

**Survey for the Eastern Massasauga (*Sistrurus c. catenatus*)
in the Carlyle Lake Region:**

Final Report for Summer 2003 – Spring 2004

Submitted to the:

**Illinois Department of Natural Resources
In Fulfillment of DNR Contract Number R041000001**

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Submitted by:

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INTRODUCTION

At the time of European settlement, the eastern massasauga (*Sistrurus catenatus catenatus*) was found throughout the northern two-thirds of Illinois. There are accounts of early travelers and farmers encountering 20 or more massasaugas in a single season (Hay, 1893). As early as 1866, however, the massasauga was noted as declining (Atkinson and Netting, 1927). Through subsequent years, habitat destruction and outright persecution reduced the Illinois range of the massasauga to a few widely scattered populations. Of the 24 localities Smith (1961) listed, only five may remain extant (Phillips *et al.*, 1999a) and abundance estimates at all but one are less than 50 individuals (Anton, 1999; Wilson and Mauger, 1999). The exception is the Carlyle Lake population, where recent size estimates have exceeded 100 individuals (Phillips *et al.*, 1999b; *Ibid* 2001). A cooperative effort between Scott Ballard of the Illinois Department of Natural Resources (IDNR) and site personnel at IDNR parks and Army Corps of Engineers (ACE) personnel at Carlyle Lake resulted in approximately 30 reports of the massasauga between 1991 and 1998 (S. Ballard, pers. com.). Most of these reports were associated with mowing and a few were the result of road mortality or incidental encounters with park personnel and visitors. In 1994, the massasauga was listed as endangered in Illinois, which resulted in increased interest in the welfare of the species. More recently, plans for commercial development around Carlyle presented by various government agencies and private groups caused the IDNR to expand its investigations into the status of the massasauga at Carlyle.

In 1999, we began a study at Carlyle Lake with three major objectives: 1) document the snake's distribution through intensive spring searches in recently burned prairie habitats, 2) estimate population size, density, sex ratios, and survivorship, and 3) estimate home range size, analyze movement patterns, and quantify habitat use. This report gives the results of the 2003-2004 field seasons on distribution, activity season, search effort, mortality, sexual size dimorphism, growth, movement, and home range.

MATERIALS AND METHODS

STUDY ORGANISM

The range of the eastern massasauga includes Illinois, Indiana, Iowa, Michigan, Missouri, New York, Ohio, Ontario, Pennsylvania, and Wisconsin. It is afforded legal protection at the state/province level throughout this range. The habitat of the massasauga varies from peat bogs in New York to mixed deciduous/coniferous forest in Ontario to lowland forest and grasslands. Massasaugas exhibit a shift in habitat use during the activity season in most localities where it has been studied (Wilson and Mauger, 1999; Johnson and Leopold, 1998; Kingsbury, 1996, 1999; Weatherhead and Prior, 1992; Seigel, 1986; Reinert and Kodrich, 1982; Minton, 1972; Smith, 1961; Wright, 1941). In general, massasaugas exhibit four distinct activity periods. Winter dormancy occurs underground in crayfish burrows in lowland areas from approximately early November through mid-March. Emergence (egress) begins on the day snakes are first found above ground in the immediate vicinity of crayfish burrows, usually late March, and ends when the snakes leave the immediate vicinity of crayfish burrows in mid-May. The primary activity period follows and ends when the snakes return to the immediate vicinity of crayfish holes in late September. Entrance (ingress) follows foraging and ends when the snakes enter crayfish burrows. Mauger (unpubl. data) found that massasaugas in northeastern Illinois may not use the

same crayfish burrow in successive years, but they return to the same general area each fall to over-winter. At the same study site, D. Mauger (unpubl. data) also documented that massasaugas may occupy foraging areas up to 375 m from over-wintering sites.

STUDY SITES

Carlyle Lake is the largest manmade reservoir in Illinois (26,000 acres) with 11,000 acres of public lands. The lake is an impoundment of the Kaskaskia River constructed by the U.S. Army Corps of Engineers (ACE) in June 1967. The entire lake is bordered by state and federally managed lands, but this public land is limited to less than a mile wide in some areas. The public lands surrounding the lake contain over 600 campsites in seven campgrounds. Many of the surrounding parks and recreation areas also provide swimming, boat access, hunting, fishing, and hiking trails. The lake can be divided into four study sites based on the main recreation areas and surrounding property. Eldon Hazlet State Park (EHSP, ca. 3,000 acres) is located at the southern end of the west side of the lake and receives over 750,000 visitors annually. Hazlet State Park also provides campsites, boat access, hiking trails, and lakefront cottages. South Shore State Park (SSSP, ca. three miles long) is located on the east side of the lake across from Hazlet. Two main areas within SSSP were searched: the Bluebell Picnic Area (BPA) and a 4.6 ha old field at the NW corner of Huey Road and saddle Dam no. 3 (HR3W and HR3E). The ACE managed spillway areas of Dam East Recreation Area (DERA) and Dam West Recreation Area (DWRA) form another study area and the ACE managed Coles Creek Access Area (CCAA) forms the fourth. Several other ACE managed sites have produced massasauga encounters since 1991 and they are James Hawn Access Area (HAWN), Carrigan Access Area (CAA), Massasauga Parking Lot (MPL), Point one (POINT), and Keysport Access Area (KAA).

SURVEY METHODS

We captured live snakes by conducting visual encounter surveys (VES, see Heyer, et al. 1994, for details) in appropriate habitat during the spring egress of 2004, subsequently referred to as VES snakes. We also took advantage of snakes encountered by ACE or IDNR staff or the public, subsequently referred to as incidental encounters and included live captures, sightings of live snakes, and dead snakes. Snakes were processed and returned to the point of capture, usually within a day of encounter. Dead snakes were preserved in formalin and vouchered in the Illinois Natural History Survey Amphibian and Reptile Collection.

Live captures were divided into initial captures and recaptures. For initial captures and recaptures greater than 30 days since their previous capture, we recorded: sex (using cloacal probing), maturity (we defined adults as snakes longer than 46 cm SVL since this was the smallest size at which a snake was observed copulating), snout-vent length (SVL) and tail length (TAIL) with a flexible tape (to the nearest mm), number of subcaudal scales (SSC), number of rattle segments (RS), and mass (MASS) with Pesola® pull spring scales or an Ohaus® electronic balance (to the nearest gram). We identified individuals by clipping ventral scales (Brown and Parker 1976), painting rattle segments (Brown *et al.*, 1984) with nail polish, injecting a PIT tag subcutaneously (Camper and Dixon 1988), and photographing the body pattern. Rattle painting was not permanent, but allowed identification of individuals from a distance to minimize disturbance.

RESULTS

We observed 31 snakes from Summer 2003 through mid-Spring 2004 (Figure 1). We captured 23 of those during spring egress timed visual encounter searches of 11 locations (Table 1). Most of the 23 captures were made in South Shore State Park with 82.88 hours of searching (Table 1). It required an average of 5.8 search-hours to capture a Massasauga in Spring 2004. In addition to the VES snakes, four snakes were encountered dead (3 DORs and 1 killed during Spring burning at Eldon Hazlet State Park [Table 2]) and four were encountered by COE personnel. Within year recaptures were only made at South Shore State Park (Table 2).

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Corps of Engineers personnel for their cooperation. Finally, we thank M. Allender, D. Shepard, A. Kuhns, T. Hunkapiller, and J. Merkelbacher for help in the field.

Table 2: Size and recapture information for *S. c. catenatus* captured and salvaged from the Carlyle Lake area, Clinton County, Illinois, from Summer 2003 through Spring 2004.

Snake	Cap Status	Cap Date	Sex	SVL	Tail	Mass	Easting	Northing	Disposition
Eldon Hazlet State Park - Apache Boat Ramp									
150	Recap	3/29/2004	Male	66.4	7.8	321	298092	4281960	Alive
Eldon Hazlet State Park - Archery Range									
316	Recap	3/20/2004	Male	59.9	6.6	239	298279	4282858	Alive
Eldon Hazlet State Park - Cottages									
421.3	Initial	9/24/2003	Male	NA	NA	NA	298398	4282255	Mortality (DOR)
438	Initial	4/17/2004	Male	NA	NA	NA	298406	4282256	Mortality (DOR)
Eldon Hazlet State Park Cabin Restoration									
421.6	Initial	3/10/2004	Male	NA	NA	NA	298383	4282675	Mortality (Management)
Eldon Hazlet State Park - Field #3									
426	Initial	4/2/2004	Male	48.5	5.8	125	296732	4283296	Alive
427	Initial	4/2/2004	Female	58.1	58.6	58.4	296701	4283265	Alive
430	Initial	4/5/2004	Male	60.8	7.6	288	296751	4283331	Alive
431	Initial	4/5/2004	Male	55.7	6.9	191	296697	4283284	Alive
434	Initial	4/6/2004	Male	67	7.7	380	296753	4283315	Alive
435	Initial	4/7/2004	Female	61.3	5.1	261	296753	4283294	Alive
Massasauga Parking Lot									
433	Initial	4/6/2004	Male	24.8	2.8	15.8	304350	4277776	Alive
437	Initial	4/7/2004	Male	23.4	2.8	26.5	304169	4277791	Alive
South Shore State Park - Saddle Dam #3									
421.9	Initial	3/7/2004	Male	NA	NA	NA	300571	4277379	Mortality (DOR)
95	Recap	3/29/2004	Male	68.1	7.5	264	300241	4277174	Alive
181	Recap	6/18/2003	Female	49.2	5.1	155	300331	4277245	Alive
181	Recap	3/29/2004	Female	51	5.2	117	300312	4277215	Alive
196	Recap	4/3/2004	Male	46	5.9	131	300320	4277258	Alive
301	Recap	3/29/2004	Male	59.7	6	226	300527	4277296	Alive
395	Recap	3/29/2004	Female	33	2.8	36	300264	4277187	Alive
395	Recap	4/2/2004	Female	33	2.8	36	300271	4277201	Alive
397	Recap	4/8/2004	Male	47.4	5.8	118	300350	4277288	Alive
422	Initial	3/17/2004	Female	51.8	4.3	168	300369	4277284	Alive
422	Recap	4/5/2004	Female	51.8	4.3	168	300372	4277297	Alive
423	Initial	3/18/2004	Female	55.7	4.9	166	300202	4277176	Alive
424	Initial	3/18/2004	Female	34.8	3.3		300364	4277262	Alive
425	Initial	3/29/2004	Female	35.7	3.4	47.5	300264	4277187	Alive
425.5	Initial	4/2/2004	Male	36.2	4.6	68.5	300308	4277244	Alive
429	Initial	4/5/2004	Female	43.2	4	124	300402	4277266	Alive
432	Initial	4/6/2004	Male	28.9	3.4	26	300217	4277183	Alive
436	Initial	4/8/2004	Male	52	5.9	152	300349	4277287	Alive

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RESULTS

We had 71 massasauga encounters (representing a maximum of 63 individuals) from 28 March to 18 April 2005, during spring egress timed visual encounter searches of 7 locations (Table 1). Fourteen of the encounters were recaptures from previous years. Thirty-eight of the 71 encounters occurred at South Shore State Park with 83.37 hours of searching.

In addition to the VES snakes, four snakes were encountered by COE personnel.

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Table 1: Search effort for *S. c. catenatus* during Spring 2004 throughout the Carlyle Lake area, Clinton County, Illinois, by site with the number of hours searched, captures made, number of captures per hour (CPUE), and the number of hours required to capture one snake (HPC).

Location	Hours	Captures	CPUE	HPC
CCA Sprayer	1.80	0	0.00	0.0
Dam East	3.38	0	0.00	0.0
Dam West	2.58	0	0.00	0.0
EHSP Campground	2.35	0	0.00	0.0
EHSP Apache	10.08	1	0.10	10.1
EHSP Archery	2.18	1	0.46	2.2
EHSP Cabin Restoration	2.40	0	0.00	0.0
EHSP Field 3	20.61	4	0.19	5.2
Gateway	1.00	0	0.00	0.0
Mass Parking Lot	3.77	1	0.27	3.8
SSSP-W	82.88	16	0.19	5.2
Total	133.03	23	0.17	5.8