

Table 1. Snake species encountered during surveys in Knox County 2011-2013.

		Western Fox Snake <i>Elaphe vulpina</i>	Milk Snake <i>Lampropeltis triangulum</i>	Northern Water Snake <i>Nerodia sipedon</i>	Dekay's Brownsnake <i>Storeria dekayi</i>	Red-bellied Snake <i>Storeria occipitomaculata</i>	Garter Snakes <i>Thamnophis</i> spp
Number of Individuals in 2011	Coverboards 58 days Spring & Summer	1	0	0	27	5	112
	Visual Survey 58 man hours	1	0	1	0	3	3
	Drift Fence - Fall 42 trap nights	1	1	0	1	0	12
	Total	3	1	1	28	8	127
Number of Individuals in 2012	Coverboards 43 days Spring & Summer	0	0	0	7	6	37
	Visual Survey 129 man hours	0	0	0	0	0	4
	Drift Fence- Spring 43 trap nights	0	0	0	0	0	21
	Drift Fence- Fall 33 trap nights	0	0	0	0	0	6
	Total	0	0	0	7	6	68
Number of Individuals in 2013	Coverboards 18 days Spring	0	0	0	2	6	10
	Total	0	0	0	2	6	10
TOTAL 2011-2013		3	1	1	37	20	205

Table 2. Snake species encountered during surveys at Massassauga Prairie Nature Preserve, Warren County, 2011-2013.

		Western fox snake <i>Elaphe vulpina</i>	Milk snake <i>Lampropeltis triangulum</i>	Northern water snake <i>Nerodia sipedon</i>	Dekay's brownsnake <i>Storeria dekayi</i>	Redbellied snake <i>Storeria occipitomaculata</i>	Garter snakes <i>Thamnophis spp</i>
Number of Individuals in 2011	Coverboard 58 days Spring & Summer	1	0	0	0	0	1
	Visual Survey	0	0	0	0	0	0
	Total	1	0	0	0	0	1
Number of Individuals in 2012	Coverboard 43 days Spring & Summer	0	0	0	1	5	1
	Visual Survey	0	0	0	0	0	0
	Total	0	0	0	1	5	1
TOTAL 2011-2012		1	0	0	1	5	2

Table 3. Catch per unit effort between years for all survey methods in Knox County, Illinois.

Survey Type	Catch Per Unit Effort (CPUE)			MEAN
	2011	2012	2013	
Coverboards (captures per trap day)	0.83	0.04	0.07	0.06
Live Traps (captures per trap day)	0.007	0.003	N/A	0.005
Visual Surveys (snakes per hour)	0.14	0.03	N/A	0.06

Discussion:

Because of missing survey data, the total number of garter and red bellied snakes is underreported here, making analysis difficult. Nevertheless, there was a low diversity and low total number of snakes found at these sites during the study.

It would be difficult to analyze the coverboard and drift fence data in a meaningful way as there was not much replication from year to year. Coverboard searching received similar intensity in 2011 and 2012 at 58 and 43 respectively. However, a majority of the searches in 2011 occurred during the summer and in 2012 they were conducted in the spring. In addition, spring 2012 coverboard searches occurred a full month earlier than in 2011. Similarly, drift fence numbers are skewed by season; the 2011 results are from the fall only and the 2012 results include both the spring and fall.

Even the visual surveys are difficult to correlate to one another. The 2012 season had more than twice as many hours (129 hours) as the 2011 visual searches (58 hours) because there was an additional warm month earlier in the spring to survey. Many of those late March searches could have been completed before snakes were out and active. In addition, not each site that was burned in 2011 was burned in 2012. And finally, the search intensity differed between sites and years as well.

Weather conditions may have adversely affected searching in some periods of this study. Spring 2011 was unusually wet followed by unusually dry conditions in the summer and fall. Soil was extremely dry, even under coverboards. An unseasonably warm spring early in 2012 caused vegetation to grow quickly which resulted in poor conditions for visual surveys. Drought conditions from below normal rainfall extended from summer 2011 through the end of 2012. Climate observations are from the National Weather Service (<http://www.nws.noaa.gov>).

Other than poor weather sometimes affecting searching conditions, there is no explanation for the low diversity and total number of snakes encountered in Knox County and at Massasauga Prairie Nature Preserve. All habitats in the study area appear to be favorable for snakes and few disturbances were noted in the study areas during the surveys. Small mammals were captured in the live traps which would indicate a good food source for snakes.

One positive aspect of the study is that we had many opportunities to talk to landowners and others who traveled the roads in this area. The drift fence was near a road intersection and many people stopped to talk to us while we were checking live traps. We passed out informational brochures to landowners and gave DNR contact information to anyone to whom we talked. Most

passersby had stories about encounters with eastern massasauga rattlesnakes from 20-40 years ago. Unfortunately, we did not hear of any recent familiar observations. We are hopeful that any additional massasauga rattlesnake encounters will be reported to us because of the public relations effort put forth during the study.

Because of the large amount of habitat available at the Knox County sites, additional rattlesnake surveys should be conducted. There are many acres of marginal wetland and upland areas which have not been searched. Massasauga Prairie Nature Preserve received the least search time during this study and should be surveyed again for massasauga rattlesnakes. Although the protected area in the Nature Preserve is small, it is possible that massasaugas still inhabit the site in low numbers.

Appendix D provides a summary of the budgetary expenditures over the life of the grant.

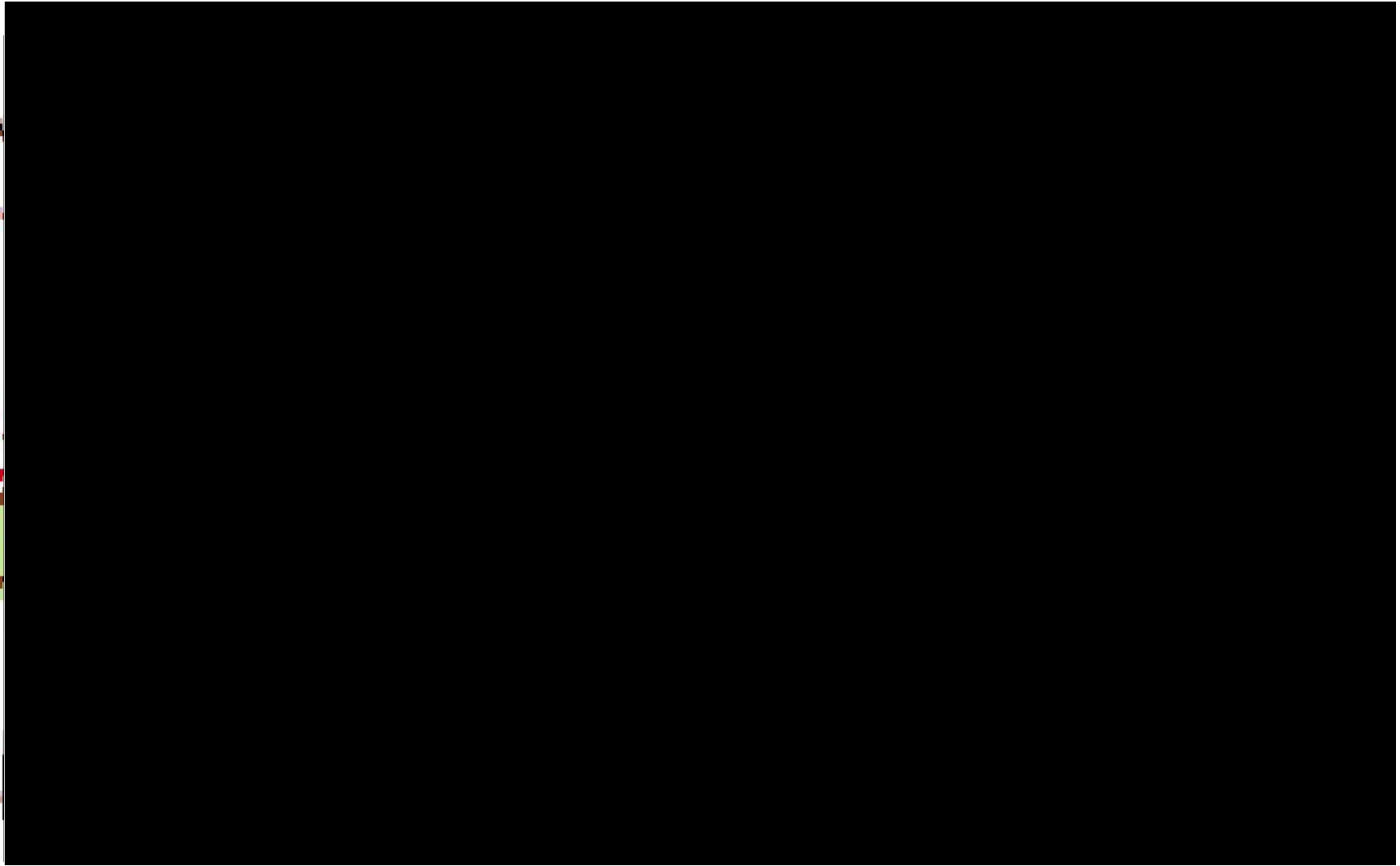
Summary:

Eastern massasaugas have been documented in Knox County at six separate locations and were last seen in 2010. A population of massasaugas also historically occurred at Massasauga Prairie Nature Preserve, with the most recent sighting in 1972. The purpose of this project was to contract survey teams to conduct comprehensive snake surveys in Knox County at locations known to have recent or historic eastern massasauga rattlesnake occurrences and in areas of adjacent suitable habitat. This study included visual surveys, coverboard surveys, and live trapping along 600 feet of drift fence. No massasauga rattlesnakes were located during the study in Knox County or at Massasauga Prairie Nature Preserve. Despite large acreage of appropriate snake habitat, the diversity and total number of snakes encountered were low. Six snake species were recorded, including Dekay's brownsnake (*Storeria dekayi*), garter snakes (*Thamnophis* spp.), redbellied snake (*Storeria occipitomaculata*), milk snake (*Lampropeltis triangulum*) western fox snake (*Elaphe vulpina*), and northern water snake (*Nerodia sipedon*). Further surveys should be conducted for massasauga rattlesnakes at Massasauga Prairie Nature Preserve and in previously unsurveyed locations of appropriate habitat in Knox County.

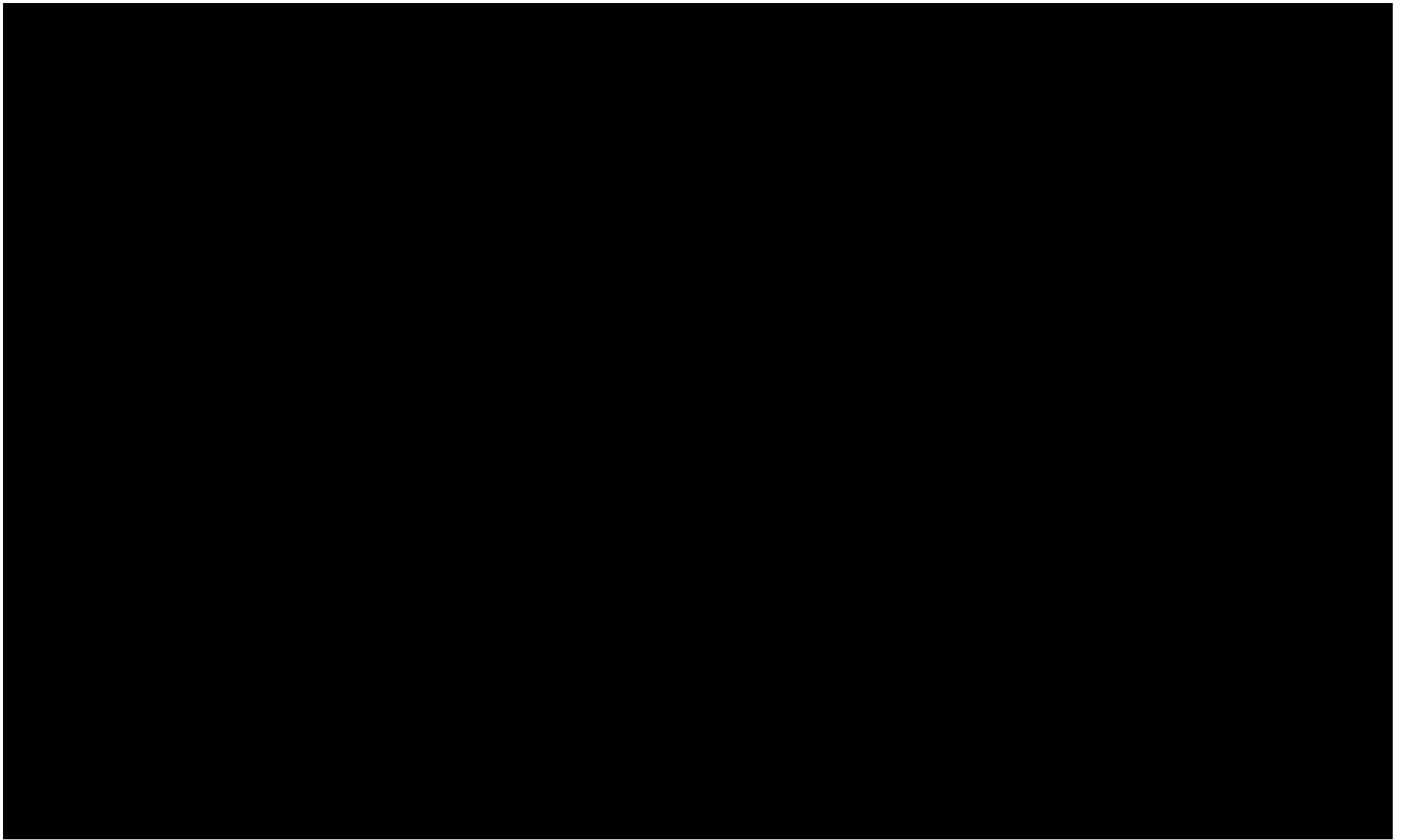
References

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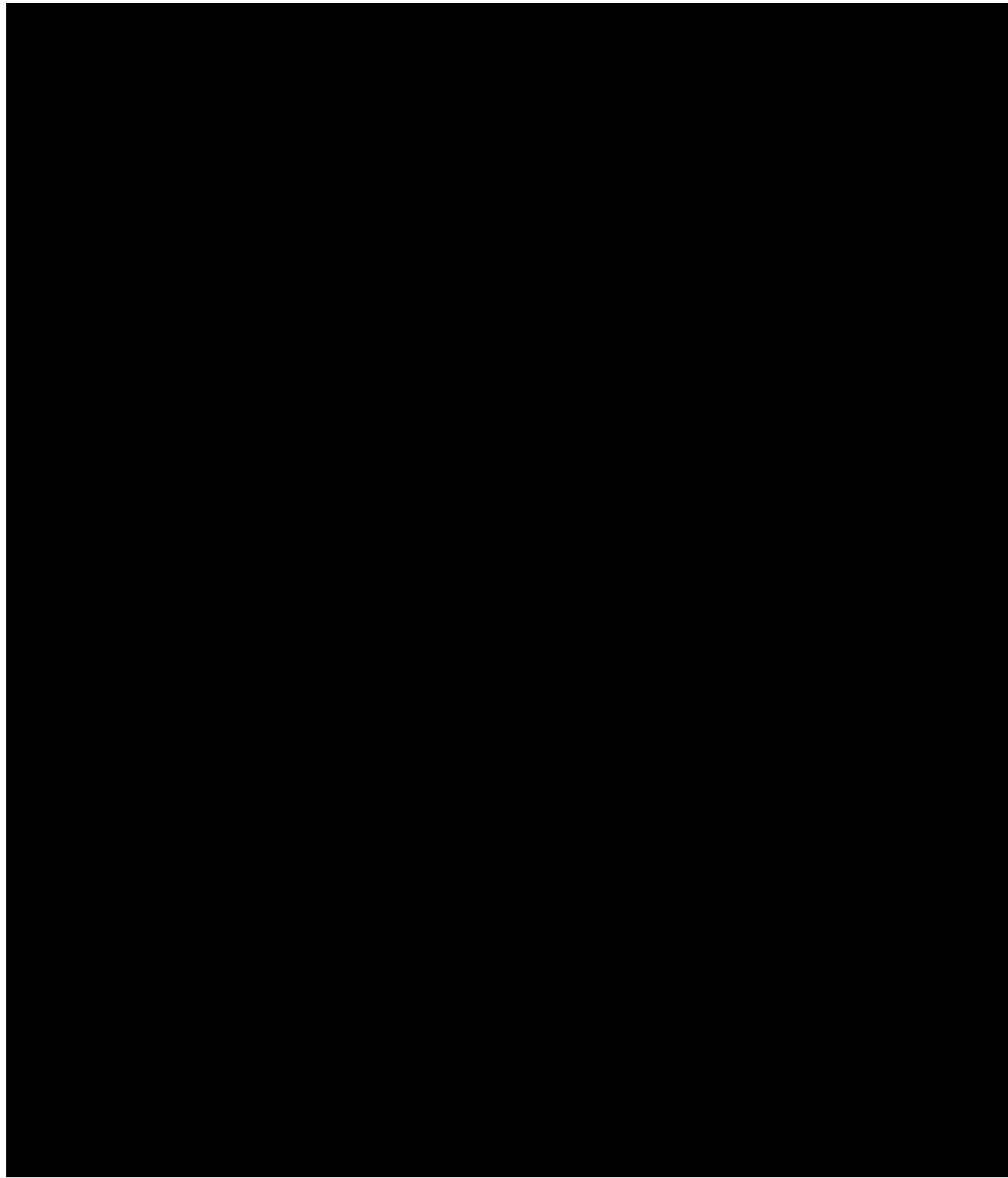
APPENDIX A
Coverboard Placement in Knox and Warren Counties



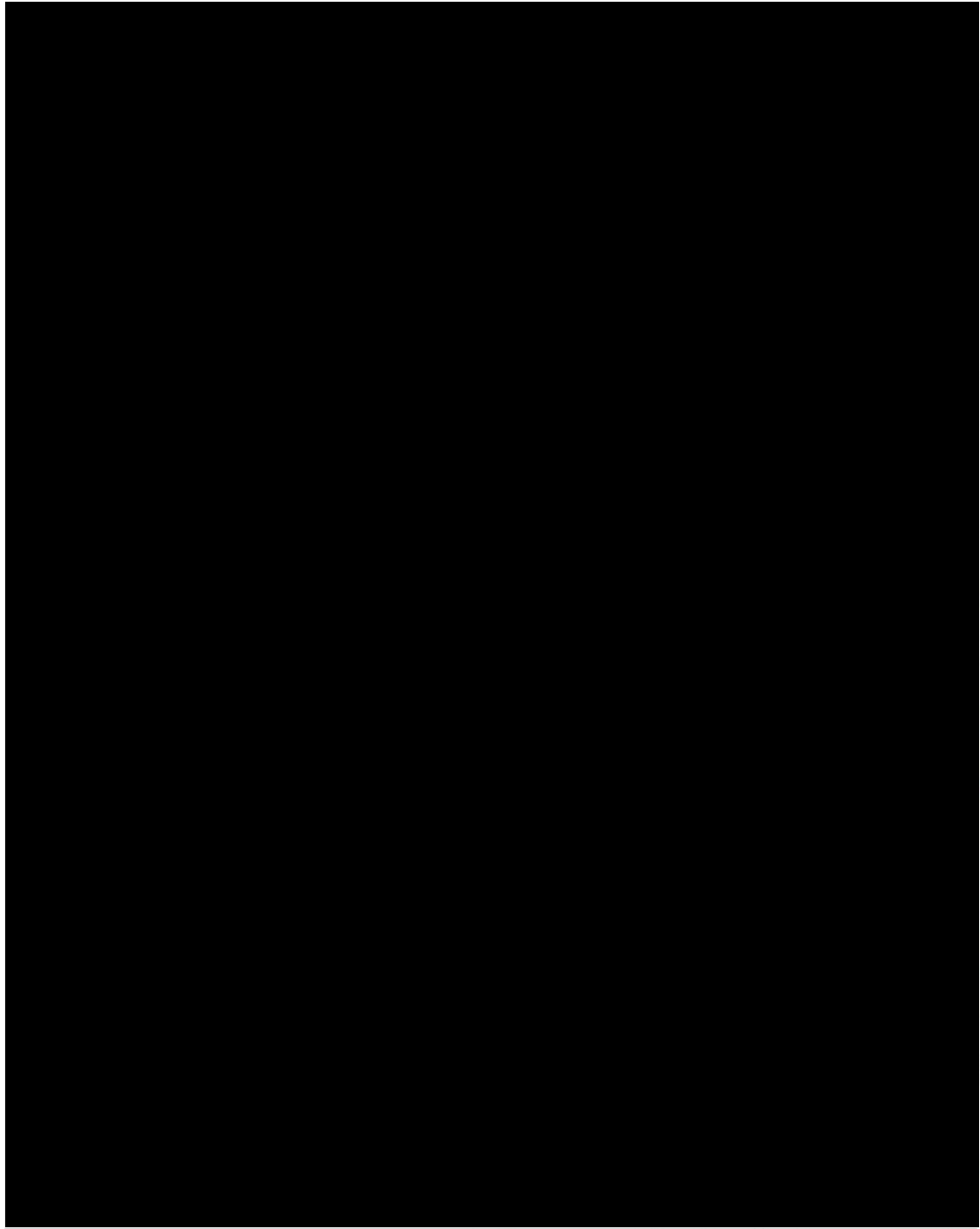
Warren County 2011 and 2012 eastern massasauga rattlesnake coverboard survey locations. [REDACTED].



All Knox County, 2011 and 2012 eastern massasauga rattlesnake coverboard survey locations; [redacted]
[redacted]



Details of Knox County 2011 and 2012 eastern massasauga rattlesnake coverboard survey locations; [REDACTED]



Knox County 2013 eastern massasauga rattlesnake coverboard survey locations. [redacted]
[redacted]

APPENDIX B
Location of Drift Fence

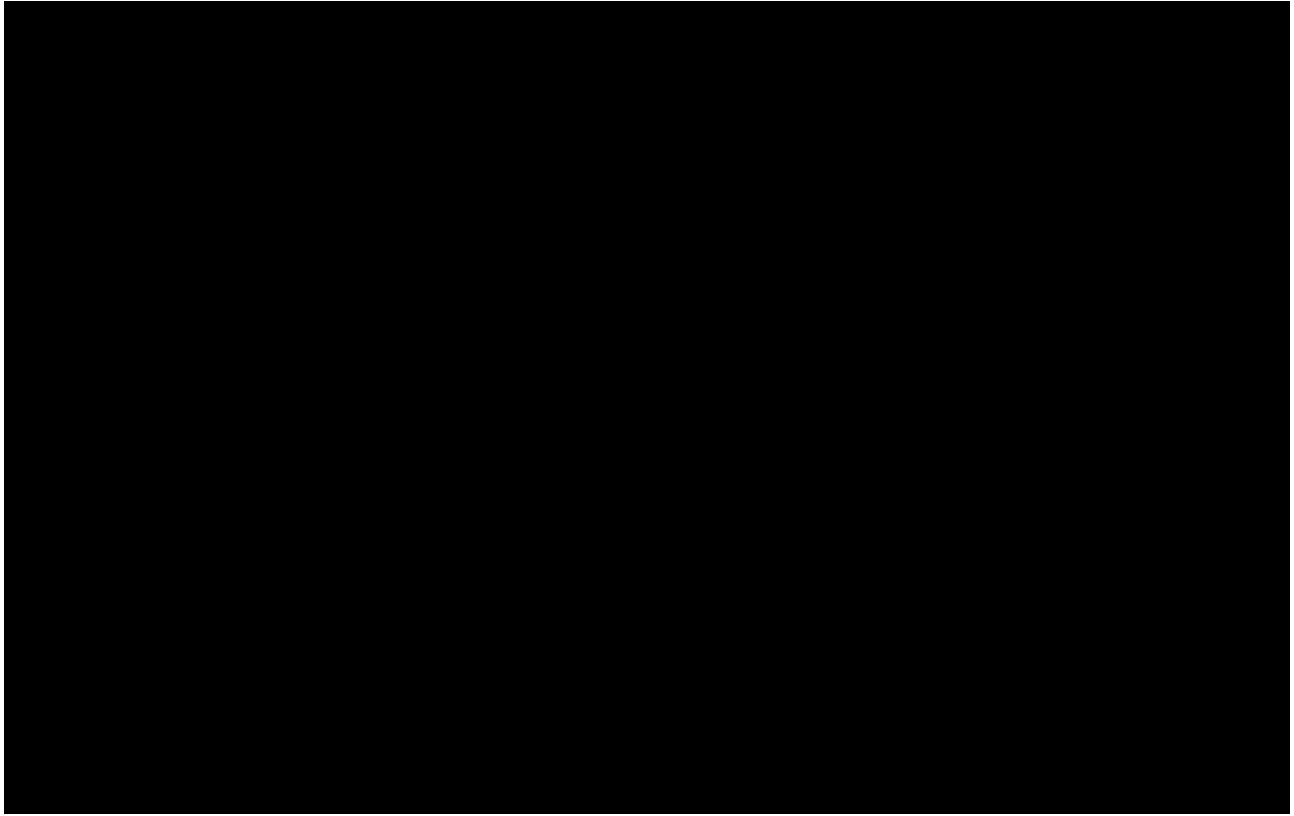


Figure 9. Distant (left) and close up aerial views (right) of the silt fence placement based on recent massasauga sightings (red dots) in Knox County.

APPENDIX C
Summary of the Snakes Observed Across all Detection
Methods, Seasons, Years, and Locations.

Appendix C. Results from 2013 coverboard surveys by site and season.

	Liston Wetland (1-5)	Liston Forest (6-10)	Liston Prairie (11-15)	Knox County Total
Spring 2013 (4/3/13-5/3/13)				
Number of days checked				18
Dekay's Brownsnake (<i>Storeria dekayi</i>)	0	0	2	2
Garter snakes (<i>Thamnophis</i> spp.)	6	1	3	10
Redbellied snake (<i>Storeria occipitomaculata</i>)	6	0	0	6
TOTAL	12	1	5	18
Temperature Range				41-85° F

Appendix C. Results from 2013 live trapping surveys by year and season.

	Fall 2011 (9/15/2011-10/27/11)			Spring 2012 (3/20/12-5/27/12)			Fall 2012 (9/15/12-10/30/12)		
	East Side	West Side	Total	East Side	West Side	Total	East Side	West Side	Total
# Trap Nights			42			43			33
Air Temperature Range			51-85° F			45-87° F			39-75° F
Garter snake (<i>Thamnophis</i> spp.)	7	5	12	10	10	21	2	3	6
Milk snake (<i>Lampropeltis triangulum</i>)	1	0	1	0	0	0	0	0	0
Western fox snake (<i>Elaphe vulpina</i>)	1	0	1	0	0	0	0	0	0
Dekay's brown snake (<i>Storeria dekayi</i>)	0	0	1	0	0	0	0	0	0
American toad (<i>Bufo americanus</i>)	1	0	1	0	0	0	0	0	0
Spring peeper (<i>Pseudacris crucifer</i>)	1	0	1	0	0	0	0	0	0
Other anurans	0	0	0	1	1	2	3	0	5
Voles	4	0	6	0	0	0	1	1	2
Shrews	1	1	3	0	0	0	0	0	2
Mice	0	2	3	0	0	5	0	1	1
SNAKE TOTALS			15			21			6

*Note: If the E/W side columns do not add up to the total, it is because an animal was found, but the fence side was not specified.

APPENDIX D
Budgetary Expenses

Total project expenses for Wildlife Preservation Fund Grant #RC11L20W, Eastern Massasauga Surveys in Knox and Warren Counties, Illinois

	Amount Allocated in Grant	Amount Paid with WPF	Amount paid with IDNR commodities funds	Balance
Salaries and wages w/ fringe benefits	\$ 13,980.00	\$14,551.16	\$0	-\$ 571.16
Materials & Supplies	\$0	\$0	\$768.61	
Travel	\$ 1,020.00	\$448.80	\$0	\$ 571.20
TOTAL DIRECTS	\$ 15,000.00	\$14999.96		\$ 0.04
INDIRECT COSTS	\$ 1,500.00	\$1500.04		-\$ 0.04
TOTAL BUDGET	\$ 16,500.00			\$ 0.00

Commodity expenses paid by IDNR Natural Heritage

Item	Cost
Amphibian and Reptiles of Illinois field guides (2)	\$49.50
Pillowcases, locking tubs, and bucket for transporting snakes	\$41.72
Snake tongs (5)	\$445.00
Drift fence supplies and stakes, top soil for burying fence, and landscape fabric for covering minnow traps	\$232.39
TOTAL OF EXPENSES	\$768.61