WEAVER BOTTOMS

2001 TURTLE SURVEY; MANAGEMENT and CONSERVATION CONCERNS

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SUMMARY : 2001 WEAVER BOTTOMS TURTLE SURVEY

1. The current survey suggests that the populations of six of the eight species of turtles inhabiting Weaver Bottoms are being impacted negatively. Populations with large adults missing and highly biased sex ratios suggest harvest damage (*Chelydra*, and both *Trionyx*). Depressed populations and fragmented population structure are symptomatic of habitat destruction (*Trionyx muticus*, *Emydoidea*, *Graptemys ouachitensis*, and *Graptemys geographica*). Chronic reduction in the survival of adults through over harvesting or habitat loss, requires increased recruitment and survivorship of juveniles to maintain population stability. The probability that juvenile survivorship could increase enough to compensate for adult mortality is very low considering the degradation of habitat in the Weaver Bottoms.

2. The five areas sampled in Weaver Bottoms were well vegetated and were picked to represent the best turtle habitats available. Due to the limited number of traps, open areas were not sampled.

3.

There was no evidence of recruitment of hatchling or young juveniles into the population in Weaver Bottoms.

4. Eight species of turtles were captured in Weaver Bottoms: two softshell turtles (*Trionyx muticus* and *Trionyx spiniferus*); three map turtles (*Graptemys ouachitensis*, *Graptemys geographica*, *Graptemys pseudogeographica*); two emydid turtles (*Emydoidea blandingii* and *Chrysemys picta belli*); and the common snapping turtle (*Chelydra serpentina*).

5. Four of the species appeared to be well represented (*Chelydra serpentina*, *Trionyx spiniferus*, *Graptemys pseudogeographica*, and *Chrysemys picta belli*); two species were less well represented (*Emydoidea blandingii*, *Graptemys geographica*); and two species were rare (*Graptemys ouachitensis*, *Trionyx muticus*).

6. Three species are directly harvested for meat (*Chelydra serpentina*, *Trionyx muticus* and *Trionyx spiniferus*), and all three species are also at risk of being captured and drowned by set lines used for commercial fishing. *Chelydra* and *Trionyx spiniferus* appear reduced in numbers because of harvesting pressures.

7. All Spiny Softshell females over 210 mm that were captured in Weaver Bottoms were females. Females may not reproduce until they are 255 to 285 mm in carapace length (Webb, 1962). Breckingridge (1955) indicated that it takes 15 to 20 years for a Spiny Softshell female to reach 300 mm. This data would suggest that almost all sizes of reproductive females are presently allowed to be harvested, and that the recovery time for a harvested female is considerable. The small proportion of reproductive-sized females (17 % of the turtles captured) seems low and may be the result of harvesting pressure.

8. Snapping Turtles represented 7.4 % of the turtle captures in the Weaver Bottoms; whereas Paisley (Wisconsin DNR Report, 1997-99) found in similar habitat at Pool #8 of the Mississippi River that Snapping Turtles made up 42 % of the turtles caught. Adult sex ratios are strongly male biased (15 females per 100 males) in Weaver Bottoms (adult sex ratios in an unharvested population in Michigan is 1:1). Both the small percentage of Snapping Turtles present in the Weaver Bottoms, and their highly biased male sex ratio, suggest harvest damage. It appears to take Snapping Turtles between 10 to 12 years to reach harvestable size (Figure 5).

9. Adult sex ratio of *Chrysemys picta belli* at Weaver Bottoms was male biased (5:1). One other population in Michigan has a male biased adult sex ratio (2.3 : 1) that does not result from trapping bias (Congdon, pers. comm.). Some females appear to mature in Weaver Bottoms in 6 to 9 years at a carapace length of 145 to 160 mm (Figure 3b). In Minnesota, Painted Turtles less than five inches in carapace length (130 mm) can be harvested with no limits. Based on the size restriction, 32 % of the turtles sampled (Figure 3b) could be harvested.

10. Less than 3 % of the aquatic habitat of Weaver Bottoms was surveyed. More baseline data needs to be collected through a longer and more intensive trapping regimen in order to accumulate enough information to draw up a multi-species management plan for the turtles of Weaver Bottoms.

BACKGROUND

Blanding's turtles (*Emydoidea blandingii*) are listed as "threatened" in Minnesota and Wisconsin and they are a Federal Candidate 2 Species. The population that inhabit the wetlands and rivers within the Weaver Dunes Complex of Wabasha, Minnesota, is apparently the largest in the world (greater than 5,000 individuals, Pappas et al, 2000). East of the Weaver Dunes Complex, is the Weaver Bottoms, a 1620 ha former marsh area that was flooded in 1938 by impoundment of the Mississippi River by the U.S. Army Corps of Engineers for commercial navigation. Prior to impoundment, Weaver Bottoms consisted of a mosaic of wetland meadows, forest, and wetlands (marshes, channels, creeks, lakes, ponds, and sloughs). Before flooding, the Weaver Bottoms appeared in old photos to be excellent turtle habitat, especially for the Blanding's Turtle. Since the inundation, the area of aquatic vegetation has been reduced from approximately 1335 ha to 731 ha between 1938 and 1975 and the loss of aquatic vegetation is now almost complete (Pappas,et al, 2000).

Blanding's Turtles are long-lived, with some individuals documented at older than 70 years of age (Brecke and Moriarty, 1989). Because of their longevity, some individuals in the population were probably present when the Weaver Bottoms was flooded in 1938. Recent telemetry work by Dr. J.W. Lang of The University of North Dakota and his graduate student, Mark Hamernick (Hamernick, 2001), on the home ranges of Blanding's Turtles at Weaver, confirms their current use and/or inhabitation of the Weaver Bottoms.

In addition to Blanding's Turtles, seven other species of turtles also inhabit the Weaver Bottoms. As a result, the combined Weaver Dunes and Weaver Bottoms areas represent one of the largest and most diverse turtle assemblages in the U.S. However, little is known of the structure of the turtle community of the area. The following objectives were proposed for a survey of the turtles.

OBJECTIVES

1. Initiate survey of the distribution and abundance of Blanding's Turtles in the Weaver Bottoms through the trapping of selected sites within the wetland.

2. Make a preliminary assessment of the population structure of Blanding's Turtles within the Weaver Bottoms.

3. Collect preliminary data on the distribution and abundance of the seven other species of turtles that inhabit the Weaver Bottoms (with reference to habitat selection).

4. Based on the results from the summer of 2001 trapping of turtles in the Weaver Bottoms, begin assessment of the turtle community.

5. Explore data for information that can be used to develop a comprehensive management plan for Weaver Bottoms turtle populations.

STUDY AREAS and METHODOLOGY

The Weaver Bottoms are located on the western edge of Pool #5 of the Upper Mississippi River (Figure 1). Five locations were trapped within the Weaver Bottoms from 25 May until 10 September, 2001 for a total of 105 trap days. Earlier trapping was prevented by unseasonable flooding.

Turtles were caught by using 14-17 baited hoop traps (1.5m x 0.8m x 25mm mesh) at each location. Nine of the traps had 15 m x 1.25 m leads. A location was trapped for approximately 20 days.

Upon capture, each turtle was weighed (grams), and length, width and height were measured to the nearest mm. Shell anomalies and injuries were noted and females were palpated for shelled eggs. Growth annuli were noted when possible for selected species (*Chelydra*, *Chrysemys*, *Graptemys* and *Emydoidea*) to determine age. All turtles were individually marked by notching or drilling a unique numerical code into their carapacial marginals before release (Cagle, 1939).

Specific trapping locations are circled and numbered as Site #1 - #5 on the Weaver Bottoms map (Figure 1). A brief description of each follows :

TRAP SITES

Site #1 - Half Moon Lake (North Bay)

This site is a shallow marsh bay (0.5 m - 1.5 m deep x 8 ha) off of a westerly meander of Murphy's Cut flowage from the Mississippi River proper. It is bordered on the north and west by floodplain forest. Its eastern periphery is a peninsula of emergent vegetation with the south being exposed to open water at the north end of Half Moon Lake. The bay interfaces with a vegetational zone (3-15 m) of mainly rooted aquatics (Nymphaea and Nelumbo) and submergent (Ceratophyllum and Potamegeton) plants. The northern shore also has an interspersing of sedges (Carex). There is a layer of soft substrate (0.25 - 0.5 m) atop a firm sand bottom.

Site #2 - Murphy's Cut Pond

This site is virtually a large, land-locked pond (0.5 - 2.0 m deep x 10 ha) located east of Murphy's Cut proper just before it enters the north end of the Weaver Bottoms. Other than a six meter exit opening, the pond is surrounded completely by floodplain forest, willow thickets or emergent vegetation. Habitat-wise, it is the most heavily vegetated of the 5 sites that we trapped with submergents, rooted aquatics and emergents in abundance. Dominant plants would include Typha, Phragmites, Carex, Nymphaea, Nelumbo, some Sagittaria, Ceratophyllum, Potamegeton, and Lemna. The pond bottom is mainly soft muck (0.25 - 0.75 m deep).

Site #3 - Minnesota # 5

This is an area of protected water (0.5 - 2.0 m deep x 7-8 ha) that lies behind (west) the natural levee of the Mississippi River between channel modifications (rock-lined cuts) Minn. #4 and Minn. #6. It is a river marsh that is bordered on the south and north by strong current off of the main channel. It has a firm sand bottom. The most abundant vegetation lies in the central part of the marsh behind the rock closure of Minn. #5. It is dominated by emergents (Typha and Phragmites) and rooted aquatics (Nymphaea and Nelumbo) with an interspersing of submergents (Potamgeton and Ceratophyllum). Most of this area is open, quiet water with river access.

Site #4 - Whitewater River (North Bay)

This trapping site is the bay northwest of the mouth of the Whitewater River and its outer north shoreline that faces the Weaver Bottoms. The inner bay is approximately 8 ha with a water depth of 0.5 - 1.5 meters and it has a soft muck bottom (0.5- 0.75 m). The inner

bay is heavily vegetated with emergents (Typha, Phragmites, Sagittaria and Pontederia), rooted aquatics (Nymphaea and Nelumbo) and submergents (Potamegeton, Ceratophyllum and Vallisneria). The overall vegetational density and diversity of this bay is most similar to Site #2 (Murphy's Cut Pond).

The outer north shoreline of this site does not have the same dense vegetation nor the soft muck bottom of the inner bay. It has a firm sand bottom with a linear zone (15 - 30 m wide x 1.25 m deep)) of rooted aquatic (Nelumbo and Nymphaea) and emergent (Typha and Phragmites) vegetation.

Site # 5 - Minnesota #10

This area of protected water lies behind the natural levee of the Mississippi River to the north and south of Minn. #10, a rock-lined channel modification that flows west into the Weaver Bottoms. North of this modified channel is a large expanse of sandy bottomed lily and lotus marsh (7-8 ha x 1.0 - 1.5 m deep) bordered on the levee side by emergents (Typha and Sagittaria) and on the open water side by various submergents and aquatics (Potamegeton, Ceratophyllum, Lemna, etc.) On the northern edge of this marsh are numerous sand flats formed by Minn. #7, a natural channel through the levee that flows southwest into the Weaver Bottoms.

South of Minn. #10, behind the natural levee, is a shallow, open water bay (1.0 - 1.5 m deep x 4 ha) with sparse stands of the aforementioned emergent, submergents and rooted aquatics.

RESULTS

Blanding's Turtle (*Emydoidea blandingii*)

We focused on Blanding's Turtles because of the long-term historical data that has been collected (Pappas, et al. 2000) offers an opportunity to compare the Weaver Bottoms to other areas within the Weaver Dunes complex. Ten Blanding's Turtles were caught, of which nine were very old adults (25 + years) and one was a 14 yr old female that moved from the Weaver Bottoms into the Weaver Dunes shortly after her initial capture in June (Jeff Lang, pers. comm.). Seven of the ten turtles had visited the Weaver Dunes in the preceding 1 to 2 years. Based on recapture records, two females had apparently moved from the land in 1999, a round trip of over 15 km. Blanding's Turtles were caught at All capture sites were

More of this habitat type, and presumably the Blanding's Turtles that occupied it, existed prior to inundation of the Weaver Bottoms. The "reservoir aging" effect (Nelson, 1998) appears to be continuing in the Weaver Bottoms and it is apparently destroying the last of these preferred habitats of the Blanding's Turtle.

The population size for Blanding's Turtles was estimated at > 5000 adults, and hatchlings and juveniles were routinely captured. We caught no juvenile turtles in (Pappas, et al., 2000). The paucity of juveniles may be due to the lack of vegetated habitats such as sedge and alder that are strongly preferred by young Blanding's Turtles (Pappas and Brecke, 1992). It is probable that as became an open, wind-swept lake, recruitment of juvenile Blanding's Turtles has become rare and the population is maintained by immigration of adults. More habitat specific trapping needs to be done to determine the levels of hatchling recruitment

The Turtle Community

A total of 1180 turtle captures were made (Table 1) in the Weaver Bottoms. Areas of significant concern, based on the species composition found, are the absolute and relatively low numbers of Smooth Softshells (0.2 %), Ouachita Map Turtles (0.3 %), Blanding's Turtles (0.8 %), Common Map Turtles (2.5 %), Snapping Turtles (7.4 %), and Spiny Softshells (9.1 %). Only two species of turtles, the Western Painted Turtle (66.7 %) and the False Map Turtle (12.9 %) appear to be reasonably abundant compared to other sites.

Table 1. Summary of turtle species composition in the Weaver Bottoms of Southeastern Minnesota presented from lowest to highest proportions of total turtle captures.

Turtle Species	N	% Total	% Males	% Females	% Juveniles
Chrysemys picta belli	794	66.7	82.6	16.4	1.0
Emydoidea blandingii	10	0.8	50.0	50.0	0.0
Graptemys geographica	30	2.5	66.7	20.0	13.3
Graptemys ouachitensis	4	0.3	50.0	25.0	25.0
Graptemys pseudogeographica	154	12.9	48.7	47.4	3.9
Chelydra serpentina	88	7.4	84.1	14.8	1.1
Trionyx muticus	2	0.2	50.0	50.0	0.00
Trionyx spiniferus	108	9.1	59.2	39.8	0.93

Species of turtles that prefer lentic aquatic habitats (Painted, Snapping, Common Maps and Blanding's Turtles) represent 77.4 % of the turtle captures. Lotic, or faster water species (Smooth and Spiny Softshells, Ouachita and False Map Turtles) represent only 22.6 % of the captures. Since no historical data on species composition of Weaver Bottoms exists, conclusions drawn from the preliminary data should be viewed with caution; however, the relative species abundances strongly suggest that pond/marsh or lentic habitat-type turtles predominate in Weaver Bottoms. What was once a diverse wetland of river channels, streams, lakes, sloughs, and ponds appears to have evolved into a open, wind-swept lake by a process known as "reservoir aging" (Nelson, 1998).

SPECIES SUMMARIES

Blanding's Turtle (*Emydoidea blandingii*) -- (see above)

Smooth Softshell (*Trionyx muticus*)

Only two adult turtles were caught, although at least four of the trapping sites appeared to have habitat to support them. Mike Davis, who used to commercially fish in the Weaver Bottoms twenty years ago, stated that he used to catch them in small numbers. Although they were probably never common in Weaver Bottoms, their numbers may have been recently reduced even further due to the continuing habitat degradation in the Weaver Bottoms and the commercial trapping of turtles and fish (all sizes of Softshells are very vulnerable to the set lines used for commercial fishing and drown easily when hooked). They are the rarest turtle at Weaver and, probably, in all of Minnesota.

Spiny Softshell (*Trionyx spiniferus*)

The body size distribution of 108 spiny softshells is represented in Figure 2a. Whereas smaller size classes are represented, larger bodied individuals appear to be under-represented.

Spiny Softshells made up 9.3 % of the turtles trapped in the Weaver Bottoms. Various studies have listed the proportion of Spiny Softshells within turtle assemblages within habitats generally similar to Weaver Bottoms as 16 %, 25.3 %, 52.9 %, and 66.6 % (Ernst, et al, 1994); compared to other areas, softshell turtles are under-represented in Weaver Bottoms. The riverine habitats with sand bars, soft bottoms and some aquatic vegetation that are preferred by Softshell Turtles, all exist within the Weaver Bottoms. The low numbers of Softshells may be due to exploitation associated with trapping and commercial fishing (they are very susceptible to being caught on set lines and drowning).

All individuals over 210 mm that were captured in Weaver Bottoms were females. Breckingridge's (1955) data indicated that it would take 15 to 20 years for a Spiny Softshell female to reach 300 mm; if females do not reproduce until they are 255 to 285 mm in carapace length (Webb, 1962), only 17 % of this sample appears to have reproductive potential; a proportion that appears low for a long -lived species that continues to be harvested. Over all body sizes of adults sampled, there were 64 males and 43 females; an adult sex ratio that is similar to other populations studied (Vogt and Bull, 1982). The lower numbers of females may result from harvesting females only because males do not attain the legal harvest size (12 inch or 305 mm carapace length).

Ouachita Map Turtle (*Graptemys ouachitensis*)

Only four juveniles were caught at two trap sites. A third trap site appeared to have habitat to support them. In similar habitat at Pool #8 in the 1970's, Ouachita Map Turtles represented 51 % versus 49 % False Map Turtles of 1117 Map Turtles caught (Vogt, 1980). The Weaver Bottoms percentages were 2.5 % Ouachita Map Turtles versus 97.5 % False Map Turtles. More sampling/trapping needs to be done at Weaver Bottoms and Pool #8 to determine if these numbers are an accurate reflection of the turtle's status. The habitat and diet preferences of all Map Turtles need to be examined in detail .

Common Map Turtle (*Graptemys geographica*)

Body size distributions of the thirty turtles captured are represented in Figure 2b. Even though the sample is small, smaller bodied classes and reproductive females are present.

Habitat and food items appear sufficient to support limited numbers of Common Map Turtles within Weaver Bottoms. Common Map Turtles represented 2.5 % of the total turtle captures. In Vogt's (1980) classic study of Map Turtles in Pool #8 of the Mississippi River, they found that Common Maps represented 7 % and 10 % of the total Map Turtles caught in two respective years. Common Map Turtles represented 16 % of the total Map Turtles in our small sample. Because Common Map Turtles are mollusc specialists, population numbers are dependent on the availability of mollusks. Unfortunately, there is a paucity of data in the literature about the population status of the turtle or for their mollusc prey. Based on the known habitat preferences, we expected to catch more of these turtles in the areas trapped.

Common Map Turtle **False Map Turtle**

False Map Turtle (*Graptemys pseudogeographica*)

The body size distribution of the False Map Turtle indicates that all body size classes are present (Figure 2c). It is the second most abundant turtle captured in Weaver Bottoms (12.9 %). Larger size classes of females could be under-represented because they may have been congregated in deeper water near nesting beaches during much of the trapping season. False Map Turtles are generalist omnivores that prefer water with abundant vegetation and are found in backwaters, and contiguous marshes of large rivers.

Enough known aged individuals (n = 70) were caught to allow the plotting of a preliminary growth versus age curve for this species (Figure 3a). The data suggests that males mature at ages > 4 years and females > 8 years; estimates that are in agreement with those of Vogt (1980) for both sexes in Pool #8.

Photograph courtesy of Janet Hostetter

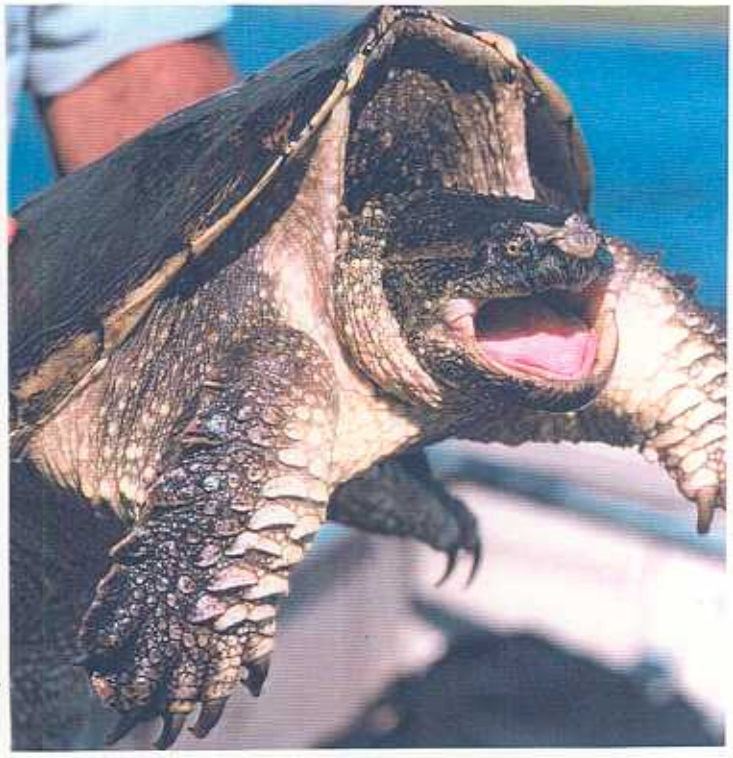
Snapping Turtle (*Chelydra serpentina)*

The body size distributions of 73 Snapping Turtles captured in Weaver Bottoms is represented in Figure 4a. Even though the sample is small, small, medium, and large size classes of turtles, are represented.

Snapping Turtles represented 7.4 % of the turtle captures in the Weaver Bottoms. Paisley (Wisconsin DNR Report, 1997-99), found in similar habitat at Pool # 8 of the Mississippi River that Snapping Turtles made up 42 % of the turtles caught. Furthermore, in Paisley's study, female turtles made up 37 % of the Snappers caught at Pool # 8 versus only 15 % females in the Weaver Bottoms (present study). Based on these comparisons, we expected that there should be more Snapping Turtles overall in the Weaver Bottoms, and with a higher percentage of females. The Snapping Turtle population in Weaver Bottoms may be reduced because of excessive commercial trapping pressure and/or ongoing loss of vegetation. The highly skewed adult sex ratio suggests that something is impacting females more than males.

Snapping Turtles, 10 inches or larger (254 + mm) in carapace width, may be legally harvested for human consumption. Figure 5 represents the body size of thirty-five

Snapping Turtles from Weaver Bottoms in relation to their age based on discernible growth annuli. It appears to take a Snapping Turtle between 10 to 12 years, to reach harvestable size. It is not known at what size or age that a majority of females reaches reproductive maturity in Weaver Bottoms. The youngest mature females in Michigan were 12 years at about 220 mm carapace length (Congdon, pers. comm.), and in Ontario, females mature between 17-19 years of age at carapace length of 249 - 258 mm (Galbraith,et al, 1989). If Snapping Turtles in Weaver Bottoms mature at similar age and sizes to females in Michigan, then the current turtle trapping regulations allow, not only harvest of the most reproductive females (largest) in the population, but also very young females. A carapace length greater than 310 mm represents a harvestable turtle (corresponds with a 10 inch shell width). Only 19 % of the turtles caught during the present survey were of legal size (Figure 4a).



In a 1997-99 Wisconsin DNR Snapping Turtle Study by Paisley in Pool #8, approximately 27 % of the turtles caught were of harvestable size. Even moderate harvest of adults (particularly females) can reduce populations of long-lived organisms at a very rapid rate (Congdon, et al. 1993; 1994). The population at Weaver Bottoms may have already been impacted by a combination of habitat changes and harvesting. Whatever the causes, differences in body sizes of adult turtles in Pool #8 and Weaver Bottoms should be taken into account when setting regulatory guidelines. Just as we have zones within this state that regulate the harvest of resources based on their current populations (fish species, geese, deer, etc.), management of harvestable turtles should also be managed with similar guidelines.

Western Painted Turtle (*Chrysemys picta belli*)

Western Painted Turtles are the most abundant turtle in the Weaver Bottoms (66.7 %) and all size classes are represented in their body size distribution (Figure 4b). In habitat that is similar to the Weaver Bottoms, Western Painted Turtles represented 51 % of the turtle captures at Pool #8 (Paisley, 1999). In the St. Croix River of Minnesota, Western Painted Turtles represented 12 % of 1204 turtle captures (DonnerWright, et al, 1999), and in another riverine environment in Pennsylvania, they represented 18.4 % of the turtles caught (Norman, 1989). The adult sex ratio at Weaver Bottoms was male biased (5 : 1); one Michigan population has a male biased (2.3 : 1) adult sex ratio that is not the result of trapping bias (Congdon, pers. comm.).

The growth of both sexes of Painted Turtles was examined (Figure 3b). In some northern populations, male Painted Turtles mature in their 4 to 5th year at a carapace length of 83 - 108 mm (Cagle, 1954; Ernst, 1971b; Mitchell, 1988). If males in Weaver Bottoms mature at the same age, they would be 105 - 115 mm in carapace length. Some females appear to mature at Weaver in their 6 to 9 th year at a carapace length of 145 - 160 mm.

In Minnesota, Painted Turtles less than five inches in carapace length (130 mm) can be harvested with no limits. Based on the size restriction, 32 % of the turtles sampled (Figure 4b), could be harvested. For long-lived organisms, the harvest of juveniles would have less immediate impact on the population than would harvesting the same number of adults (Congdon, et al, 1993, 1994). However, over a number of years, harvests of the smallest (youngest) one third of a population, will certainly negatively impact a populations stability and persistence.

DISCUSSION

We think that some trapping results were due sampling biases because limitations in time, manpower, and equipment in light of the number of individuals of the eight species of turtles and the size of the Weaver Bottoms. We view our work as a preliminary effort that demonstrates that an in-depth survey is required to truly understand the turtle community and the potential impact on it by the U.S. Corps of Engineers and the US Fish and Wildlife Service's efforts to restore the Weaver Bottoms. The protection and management of the Weaver Dunes ecosystem in general, and the large and diverse turtle community specifically, should be a goal of all members of the wildlife community.

Only five areas, representing less than 3 % of the aquatic habitat, were trapped in the Weaver Bottoms during 2001. We tried to select five sites that were representative of the varying habitats that exist within the Weaver Bottoms. The only habitats that we avoided were the large, open expanses of water that seem to now dominate Weaver Bottoms. Marshes and ponds (Sites 2 and 4), river sloughs (Sites 1 and 3), channels (Sites 1, 3 and 5), and lakes (Sites 3, 4 and 5) were all sampled. Some of the sample site were combinations of habitats.

Trapping results indicate that of the eight species of turtles inhabiting the Weaver Bottoms, two are rare, four are less abundant than anticipated based on historical trapping records and studies of other areas, and two are abundant.

Rare - The Smooth Softshell may just be a rare turtle along the southern Minnesota section of the Mississippi River. In contrast, it could be a victim of habitat and diet requirements that no longer exist in Weaver Bottoms, or it could be reduced due to harvesting. That Blanding's Turtles are abundant , suggests that their numbers have been substantially reduced due to habitat degradation. In addition, recruitment into the adult population may be minimal because the shallow shoreline vegetation required to support neonate and juvenile Blanding's Turtles has been substantially eliminated in Weaver Bottoms.

Reduced from Expected - Snapping Turtles and Spiny Softshell Turtles appear to be reduced in numbers because of turtle harvesting pressures and unintended drowning by commercial fisherman. Fewer Ouachita Map Turtles were captured in Weaver Bottoms than expected based on historical capture data from Pool #8 (Vogt, 1980); where 573 were captured in one summer. In addition, only four juveniles were captured in Weaver Bottoms. A combination of specialized diet of the turtles coupled with habitat alteration may be an important cause of the low numbers of individuals captured.

The Common Map Turtle appears in numbers less than expected based on the habitats trapped. Even though only 30 were caught, their population structure suggested limited stability. More trapping needs to be initiated to more accurately determine the size and health of this population. Also, because they are mollusc specialists, their specific dietary

prey items need to be identified to further understand their viability.

Abundant - The Painted Turtle and the False Map Turtle populations both have all body sizes present, and growth, age of maturity and recruitment seem to indicate healthy populations in Weaver Bottoms. Painted Turtles comprise a higher proportion of the total turtle community (67 %) than found in similar habitat in Pool # 8 (51 %) or in the St. Croix riverine habitat (12 %). The high proportion of Painted Turtles in Weaver Bottoms may be a reflection of the positive impact of the "reservoir aging" process on their population and they may be at higher numbers because of negative effects on other species populations.

The abundance of False Map Turtles here may be because they prefer the slow moving sections of rivers with dense aquatic vegetation and their diet is more general than the other two species of Map Turtles found in Weaver Bottoms.

Conclusions - The negative impact on plant, fish, waterfowl and some mammal species of the ongoing habitat degradation in the Weaver Bottoms has been documented. Results from the current survey of the eight species turtle community suggest that some of the turtles are also negatively impacted. Because they are long- lived, the recovery time for reduced populations can be considerably longer than that of short- lived organisms. Chronic reduction in the survival of adults through over harvesting or habitat loss, requires increased recruitment and survivorship of juveniles to maintain population stability. The probability that juvenile survivorship could increase enough to compensate for adult mortality is very low considering that the Weaver Bottoms habitat has been degraded.

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List of Figures.

Figure 2.

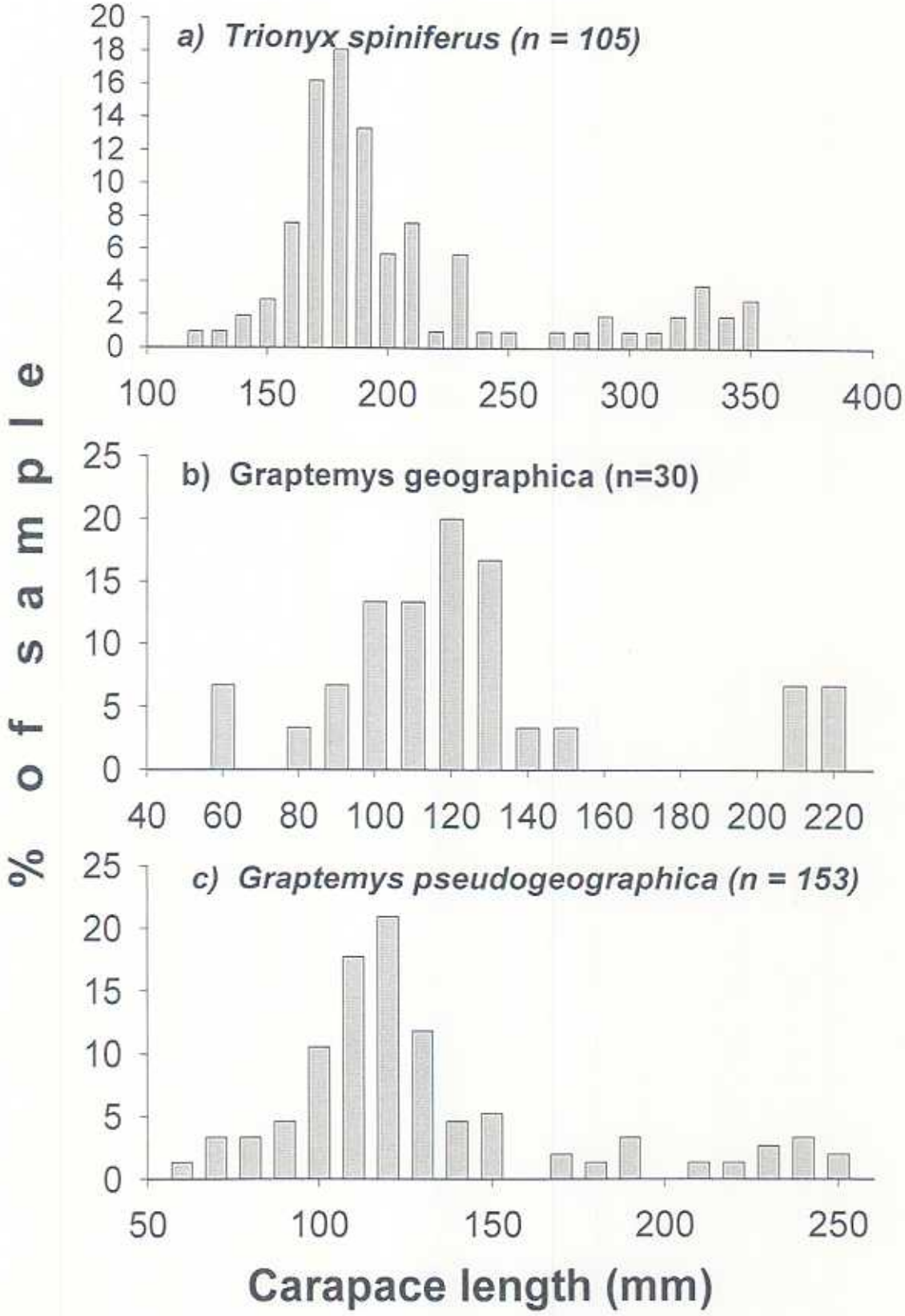

a) Trionyx spiniferus (n = 105)
b) Graptemys geographica (n=30)
c) Graptemys pseudogeographica (n = 153)
% of sample
Carapace length (mm)

Figure 3.

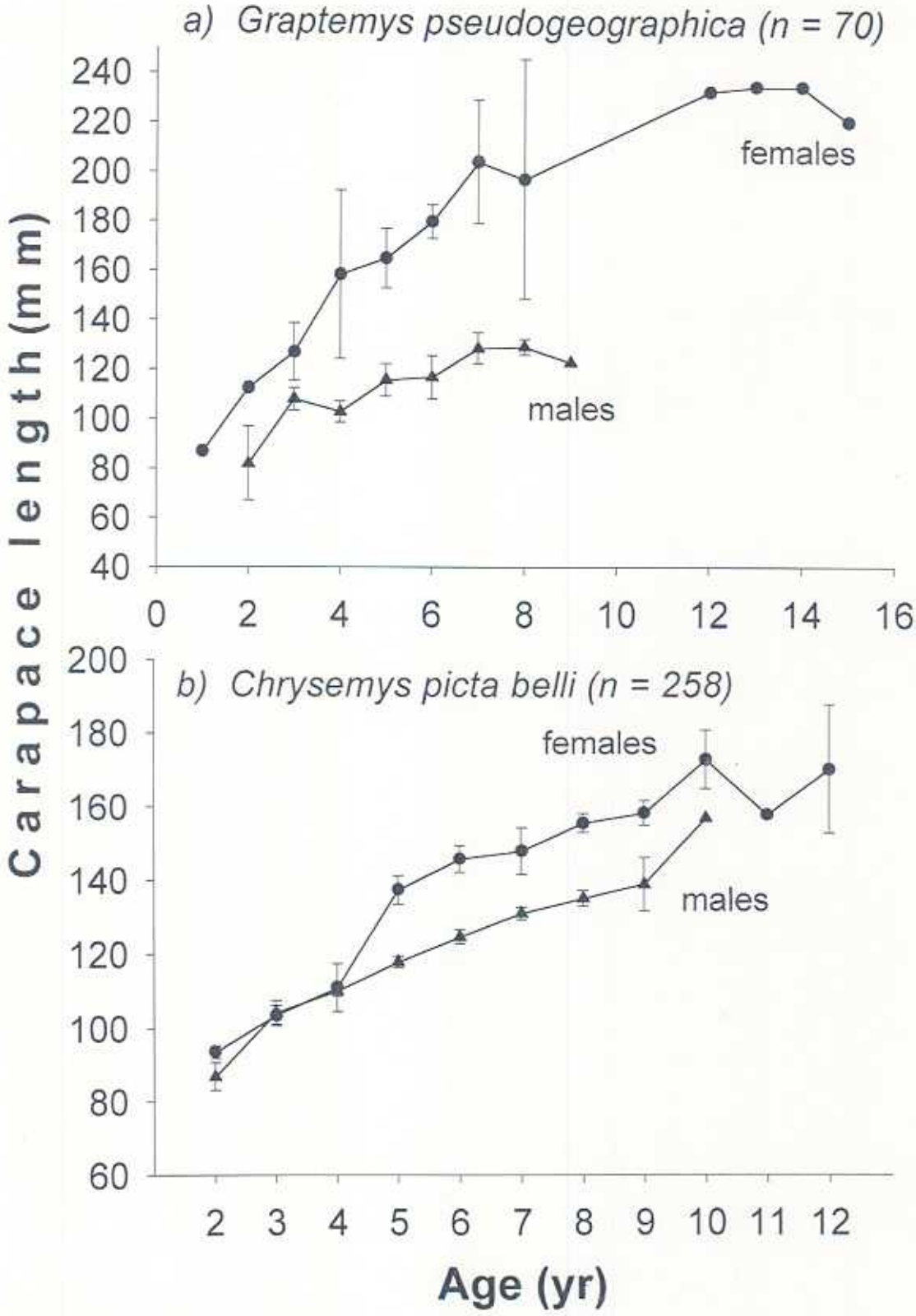

a) Graptemys pseudogeographica (n = 70)
females
males
240
220
200
180
160
140
120
100
80
60
40
0
2
4
6
8
10
12
14
16
b) Chrysemys picta belli (n = 258)
females
males
200
180
160
140
120
100
80
60
2
3
4
5
6
7
8
9
10
11
12
Carapace length (mm)
Age (yr)

Figure 4.

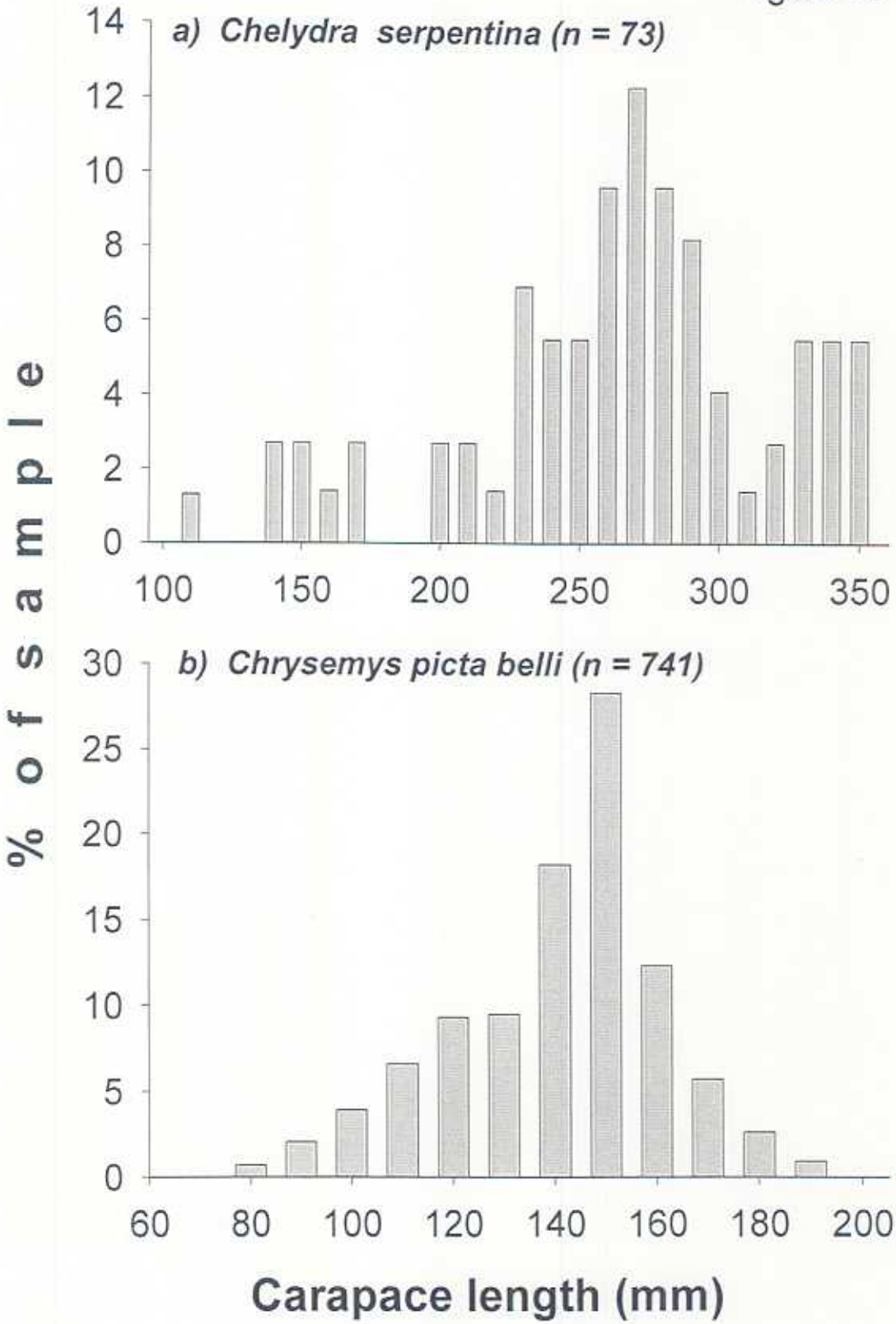
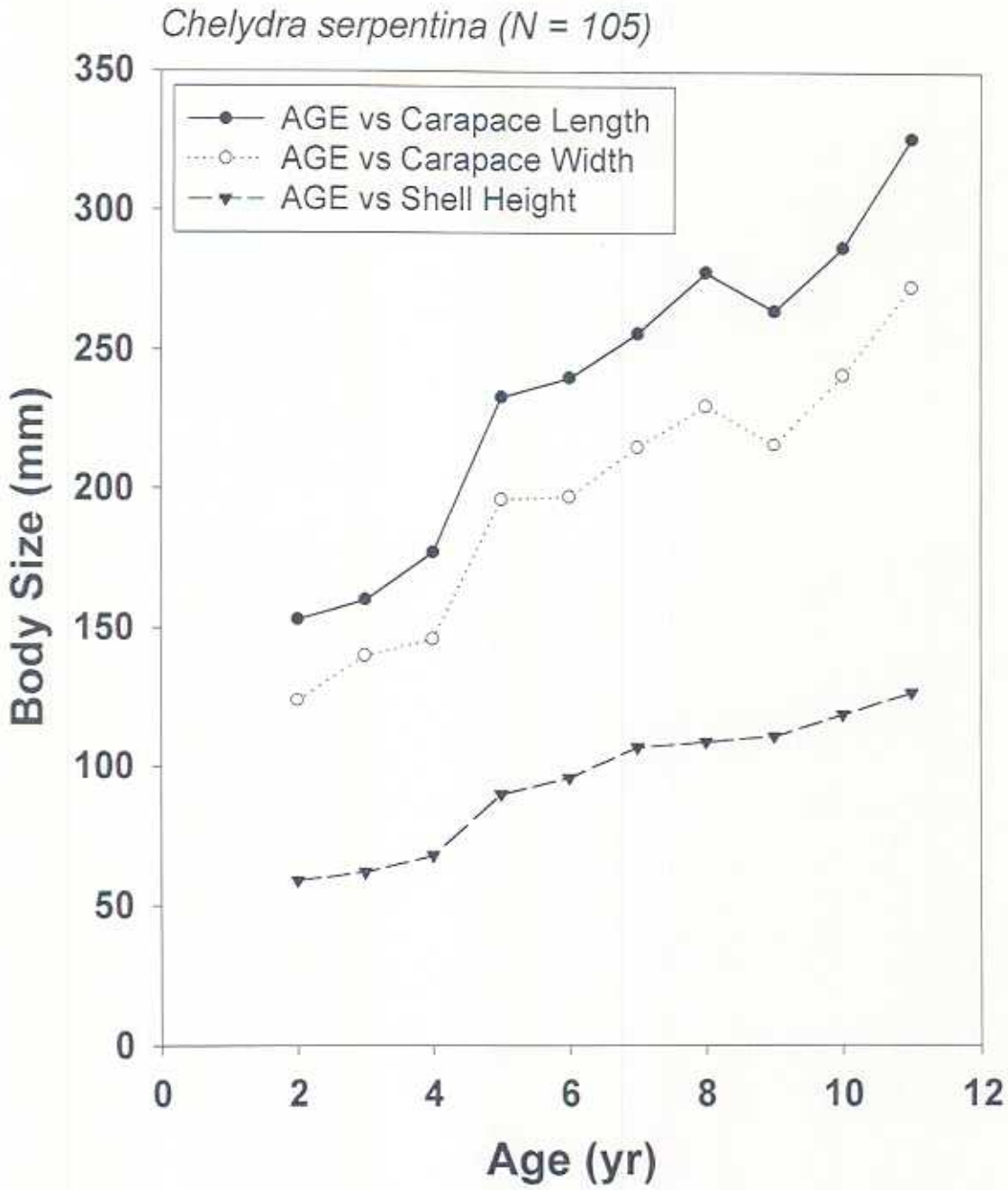

a) Chelydra serpentina (n = 73)
14
12
10
8
6
4
2
0
100
150
200
250
300
350
b) Chrysemys picta belli (n = 741)
30
25
20
15
10
5
0
60
80
100
120
140
160
180
200
% of sample
Carapace length (mm)

Figure 5.


Chelydra serpentina (N = 105)
AGE vs Carapace Length
AGE vs Carapace Width
AGE vs Shell Height
Body Size (mm)
Age (yr)
0
50
100
150
200
250
300
350
0
2
4
6
8
10
12

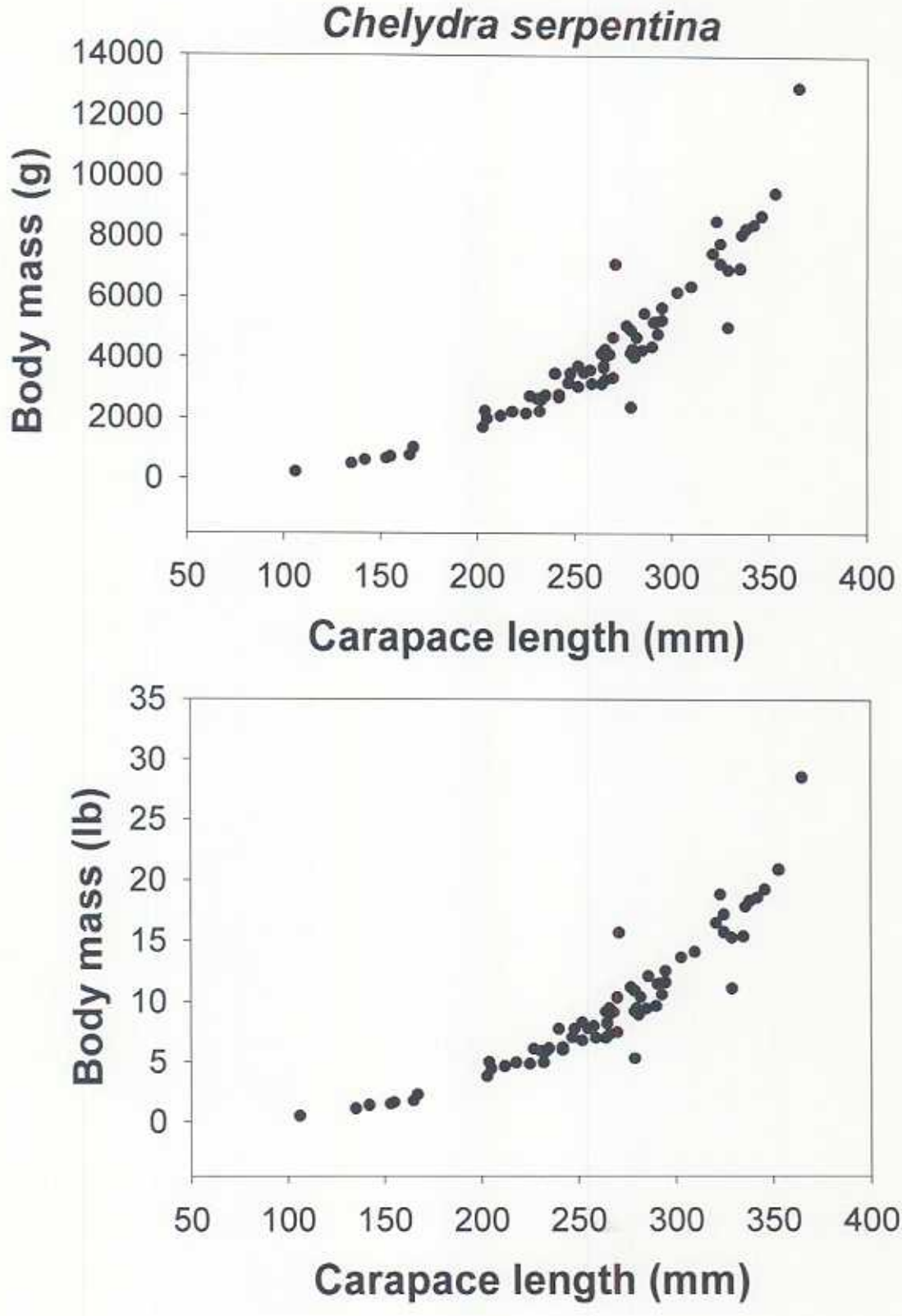


Figure 6. Weight versus carapace length of 65 Snapping Turtles (Weaver 2001).

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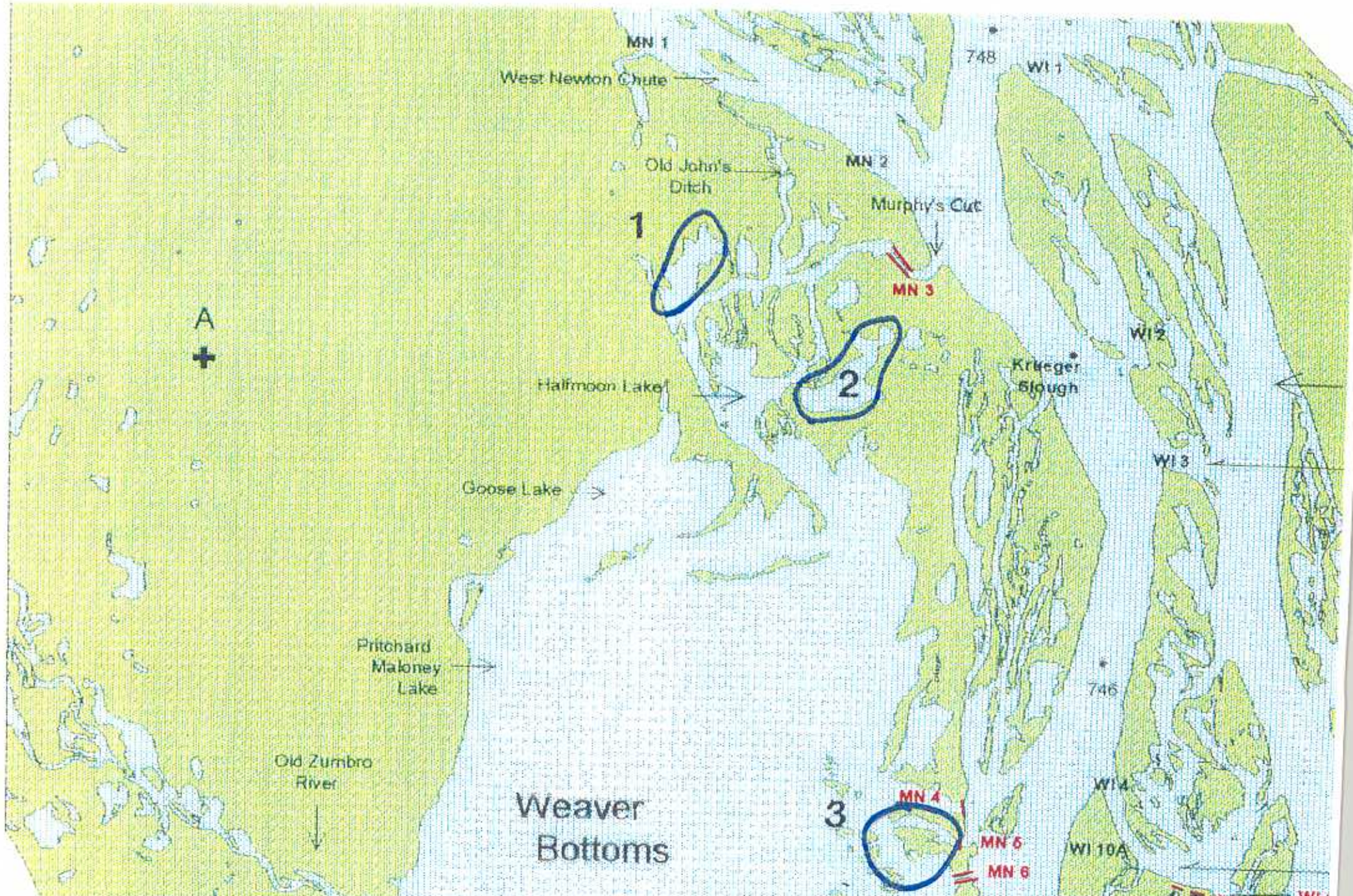
MN 1
West Newton Chute
748
WI 1
Old John's Ditch
MN 2
Murphy's Cut
1
MN 3
A
WI 2
Krueger Slough
Halfmoon Lake
2
WI 3
Goose Lake
Pritchard Maloney Lake
746
Old Zumbro River
Weaver Bottoms
3
MN 4
MN 5
MN 6
WI 4
WI 10A

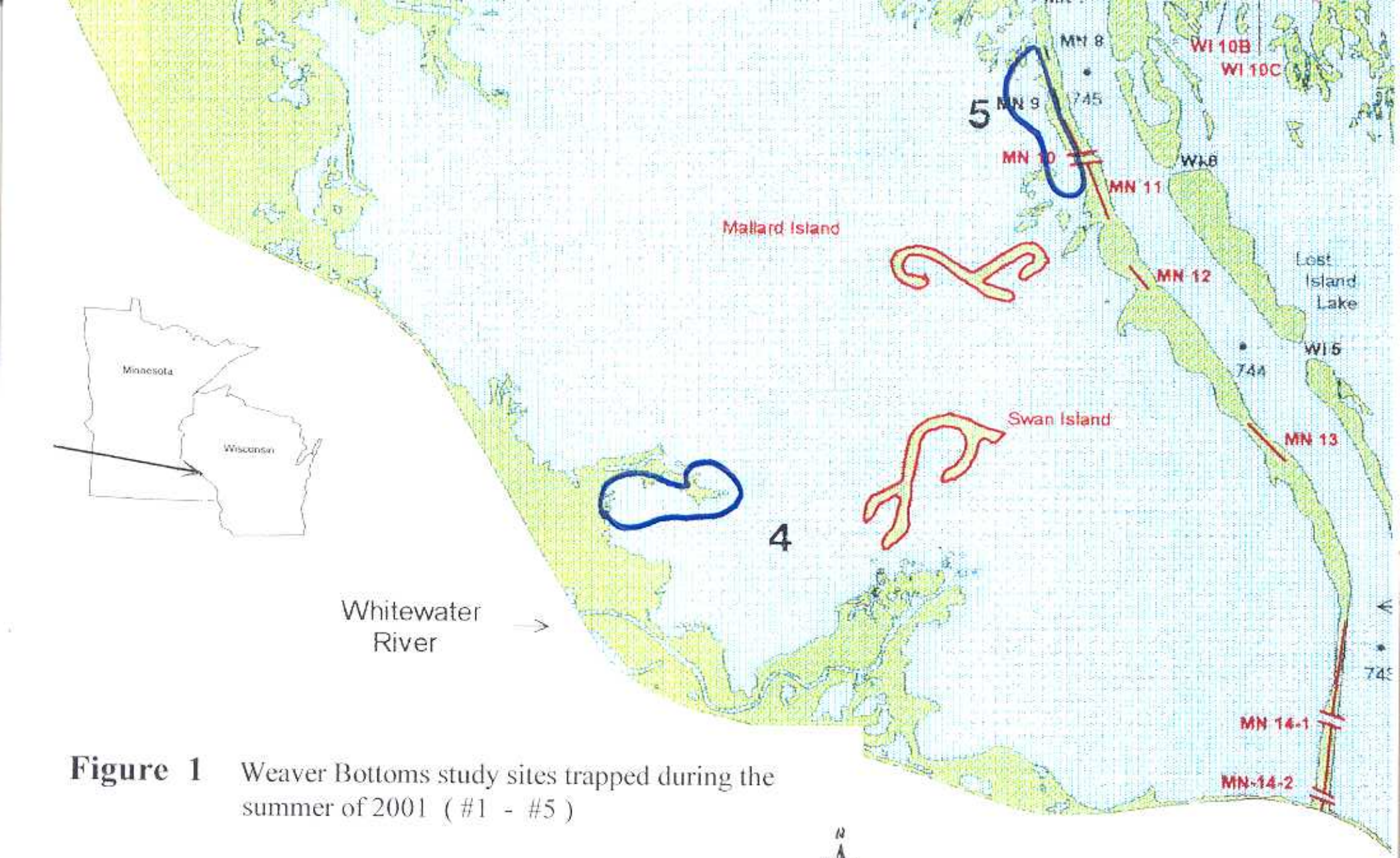

Figure 1 Weaver Bottoms study sites trapped during the summer of 2001 (#1 - #5)