APPENDIX E

Eastern Massasauga (*Sistrurus c. catenatus*) Management Plan, Carlyle Lake, Illinois

Illinois Department of Natural Resources
And
U.S. Army Corps of Engineers, St. Louis District

In Cooperation With The
U.S. Fish and Wildlife Service, Region III

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INTRODUCTION

The objective of this management plan is to locate, protect, enhance, and where appropriate, expand habitat suitable for hibernation, seasonal movements, foraging and reproduction of the eastern massasauga (*Sistrurus c. catenatus*) on Federal and state lands at Carlyle Lake, while allowing for continued flood damage reduction on the Kaskaskia River, domestic and industrial water supply, water quality enhancement, fish and wildlife conservation, hydropower, navigation and recreational use of the area as specified in the lake's legal authorization. Data collected as a result of this management plan will help identify areas that may require land use classification changes in order to protect ecologically sensitive areas. This will require research into the habitat use of the massasauga, evaluation of current management practices and how they may affect the massasauga, careful management of current and potential habitat, and education of the general public and government agencies to reduce human-caused mortality of the species. If changes to the Carlyle Lake Master Plan are required to accomplish the goals outlined within the management plan, public involvement will be sought during the decision making process. This plan recognizes the importance of private property adjacent to Carlyle Lake for the long-term management of the massasauga population. The Illinois Department of Natural Resources and the Corps of Engineers will work cooperatively with private property owners to improve habitat and management for massasaugas on a voluntary basis.

The plan described here is based on existing information (Appendix A; Johnson et al. 2000; Szymanski 1998; Phillips 2001, personal communication, unpublished data for Carlyle Lake) and will be implemented in a step-wise approach and adapted as new information about the massasauga becomes available. This management plan will be reviewed every five years and if significant new information warrants a revision, the document will be revised. Items included in this plan will be implemented based on the availability of funds.

LEGAL AUTHORITIES

The Corps has an obligation pursuant to the Endangered Species Act of 1973 to review operation and maintenance activities for potential impacts on threatened or endangered species. A major tenant of the Endangered Species Act is that Federal agencies should seek to conserve threatened and endangered species and to utilize their authorities in furtherance of the purposes of the Act. The U.S. Fish and Wildlife Service elevated the eastern massasauga to a candidate species in October 1999. Although candidate species are not afforded the protection of the Endangered Species Act, Federal agencies are encouraged to implement actions to conserve and protect these species, thus reducing the need to list them as either threatened or endangered in the future.

The Illinois Endangered Species Protection Act [520 ILCS 10/1 et seq.] gives the Illinois Department of Natural Resources the mandate to actively plan and implement a program for the conservation of endangered and threatened species in Illinois. That program is to include research, management and cooperative agreements with other agencies. The protection and

enhancement of habitat for the eastern massasauga in the Carlyle Lake vicinity in cooperation with the Corps of Engineers and other landowners is in keeping with this conservation mandate.

CURRENT ACTIONS AND RECOMMENDATIONS

The Illinois Department of Natural Resources and the U.S. Army Corps of Engineers are responsive to the need to implement stewardship practices that will protect the eastern massasauga population. Recommended changes in management practices will be based on the best available scientific data from current and previous studies. The following actions will be taken by the IDNR and COE in an effort to minimize and mitigate potential negative impacts to the massasauga resulting from new construction and operation and maintenance of existing Federal and state facilities at Carlyle Lake.

Disturbance in existing developed areas can proceed without an assessment of potential impacts to the massasauga. Developed areas include all areas that are currently being intensely managed for administrative, recreation, and fish and wildlife purposes. Developed areas are defined as those areas where natural vegetation has been removed and replaced with agricultural crops, maintained lawn that is mowed more than twice in a season, and non-living cover such as gravel, asphalt, concrete, wood chips and aggregate. Although meeting the definition of developed, rip-rapped shorelines are considered undeveloped because massasaugas may hibernate in crayfish burrows below the riprap.

Disturbance in undeveloped areas must be preceded by an assessment of potential impacts to the massasauga. A survey for possible massasauga hibernacula will be required if the assessment indicates potential massasauga habitat impacts. The hibernacula surveys will be conducted during the month of April to insure the highest probability of detecting emerging snakes. Surveys will be conducted over several days following two consecutive days of above 60-degree F temperatures. If hibernacula are discovered, alternative construction/development sites will be evaluated or appropriate conservation measures will be taken.

Conservation Measures to be Used if Massasauga Habitat is Disturbed

Construction activities involving land clearing and heavy equipment use in areas known or suspected to be hibernacula and their adjacent foraging areas should be limited to May 16 through October 15. The time limitations are recommended to protect massasaugas while in the hibernacula. Prior to beginning construction activities, the impacted area will be fenced to limit snake movement into the area, searched, and declared free of massasaugas. If massasaugas are encountered in a construction zone, the procedures outlined in Appendix B should be followed. Concentrations of known hibernacula should *not be impacted*.

Saddle dams that are not heavily used by visitors will be mowed on an infrequent basis (2-3 times/year) to minimize incidental mowing mortality. The grass heights of these areas will not

be cut below 15.24 cm (6 in) to further reduce mortality.

Controlled hunting areas will be managed to the greatest extent possible to benefit the massasauga. For example, prescribed burns will be conducted by burning either before the first emergence of the massasaugas in the Spring (generally prior to the first week of April) or on days when massasaugas are unlikely to be active. If the air temperature is above 55 degrees F, a visual search will be conducted to ensure that snakes are not active in the areas to be burned. Required mowing will be limited to hunter walking paths, and although outside the recommended disturbance window, may be conducted after the second week in September. Prior to mowing walking paths, a visual inspection of the pathways will be conducted to insure that massasaugas are not in the area. The grass heights of these areas will be not be cut below 20.32 cm (8 in) to reduce mowing mortality.

Mower operators will be given training on snake identification and will report all sightings of massasaugas. They will be instructed to specifically avoid killing any snakes and to report accidental fatalities. A post-mowing survey in areas infrequently mowed will be conducted after each mowing to document any deaths. All massasaugas killed during mowing will be provided to the IDNR.

Caution should be exercised during the application of pesticides in areas known to have massasaugas. Pesticides with low toxicity and a short half-life should be used when possible. If there are uncertainties regarding the potential effects of a pesticide, and application in massasauga sites cannot be avoided it should be restricted to the period when the snakes are most likely to be underground (mid-November through mid-April).

Succession control, an important wildlife management tool, will be conducted to control unwanted woody encroachment into known massasauga habitat. Prescribed burns will be conducted by burning either before the first emergence of massasaugas in the spring (generally prior to the first week of April) or on days when massasaugas are unlikely to be active. If the air temperature is above 55 degrees F, a visual search will be conducted to ensure that snakes are not active in the areas to be burned. If snakes are observed, the prescribed burn will be postponed until conditions are suitable for burning. Brush-hogging will be limited to October 16 through May 15. Prescribed burns and brush-hogging in areas not known to have massasaugas will be conducted according to existing guidance.

When conducting succession control measures the following life history information will be taken into consideration. Massasaugas are intolerant of closed canopy forests because they need open areas with direct sunlight for thermoregulation. They are also probably intolerant of open (treeless) grassland. They require a mixture of grassy areas with some scattered structure, either shrubs or trees. The exact density of trees and/or shrubs is not known at this time, but preliminary data suggest that 20-30 per ha (49-74 per ac) is appropriate for the massasauga.

RESEARCH AND DATA NEEDS

1. Data Collection

a. Compile existing information collected by The Illinois Department of Natural Resources (IDNR) and the U.S. Army Corps of Engineers (COE) regarding the locations of massasaugas in the Carlyle Lake area.
The Illinois Department of Natural Resources has been recording sightings of eastern massasauga since 1990. Their data, in combination with that of the COE, will be combined on a single map. A brief written report describing the source of the data will accompany the map. This report will be available to all cooperating Federal and state agencies.

b. Conduct surveys on Federal and state land at Carlyle Lake to identify hibernacula and important habitats.

Eastern massasaugas exhibit a seasonal shift in habitat requirements. They occupy lowland areas for hibernating from approximately mid-October through mid-May and utilize a variety of habitat types for foraging from approximately mid-May through mid-October. Hibernacula tend to be lowland sites with massasaugas denning alone in crayfish burrows (Seigel 1986; Johnson 1989; Mauger 1993; Ballard 1994; Rennicke 1996). It has been found that massasaugas hibernate in wet crayfish holes at depths below the frost line, and can withstand freezing body temperatures for short periods without harm (Maple and Orr 1968).

All low, wet areas surrounding Carlyle Lake that have prospective hibernacula habitat will be systematically surveyed during April and/or October to locate massasaugas emerging or returning to their hibernacula sites. Surveys will be a joint effort between the COE, IDNR and the U.S. Fish and Wildlife Service. All locations will be recorded in a single database to be shared among agencies. The management practices recommended in the following section will be applied to these areas.

c. Request the assistance of private property owners and special interest groups that are adjacent to Federal land at Carlyle Lake and within the watershed to help locate any concentrations of massasaugas on private property.

The COE owns a narrow strip of land that surrounds Carlyle Lake (up to elevation 450 NGVD). The remainder of the land needed for the lake to operate up to the top of the flood control pool of 462.5 NGVD is private property. The right to flood is owned by the Federal government from 450 NGVD to 465.5 NGVD. This limited amount of land makes it necessary to document massasauga use and habitat in areas that are in private ownership. It is also necessary to document areas where snakes come in contact with humans on a regular basis. The Carlyle Lake staff is aware of several residents who have knowledge of areas where massasaugas are seen annually. There are also reports of snakes occurring in the Shoal Creek area, below the dam, and above the railroad tracks on the east side of the lake. The request for public assistance will be

extended to IDNR Ecosystem Partnerships at the lake (Carlyle Lake Association) and below the dam (Original Kaskaskia Wilderness Association and Kaskaskia Watershed Coalition) for their assistance in identifying other populations in the watershed and around the lake. These areas need to be identified, recorded and studied as funding becomes available. Public meetings could also identify causes and locations of mortality such as sections of highway where road kill snakes are seen regularly. Public meetings could also be used to further educate the public on the status of the massasauga.

d. Involve other governmental agencies working around Carlyle Lake (county, township, cities, state, and Federal agencies) in the data collection and stewardship activities to protect the massasauga.

The many county, township, city, state and Federal agencies that operate around Carlyle Lake and within the Kaskaskia watershed will be requested to assist during data collection activities and to adopt the stewardship recommendations included in this management plan. The information that is gathered with these efforts will be distributed to agencies to benefit all governmental bodies with regard to the Endangered Species Act.

e. A written report containing all collected information will be completed and distributed among the cooperating state and Federal agencies.

2. Develop a study design for a road survey that will be carried out during the spring and fall each year.

A popular index used to assess the status and trends of a population of snakes is the road survey. There are currently no means to determine the year-to-year change in the health of the massasauga population around Carlyle Lake. A reproducible method will be developed so that the survey results can be compared from year-to-year. A route through all areas around the lake and in the watershed known to have massasaugas will be established. Data such as the date, location, time, air temperature, and time spent driving the route will be recorded. The road survey will involve other local, state, Federal and IDNR Ecosystem Partnerships in the data collection.

3. Conduct research to determine distribution, abundance, density, birth rates, death rates, home range size, daily movements, and habitat selection.

Radio-telemetry research is underway at Eldon Hazlet and South Shore state parks and Corps property. Massasaugas of adequate size have been equipped with implanted transmitters, enabling researchers to locate those snakes on a regular basis. Each time a snake is located, data on habitat and activities of the snake are collected. Funding has been secured to allow the telemetry work to continue through the summer of 2001. Objectives of the telemetry study are to determine home range, activity patterns and specific habitat use of the massasauga around Carlyle Lake.

Mark-recapture research is also underway at South Shore State Park. Objectives are to determine distribution, abundance, density, birth and death rates. This research is currently being extended to the remainder of the area and should be continued for at least five years. The long-term objective of this research is to estimate the long-term viability of the eastern massasauga in the Carlyle Lake area.

EDUCATION AND OUTREACH

1. Design a public relations program to help improve the public perception of the species.

The long-term survival of the eastern massasauga will depend on how well the public accepts the species as a necessary part of the ecosystem. Programs aimed at area residents and summer campers will be developed to help stress the benefits the species has on the area and to counteract the many misconceptions the public has concerning venomous snakes. The programs will also address the issues of snakebites and what to do when a massasauga is encountered.

Interpretive programs are currently conducted at the lake's visitor center by the COE and at South Shore and Eldon Hazlet state parks by the IDNR. These programs can be used to reach many of the lake's visitors.

Signs that alert the public to the fact that venomous snakes occur in the area and are a part of nature should be posted in areas thought to be inhabited by massasaugas. These signs should inform the public of the shy, retreating nature of massasaugas and that they are protected by law and may not be killed, collected, or harassed.

Site brochures, controlled hunting information, and other site-specific publications should include basic information about the presence of massasaugas, their protected status, and how to handle chance encounters. All publications, signs, and other information sources will need to be carefully designed in order to promote protection of the species while not creating an atmosphere in which site visitors are reluctant to continue normal activities for fear of an encounter with a massasauga.

A plan will also be developed to educate people in the Kaskaskia Watershed about the snake. Education programs will be coordinated and fully involve the IDNR Ecosystem Partnerships in the area. Partnerships exist at the lake and below the dam. Request for funding educational programs in the watershed will be submitted to the partnerships as well as request for assistance from their members. Efforts will also be made to involve the Kaskaskia Watershed Coalition in the educational and protection efforts. Other Federal, state, and local agencies will also be requested to participate in the development and implementation of this educational program. The key to the continued survival of the massasauga is the education of the watershed's population, especially the young people.

2. State and Federal employee education.

Area Conservation Officers and Lake Staff need to be informed about what to look for concerning collectors. They need to be informed that the spring and fall migrations make the snake most vulnerable to being killed and/or collected. Prosecution needs to be pursued to emphasize the seriousness of the crime of collecting and/or killing of a state-listed species. If the species becomes Federally listed, the emphasis on preventing collecting on COE property will become a higher priority. All lake staff will be informed and required to implement the Protocol for Handling Massasaugas.

HABITAT RESTORATION AND ENHANCEMENT

1. Develop a plan to expand habitat on Federal and state lands and private property around the lake or other areas in the watershed with known populations. The plan will be based on data collection, monitoring, and public involvement. The plan will involve other Federal, state, local agencies, and watershed interest groups in prioritization, funding, and implementation.

Due to the lack of publicly controlled land surrounding Carlyle Lake, efforts will need to be made at securing easements or other means to continue to provide habitat for the massasauga on private land, if the snakes are to continue to survive. Due to the limited home range of the species, massasaugas may travel on adjacent private property. Currently, much of the adjacent private land is still agricultural; however, with the growth that is being expected in the Metro-East area and in Clinton County, much of the adjacent land is expected to be developed for housing or commercial use in the next 10 to 15 years. It is critical to develop a prioritized plan to use the many existing Federal, state, and private programs to acquire, **from voluntary sellers**, conservation easements to preserve, enhance, and/or restore massasauga habitat adjacent to COE property. Federal and state agencies will be asked to consider areas that offer protection, enhancement, or restoration of massasauga habitat as a priority for funding. Based on data collection, adjacent private lands will be prioritized for enrollment in programs offered by agencies such as NRCS, USFWS, Illinois Department of Agriculture, IDNR, USEPA and IEPA. The Carlyle Lake Ecosystem Partnership will be asked to work with adjacent landowners to secure their involvement in these programs which will provide numerous other benefits to the lake such as improved water quality, reduced siltation, habitat for many other species, etc.

The Register of Land and Water Reserves is a tool that can accomplish long-term protection of an area and still allow some non-intrusive consumptive use. The Register of Land and Water Reserves was begun in 1993 and allows landowners to legally protect important natural resources over the long term while still providing for compatible use and recreation, including hunting, fishing, camping, and trails. Registered areas may be in public or private ownership (Illinois Nature Preserves Commission 1995).

It may also be possible to develop inter-agency agreements with entities such as county and

township road departments that affect massasauga habitat through their maintenance and construction activities. Such agreements could include guidelines for carrying out routine activities in a manner that would minimize adverse effects on massasaugas and their habitat.

FUTURE ACTIONS

1. Produce a report and accompanying map(s) describing the locations of all massasauga sightings, hibernacula, summer foraging areas, and potentially important habitat around Carlyle Lake and in the watershed.

2. Revise stewardship practices, if necessary, as additional information concerning the massasauga becomes available.

3. Develop a priority list of adjacent property or other areas in the watershed that would most benefit the snake population by participating in the government or private programs for habitat preservation, improvement, and/or creation. **Participation in such programs will be strictly voluntary.**

4. Conduct further radio-telemetry studies, if necessary, using individuals from previously unknown populations.

5. Develop site-specific plans with goals and objectives for creating habitat on public lands. Similar plans will be developed for voluntary private landowners.

6. Once the IDNR telemetry study has been completed and the activity patterns mapped out, road crossings and other hazards will be closely studied. If specific roads are found to be particularly hazardous during spring and fall migrations, alternatives will be developed to help reduce the chance of mortality (i.e., road closures, road signs, speed bumps, and/or culverts). Similar conditions may be applied to other locations as other studies are completed.

7. Continuation of the mark and recapture study that began in 1999 will allow for determination of the survival, growth and longevity of massasaugas. Other life history information, including age at first reproduction, frequency of reproduction and food habits will also be gathered from individually identified snakes. Marking techniques may include scale clipping, painting of rattles and implantation of passive integrated transponder (PIT) tags.

8. Long-term monitoring of the massasauga population at Carlyle Lake will be necessary to determine the status of the population and the effects that prescribed management practices and other activities at the site are having on the species. Monitoring should include a continuation of the collection of data from snake's encountered incidental to routine site activities and a well-designed mark and recapture study that will provide data suitable for statistical analysis. Accurate knowledge of the status and trends of the Carlyle Lake massasauga population is

needed both to allow modification of site management practices, where appropriate, and to verify compliance with any candidate conservation agreements that may be developed. A dependable source of funding will be required for the continuation of monitoring.

9. Develop inter agency agreements with entities such as county and township road departments that affect massasauga habitat through their maintenance and construction activities. Such agreements could include guidelines for carrying out routine activities in a manner that would minimize adverse effects on massasaugas and their habitat.

CONCLUSION

Endangered Species stewardship practices recommended by this management plan will apply to all Land Managers operating on Federal and state land at Carlyle Lake.

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APPENDIX A: LIFE HISTORY INFORMATION

TAXONOMY AND DESCRIPTION

The eastern massasauga (*Sistrurus catenatus*) is a member of a small group of rattlesnakes often known as pygmy rattlesnakes or swamp rattlesnakes. Three subspecies of *S. catenatus* are recognized, *S. c. catenatus*, *S. c. tergeminus*, and *S. c. edwardsii* (Conant & Collins 1991). All Illinois specimens have been assigned to the subspecies *S. c. catenatus* (Smith 1961).

Smith (1961) described the eastern massasauga as "a moderate-sized, stout-bodied rattlesnake." The largest Illinois specimen known at the time of Smith's work was 885 mm in total length. The species was further described as having a gray or light brown groundcolor above with 29-40 middorsal light-edged, dark, round, or concave blotches; each side of body with 2 or 3 rows of alternating round dark spots; tail with 4 to 7 dark rings; venter heavily mottled with black; narrow but distinct light stripe extending from pit to angle of jaws on each side of head; top of head with a pair of dark bars extending from the parietal onto the neck (Smith 1961).

ECOLOGY & LIFE HISTORY

Population Ecology

Little is known about the population ecology of the eastern massasauga. Several studies have made estimates of population size and density on small sites. Estimates of population density have ranged from 0.56 to 3.91 snakes per ha (1.4-9.7 per ac) (Maple 1968, Reinert 1978). The 1999 surveys at Carlyle Lake resulted in an estimate of as many as 75 snakes in an area of approximately 16.2 hectares (40 acres). This would indicate a density of as great as 4.6 snakes per hectare in this hibernaculum.

Survival rates of eastern massasaugas are also poorly known. Keenlyne (1968) estimated 50% mortality among first year animals and a mean expectation of further life for the 0-1 year class was 2.85 years. Limited observations by King (1997) found a mortality rate of 78% for neonates from parturition to the first hibernation season.

Habitat Use

Eastern massasaugas exhibit a seasonal shift in habitat requirements. From approximately mid-October through mid-May they occupy lowland areas for hibernating and from approximately mid-May through mid-October they occupy a variety of habitat types for foraging. Hibernacula tend to be lowland sites with massasaugas denning alone in crayfish burrows (Seigel 1986;

Johnson 1989; Mauger 1993; Ballard 1994; Rennicke 1996). In a study in northeastern Ohio, it was found that massasaugas hibernate in wet crayfish holes at depths below the frost line, and can withstand freezing body temperatures for short periods without harm (Maple and Orr 1968). Mauger (2000, personal communication) found that while massasaugas may not use the same crayfish burrow, they will return to the same general area each fall to overwinter. It has been documented in a northeastern Illinois study (Mauger 1993) that snakes may occupy a foraging area up to 2.42 km (1.5 mi) in radius from overwintering sites. At Carlyle Lake, Phillips (2001, personal communication) has documented that distance to be approximately 1 kilometer (0.62 miles).

In a New York study, Johnson (1989) found that female massasaugas utilize lowland areas as basking and birthing sites. A northeastern Illinois study (Wright 1941) found that females mature in their third year. Data from Pennsylvania and Missouri indicate that reproduction is either annual or biennial (Reinert 1981; Seigel 1986), with broods of 8-10 young being produced (Ernst 1992).

Data collected at Carlyle Lake (Phillips et al. 1999) suggest that massasaugas actively select locations close to retreats and shrubs for a period of several weeks after spring emergence from hibernation. This same pattern of remaining near areas of shelter has been observed during the summer and fall (Bielema 1973). Because we lack site specific information concerning habitat utilization by pregnant females, additional research will be required to determine appropriate management practices for this portion of the population.

Dispersal and Home Range

Researchers have measured the area used by massasaugas in at least three different ways. Some studies looked at home range in the traditional sense (the total area used by an individual over a specified time). Others considered the average daily movement or the range length (the distance between any two points an individual snake moved).

By all measures, pregnant female massasaugas are generally less active than males or non-pregnant females. King (1997), however, found average range lengths of 1,331 m (4,367 ft) for adult males, 653 m (2,142 ft) for gravid females and 334 m (1,096 ft) for non-pregnant females. Mean home ranges recorded by King (1997) included 161 ha (398 ac) for males, 2.8 ha (7 ac) for pregnant females and 6.7 ha (17 ac) for non-pregnant females. The maximum range length recorded by King (1997) was 3,156 m (10,354 ft).

Food Habits

Massasaugas detect food items by thermal, visual, vibration or chemical cues (Prior 1991). The major prey items include rodents and snakes (Seigel 1986; Johnson 1995).

Mortality

King (1997) identified road kills, predation and intentional killing by humans as the causes of the death of snakes involved in his study. The rattle from an adult snake and transmitters from three neonates were found in one owl pellet (King 1997). At Carlyle Lake, these same causes of mortality have been documented (Ballard & Phillips, personal communication). Siegel (1986) found that road kills accounted for more than 25% of the massasaugas collected during his study.

DISTRIBUTION

Range-wide

The range of the eastern massasauga is typically described as western New York and southern Ontario to eastern Iowa and extreme eastern Missouri (Conant & Collins 1991).

Illinois

Historically, eastern massasaugas were documented in 18 Illinois counties by either vouchers or literature records, with the presumed range comprising the northern four-fifths of Illinois (Smith 1961). An update prepared by Morris (1990) added three more counties. A recent study funded by the Wildlife Preservation Fund (Beltz 1992) suggested the current distribution of massasaugas includes no more than eight Illinois counties. Newer findings suggest that the Carlyle Lake population is the only known viable population of massasaugas in Illinois, and is the last stronghold for the species in the state. For example, Allerton Park in Piatt County has been listed as one of two or three areas in Illinois where massasaugas are thought to occur in fairly large, stable populations. Post (1994) stated: "Allerton Park in central Illinois is one of the last places in the state to view the snake." Beltz (1992) considered the Allerton Park population to be a "stable, fairly large population," with its "probability of survival as very high." However, no massasaugas have been reported at the park in six years (Kingston 2000, personal communication). Most of the massasaugas seen at Allerton Park have been at the prairie restoration on the south side of the Sangamon River, but those snakes were moved there over the last 20 years from the vicinity of the 4-H camp on the north side of the Sangamon River (approximately 1.5 km away). It is possible that moving the snakes from suitable habitat at the 4-H camp to unsuitable habitat in the prairie restoration has resulted in the decline of the species at Allerton Park. It is premature to say that the population has been extirpated, but clearly the massasauga population at Allerton Park is not well understood. The population there is thought to number around 30 (Phillips and Korab 1998). After several years of fruitless searching, eastern massasaugas have been documented in Will and Lake Counties during 1999. A pregnant female found in Will County gave birth to 20 young, all of which were released along with the adult snake. (Anton 2000, personal communication).

In spite of these recent records in northeast Illinois, the stability of the Allerton Park, Will, and

Cook/Lake populations is unknown, making the Carlyle Lake population even more important to protect the species from extirpation. Furthermore, the fact that the status of the Allerton Park population has gone from stable to uncertain in six years demonstrates the fragile nature of populations of this species.

Carlyle Lake

The eastern massasauga is known from Carlyle Lake along the shorelines and adjacent habitat south of the railroad trestle that connects Keyesport and Boulder. The species is present at both state parks– Eldon Hazlet and South Shore. On the east side, sightings have been made at the Dam East Recreation Area and east and northeast along Saddle Dam 2, through South Shore State Park, along Saddle Dam 3, and then north to just south of the Coles Creek Recreation Area. Two additional localities exist just south and southwest of the Boulder Recreation Area. The 1997 South Shore State Park plan of work identified and set aside approximately 40 acres at the east end of the park, north of Saddle Dam 3, as a "massasauga research area", due to the concentration of sightings in this area. Intensive searches during the spring of 1999 found 48 eastern massasaugas in this area (Phillips et al. 1999).

STATE AND FEDERAL STATUS

The eastern massasauga was added to the Illinois list as state-endangered in 1994 (Illinois Endangered Species Protection Board 1994). Over its range, the species is endangered in Iowa, Missouri, New York, Pennsylvania, and Wisconsin; it is threatened in Indiana, and is a species of special concern in Michigan, Minnesota, and Ohio (Levell 1995). A status report was completed by the U. S. Fish and Wildlife Service (Szymanski 1998) to determine if the species should be elevated to candidate status, and if so, it will be followed by a proposal to list it as Federally Threatened. The U.S. Fish and Wildlife Service elevated the eastern massasauga to candidate status in October 1999.

CAUSES OF DECLINE

As with most rare species, the principle cause of the decline of the eastern massasauga is ongoing modification and destruction of suitable habitat. The wet prairie habitat favored by the species was once widespread across large portions of Illinois and the Midwest. As these areas were converted to agricultural use or developed for residential or commercial uses, massasaugas were either forced from the area, killed directly, or left without suitable habitat for hibernation, reproduction, and long-term survival.

Other causes of the reduction in the range and abundance of the eastern massasauga are secondary effects of the conversion of their habitats. As development for human objectives

continues, road kills become more likely, and encounters between humans and massasaugas increase. Unfortunately, many of these encounters result in the death of the snake at the hands of a person who does not understand the role of the massasauga and other snakes in the ecosystem.

CURRENT THREATS

Current threats to the massasauga are the same as the causes of decline described above. Habitat loss is ongoing, with conversion of relatively intact habitat to urban uses being a particular problem in areas such as northeast Illinois. Road kills are documented on a regular basis, even where populations are believed to be severely diminished (Anton 2000, personal communication). Intentional killing of massasaugas and other venomous snakes are common, even on public lands where the species are protected by law (Ballard 2000, personal communication). At Carlyle Lake, mortality as a result of road kills and intentional killing has been recorded as recently as the summer of 1999 (Ballard 2000, personal communication). Development of undeveloped areas at Carlyle Lake is also a potential cause of mortality through direct killing during construction or as a result of habitat loss.

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APPENDIX B. PROTOCOL FOR HANDLING MASSASAUGAS AT CARLYLE LAKE

When a massasaugas is encountered, the following steps should be taken:

1) Immediately call the following contact people, in the order listed, until you contact one:

1. Jim Birdsell, IDNR Naturalist, Eldon Hazlet State Park	(618) 594-3015
2. Joe Smothers, Corps of Engineers, Carlyle Lake	(618) 594-2484
3. Dr. Mike Dreslik, INHS	(217) 300-0970
4. Dr. Chris Phillips, INHS	(217) 244-7077

2) Stop any activities that could harm the snake (for example, heavy equipment operation within a few meters of the snake).

3) If the snake moves away, let it go, but follow at a safe distance until it stops again or it goes into an inaccessible area (thick brush, underground, etc.).

4) Mark the area where the snake was initially seen and where it was last seen or be able to point-out these positions to the contact person. Wait as near as possible to the snake or its last observed position until the contact person arrives.

5) With help from the contact person, fill out the "massasauga data sheet" as completely as possible.

The contact person should do the following:

1) Respond by meeting the caller at the site as soon as possible. If you can't respond, call the back-up person and ask them to respond.

2) Once you arrive at the site, assist the caller in filling out the "massasauga sighting data sheet". This may work best if you fill out the sheet by asking them the questions. Assign a "sighting number" to the data sheet. This number should be a unique number, so Jim and Joe will have to coordinate the assigning of numbers, so they don't assign the same number twice.

3) Flag the original location with a forestry flag numbered with the sighting number.

4) If the snake is dead (a road-kill, for example), put it in a plastic bag and freeze it immediately. Write the sighting number on a piece of paper and put it in the bag with the snake. Contact Dr. Mike Dreslik to have him get the snake for preservation, register the GPS coordinates and record habitat data at the location. This may take up to two weeks if no live snakes are ready to be processed (see below), so the forestry flagging should be secured and checked at least every other day, if possible.

5) If the snake is alive, carefully put it in a snake bag using a snake hook at least three feet long. Transport the snake to the Eldon Hazlet site office and transfer it to an approved container for housing venomous snakes. Provide it with a heavy dish full of water and a heat source if the room is less than 70 degrees F. Contact Dr. Mike Dreslik as soon as you can after the snake is secured in the site office. Arrangements will be made for the transfer of the snake to Dr. Mike Dreslik within three days. Dr. Dreslik will process the snake (permanently mark it, photograph it, and weigh it) and register the capture location. Dr. Dreslik may take the snake to the veterinarian for radio transmitter implantation or he may release it near the capture location if possible. All releases will be made as close to the capture location as reasonably possible. If this is not possible, a release site will be chosen with the consultation of Dr. Mike Dreslik.

6) Make a copy of the "massasauga data sheet" and it to Dr. Mike Dreslik at the addresses listed below. The original should be filed at the Hazlet site office.

Dr. Mike Dreslik
Herpetologist
Illinois Natural History Survey
607 East Peabody Drive
Champaign, Illinois 61820

Phone: 217-300-0970
FAX: 217-244-0802
dreslik@illinois.edu

NOTE:

All equipment required to safely perform these procedures will be supplied by the IDNR, Division of Natural Heritage. Items will include snake bags, snake tongs, transport containers, water bowls and reptile heat source.

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