A 1994 UNIONID MUSSEL SURVEY (MOLLUSCA: BIVALVIA: UNIONIDAE) FROM THE HEADWATERS OF THE ROOT RIVER SYSTEM, MN, TO THE MISSISSIPPI RIVER.

BY

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FINAL REPORT

JUNE 1995

FOR

MINNESOTA DEPARTMENT OF NATURAL RESOURCES

NONGAME RESEARCH PROGRAM

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1 ABSTRACT

A 1994 UNIONID MUSSEL SURVEY (MOLLUSCA: BIVALVIA: UNIONIDAE) FROM THE HEADWATERS OF THE ROOT RIVER SYSTEM, MN, TO THE MISSISSIPPI RIVER.

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The Root River of Minnesota apparently has never been surveyed for unionid mussels. This report gives the results of sampling for unionids from 6 - 17 June 1994 at 117 bridge and road access sites between the Root River system headwaters and the Mississippi River. We also sampled sites on the nearby Upper Iowa (2) and Little Iowa Rivers (8), for a total of 127 sites.

The main stem of the Root River starts just NE of Lanesboro, MN, at the confluence of the North and Middle Branches, and flows easterly to its confluence with the Mississippi River, between La Crescent and Brownsville, MN. Sampling consisted of wading and shoreline searches in the headwaters and middle reaches of the Root River system, and shoreline searches by boat in the lower six miles of the Root River from Hokah, MN, to the, river's mouth.

This Root River survey included the main stem and all four major tributaries, and yielded at least 16 unionid mussel species. However, only three species were found alive, represented by five living mussels: Venustaconcha e. ellipsiformis (Conrad, 1836), Ellipse (3), and Lampsilis radiata luteola (Lamarck, 1819), Fatmucket (1) were found at one South Branch site, 0.5 mi N of Etna, MN, and one Anodontoides ferussacianus (Lea, 1834) Cylindrical Papershell, was found at a North Branch site, 4 mi NW of Dexter, MN. A number of the remaining species were represented by fairly fresh-dead shells. The most species (12) were found in the North Branch of the Root River, among 22 sites, however the most shells were found in the South Branch among 40 sites (nine species). Eleven species were found among eight sites on the Middle Branch of the Root River. The most common species found, both dead and alive, Venustaconcha e. ellipsiformis, also lives in the Cannon and Zumbro Rivers of southeastern Minnesota, but apparently was not found in western Wisconsin for over 60 years, until 1992-1994, when it was found in a tributary of the Chippewa River, near Cadott, WI.

Overall, our data show severe impacts to the 117 sites on the Root River system. We were unable to pinpoint the precise impacts that led to this situation, but our preliminary conclusions are that cumulative impacts, primarily agricultural, are apparently responsible. Since the Zebra Mussel is exploding in the Mississippi system, we must quickly identify tributary molluscan fauna, or risk losing unique populations before they can be identified. We hope to have additional funding to complete areas not sampled in 1994, including portions of the North Branch, South Branch, and Root River main stem, plus a number of tributary creeks.

2 INTRODUCTION AND BACKGROUND

In recent times about 30 unionid mussel species have been reported alive from Pool 8 of the Mississippi Rivet between Brownsville, MN, and La Crescent, MN (Fuller 1978, 1980a, 1980b; Havlik 1980, 1983), including, the endangered Lampsilis higginsi (Lea, 1857), Higgins' Eye, and other rare Upper Mississippi River species, such as Anodonta suborbiculata Say, 1831, Flat Floater. A. suborbiculata was first reported in a Wisconsin backwater slough, Mississippi River Pool 8, in 1978 (Havlik 1981). This species has been expanding upstream in the Mississippi River system, apparently taking advantage of slower waters created by the locks and dams.

The overall unionid fauna of the Mississippi River between Minnesota and Wisconsin, including Pool 8, is quite well known, although specific distribution patterns are not well understood (Baker 1928; Dawley 1944, 1947; van der Schalie and van der Schalie 1950; Fuller 1978, 1980a, 1980b; Havlik 1983; Thiel 1981).

Some Minnesota tributaries of the Mississippi River, such as the Root River, have apparently never been sampled intensively for unionid mollusks. The Root River system, with a watershed of 1670 square miles (Waters 1977), starts over 90 miles W its confluence with the Mississippi River S of La Crescent, MN (Figures 1, 2, 3).

The Root River drops 550 feet from its headwaters to the Mississippi River (Waters 1977). Because erosion problems with the Root River fisheries, Thaddeus Surber (1924, in Waters 1977) conducted a biological survey of the Root River system in the early 1920's, walking over 1000 miles recording fish species seen in the various tributaries of the system.

Sound management practices are difficult to impossible, if the organisms to be managed have not been identified and quantified, particularly if there are federal and state endangered and rare species nearby. In addition, there are potential impacts from the exotic Zebra Mussel, Dreissena polymorpha (Pallas 1771), whose populations are exploding in the nearby Mississippi River.

During September 1993, Malacological Consultants conducted a unionid mollusk survey at 150 sites on the Elkhorn River in north-central Nebraska (Clausen and Havlik 1994). Due to the nature of the 300 mile long Elkhorn River and major tributaries, most sampling was done at bridge crossings and road access points. We expected that a unionid mussel survey of the Root River would have be conducted similarly, so the same sampling methods were proposed for this Root River project.

The Elkhorn River once had as many as 30 mussel species. However, we only found seven living species among 231 living mussels, mainly from the upper reaches of the main stem of the Elkhorn, and in the lower reaches of major tributaries. The moat abundant mussel bed found was in an upstream tributary, less than three meters wide.

This Root River study was proposed to fill part of the data gaps in Minnesota's faunal inventories. Field work is necessary to refine inventory data and to identify any rare species populations.

3 METHODS

Bridge and road access points were determined on 30 - 7.5' topographic maps encompassing the Root River system of southeastern Minnesota. The main stem of the Root River begins near Chatfield, MN, at River Mile 85.0. The headwaters of major tributaries are N of Renova, MN (North Branch), W of Fillmore, MN (Middle Branch), *S* of Grand Meadow, MN (South Branch), and NE of Harmony, MN (South Fork) (Figures 1, 2, 3). The southern portion of this area, near the Minnesota - Iowa border, contains the headwaters of the Little Iowa River, which is a tributary of the Upper Iowa River (Figure 4).

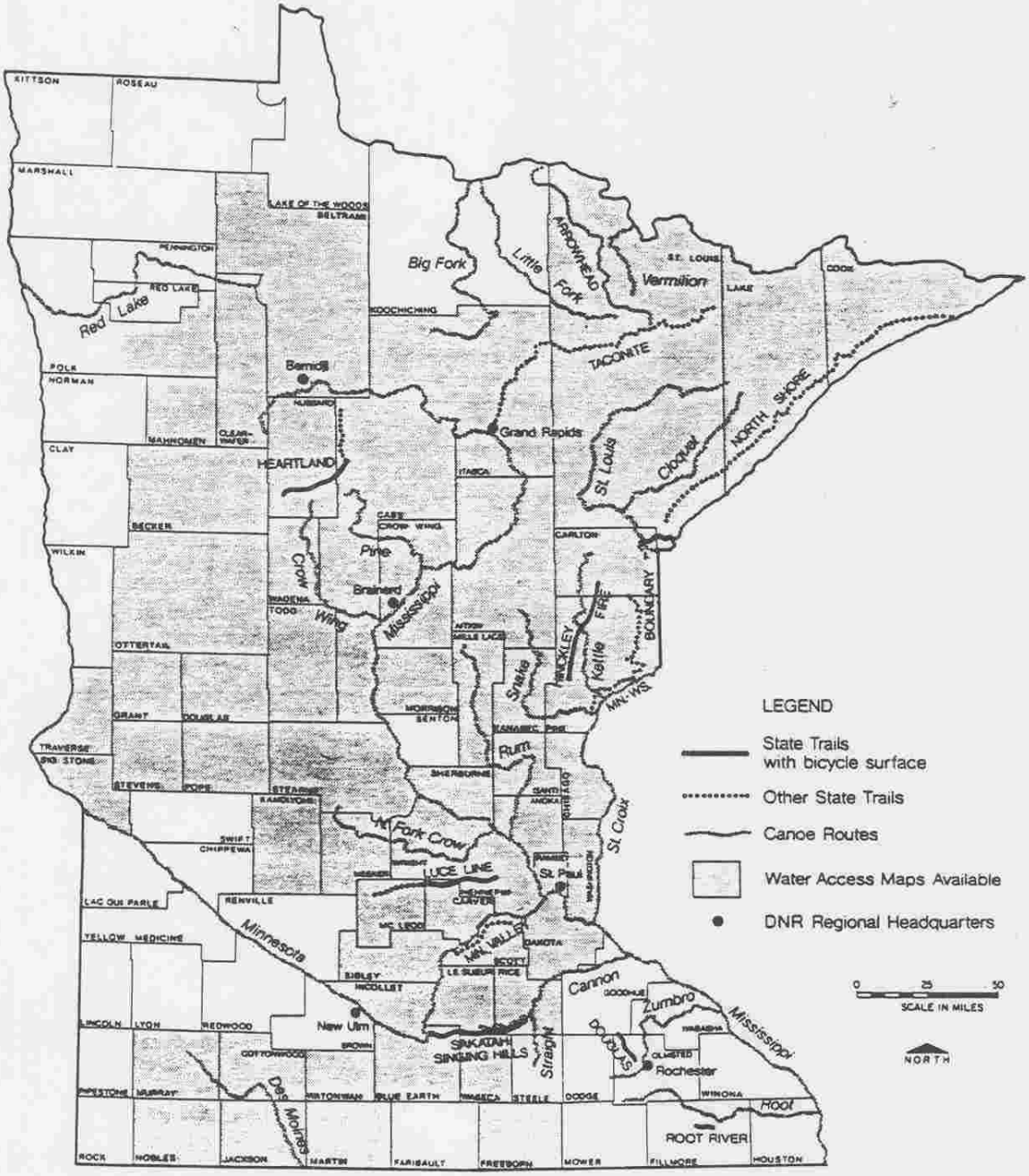
Initially we had intended to start with the Main Stem of the Root River, but two days of sampling on the lower Root River from its junction with the Mississippi River and upstream on the Root River to Hokah, MN, plus sampling at several areas near Lanesboro, MN, were generally non-productive. Given the results of the Elkhorn River, NE, study, we then decided to start at the extreme headwaters of each major Root River tributary, and methodically work our way downstream sampling every bridge site and road access.

At each site random sampling was done to the point of diminishing returns. One person proceeded upstream for up to 200 m at each site, and another person proceeded downstream for about the same distance, averaging about 50 m in each direction. Searches were conducted in the water where possible, and along the shoreline, and in the shoreline vegetation.

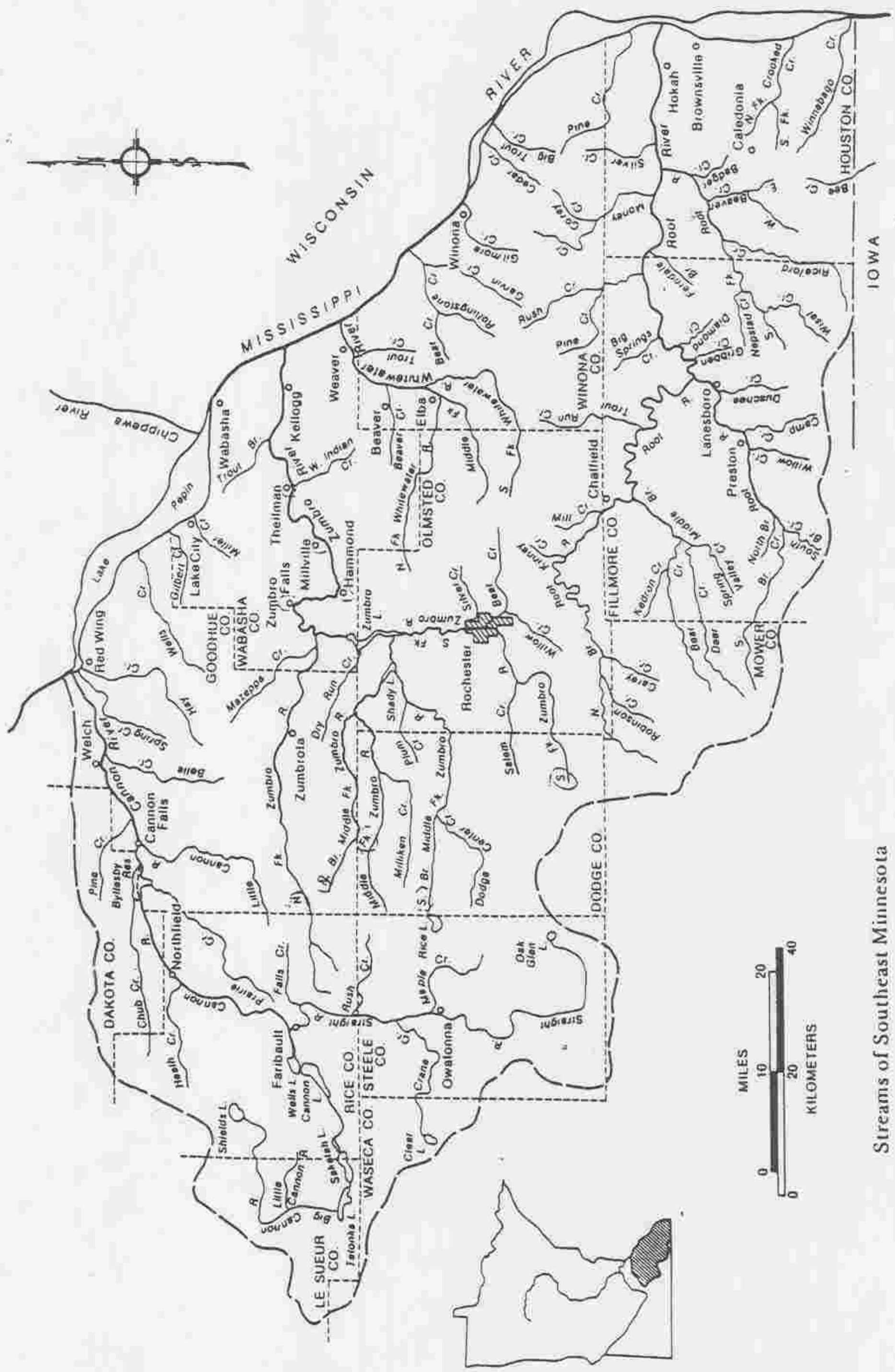
Living mussels were identified, enumerated, aged, measured, and retained, as practical. Empty shells, valves, and fragments were also identified, enumerated, and retained, when practical. Representative voucher specimens from most sites were deposited at the J. F. Bell Museum, University of Minnesota, Minneapolis, MN. Some specimens were also sent to The Ohio State University Museum of Biological Diversity, Columbus, OH. All specimens were grossly examined for <u>Dreissena polymorpha.</u>

We used four county maps to help determine localities, and to determine the physical relationship of various Root River branches to each other and to the River system. Sampling locations were plotted on 7.5 minute topographic maps. Field sheets were designed for this project. Locale and other data were recorded on a separate sheet for each site. Some colored slides were taken throughout the study area.

3.1 FIGURE 1. MINNESOTA MAP SHOWING THE ROOT RIVER SYSTEM

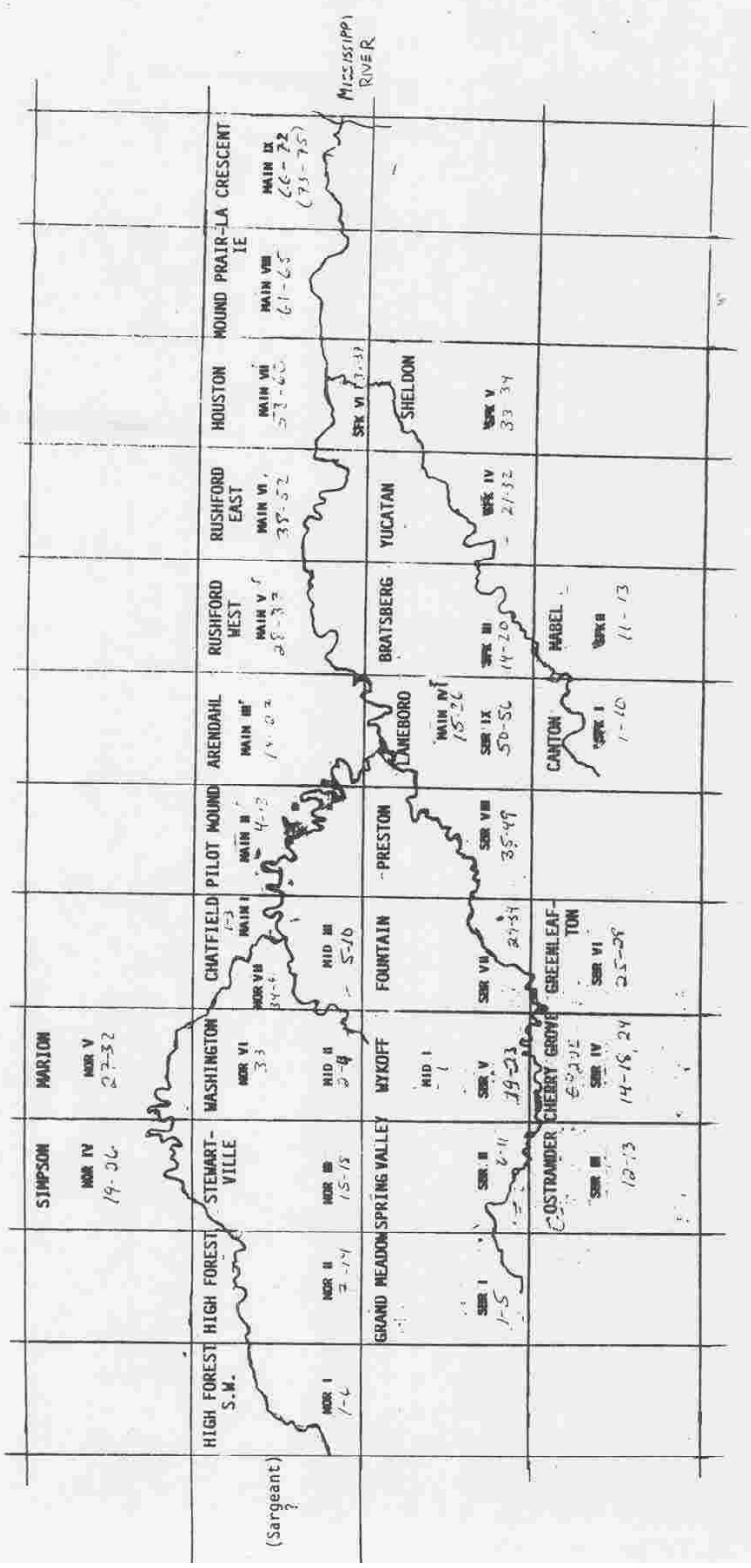


3.2 FIGURE 2. ROOT RIVER SYSTEM MAP (FROM WATERS 1977)

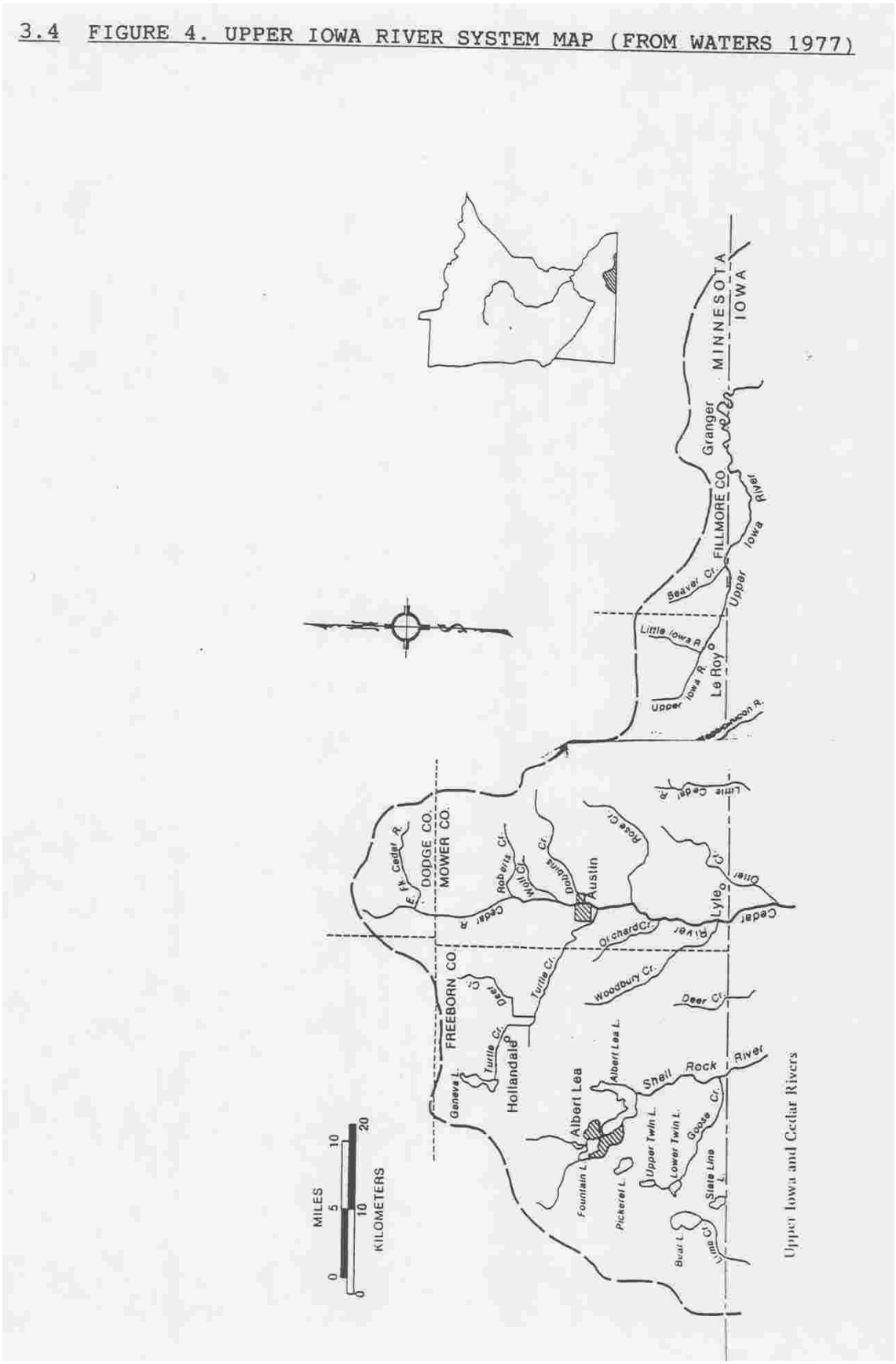


Streams of Southeast Minnesota

3.3 FIGURE 3. ROOT RIVER SYSTEM, 7.5' TOPOGRAPHIC MAPS



3.4 FIGURE 4. UPPER IOWA RIVER SYSTEM MAP (FROM WATERS 1977)



4 RESULTS

From 6 to 17 June 1994, 117 sites on the Root River system were surveyed at bridge and road access sites from the headwaters, to the Mississippi River, to determine the presence of unionid mollusks, their distribution, diversity, and relative abundance. We also sampled two sites on the nearby Upper Iowa River, and eight sites on the nearby Little Iowa River, for a total of 127 sites.

This survey, which included portions of the main stem and four major tributaries, yielded at least 16 species of unionid mollusks (Table 1). However, only three living unionid species were found, represented by five living mussels (Table 2). Several empty shells need further study to confirm their identification.

Some unionids were aged, and measured for length to the nearest mm. We've found length to be the most important measurement based on our work at Prairie du Chien, WI (Havlik and Stein 1993). Mussels were sexed as practical. Specimens were enumerated on a separate field sheet for each site. Visual habitat observations were recorded as appropriate. Empty shells were enumerated and identified, and most were retained as practical.

In actual abundance, Venustaconcha e. ellipsiformis was the species most often found with over 200 specimens from 16 sites (Table 3). The species that occurred most frequently was Anodonta grandis f. grandis Say, 1829, Floater, which was found at 32 sites. Lasmigona complanata (Barnes, 1823), White Heelsplitter, was found at 15 sites. Strophitus u. undulatus (Say, 1817), Strange Floater, and Lampsilis ventricosa (Barnes, 1823), Pocketbook, were each found at 14 sites, while Lampsilis radiata luteola (Lamarck, 1819), Fatmucket, and Anodontoides ferussacianus (Lea, 1834) Cylindrical Papershell, were found at 13 and 12 sites respectively. Seven unionid species were found at 12 or more sites, while the remainder were found at seven or fewer sites, including three species found at only one site each (Table 3). No Dreissena polymorpha, Zebra Mussels, were found.

Root River system sampling sites were plotted on 30 - 7.5 minute topographic maps. Sites were numbered starting with the headwaters of each river segment, including the Root River main stem. Each site was given a number on both the field sheet and the maps, such as SB1 (South Branch, Site 1), or SF25 (South Fork, Site 25) etc.

On the second day of this study we started at the confluence with the Mississippi River. Three persons proceeded upstream via boat for six miles to Hokah, MN, looking for mussels shells along the river banks and sandbars. No unionids were found, dead or alive.

The following number of sites have been sampled on each segment of the Root River system. Sampling on the South Fork and Middle Branch has been completed, but not on their tributaries. The number of sites remaining to be sampled on other river segments, plus their tributaries, are listed below.

NUMBER OF SITES DONE, AND REMAINING, ROOT RIVER SYSTEM, JUNE 1994

	DONE	REMAINING (estimated)
ROOT RIVER MAINSTEM	14	57
MISC. TRIBUTARY CREEKS	1	100
SOUTH BRANCH 40	24	
SOUTH FORK (completed)	27	-
MIDDLE BRANCH (completed)	8	-
MIDDLE BRANCH TRIBUTARIES:		
DEER CREEK	3	24
BEAR CREEK	2	45
SPRING VALLEY CREEK	-	24
NORTH BRANCH	21	24
MISCELLANEOUS TRIBUTARY CREEKS	1	25
UPPER IOWA RIVER	2	-
LITTLE IOWA RIVER (completed)	8	-
	127	323

4.1 VOLUNTEER HELP AND PUBLIC INVOLVEMENT

We solicited volunteer help for the 1994 Root River study. Students from several southeastern Minnesota high schools, and three supervisors, all working for the Private Industry Council, Inc., Caledonia, MN, assisted us for two days in the field. All volunteers were required to wear life jackets when working in the Root River.

Thus, 14 students aged 14 to 17, plus their supervisors including Wayne Highum, local Director of the Private Industry Council, were given a real life biological research experience on the South Branch of the Root River, both upstream and downstream of the Mystery Cave complex (Appendix: Miscellaneous Correspondence).

The enthusiastic response of our young volunteers was most rewarding. They wanted to continue working with us, but unfortunately not all areas of the Root River system are suitable for wading (too deep), and in one area a local landowner warned that a creek flowed over the Mystery Cave System, and that the stream bed might not be safe to walk on. In addition, at that point nearly all of our time allotted for field work had been used up. Student volunteers however, could be very helpful on the smaller creeks.

We also spoke to the Fillmore County Water Resources Board, Tuesday, 14 June 1994 (Appendix: Miscellaneous Correspondence). A general slide presentation and display was given to about 10 persons. Questions were answered on the importance of mussels in the Root River ecosystem to give the Board insight into problems with the River system. A statement was included that this Root River project was funded by the Minnesota Nongame Wildlife Program from contributions to the Minnesota Nongame Wildlife Tax Checkoff. We were not aware of any other media coverage for this project.

5 DISCUSSION

This Root River study was essentially conducted by the same team that conducted the Elkhorn River, Nebraska, study (Clausen and Havlik 1994). This

crew is very experienced at quickly assessing the presence or absence of mussels. Thus if unionids were present, we should have at least found evidence of empty shells, and sometimes did at some distance away from the river channel.

Based on our 1993 experiences at 150 sites on the Elkhorn River,. Nebraska, if unionids are present, they are more likely be found near or upstream of the midpoint of a small river system. But, because of a reasonably diverse unionid fauna in the nearby Mississippi River, unionids should also be present in the lower Root River, although they may be more difficult to find, unless brailing is feasible, or low water conditions reveal shells on sandbars or shorelines.

If we had sampled only at every other road access or bridge site, we could have missed our more productive sites, particularly at the site two miles W of Mystery Cave #1 (0.5 mile N of Etna, MN).

No quantitative sampling was done, because no mussel concentrations were found. In many areas quantitative sampling would be very time consuming because of largely broken bedrock substrata. We would only consider recommending a few sites for quantitative sampling.

The lower Root River is known to carry a considerable sediment load. This sediment load is evidenced by the frequent need for U.S. Army Corps of Engineers navigation channel maintenance dredging downstream of its confluence with the Mississippi River, and near Brownsville, MN. In May 1985 the Principal Investigator briefly took her john boat about two miles up the Root River, nearly to the Hwy 26 bridge, and did not note any obvious mussel concentrations or shoreline middens at that time.

The most common unionid species found, dead and alive, in southeastern Minnesota, Venustaconcha e. ellipsiformis (Conrad, 1836), Ellipse Shell, apparently has not been reported in western Wisconsin for over 60 years, although the species has been found alive in eastern Minnesota since the 1980's in the Cannon, Straight, and Zumbro Rivers (Davis 1988, Bright et. al 1989).

In May 1995 it came to our attention that living specimens of Venustaconcha e. ellipsiformis had been found in the Yellow River, Cadott, WI, (Dr. Terry Balding, personal communication). That site is about 100 river miles from the Mississippi River, about the same distance as the more productive V. e. ellipsiformis sites on the Root River system. For a further discussion of V. e. ellipsiformis see Section 5.8.

Waters (1977) states that the adverse agricultural impacts actually started in the 1840's when European man began settlement and farming in Houston County, in southeastern Minnesota.

In 1994 cattle, horses, and pigs were observed in the Root River system in many areas. Some headwater fields are tiled and drained, particularly on the South Branch. Agricultural use is heavy throughout much of the Root River system, with steep, eroding river-banks in many areas.

Hove and Neves (1994) stated that road construction, cattle grazing, and feed lots that often introduce excessive silt and nutrients into a stream, were the most detrimental activities to the continued existence of Pleurobema collina (Conrad, 1837), James Spinymussel, a federally endangered unionid mussel endemic to the James River watershed, near Richmond, Virginia.

Since nearly all of the riparian lands bordering streams with P. collina were privately owned, any increased, intensive use of riparian habitat would probably deteriorate water quality and thus habitat suitability.

During life history studies of P. collina, Hove and Neves (1994, p. 34) were led to believe that two species of Catostomidae (white sucker and northern hog sucker), and perhaps other benthic feeders, may ingest glochidia incidentally in streams. Both of these fish species are present in the South Branch of the Root River (Schmidt 1993a). Apparently this phenomena has not been reported before, but in streams with a limited unionid fauna this could be a serious problem.

Overall, our data show severe impacts to the Root River system. We were unable to pinpoint the precise impacts that led to this situation, but similar to Hove and Neves' observations (1994), our preliminary conclusions are that cumulative impacts, primarily agricultural, are apparently responsible for the near decimation of the unionid fauna.

Most Root River system topographic maps are very outdated. Many highway designations (numbers) have changed. Occasionally the present roads are not shown, or else the river or the road have changed considerably. MNDNR should request that the U.S. Geological Survey update these maps. County maps, apparently updated more frequently, are very helpful, but lack clear detail for small streams. A discussion of the various segments of the Root River system follows.

5.1 NORTH BRANCH ROOT RIVER, MN, JUNE 1994

About half (22) of the sites have been sampled on the North Branch of the Root River which starts about 10 miles NE of Austin, MN, and N of Renova, MN. The North Branch joins the Middle Branch River near Chatfield, MN (Waters 1977), to become the main stem of the Root River, at River Mile 85.0. Eleven unionid species were found in the North Branch, with the possibility of an additional species being represented.

The only living unionid in the North Branch, was found about 1.5 miles from the headwaters. Anodontoides ferussacianus, Cylindrical Papershell, was represented by one - five year old living specimen, at the bridge 3.5 mi NW of Dexter. Dawley (1944) states A. ferussacianus is usually the first unionid species to appear in the headwaters of a stream. Our findings confirmed this.

We found empty Venustaconcha e. ellipsiformis at three sites. This species should be living in the area near the mouth of Robinson Creek, just E of the town of High Forest, MN. About 25 sites should be sampled on North Branch tributaries, including Robinson Creek.

In May 1994, Jeff Weiss, a MNDNR employee, Rt. #1, Box 85, Lanesboro, MN 55940 (phone: 507-467-2442), collected old-dead Alasmidonta marginata Say, 1818, Elktoe, Lasmigona costata (Rafinesque, 1820), Fluted Shell, Lasmigona complanata, White Heelsplitter, Truncilla truncata Rafinesque, 1820, Deertoe, Lampsilis ventricosa, Pocketbook, and possibly Pleurobema sintoxia (Rafinesque, 1820), Round Pigtoe, from the North Branch of the Root River. L. costata, P. sintoxia, and T. truncata were not found in the North Branch during our study. These specimens, verified by this P.I., February 1995, were added to the voucher specimens from this study, and deposited at the Bell Museum.

We were very concerned that, at the time of our field work, we were not made aware of plans to alter the North Branch of the Root River at Stewartville, MN. Our field work did not reach the area to be impacted at Stewartville. Subsequently, we expressed our concerns in writing to the U.S. Army Corps of Engineers, and to the Minnesota Department of Natural Resources, Rochester, MN. As a result, the Minnesota Department of Natural Resources did a brief survey (Appendix: Miscellaneous Correspondence).

5.2 MIDDLE BRANCH ROOT RIVER, MN, JUNE 1994

We sampled all eight easily accessible sites on the Middle Branch of the Root River, which flows between Fillmore and Chatfield, MN. Nine unionid species, and possibly another species yet to be confirmed, were represented by empty shells. We strongly urge that all possible sites be sampled on at least three creeks that are tributaries of the Middle Branch of the Root River.

5.2.1 DEER BEAR AND SPRING VALLEY CREEKS

We sampled three sites near the confluence of Deer Creek and the Middle Branch; three unionid species were found. We also sampled two sites near the confluence of Bear Creek and the Middle Branch. Three unionid species were found.. Both creeks looked promising for the presence of more unionid mussel species.

In May 1994, Jeff Weiss, a MNDNR employee, collected empty Anodonta grandis f. grandis, Lasmigona costata (fairly fresh), Lampsilis ventricosa, and Lampsilis radiata luteola from Bear Creek. These specimens, verified by this Par., February 1995, were added as vouchers from this study, and deposited at the Bell Museum. This makes at least seven unionid species from Bear Creek.

These two creeks, plus Spring Valley Creek should be sampled from their headwaters to their junctions with the Middle Branch of the Root River, for a total of nearly 100 more sites. One of the high school students who worked with us stated that she had seen mussels and shells on Spring Valley Creek, NE of Spring Valley, MN, but we did not have time to verify this report in 1994.

5.3 SOUTH BRANCH ROOT RIVER, MN, JUNE 1994

Nearly two-thirds (40) of the potential sites have been sampled on the South Branch of the Root River. The South Branch seems to be the most productive Root River area, with two living unionid species and seven additional species represented by empty shells.

The South Branch originates S of Grand Meadow; MN, and flows easterly through glacial drift, an agricultural area, to E of Hwy 63. Starting two miles east of Hwy 63, the South Branch flows through the non-glaciated Driftless Area for the rest of its length. NE of Lanesboro, MN, the South Branch joins the Root River main stem at River Mile 55.3 (Waters 1977). According to a MENDER canoe map, the South Branch is considered a cold water trout stream.

The first unionid shells were found at the sixth site, 5.5 miles from the headwaters. Three species were found within 10 miles of the South Branch headwaters, including Toxolasma parvus (Barnes, 1823), Lilliput, a species once thought not to be a regular part of the Upper Mississippi River mussel

fauna (van der Schalie and van der Schalie 1950). We did not expect to find this species so far upstream, and so close to a headwaters.

All nine South Branch unionid species were present in the most productive area, Site 15, 0.5 mile N of Etna, MN. Seven species were represented by empty shells, and three Venustaconcha e. ellipsiformis, Ellipse, and one Lampsilis radiata luteola, Fatmucket, were found alive. Over 200 shells of V. e. ellipsiformis were found at this site, which is two miles W of Mystery cave #1.

At this site, just inside of the Driftless Area, the broken-up bedrock substrata is difficult to sample, but it is the only site found to date where quantitative sampling might be attempted. We could not understand why few unionids were found immediately upstream and downstream of this reasonably productive site.

MNDNR personnel at Mystery Caves provided a personalized tour of both caves in order to help us understand what impact, if any, the 12 mile long cave system has had on the unionid fauna of the South Branch of the Root River.

Although we have not completed sampling on South Branch, it appears that the Caves presently act as somewhat of a barrier for the unionid fauna, since we found more unionid species and specimens upstream of the Caves than downstream. However, the Caves may just happen to be the point at which the agricultural impacts have accumulated to the extent that in reality, the agricultural impacts are the real problem.

Montz (1993) recommended that easements for a buffer zone be negotiated upstream of the Mystery Caves, in order to reduce upstream sedimentation in the cave system. A buffer would also ease impacts from pesticides and herbicides used in those largely agricultural areas. These efforts would require the considerable cooperation of the landowners.

The Myron Rollie family (phone: 507-352-6561) graciously allowed our field crew, including 14 students and their supervisors, access through their farm fields to an area known as Seven Springs. At Seven Springs the underground portion of the South Branch of the Root River reemerge from these springs, and the South Branch no longer flows partially underground through the cave complex.

5.4 SOUTH FORK ROOT RIVER, MN, JUNE 1994

All of the twenty-seven sites were sampled throughout the entire. South Fork of the Root River, from NE of Harmony, MN, to E of Houston, MN, where this tributary joins the main stem of the Root River at River Mile 17.7. No trace of unionid mussels were found, dead or alive. Not even a shell fragment was found. Dead sphaeriids (fingernail clams) were seen at one site, 1.2 mi NW of Yucatan, Houston County, MN. Sampling on the South Fork has been completed.

The South Fork did not appear particularly different from any other part of the Root River system, so we have few clues as to the conditions that apparently lead to a complete lack of unionids. We talked to the owner of the Orr Tree Farm, near Yucatan, MN, who stated that he had never seen any "clams" in the South Fork in over 70 years. Mr. Orr stated that there were catfish, carp, trout, and turtles in the section of the river that flowed

through his land. Perhaps the South Fork of the Root River simply never had unionid populations, although habitat appeared suitable in a number of areas.

Cows had access to the South Fork at a number of sites, including near the headwaters. A dead pig was also seen in the South Fork. There were swallow nests under most bridges, including up to 400 swallow nests at one site. The swallows were hatching their broods, and were usually very agitated by our presence on bridges. We did not feel threatened, although the sight was frequently reminiscent of the movie "The Birds".

The South Fork is considered a cold water trout stream. Only a few fish were seen, although fishermen were observed in several areas. The first fish observed were at the seventh site from the headwaters, on Fillmore County Highway 18, Canton Quad, Section 33, T 101 N, R 9 W, 1.5 mi SW of Amherst, MN. Minnows were seen at a number of sites, along with frogs and tadpoles, plus tracks from deer, mink, and raccoon.

In several areas trees were felled so that they apparently served as riprap along the shoreline. At one site near Houston, MN, trees appeared to have been cut so that they would not clog the area under the bridge. This caused this section of the River to look like a drainage ditch, with corn growing 15 m from the waters edge.

Whether or not this type of stream (cold water) is compatible with unionid mollusk populations is not entirely clear, but it should not be a problem. The upstream section of the South Fork appeared to be ideal unionid habitat, especially since portions of the stream were bordered by limestone cliffs, particularly two miler NW of Tawney, MN, Section 17, Bratsburg quadrangle map.

5.5 MAIN STEM ROOT RIVER, MN, JUNE 1994

Fifteen sites were sampled on the main stem of the Root River, with about 57 sites remaining. Only eight unionid species were found, all represented by empty shell. The entire area from Hokah, MN, to the mouth of the Root River was sampled by a boat float trip; no mussels were found, dead or alive. Overall, the banks of the Root River, especially downstream of Houston, are subject to considerable erosion.

5.6 UPPER IOWA RIVER, MN, SITES, JUNE 1994

We talked to two boys fishing in ,a pond 3.5 mi SW of Spring Valley, MN. The boys had seen mussels in the Upper Iowa River, both upstream and downstream of the Lake Louise Dam, Lake Louise State Park, Le Roy, MN, especially after the 1993 flood.

Since we were about 12 miles from the Lake Louise dam, and since we had found few unionids up to that point during this Root River project, we detoured to look at one site upstream, and one site downstream of the Lake Louise dam, Le Roy, on the Upper Iowa River. Six species were represented by empty shells.

The area downstream of the Lake Louise Dam appeared more promising, however only a relatively small portion of the Upper Iowa River is within the state of Minnesota, draining a Minnesota area of 70 square miles (Waters 1977). In 1972 the Upper Iowa River was one of 27 designated as a National Wild and Scenic River.

The Iowa portion of the Upper Iowa River may have been sampled for unionids by college students and others (Eckblad and Coon 1984). Additional studies were also done on various Iowa Rivers by Dr. Terry Frest, formerly at the University of Iowa, Iowa City, IA. We have not seen these reports, so we do not know if the Minnesota portion of the Upper Iowa River was ever sampled for unionids.

5.7 LITTLE IOWA RIVER, MN, SITES, JUNE 1994

The Little Iowa River joins the Upper Iowa River just N of Le Roy, MN. Since we crossed this tributary enroute back to our project sites, we sampled eight sites as we traveled to sample sites on the South Fork of the Root River. One mussel species, Anodonta grandis f. grandis, Floater, was represented by empty shells. Sampling of the Little Iowa River, in MN, for unionid mussels has been completed.

5.8 DISCUSSION OF Venustaconcha e. ellipsiformis (Conrad, 1836)

Simpson (190.0) reported Lampsilis ellipsiformis occurred in the "Upper Mississippi Valley generally; south to about 38° latitude; western New York; southern Michigan; southern Canada; Red River of the North". Grier and Mueller (1922-1923) quoted Simpsoil (1914), adding "we did not collect it (Ligumia ellipsiformis) north of there, nor does it extend into Central and Northern Minnesota".

Geiser (1910) reported Lampsilis ellipsiformis in the Volga River, Fayette, IA, and in the Wapsipinicon River, Independence, IA, and at other localities. Pratt (1876) (in Grier and Mueller 1923) also reported L. ellipsiformis from Iowa. Dawley (1944, 1947) did not report Venustaconcha e. ellipsiformis from Minnesota.

van der Schalie and van der Schalie (1963) extensively discussed Venustaconcha e. ellipsiformis, and reported on the ecological preferences and life history of this species. The largest specimen they found was 55 mm long. The van der Schalies were unable to identify a host fish from among 1,6 common fish species collected from Ore Creek, near Hartland, Livingston County, Michigan. The host for V. e. ellipsiformis could be an organism other than a fish, or possibly development could occur without a host.

Schmidt (1993a) reported 20 fish species (seven families), represented among 675 fish in the South Branch of the Root River Mystery Cave complex, seven miles SE of Spring Valley, MN. The common shiner and southern redbelly dace were 19.1% and 21.2% of the catch respectively. The blacknose dace (13.3%) and creek chub (9.5%) were the most frequently sampled, at six stations each.

The van der Schalie's (1963) reported the common shiner and creek chub, plus six other fish species common to both the South Branch of the Root River and Ore Creek, Michigan, but apparently not the blacknose dace and the southern redbelly dace. These four fish species would be obvious starting choices for any host fish studies for Venustaconcha e. ellipsiformis.

Other unpublished data indicates 27 fish species occur in the Root River system, and Schmidt (1993b) reported 37 fish species from the Forestville-Mystery Cave State Park.

Cummings and Mayer (1992) reported Venuataconcha e. ellipsiformis as extirpated from Ohio, threatened in Wisconsin and Iowa, and a species of special concern in Illinois and Indiana.

The first recent Minnesota record of Venustaconcha e. ellipsiformis was from the Straight River in the 1980's (Davis 1988). The first living specimens were found in the Cannon and Straight Rivers of Minnesota (Davis 1988). Other recent researchers recorded V. e. ellipsiformis from the Zumbro River, MN (Bright et. al. 1989) however Mathiak (1979) only reported V. e. ellipsiformis from several sites in southeastern Wisconsin. Bright et. al (1990) did not find V. e. ellipsiformis in the Minnesota River.

We found empty shells of Venustaconcha e. ellipsiformis at 16 Root River system sites. Although Anodonta grandis f. grandis was found at twice as many sites (32), the shells of V. e. ellipsiformis were more numerous. The largest V. e. ellipsiformis found was 80 mm long, 45 mm high, and 35 mm wide. This specimen was considerably larger than the one reported by the van der Schalie's (1963).

Since the Root River system is mostly within the Driftless Region of the Upper Mississippi River (Waters 1977), it is possible that the V. e. ellipsiformis presently found in the Root River, and some other Mississippi River tributaries, descended from specimens that somehow managed to survive during the last glaciation, or else these rivers were repopulated with V. e. ellipsiformis, via the Upper Mississippi River, after the last glacier receded.

As far as we can ascertain, no one has definitely recorded Venustaconcha e. ellipsiformis from the Mississippi River since the early 1920's (crier and Mueller 1922-1923, Fuller 1978). This species may have been found at Prairie du Chien, WI, (Clarke 1993), but if a voucher specimen was not retained, the identification would be in question since no other V. e. ellipsiformis specimens have been reported by various recent researchers from Prairie du Chien or any other Mississippi River sites.

Until now, it had been assumed that the only other recent record of living Venustaconcha e. ellipsiformis in a Wisconsin tributary of the Mississippi River was a record of one specimen from the Grant River downstream of Burton, WI, found by David J. Heath in 1983 (Theler 1987). The Mouth of the Grant River is at Mississippi River Mile 593.2, about 100 river miles downstream from the mouth of the Root River, at Mississippi River Mile 693.7.

However, a chance sighting of a photo-story in the Milwaukee Journal Sentinel newspaper, 25 May 1995, which stated that Venustaconcha e. ellipsiformis had been found in the Yellow River near Cadott, WI. Dr. Terry Balding, University of Wisconsin - Eau Claire, WI, stated he found this species alive in the Yellow River in 1993 and 1994. An empty shell of V. e. ellipsiformis has also been found in another nearby tributary in 1994 (Appendix: Miscellaneous Correspondence). Balding's field observations agreed with conditions we found during this survey: V. e. ellipsiformis is apparently only a species of small streams, about 6 m to 20 m wide.

In view of the above recent finds, the headwaters of other Mississippi River tributaries, such as the Kickapoo and Black Rivers of Wisconsin, and the Cannon and Zumbro Rivers of Minnesota, should be examined more carefully for Venustaconcha e. ellipsiformis.

5.9 OTHER ROOT RIVER SYSTEM UNIONID SPECIES

Of the 16 confirmed unionid mollusk species found in the Root River system, three species were represented by living unionids, seven species were represented by fresh-dead shells, and the other species were represented only by sub-fossil shells (Table 1).

The species that occurred most often was Anodonta arandis f. grandis, at 32 locations (Table 3). Other frequently occurring species were V. e. ellipsiformis (16 sites), Lasmigona complanata (15 sites), Strophitus u. undulatus and Lampsilis ventricosa (both 14 sites), Lampsilis radiata luteola (13 sites), and Anodontoides ferussacianus, (12 sites). Only Lampsilis ventricosa and Lampsilis radiata luteola occurred in four segments of the Root River system, while six species occurred in three river segments (Table 3).

There is the possibility of one or more additional species in the Root River as we collected some shells from several sites that need further study before positive identifications can be made. Both of the forms Anodonta grandis f . grandis and Anodonta grandis f. corpulenta Cooper, 1834, Giant Floater, appear to be present in the Root River. A. g. grandis is certainly alive in the Root River system since it was represented at so many locations by empty shells (Table 3).

6 RECOMMENDATIONS AND PRELIMINARY CONCLUSIONS

The following recommendations are made to conserve and manage the tenuous unionid mollusk populations the Root River system of southeastern Minnesota.

We recommend that the mussel survey of the Root River system be completed as soon as possible, at all bridge and road access points not sampled in 1994, between the headwaters and the Mississippi River, including a number of small tributaries. The sampling of the South Fork and Middle Branch has been completed.

In 1994 the most promising mussel populations were in the upstream reaches of the Root River system. Therefore, we recommend expanding this survey to include a number of small tributaries, such as Deer, Bear, and Spring Valley Creeks, tributaries of the Middle Branch of the Root River, and Robinson Creek, a tributary of the North Branch of the Root River. Other tributaries creeks should be surveyed as appropriate, since we found living unionids within 1.5 miles of the headwaters of the North Branch.

If mussels are present in the Root River, they are more likely to be found above the midpoint of the river system, and in small tributaries. Because of the diverse unionid fauna living in the nearby Mississippi River, mussels could also be present in the lower Root River, although they may be more difficult to find, unless sampling with a crowfoot bar is feasible, or low water conditions reveal shells on sandbars or along shorelines.

In late October 1994 we discovered that Stewartville, MN, had applied for permits to change the channel of the North Branch of the Root River and a tributary creek, in the bed of the former Lake Florence (see Appendix). The Lake Florence dam failed during the 1993 flood, and will not be replaced. We have not surveyed this area. Nature preservation can be accomplished only by identifying the fauna to be preserved, and its habitat. I

The only area remotely recommended as a unionid refuge is the site two miles W of Mystery Cave #1, 0.5 miles N of Etna, MN. Well over 200 empty shells were found at this site, however that was the result of over 20 person-hours of collecting.

Sampling should continue to consist of wading and shoreline searches in the headwaters, and similar sampling using a boat when conditions permit. After this survey is completed, a decision should be made about sampling by SCUBA diving at selected sites. We are not prepared to make recommendations on sampling by SCUBA diving, based on present data.

Living unionids should be aged and measured. Voucher specimens of each species, preferably empty shells, from each site should be retained for deposit at the Bell Museum, Minneapolis, MN, and similar institutions. Excess living shells should be returned to the site where found. Sampling locations and mussel beds should be plotted on topographic maps to be housed by the Minnesota Department of Natural Resources, although plotting sites on county maps would make a less cumbersome record. Eventually all mussel information should be recorded in a Geographic Information System.

Recommendations for unionid management would include keeping the cattle, horses, and pigs out of the Root River system waters. Best Management Practices (BMP), such as no till farming, should be encouraged along with a decrease in the use of fertilizers and herbicides. Buffer strips of vegetation and trees should be established as much as possible along the Root River, its tributaries, and creeks.

Freshwater mussel displays and posters should be set up along the Root River Bike Trail, to broaden public awareness and understanding of the complexities of the natural river environment.

Specific suggestions, similar to those given above, were listed in the initial newsletter of the Redwood-Cottonwood Rivers Control Area (RCRCA News 1995). The goals for the Redwood River Clean Water Project include reduction of sediment and nutrients in the main stem of the river by 15-30%, and a 10-30% reduction in sediment and nutrients from the tributaries. These rivers are southwestern Minnesota tributaries of the Minnesota River.

The Redwood River project plans to achieve its goals through a technical assistance program in which there will be cost-share and/or incentive payments to farmers who implement BMP's. They also plan personal contact with individual landowners. The project activities including a monitoring and evaluation component by tracking BMP's in the watershed, and the impact on water quality.

The Redwood project includes an assessment of tillage practices to determine the amount of erosion, and also has ongoing water quality sampling at several sites to allow before and after comparisons. An education and information project component will provide watershed residents with information on problems and solutions related to water quality, and educate them about practices that will reduce water pollution.

Since the Zebra Mussel is rapidly spreading in the Upper Mississippi River system, we must identify the native *unionid mussel* fauna in tributaries, or risk losing unique populations before they can be identified.

7 ACKNOWLEDGMENTS

The able assistance of James Frink and David Christel in the field is acknowledged. Michael Havlik's knowledge of the lower Root River, from the Mississippi River to Hokah, MN, was extremely helpful during the boat survey. Malacological Consultants donated part of the Principal Investigator's time, and equipment use.

The majority of this project was funded by the Minnesota Nongame Wildlife Program, from contributions to the Minnesota Nongame Wildlife Tax Checkoff. The encouragement of Richard J. Baker, Minnesota Department of Natural Resources Nongame Research Program, is acknowledged.

We also acknowledge the assistance of Wayne Highum, and 14 students participating in a Private Industry Council program at Caledonia, MN, who assisted in the field for two days. Without their help we would not have recovered some of the unionid specimens found during this survey.

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9 APPENDIX

9.1 TABLE 1. UNIONID MOLLUSKS, ROOT RIVER SYSTEM MN, JUNE 1994

LIVING:

1. Venustaconcha e. ellipsiformis (Conrad, 1836), Ellipse Shell (3)
2. Anodontoides ferussacianus (Lea, 1834) Cylindrical Papershell (1)
3. Lampsilis radiata luteola (Lamarck, 1819), Fat Mucket (1)

SPECIES REPRESENTED BY EMPTY SHELLS (F = fresh or fairly fresh)

4. Anodonta grandis f. grandis Say, 1829, Floater (F)
5. Anodonta grandis f. corpulenta Cooper, 1834, Stout Floater
6. Strophitus u. undulatus (Say, 1817), Squaw Foot (F)
7. Alasmidonta marginata Say, 1818, Elk Toe
8. Lasmigona complanata (Barnes, 1823), White Heel Splitter (F)
9. Lasmigona costata (Rafinesque, 1820), Fluted Shell (F)
10. Lasmigona compressa (Lea, 1829) Creek Heelsplitter
11. Fusconaia flava (Rafinesque, 1820), Pig-Toe
12. Elliptio dilatata (Rafinesque, 1820), Spike
13. Actinonaias ligamentina carinata (Barnes, 1823), Mucket
14. Potamilus alatus (Say, 1817), Pink Heel Splitter (F)
15. Toxolasma parvus (Barnes, 1823), Lilliput Shell (F)
16. Lampsilis ventricosa (Barnes, 1823), Pocketbook (F)

Living species:	3
Fresh-dead species:	7
Worn-dead species:	6

Total species:	16

QUESTIONABLE SPECIES MAY BE:

17. Villosa iris iris (Lea, 1829), Rainbow
18. Ligumia subrostrata (Say, 1831) Pondmussel

TABLE 2. UNIONID MOLLUSKS ROOT RIVER SYSTEM MN BY BRANCH

TOTAL SITES 127 # SUBSITES:	MAIN STEM 15	N.BRANCH 22	M.BRANCH 13	S.BRANCH 40	S.FORK 27	UPPER IA 2	LITTLE IA 8	#TRIBU-TARIES
1. Anodonta grandis grandis, Floater		D	D	D		D	D	5
2. Anodonta grandis corpulenta, Stout Floater		D						1
3. Anodontoides ferussacianus, Cylindrical Papershell		1		D		D		3
4. Strophitus undulatus, Squaw Foot		D	D	FD				3
5. Alasmidonta marginata, Elk Toe	D	D	D					3
6. Lasmigona cosplanata, White Heel Splitter		D	D			D		3
7. Lassigona costata, Fluted Shell	D	MN	MN	D				4
8. Lasmigona compressa, Creek Heelsplitter	D	D		D				3
9. Fusconaia flava, Pig-Toe	D		D			D		3
10. Elliptio dilatata, Spike			D					1
11. Actinonaias ligamentina carinata, Mucket			D					1
12. Potamilus alatus, Pink Heel Splitter	D							1
13. Toxolasma parvus, Lilliput Shell		D		D				2
14. Venustaconcha e. ellipsiformis, Ellipse Shell		D	D	3				3
15. Lampsilis radiata luteola, Fat Mucket	D	D	D	1				4
16. Lampsilis ventricosa, Pocketbook	D	D	D	D		D		5
17. Unidentified specimens	D	D	D			D		4
TOTAL ALIVE	0	1	0	4	0	0	0	
TOTAL LIVE SPECIES	0	1	0	2	0	0	0	
TOTAL SPECIES (THIS STUDY)	8	12	11	9	0	6	1	

D = DEAD; FD = FAIRLY FRESH-DEAD SHELLS
N (#): NUMBER LIVING
MN = EMPTY SPECIMENS FOUND BY MN DNR EMPLOYEES
(they also found Pleurobema sintoxia (Rafinesque, 1820), Round Pigtoe, and Truncilla truncata Rafinesque, 1820, Deertoe)

9.3 TABLE 3. UNIONID SPECIES FREQUENCY OF OCCURRENCE JUNE 1994

TOTAL SITES 127	MAIN STEM # SUBSITES: 15	N.BRANCH 22	M.BRANCH 13	S.BRANCH 40	S.FORK 27	UPPER IA 2	LITTLE IA 8	TOTAL TIMES FOUND
1. Anodonta grandis grandis, Floater		13	2	14		1	2	32
2. Venustaconcha e. ellipsiformis, Ellipse Shell		3	4	9				16
3. Lasmigona complanata, White Heel Splitter		7	6			2		15
4. Strophitus undulatus, Squaw loot		7	3	4				14
5. Lampsilis ventricosa, Pocketbook	4	6	3			1		14
6. Lampsilis radiata luteola, Fat Mucket	3	4	1	4		1		13
7. Anodontoides ferussacianus, Cylindrical Papershell		3		8		1		12
8. Unidentified specimens	2	1	4					7
9. Lasmigona compressa, Creek Heelsplitter	1	1		4				6
10. Toxolasma parvus, Lilliput Shell		1		4				5
11. Fusconaia flava, Pig-Toe	1		2			1		4
12. Alasmidonta marginata, Elk Toe	1	1	1					3
13. Lasmigona costata, Fluted Shell	1		1	1				3
14. Elliptio dilatata, Spike			3					3
15. Anodonta grandis corpulenta, Stout Floater		1						1
16. Actinonaias ligamentina carinata, Mucket				1				1
17. Potamilus alatus, Pink Heel Splitter	1							1
TOTAL SPECIES	8	12	11	9	0	6	1	

9.4 MISCELLANEOUS CORRESPONDENCE

FILLMORE COUNTY
WATER COORDINATOR

900 Washington St N.W.
Box A
Preston, MN 55965
(507) 765-3305

FILLMORE COUNTY WATER PLANNING COMMITTEE
Joint Meeting of Technical and Advisory Committees

Tuesday, June 14, 1994
7:30 p.m.
New Commissioners' Room, Courthouse, Preston

AGENDA

1. Approval of Minutes and Agenda

2. Root RiverFreshwater Mussel Study - Marian Havlik, Malocological Consultants, LaCrosse, WI

3. Election of Chairperson and Vice-Chairperson

4. "Clean Water for Our Future" Meeting Results ** Questions and Comments

5. County Fair Booth - Volunteer Sign Up

6. Water Plan Updates

   - Geologic Atlas - Dye trace results
   - Septic System Demonstrations
   - Farm*A*Syst Workshop & State Conference Presentation
   - Inventory Data Entry & Challenge Grant Application

7. Adjourn

** Please bring with you the summary of results from these meetings sent to you in April. Thank you!

DEPARTMENT OF THE ARMY

ST. PAUL DISTRICT. CORPS OF ENGINEERS
ARMY CORPS OF ENGINEERS CENTRE
190 FIFTH STREET EAST
ST. PAUL. MN 55101-1838

February 15, 1995

Construction-Operations
Regulatory (1994-00328-IP-MAM)

Ms. Marian Havlik
Malacological Consultants
1603 Mississippi Street
La Crosse, Wisconsin 54601

Dear Ms. Havlik:

This responds to your comments concerning the Public Notice for the City of Stewartville No. 1994-00328-IP-MAM. You requested than a malacological survey be conducted in the Root River in the vicinity of Stewartville, Minnesota.

You indicated in your letter that the basis for requesting a survey was that evidence of Venustaconcha ellipsiformis, Ellipse shell, in the Root River system

Our responsibility under the Endangered Species Act of 1973, is limited to Federally designated endangered and threatened species. Venustaconcha ellipsiformis is not included on the Federal list of threatened or endangered species. Therefore, a survey is not considered to be warranted in this case.

Thank you for your comments. Upon completion of our public interest review, we will advise you of our final decision regarding this request for a Department of the Army permit. If you have any question, contact Mary Marx in our La Crosse Office at (608) 784-8236.

Ben Wopat
Chief, Regulatory Branch

Copy furnished:
Boonestro, Rosene, Anderlik & Associates
2335 West Highway 36
St. Paul, MN 55113

Minnesota Department of Natural Resources
P.O. Box 6247
Rochester, MN 55903

U.S. Fish and Wildlife Service
4101 East 80th Street
Bloomington, MN 55425-1665

her the
ner As-
acked"

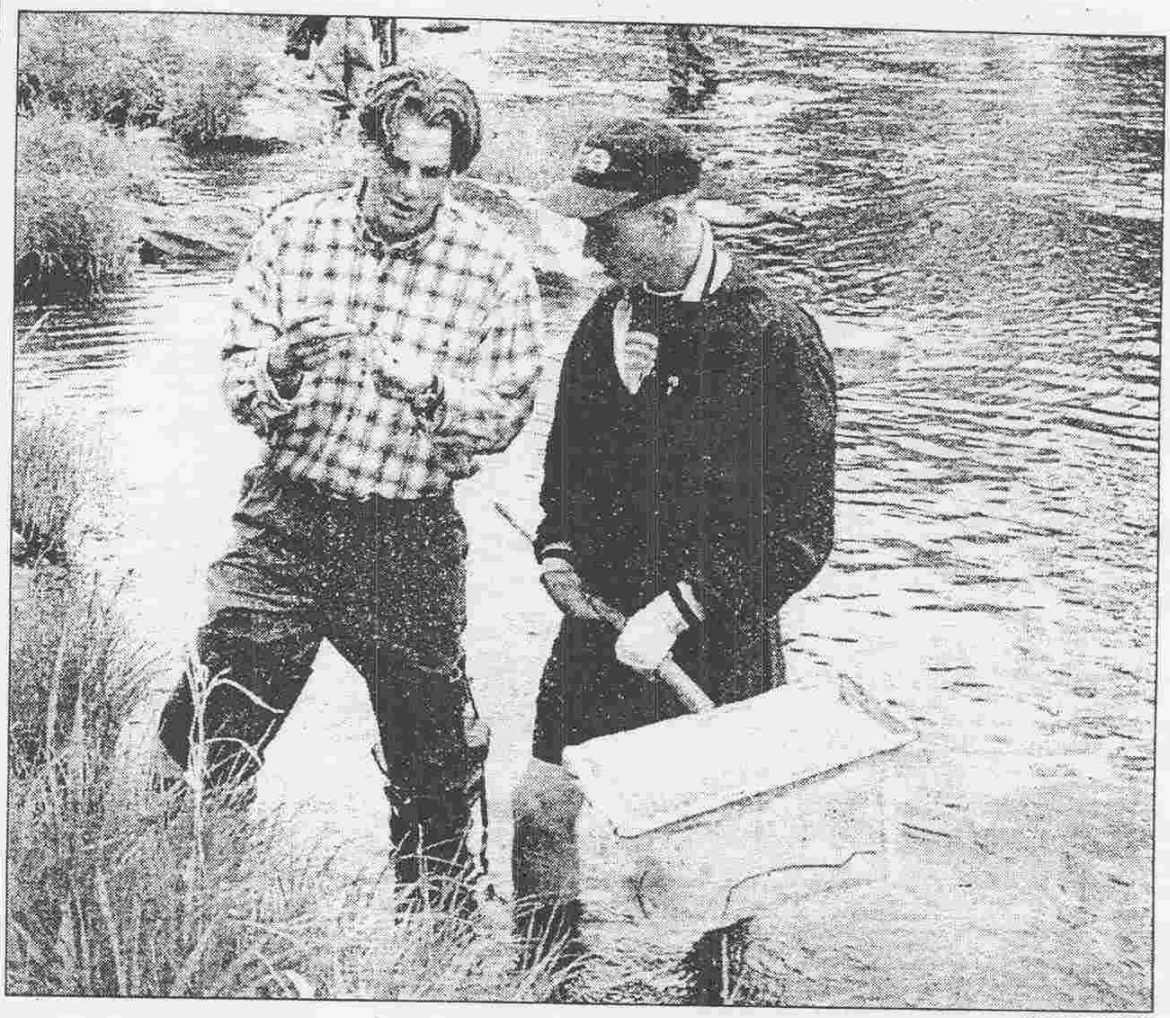
Coalition for Public Education, said Prosser was "weaving bizarre conspiracies" to attack legitimate democratic activity.

right-wing buzzwords the center wants its volunteers to watch for and report when they are used.

search center's Milwaukee telephone number Thursday was not returned.

Milwaukee Sentinel Journal 25 May 1995

Mussel work



ASSOCIATED PRESS

Colin Dovichin (left), a member of the River Watch group, shows some findings to Cadott High student Bob Olinske. The two later found some ellipse mussels, which are on the endangered species list.

Yellow Paper Streetcar

Tuition reciprocity questioned

UNIVERSITY OF WISCONSIN-EAU CLAIRE
EAU CLAIRE, WI 54702-4004

Department of Biology
(715) 836-4166
FAX: (715) 836-5089

June 1, 1995

Marion Havlik
1603 Mississippi Street
La Crosse, WI 54601

Dear Marion,

In response to your request for information on the ellipse I provide the following.

A dead shell was taken in 1992 from the Yellow River near Cadott, WI and verified by Dr. Stansbery. Three specimens were sent with soft parts to OSU in 1993 and three also in 1994.

In 1994 a student in one of the classes at UWEC brought in a shell, I identified it as the ellipse and I had Dr. Stansbery verify. This specimen was taken from another small tributary of the Chippewa River in the same general area as the Yellow.

In 1993 Heath. reported to me he had seen a couple shells in the Yellow River that he thought were the ellipse, but wanted to see some more shells to be sure. He also reported that the U.S. Forest Service had reported it from the Yellow in 1994.

I heard that Cawley and Davis both had found it somewhere recently.

Would you do me a favor; when you chase down the U.S. Forest Service, Cawley and Davis reports could you let me know what you find out?

Sincerely,

Terry Balding, Ph.D.

pk

MALACOLOGICAL CONSULTANTS
Naiad Mollusks: Research • Surveys • Lectures • Specimens • SCUBA Diving
1603 Mississippi Street La Crosse, Wisconsin 54601 U.S.A.
Phone: 608-782-7958 Cellular: 608-780-0709

25 November 1994

Char Hauger, Chief, Central Permit Section
Reg. Branch, Corps of Engineers
1421 US Post Office and Custom House
St. Paul, MN 55101

RE: 95-00328-IP-MAM, Discharge fill material into North Branch Root River, Stewartville, MN

Malacological Consultants began a unionid mussel survey of the Root River System, MN, June 1994, for the MNDNR Nongame Program. We completed 120 sites on the system, including 27 sites on the North Branch, from the headwaters to High Point, MN, before funding ran out. We had no idea such drastic changes were planned for the Stewartville, MN, area of the North Branch of the Root River until receiving this Public Notice, early November 1995.

We suggest the following before any changes are made to the North Branch of the Root River, Stewartville. A mussel survey must be conducted from High Point to Stewartville, and downstream of Stewartville for at least five (to 10) miles, depending on results. We found evidence of Venustaconcha e. ellipsiformis (Conrad, 1836), Ellipse shell, at and west (upstream) of High Point.

Venustaconcha ellipsiformis was recently proposed for endangered status by the MNDNR because of its rarity in the state. We found evidence of this species in a number of (upstream/headwaters) areas of the Root River system, but have only found three live specimens to date. In Minnesota V. ellipsiformis is only known to be living in the Cannon, Zumbro, and now the Root River systems. Interestingly enough, the Ellipse shell apparently has not been found alive in any western Wisconsin rivers draining into the Mississippi River, opposite Minnesota. We spoke to persons from the Stewartville area who reported mussels in this portion of the North Branch. In general the upstream reaches of the system appear to be the only refugia for living mussels in the Root River system.

Obviously, we would like to either conduct this survey, or somehow be involved (with funding), so that we could compare the results of this survey with the rest of our work. The MN Nongame Program will not accept proposals for the program until late 1995. If a continuation of the mussel survey were funded, field work would begin June 1996. If some other source of funding can be found, the work could be done June 1995. I was also under the impression that the MNDNR wanted to "leave ecosystems as they are". In a short time, the North Branch would establish its own meanders; then riprap.

Marian E. Havlik, Malacological Consultants

cc: MNDNR Nongame Program, Richard Baker, Director

STATE OF MINNESOTA OFFICE MEMORANDUM

DEPARTMENT OF NATURAL RESOURCES

DATE: January 3, 1995

TO: Larry Gates

FROM: Mike Davis

PHONE: (612) 345-3331

SUBJECT: Mussels in the vicinity of the former Lake Florence Dam on the Root River.

On December 28,1994 we searched the area immediately below the former dam and the river now flowing through the former lake bed by wading and hand picking mussel shells.

No live freshwater mussels were found.. We did find recently dead shells of the following species however:

Anodonta qrandis - floater
Lasmigona complanata - white heelsplitter

We also found old shells, some apparently very old, along the banks and in rocky areas being exposed by the headward erosion of the river into the former lake bed. It appeared to us that the river is beginning to expose riverine substrates which predate the artificial lake formed by the dam. It was obvious that these coarse substrates correspond to former riffle areas within the Root River. Habitat for mussels was changed drastically by damming the river and limited its mussel fauna to the quiet water muddy substrate adapted species we found recent evidence of. Other species which lived in the river prior to its impoundment include:

Lampsilis luteola - fat mucket
Lampsilis ventricosa - pocketbook
Lasmigona costata - fluted shell
Pleurobema sintoxia - round pigtoe

It would appear that, if left to achieve relative equilibrium, the Root River at this site will rather quickly (2-3 years) reestablish its natural gradient and sinuosity through the former lake bed. As this process unfolds the river will become increasingly productive as the freshly reexposed substrates are colonized by invertebrates, fish are attracted in and mussel larvae from mussel populations elsewhere in the river arrive via their respective fish hosts and recolonize the site.

Allowing the river to restore itself would in my opinion result in the most ecologically desirable and stable condition in the long term and would be accomplished at no public expense.

c: Jack Heather Rich Baker
Marian Havlik

MALACOLOGICAL CONSULTANTS
Naiad Mollusks: Research • Surveys • Lectures • Specimens • SCUBA Diving
1603 Mississippi Street
La Crosse, Wisconsin 54601 U.S.A.
Phone: 608-782-7958

15 June 1994

Donna Rasmussen
Filmore County Water Coordinator
900 Washington St. NW, Box A
Preston, MN 55965

Dear Donna:

Thank you for asking me to speak to the Filmore County Water Resources Board, Tuesday, 14 June 1994. I hope that our presentation gave the Board some insight into the Root River system in Filmore County.

INVOICE

Presentation to Fillmore County
Water Resources Board: 14 June 1994:

Mileage, La Crosse, WI > Preston, MN
120 miles X $0.25/mile:

Total due:

Thank you.

Sincerely,

Marian E. Havlik, Owner
Malacological Consultants

Private Industry Council, Inc.
Job Training Office
PO. Box 410
Sprague National Bank Building Caledonia, Minnesota 55921 I
507-724-5231 Toll Free 1-800-657-4629

Dear Marian:

Here is the list of the students, who assisted your team with the Root River malacological survey. The students certainly enjoyed the experience, and it certainly gave the students the academic enrichment that we had hoped to add to the summer work experience.

Shaun Riley	Wendy Storlie
Ryan Danielson	Jenny Kugel
Cynthia Foreaker	Craig Hahn
Lorena Alvirez	Jayme Solum
Robin Hebig	Darren Donlan
Kelly Domasky	Jamie Alfson
Quin Oredson	Leah Olson

Thanks again for your support.

Respectfully,

Wayne Highum