you have questions or concerns regarding eastern massasauga rattlesnake populations in your area, please contact Yuman Lee of Michigan Natural Features Inventory at (517) 373-3751 or by email at leeyu@michigan.gov.

Suggested reference: Holman, J.A., J.H. Harding, M.M. Hensley, and G.R. Dudderar. 1999. Michigan Snakes. Extension Bulletin E-2000, Michigan State University Extension and Michigan State University Museum: East Lansing.

Bio: Rebecca Christoffel is a doctoral candidate in the Department of Fisheries and Wildlife at Michigan State University. Her doctoral work has focused on the incorporation of human dimensions insights to enhance rare snake conservation in the upper Midwest. Further information on her research can be found at http://www.fw.msu.edu/rileylab/people/christoffel.

Eastern massasauga rattlesnake. Note the three stripes running from the head down its neck, the rattle on the tail and the large wedge-shaped head.

Eastern hognose snake. Note the two large “eye patches” on the back of its head. When old, hognose snakes often fade to a solid gray-green color, but still retain these two large black eyespots which enable easy identification.

Eastern fox snake Note the plain copper-colored head; these animals are often called copperheads, though they are harmless and not even closely related to true copperheads.

Eastern milk snake. Note the black border of each blotch and the small head and slim body.

Northern water snake. Note the large body and head without stripes running down from the head to its back. This animal will almost always be found in water or right on the water's edge.

Fall Snake Migration and Humans

By Rebecca Christoffel, Daria Hyde and Yu Man Lee

Just as the leaves on our trees are changing colors, snakes are migrating from their warm season haunts to their hibernacula (places where they will spend the winter underground). Snakes must avoid freezing or they'll perish; so every year in September and October, they must return to a place where they can avoid freezing temperatures, such as tree root networks, burrows dug by other animals such as a mouse or crayfish, rock dens, or old stone foundations in houses.

September and October are two months in which many people encounter snakes because the snakes are migrating to their hibernacula and are spending increased time basking in the open to raise their body temperatures. Movement catches the human eye and snakes that are lying out in the open are much easier for us to spot than those that are either in tall grass or spending their time in brush or under rocks or logs. Young snakes that have recently hatched or emerged also are often seen in the fall.

Most snakes that people encounter on their properties in the fall are moving through to their overwintering sites, and generally will not remain where you find them. This is particularly true when a snake is found in the open, with no visible cover within easy reach. Because snakes are prey for many aerial predators, such as hawks, they typically do not spend a lot of time in very open areas, but instead will spend their time in some sort of cover, whether it be tall grass or brush.

Although Michigan is home to eighteen kinds of snakes, only one, the eastern massasauga rattlesnake*,* is venomous. The eastern massasauga relies on its cryptic coloration to hide from potential predators and generally does not strike but will do so if threatened. This snake is readily identified by its short (~24-30 inches), stout body, wedge-shaped head, and rattle. Three dark stripes run down from the snake's head onto its neck. Eastern massasaugas usually have a gray, tan or light brown background color with dark blotches along their

backs and sides, though some individuals are entirely black (melanistic). There are also several snakes in Michigan that are completely harmless but look very similar and are often mistaken for the eastern massasauga. These include the eastern milk snake, northern water snake, eastern hognose snake, and eastern fox snake.

As part of an educational outreach effort to build capacity within individuals and communities to safely co-exist with eastern massasauga rattlesnakes, a network of volunteers has been trained to address human-snake encounters in areas with massasauga populations. The volunteer snake responder network is coordinated centrally by the Michigan Natural Features Inventory (MNFI), a program of Michigan State University Extension, in collaboration with regional coordinators at Binder Park Zoo in southwest Michigan and the Detroit Zoo in southeast Michigan.

The regional coordinators will field calls from the public as well as professional agencies and organizations regarding human-snake encounters. Upon investigation and if necessary, the regional coordinator will contact and ask a trained volunteer to respond to a call about a snake encounter and provide on-site assistance to address the concern.

It is hoped that by training local residents to respond to human-snake concerns in their area, these concerns will be appropriately addressed in a timely manner and with accurate and consistent information. In addition, these trained volunteers will have access to experts that can provide additional assistance if necessary.

Individuals who need assistance with massasaugas or other snakes on their property can contact Chris Gertiser and Lisa Duke at Binder Park Zoo at 269-979-1351 in southwest Michigan or Jeff Jundt at the Detroit Zoo at 248-541-5717 ext. 3159 in southeast Michigan. For more information about the volunteer snake responder network or to report a massasauga sighting, please contact Yu Man Lee or Daria Hyde with MNFI at 517-373-1552. To learn more about Michigan's snakes, particularly the eastern massasauga rattlesnake, please go to http://www.msue.msu.edu/mnfi/emr.

Appendix 16. Eastern Massasauga workshop pre-program survey and key to scores used in 2008.

2008 Eastern Massasauga Rattlesnake Workshop Pre-program Survey

We would like to ask about your perceptions of Michigan's snakes. In this survey, the term non-venomous (non-poisonous) snake refers to a snake that does not use venom to kill its food item. A rattlesnake (poisonous) is a snake that does use venom (poison) to kill food items.

1.) How many kinds of non-venomous snake(s) do you think live in Michigan? (Please mark an "X" in one box.)

None	1-4	5-10	11-15	16-20	More than 20	Unsure

2.) How many kinds of rattlesnake(s) do you think live in Michigan?

None	1	2	3	More than 3	Unsure

3.) How would you describe your level of personal interest in Michigan's snake(s)?

Very interested	Somewhat interested	No opinion	Somewhat disinterested	Very disinterested

4.) Do you think Michigan's non-venomous snake(s) need protection from human killing and collecting?

☐ Yes ☐ No ☐ No opinion

5.) Do you think Michigan's rattlesnake(s) need protection from human killing and collecting?

☐ Yes ☐ No ☐ No opinion

6.) Are you aware of any specific laws that protect Michigan's snake(s)?

☐ Yes ☐ No ☐ No opinion

7.) Do you believe close contacts between rattlesnakes and humans are increasing or decreasing in Michigan?

Increasing a lot	Increasing somewhat	Staying the same	Decreasing somewhat	Decreasing a lot	Unsure

8.) To what extent do you believe that you personally are at risk from rattlesnakes in the areas that you live and recreate?

I am at great risk	I am at some risk	I am at a slight risk	I am at no risk	Unsure

9.) Please mark an "X" in the box that most closely agrees with your opinion for each statement. *(SA=Strongly agree, A=Agree, U=Unsure, D=Disagree, SD=Strongly disagree)*

b. E. Massasauga Rattlesnakes	SA	A	U	D	SD
I enjoy seeing rattlesnakes in the wild in Michigan.					
Rattlesnakes help to control mice, rats and other pests in Michigan.					
Whether or not I see one, I get some benefit from just knowing that rattlesnakes live in Michigan.					
Rattlesnakes are important to maintain the balance of nature in Michigan.					
Rattlesnakes pose a threat to people by their presence in Michigan.					
Rattlesnakes are likely to spread disease to humans in Michigan.					
In Michigan, rattlesnakes pose an unacceptable threat to pet dogs and cats.					
Rattlesnake bites in Michigan cause deaths to residents each year.					
In Michigan, the risk of being *injured* by a rattlesnake is acceptably low.					
In Michigan, the risk of a person being *killed* by a rattlesnake is acceptably low.					
I would be *less* likely to have a rattlesnake moved off my property if I knew that it probably would die as a result.					
If I knew a rattlesnake lived within a mile of my home, it would decrease my enjoyment of living there.					

11.) For each event below indicate which of the four choices you would most likely make by placing an "X" in the appropriate box.

Event	*I would **not** do anything.*	*I would **ask** someone what I should do.*	*I would **tell** some one to remove the rattlesnake.*	*I would **kill** the rattlesnake.*	*Unsure*
You see a rattlesnake near your home *once* .					
You hear about *one* time when a rattlesnake strikes at a neighbor's dog or cat.					
You see a rattlesnake near your home *more than once* in a week.					
Pets near your home are *repeatedly* threatened by a rattlesnake.					
A rattlesnake bites a pet near your home *once.*					
A rattlesnake bites *several* pets *over a summer* near your home.					
You see a rattlesnake on your porch *once*.					

KEY

2008 Eastern Massasauga Rattlesnake Workshop Pre-program Survey

We would like to ask about your perceptions of Michigan's snakes. In this survey, the term non-venomous (non-poisonous) snake refers to a snake that does not use venom to kill its food item. A rattlesnake (poisonous) is a snake that does use venom (poison) to kill food items.

1.) How many kinds of non-venomous snake(s) do you think live in Michigan? (Please mark an "X" in one box.)

None	1-4	5-10	11-15	16-20	More than 20	Unsure
0	0	0	0	1	0	99

2.) How many kinds of rattlesnake(s) do you think live in Michigan?

None	1	2	3	More than 3	Unsure
0	1	0	0	0	99

3.) How would you describe your level of personal interest in Michigan's snake(s)?

Very interested	Somewhat interested	No opinion	Somewhat disinterested	Very disinterested
4	**3**	**88**	**2**	**1**

4.) Do you think Michigan's non-venomous snake(s) need protection from human killing and collecting?

2 Yes 1 No 88 No opinion

5.) Do you think Michigan's rattlesnake(s) need protection from human killing and collecting?

2 Yes 1 No 88 No opinion

6.) Are you aware of any specific laws that protect Michigan's snake(s)?

2 Yes 1 No 88 No opinion

7.) Do you believe close contacts between rattlesnakes and humans are increasing or decreasing in Michigan?

Increasing a lot	Increasing somewhat	Staying the same	Decreasing somewhat	Decreasing a lot	Unsure
1	2	3	4	5	99

8.) To what extent do you believe that you personally are at risk from rattlesnakes in the areas that you live and recreate?

I am at great risk	I am at some risk	I am at a slight risk	I am at no risk	Unsure
1	2	3	4	99

9.) Please mark an "X" in the box that most closely agrees with your opinion for each statement. *(SA=Strongly agree, A=Agree, U=Unsure, D=Disagree, SD=Strongly disagree)*

b. E. Massasauga Rattlesnakes	SA	A	U	D	SD
I enjoy seeing rattlesnakes in the wild in Michigan.	2	1	99	-1	-2
Rattlesnakes help to control mice, rats and other pests in Michigan.	2	1	99	-1	-2
Whether or not I see one, I get some benefit from just knowing that rattlesnakes live in Michigan.	2	1	99	-1	-2
Rattlesnakes are important to maintain the balance of nature in Michigan.	2	1	99	-1	-2
Rattlesnakes pose a threat to people by their presence in Michigan.	-2	-1	99	1	2
Rattlesnakes are likely to spread disease to humans in Michigan.	-2	-1	99	1	2
In Michigan, rattlesnakes pose an unacceptable threat to pet dogs and cats.	-2	-1	99	1	2
Rattlesnake bites in Michigan cause deaths to residents each year.	-2	-1	99	1	2
In Michigan, the risk of being *injured* by a rattlesnake is acceptably low.	2	1	99	-1	-2
In Michigan, the risk of a person being *killed* by a rattlesnake is acceptably low.	2	1	99	-1	-2
I would be *less* likely to have a rattlesnake moved off my property if I knew that it probably would die as a result.	2	1	99	-1	-2
If I knew a rattlesnake lived within a mile of my home, it would decrease my enjoyment of living there.	-2	-1	99	1	2

11.) For each event below indicate which of the four choices you would most likely make by placing an "X" in the appropriate box.

Event	*I would **not** do anything.*	*I would **ask** someone what I should do.*	*I would **tell** some one to remove the rattlesnake.*	*I would **kill** the rattlesnake.*	*Unsure*
You see a rattlesnake near your home *once*.	4	3	2	1	99
You hear about *one* time when a rattlesnake strikes at a neighbor's dog or cat.	4	3	2	1	99
You see a rattlesnake near your home *more than once* in a week.	4	3	2	1	99
Pets near your home are *repeatedly* threatened by a rattlesnake.	4	3	2	1	99
A rattlesnake bites a pet near your home *once.*	4	3	2	1	99
A rattlesnake bites *several* pets *over a summer* near your home.	4	3	2	1	99
You see a rattlesnake on your porch *once*.	4	3	2	1	99

Appendix 17. Eastern Massasauga workshop post-program survey and key to scores used in 2008.

2008 Eastern Massasauga Rattlesnake Post Workshop Survey

1.) Before attending this workshop, were you aware that the eastern massasauga rattlesnake is a candidate for federal listing under the Endangered Species Act?

☐ Yes ☐ No ☐ Unsure

2.) Before attending this workshop, were you aware that the eastern massasauga rattlesnake is protected under a Director's Order in Michigan?

☐ Yes ☐ No ☐ Unsure

3.) Please rate how confident you are that you can identify a massasauga from other Michigan snakes.

Not confident ---------- Very Confident
1 2 3 4 5

4.) Please rate how well the workshop prepared you for dealing with individuals with rattlesnake concerns.

Did not prepare ---------- Prepared well
1 2 3 4 5

5.) How many kinds of non-venomous snake(s) do you think live in Michigan? (Please mark an "X" in one box.)

None	1-4	5-10	11-15	16-20	More than 20	Unsure

7.) How many kinds of rattlesnake(s) do you think live in Michigan?

None	1	2	3	More than 3	Unsure

8.) How would you describe your level of personal interest in Michigan's snake(s)?

Very interested	Somewhat interested	No opinion	Somewhat disinterested	Very disinterested

9.) Do you think Michigan's non-venomous snake(s) need protection from human killing and collecting?

☐ Yes ☐ No ☐ No opinion

10.) Do you think Michigan's rattlesnake(s) need protection from human killing and collecting?

☐ Yes ☐ No ☐ No opinion

11.) Are you aware of any specific laws that protect Michigan's snake(s)?

☐ Yes ☐ No ☐ No opinion

12.) Do you believe close contacts between rattlesnakes and humans are increasing or decreasing in Michigan?

Increasing a lot	Increasing somewhat	Staying the same	Decreasing somewhat	Decreasing a lot	Unsure

13.) To what extent do you believe that you personally are at risk from rattlesnakes in the areas that you live and recreate?

I am at great risk	I am at some risk	I am at a slight risk	I am at no risk	Unsure

14.) Please mark an "X" in the box that most closely agrees with your opinion for each statement. *(SA=Strongly agree, A=Agree, U=Unsure, D=Disagree, SD=Strongly disagree)*

E. Massasauga Rattlesnakes	SA	A	U	D	SD
I enjoy seeing rattlesnakes in the wild in Michigan.					
Rattlesnakes help to control mice, rats and other pests in Michigan.					
Whether or not I see one, I get some benefit from just knowing that rattlesnakes live in Michigan.					
Rattlesnakes are important to maintain the balance of nature in Michigan.					
Rattlesnakes pose a threat to people by their presence in Michigan.					
Rattlesnakes are likely to spread disease to humans in Michigan.					
In Michigan, rattlesnakes pose an unacceptable threat to pet dogs and cats.					
Rattlesnake bites in Michigan cause deaths to residents each year.					
In Michigan, the risk of being *injured* by a rattlesnake is acceptably low.					
In Michigan, the risk of a person being *killed* by a rattlesnake is acceptably low.					
I would be *less* likely to have a rattlesnake moved off my property if I knew that it probably would die as a result.					
If I knew a rattlesnake lived within a mile of my home, it would decrease my enjoyment of living there.					

15.) For each event below indicate which of the four choices you would most likely make by placing an "X" in the appropriate box.

Event	*I would **not** do anything.*	*I would **ask** someone what I should do.*	*I would **tell** some one to remove the rattlesnake.*	*I would **kill** the rattlesnake.*	*Unsure*
You see a rattlesnake near your home *once* .					
You hear about *one* time when a rattlesnake strikes at a neighbor's dog or cat.					
You see a rattlesnake near your home *more than once* in a week.					
Pets near your home are *repeatedly* threatened by a rattlesnake.					
A rattlesnake bites a pet near your home *once.*					
A rattlesnake bites *several* pets *over a summer* near your home.					
You see a rattlesnake on your porch *once*.					

16.) What additional information would assist you in managing land with rattlesnakes, and in addressing individuals' concerns about rattlesnakes?

_____

_____

17.) Are there any pressing questions or further information that you would like to receive concerning Michigan's snakes?

☐ Yes ☐ No

If yes, please provide the following:

Name: _____
Address: _____
_____

Email: _____

Thank you for your time and your feedback!!

KEY

2008 Eastern Massasauga Rattlesnake Post Workshop Survey

1.) Before attending this workshop, were you aware that the eastern massasauga rattlesnake is a candidate for federal listing under the Endangered Species Act?

1 Yes 2 No 99 Unsure

2.) Before attending this workshop, were you aware that the eastern massasauga rattlesnake is protected under a Director's Order in Michigan?

1 Yes 2 No 99 Unsure

3.) Please rate how confident you are that you can identify a massasauga from other Michigan snakes.

Not confident ---------- Very Confident
1 2 3 4 5

4.) Please rate how well the workshop prepared you for dealing with individuals with rattlesnake concerns.

Did not prepare ---------- Prepared well
1 2 3 4 5

5.) How many kinds of <u>non-venomous snake(s)</u> do you think live in Michigan? (Please mark an "X" in one box.)

None	1-4	5-10	11-15	16-20	More than 20	Unsure
0	0	0	0	1	0	99

7.) How many kinds of <u>rattlesnake(s)</u> do you think live in Michigan?

None	1	2	3	More than 3	Unsure
0	1	0	0	0	99

8.) How would you describe your level of personal interest in Michigan's snake(s)?

Very interested	Somewhat interested	No opinion	Somewhat disinterested	Very disinterested
4	**3**	**88**	**2**	**1**

9.) Do you think Michigan's <u>non-venomous snake(s)</u> need protection from human killing and collecting?

1 Yes 2 No 88 No opinion

10.) Do you think Michigan's rattlesnake(s) need protection from human killing and collecting?

1 Yes 2 No 88 No opinion

11.) Are you aware of any specific laws that protect Michigan's snake(s)?

1 Yes 2 No 88 No opinion

12.) Do you believe close contacts between rattlesnakes and humans are increasing or decreasing in Michigan?

Increasing a lot	Increasing somewhat	Staying the same	Decreasing somewhat	Decreasing a lot	Unsure
1	2	3	4	5	99

13.) To what extent do you believe that you personally are at risk from rattlesnakes in the areas that you live and recreate?

I am at great risk	I am at some risk	I am at a slight risk	I am at no risk	Unsure
1	2	3	4	99

14.) Please mark an "X" in the box that most closely agrees with your opinion for each statement. *(SA=Strongly agree, A=Agree, U=Unsure, D=Disagree, SD=Strongly disagree)*

E. Massasauga Rattlesnakes	SA	A	U	D	SD
I enjoy seeing rattlesnakes in the wild in Michigan.	2	1	99	-1	-2
Rattlesnakes help to control mice, rats and other pests in Michigan.	2	1	99	-1	-2
Whether or not I see one, I get some benefit from just knowing that rattlesnakes live in Michigan.	2	1	99	-1	-2
Rattlesnakes are important to maintain the balance of nature in Michigan.	2	1	99	-1	-2
Rattlesnakes pose a threat to people by their presence in Michigan.	-2	-1	99	1	2
Rattlesnakes are likely to spread disease to humans in Michigan.	-2	-1	99	1	2
In Michigan, rattlesnakes pose an unacceptable threat to pet dogs and cats.	-2	-1	99	1	2
Rattlesnake bites in Michigan cause deaths to residents each year.	-2	-1	99	1	2
In Michigan, the risk of being *injured* by a rattlesnake is acceptably low.	2	1	99	-1	-2
In Michigan, the risk of a person being *killed* by a rattlesnake is acceptably low.	2	1	99	-1	-2
I would be *less* likely to have a rattlesnake moved off my property if I knew that it probably would die as a result.	2	1	99	-1	-2
If I knew a rattlesnake lived within a mile of my home, it would decrease my enjoyment of living there.	-2	-1	99	1	2

15.) For each event below indicate which of the four choices you would most likely make by placing an "X" in the appropriate box.

Event	*I would **not** do anything.*	*I would **ask** someone what I should do.*	*I would **tell** some one to remove the rattlesnake.*	*I would **kill** the rattlesnake.*	*Unsure*
You see a rattlesnake near your home *once* .	4	3	2	1	99
You hear about *one* time when a rattlesnake strikes at a neighbor's dog or cat.	4	3	2	1	99
You see a rattlesnake near your home *more than once* in a week.	4	3	2	1	99
Pets near your home are *repeatedly* threatened by a rattlesnake.	4	3	2	1	99
A rattlesnake bites a pet near your home *once.*	4	3	2	1	99
A rattlesnake bites *several* pets *over a summer* near your home.	4	3	2	1	99
You see a rattlesnake on your porch *once*.	4	3	2	1	99

16.) What additional information would assist you in managing land with rattlesnakes, and in addressing individuals' concerns about rattlesnakes?

_____

_____

17.) Are there any pressing questions or further information that you would like to receive concerning Michigan's snakes?

1 Yes 2 No

If yes, please provide the following:

Name: _____
Address: _____
_____

Email: _____

Thank you for your time and your feedback!!

#_____ **Date** _____

A Long-term Post-Workshop Survey about Michigan's Snakes

1. Please place an "X" in the box to the right of each statement that most closely reflects your feelings since participating in this study.

Participating in a program about snakes has caused…	**Greatly Increase**	**Somewhat Increase**	**Has not Affected This**	**Somewhat Decrease**	**Greatly Decrease**
…my interest in learning about snakes to …					
…my negative feelings toward snakes to…					
…the time I spend looking for opportunities to learn about snakes to…					
…my fear of snakes to…					
…my interest in having a snake as a pet to…					
…my feelings of being at personal risk of being bitten by a rattlesnake to…					
…my positive feelings toward snakes to…					
…the attention I pay to information about snakes to…					

2. Have you had any personal observations or encounters with snakes since you attended a workshop on Michigan's snakes?

☐ No
☐ Yes
If **yes**, please describe: _____

_____

3. How would you describe your current level of personal interest in Michigan's snake(s)? (Please mark an "X" in one box.)

Very interested	Somewhat interested	No opinion	Somewhat disinterested	Very disinterested

4. Do you think Michigan's non-venomous snake(s) need protection from human killing and collecting? (Please mark an "X" in one box.)

☐ Yes ☐ No ☐ No opinion

5. Do you think Michigan's rattlesnake(s) need protection from human killing and collecting? (Please mark an "X" in one box.)

☐ Yes ☐ No ☐ No opinion

6. Please mark an "X" in the box that most closely reflects your opinion for each statement. ***(SA=Strongly agree, A=Agree, U=Unsure, D=Disagree, SD=Strongly disagree)***

Non-venomous snakes	**SA**	**A**	**U**	**D**	**SD**
I enjoy seeing non-venomous snakes in the wild in Michigan.					
Non-venomous snakes help to control mice, rats and other pests in Michigan.					
Whether or not I see one, I get some benefit from just knowing that non-venomous snakes live in Michigan.					
Non-venomous snakes are important to the balance of nature in Michigan.					
Non-venomous snakes pose a threat to people by their presence in Michigan					
Non-venomous snakes are likely to spread disease to humans in Michigan.					
In Michigan, non-venomous snakes pose an unacceptable threat to dogs and cats.					
Non-venomous snakebites cause deaths to Michigan residents each year.					
In Michigan, the risk of a person being *injured* by a non-venomous snake is acceptably low.					
In Michigan, the risk of a person being *killed* by a non-venomous snake is acceptably low.					
I would be *less* likely to have a non-venomous snake moved off my property if I knew that it probably would not survive as a result.					
If I knew a non-venomous snake lived within a mile of my home, it would decrease my enjoyment of living there.					

Rattlesnakes	**SA**	**A**	**U**	**D**	**SD**
I enjoy seeing rattlesnakes in the wild in Michigan.					
Rattlesnakes help to control mice, rats and other pests in Michigan.					
Whether or not I see one, I get some benefit from just knowing that rattlesnakes live in Michigan.					
Rattlesnakes are important to the balance of nature in Michigan.					
Rattlesnakes pose a threat to people by their presence in Michigan.					
Rattlesnakes are likely to spread disease to humans in Michigan.					
In Michigan, rattlesnakes pose an unacceptable threat to dogs and cats					
Rattlesnake bites cause deaths to Michigan residents each year.					
In Michigan, the risk of a person being *injured* by a rattlesnake is acceptably low.					
In Michigan, the risk of a person being *killed* by a rattlesnake is acceptably low.					
I would be *less* likely to have a rattlesnake moved off my property if I knew that it probably would not survive as a result.					
If I knew a rattlesnake lived within a mile of my home, it would decrease my enjoyment of living there.					

7. How would you like to see the number of <u>non-venomous snakes in your neighborhood</u> change? (Please mark an "X" in one box.)

Increase a lot	Increase somewhat	Stay the same	Decrease somewhat	Decrease a lot	No opinion

8. How would you like to see the number of <u>rattlesnakes in your neighborhood</u> change? (Please mark an "X" in one box.)

Increase a lot	Increase somewhat	Stay the same	Decrease somewhat	Decrease a lot	No opinion

9. To what extent do you believe that you personally are at risk from rattlesnakes in the areas that you live and recreate?

I am at great risk	I am at some risk	I am at a slight risk	I am at no risk	Unsure

10. For each event below indicate which of the four choices you would most likely make by placing an "X" in the appropriate box.

<u>Event</u>	I would **not** do anything.	I would **ask** someone what I should do.	I would **tell** some one to remove the rattlesnake	I would **kill** the rattlesnake.	Unsure
You see a rattlesnake near your home <u>once.</u>					
You hear about *<u>one</u>* time when a rattlesnake strikes at a neighbor's dog or cat.					
You see a rattlesnake near your home *<u>more</u> <u>than</u> <u>once</u>* in a week.					
Pets near your home are *<u>repeatedly</u>* threatened by a rattlesnake.					
A rattlesnake bites a pet near your home *<u>once.</u>*					
A rattlesnake bites *<u>several</u>* pets *over a summer* near your home.					
You see a rattlesnake on your porch *<u>once.</u>*					

Six situations are described below that might be associated with increasing numbers of rattlesnakes in your neighborhood. *Use these to answer Questions 16 and 17 that follow.*

Possible Situation in your neighborhood	
Increasing Rattlesnake Numbers ↑	**Situation F** *frequent* sightings of rattlesnakes bites to pets or livestock *occasionally* reported bites to humans *rarely* occur *residents* must take precautions with pets, livestock, children rattlesnake populations are abundant and widespread
	Situation E *regular* sightings of rattlesnakes bites to pets or livestock *occasionally* reported bites to humans are *rare* but do occur rattlesnake populations are healthy and connected
	Situation D *regular* sightings of rattlesnakes pets or livestock are *rarely* bitten rattlesnake populations are healthy but scattered
	Situation C rattlesnakes are *occasionally* sighted by people pets or livestock are *rarely* bitten rattlesnake populations are small and isolated
	Situation B rattlesnakes exist but *rarely* sighted by anyone rattlesnake populations are at risk of extinction
	Situation A no rattlesnakes exist in your neighborhood

11. Which of the possible <u>Situations</u> would you *<u>prefer</u>*** for your neighborhood? (Please mark an "X" in one box.)**

A	B	C	D	E	F	Unsure

12. What is the lowest level of <u>rattlesnakes</u> (which <u>Situation</u>) that would cause you to express concerns to an authority and request that they do something to reduce the number of <u>rattlesnakes in your neighborhood</u>? (Mark an "X" in one box.)

A	B	C	D	E	F	Unsure

Thank you very much for your participation in this research!

Coding Key for Long-term Assessments
#_Key in as entered **Date MM/DD/YY__**

A Long-term Post-Workshop Survey about Michigan's Snakes

1. Please place an "X" in the box to the right of each statement that most closely reflects your feelings since participating in this study.

Participating in a program about snakes has caused…	**Greatly Increase**	**Somewhat Increase**	**Has not Affected This**	**Somewhat Decrease**	**Greatly Decrease**
…my interest in learning about snakes to …	**5**	**4**	**3**	**2**	**1**
…my negative feelings toward snakes to…	**1**	**2**	**3**	**4**	**5**
…the time I spend looking for opportunities to learn about snakes to…	**5**	**4**	**3**	**2**	**1**
…my fear of snakes to…	**1**	**2**	**3**	**4**	**5**
…my interest in having a snake as a pet to…	**5**	**4**	**3**	**2**	**1**
…my feelings of being at personal risk of being bitten by a rattlesnake to…	**1**	**2**	**3**	**4**	**5**
…my positive feelings toward snakes to…	**5**	**4**	**3**	**2**	**1**
…the attention I pay to information about snakes to…	**5**	**4**	**3**	**2**	**1**

2. Have you had any personal observations or encounters with snakes you attended a workshop on Michigan's snakes?
1 No
2 Yes
If **yes**, please describe: **Key in as entered**

3. How would you describe your current level of personal interest in Michigan's snake(s)? (Please mark an "X" in one box.)

Very interested	Somewhat interested	No opinion	Somewhat disinterested	Very disinterested
4	**3**	**88**	**2**	**1**

4. Do you think Michigan's non-venomous snake(s) need protection from human killing and collecting? (Please mark an "X" in one box.)

1 Yes **2** No **88** No opinion

5. Do you think Michigan's rattlesnake(s) need protection from human killing and collecting? (Please mark an "X" in one box.)

1 Yes **2** No **88** No opinion

6. Please mark an "X" in the box that most closely reflects your opinion for each statement. ***(SA=Strongly agree, A=Agree, U=Unsure, D=Disagree, SD=Strongly disagree)***

Non-venomous snakes	**SA**	**A**	**U**	**D**	**SD**
I enjoy seeing non-venomous snakes in the wild in Michigan.	**2**	**1**	**99**	**-1**	**-2**
Non-venomous snakes help to control mice, rats and other pests in Michigan.	**2**	**1**	**99**	**-1**	**-2**
Whether or not I see one, I get some benefit from just knowing that non-venomous snakes live in Michigan.	**2**	**1**	**99**	**-1**	**-2**
Non-venomous snakes are important to the balance of nature in Michigan.		**1**	**99**	**-1**	**-2**
Non-venomous snakes pose a threat to people by their presence in Michigan	**-2**	**-1**	**99**	**1**	**2**
Non-venomous snakes are likely to spread disease to humans in Michigan.	**-2**	**-1**	**99**	**1**	**2**
In Michigan, non-venomous snakes pose an unacceptable threat to dogs and cats.	**-2**	**-1**	**99**	**1**	**2**
Non-venomous snakebites cause deaths to Michigan residents each year.	**-2**	**-1**	**99**	**1**	**2**
In Michigan, the risk of a person being *injured* by a non-venomous snake is acceptably low.	**2**	**1**	**99**	**-1**	**-2**
In Michigan, the risk of a person being *killed* by a non-venomous snake is acceptably low.	**2**	**1**	**99**	**-1**	**-2**
I would be *less* likely to have a non-venomous snake moved off my property if I knew that it probably would not survive as a result.	**2**	**1**	**99**	**-1**	**-2**
If I knew a non-venomous snake lived within a mile of my home, it would decrease my enjoyment of living there.	**-2**	**-1**	**99**	**1**	**2**

Rattlesnakes	**SA**	**A**	**U**	**D**	**SD**
I enjoy seeing rattlesnakes in the wild in Michigan.	**2**	**1**	**99**	**-1**	**-2**
Rattlesnakes help to control mice, rats and other pests in Michigan.	**2**	**1**	**99**	**-1**	**-2**
Whether or not I see one, I get some benefit from just knowing that rattlesnakes live in Michigan.	**2**	**1**	**99**	**-1**	**-2**
Rattlesnakes are important to the balance of nature in Michigan.	**2**	**1**	**99**	**-1**	**-2**
Rattlesnakes pose a threat to people by their presence in Michigan.	**-2**	**-1**	**99**	**1**	**2**
Rattlesnakes are likely to spread disease to humans in Michigan.	**-2**	**-1**	**99**	**1**	**2**
In Michigan, rattlesnakes pose an unacceptable threat to dogs and cats	**-2**	**-1**	**99**	**1**	**2**
Rattlesnake bites cause deaths to Michigan residents each year.	**-2**	**-1**	**99**	**1**	**2**
In Michigan, the risk of a person being *injured* by a rattlesnake is acceptably low.	**2**	**1**	**99**	**-1**	**-2**
In Michigan, the risk of a person being *killed* by a rattlesnake is acceptably low.	**2**	**1**	**99**	**-1**	**-2**
I would be *less* likely to have a rattlesnake moved off my property if I knew that it probably would not survive as a result.	**2**	**1**	**99**	**-1**	**-2**
If I knew a rattlesnake lived within a mile of my home, it would decrease my enjoyment of living there.	**-2**	**-1**	**99**	**1**	**2**

7. How would you like to see the number of <u>non-venomous snakes in your neighborhood</u> change? (Please mark an "X" in one box.)

Increase a lot	Increase somewhat	Stay the same	Decrease somewhat	Decrease a lot	No opinion
5	**4**	**3**	**2**	**1**	**88**

8. How would you like to see the number of <u>rattlesnakes in your neighborhood</u> change? (Please mark an "X" in one box.)

Increase a lot	Increase somewhat	Stay the same	Decrease somewhat	Decrease a lot	No opinion
5	**4**	**3**	**2**	**1**	**88**

9. To what extent do you believe that you personally are at risk from rattlesnakes in the areas that you live and recreate?

I am at great risk	I am at some risk	I am at a slight risk	I am at no risk	Unsure
1	**2**	**3**	**4**	**99**

10. For each event below indicate which of the four choices you would most likely make by placing an "X" in the appropriate box.

<u>Event</u>	I would **not** do anything.	I would **ask** someone what I should do.	I would **tell** some one to remove the rattlesnake	I would **kill** the rattlesnake.	Unsure
You see a rattlesnake near your home <u>once.</u>	**4**	**3**	**2**	**1**	**99**
You hear about <u>*one*</u> time when a rattlesnake strikes at a neighbor's dog or cat.	**4**	**3**	**2**	**1**	**99**
You see a rattlesnake near your home <u>*more than once*</u> in a week.	**4**	**3**	**2**	**1**	**99**
Pets near your home are <u>*repeatedly*</u> threatened by a rattlesnake.	**4**	**3**	**2**	**1**	**99**
A rattlesnake bites a pet near your home <u>*once.*</u>	**4**	**3**	**2**	**1**	**99**
A rattlesnake bites <u>*several*</u> pets *over a summer* near your home.	**4**	**3**	**2**	**1**	**99**
You see a rattlesnake on your porch <u>*once.*</u>	**4**	**3**	**2**	**1**	**99**

Six situations are described below that might be associated with increasing numbers of rattlesnakes in your neighborhood. *Use these to answer Questions 16 and 17 that follow.*

Possible Situation in your neighborhood	
Increasing Rattlesnake Numbers ↑	**Situation F** *frequent* sightings of rattlesnakes bites to pets or livestock *occasionally* reported bites to humans *rarely* occur *residents* must take precautions with pets, livestock, children rattlesnake populations are abundant and widespread
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	Situation D *regular* sightings of rattlesnakes pets or livestock are *rarely* bitten rattlesnake populations are healthy but scattered
	Situation C rattlesnakes are *occasionally* sighted by people pets or livestock are *rarely* bitten rattlesnake populations are small and isolated
	Situation B rattlesnakes exist but *rarely* sighted by anyone rattlesnake populations are at risk of extinction
	Situation A no rattlesnakes exist in your neighborhood

11. Which of the possible <u>Situations</u> would you *<u>prefer</u>*** for your neighborhood? (Please mark an "X" in one box.)**

A	B	C	D	E	F	Unsure
1	**2**	**3**	**4**	**5**	**6**	**99**

12. What is the lowest level of <u>rattlesnakes</u> (which <u>Situation</u>) that would cause you to express concerns to an authority and request that they do something to reduce the number of <u>rattlesnakes in your neighborhood</u>? (Mark an "X" in one box.)

A	B	C	D	E	F	Unsure
1	**2**	**3**	**4**	**5**	**6**	**99**

Thank you very much for your participation in this research!