Baseline Surveys for the Massasauga Rattlesnake in Minnesota, 2002 & 2003

Prepared for the

Minnesota Department of Natural Resources

May, 2004

EMMONS & OLIVIER RESOURCES

May 15, 2004

Richard Baker
Department of Natural Resources
500 Lafayette Rd.
Box 25
St. Paul MN, 55155

RE: Baseline Surveys for the Massasauga Rattlesnake in Minnesota
Final Project Report
Contract No. A36561

Dear Mr. Baker:

We are pleased to submit to you the final report for the *Baseline Surveys for the Massasauga Rattlesnake in Minnesota*. This report is the culmination of a 2-year field survey project conducted during 2002 and 2003. The project was funded by the Minnesota Department of Natural Resources.

This report documents the methodology and results of our field survey efforts. In addition to the contract specified final report elements, also enclosed is a CD containing the GIS data assembled for this project and electronic images taken during field surveys.

Special thanks goes to yourself, Carol Hall and other members of the MNDNR staff who assisted with this effort. In addition, the advice and training provided to our survey team by Robert Hay, WS DNR and Eric McCumber was invaluable.

Even though no evidence of massasaugas were found in the survey area, we sincerely hope the information contained herein, will aid in future herpetile survey efforts within southeast Minnesota.

Respectfully Submitted,

Jason R. Naber Michael J. Majeski Anthony R. DeMars

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Abstract

In the state of Minnesota the current status of the eastern massasauga rattlesnake *(Sistrurus catenatus catenatus)* is listed as "endangered". Evidence supporting this species' existence in Minnesota is not well documented. A previous study conducted by John Levell documented the historical massasauga records in Minnesota. Field surveys conducted in Houston, Winona and Wabasha counties as part of Levell's study in 1993 did not produce any massasauga evidence. Known populations of massasauga rattlesnakes exist on the east side of the Mississippi River in Wisconsin but historical records can not confirm a population in Minnesota. Our study was conducted to establish a baseline effort for which future survey efforts may be conducted to help determine the official status of the massasauga in Minnesota. Our extensive survey efforts conducted in 2002 and 2003 field seasons focused on areas containing suitable massasauga habitat and historic record locations identified by Levell. A GIS was used to assemble historical record data, aerial photography and land cover to help prioritize survey sites. Surveys were conducted over a two-year period in Houston, Winona and Wabasha counties. Survey methods focused on searching meadows and forest edges along the Mississippi River and its major tributaries. Special attention was given to brush piles and basking sites that through our experience in Wisconsin have been found to be frequently used by massasaugas. Although suitable habitat exists in Minnesota and viable populations are known in adjacent Wisconsin, the survey efforts conducted as part of this baseline project did not produce any evidence of massasaugas in Minnesota. It is recommended that priority sites be resurveyed in upcoming years to help determine this species' official status in Minnesota.

Introduction

The objective of this project is to expend sufficient effort on massasauga rattlesnake *(Sistrurus catenatus catenatus)* surveys in Minnesota to help determine the status of this species in the state.

There has been little research done on the massasauga in Minnesota, likely because of a lack of reliable evidence indicating that a viable population of snakes exists. Moreover, the only documented specimen known from the state is from a snake caught in Wabasha County near Wabasha on June 15, 1936. The exact location of this discovery remains unknown (Levell 1994, Breckenridge 1938). John Levell and MCBS staff conducted the only documented research on massasaugas in Minnesota in 1993. Their search efforts in southeastern Minnesota produced no massasauga sightings. The information provided in their final report was a very useful tool in survey planning for this study.

EOR staff gained experience surveying for massasaugas by assisting with the massasauga telemetry study in the Tiffany State Wildlife Area for the Wisconsin Department of Natural Resources. The study was very useful in understanding snake behavior and habitat use in southwestern Wisconsin. Observed habitat requirements and activity periods of the Wisconsin snakes as well as protocol from Casper et al. (2001) aided in fine-tuning the survey protocol used for this study. Jason Naber, Mike Majeski and Tony DeMars of EOR completed field surveys and habitat assessments for this project.

Materials and Methods

Three counties in the southeast corner of the state were included in the survey area: Wabasha, Winona and Houston counties. Initial prioritization of survey sites was based on past massasauga surveys conducted in Minnesota. Site evaluations completed in Wabasha, Winona, and Houston counties by Levell (1994) were used to highlight the best potential habitat within the survey areas. The recommendations and historic sightings stated in Mr. Levell's report were taken into account when identifying the highest priority sites. Also, favorable habitat types were identified using digital aerial imagery, Minnesota County Biological Survey (MCBS) data, National Wetland Inventory (NWI) data, and digital topographic maps. A GIS was used to organize the data and aided in prioritizing survey sites.

Based on information from past massasauga surveys in Minnesota and map data, 12 areas having the highest potential for massasaugas were delineated. Detailed information on each survey site can be found in Appendix 1. Each site was surveyed at least once during the 2002 or 2003 field season and notes were taken on habitat quality. Information collected from each site included time and date of survey, weather conditions, brief description of dominant plant species, and a tally of herpetiles found during the survey. A field guide by Oldfield and Moriarty (1994) was useful in identifying herpetile specimens encountered. The areas that contained the best potential habitat were visited at a greater frequency than other sites. In addition, special attention was paid to the presence of crawfish burrows at each site since massasaugas have used these burrows for winter hibernation in Wisconsin (personal observation). Site conditions observed in 2002 helped narrow our search areas in 2003 and allowed for greater concentration on areas that seemed to have the greatest potential for the existence of a remnant or dislocated population of snakes.

Using the survey protocol from Casper et al. (2001) as a guide, openings in the floodplain and lowland hardwood forests and their associated edges were surveyed whenever possible. Based on our experiences from surveying snakes in the Tiffany Wildlife Area, greater survey effort was applied when brush piles, logs, matted vegetation, and other basking sites. Boards, sheet metal, and large flaps of bark were also flipped over whenever these "terrestrial refuges" were found in the field.

Accounts by Levell (1994) suggest that historical sightings near Reads Landing and the Zumbro bottoms may be the result of snakes that have rafted across the Mississippi River from Wisconsin. If such were the case, the best chance for locating a rafting individual would be along levees and other areas of accumulated flotsam across from the Chippewa River.

Results

Surveys conducted in 2002 and 2003 did not produce any evidence of massasaugas. Field work was planned around local forecasted weather conditions. More time was spent on field surveys in 2003 compared to 2002 since time was needed in 2002 for map creation and site prioritization. Habitat quality varied from site to site from monotypic reed canary grass meadows to diverse wet meadows, lowland hardwoods and shrub-carrs. Although massasaugas were not encountered in either year of this study, 19 species of herpetiles were recorded (Table 1).

Table 1. Herpetofauna found during 2002 & 2003 surveys.

Species	Cannon River Bottoms	Wilcox Landing	Half Moon Lake	Zumbro Confluence	McCarthy Lake WMA	Bass Camp
Leopard Frog	X	X	X		X	X
Green Frog		X			X	
Gray Tree Frog					X	
Bull Frog						
American Toad				X		
Common Garter Snake	X	X	X	X	X	
Gopher Snake			X			
Fox Snake					X	
Red-bellied Snake*						
Northern Water Snake		X		X		
Brown Snake*					X	
Eastern Hognose Snake						
Six-lined Racerunner						
Snapping Turtle				X	X	
Map Turtle**			X			
False Map Turtle						X
Smooth Softshell Turtle						
Painted Turtle	X				X	
Blanding's Turtle					X	

* Non-confirmed sighting
** Exact species not confirmed

Table 1 Continued.

Species	Alma Levee	Trout Creek	Zumbro Bottoms	Whitewater WMA	Reno Bottoms	Root Bottoms
Leopard Frog	X	X	X	X	X	X
Green Frog		X		X	X	X
Gray Tree Frog			X		X	
Bull Frog					X	X
American Toad			X	X	X	
Common Garter Snake	X	X	X	X	X	X
Gopher Snake						
Fox Snake		X		X		
Red-bellied Snake*					X	
Northern Water Snake					X	
Brown Snake*			X		X	
Eastern Hognose snake		X				
Six-lined Racerunner					X	
Snapping Turtle		X				
Map Turtle**			X		X	X
False Map Turtle					X	
Smooth Softshell Turtle					X	
Painted Turtle		X				X
Blanding's Turtle						

* Non-confirmed sighting
** Exact species not confirmed

Discussion

Based on personal experience from the telemetry study in Wisconsin, there appears to be small windows of opportunity for finding massasaugas, particularly in basking situations. Some literature suggests, as Casper et al. (2001) that preferred survey times are during the morning and evening hours. Hay and McCumber (2000) found capture rates were relatively equal throughout different times of the day when favorable weather conditions existed, but on sunny days when temperatures were above 85^0 F, snakes were only found basking in the morning before 9:30 a.m. and after 5:00 p.m. Daytime temperatures for this survey ranged from the mid 50's to mid 80's in both years. Gravid females appeared to tolerate longer basking sessions than other snakes in all weather conditions, even during rainfall. It was relatively common for gravid females to show basking site fidelity, using the same basking sites for weeks in a row before moving on. The likelihood of seeing a snake concealed in cover was near impossible. Even in an area with a large population of snakes, vegetation height and density significantly obscured visibility. Late season surveying proved most difficult as vegetative growth reached its maximum, creating dense, tangled groundcover and shading out small early season basking sites.

To improve the odds for finding massasaugas in Minnesota, effort was made to survey during the morning hours when there was the greatest potential for finding snakes. However, not all suitable habitat could be surveyed during the prime hours of the day and inevitably some areas were surveyed in the afternoon. Therefore, multiple site visits were needed in order to reduce the bias produced from the order of survey site selection. If an individual snake or a remnant population of snakes existed in one of the sites, it could have been easily overlooked depending on the time of the survey and weather conditions.

Other factors that may have affected the outcome of this study are flooding events and drought. The snake populations in Wisconsin were negatively impacted after prolonged flooding of the Mississippi River in 2001 (Hay and McCumber, 2002). Although the actual cause for low snake numbers after the flood was not determined, there appeared to be a strong correlation between the loss of snakes and the severity of the flood. If there were massasaugas within the Mississippi River floodplain in southeastern Minnesota before the 2001 flood, it is possible these snakes would experience a similar population decline after the flood.

Karns (1986) observed that herpetiles seemed to vanish when drought conditions exist. From July to October of 2003, southeastern Minnesota experienced one of the driest periods on record (personal communication, MN DNR State Climatology Office). It is unknown if drought would negatively effect massasaugas in Minnesota.

Recommendations

It is difficult and improper to determine the status of any population of animals with limited research, especially one as elusive as the massasauga. Casper et al. (2001) recommend a survey effort for a minimum of ten years before concluding the possibility of population extirpation. As this being a two-year study, we can only conclude that massasaugas were not found because of climatic factors, chance, or low numbers of snakes. Suitable habitat in southeastern Minnesota is extensive and requires multiple site visits over several years to thoroughly assess for the presence of massasaugas. We highly recommend "seeding" basking structures, such as brush piles, in areas that house few basking sites, especially vast reed canary meadows where thick vegetation

makes for difficult traversing and surveying. Those basking sites should be constructed and mapped using GPS. Follow up surveys should then focus on intensive searches around the constructed basking sites. From our field work and our simple ranking matrix identified in Appendix 1 of this report, we recommend seeding sites include the Root bottoms, Reno bottoms, McCarthy Lake WMA and the Whitewater WMA.

References

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Karns, D.R. 1986. Field Herpetology: Methods for the study of amphibians and reptiles in Minnesota. James Ford Bell Museum of Natural History Occasional Paper No. 18. Minneapolis, MN.

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Appendix 1: Survey Site Descriptions and Locations

The following section includes one-page summaries for each area surveyed as part of this study. Each site summary includes a description of habitat surveyed, a rough map and an assessment of its potential for supporting massasaugas. In and effort to quantify and compare sites surveyed, a simple ranking matrix was developed. Future survey efforts should evaluate this information and use it to prioritize sites for additional surveys.

A total of five criteria were used in the ranking matrix. Following is a description of each criterion's definition and how it was evaluated. A simple numeric score for each site was applied to each criterion with a value of 5 being high and 1 being low. Historic aerial photographs were not used in this ranking methodology. Rankings were based solely on current conditions. Researching historic aerial photographs would help assess the duration current site conditions have existed at each location.

Habitat: Does the site contain suitable habitat to support massasaugas? Comparisons were made to massasauga supporting habitat from personal experience in Wisconsin and nation-wide literature. Comparing vegetative communities to those found within the Tiffany Wildlife Area provided valuable information about the site's hydrologic regime, historic land use and current suitability to massasaugas. Additional considerations were given for evidence of crayfish borrows and evidence of small rodents and other prey animals.

Flood Protection: Is the site protected from large, long-duration flood events? Large flood events that occur particularly post emergence, could have a negative effect on massasauga populations. Without adequate cover above floodwaters, massasaugas seem more prone to predation. Areas with adequate cover above frequent flood elevations were ranked higher on this criterion.

Rafting Potential: Is the site adjacent to or immediately down river from a known population of massasaugas? Known populations of massasaugas exist on the Wisconsin side of the Mississippi River. Although not well documented, it seems possible that periodically a massasauga could make it from the east-side of the River to the west. Either by its own power or by being atop flotsam dislodged in a flood, a single individual could end up on the Minnesota side of the river. Finding one relocated massasauga as opposed to a viable population is logically more difficult.

Security: Is the habitat relatively remote and difficult to access? This was considered for two reasons. First, is the site so remote that a population of massasaugas could have existed here for many years without detection? Second, if a population does exist here would it be extremely difficult for humans to access?

Historical Evidence: Is there credible evidence indicating massasaugas have been found near the survey site? John Levell researched historical records and provided that information in his 1994 report. Our ranking was based on his research.

Cannon River Bottoms

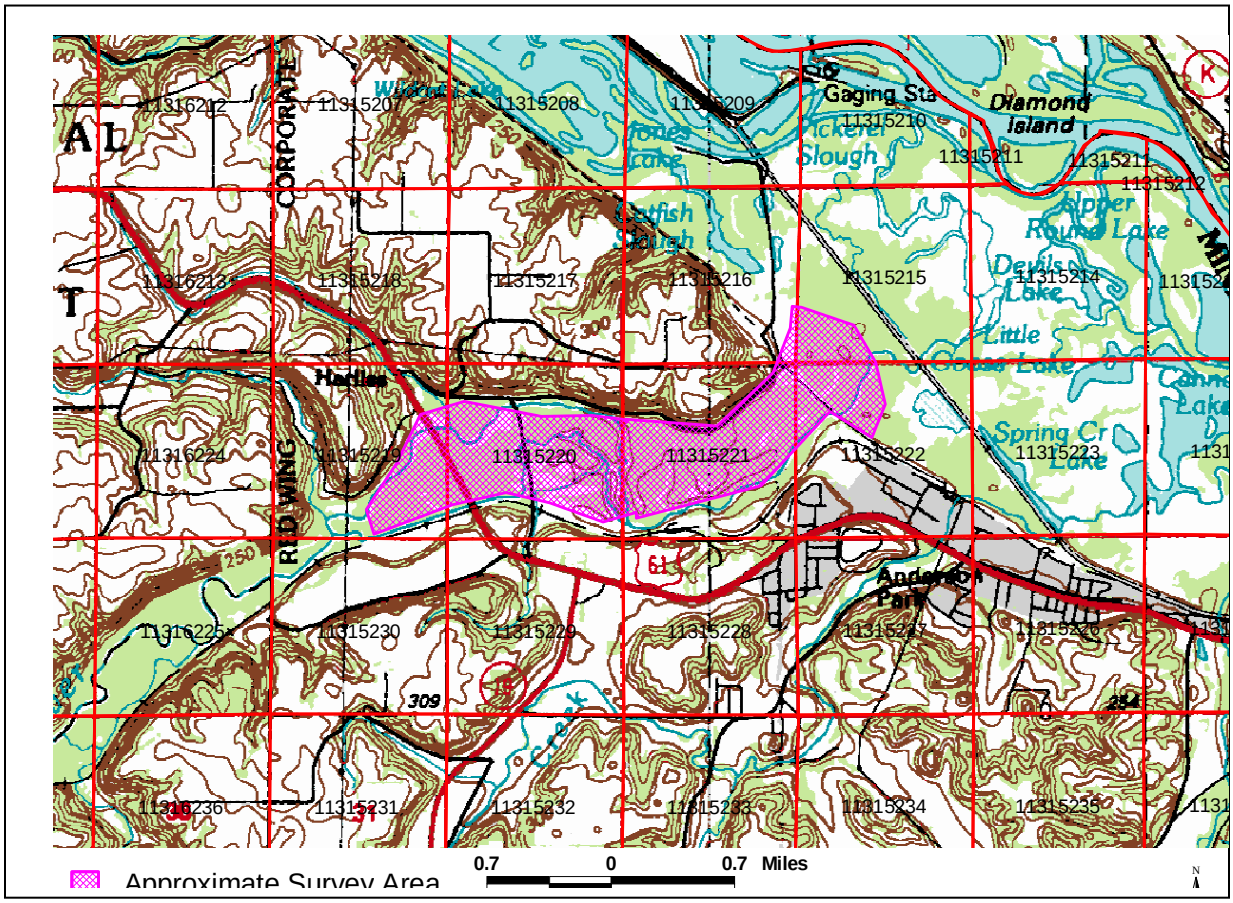
Location: Goodhue County (T113N R15W Sections 15,16,19,20,21,22)

Site description: This area consisted of a lowland hardwood forest with patches of open meadow throughout. There was little plant diversity, mostly reed canary grass, and flood prone areas were sparsely vegetated. Few basking sites existed, though downed trees were present in some areas.

Assessment: It is unknown where the location of the historic massasauga sighting is for the Cannon River bottoms, but areas upstream of our survey site seem to have greater potential. This site was chosen based on historical information provided in the Levell report and the possibility of a viable population of massasaugas living within the bottoms seemed relatively high, since the area lies north of known populations of massasaugas in Wisconsin and the probability of a rafting individual to this area is unlikely.

Ranking: 14

Habitat	Flood Protection	Rafting Potential	Security	Historical Evidence
3	3	1	2	5



Wilcox Landing

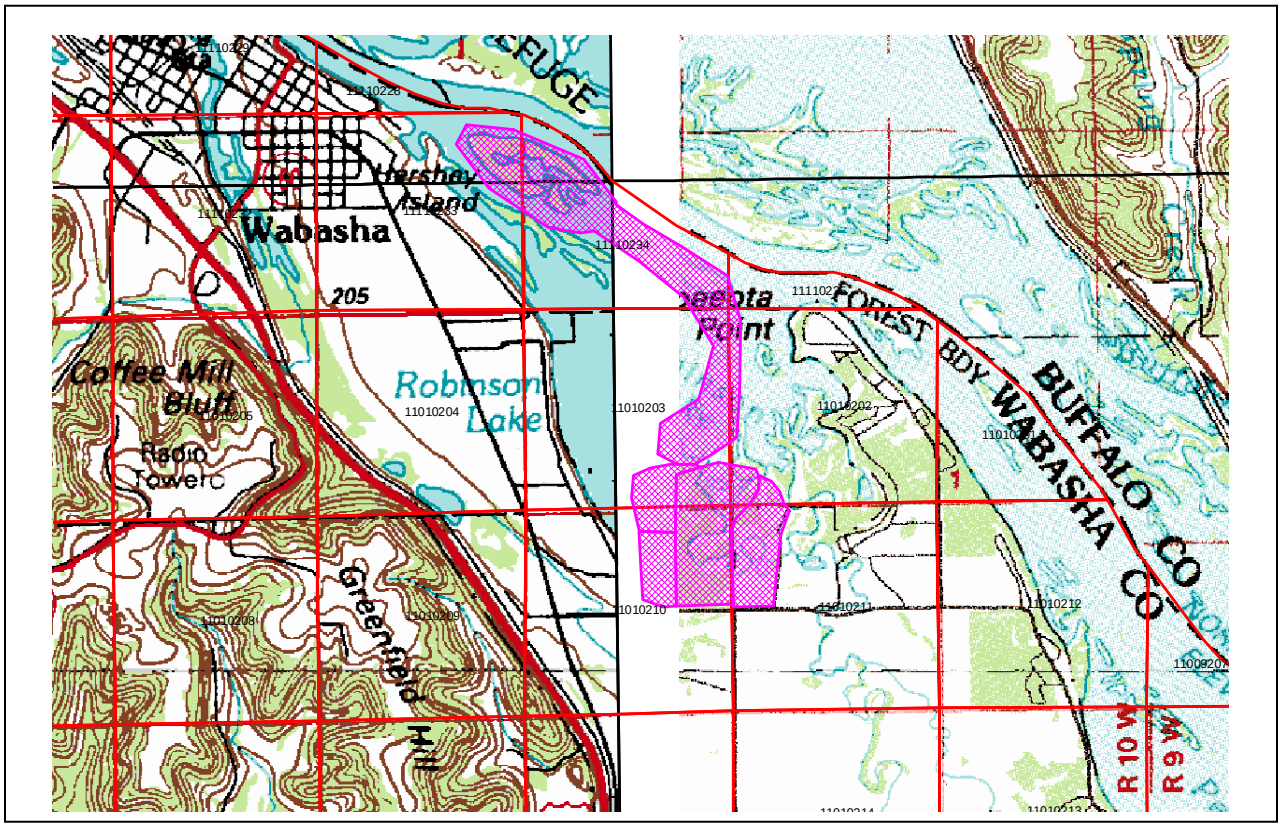
Location: Wabasha County (T110N R10W Sections 2,3,10,11,33,34)

Site description: Patchy lowland hardwoods with shrubs at the edges of the openings were found at this site. The open areas contained reed canary grass and mixed species of sedges. Driftwood and downed trees were found throughout

Assessment: This site has good snake habitat with many crayfish burrows but may be flooded for long periods of time due to its close proximity to the Mississippi River. The site is just down river from the Chippewa River confluence and therefore has a high potential for relocated individuals. Hershey Island is a prime location for relocated massasaugas, however, very little habitat exists here and there is a lot of human activity.

Ranking: 12

Habitat	Flood Protection	Rafting Potential	Security	Historical Evidence
3	2	5	1	1



Alma Levee

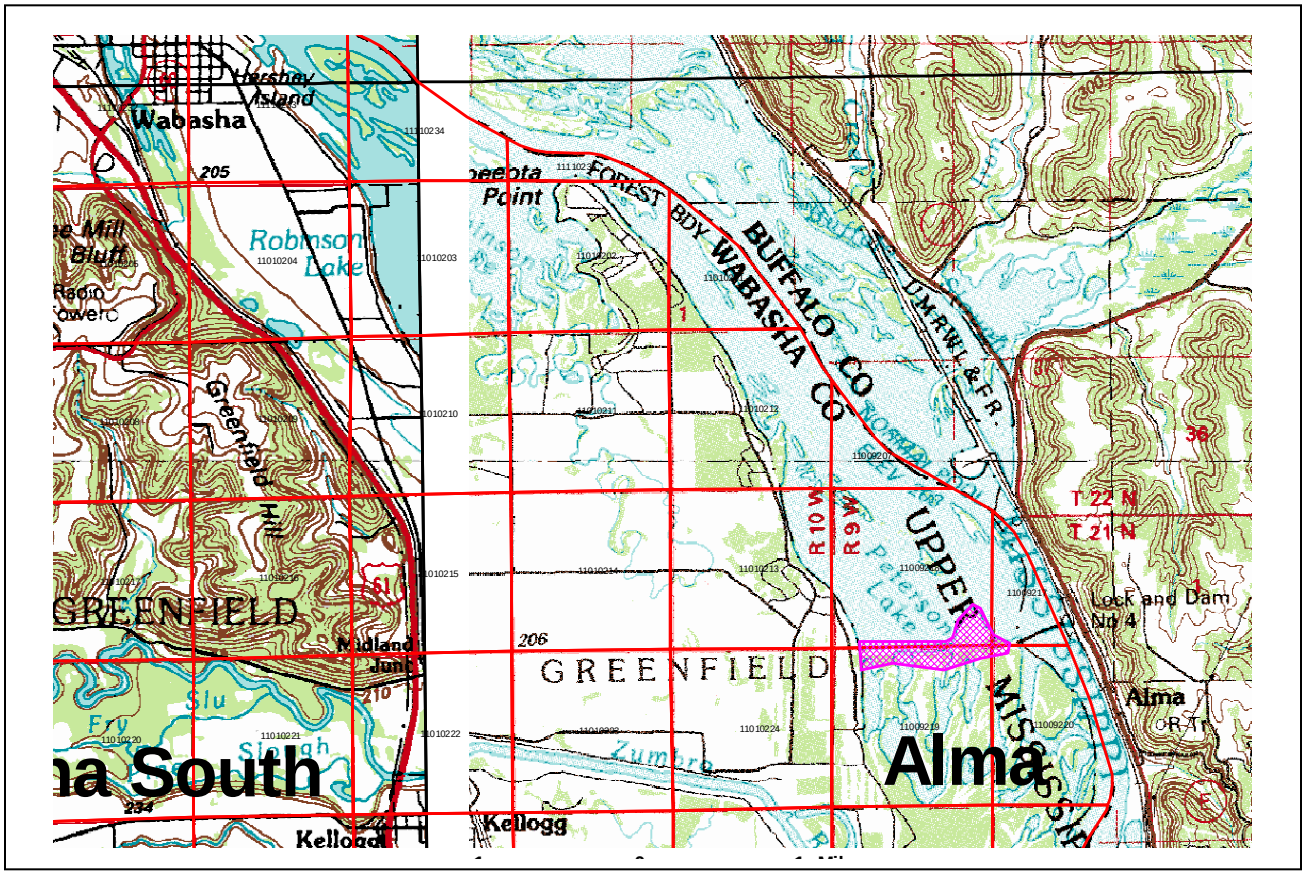
Location: Wabasha County (T110N R9W Section 17,18,19,20)

Site description: The sandy floodplain forest peninsula that lies just north of the levee contains adequate habitat. The fringes are lined with trees and shrubs and the central area is a dominated by native grasses. Many garter snakes were found during the surveys.

Assessment: The likelihood of massasaugas establishing and sustaining a population here is fairly low but the site has great potential for catching a rafting individual from the Chippewa River of Wisconsin.

Ranking: 17

Habitat	Flood Protection	Rafting Potential	Security	Historical Evidence
3	3	5	3	3



Zumbro Bottoms

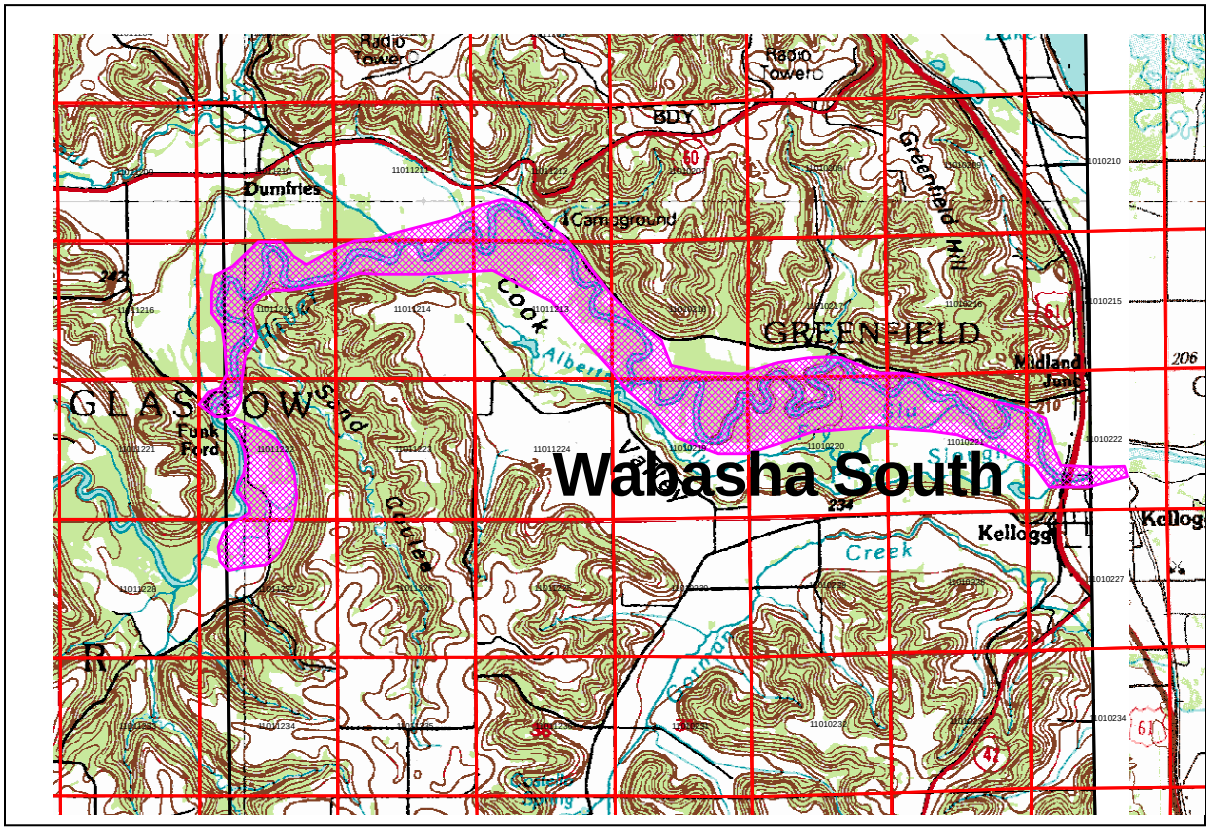
Location: Wabasha County (T110N R11W Sections 11,12,13,14,15,21,22,27)
(T110N R10W Sections 16,17,18,19,20,21,22)

Site description: This area contains a variety of habitats including lowland hardwood forests, old and lightly grazed pastures, and savannah meadows with an understory consisting of forbs and grasses. The driftwood and logjams found throughout make for great basking sites for snakes.

Assessment: There are many pockets of suitable habitat along the Zumbro River. The possibility of a relic population of massasaugas living within the river bottoms is possible. A reach of the river from T110N R11 S15 to highway 61 was surveyed using a canoe and the best potential sites were surveyed on foot. The extent of potential habitat and infrequent prolonged flooding make this area worthy of future field investigations.

Ranking: 18

Habitat	Flood Protection	Rafting Potential	Security	Historical Evidence
5	5	1	4	3



Half Moon Lake, Zumbro Confluence

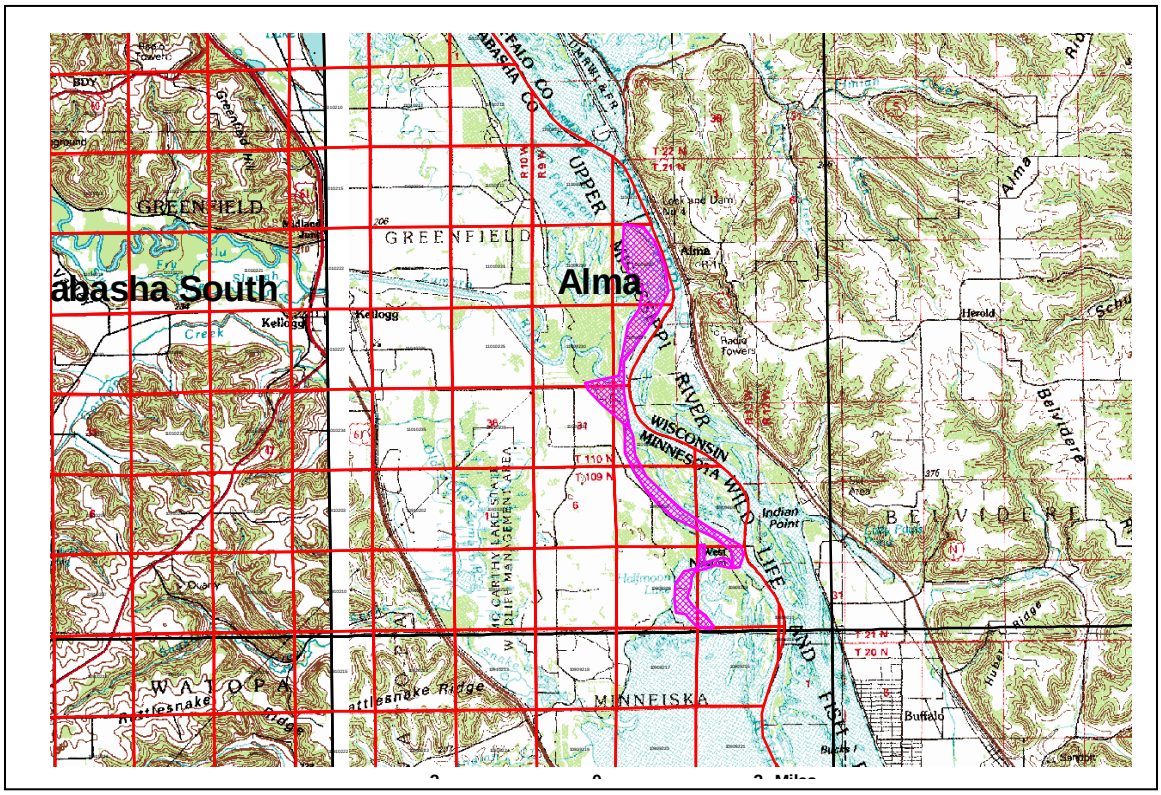
Location: (Half Moon) Wabasha County (T109N R9W Sections 5,8,9,16)
Location: (Zumbro) Wabasha County (T110N R9W Sections 17,20,29,30,31,32)

Site descriptions: The mainland edges and islands within the Half Moon area (southeast corner of section 8) contained meadows with mixed species of sedges and reed canary grass. The clearing beneath the power lines near the Zumbro confluence and the adjacent floodplain consisted of a floodplain forest with reed canary grass and nettle dominating the understory and large debris piles of driftwood were found closer to the river.

Assessment: The size of suitable habitat within this site was relatively small and the potential for a viable population of massasaugas occurring here appears low. The site is in close proximity to the Mississippi River and is subject to extensive flooding, however the possibility for a rafting individual is likely.

Ranking: 15

Habitat	Flood Protection	Rafting Potential	Security	Historical Evidence
2	2	4	2	5



McCarthy Lake WMA

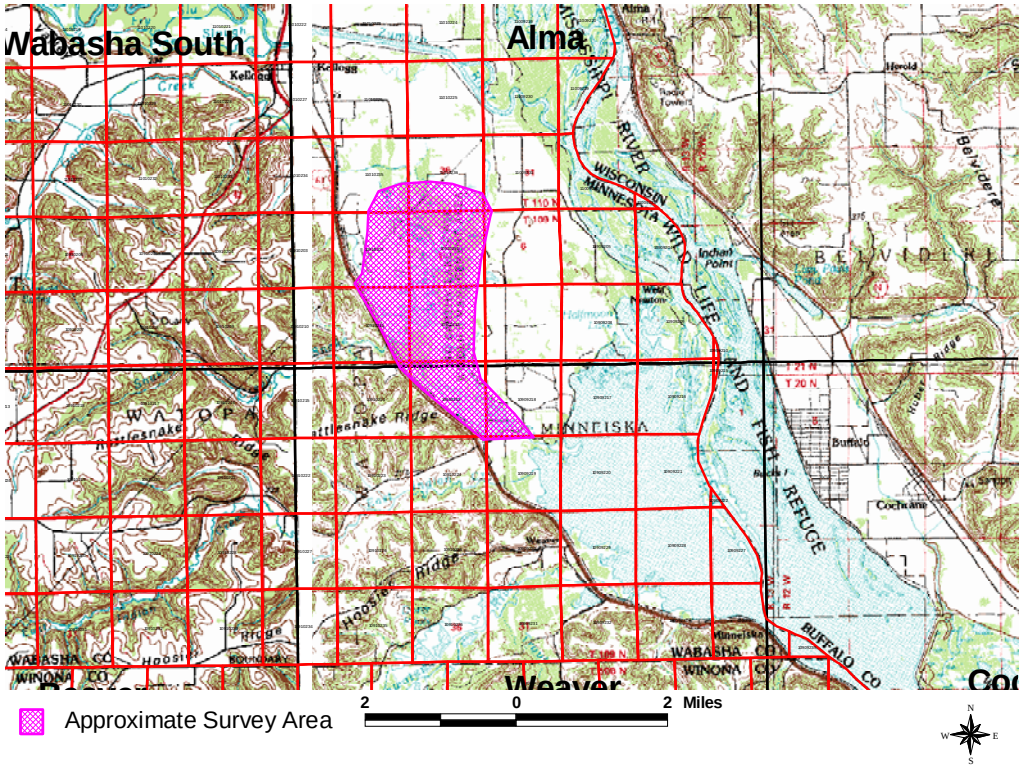
Location: Wabasha County (T109N R10W Sections 1,2,11,12,13,14,24)
(T109N R9W Sections 6,18,19)
(T110N R10W Sections 35,36)
(T110N R9W Section 31)

Site description: The southeastern portions of the WMA contained diverse sedge and wet meadows with dogwood and willow near the edges. The northern parts of the site contained a diverse mosaic of open wet prairie and shrub prairie.

Assessment: The chance for a population of massasaugas occurring in this area seems relatively high. The diverse and extensive habitat appears ideal for massasaugas with crayfish burrows throughout. The public seldom uses the remote areas of this WMA. The WMA likely floods with the rise of the Mississippi river but the upland areas may provide as refuges during times of high water. Some areas of the WMA contained open water and deep marsh habitat. Further site investigation within the wet meadows and prairies is highly recommended.

Ranking: 21

Habitat	Flood Protection	Rafting Potential	Security	Historical Evidence
5	4	3	4	5



Trout Creek, Whitewater WMA

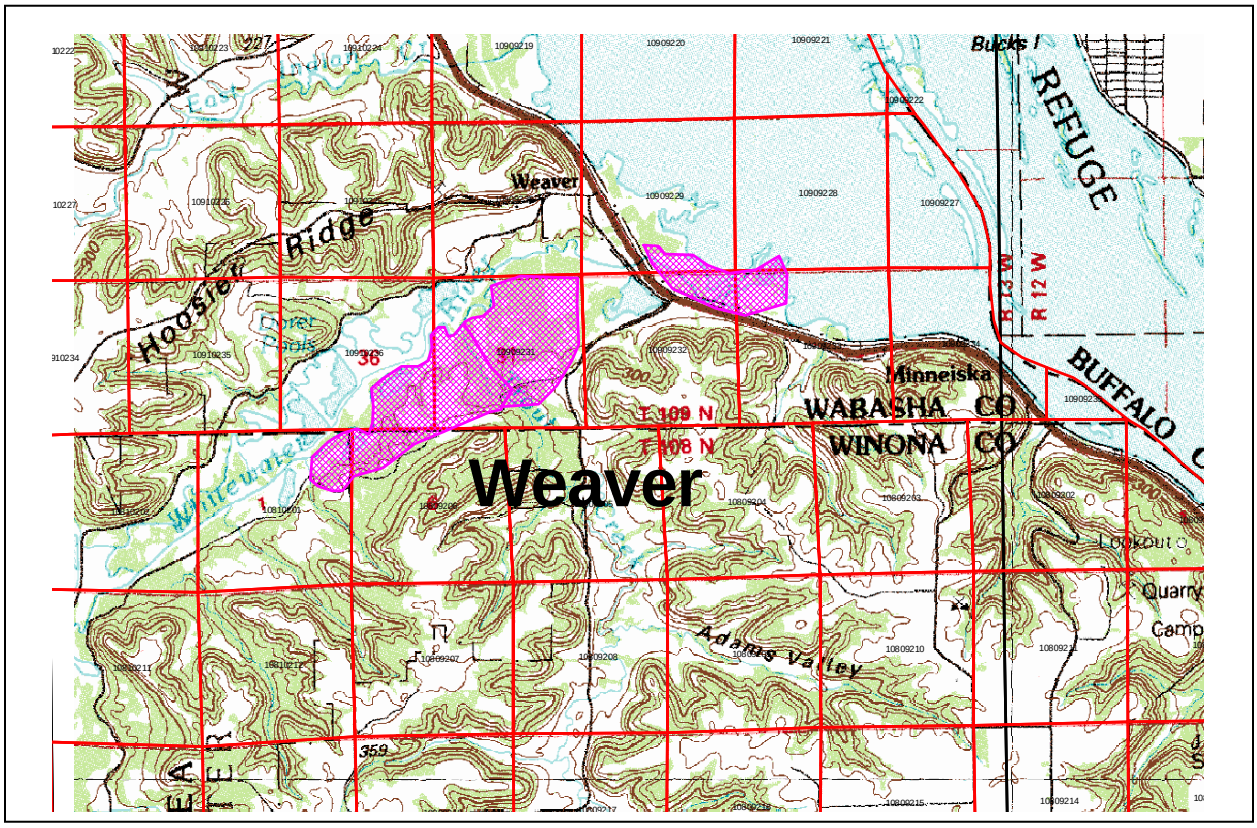
Location: Wabasha County (T109N R10W Section 36)
(T109N R9W Sections 6,28,29,31,32,33)
Winona County (T108N R10W Section 1)
(T108N R9W Section 6)

Site description: This lowland hardwood forest contains black willow, green ash, American elm, basswood, hackberry, and box elder. A variety of shrubs and forbs make up the understory. Small openings and downed timber were found throughout the site.

Assessment: The habitat in this area appears suitable for massasaugas. The likelihood of a viable population of massasaugas existing here is fairly good. This remote site is not subject to long durations of inundation as other sites that are closer to the Mississippi river.

Ranking 18

Habitat	Flood Protection	Rafting Potential	Security	Historical Evidence
4	4	2	3	5



Whitewater WMA

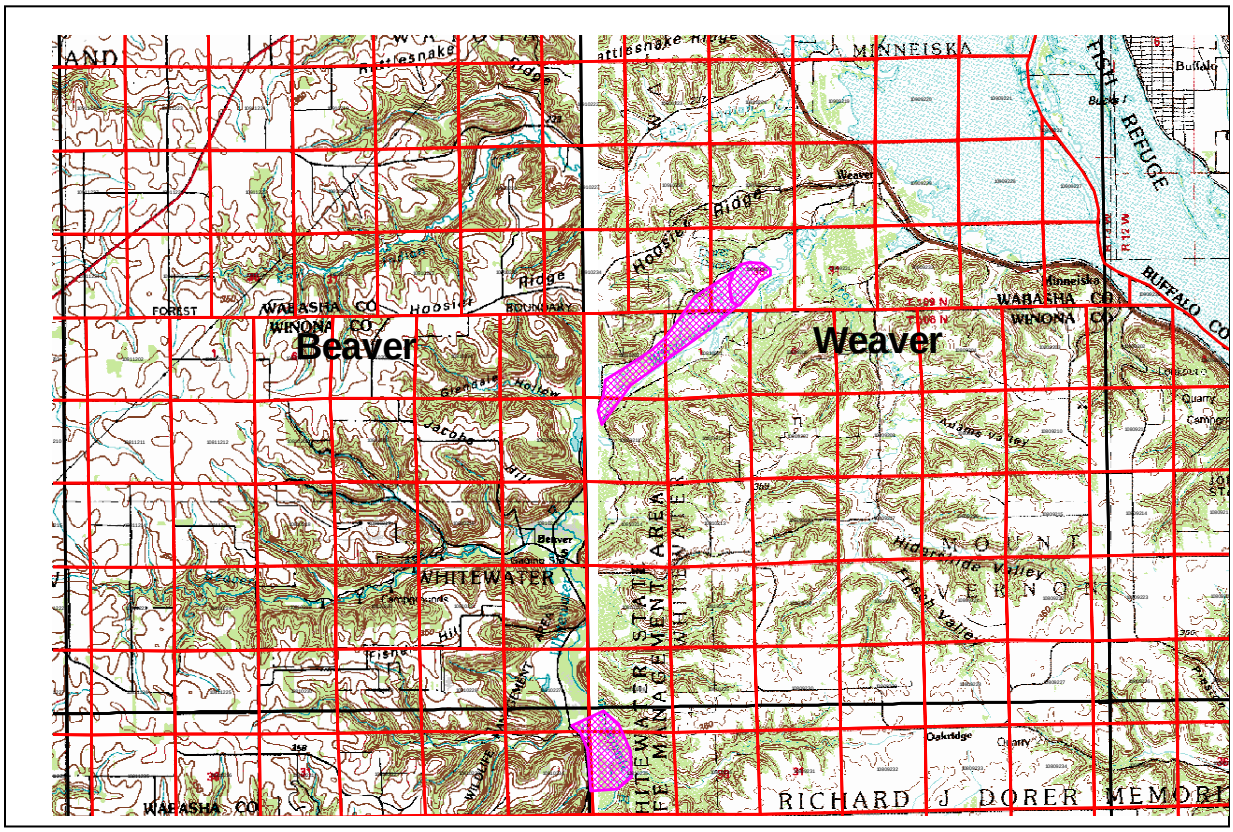
Location: Wabasha County (T109N R10W Sections 35,36)
Winona County (T108N R10W Sections 1,2,11,26,27,34,35)

Site description: Search efforts were concentrated near the river at the lower half of the WMA. The search areas contained a lowland hardwood forest of cottonwood, walnut, basswood, green ash, silver maple, dogwood, and willow with pockets of open meadows dominated by reed canary grass. Driftwood and fallen trees were found throughout the area and seem to be suitable basking sites for snakes.

Assessment: The habitat observed within our search areas of the WMA was of lower quality than other sites for this study. The plant diversity was low with reed canary grass being the dominant species. The habitat along the river is extensive and our search efforts included only a small portion of the WMA. In addition, the potential for massasaugas occurring in the area is elevated with the report of massasaugas being released here during the early 1980's.

Ranking: 17

Habitat	Flood Protection	Rafting Potential	Security	Historical Evidence
4	5	1	3	4



Bass Camp

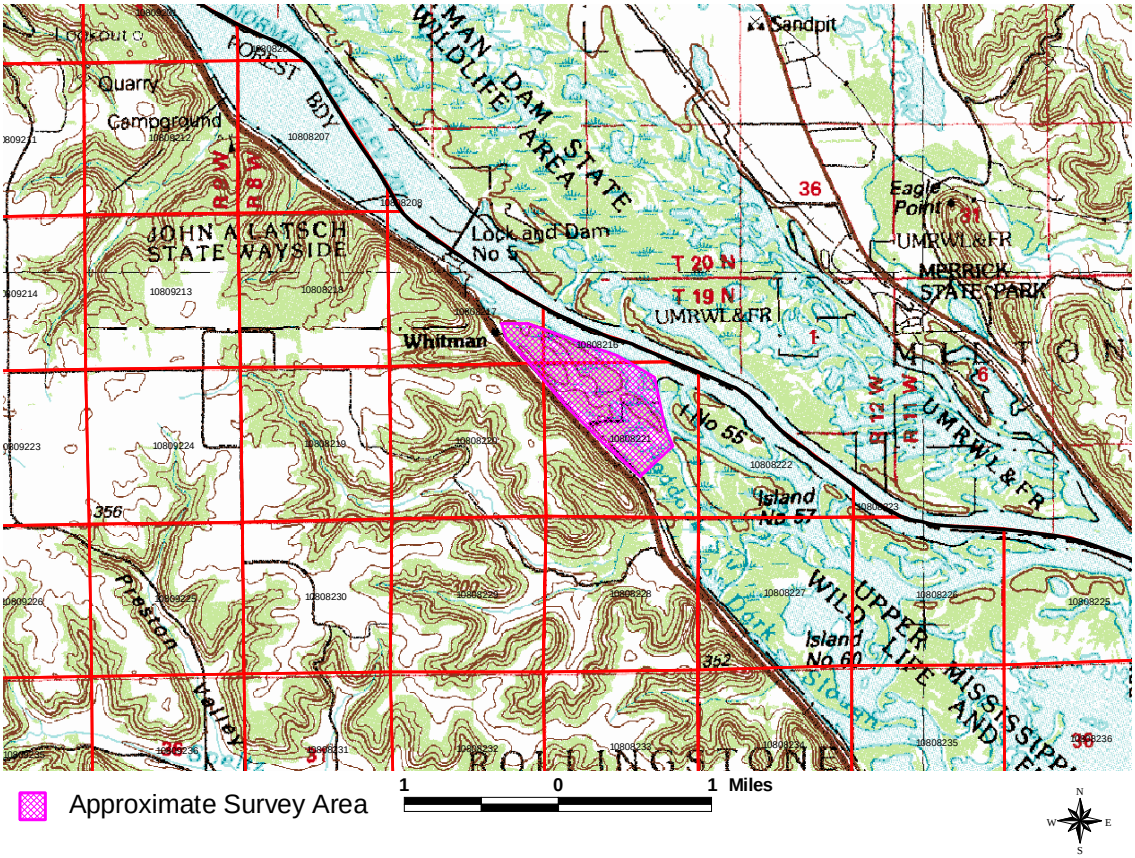
Location: Winona County (T108N R8W Sections 16, 17)

Site description: This wooded area contained silver maple, American elm, and river birch with nettle and reed canary grass throughout. This site lies just below lock and dam #5 and although water levels were very low during the time of survey, this area appears very flood prone.

Assessment: The habitat within this area was fairly poor and likely does not support massasaugas. Being situated next to a RV park, this site is used heavily by the public and ATV trails were found throughout.

Ranking: 7

Habitat	Flood Protection	Rafting Potential	Security	Historical Evidence
1	1	3	1	1



Root Bottoms

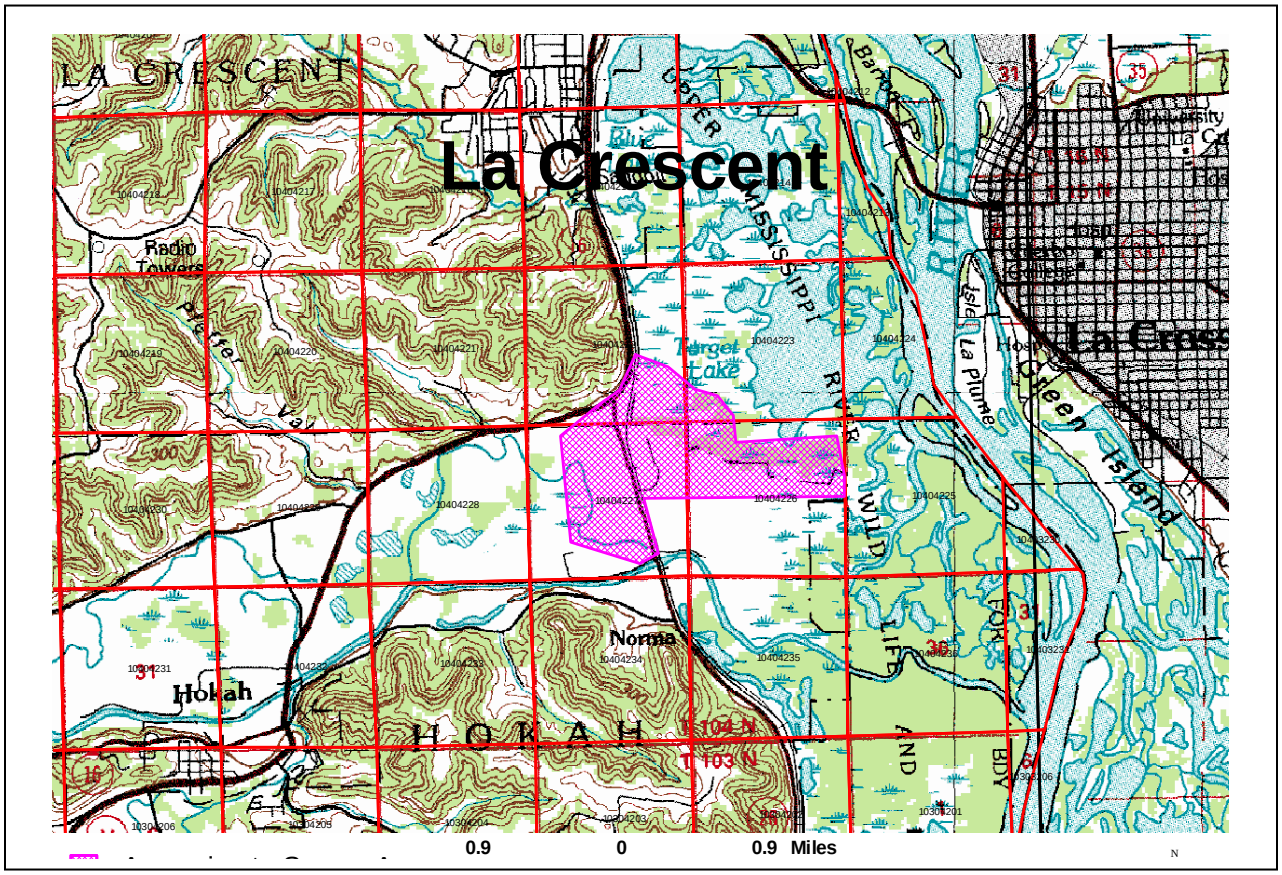
Location: Houston County (T104N R4W Sections 22,23,26,27)

Site description: Areas surveyed in the Root bottoms contained flood plain forests, open wet meadows, and lowland hardwood forests. Abandoned railroad tracks ran through parts of the site and some areas contain excavated pools and ditches as well as an old river channel. Reed canary grass dominated most survey sites.

Assessment: The reed canary grass and sedge meadows appeared to be managed by mowing during certain times of the year. The railroad tracks supported a greater diversity of plants than the surrounding meadows and provide good snake habitat. Crayfish burrows were present throughout. Areas closer to the river contained downed timber and driftwood. The vast reed canary grass and sedge meadows were difficult to survey and harbored few basking sites. Good habitat is extensive throughout this site and could support a population of massasaugas.

Ranking: 14

Habitat	Flood Protection	Rafting Potential	Security	Historical Evidence
4	3	2	2	3



Reno Bottoms

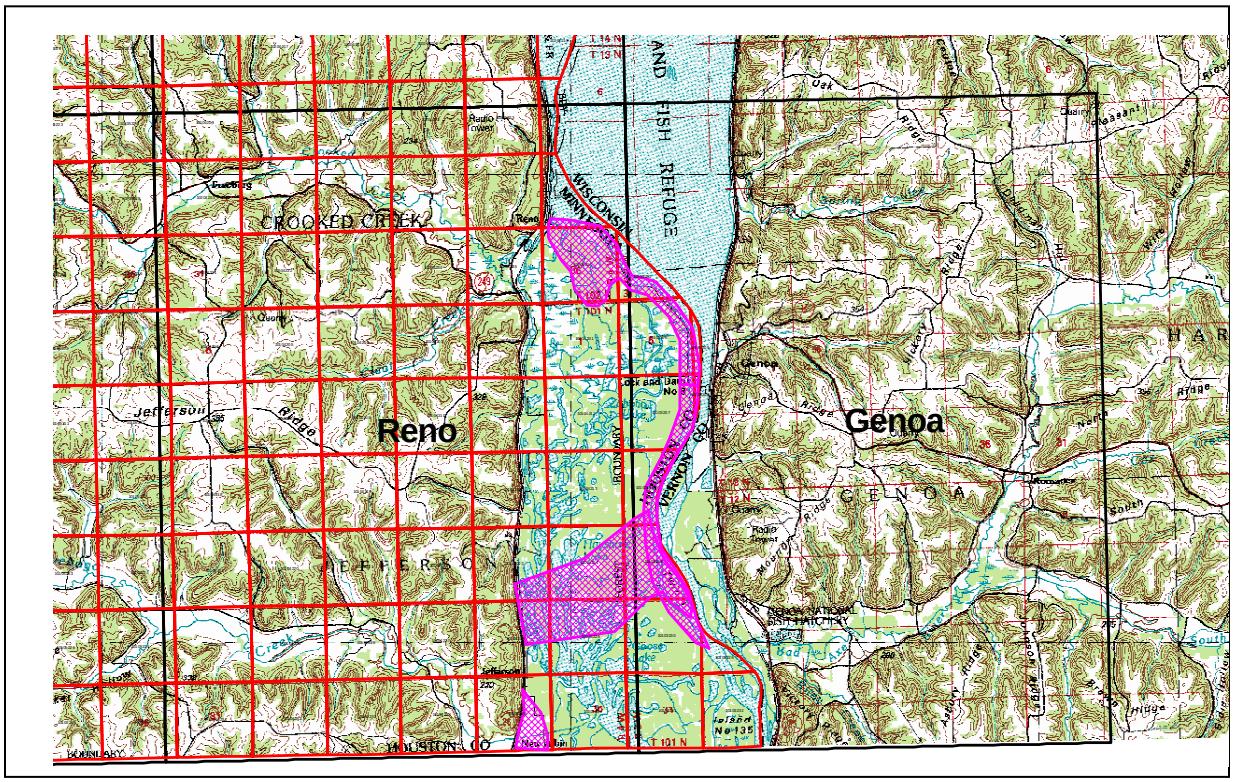
Location: Houston County (T101N R3W Sections 5,6,7,8,18,19,29,30)
(T101N R4W Sections 1,2,23,24,25,26,35)
(T102N R3W Section 31)
(T102N R4W Sections 25,26)

Site description: This area has a diversity of habitats including wet meadows, southern hardwood forests, mixed emergent marshes, and shrub marshes. Braided open water channels divide the wetland complex and make for difficult access into the interior of the bottoms. Drift piles of timber and fallen trees as well as crayfish burrows were present in most areas.

Assessment: The habitat within the bottoms is of good quality and has great potential for harboring massasaugas. Many potential areas are difficult to reach on foot and require the use of a boat for access. Higher ground elevations within the hardwood forests could be important hibernaculum sites for this species and may provide refuge during times of extensive inundation of the Mississippi River. Although the public frequently visits areas adjacent to the levee, the majority of the bottoms are difficult to access and likely do not receive much human use. Continued field investigations are highly recommended in the areas just south of the levee as well as other sites that were not surveyed during this study.

Ranking: 21

Habitat	Flood Protection	Rafting Potential	Security	Historical Evidence
5	4	3	5	4



Appendix 2: Color Slides

1. Jason Naber, McCarthy WMA, Wabasha County, Minnesota

2. Reno Bottoms, Houston County, Minnesota

3. Tony DeMars, Root Bottoms, Houston County, Minnesota

4. Trout Creek, Whitewater WMA, Wabasha County, Minnesota

5. Tony DeMars, Whitewater WMA, Wabasha County, Minnesota

6. Wilcox Landing, Wabasha County, Minnesota

7. Jason Naber, Zumbro Bottoms, Wabasha County, Minnesota

8. Alma Levee, Wabasha County, Minnesota

9. Mike Majeski, Gopher Snake, Half Moon Landing, Wabasha County, Minnesota

10. Fox Snake, Whitewater WMA, Wabasha County, Minnesota

11. Snapping Turtle, McCarthy Lake WMA, Wabasha County, Minnesota

12. Fox Snake, Trout Creek, Wabasha County, Minnesota

13. Eastern Hognose Snake, Trout Creek, Whitewater WMA, Wabasha County, Minnesota

14. Leopard Frog, Wilcox Landing, Wabasha County, Minnesota

15. Blanding's Turtle, Weaver Dunes, Wabasha County, Minnesota

16. Northern Water Snake, Half Moon Landing, Wabasha County, Minnesota