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Minnesota Department of Natural Resources
Division of Fisheries

Completion Report:

Assessment of the Fish Populations of the Minnesota River

by
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Abstract

Minnesota Department of Natural Resources, Section of Fisheries conducted a fish population assessment of the Minnesota River in August 1998. The primary objective was determination of species presence or absence; however, relative abundance, distribution, age, and growth were also examined. Sectors established for the 1992 assessment were sampled in this study with electrofishing, trapnetting, trotlining, and seining. A total of 33,777 fish were collected representing 68 species and 15 families. Collection of redfin shiner *Lythrurus umbratilis*, blue sucker *Cycleptus elongatus*, and slender madtom *Noturus exilis* was documented for the first time. Over half of the catch was collected with ¼-in (6-mm) mesh trap nets, of which the most numerous was orangespotted sunfish *Lepomis humilis*. Northern pike *Esox lucius*, channel catfish *Ictalurus punctatus*, flathead catfish *Pylodictis olivaris*, smallmouth bass *Micropterus dolomieui*, largemouth bass *M. salmoides*, sauger *Stizostedion canadense*, and walleye *S. vitreum* totaled 3.2 % of the total catch.

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Introduction

Sediment, nutrients and pathogens have reduced the appeal of the Minnesota River and contributed to numerous state and federal water quality violations (MPCA 1985; Arthur and Zischke 1994). From 1976 to 1992 the Metropolitan Waste Control Committee (MWCC) estimated concentrations in the Minnesota River of total suspended solids and total phosphorus to be 5.6 and 1.5 times higher, respectively, than the Mississippi River (MWCC 1994). These problems impact aquatic life and human health, and led to Governor Carlson's 1992 call for a decade-long initiative to make the Minnesota River "swimmable and fishable."

The initial riverwide survey was completed in 1982 by the Minnesota Department of Natural Resources (MDNR), Section of Ecological Services (Kirsch et al. 1985) and the first population assessment was completed in 1992 by MDNR Section of Fisheries (Stauffer et al. 1995). The objectives of both were fish community composition and relative abundance, but neither inventory measured microhabitat variables. A riverwide management plan had still not been written by the time a second assessment was planned; therefore, the consensus was to repeat previous sampling with minor protocol changes. This report summarizes the second assessment conducted by MDNR Section of Fisheries in 1998. It is a summary report similar to a lake survey report and not a conclusive analysis, particularly without associated habitat data.

Study Area

Approximately 88% of the 43,000 km^2 Minnesota River watershed lies within the state in the Northern Glaciated Plains, Western Corn Belt Plains and Northern Central Hardwood Forest ecoregions (Fandrei et al. 1988). Land use in the basin is now approximately 80% agricultural

(Senjem 1997). Glacial outflow cut the 539 km river valley about 9000 years ago that today is up to 8 km wide and 76 m below the surrounding land (Ojakangas and Matsch 1982). This ancient River Warren became the much smaller Minnesota River when retreating glaciers uncovered lower outlets to the north (Senjem 1997). Six dams are present in the upper 130 km of the river. The farthest downstream dam at Minnesota Falls was built on a granite outcrop that was a natural barrier to fish movement (Underhill 1989).

Methods

Sites

Kirsch et al. (1985) first identified 14 similar sectors based on channel morphology, substratum, gradient, discharge, and habitat that were numbered downstream from Big Stone Lake. For the 1992 assessment, the largest sector was divided into five to allocate three sectors to each MDNR Area office. Three sampling stations were established in each sector (4 in then Sector 9) that best represented habitat diversity. These sites were repeated in the 1998 assessment, but numbered upstream from the confluence with the Mississippi River (Figure 1; Table 1). Reach summaries are the same as Stauffer et al. (1995).

Data

Fish species' were assigned as large or small after Kirsch et al. (1985) as modified by Stauffer et al. (1995; Tables 3-4). Large species were weighed (g) and measured to total length (mm), whereas small species were counted, but not bulk weighed. Electrofishing distance was estimated from maps in Kirsch et al. (1985).

Measurements made in English units are reported as such followed by the metric conversion in parentheses. Data were initially compiled and reported by sector, and then summarized by reach using Access© and Excel© software. Rounding errors may be present in summary totals because data were summed first then converted. Catch per unit effort was calculated as number/h for electrofishing, number/net-night for trap nets and number/set for trotlines. Appendices (2-11) summarizing the 1992 data were included because they were not presented in that report.

Gear

Electrofishing was considered the most effective gear for collecting community composition and relative abundance data in the 1992 assessment (Stauffer et al. 1995) and the only required gear in 1998. Trap nets, trot lines, and seines were recommended to maximize habitats sampled. Gill nets were not used because of low efficiency and fouling difficulties. Field work was conducted 3-28 August 1998 (Table 2).

Recommended electrofishing runs were the same as the 1992 assessment, but standardized with daytime shocking, two person netting, continuous pulsed-DC shocking, upstream to down sampling, and small-mesh dipnetting of all fish. Sectors 1-17 were shocked with Coffelt VVP15 or Smith-Root GPP5.0 boat electrofishers. Sector 18 was shocked with a Smith-Root GPP5.0 stream shocker. Electrofishing unit configuration and time shocked in seconds were recorded. No electrofishing was attempted in sector 8.2 because of low water and only one person netted in sector 5.

Recommended trap net sets were one 1/4-in (6-mm) mesh single-frame net per sector and six 3/4-in (19-mm) mesh double-frame nets per sector (two per station). Sets in sectors 1-15 were made by staking the cod end to the bank and anchoring the lead 45° downstream. Sets in sectors 16-18 were made by staking the lead to the bank and anchoring the cod end approximately 90° in mid-channel. Low flows prevented sets of 1/4-in (6-mm) mesh nets in sector 11 and both sized nets in sector 8.2. Two 1/4-in (6-mm) mesh nets were set at each station in sectors 16-18. Six 1-in (25-mm) mesh double-frame nets were set in sectors 1-3 and no nets were set in sectors 4-6.

Recommended trot line sets were four channel catfish *Ictalurus punctatus* lines and four flathead catfish *Pylodictis olivaris* lines in each sector. Channel catfish lines were baited with cut bait on size 4/0 hooks and flathead catfish lines were baited with 5-9 inch live black bullhead *Ameiurus melas* on size 8/0 hooks. All lines were 80 ft (24.4 m) long with 10 hooks spaced 4 ft (1.2 m) apart that hung from 6-in (152 mm) dropper lines. Sets were made by tying one end to woody vegetation at water's edge, angling the line slightly downstream, and anchoring the end with a 15 lb (6.8 kg) concrete weight. Six channel catfish lines were set in sectors 16, 17 and 18. Six flathead catfish lines were set in sector 16 and none in sectors 17-18.

One seine haul was recommended per sector. Hauls were made by pulling a 50 ft (15.2 m) seine upstream in slack water. Two hauls were made in sector 2; three in sectors 4, 5 and 16; four in sector 6; and none in sectors 17 and 18.

Age and Growth

Aging structures were sought from species in Table 3. Recommended collection per sector was five individuals of each species per 25 mm length category. Each Area office was assigned species to age and analyze (Table 3). DisBcal89 software from the Missouri Department of Conservation was used to determine back-calculation of growth. A minimum of two fish were required by the program to perform the calculation.

Contaminants

Mercury and polychlorinated biphenyl (PCB) contamination were assessed virtually riverwide for the first time in common carp *Cyprinus carpio*, channel catfish and walleye *Stizostedion vitreum* from Sectors 1-3 and 7-18. Sauger *S. canadense* and white bass *Morone chrysops* were assessed from Sectors 4-6. Recommended collection per sector was four individuals from each length category [<15 in (381 mm), 15 to 25 in (381 to 635 mm), and > 25 in (635 mm)]. Specimens were individually wrapped in aluminum foil, iced in the field, and shipped frozen to the Ecological Services Pathology Laboratory. Analyses were conducted by Ecological Services and the Minnesota Department of Agriculture.

Results and Discussion

Comparisons with the previous surveys and assessments were limited by the absence of microhabitat measurements, lack of a statewide stream database, and differences in sampling protocols (Kirsch et al. 1985; Stauffer et al. 1995; Table 2). August flows from four USGS gauging stations were included to broadly characterize macrohabitat (Figure 2; Appendix

1). Collection of redfin shiner *Lythrurus umbratilis*, blue sucker *Cycleptus elongatus,* and slender madtom *Noturus exilis* was documented for the first time (Kirsch et al. 1985; Underhill 1989; Bailey et al. 1994; Stauffer et al 1995).

A total of 33,777 fish from 15 families and 68 species were collected in 1998 (Table 5). The majority of both species (59%) and catch (61%) were large. A total of 17,603 fish from 15 families and 64 species were collected in 1992 (Appendices 2-11). The majority of these species (56%) were large, but the majority of the catch (56%) were small species. Families represented in 1998 were Cyprinidae (17 species), Catostomidae (11 species), Centrarchidae (10 species), Percidae (9 species), Ictaluridae (7 species), Hiodontidae (2 species), Acipenseridae (1 species), Lepisosteidae (1 species), Amiidae (1 species), Anguillidae (1 species), Clupeidae (1 species), Esocidae (1 species), Gasterosteidae (1 species), Percichthyidae (1 species), and Scianenidae (1 species). Length-frequency distributions of large fish collected by all gear in 1998 are presented in Tables 6-8.

Northern pike *Esox lucius*, channel catfish, flathead catfish, smallmouth bass *Micropterus dolomieu*, sauger, and walleye totaled 3.2% of the catch compared to 4.7% in 1992. Species collected in 1998, but not in 1992 were American eel *Anguilla rostrata,* pugnose shiner *Notropis anogenus*, blacknose shiner *N. heterolepis*, redfin shiner, blue sucker, greater redhorse *Moxostoma valenciennesi*, brown bullhead *A. nebulosus*, slender madtom, and banded darter *Etheostoma zonale*. Species collected in 1992, but not 1998 were central mudminnow *Umbra limi*, central stoneroller *Campostoma anomalum*, silver chub *Macrhybopsis storeriana*, bigmouth shiner *N. dorsalis*, and mimic shiner *N. volucellus*.

In 1998, 21 species (15 large and 6 small) were collected in all three reaches. Large fish found riverwide included northern pike, walleye, black crappie *Pomoxis nigromaculatus*, white crappie *P. annularis*, and channel catfish. Greater numbers of walleye and northern pike were collected in Reach 3 than the other two. Twenty species were collected exclusively below Minnesota Falls in Reaches 1 and 2 (13 large and 7 small), including redfin shiner, blue sucker, shovelnose sturgeon *Scaphirhynchus platorynchus*, American eel, flathead catfish, smallmouth bass, and sauger. Fourteen species were collected exclusively above Minnesota Falls in Reach 3 (6 large and 8 small), in particular bluegill *Lepomis macrochirus*, largemouth bass *M. salmoides*, and five ictalurids, including the slender madtom. Flathead catfish and smallmouth bass were collected in Reach 3 in 1992, but absent in 1998. Minnesota Falls and the hydropower dam at Granite Falls impede movement for many species except at high flows; however, other habitat differences may also limit species diversity.

A total of 59 species and 27.1% of the total catch were collected by electrofishing (Tables 9-10). Electrofishing catch rates (numbers/h) were generally higher in 1998 than 1992. Of the nine species not collected by electrofishing, five were only collected by seining. A total of 59 species and 68.6% of the total catch were collected by small-mesh trapnetting and seining (Tables 11-12, and 18-19). A total of 32 species and 3.5% of the total catch were collected by large-mesh trapnetting (Tables 13-15). Trotlining catch rates (Tables 16-17) were lower in 1998 than in 1992, but bait and hook size were different between assessments. Length-frequency histograms of electrofishing and trotlining catches of channel catfish and flathead catfish are presented in Figures 3-4.

Age and back-calculated length at annulus were determined for fish from 14 species (Table 20). Channel catfish, white bass, black crappie, and walleye were the only fish aged from all three reaches. Fish from sixteen species were aged in 1992, seven of which were collected from all three reaches. No statewide database exists from which appropriate comparisons may be drawn.

Mercury and PCB levels (ppm) were summarized (Tables 21-22), but statewide values are not available for comparison. These data were presented in the Fish Consumption Advisory (MDH 2000) as a recommended number of meals per time period.

Recommendations

Future sampling should measure habitat variables and should consider measuring at the microhabitat level. Global positioning system (GPS) locations of sampling sites should also be recorded.

Acknowledgements

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References

Arthur, J.W. and J.A. Zischke. 1994. *Evaluation of watershed quality in the Minnesota River basin.* Office of Research and Development, U.S. Environmental Protection Agency, Duluth, MN. EPA-600-R94-143.

Bailey, P.A., J.W. Enblom, S.R. Hanson, P.A. Renard, and K. Schmidt. 1994. A fish community analysis of the Minnesota River basin. *In* Minnesota Pollution Control Agency, editor. *Minnesota River Assessment Project. Volume III: Biological and toxicological assessment.* St. Paul, MN.

Fandrei, G., S. Heiskary, S. McCollor. 1988. Descriptive characteristics of the seven ecoregions in Minnesota. Minnesota Pollution Control Agency, Division of Waters, Program Development Section. Unpublished manuscript.

Kirsch N.A., S.A. Hanson, P.A. Renard, & J.W. Enblom. 1985. *Biological survey of the Minnesota River.* St. Paul.

Metropolitan Waste Water Control Commission (MWWCC). 1994. Water quality analysis of the Lower Minnesota River and selected tributaries: River (1976-1991) and nonpoint source (1989-1992) monitoring. Vol. 1. *In* Minnesota Pollution Control Agency, editor. *Minnesota River Assessment Project Report. Vol. 2., Physical and Chemical Assessment.* St. Paul, MN.

Minnesota Department of Health (MDH). 2000. *Minnesota fish consumption advisory.* St. Paul, MN.

Minnesota Pollution Control Agency (MPCA). 1985. *Lower Minnesota River waste load allocation study.* St. Paul, MN.

Ojakangas, R. W. And C. L. Matsch. 1982. *Minnesota's geology.* University of Minnesota Press. Minneapolis.

Senjem, N. 1997. *Minnesota River basin information.* Minnesota Pollution Control Agency. St. Paul.

Stauffer, K., B. Carlson, T. Jones, T. Kolander, J. Malzhan, T. Polomis, and B. Schultz. 1995. A survey of the fish populations of the Minnesota River. Minnesota Department of Natural Resources. St. Paul, MN.

Underhill, J. C., 1989. The distribution of Minnesota fishes and late pleistocene glaciation. *Journal of Minnesota Academy of Science.* 55(1):32-37.

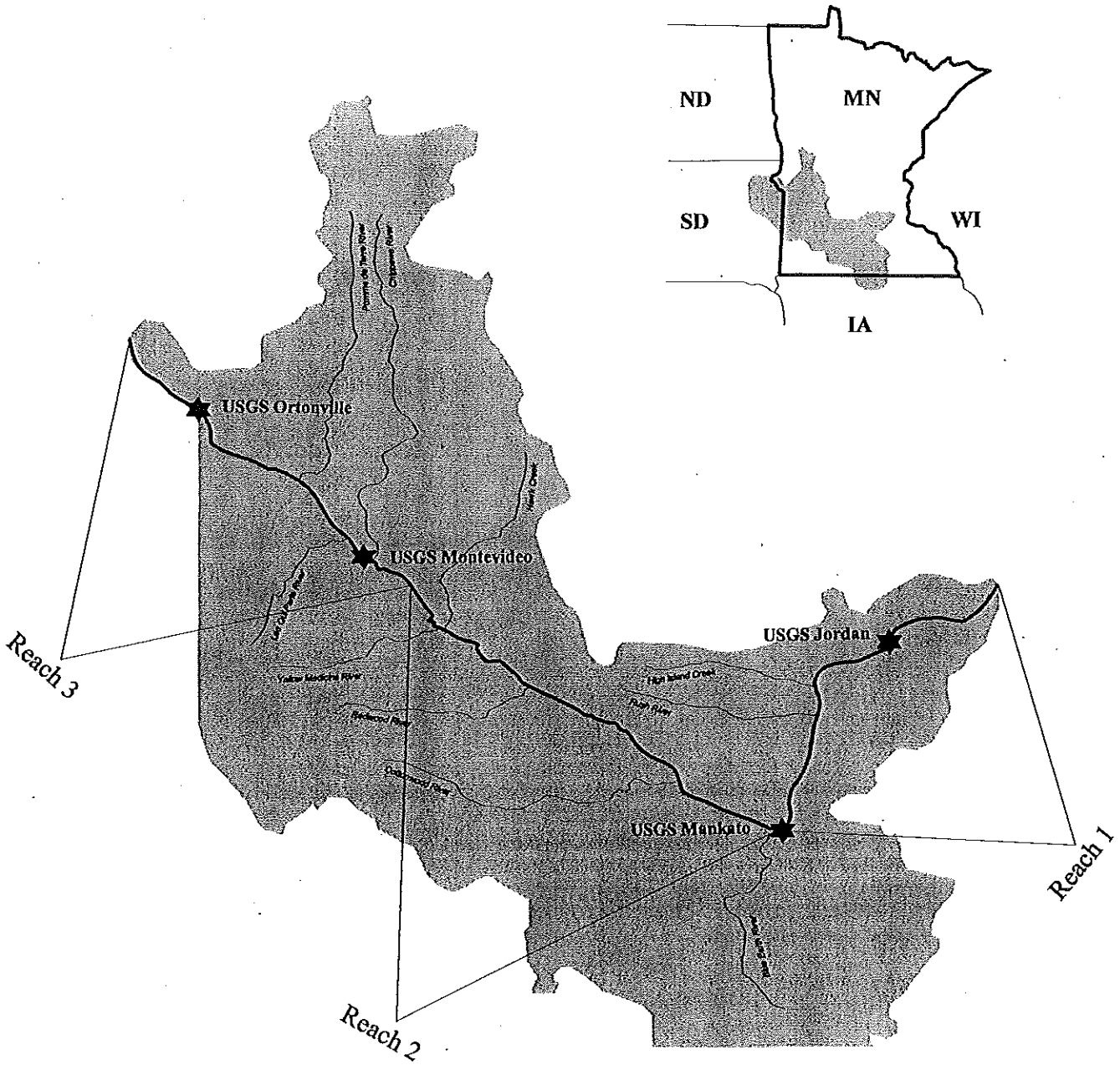
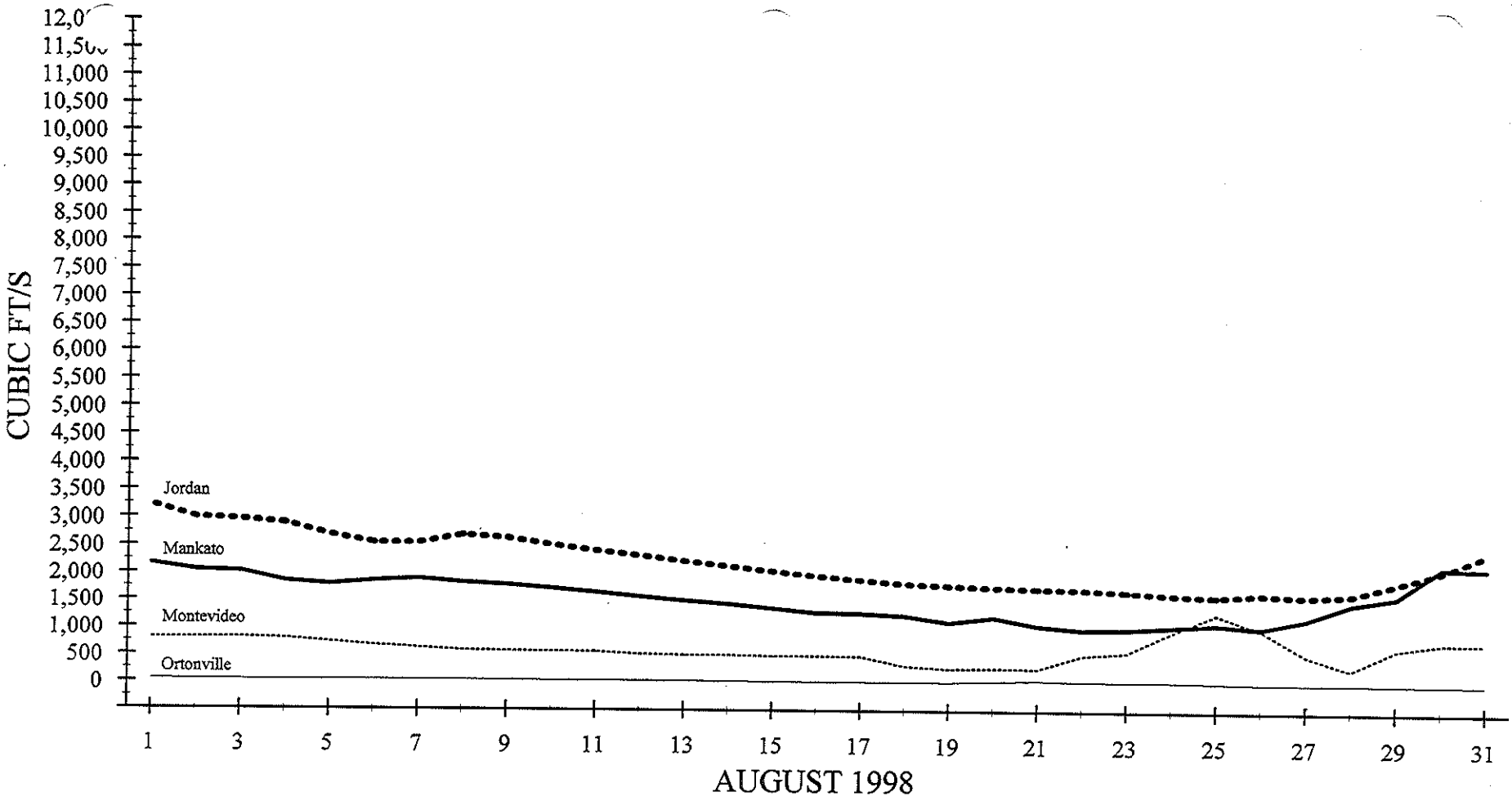


Figure 1. 1998 Minnesota River population assessment reach designations and locations of USGS gauging stations.



	Ortonville	Montevideo	Mankato	Jordan
August 1998 mean daily flow (cubic ft/s)	37.8	620.0	1539.0	2199.0
August 1998 minimum daily flow (cubic ft/s)	22.0	277.0	998.0	1620.0
August 1998 maximum daily flow (cubic ft/s)	66.0	1300.0	2190.0	3220.0
Period of record mean daily flow (cubic ft/s)	77.8	586.0	2365.0	3336.0
Period of record minimum daily flow (cubic ft/s)	0.3	0.6	37.4	178.0
Period of record maximum daily flow (cubic ft/s)	1299.0	7084.0	23520.0	25660.0

Figure 2. Flow (cubic ft/s) at four USGS gauging stations on the Minnesota River for August 1998 with period of record flows.

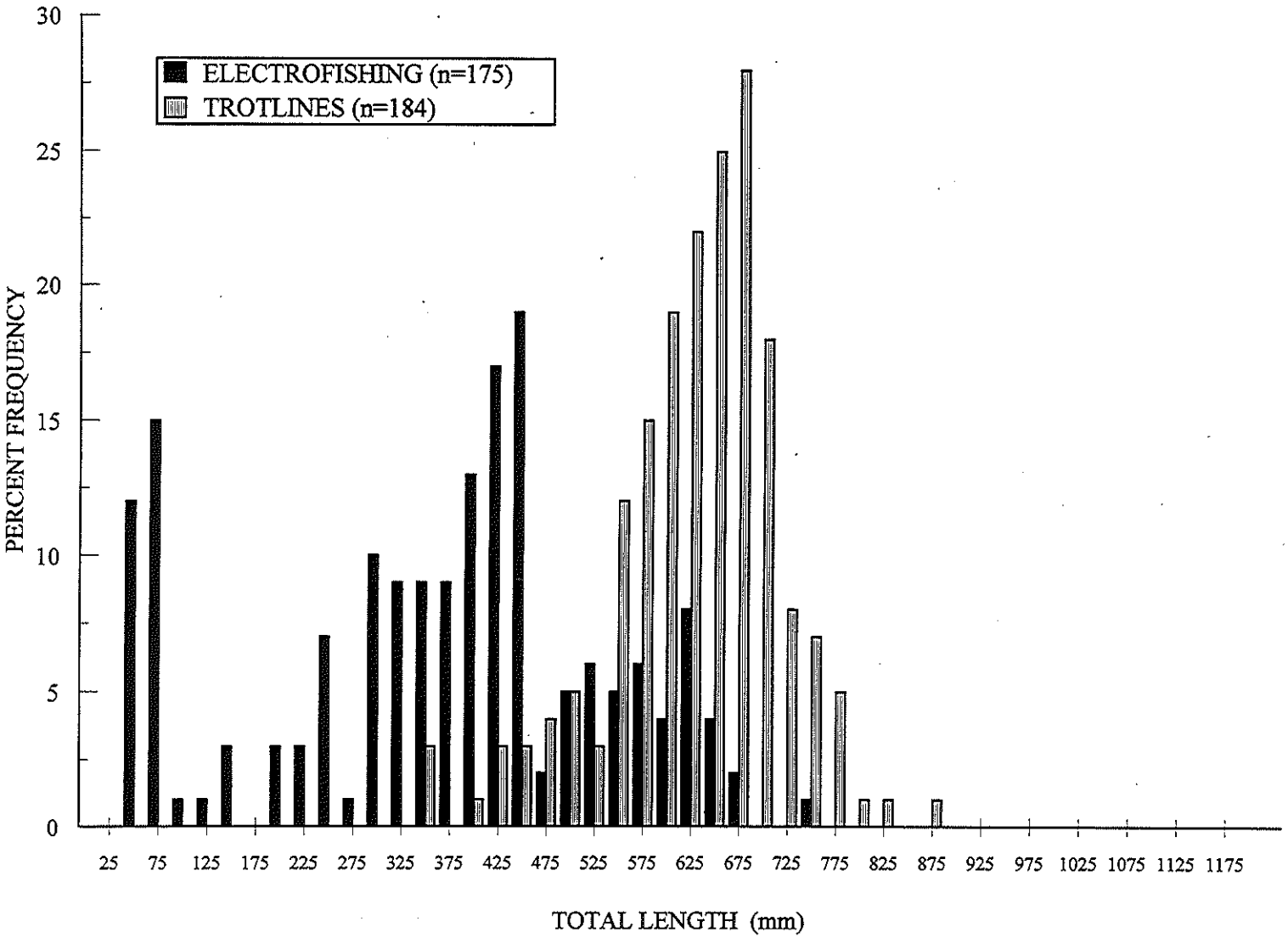


Figure 3. Length-frequency distribution of channel catfish from electrofishing and trotlining for all reaches for the 1998 Minnesota River population assessment.

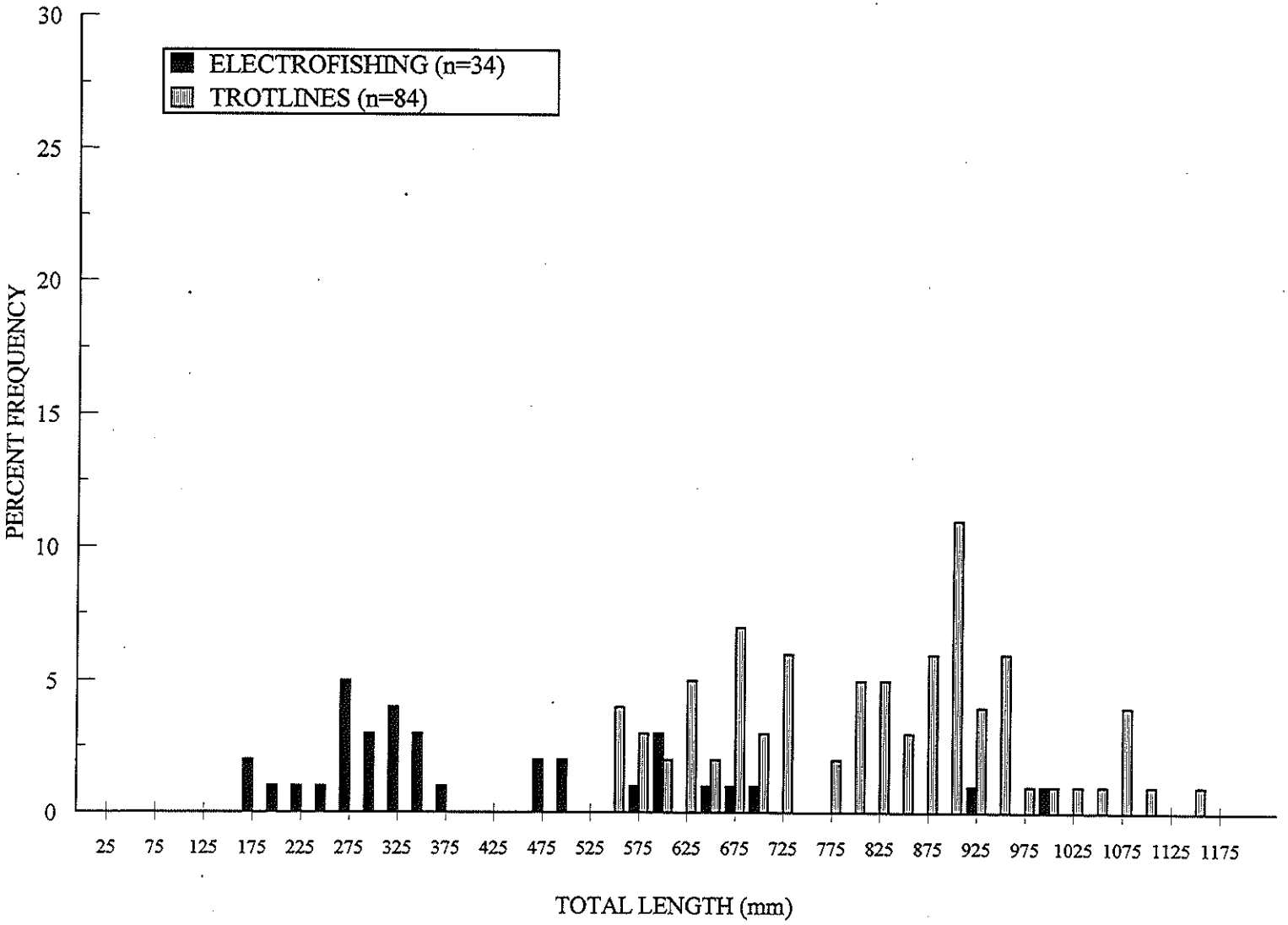


Figure 4. Length-frequency distribution of flathead catfish from electrofishing and trotlining for all reaches for the 1998 Minnesota River population assessment.

Table 1. Location and length of study reaches in river miles (rm) and river kilometers (rkm) for the 1998 Minnesota River population assessment.

Reach	Sector[1]	Downstream Boundary rm / rkm	Upstream Boundary rm / rkm	Length rm / rkm	Assigned Management Area
1		**0.0 / 0.0**	**112.0 / 180.2**	**112.0 / 180.2**	
	1	0.0 / 0.0	21.0 / 33.8	21.0 / 33.8	West Metro
	2	21.0 / 33.8	40.0 / 64.4	19.0 / 30.6	West Metro
	3	40.0 / 64.4	58.0 / 93.3	18.0 / 29.0	West Metro
	4	58.0 / 93.3	76.0 / 122.3	18.0 / 29.0	Waterville
	5	76.0 / 122.3	94.0 / 151.2	18.0 / 29.0	Waterville
	6	94.0 / 151.2	112.0 / 180.2	18.0 / 29.0	Waterville
2		**112.0 / 180.2**	**254.7 / 409.8**	**142.7 / 229.6**	
	7	112.0 / 180.2	120.0 / 193.1	8.0 / 12.9	Windom
	8	120.0 / 193.1	145.0 / 233.3	25.0 / 40.2	Windom
	9	145.0 / 233.3	174.0 / 280.0	29.0 / 46.7	Windom
	10	174.0 / 280.0	225.0 / 362.0	51.0 / 82.1	Hutchinson
	11	225.0 / 362.0	243.6 / 392.0	18.6 / 29.9	Hutchinson
	12	243.6 / 392.0	254.7 / 409.8	11.1 / 17.9	Hutchinson
3		**254.7 / 409.8**	**332.8 / 535.5**	**78.1 / 125.7**	
	13	254.7 / 409.8	257.8 / 414.8	3.1 / 5.0	Spicer
	14	257.8 / 414.8	261.5 / 420.8	3.7 / 6.0	Spicer
	15	261.5 / 420.8	289.7 / 466.1	28.2 / 45.4	Spicer
	16	302.8 / 466.1	305.3 / 491.2	2.5 / 4.0	Ortonville
	17	309.1 / 491.2	319.6 / 514.2	10.5 / 16.9	Ortonville
	18	319.7 / 514.2	332.8 / 535.5	13.1 / 21.1	Ortonville

[1] modified from Kirsch et al. 1985

Table 2. Sampling effort by gear for the 1998 Minnesota River population assessment.

Sector	Stations	Electrofishing Distance ft	Electrofishing Distance m	Electrofishing Time s	Electrofishing Time h	Trap Net-Nights ¼-in (6-mm) mesh	Trap Net-Nights ¾-in (19-mm) mesh	Trap Net-Nights 1-in (25-mm) mesh	Trot Line Sets 4-0 / 8-0	Seine Hauls
1	3	10,982	3,347	6,185	1.7	0	0	1	4 / 4	1
2	3	14,256	4,345	5,510	1.5	0	0	2	4 / 4	2
3	3	16,368	4,989	5,417	1.5	0	0	3	4 / 4	1
4	3	3,000	914	6,000	1.7	0	0	0	4 / 4	3
5	3	3,000[1]	914[1]	4,800[1]	1.3[1]	0	0	0	4 / 4	3
6	3	3,000	914	6,600	1.8	0	0	0	4 / 4	4
Reach 1 Total	18	50,606	15,423	34,512	9.6	0	0	6	24 / 24	14
7	3	17,424	5,311	12,000	3.3	3	6[2]	0	4 / 4	1
8	2	10,032	3,058	6,000	1.7	2	4	0	4 / 4	1
9	3	12,672	3,862	8,100	2.3	3	6	0	4 / 4	1
10	4	12,144	3,701	7,932	2.2	4	8	0	4 / 4	1
11	3	3,696	1,127	6,706	1.9	0	6	0	4 / 4	1
12	3	11,616	3,541	6,153	1.7	3	6	0	4 / 4	1
Reach 2 Total	18	67,584	20,600	46,891	13.0	15	36[2]	0	24 / 24	6
13	3	14,253	4,344	7,440	2.1	3	6	0	4 / 4	1
14	3	12,670	3,862	7,080	2.0	3	6	0	4 / 4	1
15	3	10,559	3,218	4,980	1.4	3	6	0	4 / 4	1
16	3	6,400	1,951	3,535	1.0	6	6	0	6 / 6	3
17	3	5,300	1,615	6,660	1.9	6	6	0	6 / 0	0
18	3	2,300	701	5,500	1.5	6	6	0	6 / 0	0
Reach 3 Total	18	51,482	15,691	35,195	9.8	27	36	0	30 / 18	6
Total	54	169,672	51,714	116,598	32.4	42	72[2]	6	78 / 66	26

[1] one person netted

[2] one net collapsed, count of nets fished is one less

Table 3. List of species designated as large for the 1998 Minnesota River population assessment. Species from which aging structures were sought are denoted by "X" followed by the Area office assigned to analyze age and growth.

Family	Species	Common Name	Area Office
Petromyzontidae	*Ichthyomyzon castaneus*	chestnut lamprey	
	Ichthyomyzon unicuspis	silver lamprey	
	Lampetra appendix	American brook lamprey	
Acipenseridae	*Scaphirhynchus platorynchus*	shovelnose sturgeon	X Hutchinson
Polyodontidae	*Polyodon spathula*	paddlefish	
Lepisosteidae	*Lepisosteus osseus*	longnose gar	
	Lepisosteus platostomus	shortnose gar	
Amiidae	*Amia calva*	bowfin	
Anguillidae	*Anguilla rostrata*	American eel	
Hiodontidae	*Hiodon alosoides*	goldeye	
	Hiodon tergisus	mooneye	
Salmonidae	*Oncorhynchus mykiss*	rainbow trout	
	Salmo trutta	brown trout	
Esocidae	*Esox lucius*	northern pike	X Spicer
Cyprinidae	*Carassius auratus*	goldfish	
	Cyprinus carpio	common carp	
Catostomidae	*Carpiodes carpio*	river carpsucker	
	Carpiodes cyprinus	quillback	
	Carpiodes velifer	highfin carpsucker	
	Catostomus commersoni	white sucker	
	Hypentelium nigricans	northern hog sucker	
	Ictiobus bubalus	smallmouth buffalo	
	Ictiobus cyprinellus	bigmouth buffalo	
	Moxostoma anisurum	silver redhorse	
	Moxostoma carinatum	river redhorse	

Table 3 continued.

Family	Species	Common Name	Area Office
	Moxostoma duquesnei	black redhorse	
	Moxostoma erythrurum	golden redhorse	
	Moxostoma macrolepidotum	shorthead redhorse	
	Moxostoma valenciennesi	greater redhorse	
Ictaluridae	*Ameiurus melas*	black bullhead	
	Ameiurus natalis	yellow bullhead	
	Ameiurus nebulosus	brown bullhead	
	Ictalurus punctatus	channel catfish	X Hutchinson
	Pylodictis olivaris	flathead catfish	X Hutchinson
Gadidae	*Lota lota*	burbot	
Percichthyidae	*Morone chrysops*	white bass	X Windom
Centrarchidae	*Ambloplites rupestris*	rock bass	X Windom
	Lepomis hybrid	hybrid sunfish	X Waterville
	Lepomis cyanellus	green sunfish	
	Lepomis gibbosus	pumpkinseed	X Waterville
	Lepomis humilis	orangespotted sunfish	
	Lepomis macrochirus	bluegill	X Windom
	Micropterus dolomieui	smallmouth bass	X West Metro
	Micropterus salmoides	largemouth bass	X West Metro
	Pomoxis annularis	white crappie	X Waterville
	Pomoxis nigromaculatus	black crappie	X Waterville
Percidae	*Perca flavescens*	yellow perch	X Spicer
	Stizostedion canadense	sauger	X Ortonville
	Stizostedion vitreum	walleye	X Ortonville
Sciaenidae	*Aplodinotus grunniens*	freshwater drum	

Table 4. List of species designated as small for the 1998 Minnesota River population assessment.

Family	Species	Common Name
Clupeidae	*Dorosoma cepedianum*	gizzard shad
Umbridae	*Umbra limi*	central mudminnow
Cyprinidae	*Campostoma anomalum*	central stoneroller
	Campostoma oligolepis	largescale stoneroller
	Hybognathus hankinsoni	brassy minnow
	Macrhybopsis aestivalis	speckled chub
	Macrhybopsis storeriana	silver chub
	Nocomis biguttatus	hornyhead chub
	Notemigonus crysoleucas	golden shiner
	Notropis anogenus	pugnose shiner
	Notropis atherinoides	emerald shiner
	Notropis blennius	river shiner
	Luxilus cornutus	common shiner
	Notropis dorsalis	bigmouth shiner
	Notropis heterodon	blackchin shiner
	Notropis heterolepis	blacknose shiner
	Notropis hudsonius	spottail shiner
	Notropis rubellus	rosyface shiner
	Notropis spilopterus	spotfin shiner
	Notropis stramineus	sand shiner
	Notropis texanus	weed shiner
	Notropis volucellus	mimic shiner
	Phoxinus eos	northern redbelly dace
	Phoxinus erythrogaster	southern redbelly dace
	Pimephales notatus	bluntnose minnow

Table 4 continued.

Family	Species	Common Name
	Pimephales promelas	fathead minnow
	Rhinichthys atratulus	blacknose dace
	Rhinichthys cataractae	longnose dace
	Semotilus atromaculatus	creek chub
	Margariscus margarita	pearl dace
Ictaluridae	*Noturus flavus*	stonecat
	Noturus gyrinus	tadpole madtom
Percopsidae	*Percopsis omiscomaycus*	trout-perch
Cyprinodontidae	*Fundulus diaphanus*	banded killifish
Gasterosteidae	*Culaea inconstans*	brook stickleback
Percidae	*Ammocrypta clara*	western sand darter
	Etheostoma caeruleum	rainbow darter
	Etheostoma exile	Iowa darter
	Etheostoma flabellare	fantail darter
	Etheostoma nigrum	Johnny darter
	Etheostoma zonale	banded darter
	Percina caprodes	logperch
	Percina maculata	blackside darter
	Percina phoxocephala	slenderhead darter

Table 5. Species collected by gear during the 1998 Minnesota River population assessment. Gear types are electrofishing (E), ¼-in (6-mm) mesh trap net (T¼), ¾-in (19-mm) mesh trap net (T¾), 1-in (25-mm)mesh trap net (T1), 4/0 hook trot line (T4), 8/0 hook trot line (T8), and seine haul (S).

Common Name	Reach 1	Reach 2	Reach 3
shovelnose sturgeon	E	E	
shortnose gar	E T1	E T¼ T¾	
bowfin	T1 T4		
American eel		T¾	
gizzard shad	E S	E T¼ S	
goldeye	E	E	
mooneye	E	E	
northern pike	E T1	E T¾	E T¼ T¾
common carp	E T1 S	E T¼ T¾ S	E T¼ T¾ T4 S
brassy minnow			E
hornyhead chub			
golden shiner		S	E T¼ T¾
pugnose shiner		S	
emerald shiner	E S	E T¼ S	E T¼ S
river shiner		E T¼	
common shiner	S	E S	E T¼ T¾
blacknose shiner		T¼	
spottail shiner		E T¼	E T¼ T¾ S
rosyface shiner	S	E	E
spotfin shiner		E T¼ S	E T¼ S
sand shiner	S	E T¼ S	

Table 5 continued.

Common Name	Reach																	
	1					2						3						
redfin shiner	E																	
bluntnose minnow					S		T¼				S	E	T¼					S
fathead minnow					S	E	T¼				S	E	T¼					S
blacknose dace												E						
creek chub											S	E						
river carpsucker	E		T1		S	E		T¾						T¾				
quillback	E		T1		S	E		T¾			S	E	T¼					
highfin carpsucker	E					E		T¾						T¾				
white sucker								T¾			S	E	T¼	T¾				
blue sucker	E					E												
northern hog sucker						E												
smallmouth buffalo	E		T1			E		T¾										
bigmouth buffalo	E					E		T¾				E	T¼	T¾				
silver redhorse	E											E		T¾				
golden redhorse	E				S	E		T¾				E		T¾				
shorthead redhorse	E					E		T¾			S	E	T¼	T¾				S
greater redhorse	E											E						
black bullhead								T¾				E	T¼	T¾				
yellow bullhead												E	T¼	T¾		T4		
brown bullhead												E	T¼					
channel catfish	E			T4	T8	E	T¼	T¾		T4	T8	E	T¼	T¾		T4	T8	S
slender madtom												E						
stonecat													T¼	T¾				

Table 5 continued.

Common Name	Reach																	
	1						2							3				
tadpole madtom														E	T¼	T¾		S
flathead catfish	E			T4	T8		E	T¼	T¾		T4	T8	S					
brook stickleback																		S
white bass	E		T1			S	E	T¼	T¾				S	E	T¼	T¾		S
rock bass														E	T¼			
hybrid sunfish							E											
green sunfish							E						S	E				
pumpkinseed														E	T¼			
orangespotted sunfish						S		T¼					S	E	T¼	T¾		S
bluegill														E	T¼	T¾		
smallmouth bass	E						E											
largemouth bass														E	T¼			
white crappie			T1				E		T¾						T¼	T¾		
black crappie	E		T1				E		T¾					E	T¼	T¾		S
Iowa darter																		S
Johnny darter						S	E						S	E	T¼			S
banded darter						S												
yellow perch													S	E	T¼	T¾		S
logperch							E							E				
blackside darter													S	E				S
slenderhead darter							E							E	T¼			S
sauger	E		T1				E		T¾									
walleye	E						E		T¾			T8		E	T¼	T¾		
freshwater drum	E		T1	T4		S	E	T¼	T¾				S	E	T¼	T¾		S

Table 6. Length-frequency distributions of large fish collected in Reach 1 for the 1998 Minnesota River population assessment.

Total Length (mm)	shovelnose sturgeon	shortnose gar	bowfin	goldeye	mooneye	northern pike	common carp	river carpsucker
<100								
100 -124								1
125 -149								
150 - 174								
175 - 199								1
200 - 224								
225 - 249								
250 - 274								
275 - 299							2	
300 - 324	1				1		2	
325 - 349	1						4	2
350 - 374							10	1
375 - 399	1						26	4
400 - 424							46	11
425 - 449							56	12
450 - 474		1		1			57	11
475 - 499				2			47	5
500 - 524		1					34	1
525 - 549		8					30	
550 - 574		5					21	
575 - 599		5				1	14	
600 - 624	1	2	1			1	13	
625 - 649		2					5	
650 - 674	1						3	
675 - 699		1						
700 - 724	2						1	
725 - 749	1							
750 - 774								
775 - 799	2							
800 - 824								
825 - 849								
850 - 874								
875 - 899								
900 - 924								
925 - 949								
950 - 974								
975 - 999						1		
1000 - 1024								
1025 - 1049								
1050 - 1074								
1075 - 1099								
>1100								
Total	10	25	1	3	1	3	371	49

Table 6 continued.

Total Length (mm)	quillback	highfin carpsucker	blue sucker	smallmouth buffalo	bigmouth buffalo	silver redhorse	golden redhorse	shorthead redhorse
<100		1				1		
100 -124								
125 -149	2	1					1	
150 - 174		4						
175 - 199								
200 - 224	1							
225 - 249		1		1		1		2
250 - 274								
275 - 299				1				
300 - 324		2		2				1
325 - 349		1		2				
350 - 374		2		2	6			
375 - 399		3		1	5			
400 - 424		2		1	4		1	1
425 - 449	2			1	4			1
450 - 474	3				2			
475 - 499	1			2	3			
500 - 524	1				3			
525 - 549				2	2			
550 - 574				1	1			
575 - 599			1	1	1			
600 - 624								
625 - 649								
650 - 674					1			
675 - 699			1					
700 - 724								
725 - 749								
750 - 774								
775 - 799								
800 - 824								
825 - 849								
850 - 874								
875 - 899								
900 - 924								
925 - 949								
950 - 974								
975 - 999								
1000 - 1024								
1025 - 1049								
1050 - 1074								
1075 - 1099								
>1100								
Total	10	17	2	17	32	2	2	5

Table 6 continued.

Total Length (mm)	greater redhorse	channel catfish	flathead catfish	white bass	smallmouth bass	black crappie	sauger	walleye
<100	1			9				
100 -124				2				2
125 -149		1				2		1
150 - 174						2		
175 - 199						1		
200 - 224								
225 - 249							1	
250 - 274								1
275 - 299			1	1	1		1	2
300 - 324	1		1	3	1		1	
325 - 349				1	3		2	
350 - 374			1	2	3		5	
375 - 399		1		3	2		3	1
400 - 424		1		3			2	
425 - 449	1	1					2	1
450 - 474		1	1					
475 - 499			1					1
500 - 524		1						1
525 - 549		2	1					1
550 - 574		5	1					1
575 - 599		3	2					
600 - 624		4	1		1			
625 - 649		4						
650 - 674		3	4					
675 - 699		3	3					
700 - 724		1	2					
725 - 749								
750 - 774		1						
775 - 799		2	1					
800 - 824		1	3					
825 - 849			1					
850 - 874			4					
875 - 899			3					
900 - 924			3					
925 - 949			4					
950 - 974								
975 - 999								
1000- 1024			1					
1025 - 1049								
1050 - 1074			2					
1075 - 1099			1					
>1100			1					
Total	3	35	43	24	11	5	17	12

Table 6 continued.

Total Length (mm)	freshwater drum
<100	
100 -124	
125 -149	
150 - 174	
175 - 199	
200 - 224	1
225 - 249	
250 - 274	4
275 - 299	2
300 - 324	3
325 - 349	4
350 - 374	7
375 - 399	13
400 - 424	2
425 - 449	2
450 - 474	3
475 - 499	1
500 - 524	
525 - 549	
550 - 574	
575 - 599	
600 - 624	
625 - 649	
650 - 674	
675 - 699	
700 - 724	
725 - 749	
750 - 774	
775 - 799	
800 - 824	
825 - 849	
850 - 874	
875 - 899	
900 - 924	
925 - 949	
950 - 974	
975 - 999	
1000 - 1024	
1025 - 1049	
1050 - 1074	
1075 - 1099	
>1100	
Total	42

Table 7. Length-frequency distributions of large fish sampled in Reach 2 for the 1998 Minnesota River population assessment.

Total Length (mm)	shovelnose sturgeon	shortnose gar	American eel	goldeye	mooneye	northern pike	common carp	river carpsucker
<100							1	
100 -124				1				1
125 -149								
150 - 174								
175 - 199								
200 - 224								
225 - 249								
250 - 274				1	3			
275 - 299					1		1	1
300 - 324							1	
325 - 349				1			3	1
350 - 374				4		1	18	1
375 - 399				5			24	15
400 - 424		1		1			45	21
425 - 449				1			58	17
450 - 474		1		1			47	11
475 - 499		1					52	4
500 - 524		3					45	
525 - 549		7					39	
550 - 574		9					21	
575 - 599		12					14	
600 - 624		9					22	
625 - 649		4					14	
650 - 674	2	5					13	
675 - 699		4					6	
700 - 724	1						2	
725 - 749	4							
750 - 774	2						1	
775 - 799	3							
800 - 824	1							
825 - 849						1		
850 - 874								
875 - 899						1		
900 - 924			1			1		
925 - 949								
950 - 974								
975 - 999								
1000 - 1024								
1025 - 1049								
1050 - 1074								
1075 - 1099								
>1100								
Total	13	56	1	15	4	4	427	72

Table 7 continued.

Total Length (mm)	quillback	highfin carpsucker	white sucker	blue sucker	northern hogsucker	smallmouth buffalo	bigmouth buffalo	golden redhorse
<100	23		2		1	2		7
100 -124	1							
125 -149		1						1
150 - 174	1	1						
175 - 199		2						1
200 - 224	2		1					
225 - 249	1	1						
250 - 274					1	1		
275 - 299	2							
300 - 324						5		
325 - 349	2	2				4	2	
350 - 374	4	3				1	10	
375 - 399	4	5				6	15	
400 - 424		6				4	10	
425 - 449	2	5				13	13	
450 - 474		1				11	15	
475 - 499		1				8	12	1
500 - 524						5	13	
525 - 549						5	3	
550 - 574						1		
575 - 599							3	
600 - 624						1	2	
625 - 649							3	
650 - 674								
675 - 699				1			1	
700 - 724								
725 - 749								
750 - 774								
775 - 799								
800 - 824								
825 - 849								
850 - 874								
875 - 899								
900 - 924								
925 - 949								
950 - 974								
975 - 999								
1000 - 1024								
1025 - 1049								
1050 - 1074								
1075 - 1099								
>1100								
Total	42	28	3	1	2	67	102	10

Table 7 continued.

Total Length (mm)	shorthead redhorse	black bullhead	channel catfish	flathead catfish	white bass	hybrid sunfish	green sunfish	orangespotted sunfish
<100	9		52	4	16	1	2	16
100 -124			1		23			
125 -149	4		3					
150 - 174	6	1	1	2				
175 - 199	5		2	1				
200 - 224	3		5	1				
225 - 249	1		7	1	1			
250 - 274	6		1	5				
275 - 299	3		3	2				
300 - 324	8		1	3	5			
325 - 349	8		5	4	3			
350 - 374	13		3		5			
375 - 399	5		3		2			
400 - 424	1		4					
425 - 449	1		2					
450 - 474			4	1				
475 - 499			2	1				
500 - 524			5					
525 - 549			6	3				
550 - 574			9	3				
575 - 599			9	2				
600 - 624			12	6				
625 - 649			6	3				
650 - 674			8	3				
675 - 699			7	1				
700 - 724			4	6				
725 - 749			6					
750 - 774			2	2				
775 - 799				3				
800 - 824				2				
825 - 849				3				
850 - 874			1	1				
875 - 899				8				
900 - 924				3				
925 - 949				2				
950 - 974				1				
975 - 999				2				
1000 - 1024								
1025 - 1049				1				
1050 - 1074				2				
1075 - 1099								
>1100								
Total	73	1	174	82	55	1	2	16

Table 7 continued.

Total Length (mm)	smallmouth bass	white crappie	black crappie	yellow perch	sauger	walleye	freshwater drum
<100				2			81
100 -124			1				13
125 -149			2			3	
150 - 174	1	1			1	2	
175 - 199		1					1
200 - 224			1			1	
225 - 249					4		
250 - 274						4	5
275 - 299					1	1	17
300 - 324					2	2	14
325 - 349	1					2	4
350 - 374					2		12
375 - 399						3	15
400 - 424					1	2	6
425 - 449					1		11
450 - 474						1	4
475 - 499						1	
500 - 524						1	2
525 - 549						1	1
550 - 574						1	1
575 - 599							
600 - 624							
625 - 649						1	
650 - 674						1	
675 - 699							
700 - 724							
725 - 749							
750 - 774							
775 - 799							
800 - 824							
825 - 849							
850 - 874							
875 - 899							
900 - 924							
925 - 949							
950 - 974							
975 - 999							
1000 - 1024							
1025 - 1049							
1050 - 1074							
1075 - 1099							
>1100							
Total	2	2	4	2	12	27	187

Table 8. Length-frequency distributions of large fish sampled in Reach 3 for the 1998 Minnesota River population assessment.

Total Length (mm)	northern pike	common carp	river carpsucker	quillback	highfin carpsucker	white sucker	bigmouth buffalo	silver redhorse
<100		77				40	2	
100 -124		90		1		9	22	
125 -149		62				7	6	
150 - 174		22				1		
175 - 199	1	21				2		
200 - 224	6	3				8		
225 - 249	12	3		1		3		
250 - 274	4	7				2		
275 - 299	3	3				1		
300 - 324		7				3		1
325 - 349		3				1	2	3
350 - 374	3	2		1		4		1
375 - 399	6	6	1			7	1	1
400 - 424	6	4	2		1	20	5	1
425 - 449	5	10		1	1	12	4	1
450 - 474	10	16				8	1	
475 - 499	6	12				2		
500 - 524	5	15		1		2	5	1
525 - 549	11	9					1	
550 - 574	4	11					1	
575 - 599	6	16					2	
600 - 624	9	26						
625 - 649	4	29						
650 - 674	6	23					2	
675 - 699	4	19						
700 - 724	2	21						
725 - 749	4	7						
750 - 774	3	2						
775 - 799	2	1						
800 - 824		2						
825 - 849	4							
850 - 874	3	1						
875 - 899								
900 - 924								
925 - 949								
950 - 974								
975 - 999	1							
1000 - 1024	1							
1025 - 1049								
1050 - 1074								
1075 - 1099								
>1100								
Total	131	530	3	5	2	132	54	9

Table 8 continued.

Total Length (mm)	golden redhorse	shorthead redhorse	greater redhorse	black bullhead	yellow bullhead	brown bullhead	channel catfish	white bass
<100	1	31		71	1		19	84
100 -124				288	1			105
125 -149		2		573	13			7
150 - 174	1	7		364	18		1	1
175 - 199		7		98	16			
200 - 224		12		29	14			
225 - 249	1	3		13	10			3
250 - 274		8		26	15	2	1	12
275 - 299	1	14		1	1	1	7	2
300 - 324	2	14		16	6		7	5
325 - 349	4	22					9	1
350 - 374	6	36		1			8	7
375 - 399	2	38					10	2
400 - 424	1	48					15	1
425 - 449	1	56					23	
450 - 474	3	59					2	
475 - 499	1	32	1				10	
500 - 524		14					3	1
525 - 549	1	4					10	
550 - 574	1	1					5	
575 - 599	2						14	
600 - 624							16	
625 - 649							18	
650 - 674							20	
675 - 699							9	
700 - 724							4	
725 - 749							2	
750 - 774							1	
775 - 799								
800 - 824								
825 - 849								
850 - 874								
875 - 899								
900 - 924								
925 - 949		1						
950 - 974								
975 - 999								
1000 - 1024								
1025 - 1049								
1050 - 1074								
1075 - 1099								
>1100								
Total	28	409	1	1,480	95	3	214	231

Table 8 continued.

Total Length (mm)	rock bass	green sunfish	pumpkinseed sunfish	orangespotted sunfish	bluegill	largemouth bass	white crappie	black crappie
<100		8	17	6	54	56	17	2,446
100 -124		8	3		19	74		58
125 -149					2	15		26
150 - 174					8			49
175 - 199	4				4			32
200 - 224	2					6	1	27
225 - 249	12					5		21
250 - 274						2		5
275 - 299						1		2
300 - 324						2		
325 - 349								
350 - 374						1		
375 - 399						1		
400 - 424								
425 - 449								
450 - 474								
475 - 499								
500 - 524								
525 - 549								
550 - 574								
575 - 599								
600 - 624								
625 - 649								
650 - 674								
675 - 699								
700 - 724								
725 - 749								
750 - 774								
775 - 799								
800 - 824								
825 - 849								
850 - 874								
875 - 899								
900 - 924								
925 - 949								
950 - 974								
975 - 999								
1000 - 1024								
1025 - 1049								
1050 - 1074								
1075 - 1099								
>1100								
Total	18	16	20	6	87	163	18	2,666

Table 8 continued.

Total Length (mm)	yellow perch	walleye	freshwater drum
<100	3,430		99
100 -124	266	2	244
125 -149	125	12	105
150 - 174	61	17	1
175 - 199	20	17	
200 - 224	9	2	
225 - 249	10	6	11
250 - 274	7	12	12
275 - 299		42	25
300 - 324		19	63
325 - 349		29	31
350 - 374		34	16
375 - 399		24	12
400 - 424		24	8
425 - 449		13	3
450 - 474		5	2
475 - 499		9	3
500 - 524		8	1
525 - 549		2	2
550 - 574		4	2
575 - 599			
600 - 624			
625 - 649			
650 - 674			
675 - 699			
700 - 724			
725 - 749			
750 - 774			
775 - 799			
800 - 824			
825 - 849			
850 - 874			
875 - 899			
900 - 924			
925 - 949			
950 - 974			
975 - 999			
1000 - 1024			
1025 - 1049			
1050 - 1074			
1075 - 1099			
>1100			
Total	3,928	281	640

Table 9. Total catch and catch rates (number/h) of large fish from electrofishing for the 1998 Minnesota River population assessment.

	Reach						Total	
	1		2		3			
Common Name	Number	Rate (SE)	Number	Rate (SE)	Number	Rate (SE)	Number	Rate (SE)
shovelnose sturgeon	7	0.7 (0.8)	13	1.0 (1.2)	0	0.0 (0.0)	20	0.6 (0.9)
shortnose gar	24	2.5 (2.2)	32	2.5 (1.8)	0	0.0 (0.0)	56	1.7 (2.0)
goldeye	3	0.3 (0.5)	15	1.2 (0.7)	0	0.0 (0.0)	18	0.6 (0.7)
mooneye	2	0.2 (0.4)	4	0.3 (0.5)	0	0.0 (0.0)	6	0.2 (0.4)
northern pike	1	0.1 (0.2)	1	0.1 (0.2)	20	2.0 (1.7)	22	0.7 (1.3)
common carp	360	37.5 (32.7)	389	29.9 (11.5)	375	38.3 (24.7)	1124	34.7 (23.5)
river carpsucker	48	5.0 (6.7)	62	4.8 (5.9)	0	0.0 (0.0)	110	3.4 (5.4)
quillback	4	0.4 (0.6)	17	1.3 (1.2)	4	0.4 (0.4)	25	0.8 (0.9)
highfin carpsucker	17	1.8 (2.2)	21	1.6 (2.1)	0	0.0 (0.0)	38	1.2 (1.9)
white sucker	0	0.0 (0.0)	0	0.0 (0.0)	95	9.7 (8.1)	95	2.9 (6.3)
blue sucker	2	0.2 (0.4)	1	0.1 (0.1)	0	0.0 (0.0)	3	0.1 (0.2)
northern hog sucker	0	0.0 (0.0)	2	0.2 (0.3)	0	0.0 (0.0)	2	0.1 (0.2)
smallmouth buffalo	16	1.7 (3.3)	64	4.9 (5.7)	0	0.0 (1.4)	80	2.5 (4.1)
bigmouth buffalo	32	3.3 (4.6)	101	7.8 (7.1)	32	3.3 (5.8)	165	5.1 (6.1)
silver redhorse	2	0.2 (0.4)	0	0.0 (0.0)	6	0.6 (1.8)	8	0.2 (1.0)
golden redhorse	2	0.2 (0.7)	11	0.8 (1.4)	26	2.7 (2.1)	39	1.2 (1.8)
shorthead redhorse	8	0.8 (1.2)	72	5.5 (4.2)	263	26.8 (29.9)	343	10.6 (20.4)
[illegible]er redhorse	3	0.3 (0.5)	0	0.0 (0.0)	1	0.1 (0.4)	4	0.1 (0.4)
black bullhead	0	0.0 (0.0)	0	0.0 (0.0)	7	0.7 (0.9)	7	0.2 (0.6)
yellow bullhead	0	0.0 (0.0)	0	0.0 (0.0)	8	0.8 (1.3)	8	0.2 (0.8)
brown bullhead	0	0.0 (0.0)	0	0.0 (0.0)	2	0.2 (0.8)	2	0.1 (0.5)
channel catfish	4	0.4 (0.7)	82	6.3 (6.4)	89	9.1 (13.1)	175	5.4 (8.6)
flathead catfish	9	0.9 (1.6)	25	1.9 (1.5)	0	0.0 (0.0)	34	1.0 (1.4)
white bass	14	1.5 (1.1)	25	1.9 (1.8)	198	20.2 (47.3)	237	7.3 (27.4)
rock bass	0	0.0 (0.0)	0	0.0 (0.0)	16	1.6 (1.2)	16	0.5 (0.7)
hybrid sunfish	0	0.0 (0.0)	1	0.1 (0.2)	0	0.0 (0.0)	1	<0.1 (0.1)
green sunfish	0	0.0 (0.0)	1	0.1 (0.20	16	1.6 (4.0)	17	0.5 (2.4)
pumpkinseed	0	0.0 (0.0)	0	0.0 (0.0)	17	1.7 (4.3)	17	0.5 (2.5)
orangespotted sunfish	0	0.0 (0.0)	0	0.0 (0.0)	646	65.9 (46.1)	646	19.9 (30.8)
bluegill	0	0.0 (0.0)	0	0.0 (0.0)	55	5.6 (9.2)	55	1.7 (5.7)
smallmouth bass	11	1.1 (0.0)	2	0.2 (0.4)	0	0.0 (0.0)	13	0.4 (0.3)
largemouth bass	0	0.0 (0.0)	0	0.0 (0.0)	94	9.6 (19.8)	94	2.9 (11.8)
white crappie	0	0.0 (0.0)	1	0.1 (0.2)	0	0.0 (0.0)	1	<0.1 (0.1)
black crappie	2	0.2 (0.4)	1	0.1 (0.2)	54	5.5 (6.0)	57	1.8 (4.2)
yellow perch	0	0.0 (0.0)	0	0.0 (0.0)	599	61.1 (68.6)	599	18.5 (47.2)
sauger	16	1.7 (2.1)	11	0.8 (0.9)	0	0.0 (0.0)	27	0.8 (1.5)
walleye	12	1.3 (1.1)	21	1.6 (1.6)	133	13.6 (13.4)	166	5.1 (9.6)
[illegible]water drum	39	4.1 (5.6)	158	12.2 (10.9)	347	35.4 (35.3)	544	16.8 (23.4)
Total	638	66.5 (8.0)	1133	87.2 (6.2)	3103	316.6 (21.7)	4874	150.4 (14.0)

Table 10. Total catch and catch rates (number/h) of small fish from electrofishing for the 1998 Minnesota River population assessment.

	Reach						Total	
	1		2		3			
Common Name	Number	Rate (SE)	Number	Rate (SE)	Number	Rate (SE)	Number	Rate (SE)
gizzard shad	1331	138.6 (295.8)	113	8.7 (8.9)	0	0.0 (0.0)	1444	44.6 (172.0)
hornyhead chub	0	0.0 (0.0)	0	0.0 (0.0)	4	0.4 (0.5)	4	0.1 (0.3)
golden shiner	0	0.0 (0.0)	0	0.0 (0.0)	2	0.2 (0.4)	2	0.1 (0.2)
emerald shiner	1959	204.1 (284.4)	57	4.4 (7.1)	68	6.9 (6.2)	2084	64.3 (179.8)
river shiner	0	0.0 (0.0)	1	0.1 (0.2)	0	0.0 (0.0)	1	<0.1 (0.1)
common shiner	0	0.0 (0.0)	1	0.1 (0.2)	13	1.3 (0.9)	14	0.4 (0.6)
spottail shiner	0	0.0 (0.0)	1	0.1 (1.2)	54	5.5 (5.3)	55	1.7 (3.3)
rosyface shiner	0	0.0 (0.0)	1	0.1 (0.2)	4	0.4 (0.4)	5	0.2 (0.3)
spotfin shiner	0	0.0 (0.0)	129	9.9 (12.8)	156	15.9 (13.9)	285	8.8 (11.4)
sand shiner	0	0.0 (0.0)	10	0.8 (1.3)	0	0.0 (0.0)	10	0.3 (0.8)
redfin shiner	1	0.1 (0.3)	0	0.0 (0.0)	0	0.0 (0.0)	1	<0.1 (0.2)
bluntnose minnow	0	0.0 (0.0)	0	0.0 (0.0)	66	6.7 (6.2)	66	2.0 (3.8)
fathead minnow	0	0.0 (0.0)	2	0.2 (0.3)	156	15.9 (10.5)	158	4.9 (6.9)
blacknose dace	0	0.0 (0.0)	0	0.0 (0.0)	2	0.2 (0.3)	2	0.1 (0.2)
creek chub	0	0.0 (0.0)	0	0.0 (0.0)	3	0.3 (0.3)	3	0.1 (0.2)
slender madtom	0	0.0 (0.0)	0	0.0 (0.0)	1	0.1 (0.3)	1	<0.1 (0.2)
tadpole madtom	0	0.0 (0.0)	0	0.0 (0.0)	30	3.1 (2.0)	30	0.9 (1.3)
Johnny darter	0	0.0 (0.0)	1	0.1 (0.2)	2	0.2 (0.40	3	0.1 (0.3)
logperch	0	0.0 (0.0)	1	0.1 (0.2)	2	0.2 (0.4)	3	0.1 (0.3)
blackside darter	0	0.0 (0.0)	0	0.0 (0.2)	96	9.8 (8.60	96	3.0 (5.5)
slenderhead darter	0	0.0 (0.0)	2	0.2 (0.3)	18	1.8 (2.5)	20	0.6 (1.4)
Total	3291	342.8 (95.6)	319	24.5 (4.6)	677	69.1 (5.2)	4287	132.3 (55.6)

T e 11. Total catch and catch rates (number/net-night) of large fish sampled by 1/4-in (6-mm) mesh trapnetting for the 1998 Minnesota River population assessment.

	Reach						Total	
	1		2		3			
Common Name	Number	Rate (SE)	Number	Rate (SE)	Number	Rate (SE)	Number	Rate (SE)
shortnose gar	-	-	3	0.2 (0.3)	0	0.0 (0.0)	3	0.1 (0.2)
northern pike	-	-	0	0.0 (0.0)	38	1.4 (1.1)	38	0.9 (1.0)
common carp	-	-	1	0.1 (0.0)	56	2.1 (1.3)	57	1.4 (1.2)
quillback	-	-	0	0.0 (0.0)	1	<0.1 (0.1)	1	<0.1 (0.1)
white sucker	-	-	0	0.0 (0.0)	17	0.6 (0.8)	17	0.4 (0.6)
bigmouth buffalo	-	-	0	0.0 (0.0)	7	0.3 (0.2)	7	0.2 (0.2)
shorthead redhorse	-	-	0	0.0 (0.0)	41	1.5 (1.2)	41	1.0 (1.0)
black bullhead	-	-	0	0.0 (0.0)	1426	52.8 (36.3)	1426	34.0 (28.5)
yellow bullhead	-	-	0	0.0 (0.0)	60	2.2 (1.9)	60	1.4 (1.7)
brown bullhead	-	-	0	0.0 (0.0)	1	<0.1 (0.10	1	<0.1 (0.1)
channel catfish	-	-	18	1.2 (1.0)	15	0.6 (0.9)	33	0.8 (1.0)
flathead catfish	-	-	4	0.3 (0.2)	0	0.0 (0.0)	4	0.1 (0.2)
white bass	-	-	2	0.1 (0.2)	10	0.4 (0.6)	12	0.3 (0.5)
rock bass	-	-	0	0.0 (0.0)	2	0.1 (0.1)	2	<0.1 (0.1)
pkinseed	-	-	0	0.0 (0.0)	3	0.1 (0.1)	3	0.1 (0.1)
orangespotted sunfish	-	-	7	0.5 (0.5)	5571	206.3 (128.10	5578	132.8 (99.4)
bluegill	-	-	0	0.0 (0.0)	29	1.1 (1.2)	29	0.7 (1.0)
largemouth bass	-	-	0	0.0 (0.0)	69	2.6 (4.5)	69	1.6 (3.4)
crappie (unident.)	-	-	1	0.0 (0.2)	0	0.0 (0.0)	1	0.1 (0.1)
white crappie	-	-	0	0.0 (0.0)	17	0.6 (1.1)	17	0.4 (0.8)
black crappie	-	-	0	0.0 (0.0)	2399	88.9 (80.5)	2399	57.1 (60.5)
yellow perch	-	-	0	0.0 (0.0)	3282	121.6 (110.8)	3282	78.1 (82.1)
walleye	-	-	0	0.0 (0.0)	40	1.5 (2.2)	40	1.0 (1.7)
freshwater drum	-	-	2	0.1 (0.2)	77	2.9 (1.2)	79	1.9 (1.5)
Total	-	-	37	2.5 (0.3)	13,161	487.4 (40.6)	13,198	314.2 (37.4)

Table 12. Total catch and catch rates (number/net-night) of small fish from 1/4-in mesh (6-mm) trapnetting for t 1998 Minnesota River population assessment.

	Reach						Total	
	1		2		3			
Common Name	Number	Rate (SE)	Number	Rate (SE)	Number	Rate (SE)	Number	Rate (SE)
gizzard shad	-	-	6	0.4 (0.8)	0	0.0 (0.0)	6	0.1 (0.6)
golden shiner	-	-	0	0.0 (0.0)	76	2.8 (1.7)	76	1.8 (1.3)
emerald shiner	-	-	280	18.7 (26.9)	920	34.1 (30.7)	1200	28.6 (27.6)
river shiner	-	-	2	0.1 (0.2)	0	0.0 (0.0)	2	<0.1 (0.1)
common shiner	-	-	0	0.0 (0.0)	15	0.6 (0.5)	15	0.4 (0.4)
blacknose shiner	-	-	4	0.3 (0.4)	0	0.0 (0.0)	4	0.1 (0.3)
spottail shiner	-	-	11	0.7 (1.0)	3021	111.9 (62.8)	3032	72.2 (49.0)
spotfin shiner	-	-	15	1.0 (0.9)	76	2.8 (2.6	91	2.2 (1.9)
sand shiner	-	-	4	0.3 (0.5)	0	0.0 (0.0)	4	0.1 (0.3)
shiner (unident.)	-	-	3	0.2 (0.5)	0	0.0 (0.0)	3	0.1 (0.3)
bluntnose minnow	-	-	4	0.3 (0.3)	35	1.3 (0.7)	39	0.9 (0.6)
fathead minnow	-	-	6	0.4 (0.6)	144	5.3 (2.9)	150	3.6 (2.3)
stonecat	-	-	0	0.0 (0.0)	4	0.1 (0.1)	4	0.1 (0.1)
tadpole madtom	-	-	0	0.0 (0.0)	772	28.6 (20.9)	772	18.4 (15.8
Johnny darter	-	-	0	0.0 (0.0)	2	0.1 (0.1)	2	<0.1 (0.1)
slenderhead darter	-	-	0	0.0 (0.0)	14	0.5 (0.4)	14	0.3 (0.3)
Total	-	-	335	22.3 (7.1)	5079	188.1 (19.6)	5414	128.9 (15.1)

Table 13. Total catch and catch rates (number/net-night) of large fish from 3/4-in mesh (19-mm) trapnetting for the 1998 Minnesota River population assessment.

	Reach						Total	
	1		2		3			
Common Name	Number	Rate (SE)	Number	Rate (SE)	Number	Rate (SE)	Number	Rate (SE)
shortnose gar	-	-	21	0.6 (0.7)	0	0.0 (0.0)	21	0.3 (0.6)
American eel	-	-	1	<0.1 (0.1)	0	0.0 (0.0)	1	<0.1 (0.1)
northern pike	-	-	3	0.1 (0.1)	73	2.0 (3.0)	76	1.1 (2.2)
common carp	-	-	37	1.1 (0.6)	96	2.7 (2.8)	133	1.9 (2.2)
river carpsucker	-	-	10	0.3 (0.3)	3	0.1 (0.2)	13	0.2 (0.2)
quillback	-	-	2	0.1 (0.1)	0	0.0 (0.0)	2	<0.1 (0.1)
highfin carpsucker	-	-	7	0.2 (0.3)	2	0.1 (0.1)	9	0.1 (0.3)
white sucker	-	-	1	<0.1 (0.1)	20	0.6 (0.8)	21	0.3 (0.6)
smallmouth buffalo	-	-	3	0.1 (0.1)	0	0.0 (0.1)	3	<0.1 (0.1)
bigmouth buffalo	-	-	1	<0.1 (0.1)	15	0.4 (0.8)	16	0.2 (0.6)
silver redhorse	-	-	0	0.0 (0.0)	3	0.1 (0.1)	3	<0.1 (0.1)
golden redhorse	-	-	1	<0.1 (0.1)	2	0.1 (0.1)	3	<0.1 (0.1)
shorthead redhorse	-	-	2	0.1 (0.1)	105	2.9 (4.0)	107	1.5 (3.1)
black bullhead	-	-	1	<0.1 (0.1)	47	1.3 (2.7)	48	0.7 (2.0)
yellow bullhead	-	-	0	0.0 (0.0)	25	0.7 (1.1)	25	0.4 (0.8)
channel catfish	-	-	3	0.1 (0.1)	9	0.3 (0.4)	12	0.2 (0.3)
flathead catfish	-	-	2	0.1 (0.1)	0	0.0 (0.0)	2	<0.1 (0.1)
white bass	-	-	12	0.3 (0.3)	16	0.4 (0.5)	28	0.4 (0.4)
orangespotted sunfish	-	-	0	0.0 (0.0)	1	<0.1 (0.1)	1	<0.1 (0.1)
bluegill	-	-	0	0.0 (0.0)	3	0.1 (0.2)	3	<0.1 (0.2)
white crappie	-	-	1	<0.1 (0.1)	1	<0.1 (0.1)	2	<0.1 (0.1)
black crappie	-	-	3	0.1 (0.1)	212	5.9 (6.4)	215	3.0 (5.1)
yellow perch	-	-	0	0.0 (0.0)	45	1.3 (2.3)	45	0.6 (1.7)
sauger	-	-	1	<0.1 (0.1)	0	0.0 (0.0)	1	<0.1 (0.1)
walleye	-	-	5	0.1 (0.2)	108	3.0 (5.1)	113	1.6 (3.7)
freshwater drum	-	-	14	0.4 (0.6)	215	6.0 (5.4)	229	3.2 (4.7)
Total	-	-	131	3.7 (0.3)	1001	27.8 (2.7)	1132	15.9 (2.0)

Table 14. Total catch and catch rates (number/net-night) of small fish from 3/4-in mesh (19-mm) trapnetting for the 1998 Minnesota River population assessment.

	Reach						Total	
	1		2		3			
Common Name	Number	Rate (SE)	Number	Rate (SE)	Number	Rate (SE)	Number	Rate (SE)
golden shiner	-	-	0	0.0 (0.0)	2	0.1 (0.1)	2	<0.1 (0.1)
common shiner	-	-	0	0.0 (0.0)	1	<0.1 (0.1)	1	<0.1 (0.1)
spottail shiner	-	-	0	0.0 (0.0)	1	<0.1 (0.1)	1	<0.1 (0.1)
stonecat	-	-	0	0.0 (0.0)	2	0.1 (0.1)	2	<0.1 (0.1)
tadpole madtom	-	-	0	0.0 (0.0)	4	0.1 (0.1)	4	0.1 (0.1)
Total	-	-	0	0.0 (0.0)	10	0.3 (0.1)	10	0.1 (0.1)

T(15. Total catch and catch rates (number/net-night) of fish from 1-in mesh (25-mm) trapnetting for the 1998 Minnesota River population assessment.

	Reach						Total	
	1		2		3			
Common Name	Number	Rate (SE)	Number	Rate (SE)	Number	Rate (SE)	Number	Rate (SE)
shortnose gar	1	0.2 (0.1)	-	-	-	-	1	0.2 (0.1)
bowfin	1	0.2 (0.1)	-	-	-	-	1	0.2 (0.1)
northern pike	2	0.3 (0.3)	-	-	-	-	2	0.3 (0.3)
common carp	11	1.8 (1.2)	-	-	-	-	11	1.8 (1.2)
river carpsucker	1	0.2 (0.1)	-	-	-	-	1	0.2 (0.1)
quillback	6	1.0 (0.6)	-	-	-	-	6	1.0 (0.6)
smallmouth buffalo	1	0.2 (0.1)	-	-	-	-	1	0.2 (0.1)
white bass	1	0.2 (0.1)	-	-	-	-	1	0.2 (0.1)
white crappie	1	0.2 (0.4)	-	-	-	-	1	0.2 (0.4)
black crappie	3	0.5 (0.8)	-	-	-	-	3	0.5 (0.8)
sauger	1	0.2 (0.1)	-	-	-	-	1	0.2 (0.1)
freshwater drum	2	0.3 (0.2)	-	-	-	-	2	0.3 (0.2)
Total	31	5.2 (0.5)	-	-	-	-	31	5.2 (0.5)

Table 16. Total catch and catch rates (number/set) of fish from trotlining (4/0 hooks) for the 1998 Minnesota Ri population assessment.

	Reach						Total	
	1		2		3			
Common Name	Number	Rate (SE)	Number	Rate (SE)	Number	Rate (SE)	Number	Rate (SE)
bowfin	1	<0.1 (0.1)	0	0.0 (0.0)	0	0.0 (0.0)	1	<0.1 (0.1)
common carp	0	0.0 (0.0)	0	0.0 (0.0)	3	0.1 (0.2)	3	<0.1 (0.1)
yellow bullhead	0	0.0 (0.0)	0	0.0 (0.0)	2	0.1 (0.1)	2	<0.1 (0.1)
channel catfish	26	1.1 (0.7)	40	1.7 (0.9)	53	1.8 (2.3)	119	1.5 (1.5)
flathead catfish	2	0.1 (0.0)	1	<0.1 (0.1)	0	0.0 (0.0)	3	<0.1 (0.1)
freshwater drum	1	<0.1 (0.1)	0	0.0 (0.0)	0	0.0 (0.0)	1	<0.1 (0.1)
Total	30	1.3 (0.5)	41	1.7 (0.7)	58	1.9 (1.1)	129	1.7 (0.8)

T 17. Total catch and catch rates (number/set) of fish from trotlining (8/0 hooks) for the 1998 Minnesota River population assessment.

	Reach						Total	
	1		2		3			
Common Name	Number	Rate (SE)	Number	Rate (SE)	Number	Rate (SE)	Number	Rate (SE)
channel catfish	5	0.2 (0.2)	16	0.7 (0.6)	44	2.4 (3.2)	65	1.0 (1.8)
flathead catfish	32	1.3 (0.50)	49	2.0 (1.8)	0	0.0 (0.0)	81	1.2 (1.3)
walleye	0	0.0 (0.0)	1	<0.1 (0.1)	0	0.0 (0.0)	1	<0.1 (0.1)
Total	37	1.5 (0.7)	66	2.8 (1.3)	44	2.4 (2.2)	147	2.2 (1.4)

Table 18. Total catch and catch rates (number/haul) of large fish from seining for the 1998 Minnesota River population assessment.

	Reach						Total	
	1		2		3			
Common Name	Number	Rate (SE)	Number	Rate (SE)	Number	Rate (SE)	Number	Rate (SE)
common carp	1	0.1 (0.4)	1	0.2 (0.4)	0	0.0 (0.0)	2	0.1 (0.3)
river carpsucker	5	0.4 (0.4)	0	0.0 (0.0)	0	0.0 (0.0)	5	0.2 (0.3)
quillback	7	0.5 (0.6)	29	4.8 (8.2)	0	0.0 (0.0)	36	1.4 (5.3)
white sucker	0	0.0 (0.0)	2	0.3 (0.8)	0	0.0 (0.0)	2	0.1 (0.5)
redhorse (unident.)	1	0.1 (0.2)	0	0.0 (0.0)	0	0.0 (0.0)	1	<0.1 (0.1)
golden redhorse	1	0.1 (0.1)	0	0.0 (0.0)	0	0.0 (0.0)	1	<0.1 (0.1)
shorthead redhorse	0	0.0 (0.0)	1	0.2 (0.4)	3	0.5 (0.5)	4	0.2 (0.3)
channel catfish	16	1.1 (1.2)	15	2.5 (2.4)	5	0.8 (2.5)	36	1.4 (2.0)
flathead catfish	0	0.0 (0.0)	1	0.2 (0.4)	0	0.0 (0.0)	1	<0.1 (0.3)
white bass	10	0.7 (1.8)	16	2.7 (5.6)	7	1.2 (1.1)	33	1.3 (3.6)
green sunfish	0	0.0 (0.0)	1	0.2 (0.4)	0	0.0 (0.0)	1	<0.1 (0.3)
orangespotted sunfish	45	3.2 (6.1)	9	1.5 (1.7)	691	115.2 (57.2)	745	28.7 (28.6)
black crappie	0	0.0 (0.0)	0	0.0 (1.2)	1	0.2 (0.2)	1	<0.1 (0.8)
yellow perch	0	0.0 (0.0)	2	0.3 (0.4)	0	0.0 (0.3)	4	0.2 (0.3)
freshwater drum	69	4.9 (14.1)	13	2.2 (3.4)	1	0.2 (0.5)	83	3.2 (8.7)
Total	155	11.1 (4.0)	90	15.0 (3.0)	710	118.3 (14.8)	955	36.7 (8.0)

Table 19. Total catch and catch rates (number/haul) of small fish from seining for the 1998 Minnesota River population assessment.

Common Name	Reach 1 Number	Reach 1 Rate (SE)	Reach 2 Number	Reach 2 Rate (SE)	Reach 3 Number	Reach 3 Rate (SE)	Total Number	Total Rate (SE)
gizzard shad	1635	116.8 (329.2)	22	3.7 (7.1)	0	0.0 (0.2)	1657	63.7 (201.8)
brassy minnow	0	0.0 (0.0)	0	0.0 (0.0)	2	0.3 (0.3)	2	0.1 (0.2)
golden shiner	0	0.0 (0.0)	1	0.2 (0.4)	0	0.0 (0.0)	1	<0.1 (0.3)
shiner (unident.)	0	0.0 (0.0)	3	0.5 (1.2)	0	0.0 (0.0)	3	0.1 (0.8)
pugnose shiner	0	0.0 (0.0)	2	0.3 (2.0)	0	0.0 (0.0)	2	0.1 (1.3)
emerald shiner	981	70.1 (48.4)	115	19.2 (23.3)	38	6.3 (3.2)	1134	43.6 (39.5)
common shiner	3	0.2 (0.6)	1	0.2 (0.5)	0	0.0 (0.0)	4	0.2 (0.5)
spottail shiner	0	0.0 (0.0)	0	0.0 (0.0)	58	9.7 (4.5)	58	2.2 (2.3)
rosyface shiner	132	9.4 (26.9)	0	0.0 (0.0)	0	0.0 (0.0)	132	5.1 (16.5)
spotfin shiner	0	0.0 (0.0)	115	19.2 (41.1)	2	0.3 (0.2)	117	4.5 (25.6)
sand shiner	42	3.0 (4.3)	9	1.5 (2.0)	0	0.0 (0.0)	51	2.0 (2.8)
bluntnose minnow	1	0.1 (0.2)	3	0.5 (1.2)	10	1.7 (0.8)	14	0.5 (0.8)
fathead minnow	65	4.6 (8.3)	34	5.7 (8.7)	294	49.0 (24.3)	393	15.1 (13.4)
[illegible] chub	0	0.0 (0.0)	3	0.5 (0.6)	0	0.0 (0.0)	3	0.1 (0.4)
tadpole madtom	0	0.0 (0.0)	0	0.0 (0.0)	4	0.7 (0.3)	4	0.2 (0.2)
brook stickleback	0	0.0 (0.0)	0	0.0 (0.0)	2	0.3 (0.2)	2	0.1 (0.1)
Iowa darter	0	0.0 (0.0)	0	0.0 (0.0)	2	0.3 (0.2)	2	0.1 (0.1)
Johnny darter	2	0.1 (0.2)	1	0.2 (0.4)	12	2.0 (1.0)	15	0.6 (0.5)
banded darter	1	0.1 (0.1)	0	0.0 (0.0)	0	0.0 (0.0)	1	<0.1 (0.1)
blackside darter	0	0.0 (0.0)	1	0.2 (0.4)	2	0.3 (0.2)	3	0.1 (0.3)
slenderhead darter	0	0.0 (0.0)	0	0.0 (0.0)	2	0.3 (0.2)	2	0.1 (0.1)
Total	2862	204.4 (73.8)	310	51.7 (11.7)	428	71.3 (5.5)	3600	138.5 (45.9)

Table 20. Mean back-calculated total length (mm) at annulus and number of fish aged (N) during the 1998 Minnesota River population assessment. Standard error of back-calculated length is in parentheses.

Common Name / River Reach	N	Age (years) 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
shovelnose sturgeon																						
Reach 1	3	203	332	438	543	605	585	650	688													
		(42.2)	(29.1)	(37.2)	(48.3)	(86.3)	(0.0)	(0.0)	(0.0)													
Reach 2	13	213	325	424	496	550	599	635	666	681	693	744	779									
		(13.0)	(15.5)	(17.7)	(16.4)	(16.5)	(17.2)	(17.8)	(17.5)	(16.9)	(14.9)	(10.6)	(8.5)									
Reach 3	0																					
northern pike																						
Reach 1	3	313	477	626	750	954	967															
		(30.4)	(48.9)	(84.1)	(149.4)	(0.0)	(0.0)															
Reach 2	1[1]																					
Reach 3	88	275	427	538	618	691	738	794	825	867	912											
		(5.5)	(7.8)	(10.2)	(12.5)	(15.0)	(17.0)	(21.4)	(31.4)	(32.7)	(63.2)											
channel catfish																						
Reach 1	34	101	166	232	291	343	387	435	483	528	568	594	620	643	672	730	763	784	799			
		(4.6)	(5.0)	(5.5)	(6.1)	(7.7)	(9.1)	(10.2)	(11.4)	(11.5)	(14.1)	(11.4)	(14.6)	(25.9)	(29.7)	(0.0)	(0.0)	(0.0)	(0.0)			
Reach 2	11	83	157	213	258	312	355	405	458	503	556	586	632	662	697	746						
		(2.4)	(3.4)	(3.9)	(4.8)	(5.7)	(6.6)	(7.8)	(8.7)	(9.7)	(11.2)	(15.2)	(11.6)	(15.0)	(21.9)	(53.5)						
Reach 3	75	119	185	245	292	350	395	435	469	513	566	585	597	587	653	654						
		(8.1)	(6.0)	(6.8)	(7.4)	(9.1)	(11.2)	(13.1)	(15.6)	(18.8)	(18.6)	(22.9)	(32.9)	(48.8)	(29.0)	(0.0)						
flathead catfish																						
Reach 1	36	116	168	242	335	409	484	547	604	654	712	751	804	844	885	891	919	958	1021			
		(0.0)	(5.3)	(9.0)	(10.6)	(10.9)	(11.3)	(11.8)	(14.2)	(15.1)	(17.9)	(21.9)	(22.4)	(25.5)	(30.0)	(29.9)	(31.4)	(35.2)	(71.9)			
Reach 2	64	107	186	262	367	440	500	554	602	652	692	714	755	788	815	830	884	921	941	928	944	958
		(10.7)	(8.7)	(8.6)	(10.3)	(10.8)	(12.0)	(14.0)	(14.1)	(13.9)	(14.7)	(15.9)	(17.0)	(18.3)	(21.0)	(24.9)	(28.6)	(23.3)	(25.8)	(12.0)	(10.9)	(0.0)
Reach 3	0																					

Table 20 continued.

Common Name		Age (years)																				
River Reach	N	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
white bass																						
Reach 1	17	141	270	327	342	366	383	394	396	404												
		(5.2)	(7.1)	(9.0)	(7.3)	(9.6)	(9.7)	(9.8)	(0.0)	(0.0)												
Reach 2	51	139	247	316	350	374																
		(5.5)	(8.8)	(6.6)	(14.3)	(0.0)																
Reach 3	57	167	279	345	393																	
		(4.2)	(5.2)	(5.9)	(0.0)																	
rock bass																						
Reach 1	0																					
Reach 2	0																					
Reach 3	21	60	126	175	216	232																
		(2.3)	(4.7)	(8.2)	(5.3)	(5.3)																
pumpkinseed																						
Reach 1	0																					
Reach 2	0																					
Reach 3	15	51	103																			
		(2.1)	(0.0)																			
bluegill																						
Reach 1	0																					
Reach 2	0																					
Reach 3	42	50	110	145	175																	
		(1.7)	(7.5)	(5.8)	(2.0)																	
largemouth bass																						
Reach 1																						
Reach 2																						
Reach 3	60	73	141	262	326																	
		(3.6)	(11.5)	(25.6)	(0.0)																	

Table 20 continued.

Common Name / River Reach	N	Age (years) 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
white crappie																						
Reach 1	0																					
Reach 2	2	78	118	153																		
		(0.4)	(4.3)	(15.2)																		
Reach 3	2	92	133	196																		
		(0.0)	(0.0)	(0.0)																		
black crappie																						
Reach 1	5	76	109	152	158																	
		(3.6)	(2.7)	(9.1)	(0.0)																	
Reach 2	4	74	101	148	199																	
		(1.4)	(1.7)	(19.7)	(0.0)																	
Reach 3	91	79	113	159	203	212	224	251														
		(78.7)	(113.1)	(158.9)	(202.6)	(212.4)	(221.0)	(251.5)														
yellow perch																						
Reach 1	0																					
Reach 2	0																					
Reach 3	15	83	129	171	201	211	213	228	241													
		(1.1)	(2.3)	(4.1)	(6.1)	(5.5)	(0.0)	(0.0)	(0.0)													
sauger																						
Reach 1	17	141	258	329	377	406																
		(4.4)	(5.6)	(4.5)	(12.1)	(31.2)																
Reach 2	12	139	256	331	404																	
		(6.9)	(6.6)	(12.3)	(6.4)																	
Reach 3	0																					

Table 20 continued.

Common Name		Age (years)																			
River Reach	N	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
walleye																						
Reach 1	12	160	281	385	464	526	545	558														
		(8.9)	(17.3)	(24.0)	(13.2)	(1.8)	(0.0)	(0.0)														
Reach 2	27	181	305	408	501	546	601	642														
		(7.7)	(10.9)	(16.7)	(16.3)	(22.5)	(27.2)	(19.4)														
Reach 3	15	177	313	426	485	527																
		(2.0)	(4.5)	(5.8)	(6.7)	(13.4)																

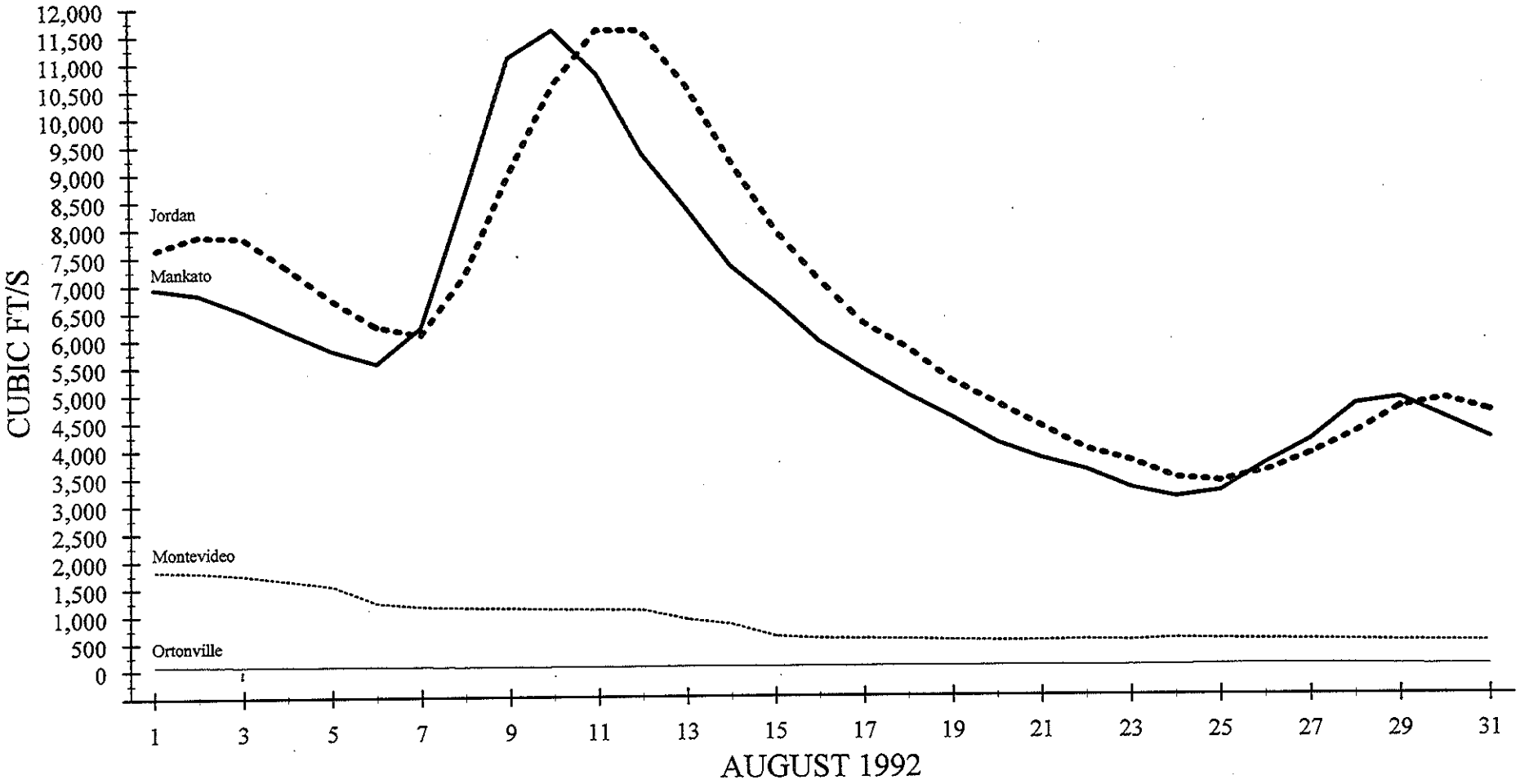
[1] DisBcal requires a minimum of two fish for back-calculation.

Table 21. Mercury levels (ppm) in fish collected for the 1998 Minnesota River population assessment.

	Reach														
	1					2					3				
	#	mean	SD	max.	min.	#	mean	SD	max.	min.	#	mean	SD	max.	min.
common carp															
<15 in (375 mm)	-	-	-	-	-	21	0.07	0.05	0.21	0.02	8	0.03	0.02	0.08	0.02
15 - 25 in (375 - 625)	16	0.13	0.05	0.29	0.06	33	0.14	0.07	0.32	0.03	25	0.13	0.07	0.33	0.03
>25 in (625 mm)	3	0.13	0.03	0.17	0.11	14	0.17	0.05	0.29	0.11	18	0.16	0.06	0.26	0.05
channel catfish															
<15 in (375 mm)	-	-	-	-	-	4	0.15	0.05	0.23	0.11	8	0.13	0.03	0.21	0.08
15 - 25 in (375 - 625)	12	0.16	0.07	0.32	0.05	27	0.22	0.14	0.65	0.06	17	0.18	0.13	0.49	0.4
>25 in (625 mm)	7	0.22	0.10	0.37	0.09	21	0.25	0.17	0.65	0.05	12	0.35	0.18	0.68	0.13
white bass															
<15 in (375 mm)	1	0.25	0.00	0.25	0.25	-	-	-	-	-	-	-	-	-	-
15 - 25 in (375 - 625)	1	0.64	0.00	0.64	0.64	-	-	-	-	-	-	-	-	-	-
>25 in (625 mm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
walleye															
<15 in (375 mm)	-	-	-	-	-	7	0.16	0.04	0.24	0.11	23	0.09	0.03	0.19	0.04
15 - 25 in (375 - 625)	4	0.22	0.09	0.32	0.11	8	0.22	0.04	0.28	0.18	12	0.14	0.05	0.22	0.06
>25 in (625 mm)	-	-	-	-	-	1	0.57	0.00	0.57	0.57	-	-	-	-	-
sauger															
<15 in (375 mm)	6	0.22	0.05	0.29	0.14	-	-	-	-	-	-	-	-	-	-
15 - 25 in (375 - 625)	3	0.44	0.29	0.85	0.19	-	-	-	-	-	-	-	-	-	-
>25 in (625 mm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 22. Polychlorinated biphenyl levels (ppm) in fish collected for the 1998 Minnesota River population assessment.

	Reach														
	1					2					3				
	#	mean	SD	max.	min.	#	mean	SD	max.	min.	#	mean	SD	max.	min.
common carp															
<15 in (375 mm)	-	-	-	-	-	19	0.02	0.02	0.11	0.01	3	0.01	0.00	0.01	0.01
15 - 25 in (375 - 625)	16	0.06	0.06	0.26	0.01	33	0.03	0.04	0.20	0.01	21	0.02	0.03	0.14	0.01
>25 in (625 mm)	3	0.08	0.03	0.41	0.12	14	0.10	0.13	0.54	0.02	18	0.08	0.18	0.77	0.01
channel catfish															
<15 in (375 mm)	-	-	-	-	-	2	0.04	0.01	0.04	0.03	1	0.04	0.00	0.04	0.04
15 - 25 in (375 - 625)	12	0.17	0.14	0.56	0.03	27	0.10	0.14	0.68	0.01	13	0.02	0.02	0.06	0.01
>25 in (625 mm)	7	0.13	0.09	0.31	0.02	21	0.17	0.17	0.67	0.01	12	0.05	0.03	0.12	0.01
white bass															
<15 in (375 mm)	1	0.55	0.00	0.55	0.55	-	-	-	-	-	-	-	-	-	-
15 - 25 in (375 - 625)	1	0.84	0.00	0.84	0.84	-	-	-	-	-	-	-	-	-	-
>25 in (625 mm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
walleye															
<15 in (375 mm)	-	-	-	-	-	4	0.01	0.00	0.01	0.01	1	0.01	0.00	0.01	0.01
15 - 25 in (375 - 625)	4	0.17	0.09	0.28	0.04	8	0.02	0.03	0.11	0.01	12	0.01	0.01	0.06	0.01
>25 in (625 mm)	-	-	-	-	-	1	0.01	0.00	0.01	0.01	0	-	-	-	-
sauger															
<15 in (375 mm)	2	0.06	0.04	0.10	0.02	-	-	-	-	-	-	-	-	-	-
15 - 25 in (375 - 625)	3	0.04	0.03	0.08	0.02	-	-	-	-	-	-	-	-	-	-
>25 in (625 mm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



	Ortonville	Montevideo	Mankato	Jordan
August 1992 mean daily flow (cubic ft/s)	53.8	872.0	6000.0	6502.0
August 1992 minimum daily flow (cubic ft/s)	38.0	470.0	3100.0	3390.0
August 1992 maximum daily flow (cubic ft/s)	79.0	1820.0	11600.0	11600.0
Period of record mean daily flow (cubic ft/s)	51.2	457.0	1980.0	2683.0
Period of record minimum daily flow (cubic ft/s)	0.3	0.6	37.4	178.0
Period of record maximum daily flow (cubic ft/s)	451.0	3165.0	13040.0	13910.0

Appendix 1. Flow (cubic ft/s) at four USGS gauging stations on the Minnesota River for August 1992 with peroiod of record flows.

Appendix 2. Total catch of large fish from electrofishing for the 1992 Minnesota River population assessment.

Common Name	Reach 1 Number	Reach 2 Number	Reach 3 Number	Total Number
shovelnose sturgeon	0	6	0	6
shortnose gar	28	48	0	76
bowfin	3	0	1	4
goldeye	3	2	0	5
mooneye	0	1	0	1
northern pike	5	3	15	23
common carp	438	542	360	1340
river carpsucker	92	42	0	134
quillback	45	45	1	91
highfin carpsucker	23	52	7	82
white sucker	0	0	36	36
northern hog sucker	0	1	0	1
smallmouth buffalo	17	33	6	56
bigmouth buffalo	18	31	125	174
silver redhorse	11	18	8	37
golden redhorse	4	14	15	33
shorthead redhorse	75	151	32	258
black bullhead	0	0	18	18
yellow bullhead	0	0	15	15
channel catfish	28	81	24	133
flathead catfish	11	11	0	22
white bass	49	22	6	77
rock bass	0	0	5	5
green sunfish	4	12	109	125
pumpkinseed	0	0	5	5
orangespotted sunfish	2	14	35	51
bluegill	1	0	9	10
smallmouth bass	5	9	9	23
largemouth bass	1	0	10	11
white crappie	1	5	5	11
black crappie	1	3	6	10
yellow perch	0	0	174	174
sauger	15	23	0	38
walleye	15	34	50	99
freshwater drum	51	40	21	112
Total	946	1243	1107	3296

Appendix 3. Total catch of small fish from electrofishing for the 1992 Minnesota River population assessment.

Common Name	Reach 1 Number	Reach 2 Number	Reach 3 Number	Total Number
gizzard shad	20	17	0	37
central mudminnow	0	0	9	9
brassy minnow	0	0	7	7
silver chub	1	0	0	1
hornyhead chub	0	0	2	2
golden shiner	0	0	26	26
emerald shiner	1365	13	141	1519
river shiner	0	1	0	1
common shiner	0	0	217	217
bigmouth shiner	5	0	0	5
spottail shiner	1	0	12	13
rosyface shiner	4	0	1	5
spotfin shiner	117	130	25	272
sand shiner	0	61	0	61
mimic shiner	0	4	0	4
bluntnose minnow	3	9	20	32
fathead minnow	0	11	251	262
blacknose dace	0	0	1	1
creek chub	0	4	0	4
stonecat	0	0	8	8
tadpole madtom	0	0	14	14
brook stickleback	0	0	3	3
Iowa darter	0	0	9	9
Johnny darter	0	0	18	18
logperch	0	1	0	1
blackside darter	0	2	17	19
slenderhead darter	0	1	0	1
river darter	0	0	1	1
Total	1516	254	782	2552

Appendix 4.. Total catch of large fish sampled by 1/4-in (6-mm) mesh trapnetting for the 1992 Minnesota River population assessment.

Common Name	Reach 1 Number	Reach 2 Number	Reach 3 Number	Total Number
northern pike	-	-	5	5
common carp	-	-	19	19
white sucker	-	-	7	7
bigmouth buffalo	-	-	4	4
shorthead redhorse	-	-	4	4
black bullhead	-	-	304	304
yellow bullhead	-	-	97	97
white bass	-	-	25	25
rock bass	-	-	7	7
pumpkinseed	-	-	4	4
orangespotted sunfish	-	-	37	37
bluegill	-	-	10	10
largemouth bass	-	-	2	2
black crappie	-	-	29	29
yellow perch	-	-	817	817
walleye	-	-	24	24
freshwater drum	-	-	16	16
Total	-	-	1411	1411

Appendix 5. Total catch of small fish from 1/4-in (6-mm) trapnetting for the 1992 Minnesota River population assessment.

Common Name	Reach 1 Number	Reach 2 Number	Reach 3 Number	Total Number
central mudminnow	-	-	1	1
brassy minnow	-	-	31	31
golden shiner	-	-	46	46
emerald shiner	-	-	969	969
common shiner	-	-	50	50
spottail shiner	-	-	21	21
rosyface shiner	-	-	1	1
spotfin shiner	-	-	1	1
bluntnose minnow	-	-	29	29
fathead minnow	-	-	769	769
tadpole madtom	-	-	592	592
brook stickleback	-	-	7	7
Iowa darter	-	-	1	1
Johnny darter	-	-	4	4
logperch	-	-	1	1
blackside darter	-	-	1	1
Total	-	-	2524	2524

Appendix 6. Total catch of large fish from 3/4-in (19-mm) trapnetting for the 1992 Minnesota River population assessment.

	Reach			
	1	2	3	Total
Common Name	Number	Number	Number	Number
shortnose gar	3	30	0	33
goldeye	0	1	0	1
mooneye	0	1	0	1
northern pike	1	8	38	47
common carp	8	68	102	178
quillback	2	1	0	3
river carpsucker	8	65	0	73
highfin carpsucker	4	5	0	9
white sucker	0	1	18	19
smallmouth buffalo	0	14	0	14
bigmouth buffalo	1	2	0	3
silver redhorse	0	7	0	7
golden redhorse	0	5	5	10
shorthead redhorse	3	29	14	46
black bullhead	0	12	270	282
yellow bullhead	1	0	63	64
channel catfish	3	26	15	44
flathead catfish	2	3	2	7
white bass	2	13	41	56
rock bass	0	0	15	15
pumpkinseed	0	0	2	2
orangespotted sunfish	0	0	2	2
bluegill	0	2	10	12
largemouth bass	0	1	0	1
white crappie	0	17	5	22
black crappie	2	9	46	57
yellow perch	0	0	43	43
walleye	1	5	59	65
freshwater drum	15	24	65	104
Total	56	349	815	1220

Appendix 7. Total catch of small fish from 3/4-in (19-mm) trapnetting for the 1992 Minnesota River population assessment.

Common Name	Reach 1 Number	Reach 2 Number	Reach 3 Number	Total Number
gizzard shad	0	1	0	1
common shiner	0	0	2	2
spotfin shiner	0	0	1	1
stonecat	0	0	1	1
tadpole madtom	0	0	13	13
Total	0	1	17	18

Appendix 8. Total catch of fish from gillnetting for the 1992 Minnesota River population assessment.

Common Name	Reach 1 Number	Reach 2 Number	Reach 3 Number	Total Number
shovelnose sturgeon	1	3	0	4
shortnose gar	0	7	0	7
goldeye	0	1	0	1
northern pike	0	1	13	14
common carp	1	11	32	44
river carpsucker	0	10	0	10
quillback	0	1	6	7
white sucker	0	0	5	5
smallmouth buffalo	0	11	0	11
bigmouth buffalo	0	2	1	3
silver redhorse	0	1	0	1
golden redhorse	0	1	1	2
shorthead redhorse	0	7	13	20
black bullhead	0	0	55	55
yellow bullhead	0	0	5	5
channel catfish	0	6	30	36
flathead catfish	0	1	0	1
white bass	0	1	0	1
rock bass	0	0	2	2
bluegill	0	0	1	1
white crappie	0	1	0	1
black crappie	0	0	4	4
yellow perch	0	0	42	42
sauger	0	1	0	1
walleye	0	2	12	14
freshwater drum	0	1	11	12
Total	2	69	233	304

Appendix 9. Total catch of fish from trotlining (4/0 and 5/0 hooks) for the 1992 Minnesota River population assessment.

Common Name	Reach 1 Number	Reach 2 Number	Reach 3 Number	Total Number
northern pike	1	2	1	4
common carp	2	2	1	5
golden redhorse	1	0	0	1
black bullhead	0	0	1	1
channel catfish	25	61	81	167
flathead catfish	18	10	0	28
white bass	1	0	0	1
freshwater drum	2	0	0	2
Total	50	75	84	209

Appendix 10. Total catch of large fish from seining for the 1992 Minnesota River population assessment.

Common Name	Reach 1 Number	Reach 2 Number	Reach 3 Number	Total Number
northern pike	-	1	-	1
common carp	-	19	-	19
river carpsucker	-	55	-	55
quillback	-	12	-	12
white sucker	-	1	-	1
northern hogsucker	-	8	-	8
smallmouth buffalo	-	7	-	7
bigmouth buffalo	-	11	-	11
silver redhorse	-	5	-	5
golden redhorse	-	34	-	34
shorthead redhorse	-	3	-	3
channel catfish	-	15	-	15
white bass	-	3	-	3
orangespotted sunfish	-	15	-	15
smallmouth bass	-	11	-	11
white crappie	-	6	-	6
walleye	-	3	-	3
freshwater drum	-	44	-	44
Total	-	253	-	253

Appendix 11. Total catch of small fish from seining for the 1992 Minnesota River population assessment.

Common Name	Reach 1 Number	Reach 2 Number	Reach 3 Number	Total Number
gizzard shad	-	12	-	12
central stoneroller	-	9	-	9
brassy minnow	-	58	-	58
emerald shiner	-	75	-	75
river shiner	-	5	-	5
common shiner	-	10	-	10
bigmouth shiner	-	1	-	1
spottail shiner	-	22	-	22
rosyface shiner	-	1	-	1
spotfin shiner	-	1590	-	1590
sand shiner	-	1087	-	1087
bluntnose minnow	-	375	-	375
blacknose dace	-	2	-	2
fathead minnow	-	2199	-	2199
creek chub	-	78	-	78
Johnny darter	-	222	-	222
logperch	-	1	-	1
blackside darter	-	38	-	38
slenderhead darter	-	31	-	31
Total	-	5816	-	5816

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Division of Fisheries

Completion Report:

Assessment of the Fish Populations of the Minnesota River

by
Bobbi Chapman

Approved by: Lee J. Sundstrom
Area Fisheries Supervisor
10/30/00
Date

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12-04-00
Date