NORTH DAKOTA GAME AND FISH DEPARTMENT

Final Report
Status of Selected Fishes with Immediate Conservation Need in North Dakota
Project T-14-R

July 1, 2006 – December 31, 2008

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Submitted by Michael G. McKenna
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STATE WILDLIFE GRANT OBJECTIVES AND ACCOMPLISHMENTS SUMMARY

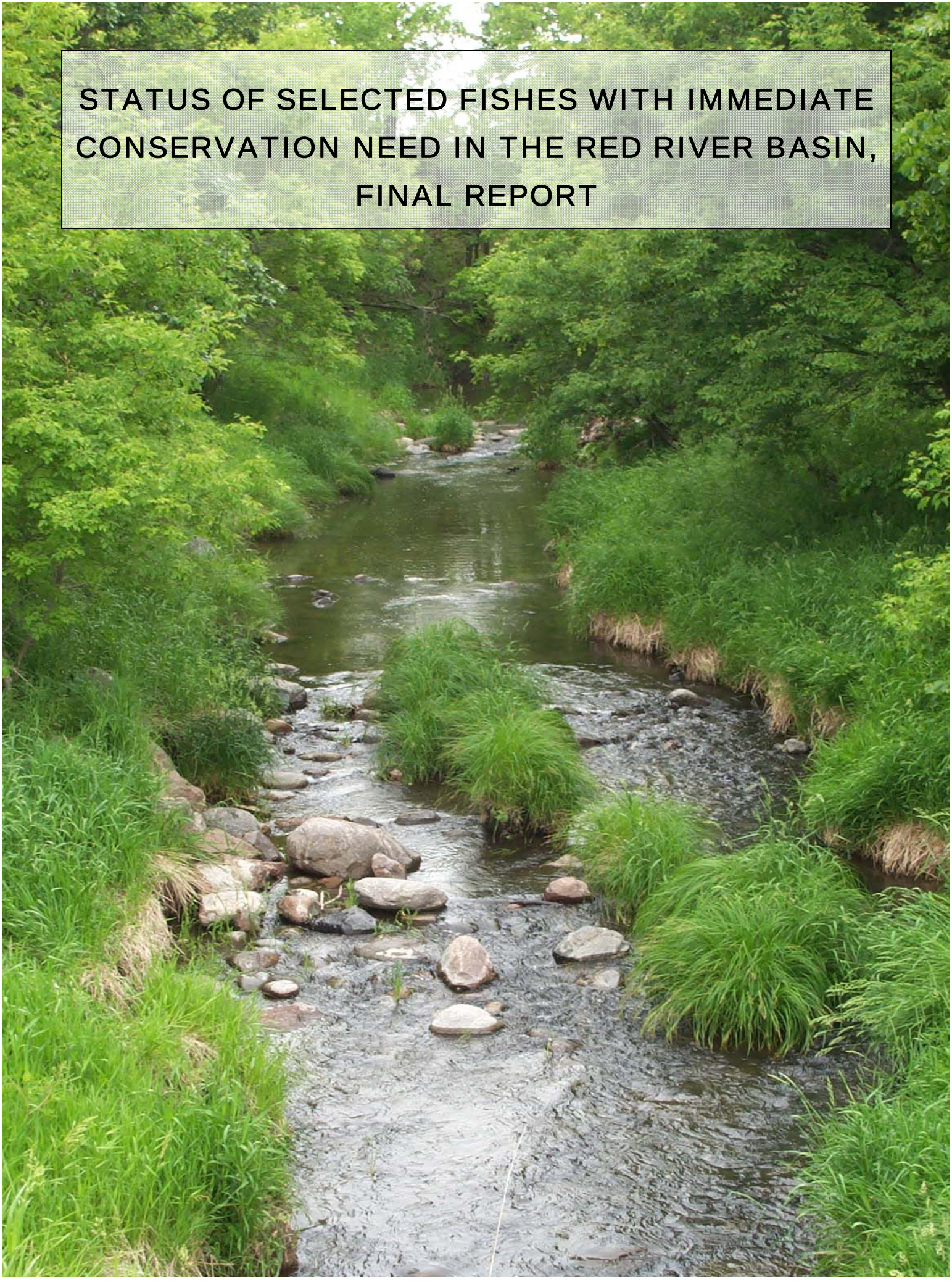
State Agency:	North Dakota Game and Fish Department
Study/Grant Number:	T-14-R
Title:	Status of selected fishes with immediate conservation need in North Dakota
Period Begin/End Dates:	July 1, 2006 to December 31, 2008
Principle Investigator & Organization:	Dr. Charles Berry South Dakota State University

Project Summary:
The goals of this report are to synthesize our study of fishes of the Red River Basin with emphasis on 17 rare species, and provide distribution maps for these species. During the summers of 2006 and 2007, we conducted 137 different sampling occasions at 125 different locations on 40 different streams. We deployed sampling gear a total of 185 times. Eight species of concern (chestnut lamprey, hornyhead chub, largescale stoneroller, northern redbelly dace, pearl dace, silver chub, trout-perch, and yellow bullhead) were collected in the Red River drainage. We did not find silver lamprey, blacknose shiner, blackchin shiner, carmine shiner, finescale dace, logperch, and pugnose shiner, which were historically collected in Red River tributaries. Hornyhead chub was collected at the most sites and was the most abundant, followed by trout-perch. Hornyhead chub was found in the Forest and Park rivers whereas trout-perch was collected in five watersheds. We determined that the species of stoneroller present in the Red River basin is the largescale stoneroller, *Campostoma oligolepis*.

Objective 1:	Accomplishments:	Location in Report:
determine the accuracy of historical information and vouchers for species of concern	Identification of voucher specimens was completed using fish keys of Trautman (1981), Pflieger (1997), and Becker (2001) and others. Fish counts were added to the existing database. The identity and counts of voucher specimens was checked by Mr. James Ladonski, Instructor of Biology, SDSU, who has experience in curation of museum collections. Vouchers are stored in SDSU Department of Wildlife and Fisheries fish collection.	Page 8
Objective 2:	Accomplishments:	Location in Report:
provide regional distribution maps and narrative summaries for species of concern using GIS location data based on	This report provides completed and updated distribution maps of 8 species of conservation priority that were collected from waters in the Red River Basin.	Pages 25-40 Table 7 (pg 43)

historical database provided by NDGFD, which will be updated throughout the study		
Objective 3: conduct field surveys of fish and habitat conditions at sites where fish have been historically found, and at other sites nearby.	Accomplishments: Researchers were able to identify and sample at 13 historical sites as well as to collect data in consecutive years from 8 sites	Location in Report: Figure 3 (pg 6) Table 6 (pg 35) Appendix VIII (pg 91)
Objective 4: Synthesize information on distribution of all study species with emphasis on the presence of central and largescale stonerollers (*Campostoma anomalum, C. oligolepis*).	Accomplishments: Stoneroller species was determined to be the largescale stoneroller (*Campostoma oligolepis*)	Location in Report: Pages 30-35

STATUS OF SELECTED FISHES WITH IMMEDIATE CONSERVATION NEED IN THE RED RIVER BASIN, FINAL REPORT



STATUS OF SELECTED FISHES WITH IMMEDIATE CONSERVATION NEED IN THE RED RIVER BASIN, FINAL REPORT

Submitted to

North Dakota Game and Fish Department

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April 2009

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EXECUTIVE SUMMARY

The goals of this report are to synthesize our study of fishes of the Red River Basin with emphasis on 17 rare species, and provide distribution maps for these species. During the summers of 2006 and 2007, we conducted 137 different sampling occasions at 125 different locations on 40 different streams. We deployed sampling gear a total of 185 times. Eight species of concern (chestnut lamprey, hornyhead chub, largescale stoneroller, northern redbelly dace, pearl dace, silver chub, trout-perch, and yellow bullhead) were collected in the Red River drainage. We did not find silver lamprey, blacknose shiner, blackchin shiner, carmine shiner, finescale dace, logperch, and pugnose shiner, which were historically collected in Red River tributaries. Hornyhead chub was collected at the most sites and was the most abundant, followed by trout-perch. Hornyhead chub was found in the Forest and Park rivers whereas trout-perch was collected in five watersheds. We determined that the species of stoneroller present in the Red River basin is the largescale stoneroller, *Campostoma oligolepis*.

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INTRODUCTION

The NDGFD prepared a Comprehensive Wildlife Conservation Strategy (Hagen et al. 2005) that addressed the needs of all fish and wildlife species, with priority on non-game species in greatest need of conservation. The conservation strategy lists several fishes of conservation need (Appendix I). The strategy addresses their distribution and abundance, key habitats, threats, ways to address the threats, and plans for monitoring species and habitats. A database of North Dakota fishes was assembled by Kelsch and Tesky (2002) to synthesize historical records. However, new requirements of the State Wildlife Grants Program require updated information. The accuracy of historical information and current status of the populations is important for conservation planning (Hayer et al. 2008).

This study began on July 1, 2006 and ended on September 30, 2008. The research focused on 17 fishes of concern in North Dakota rivers (Appendix I). Emphasis was placed on the ecology and distribution of largescale and central stonerollers (*Campostoma oligolepis* and *C. anomalum*; Appendix II). The study included a review of literature, historical records and inspection of voucher specimens for species of concern, and field sampling over two summers with several sampling gears (i.e. seine, backpack and boat electrofishing, cloverleaf traps). Lab work, data analysis and report writing were done at South Dakota State University. Annual reports were submitted after to 2006 and 2007 field seasons (Hayer et al. 2007, 2008)

Goal and Objectives:

The objective of this study was to provide information that will assist in planning activities to help conserve and restore the native riverine fishes of North Dakota. Specific objectives were to:

- determine the accuracy of historical information and vouchers for species of concern,

- provide regional distribution maps and narrative summaries for species of concern using GIS location data based on historical database provided by NDGFD, which will be updated throughout the study,
- conduct field surveys of fish and habitat conditions at sites where fish have been historically found, and at other sites nearby, and,
- synthesize information on distribution of all study species with emphasis on the presence of central and largescale stonerollers (*Campostoma anomalum, C. oligolepis*).

STUDY REGION

The study region comprises the Red River basin in North Dakota that makes up the eastern border of North Dakota with Minnesota (Figure 1). From its formation at the confluence of the Otter Tail and Bois de Sioux rivers at Wahpeton, North Dakota the river flows northward to the Canadian border into Manitoba. River gradient decreases 61 m over its 640 km course to the border (Goldstein et al. 1996). The Red River basin in North Dakota contains two major physiographic regions (Maclay et al. 1972; Winter et al. 1984): the Drift Prairie or Glaciated Plains and the Red River Valley Lake Plain, which are separated by a unique glaciated feature, the Pembina escarpment (Appendix III). Until 12,000 years ago, a large lake, Lake Agassiz, covered this region (Niemela et al. 1998). The flat topography and rich soil of the glacial Lake Agassiz basin provides for excellent but intensive agricultural production including potatoes, beans, sugar beets, corn and wheat (Goldstein et al. 1996). A majority of the Red River basin is designated as cropland with some grazing (Goldstein et al. 1996; Lorenz and Stoner 1996).

Hydrology

A majority of stream flow into the Red River mainstem (75%) originates from eastern tributaries in Minnesota (Stoner et al. 1993; Tornes et al. 1997). The largest North Dakota tributary

is the Sheyenne River (Niemela et al. 1998). Nine other tributaries enter the Red River from North Dakota and include the Wild Rice, Maple, Rush, Elm, Goose, Turtle, Forest, Park and Pembina rivers (Figures 1; 2). These rivers are influenced by channelization and flood control impoundments built to control land drainage for agriculture (Niemela et al. 1998; Hagen et al. 2005). Extensive drainage ditch systems alter the natural hydrology in this basin. Agricultural runoff and wastewater inputs also impair the system (Hagen et al. 2005). A proposed outlet from Devils Lake into the Sheyenne River also poses risks to the system (Hagen et al. 2005), which may include adverse impacts to downstream communities such as drinking water pollution, negative impact on water quality and aquatic habitat and non-native species introduction (Environmental Protection Agency 2007). Data from this study may be useful to private groups and agencies interested in this issue (e.g., L. Schleuter, personal communication).

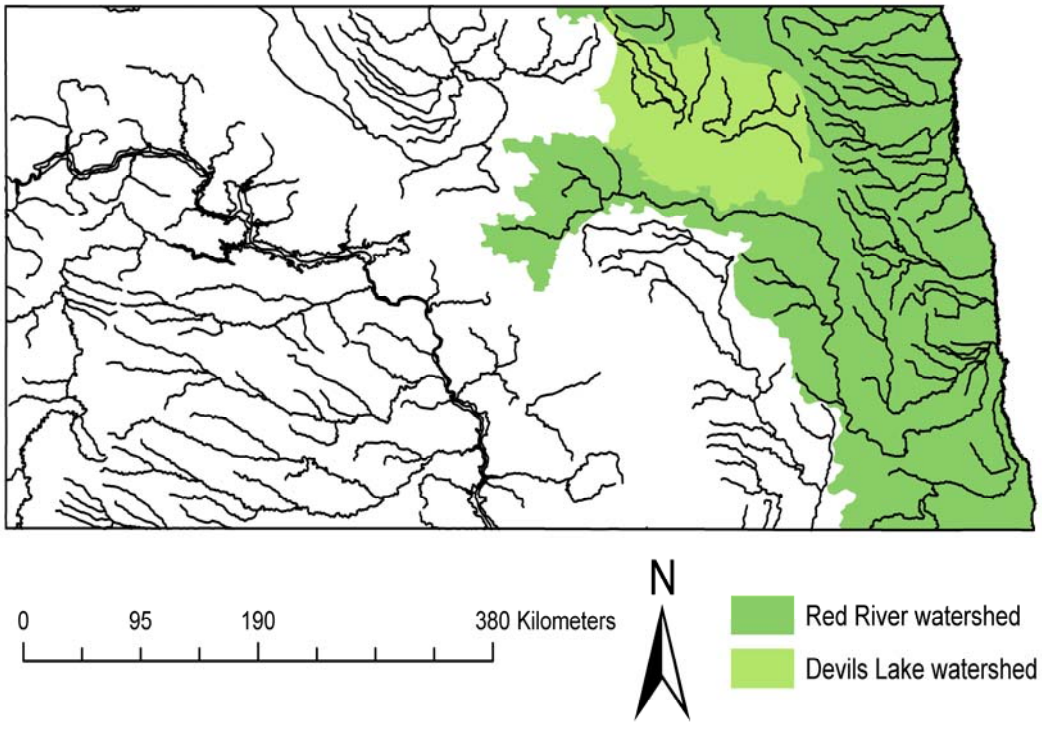

Figure 1. The Red River and Devils Lake watersheds of North Dakota.

Water quality

The Red River was included in the National Water Quality Assessment Program, so much is known about water quality in the basin (Stoner et al. 1993). High suspended sediment concentrations characterize streams that flow through heavily cropped areas. Highest sediment concentrations coincide with high stream gradient, high stream flows, and erodible stream channels (e.g., Pembina River). Urban wastewater pollution was minimal. Streams contained pollutants that are expected in an agriculture dominated basin (e.g., pesticides, phosphorous, nitrates). However, fish communities were affected more by differences in natural environmental factors than by water quality. Three factors explain about 60 percent of fish distribution variability: 1) fish habitat abundance and diversity, 2) discharge variability, and 3) undisturbed land (forest or wetland) surrounding the stream (within one mile). Dams, ditches, and riparian buffer zone width also have some affect on fish distribution and abundance (Goldstein et al. 1996).

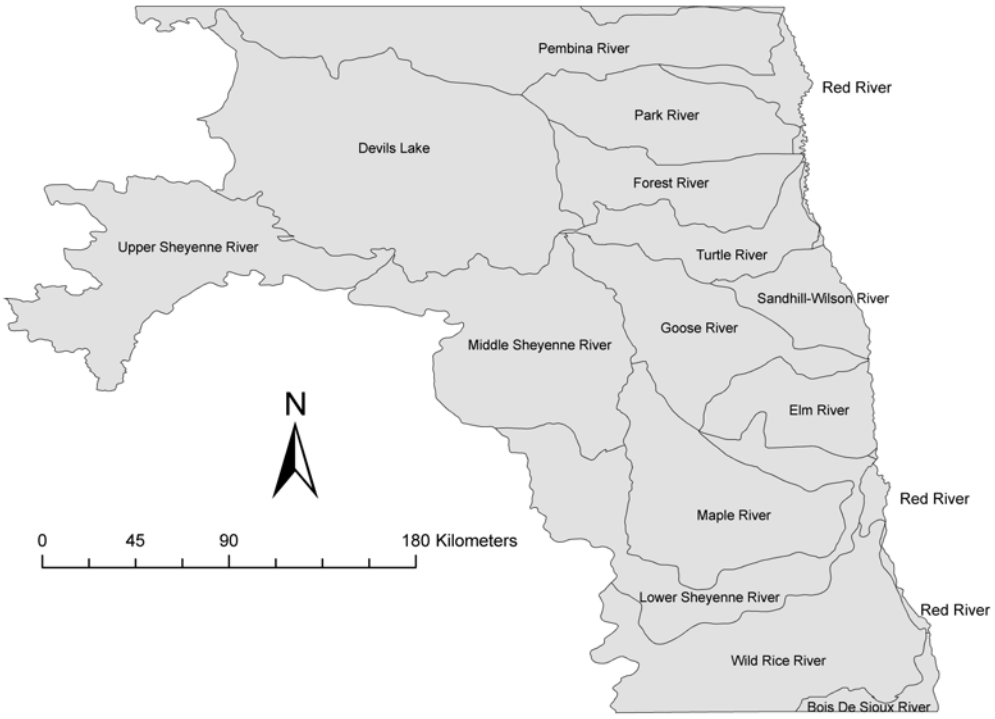

Figure 2. Subwatersheds of Red River basin tributaries in North Dakota

Fishes

Fish communities differ between the two ecoregions of North Dakota that encompass the Red River basin (Goldstein et al. 1996). The Red River tributaries in North Dakota generally flow west to east from the Northern Glaciated Plains Ecoregion where many small streams are intermittent, into the Red River Valley Lake Plain, where rivers are low-gradient and meandering (Goldstein et al. 1996). River gradient generally increases somewhat where the rivers leave the Glaciated Plains and enter the Red River Valley. This change is evident in the Pembina and Prairie Coteau Escarpments where gradient increases and cool water and forested riparian zones are typical (Bryce et al. 1998). Fish assemblages in the streams in the Prairie Coteau Escarpment are made up of 22 species dominated by cyprinids; several species (e.g., blackside darter, hornyhead chub, redbelly dace, and Carmine shiner) are considered rare in South Dakota (Dieterman and Berry 1994).

The fishes of the Red River Basin have been recently reviewed by Goldstein et al. (1996) who summarized earlier works of Peterka (1978, 1991) and others. These data and data from other studies were included in a database that we obtained from the North Dakota Game and Fish Department. Using this information, we created point distribution maps using ARC/INFO version 9.0 (Environmental Systems Research Institute 2001). These historical data included collections from 1960 to 1998 and were used to select potential sampling sites for this study (Figure 3).

METHODS

Field methods

Historical sampling locations and maps were used to locate potential sites where species of concern should occur. Sampling locations were based on access to public and private lands and where water levels and habitat conditions were favorable for sampling gear. The stream was visually assessed for stream characteristics (i.e. stream width/depth, vegetation, land use, bank

characteristics, channel habitat, substrate, etc.) prior to sampling. This was to ensure the reach encompassed all major macrohabitats (i.e. riffle, run, pool).

Fieldwork occurred during summer of 2006 at 49 sites (Appendix IV), and in summer of 2007 (May-September) at 87 sites (site 708 was resampled; Appendix V) in Red River tributaries and the Red River mainstem (Figure 3). We focused on these areas to increase sampling effort in areas where several rare species were predicted, rather than sample statewide with less effort because of logistics and late field season start.

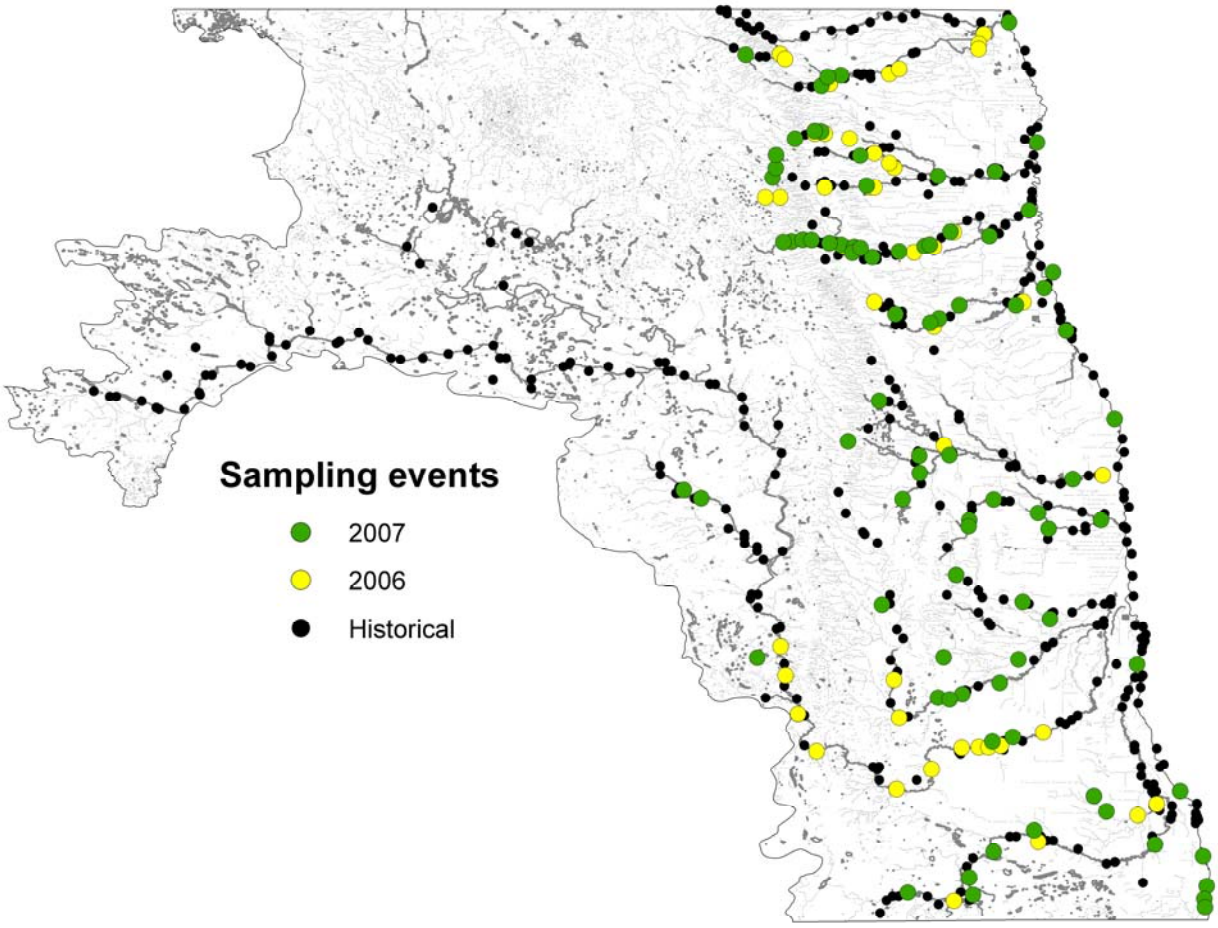

Figure 3. Historical and present sampling locations within the Red River basin

Depending on habitat conditions, fish were collected at each site with one or a combination of the following: seining, backpack electrofishing with a Smith-Root LR-24 electrofisher (depending on available habitat and flow conditions), cloverleaf minnow and predator traps and cylindrical minnow traps. Sites on the Red River mainstem were sampled with an electrofishing boat. Fishes were collected with bag seines (1.2m deep, 9.5 mm² knotless netting) that were a variety of lengths (i.e. 4.6-m, 9.1-m) and stretched to cover as much of the channel as possible. Seine hauls were made until no new species were collected and conducted mostly in a downstream direction. Electrofishing was conducted in an upstream direction and tested prior to sampling to determine adequate settings, which changed depending on stream water quality. Cloverleaf traps and minnow traps were set overnight in backwater and pool habitats. Boat electrofishing was conducted in a downstream direction at each site for five 20 minute intervals. Fishes were transferred to a live well, identified, counted and released. At most sites voucher specimens were taken of each species. When we were unsure of field identification, fishes were preserved in a 10% formalin solution and taken back to the laboratory for verification or identification. Vouchers were collected following North Dakota collection permit guidelines (permit # GNF02362977).

The time electrofished (s), area seined (m²), and trap time (h) were recorded to calculate catch-per-unit effort data for each species at each site. Water quality data were recorded after fish sampling was complete. Water quality parameters collected were: Secchi disk transparency (cm, turbiditube), water temperature (ºC), dissolved oxygen (mg L^{-1}), conductivity (µS), salinity (ppt), and pH. Water quality parameters were measured using a YSI 85 handheld dissolved oxygen and conductivity instrument (YSI incorporated 2004) and a LaMotte wide range pH kit (LaMotte Company 2004). GPS coordinates and digital photographs were also taken at each site.

Lab methods - Voucher specimens

Fixation in the field and specimen preservation in the lab followed published guidelines by the US Geological Survey (Walsh and Meador 1998). Preserved specimens were transferred from formalin to water no less than two weeks after being preserved in the field. A week later the samples were transferred to a 30% ethanol solution. After a week in ethanol, specimens were transferred to a 75% ethanol solution.

Identification of voucher specimens was completed using fish keys of Trautman (1981), Pflieger (1997), and Becker (2001) and others. Fish counts were added to the existing database. The identity and counts of voucher specimens was checked by Mr. James Ladonski, Instructor of Biology, SDSU, who has experience in curation of museum collections. Vouchers are stored in SDSU Department of Wildlife and Fisheries fish collection.

Lab methods - Stoneroller meristics

To determine which stoneroller was present a variety of scale counts (e.g.., circumferential scales, scales above the lateral line, pre-dorsal scales, and lateral line scales; Appendix II – Table 1) were measured for all stonerollers collected in 2006 and 2007. Three types of circumferential scale counts were used (oblique, vertical, and Pflieger) as a result of difficulty in accurate counts (Figure 4). The oblique count starts with the first whole scale prior to the dorsal fin origin, goes down and back on the diagonal until it reaches the ventral midline, then comes forward and up back to the starting scale. The vertical count

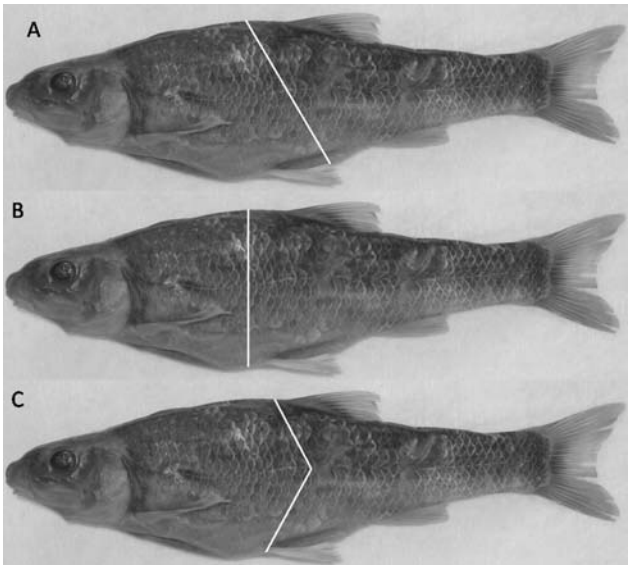

Figure 4. Three types of circumferential scale counts for *Campostoma* sp.

is a zigzag pattern around the fish at the widest part of the body (usually about four complete scales prior to the dorsal fin origin) counting the number of scale rows around the body. The Pflieger method follows the diagonals of the fish such that it starts at the same scale as the vertical count and goes down and back until the lateral line scale where the count turns forward and down until the ventral midline in front of the pelvic fins where the count turns back and up to the lateral line scale, and finally turns forward and up again until the starting scale counting each row of scales you cross.

Lab methods - Data analysis

With data up to 1998 as the base data set, we added additional data/information compiled from published literature, unpublished reports and other state agencies. These data along with 2006 and 2007 sampling data were added to the existing database.

Relative abundance (% of each species/site) and catch-per-unit-effort (CPUE) were determined for each species by site and each sampling method. The data were summarized by major drainage for each gear.

Mean values of water quality variables for each site were summarized by drainage. Preliminary data were entered into an excel spreadsheet and backed up in numerous places. Finalized data sets included a few minor changes in counts based on inspection of voucher samples. Metadata were associated with all files. All analyses were done in Excel (Microsoft Corporation).

RESULTS and DISCUSSION

Sampling effort

Red River drainage waters that were sampled throughout the study period included Pembina (includes the Little Pembina River), Tongue: Tongue River, Tongue cutoff and Busse Coulee, Park: all branches of the Park River, Cart Creek, Willow Creek as well as some unnamed tributaries and an unnamed creek; Figure 3), Forest: Forest River, Middle and South Branch Forest River, Turtle:

Turtle River, North Branch Turtle River and Saltwater Coulee; Figure 3), Goose: Goose River, Middle and South Branch Goose River and Spring Creek; Figure 3), Elm (includes South Branch Elm River), Maple: Maple River, Buffalo Creek and an unnamed Tributary to the Maple River, Sheyenne: Sheyenne River, Rush and Lower Branch Rush Rivers, Baldhill and Dead Colt Creeks, as well as some unnamed tributaries to both Rush River and Sheyenne River (Figure 3), Wild Rice (includes Wild Rice River, Antelope, Elk and Shortfoot creeks; Figure 3), Bois de Sioux and Red (includes Red and South Marais rivers; Figure 3). In 2006 there were 49 separate sampling occasions, three sites were revisited and ten sites had been sampled historically (between 1980 and 1998; Appendix IV) which gave us a total of 46 different sites. The Sheyenne River was sampled the most with 12 sampling occasions, followed by the Park River (10 sampling occasions), the Forest and Tongue rivers (each with 7 sampling occasions), the Wild Rice River (4 sampling occasions), the Turtle River (3 sampling occasions), and the Goose, Pembina, and Maple rivers (all with 2 sampling occasions). Of the sampling efforts, seining was the dominant method used (35 occasions; Appendix VI), followed by backpack electrofishing (11 occasions; Appendix VII), and overnight cloverleaf trapping (seven occasions; Appendix VIII). These overnight traps are separated from those conducted in 2007 due to not keeping the individual trap catches separate.

During 2007 sampling we had 88 separate sampling occasions, one site was revisited, three sites had been sampled historically, and 8 sites were revisited from 2006 sampling which gave us a total of 79 new sites and some consecutive years of data for 8 sites. The Forest River was sampled the most with 17 sampling occasions, followed by the Park River (11 sampling occasions), the Sheyenne River (10 sampling occasions), the Red and Wild Rice rivers (each with 8 sampling occasions), the Goose and Turtle Rivers (each with 7 sampling occasions), the Elm River (6 sampling occasions), the Maple River (5 sampling occasions), the Bois de Sioux and Tongue rivers (each with 4 sampling occasions), and the Pembina River (1 sampling occasion). Of the 88 sampling

occasions, seining was the dominant method used (46 occasions; Appendix VI), followed by backpack electrofishing (45 occasions; Appendix VII), overnight cloverleaf minnow traps (12 occasions; Appendix IX), overnight cloverleaf predator (Appendix X) and cylindrical minnow traps (Appendix XI) each with 11 occasions, and boat electrofishing which occurred six times on the Red River (Appendix XII). Throughout both sampling seasons, when possible, more than one method was used to maximize effort at a site and reduce bias associated with sampling with a particular gear.

Overall we conducted 137 different sampling occasions at 125 different locations on 40 different streams. We deployed sampling gear a total of 185 times. We seined the reach 43.8% (81 times; Appendix VI) of the sampling occasions, 30.3% (56 occurrences; Appendix VII) of the sampling events we used backpack electrofishing. We used cloverleaf minnow traps 6.5% (12; Appendix IX) of the occasions, cloverleaf predator traps and cylindrical minnow traps were equal at 5.9% (11; Appendix X and Appendix XI respectively) of the sampling occurrences, not recording which type of traps the fish came from happened 8 times (4.3% of sampling occurrences; Appendix VIII), and boat electrofishing was used the least with 6 occurrences (3.2%; Appendix XII).

Fish assemblage

In 2006, we collected and identified 16,694 individual fish from 38 species and 10 different families (Table 1). The three most abundant families were cyprinids (73.8%), catostomids (11.7%), and ictalurids (6.7%). Percids and centrarchids were also fairly abundant at 6.0 and 1.1%

Table 1. Families of fish and their relative abundance (2006; 2007; overall), fish species found, species relative abundance by year and overall (Total), species relative abundance by drainage by year and overall (Total). Fish surveys were conducted in summer of 2006 and summer 2007. A blank cell indicates the species was not collected in the drainage that year.

Family	Species	Species relative abundance (2006)	Species relative abundance (2007)	Species relative abundance (Total)	Pembina (2006)	Pembina (2007)	Pembina (Total)	Tongue (2006)	Tongue (2007)	Tongue (Total)
Petromyzontidae (0.000; 0.00003; 0.00002)	Chestnut lamprey *Ichthyomyzon castaneus*		0.000	0.000						
Hiodontidae (0.00006; 0.0005; 0.0004)	Goldeye *Hiodon alosoides*	0.000	0.001	0.000						
	Mooneye *Hiodon tergisus*		0.000	0.000						
Cyprinidae (0.738; 0.755; 0.749)	Bigmouth shiner *Notropis dorsalis*	0.102	0.049	0.065	0.033	0.133	0.092			0.000
	Blacknose dace *Rhinichthys atratulus*	0.037	0.022	0.026	0.212	0.093	0.143	0.056	0.097	0.068
	Bluntnose minnow *Pimephales notatus*	0.016	0.032	0.027						
	Brassy minnow *Hybognathus hankinsoni*	0.000	0.000	0.000		0.004	0.002			
	Common carp *Cyprinus carpio*	0.001	0.025	0.017				0.005		0.004
	Common shiner *Luxilus cornutus*	0.197	0.187	0.190	0.217	0.214	0.215	0.058	0.288	0.129
	Creek chub *Semotilus atromaculatus*	0.100	0.058	0.071	0.217	0.108	0.154	0.120	0.150	0.129
	Emerald shiner *Notropis atherinoides*	0.001	0.010	0.007						
	Fathead minnow *Pimephales promelas*	0.084	0.285	0.222	0.090	0.282	0.201	0.009	0.145	0.051
	Hornyhead chub *Nocomis biguttatus*	0.003	0.010	0.008						
	Largescale stoneroller *Campostoma oligolepis*	0.001	0.001	0.001						
	Longnose dace *Rhinichthys cataractae*	0.014	0.004	0.007	0.066	0.022	0.041	0.001		0.001
	Mississippi silvery minnow *Hybognathus nuchalis*	0.000		0.000						
	Northern redbelly dace *Phoxinus eos*	0.000	0.000	0.000						
	Pearl dace *Margariscus margarita*	0.001	0.000	0.001				0.016	0.017	0.016

Table 1 continued. Families of fish and their relative abundance (2006; 2007; overall), fish species found, species relative abundance by year and overall (Total), species relative abundance by drainage by year and overall (Total). Fish surveys were conducted in summer of 2006 and summer 2007. A blank cell indicates the species was not collected in the drainage that year.

Family	Species	Species relative abundance (2006)	Species relative abundance (2007)	Species relative abundance (Total)	Pembina (2006)	Pembina (2007)	Pembina (Total)	Tongue (2006)	Tongue (2007)	Tongue (Total)
Cyprinidae	River shiner *Notropis blennius*	0.009	0.000	0.003						
	Sand shiner *Notropis stramineus*	0.111	0.035	0.059				0.050		0.035
	Silver chub *Macrhybopsis storeriana*		0.000	0.000						
	Spotfin shiner *Cyprinella spiloptera*	0.061	0.035	0.043				0.048		0.033
Catostomidae (0.117; 0.102; 0.107)	Bigmouth buffalo *Ictiobus cyprinellus*		0.000	0.000						
	Quillback *Carpiodes cyprinus*	0.000	0.012	0.008						
	Shorthead redhorse *Moxostoma macrolepidotum*	0.007	0.001	0.003	0.018		0.007	0.005		0.004
	Silver redhorse *Moxostoma anisurum*		0.000	0.000						
	White sucker *Catostomus commersonii*	0.110	0.089	0.095	0.090	0.086	0.087	0.465	0.070	0.343
Ictaluridae (0.067; 0.069; 0.068)	Black bullhead *Ameiurus melas*	0.050	0.054	0.053				0.045	0.002	0.032
	Channel catfish *Ictalurus punctatus*	0.010	0.009	0.009				0.002		0.001
	Stonecat *Noturus flavus*	0.000	0.000	0.000				0.002		0.001
	Tadpole madtom *Noturus gyrinus*	0.006	0.006	0.006				0.019		0.013
	Yellow bullhead *Ameiurus natalis*		0.000	0.000						
Esocidae (0.0005; 0.003; 0.002)	Northern pike *Esox lucius*	0.000	0.003	0.002	0.003		0.001	0.002		0.001
Umbridae (0.000; 0.0002; 0.0001)	Central mudminnow *Umbra limi*		0.000	0.000					0.017	0.005
Percopsidae (0.004; 0.003; 0.003)	Trout-perch *Percopsis omiscomaycus*	0.004	0.003	0.003				0.005		0.004
Fundulidae (0.000; 0.00008; 0.00006)	Banded killifish *Fundulus diaphanus*		0.000	0.000						

Table 1 continued. Families of fish and their relative abundance (2006; 2007; overall), fish species found, species relative abundance by year and overall (Total), species relative abundance by drainage by year and overall (Total). Fish surveys were conducted in summer of 2006 and summer 2007. A blank cell indicates the species was not collected in the drainage that year.

Family	Species	Species relative abundance (2006)	Species relative abundance (2007)	Species relative abundance (Total)	Pembina (2006)	Pembina (2007)	Pembina (Total)	Tongue (2006)	Tongue (2007)	Tongue (Total)
Gasterosteidae (0.003; 0.010; 0.008)	Brook stickleback *Culaea inconstans*	0.003	0.010	0.008					0.034	0.010
Moronidae (0.000; 0.005; 0.003)	White bass *Morone chrysops*		0.005	0.003						
Centrarchidae (0.011; 0.020; 0.017)	Black crappie *Pomoxis nigromaculatus*	0.001	0.003	0.002					0.046	0.014
	Bluegill *Lepomis macrochirus*	0.000	0.016	0.011						
	Green sunfish *Lepomis cyanellus*		0.000	0.000						
	Orangespotted sunfish *Lepomis humilis*	0.009	0.001	0.003						
	Rock bass *Ambloplites rupestris*	0.000	0.000	0.000						
	Smallmouth bass *Micropterus dolomieu*	0.000	0.000	0.000						
	White crappie *Pomoxis annularis*		0.000	0.000						
Percidae (0.060; 0.030; 0.040)	Blackside darter *Percina maculata*	0.018	0.004	0.008		0.002	0.001	0.009	0.005	0.007
	Iowa darter *Etheostoma exile*		0.009	0.006						
	Johnny darter *Etheostoma nigrum*	0.041	0.014	0.022	0.054	0.057	0.055	0.077	0.058	0.071
	Sauger *Sander canadensis*		0.000	0.000						
	Walleye *Sander vitreus*	0.000	0.000	0.000				0.004		0.003
	Yellow perch *Perca flavescens*	0.001	0.003	0.003					0.070	0.022
Sciaenidae (0.000; 0.002; 0.001)	Freshwater drum *Aplodinotus grunniens*	0.000	0.002	0.001						
Total number collected		16694	36375	53069	391	547	938	932	413	1345
Total species		38	51	52	10	10	12	20	13	24

Table 1 continued. Families of fish and their relative abundance (2006; 2007; overall), fish species found, species relative abundance by year and overall (Total), species relative abundance by drainage by year and overall (Total). Fish surveys were conducted in summer of 2006 and summer 2007. A blank cell indicates the species was not collected in the drainage that year.

Family	Species	Park (2006)	Park (2007)	Park (Total)	Forest (2006)	Forest (2007)	Forest (Total)	Turtle (2006)	Turtle (2007)	Turtle (Total)	Goose (2006)	Goose (2007)	Goose (Total)
Petromyzontidae (0.000; 0.00003; 0.00002)	Chestnut lamprey *Ichthyomyzon castaneus*												
Hiodontidae (0.00006; 0.0005; 0.0004)	Goldeye *Hiodon alosoides*										0.002		0.000
	Mooneye *Hiodon tergisus*												
Cyprinidae (0.738; 0.755; 0.749)	Bigmouth shiner *Notropis dorsalis*	0.045	0.069	0.055	0.202	0.057	0.086	0.332	0.278	0.305			
	Blacknose dace *Rhinichthys atratulus*	0.121	0.154	0.135	0.007	0.006	0.007	0.041	0.032	0.036		0.133	0.091
	Bluntnose minnow *Pimephales notatus*				0.017	0.061	0.052						
	Brassy minnow *Hybognathus hankinsoni*												
	Common carp *Cyprinus carpio*		0.001	0.000		0.007	0.006	0.001	0.055	0.027			
	Common shiner *Luxilus cornutus*	0.296	0.286	0.292	0.310	0.258	0.269	0.206	0.342	0.274	0.005	0.217	0.150
	Creek chub *Semotilus atromaculatus*	0.155	0.176	0.163	0.144	0.062	0.078	0.035	0.034	0.034	0.026	0.190	0.138
	Emerald shiner *Notropis atherinoides*							0.002		0.001	0.005		0.001
	Fathead minnow *Pimephales promelas*	0.010	0.233	0.099	0.148	0.332	0.295	0.014	0.006	0.010	0.022	0.112	0.084
	Hornyhead chub *Nocomis biguttatus*	0.005	0.006	0.005	0.007	0.018	0.016						
	Largescale stoneroller *Campostoma oligolepis*				0.002	0.002	0.002						
	Longnose dace *Rhinichthys cataractae*	0.036		0.021	0.000	0.007	0.006	0.001	0.004	0.002			
	Mississippi silvery minnow *Hybognathus nuchalis*												
	Northern redbelly dace *Phoxinus eos*												
	Pearl dace *Margariscus margarita*	0.000	0.003	0.001									

Table 1 continued. Families of fish and their relative abundance (2006; 2007; overall), fish species found, species relative abundance by year and overall (Total), species relative abundance by drainage by year and overall (Total). Fish surveys were conducted in summer of 2006 and summer 2007. A blank cell indicates the species was not collected in the drainage that year.

Family	Species	Park (2006)	Park (2007)	Park (Total)	Forest (2006)	Forest (2007)	Forest (Total)	Turtle (2006)	Turtle (2007)	Turtle (Total)	Goose (2006)	Goose (2007)	Goose (Total)
Cyprinidae	River shiner *Notropis blennius*												
	Sand shiner *Notropis stramineus*		0.001	0.000				0.225	0.129	0.178	0.594	0.142	0.285
	Silver chub *Macrhybopsis storeriana*												
	Spotfin shiner *Cyprinella spiloptera*					0.001	0.001	0.038	0.034	0.036	0.049	0.009	0.022
Catostomidae (0.117; 0.102; 0.107)	Bigmouth buffalo *Ictiobus cyprinellus*								0.001	0.000			
	Quillback *Carpiodes cyprinus*					0.000	0.000		0.001	0.000			
	Shorthead redhorse *Moxostoma macrolepidotum*							0.016	0.004	0.010	0.003		0.001
	Silver redhorse *Moxostoma anisurum*								0.001	0.000			
	White sucker *Catostomus commersonii*	0.130	0.033	0.091	0.093	0.120	0.114	0.074	0.047	0.061	0.112	0.136	0.128
Ictaluridae (0.067; 0.069; 0.068)	Black bullhead *Ameiurus melas*	0.133	0.001	0.080		0.001	0.001		0.001	0.000			
	Channel catfish *Ictalurus punctatus*		0.002	0.001		0.001	0.001		0.001	0.000	0.008		0.002
	Stonecat *Noturus flavus*												
	Tadpole madtom *Noturus gyrinus*		0.001	0.000	0.000	0.011	0.009		0.001	0.000		0.001	0.001
	Yellow bullhead *Ameiurus natalis*												
Esocidae (0.0005; 0.003; 0.002)	Northern pike *Esox lucius*	0.001	0.004	0.002	0.000	0.003	0.002		0.001	0.000		0.002	0.001
Umbridae (0.000; 0.0002; 0.0001)	Central mudminnow *Umbra limi*												
Percopsidae (0.004; 0.003; 0.003)	Trout-perch *Percopsis omiscomaycus*										0.028	0.001	0.009
Fundulidae (0.000; 0.00008; 0.00006)	Banded killifish *Fundulus diaphanus*								0.002	0.001			

Table 1 continued. Families of fish and their relative abundance (2006; 2007; overall), fish species found, species relative abundance by year and overall (Total), species relative abundance by drainage by year and overall (Total). Fish surveys were conducted in summer of 2006 and summer 2007. A blank cell indicates the species was not collected in the drainage that year.

Family	Species	Park (2006)	Park (2007)	Park (Total)	Forest (2006)	Forest (2007)	Forest (Total)	Turtle (2006)	Turtle (2007)	Turtle (Total)	Goose (2006)	Goose (2007)	Goose (Total)
Gasterosteidae (0.003; 0.010; 0.008)	Brook stickleback *Culaea inconstans*	0.006	0.004	0.005	0.000	0.000	0.000		0.002	0.001	0.025		0.008
Moronidae (0.000; 0.005; 0.003)	White bass *Morone chrysops*												
Centrarchidae (0.011; 0.020; 0.017)	Black crappie *Pomoxis nigromaculatus*					0.000	0.000						
	Bluegill *Lepomis macrochirus*					0.030	0.024					0.001	0.001
	Green sunfish *Lepomis cyanellus*												
	Orangespotted sunfish *Lepomis humilis*												
	Rock bass *Ambloplites rupestris*				0.001	0.000	0.000						
	Smallmouth bass *Micropterus dolomieu*												
	White crappie *Pomoxis annularis*												
Percidae (0.060; 0.030; 0.040)	Blackside darter *Percina maculata*	0.010		0.006	0.002	0.004	0.003	0.003	0.010	0.006		0.007	0.005
	Iowa darter *Etheostoma exile*												
	Johnny darter *Etheostoma nigrum*	0.050	0.027	0.041	0.065	0.015	0.025	0.014	0.015	0.014	0.123	0.048	0.072
	Sauger *Sander canadensis*												
	Walleye *Sander vitreus*					0.000	0.000		0.001	0.000			
	Yellow perch *Perca flavescens*	0.002	0.001	0.002		0.005	0.004						
Sciaenidae (0.000; 0.002; 0.001)	Freshwater drum *Aplodinotus grunniens*		0.002	0.001					0.002	0.001			
Total number collected		2925	1950	4875	4861	19275	24136	1702	1668	3370	651	1408	2059
Total species		15	18	20	16	25	25	14	24	25	13	13	18

Table 1 continued. Families of fish and their relative abundance (2006; 2007; overall), fish species found, species relative abundance by year and overall (Total), species relative abundance by drainage by year and overall (Total). Fish surveys were conducted in summer of 2006 and summer 2007. A blank cell indicates the species was not collected in the drainage that year.

Family	Species	Elm (2007)	Maple (2006)	Maple (2007)	Maple (Total)	Sheyenne (2006)	Sheyenne (2007)	Sheyenne (Total)	Wild Rice (2006)	Wild Rice (2007)	Wild Rice (Total)	Bois de Sioux (2007)	Red (2007)
Petromyzontidae (0.000; 0.00003; 0.00002)	Chestnut lamprey *Ichthyomyzon castaneus*											0.001	
Hiodontidae (0.00006; 0.0005; 0.0004)	Goldeye *Hiodon alosoides*												0.018
	Mooneye *Hiodon tergisus*												0.001
Cyprinidae (0.738; 0.755; 0.749)	Bigmouth shiner *Notropis dorsalis*		0.001	0.003	0.002	0.002		0.001				0.001	
	Blacknose dace *Rhinichthys atratulus*					0.007	0.014	0.010					
	Bluntnose minnow *Pimephales notatus*					0.075		0.039					
	Brassy minnow *Hybognathus hankinsoni*					0.001	0.000	0.001					0.001
	Common carp *Cyprinus carpio*	0.006	0.002	0.001	0.002				0.012	0.140	0.122	0.086	0.015
	Common shiner *Luxilus cornutus*		0.154	0.068	0.119	0.033	0.027	0.030					
	Creek chub *Semotilus atromaculatus*	0.003	0.095	0.013	0.061	0.016	0.041	0.028				0.001	
	Emerald shiner *Notropis atherinoides*					0.003		0.001				0.129	0.150
	Fathead minnow *Pimephales promelas*	0.408	0.203	0.239	0.218	0.043	0.576	0.297	0.061	0.281	0.250	0.027	0.020
	Hornyhead chub *Nocomis biguttatus*												
	Largescale stoneroller *Campostoma oligolepis*												
	Longnose dace *Rhinichthys cataractae*					0.038		0.020					
	Mississippi silvery minnow *Hybognathus nuchalis*					0.001		0.000					
	Northern redbelly dace *Phoxinus eos*					0.000	0.007	0.004					
	Pearl dace *Margariscus margarita*					0.001		0.000					

Table 1 continued. Families of fish and their relative abundance (2006; 2007; overall), fish species found, species relative abundance by year and overall (Total), species relative abundance by drainage by year and overall (Total). Fish surveys were conducted in summer of 2006 and summer 2007. A blank cell indicates the species was not collected in the drainage that year.

Family	Species	Elm (2007)	Maple (2006)	Maple (2007)	Maple (Total)	Sheyenne (2006)	Sheyenne (2007)	Sheyenne (Total)	Wild Rice (2006)	Wild Rice (2007)	Wild Rice (Total)	Bois de Sioux (2007)	Red (2007)
Cyprinidae	River shiner *Notropis blennius*					0.062		0.032					0.002
	Sand shiner *Notropis stramineus*	0.103	0.269	0.370	0.311	0.164	0.007	0.089	0.081	0.002	0.013	0.076	0.031
	Silver chub *Macrhybopsis storeriana*												0.008
	Spotfin shiner *Cyprinella spiloptera*	0.072		0.129	0.053	0.348	0.084	0.222	0.034	0.019	0.021	0.104	0.472
Catostomidae (0.117; 0.102; 0.107)	Bigmouth buffalo *Ictiobus cyprinellus*									0.000	0.000	0.006	
	Quillback *Carpiodes cyprinus*							0.000	0.002	0.114	0.098	0.004	0.009
	Shorthead redhorse *Moxostoma*	0.004	0.011	0.003	0.008	0.021		0.011	0.003		0.000	0.001	0.018
	Silver redhorse *Moxostoma anisurum*			0.003	0.001							0.001	0.007
	White sucker *Catostomus commersonii*	0.011	0.112	0.032	0.079	0.034	0.189	0.108	0.019	0.006	0.007		0.004
Ictaluridae (0.067; 0.069; 0.068)	Black bullhead *Ameiurus melas*	0.072	0.048		0.028		0.004	0.002	0.519	0.328	0.355	0.392	0.001
	Channel catfish *Ictalurus punctatus*	0.118	0.004	0.018	0.010	0.060		0.032		0.004	0.003	0.033	0.069
	Stonecat *Noturus flavus*	0.001				0.001		0.000		0.000	0.000		0.002
	Tadpole madtom *Noturus gyrinus*	0.022	0.005		0.003	0.031	0.000	0.017	0.002		0.000		
	Yellow bullhead *Ameiurus natalis*									0.000	0.000	0.001	
Esocidae (0.0005; 0.003; 0.002)	Northern pike *Esox lucius*			0.003	0.001	0.001	0.016	0.008		0.000	0.000	0.001	0.007
Umbridae (0.000; 0.0002; 0.0001)	Central mudminnow *Umbra limi*												
Percopsidae (0.004; 0.003; 0.003)	Trout-perch *Percopsis omiscomaycus*		0.006	0.026	0.014	0.013	0.000	0.007					0.068
Fundulidae (0.000; 0.00008;	Banded killifish *Fundulus diaphanus*												

Table 1 continued. Families of fish and their relative abundance (2006; 2007; overall), fish species found, species relative abundance by year and overall (Total), species relative abundance by drainage by year and overall (Total). Fish surveys were conducted in summer of 2006 and summer 2007. A blank cell indicates the species was not collected in the drainage that year.

Family	Species	Elm (2007)	Maple (2006)	Maple (2007)	Maple (Total)	Sheyenne (2006)	Sheyenne (2007)	Sheyenne (Total)	Wild Rice (2006)	Wild Rice (2007)	Wild Rice (Total)	Bois de Sioux (2007)	Red (2007)
Gasterosteidae (0.003; 0.010; 0.008)	Brook stickleback *Culaea inconstans*	0.168		0.076	0.031	0.006	0.021	0.013		0.001	0.001		
Moronidae (0.000; 0.005; 0.003)	White bass *Morone chrysops*											0.099	0.011
Centrarchidae (0.011; 0.020; 0.017)	Black crappie *Pomoxis nigromaculatus*								0.030	0.012	0.015	0.006	0.014
	Bluegill *Lepomis macrochirus*					0.003		0.001				0.004	0.010
	Green sunfish *Lepomis cyanellus*									0.000	0.000		0.001
	Orangespotted sunfish *Lepomis humilis*					0.005	0.001	0.003	0.223		0.032	0.009	0.010
	Rock bass *Ambloplites rupestris*												0.013
	Smallmouth bass *Micropterus dolomieu*					0.002		0.001					0.002
	White crappie *Pomoxis annularis*											0.001	0.001
Percidae (0.060; 0.030; 0.040)	Blackside darter *Percina maculata*		0.092	0.015	0.060	0.019	0.011	0.016					
	Iowa darter *Etheostoma exile*						0.000	0.000		0.091	0.078		
	Johnny darter *Etheostoma nigrum*	0.012				0.010		0.005	0.005		0.001		
	Sauger *Sander canadensis*											0.001	0.009
	Walleye *Sander vitreus*								0.003		0.000	0.001	0.006
	Yellow perch *Perca flavescens*								0.007	0.001	0.001		0.002
Sciaenidae (0.000; 0.002; 0.001)	Freshwater drum *Aplodinotus grunniens*									0.001	0.000	0.018	0.019
Total number collected		1046	2174	1520	3694	2466	2240	4706	592	3548	4140	1710	1050
Total species		13	13	15	17	28	17	30	14	18	23	24	31

respectively. Species relative abundance ranged from less than 0.1 percent (goldeye, brassy minnow, Mississippi silvery minnow, Northern redbelly dace, quillback, stonecat, northern pike, bluegill, rock bass, smallmouth bass, walleye, and freshwater drum) up to 19.7% of the catch being composed of common shiners (Table 1).

Sampling during 2007 yielded 51 fish species (36,375 total individuals) representing 14 families (Table 1) of that total cyprinids comprised 75.5%, and catostomids comprised 10.2% of the total number of individual fish collected (Table 1). Ictalurids, centrarchids, and percids comprised 6.9, 2.0, and 3.0% of the total catch. Species relative abundance varied from less than 0.1% (chestnut lamprey, mooneye, brassy minnow, northern redbelly dace, pearl dace, river shiner, silver chub, bigmouth buffalo, quillback, silver redhorse, stonecat, yellow bullhead, central mudminnow, banded killifish, green sunfish, rock bass, smallmouth bass, white crappie, sauger, and walleye) to 28.5% (fathead minnow; Table 1). This trend held up overall with cyprinids comprising 74.9% of the total catch and fathead minnows and common shiners making up 22.2 and 19.0% of the total catch respectively (Table 1). As a combined total we captured 53,069 individuals representing 52 species and 14 families over the course of two years of sampling.

Species richness and species relative abundance varied across rivers and across years (Table 1). In 2006 the Sheyenne River is where we collected the greatest number of species (n=28) followed by the Tongue (n=20) and Forest rivers (n=16). The Pembina, Goose and Maple rivers contained the smallest species richness with 10, 13 and 13 species collected (Table 1). The common shiner was the most abundant in the Park and Forest drainages in 2006. The most abundant species for the other drainages was the sand shiner in the Goose and Maple drainages, creek chub in the Pembina basin, white sucker in the Tongue drainage, spotfin shiner in the Sheyenne basin, black bullhead in the Wild Rice and bigmouth shiner in the Turtle River basin.

In contrast, the Red River contained the most species that we collected (n=30) in 2007 followed by the Forest (n=25), Bois de Sioux rivers (n=24) and Turtle rivers (n=24). The lowest species richness was 10 species collected (Pembina River) followed by 13 species collected (the Tongue, Goose, and Elm rivers). The common shiner was the most abundant in the Tongue, Park, Forest, Turtle, and Goose drainages. The most abundant species for the other drainages was the fathead minnow in the Pembina, Sheyenne, and Elm basins, black bullhead in the Wild Rice and Bois de Sioux basins, spotfin shiner in the Red River and sand shiner in the Maple River (Table 1).

Water quality

Water quality measurements were taken at each site prior to sampling. Mean values for drainages by year are located in Table 2. In 2006, water temperatures ranged from 19.3 ºC (SE = 2.9) in the Turtle River to 28.5 ºC (SE = 0.6) in the Pembina River. Conductivity ranged from 757 µS/cm (SE = 81) in the Tongue River to 2141 µS/cm (SE = 114) in the Maple River. Dissolved oxygen ranged from 2.2 ppm in the Goose River to 5.7 ppm in the Sheyenne River. Salinity ranged from 0.4 ppt in the Pembina, Tongue, and Sheyenne rivers to 1.2 ppt in the Maple River.

Even though 2006 was an extremely dry year, and 2007 a wet year, there was still some continuity to the water quality parameters collected both years. In 2007, water temperatures ranged from 19.7 °C (SE = 0.62) in the Tongue River to 27.7 °C (SE = 2.69) in the Bois de Sioux River. As in 2006, conductivity was lowest in the Tongue River. It ranged from 494.75 µS/cm (SE = 87.77) to 1279.57 µS/cm (SE = 292.76) in the Turtle River. The high conductivity in the Turtle River is skewed due to sampling that was conducted in Saltwater Coulee (site 733) near a salt-water artesian well that flows into the Turtle River. The conductivity at this site was 2647 µS/cm. Even including this site, it is only 72 µS/cm higher than the mean for Turtle River in 2006 1207.33 µS/cm (SE = 506.84). Dissolved oxygen ranged from 3.21 mg/L (SE = 0.84) in the Maple River to 8.8 (SE = 0) in

Table 2. Water quality mean values across tributaries of the Red River in 2006 and 2007 with associated standard error in parentheses. A (-) indicates the data was not collected at that site.

Drainage	Year	Water Temperature (degrees °C)	Water Temperature n =	Conductivity (µS)	Conductivity n =	Dissolved Oxygen (mg/L)	Dissolved Oxygen n =	Salinity (ppt)	Salinity n =	pH	pH n =	Turbidity (cm)	Turbidity n =
Pembina	2006	28.5 (0.6)	3	850 (13.33)	3	5.6 (0.63)	3	0.4 (0)	3	-	0	-	0
Pembina	2007	27.5 (0)	1	837 (0)	1	8.8 (0)	1	0.4 (0)	1	-	0	100 (0)	1
Tongue	2006	20.7 (0.68)	8	756.63 (81.07)	8	3.65 (0.37)	8	0.44 (0.07)	5	-	0	-	0
Tongue	2007	19.7 (0.62)	4	494.75 (87.77)	4	7.93 (0.72)	4	0.23 (0.05)	4	7.65 (0.43)	4	24.95 (1.28)	4
Park	2006	23.04 (0.78)	10	853.7 (63.10)	10	4.69 (0.48)	10	0.48 (0.04)	8	-	0	-	0
Park	2007	20.83 (1.62)	10	869.46 (170.47)	9	6.72 (0.77)	6	0.92 (0.38)	9	8.18 (0.15)	8	*51.24 (8.83)	10
Forest	2006	21.78 (1.73)	4	918.5 (215.17)	4	3.68 (1.30)	4	0.5 (0.14)	4	-	0	-	0
Forest	2007	22.21 (0.59)	17	1053.18 (134.93)	17	4.93 (0.38)	17	0.54 (0.08)	17	8.36 (0.08)	16	*43.92 (5.05)	17
Turtle	2006	19.3 (2.94)	3	1207.33 (506.84)	3	4.6 (0.83)	3	0.7 (0.3)	3	-	0	-	0
Turtle	2007	21.87 (1.09)	7	1279.57 (292.76)	7	8.54 (0.67)	7	0.67 (0.14)	7	7.86 (0.14)	7	*42.00 (5.89)	7
Goose	2006	22.8 (0)	1	1236 (0)	1	2.2 (0)	1	0.6 (0)	1	-	0	-	0
Goose	2007	26 (1.28)	7	1226.57 (43.22)	7	5.90 (0.94)	7	0.59 (0.03)	7	7.99 (0.09)	7	*37.09 (8.71)	7
Elm	2007	26.55 (1.08)	6	950.5 (65.66)	6	5.29 (0.39)	6	0.47 (0.03)	6	8.28 (0.12)	5	*26.88 (10.82)	6
Maple	2006	21.75 (0.85)	2	2141 (144)	2	4.2 (0)	2	1.2 (0.1)	2	-	0	-	0
Maple	2007	20.84 (1.12)	5	1116.6 (49.51)	5	3.21 (0.84)	4	0.6 (0.03)	5	8.06 (0.12)	5	*45.4 (9.97)	5
Sheyenne	2006	22.14 (0.88)	13	848 (56.34)	13	5.75 (0.29)	10	0.45 (0.03)	13	-	0	-	0
Sheyenne	2007	20.65 (0.74)	10	733.2 (78.56)	10	5.47 (0.74)	10	0.39 (0.04)	10	7.63 (0.16)	9	*36.04 (5.83)	10
Wild Rice	2006	23.3 (0.37)	4	1426 (221.66)	4	3.45 (0.35)	2	0.75 (0.13)	4	-	0	-	0
Wild Rice	2007	27.34 (1.52)	8	1216.88 (126.74)	8	4.81 (1.07)	8	0.63 (0.06)	8	7.9 (0.07)	8	9.59 (1.22)	8
Bois de Sioux	2007	27.7 (2.69)	4	1272.5 (102.73)	4	3.29 (0.64)	4	0.6 (0.04)	4	8.38 (0.13)	4	31.45 (8.42)	4
Red	2007	20.525 (0.43)	8	691.63 (17.06)	8	5.07 (0.68)	8	0.38 (0.02)	8	8.28 (0.08)	8	16.43 (2.01)	8

the Pembina River. Salinity, as in 2006 was lowest at the Tongue River and ranged from 0.23 ppt (SE = 0.05) in the Tongue River to 0.92 ppt (SE = 0.38) in the Park River. The high mean salinity in the Park River drainage is skewed higher due to a salinity value of 3.9 ppt at site 702. The values for pH ranged from 7.63 (SE = 0.16) in the Sheyenne River to 8.36 (SE = 0.08) in the Forest River. Turbidity ranged from 9.59 cm (SE = 1.22) in the Wild Rice River to 100 cm (SE = 0) in the Pembina River. Turbidity and pH were not collected in 2006. In many drainages, the average turbidity is underestimated due to the turbiditube being 61 cm deep. Therefore the recorded turbidity was >61, but for calculations, those sites were treated as having a turbidity of 61 cm.

Literature search

We included in the 2007 report, an annotated bibliography of references. Of those, 22 (22.4%) are stoneroller references, 18 (18.4%) are references on fish distribution and habitat associations, 12 (12.2%) are general fish references, nine (9.2%) are dealing with the Red River and the associated fishes, nine (9.2%) are papers dealing with river theory, eight (8.2%) are resources on the geology of North Dakota, seven (7.1%) are general resources for North Dakota fishes, seven (7.1%) are papers discussing management implications with controlled systems and rare species, two (2.0%) are references for data management, two (2.0%) are references for ecoregions of North Dakota, one (1.0%) focuses on Sheyenne River fishes, and one (1.0%) more focuses on Forest River fishes.

Voucher specimens

We collected and preserved at least two individuals of each species at most sites as well as individuals of uncertain identity. All of these were again identified in the laboratory, cataloged and stored in the fish collection at South Dakota State University. We combined sites by drainage (i.e.,

one jar per species per drainage) to economize on shelf space. We kept the most representative individuals of each species. All stonerollers were retained by site with scale count data included.

During the quality check for some specimens from 2006, we concluded that no yellow bullheads were collected during 2006 sampling and that the individual was in fact a black bullhead. Yellow bullheads were collected in 2007. Two more fish from site 17 were identified to be largescale stonerollers (*Campostoma oligolepis*) and not the species originally thought. Other fish counts from 2006 changed slightly, but the yellow bullhead and largescale stoneroller represent the only changes associated with species of conservation priority.

Minor changes in counts resulting from the quality check for specimens collected in 2007 did not include any changes in counts of species of concern, and all field identifications were accurate.

Our identity and findings related to the river shiner require comment. In 2006 we collected and presumptively identified several young of year fishes as river shiners, but they were probably spotfin shiners (identification is difficult on young of the year specimens). In 2007, we collected and vouchered two adults presumptively identified as river shiners, and this identity was confirmed in the laboratory – the larger specimens were easier to identify.

Species of concern

Eight species of concern were collected (Table 3) in the Red River drainage. We did not find silver lamprey, blacknose shiner, blackchin shiner, carmine shiner, finescale dace, logperch, and pugnose shiner, which were historically collected in Red River tributaries (Appendix XIII).

Of the eight species of concern collected, hornyhead chub was collected at the most sites (n=17, includes 2 resampled sites) and was the most abundant (n = 394 individuals), followed by trout-perch (19 sites, 177 individuals). Hornyhead chub was restricted to the Forest and Park rivers

whereas trout-perch was collected in five watersheds (Goose, Maple, Sheyenne, Tongue, and Red rivers). Each species is discussed below.

Chestnut Lamprey

Chestnut lamprey

One chestnut lamprey was found dead on the shore of the Bios de Sioux River presumably resulting from a localized fish kill in 2007 (Table 3; Figure 5). Northern pike and stonecat were also found dead on shore. The site was characterized as a long straight run with little flow and a soft mucky stream bottom. Previous collections for the chestnut lamprey include: four in the Red River (1983 and 1984) and one in the Goose River in 1994 (Figure 5; Appendix XIII). There have been no recorded records of chestnut lamprey from the Bios de Sioux River in North Dakota or South Dakota (Hoagstrom et al. 2007).

Lampreys have unique life histories which make capture a challenge (Moser et al. 2007). Consequently, much of the available data on lamprey distribution and abundance has been collected during surveys for other fish species which may not be using efficient sampling techniques for effective lamprey capture (Moser et al. 2007). The difficulty of sampling lampreys may account for the lack of collections in the Red River basin. Also, with a more focused effort on gathering lamprey ammocoetes such as kicking up the sediment while shocking down to a block-net the collection of both species of lampreys may be much improved.

Table 3. Site number, river, drainage, sampling method and number of species of concern collected by year.

Drainage	Site	River	Year	Sampling method	Chestnut Lamprey	Hornyhead chub	Largescale stoneroller	Northern redbelly dace	Pearl dace	Silver Chub	Trout-perch	Yellow bullhead
Tongue	707	Tongue	2007	cloverleaf	-	-	-	-	**3**	-	-	-
	708	Tongue trib	2007	backpack	-	-	-	-	**4**	-	-	-
	032	Tongue	2006	cloverleaf	-	-	-	-	13	-	-	-
	061	Tongue cutoff	2006	backpack	-	-	-	-	-	-	1	-
	063	Tongue	2006	seine	-	-	-	-	-	-	4	-
Park	006	S. Br. Park	2006	backpack	-	9	-	-	-	-	-	-
	008	N. Br. Park	2007	backpack	-	-	-	-	**5**	-	-	-
	041	N. Br. Park	2006	backpack	-	1	-	-	-	-	-	-
	43	Park	2007	seine	-	**12**	-	-	-	-	-	-
Forest	017	Forest	2006	seine	-	-	1	-	-	-	-	-
	058	Forest	2006	seine	-	11	1	-	-	-	-	-
	058	Forest	2007	seine	-	**9**	-	-	-	-	-	-
	071	Forest	2006	seine	-	18	6	-	-	-	-	-
	071	Forest	2007	seine	-	**20**	-	-	-	-	-	-
	208	Forest	2007	cloverleaf/ seine	-	**5 (1, 4)**	-	-	-	-	-	-
	759	Forest	2007	backpack	-	**3**	-	-	-	-	-	-
	761	Forest	2007	backpack/seine	-	**79 (58,21)**	**31 (30,1)**	-	-	-	-	-
	762	Forest	2007	seine	-	**28**	-	-	-	-	-	-
	763	Forest	2007	seine	-	**13**	-	-	-	-	-	-
	766	Forest	2007	backpack/seine	-	**48 (23, 25)**	-	-	-	-	-	-
	767	Forest	2007	seine	-	**23**	-	-	-	-	-	-
	768	Forest	2007	backpack/seine	-	**39 (21, 18)**	**4 (4,0)**	-	-	-	-	-
	1201	Forest	2007	backpack	-	**2**	-	-	-	-	-	-
	1202	Forest	2007	seine	-	**74**	-	-	-	-	-	-
Goose	220	Goose	2006	seine	-	-	-	-	-	-	18	-
	750	Goose	2007	seine	-	-	-	-	-	-	**1**	-

Table 3 cont. Site number, river, drainage, sampling method and number of species of concern collected by year.

Drainage	Site	River	Year	Sampling method	Chestnut Lamprey	Hornyhead chub	Largescale stoneroller	Northern redbelly dace	Pearl dace	Silver Chub	Trout-perch	Yellow bullhead
Maple	051	Maple	2006	seine	-	-	-	-	-	-	9	-
	309	Maple	2006	seine	-	-	-	-	-	-	3	-
	770	Maple	2007	seine	-	-	-	-	-	-	**9**	-
	772	Maple	2007	seine	-	-	-	-	-	-	**24**	-
	773	Maple	2007	seine	-	-	-	-	-	-	**6**	-
Sheyenne	301	Sheyenne	2006	seine	-	-	-	-	2	-	1	-
	303	Sheyenne trib	2006	backpack	-	-	-	1	-	-	-	-
	304	Sheyenne	2006	seine	-	-	-	-	-	-	19	-
	305	Sheyenne	2006	seine	-	-	-	-	-	-	6	-
	307	Sheyenne	2006	cloverleaf	-	-	-	-	-	-	2	-
	308	Sheyenne	2006	seine	-	-	-	-	-	-	3	-
	710	Sheyenne trib	2007	backpack	-	-	-	**9**	-	-	-	-
	712	Sheyenne trib	2007	backpack	-	-	-	**7**	-	-	-	-
	714	Rush	2007	seine	-	-	-	-	-	-	**1**	-
Wild Rice	741	Wild Rice	2007	backpack	-	-	-	-	-	-	-	**1**
Bios de Sioux	736	Bois de Sioux	2007	seine	**1***	-	-	-	-	-	-	**1**
Red	801	Red	2007	boat	-	-	-	-	-	**5**	-	-
	802	Red	2007	boat	-	-	-	-	-	-	**1**	-
	804	Red	2007	boat	-	-	-	-	-	**1**	**7**	-
	805	Red	2007	boat	-	-	-	-	-	**1**	**55**	-
	806	Red	2007	boat	-	-	-	-	-	-	**7**	-
				Total 2006	0	39	0	1	15	0	66	0
				Total 2007	1	355	35	16	12	7	111	2
				Total	**1**	**394**	**43**	**17**	**27**	**7**	**177**	**2**

Figure 5. Historical and current records for chestnut lamprey (*Ichthyomyzon castaneus*) in the Red River basin

Hornyhead chub


Hornyhead chub

Historically, hornyhead chub has been collected at numerous sites in the Park and Forest Rivers and at one site on the Red River in 1994 (Figure 6; Appendix XIII).

We collected 39 from four sites in the Park and Forest in 2006. In 2007, we collected 355 hornyhead chubs at 13 sites (Table 3; Figure 6) on the Forest and Park rivers. Two sites on the Forest River (058 and 071) were sampled in 2006 and 2007 and hornyhead chubs were collected both years. Most of these sites were characterized by small meandering channels with moderate flow over three major habitats (riffle, run, pool) with coarse substrate and some instream vegetation.

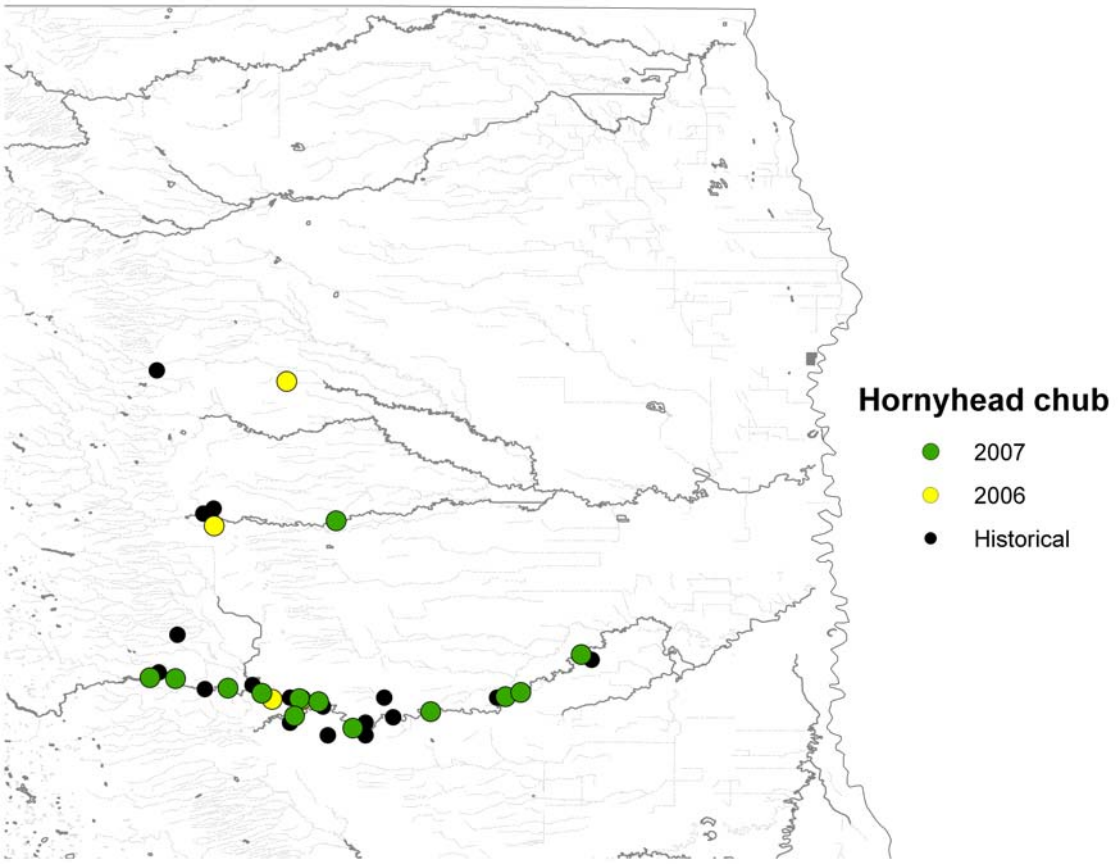

Figure 6. Historical and present records for hornyhead chub (*Nocomis biguttatus*) in Park and Forest rivers.

Largescale stoneroller

Largescale stoneroller

The Forest River is the only drainage where this stoneroller occurs in North Dakota with the exception of one record in the Elm River, which was sampled in 1996. Eleven stonerollers were collected from three sites on the Forest River in 2006 (Figure 7). Thirty-five stonerollers were collected from two sites on the Forest River in 2007 (Figure 7). Two sites where stonerollers were collected in 2006 were revisited in 2007; however they were not collected on the return visit.

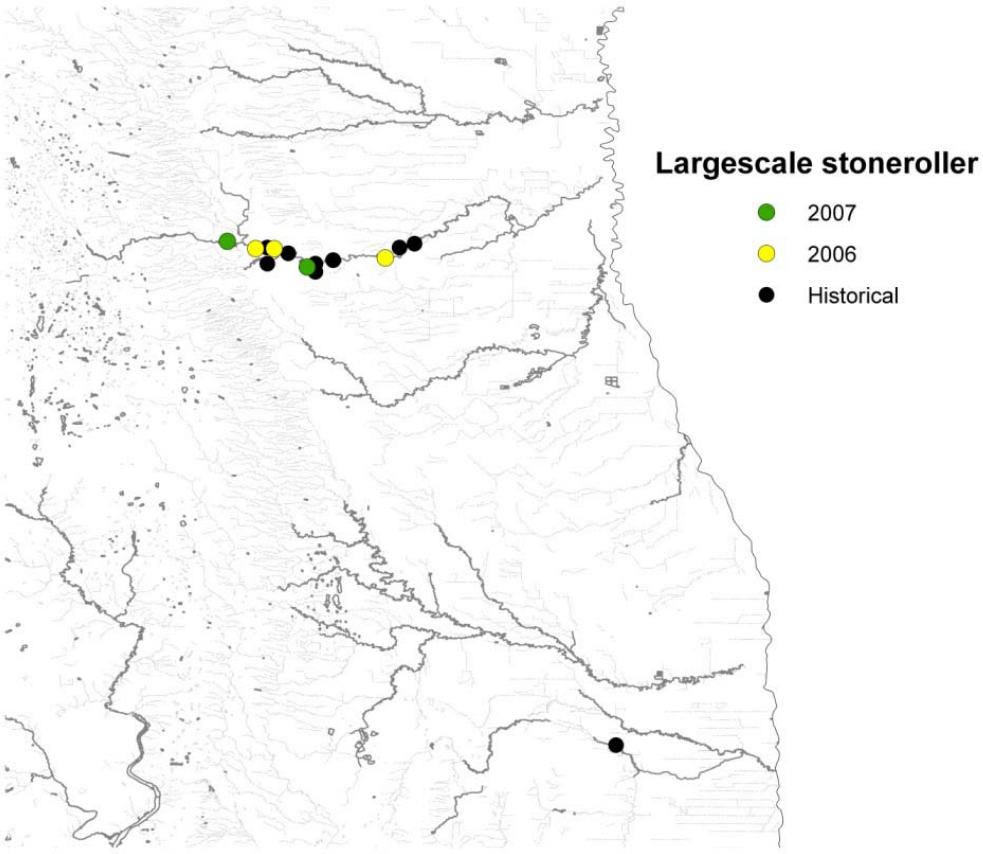

Figure 7. Historical records and present records (2006 and 2007) for largescale stoneroller (*Campostoma oligolepis*) in Forest and Elm rivers.

The best method to determine the species of stoneroller present is to do a variety of scale counts (Appendix II). The difficulty in circumferential scale counts led us to do three types of circumferential scale counts: oblique, vertical, and Pflieger (Table 4). The counts for all of the stonerollers collected include these scale counts as well and scales below the lateral line. The average length of stonerollers collected during both summers is 9.52 cm (S.E. = 0.30). The average scale counts are 13.98 (S.E. =0.15) above lateral line scales, 14.98 (S.E. = 0.13) below lateral line scales, 19.26 (S.E. =0.13) pre-dorsal scales, 44.36 (S.E. =0.20) left side lateral line scales, 44.18 (S.E. =0.22) right side lateral line scales, 32.53 (S.E. =0.24) oblique circumferential scales, 35.69 (S.E. =0.29) vertical circumferential scales, 35.93 (S.E. =0.29) Pflieger circumferential scales, and

Table 4. Stoneroller scale count data.

			Scale counts								
Collection ID	Site #	Length (cm)	Above lateral line	Below lateral line	Pre-dorsal	Lateral line L	Lateral line R	Circum-ferential (oblique)	Circum-ferential (vertical)	Around body (Pflieger)	Lat + Circum-ferential(v)
060712_A	17	4.4	13	15	18	45	43	32	34	35	79
060712_B	17	5.2	13	16	19	45	46	31	36	34	81
060712_C	17	4.3	13	14	19	43	46	31	35	35	78
060725_01A	58	5.7	15	16	20	46	44	34	35	37	81
060725_01B	58	5.5	13	16	19	44	44	30	36	36	80
060728_01A	71	8.4	15	15	18	46	44	34	37	37	83
060728_01B	71	8.5	17	15	19	44	45	35	35	38	79
060728_01C	71	9.4	16	15	20	49*	48*	34	41	39	90*
060728_01D	71	7.7	15	14	18	43	41	34	37	37	80
060728_01E	71	8.4	13	13	20	44	46*	31	35	36	79
070807_01A	761	10.0	14	15	21	45	47	32	35	37	80
070807_01B	761	12.5	13	15	19	46	46	32	33	34	79
070807_01C	761	9.5	13	15	20	43	43	31	36	37	79
070807_01D	761	10.3	16	15	20	45	44	36	39	39	84
070807_01E	761	9.5	15	16	20	48*	44	35	40	39	84
070807_01F	761	8.5	15	15	19	43*	44	34	36	36	80
070807_01G	761	9.0	14	14	19	44	45	32	33	34	77
070807_01H	761	9.0	14	14	19	44	43	33	36	39	80
070807_01I	761	9.4	14	15	18	44	43	31	35	36	79
070807_01J	761	9.6	14	15	18	43	43	33	33	34	76
070807_01K	761	9.0	14	14	18	42	43	34	35	35	77
070807_01L	761	9.3	14	16	19	46*	43	34	38	36	81
070807_01M	761	9.4	14	16	19	43	45	32	33	34	76
070807_01N	761	9.5	13	15	20	44	44	31	35	35	79
070807_01P	761	9.0	13	14	20	46*	43	31	33	34	76
070807_01Q	761	10.5	16	14	19	45	44	36	40	42	85
070807_01R	761	9.3	16	15	20	43	45	34	36	37	79
070807_01S	761	9.2	13	16	20	44	44	31	34	34	78
070807_01T	761	9.5	14	16	20	44	44	31	35	35	79
070807_01U	761	10.0	13	13	20	42	43	30	33	33	75
070807_01V	761	10.4	14	15	21	44	44	32	36	34	80
070807_01W	761	10.3	14	15	21	45	47	35	35	38	80
070807_01X	761	11.0	14	17	18	45	44	34	37	35	82
070807_01Y	761	10.9	13	16	19	44	44	33	36	37	80
070807_01Z	761	11.4	13	14	19	44	45	31	36	33	80
070807_01AA	761	11.2	14	16	19	45*	44	34	39	39	83
070807_01AB	761	11.9	14	16	19	45	45	33	37	35	82
070807_01AC	761	12.6	14	16	19	43	43	32	34	35	77
070807_01AD	761	12.1	14	15	20	44	42	33	36	37	80
070807_01AE	761	12.0	13	15	20	45	46*	31	36	35	81
070807_01AF	761	12.2	13	14	18	44	44	31	37	36	81
070816_02A	768	12.1	14	14	20	45	45	33	35	34	80
070816_02B	768	9.6	14	15	18	43	41	31	34	35	77
070816_02C	768	9.1	13	15	20	44	43	31	35	35	79
070816_02D	768	12.2	13	14	18	43	44	31	34	35	77
Means (SE)		9.52 (0.30)	13.98 (0.15)	14.98 (0.13)	19.26 (0.13)	44.36 (0.20)	44.18 (0.22)	32.53 (0.24)	35.69 (0.29)	35.93 (0.29)	79.82 (0.40)

* Scale deformities (smaller) included in this count. May therefore by biased high.

79.82 (S.E. =0.40) sum of lateral line and vertical circumferential scales. When left side lateral line scale deformities were present we used right side lateral line scale counts unless that count also contained deformities. One of the stonerollers collected had a combined count that would classify it as a central stoneroller, but due to scale deformities on the left and right side lateral lines, we looked at the pre–dorsal and above lateral line scale counts which clearly identifies it as a largescale stoneroller. The central and largescale stonerollers can hybridize (Rakocinski 1980), but the genetic differences between the two species is maintained even in areas of high hybridization. Therefore, if hybridization was occurring in the Forest River, we should have been able to collect and identify some adult central stonerollers, but that was not the case.

There are voucher specimens of stonerollers in both the Bell Museum and University of North Dakota museum collection. Jeramie Tesky (unpublished) reviewed the collection at the University of North Dakota. He used the combined lateral line and circumferential scale count with a cut off of 85 (i.e. >85 indicates central stoneroller, <85 indicates largescale stoneroller), just as we did. His work determined that the 30 specimens collected from the Forest River of North Dakota and identified as central stonerollers are all in fact largescale stonerollers. This is likely due to the fact that most of these collections took place prior to the largescale being elevated to the rank of species in 1971 (Pflieger 1971). We investigated the 8 specimens held at the Bell Museum and determined that the identification of them as largescale stonerollers was correct (Table 5). They in fact had very similar scale counts as the 45 individuals collected for this study and for which we counted scales (Table 6). This also makes sense due to these two samples being collected in 1993 and 1994, twenty years after *C. oligolepis* was raised to species status.

Table 5. Stoneroller scale count for specimens held at Bell Museum, University of Minnesota.

Collection ID	Specimen number[a]	Scale counts								
		Above lateral line	Below lateral line	Pre-dorsal	Lateral line		Circum-ferential (oblique)[b]	Circum-ferential (vertical)[c]	Around body (Pflieger)[d]	Lat + Circum-ferential[d]
					L	R				
26871	1	14	14	19	47	45	30	34	34	81
26871	2	13	14	18	45	47	31	35	35	82
26871	3	13	13	18	44	43	30	33	34	77
26871	4	13	15	17	46	44	30	33	32	79
27612	1	14	13	19	46	48*	33	34	35	82
27612	2	15	15	18	45	45	33	35	36	80
27612	3	13	14	18	44	43	30	32	32	76
27612	4	13	14	18	44	44	31	35	34	79
	Means (SE)	13.5 (0.76)	14 (0.76)	18.125 (0.64)	45.125 (1.13)	44.875 (1.40)	31 (1.31)	33.875 (1.13)	34 (1.41)	79.5 (2.20)

[a]This is an arbitrary number I gave to the individuals as I counted the scales to keep each of them separate.
[b]The oblique count starts with the first whole scale prior to the dorsal fin origin, goes down and back on the diagonal until it reaches the ventral midline, then comes forward and up back to the starting scale.
[c] The vertical count is a zigzag pattern around the fish at the widest part of the body (usually about four complete scales prior to the dorsal fin origin) counting the number of scale rows around the body (after Hubbs and Lagler 2004).
[d]. The Pflieger method follows the diagonals of the fish such that it starts at the same scale as the vertical count and goes down and back until the lateral line scale where the count turns forward and down until the ventral midline in front of the pelvic fins where the count turns back and up to the lateral line scale, and finally turns forward and up again until the starting scale counting each row of scales you cross (Pflieger 1997).
[e] Combines highest lateral line count and vertical circumferential scale count.

Table 6. Comparison of mean scale counts for voucher specimens at Bell Museum, University of Minnesota, University of North Dakota, and specimens collected as part of this study.

		Scale counts								
					Lateral line					
Collection ID		Above lateral line	Below lateral line	Pre-dorsal	L	R	Circum-ferential (oblique)	Circum-ferential (vertical)	Around body (Pflieger)	Lat + Circum-ferential (v)
2006-2007 Survey	**Means (SE)**	13.98 (0.15)	14.98 (0.13)	19.26 (0.13)	44.36 (0.20)	44.18 (0.22)	32.53 (0.24)	35.69 (0.29)	35.93 (0.29)	79.82 (0.40)
University of North Dakota	**Means (SE)**	-	-	-	44.4 (0.33)	-	-	31.8 (0.18)	-	76.27 (0.35)
Bell Museum	**Means (SE)**	13.50 (0.76)	14.00 (0.76)	18.13 (0.64)	45.13 (1.13)	44.88 (1.40)	31.00 (1.31)	33.88 (1.13)	34.00 (1.41)	79.50 (2.20)

Northern redbelly dace

Northern redbelly dace

In 2006, we collected one specimen from a small unnamed tributary to the Sheyenne River. The habitat was shallow, fast flowing, clear water, over sandy substrate, surrounded by intact and overhanging riparian vegetation. In 2007, we collected 16 northern redbelly dace in two Sheyenne River tributaries by backpack electrofishing (Table 3; Figure 7). Site 710 was a ditch with heavy instream vegetation and site 712 was characterized by a shallow meandering channel with sandy to mucky substrate, and almost 100% canopy. Historical collections of northern redbelly dace are located within Goose, Park, Rush, Sheyenne, and Tongue rivers; however, northern redbelly dace have not been collected from the Goose, Park or Tongue rivers since 1964 (Figure 7; Appendix XII).

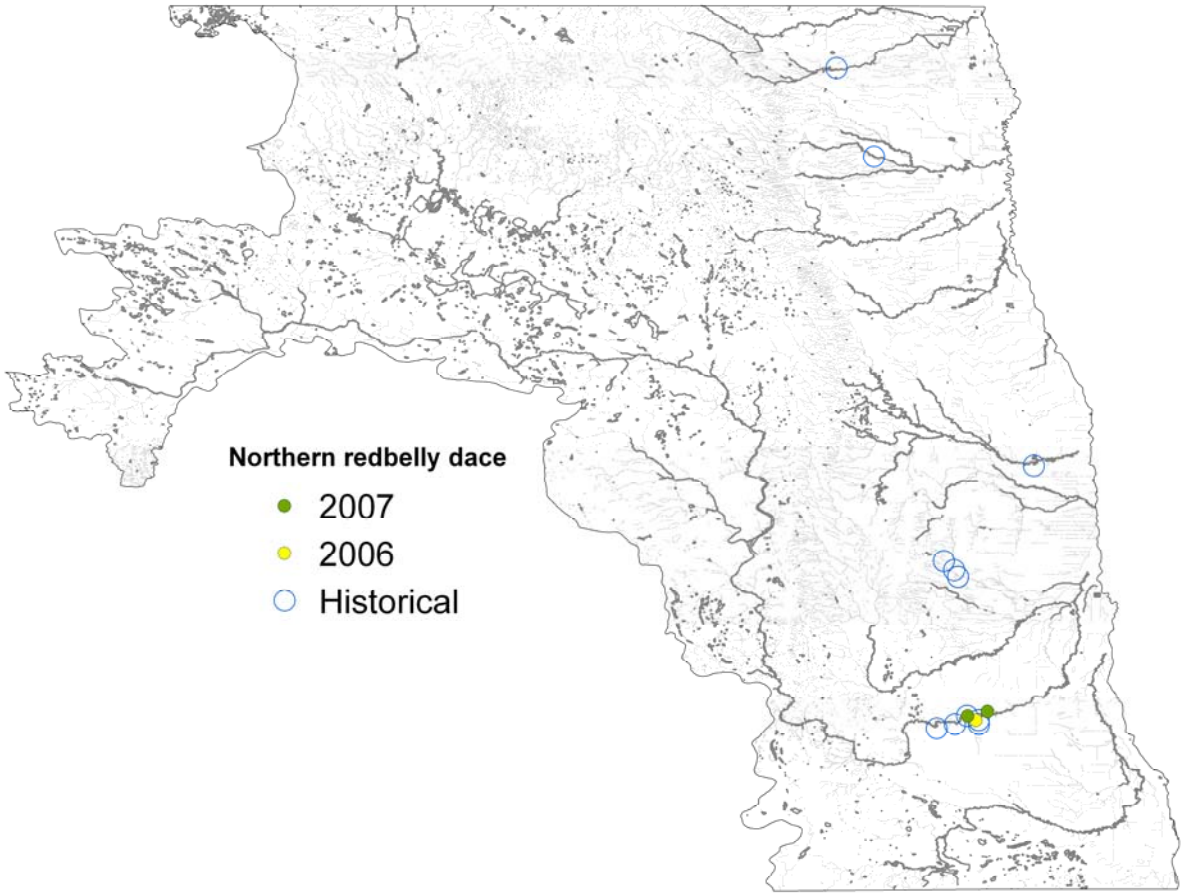

Figure 8. Historical and present records for northern redbelly dace (*Phoxinus eos*) in the Red River basin.

Pearl dace

Pearl dace

In 2006, 13 specimens were collected in cloverleaf traps at one site on the Tongue River. This site was a new location for pearl dace. Water was slow flowing over a soft, muddy stream bottom (picture in 2006 report). In 2007, 12 pearl dace were collected at two sites (Table 3; Figure 9) in the Tongue River with cloverleaf traps and backpack electrofishing. These sites had slow-flowing turbid water with soft muddy stream bottoms, steep banks and meandering channels. Two pearl dace were

collected from the Sheyenne River in 2006 where it was not previously recorded. Pearl dace were also collected in the Goose River, but not since 1964 (Figure 9; Appendix XIII).

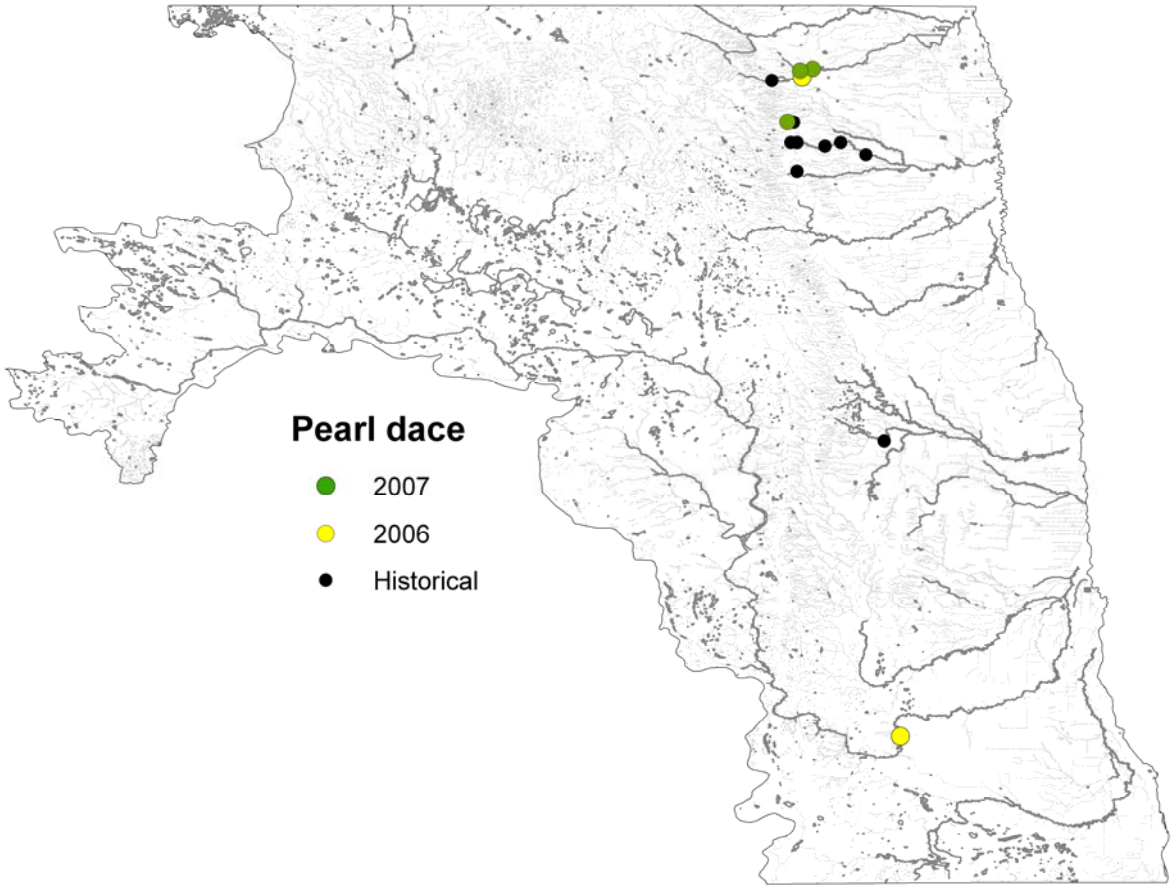

Figure 9. Historical and present records for pearl dace (*Margariscus margarita*) in the Red River basin.

Silver Chub

No silver chub were collected in 2006, but seven were collected from three sites on the Red River mainstem by boat electrofishing where they have been previously collected (Table 3; Figure 10). The silver chub is known as a

Silver chub

large river chub, which is evident by collections in the Red River mainstem. They were previously recorded from the Turtle River near the Red River confluence in 1964 and the Sheyenne River in 1977 (Figure 10; Appendix XIII).

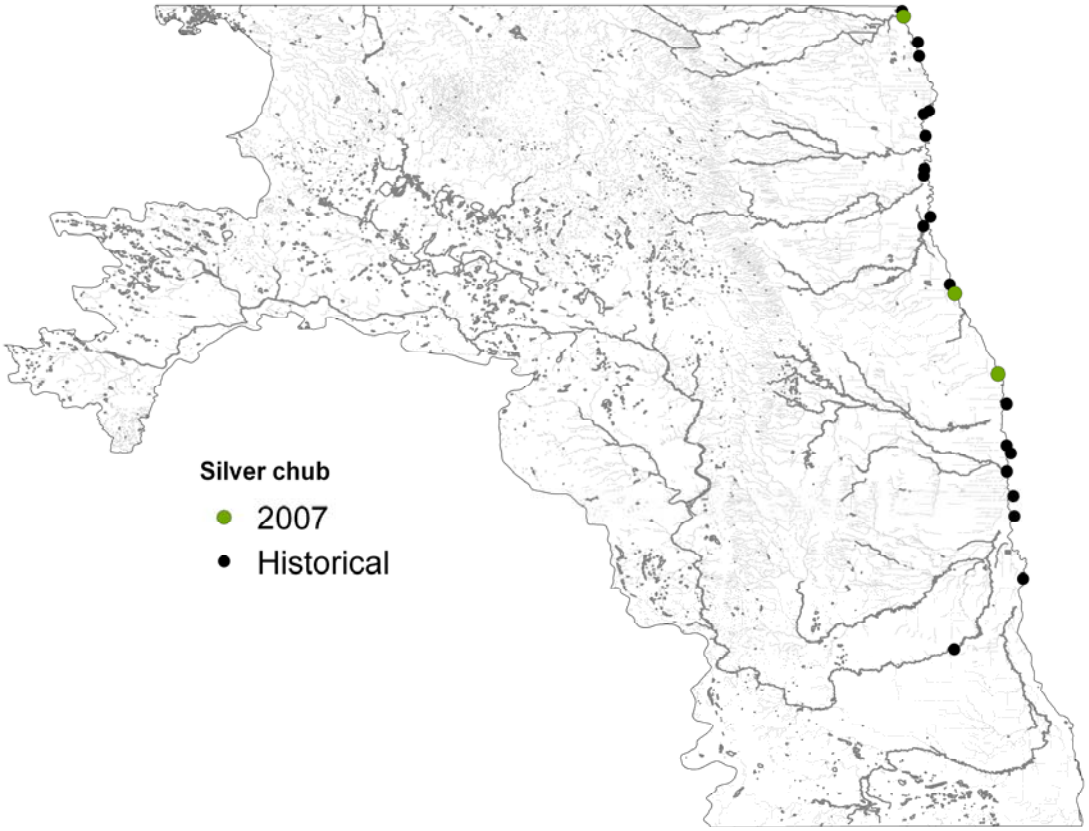

Figure 10. Historical and 2007 records for silver chub (*Macrhybopsis storeriana*) in the Red River basin

Trout-perch

In 2006, we collected 66 fish from 10 sites in the Tongue, Goose, Maple and Sheyenne rivers in all gears. The Maple and Tongue River sites represent a range extension. In 2007, we collected 177 trout-perch from 9

Trout-perch

sites in the Goose, Maple, Red, Rush, and Sheyenne rivers (Table 3; Figure 11) using seining and boat electrofishing. One individual was collected from the Rush River, a tributary of the Maple, where it has not previously been recorded (Appendix XIII) and additional sites in 2007 were new sites for the trout-perch within the Maple River.

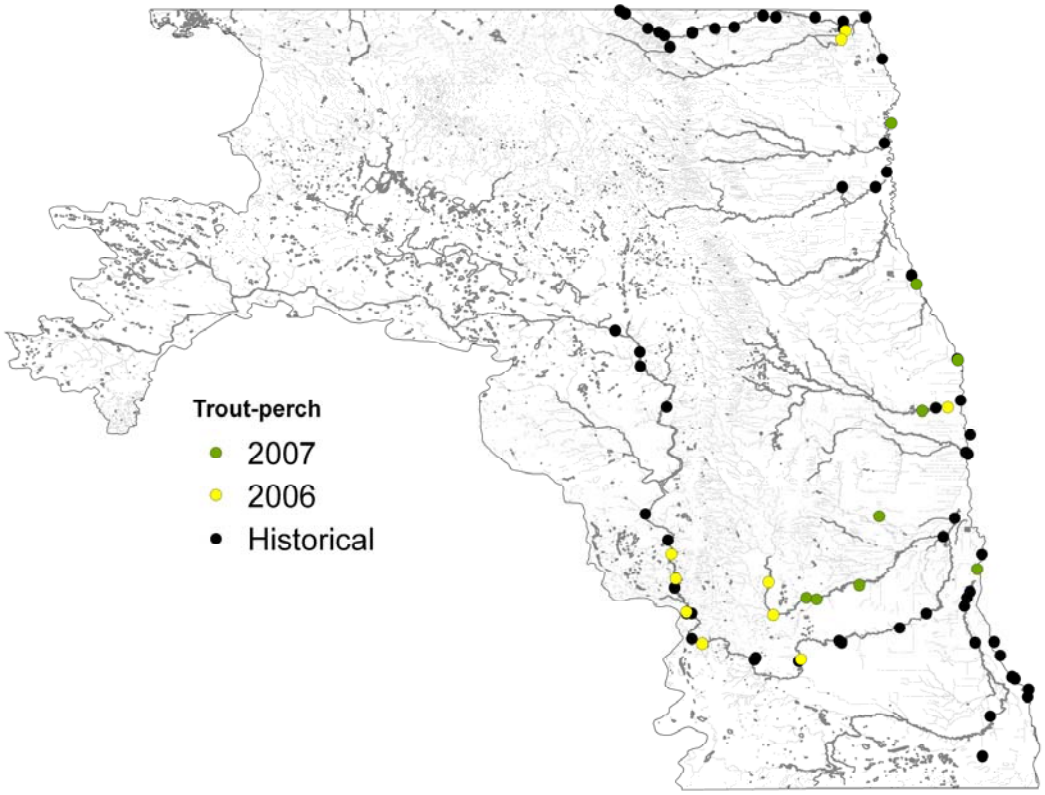

Figure 11. Historical and present records for trout-perch (*Percopsis omiscomaycus*) in the Red River basin.

Yellow bullhead

Two yellow bullhead were collected from two sites one of each of the Bios de Sioux and Wild Rice rivers in 2007 by backpack electrofishing and seining (Table 3;

Yellow bullhead

Figure 12). The site on the Bios de Sioux River was a long straight run with little flow and soft mucky stream bottom. Historically, one yellow bullhead was found at one site on the Red River mainstem in 1983 (Figure 12; Appendix XIII). Yellow bullheads have been collected in the South Dakota portion of the Bios de Sioux River where they are considered non-native (Hoagstrom et al. 2007).

Figure 12. Historical and 2007 records for yellow bullhead (*Ameiurus natalis*) in the Bios de Sioux, Wild Rice and Red Rivers.

Other Observations

- In 2006 many sites were dry and our sampling was confined to downstream sites whereas the 2007 flood allowed us to sample more headwater sites. Fish assemblages at newly wetted sites may be dominated by pioneering species and relative abundances might be skewed (see 2007 report for details).

- Central mudminnow and banded killifish were collected in the Tongue and Turtle rivers in 2007. The species are usually associated with wetlands and may have been added to the riverine assemblages by flooding (see the 2007 report for pictures and more details).

- The Maple River Dam functioned as a "dry dam" and slowly discharged flood waters, thus delaying sampling in the area of the dam (see 2007 report for pictures).

- We were among the first to report the Red River fish kill in 2007, which was dominated by channel catfish, and we noticed a reduction in our electrofishing efficiency. Investigations by others indicated the about 1,600 channel catfish were killed, and the probable cause was a bacterial infection.

- We also reported a fish kill on the Bois de Sioux in 2007, and found a dead chestnut lamprey among the dead emerald shiners, northern pike, and stonecats. However, our seine samples indicated that fish remained in the fish kill area.

- We were unable to sample much of the Sheyenne due to high water levels throughout the 2007 sampling year. Future surveys might be undertaken to assess the presence of the other 7 species (especially pugnose, blacknose, blackchin, and carmine shiners and log perch and river darter).

Conclusions

In conclusion, we accomplished each of the objectives as follows:

1) in this report we have provided the completed and updated distribution maps of 8 species of conservation priority that were collected from waters in the Red River Basin (Table 7),

2) we reviewed and synthesized literature with historical information and locations for species of concern,

3) the data from this current study has been transferred into the North Dakota historical database,

4) we were able to identify and sample at 13 historical sites as well as to collect data in consecutive years from 8 sites, and

5) all evidence indicates that the species of stoneroller that is present and has been collected in the past in the Red River Basin is the largescale stoneroller (*Campostoma oligolepis*).

Table 7. Summary of findings on Species of Conservation Priority in the Red River Basin, North Dakota.

Species	State status level	Comments
Chestnut lamprey *Ichthyomyzon castaneus*	III	One individual was collected on shore after a localized fish kill in the Bois de Sioux River - this represents the furthest upstream collection of this species; a focused sampling effort should be deployed to locate the ammocoetes of both lamprey species to better assess their status.
Silver lamprey *Ichthyomyzon unicuspis*	III	None were collected; a focused sampling effort should be deployed to locate the ammocoetes of both lamprey species to better assess their status.
Blackchin shiner *Notropis heterodon*		None were collected.
Blacknose shiner *Notropis heterolepis*	III	None were collected.
Carmine shiner *Notropis percobromis*	III	None were collected.
Central stoneroller *Campostoma anomalum*	III	None were collected; the *Campostoma* species present in the Red River basin is in fact the largescale stoneroller.
Largescale stoneroller *Campostoma oligolepis*		This is the species found in the Forest River of the Red River basin. Confined to the middle reaches of the Forest River. This not only represents a known range extension to the north and west for this species, it is also among the first reports of this species from the Red River basin.
Finescale dace *Phoxinus neogaeus*	III	None were collected.
Hornyhead chub *Nocomis biguttatus*	III	Locally common in the Forest River above Lake Ardoch.
Northern redbelly dace *Phoxinus eos*	III	Collected in tributaries to the Sheyenne River near previous collection sites.
Pearl dace *Margariscus margarita*	III	Collected from the Tongue River basin. Two captured in Sheyenne River (these represent a new drainage for this species in this state).
Pugnose shiner *Notropis anogenus*	III	None were collected.
Silver chub *Macrhybopsis storeriana*	III	Collected seven individuals at three sites on the Red River. This is a large river species and more effort and efficient sampling methods should be used to better assess the current status of this species.
Yellow Bullhead *Amieurus natalis*	III	Collected two individuals: one on the Bois de Sioux and one on the Wild Rice rivers. This is a species at the western extent of its range in North Dakota. The collection of one individual just outside of Tewaukon National Wildlife Refuge may be of concern to the waters within the reserve.
Trout-perch *Percopsis omiscomaycus*	III	Locally common in many streams in the Red River basin. The collections in the Rush River represent a new river for this species; the collections in the Maple River are the most upstream collections of this species in the Maple River.
Logperch *Percina coprodes*	III	None were collected.
River darter *Percina shumardi*	III	None were collected.

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Appendix I. North Dakota fish species of conservation priority with associated status levels. Level I refer to those species that are declining either within the state or across their range. Status II species are species with a moderate conservation priority and Level III are those species with a moderate conservation priority but are believed to be peripheral or non breeding within the state (Hagen et al. 2005).

Family	Species	Status level	Why listed
Petromyzontidae	Chestnut Lamprey *Ichthyomyzon castaneus*	III	Few records in ND, may be only a migrant in Red River
	Silver Lamprey *Ichthyomyzon unicuspis*	III	Few records in ND, may be only a migrant in Red River
Acipenseridae	Pallid sturgeon *Scaphirhynchus albus**	II	Federally endangered species. Loss of habitat from damming and channelization of Missouri River drainage
Polyodontidae	Paddlefish *Polyodon spathula**	II	Loss of suitable breeding habitat from damming the Missouri River drainage
Cyprinidae	Blackchin shiner *Notropis heterodon*		Little is known and not a species of immediate conservation concern
	Blacknose shiner *Notropis heterolepis*	III	Land use changes resulting in habitat loss and degradation
	Carmine shiner *Notropis percobromus*	III	Land use causing loss of suitable habitat
	Central stoneroller *Campostoma anomalum*	III	Rare in ND, little is known of status
	Largescale stoneroller *Campostoma oligolepis*		Confusion on which stoneroller occurs in the Red river
	Finescale dace *Phoxinus neogaeus*	III	Rare in ND, loss of suitable habitat
	Flathead chub *Platygobio gracilis*	II	Reduced sedimentation from channelization and impoundments
	Hornyhead chub *Nocomis biguttatus*	III	Water quality degradation is a concern, little is known of status
	Northern redbelly dace *Phoxinus eos*	II	Loss of suitable habitat from land use practices surrounding rivers and streams
	Pearl dace *Margariscus margarita*	I	Rare in ND, little is known of its status
	Pugnose shiner *Notropis anogenus*	III	Increased sedimentation, no recent records in ND
	Sicklefin chub *Macrhybopsis meeki**	I	ND's rarest fish. A federal candidate species, loss of free-flowing river sections from damming and channelization
	Silver chub *Macrhybopsis storeriana*	II	Rare in ND, little is known of status or habits
	Sturgeon chub *Macrhybopsis gelida**	I	Native to ND, but in low numbers. Dams and channelization threaten habitat.
Catostomidae	Blue sucker *Cycleptus elongatus**	I	Rare in ND, loss of habitat from damming and channelization in the Missouri River system
Ictaluridae	Flathead catfish *Pylodictis olivaris**	III	Few recordings in ND
Ictaluridae	Yellow bullhead *Ameiurus natalis*	III	Rare in ND which is on the western edge of its range
Percopsidae	Trout-perch *Percopsis omiscomaycus*	II	Imperiled in much of northern range from loss of suitable habitats.
Percidae	Logperch *Percina caprodes*	III	ND is on the western edge of its range, few collections within the state, is considered an American Fisheries society species of concern
	River darter *Percina shumardi*	III	Occurs in low numbers in ND and is declining nationwide

Appendix II. Stoneroller synthesis of literature

The continental divide crosses near the tri-state area of South Dakota, Minnesota, and North Dakota. Here the headwaters of the Red, Mississippi, and Missouri rivers come together and provide opportunity for interbasin transfer of fishes. The majority of fishes in the Red River basin migrated from the Mississippi River basin (Underhill 1989). Two cyprinid species, largescale stoneroller (*Campostoma oligolepis,* Hubbs and Greene 1935) and central stoneroller (*C. anomalum* (Rafinesque, 1820)) may be present in North Dakota.

Missouri River Basin, North Dakota

Central and largescale stonerollers are commonly sympatric in the lower Missouri Basin (Galat et al. 2005), but the distribution of the central stoneroller is thought to extend farther up the Missouri River basin than the distribution of the largescale stoneroller. Neither the largescale nor the central stoneroller has been reported in North Dakota in tributaries west of the Missouri River, or in the Missouri River itself (Hoagstrom et al. 2006) with the exception of Duck Creek (Western ND in Adams County), which was reported by the ND Department of Health in 1996 and 1997. Lee et al. (1980) reported the central stoneroller in the upper James River.

North Dakota

Both stonerollers have been collected in the Lake Agassiz Plain ecoregion, which is the drainage basin of the Red River that includes portions of North Dakota, Minnesota, and South Dakota (Hankinson 1929; Lee et al. 1980; Niemela et al. 1998; Koel and Peterka 2003). These records represent the northwestern most collections of these species (Trautman 1981; Koel and Peterka 2003). The central stoneroller was reported in the Forest River by Feldman (1963) and Copes and Tubb (1966). The first reported collection of the largescale stoneroller was from the Forest River in 1964 by Copes and Tubb (1966) and Schaible and Stish (unpublished data 1966) on separate occasions. Lee et al. (1980) reported the central stoneroller in the Forest River but not the largescale stoneroller. DeKrey (1988) report the largescale stoneroller at three different sites on the Forest River. Koel and Peterka (2003) reported both species of stonerollers from the Forest River. It has also been reported in the Elm River (Red River tributary) in 1996 by ND Department of Health. The two species of stoneroller may occur in the same streams in North Dakota but the historical records of central stoneroller in the Forest River are in doubt.

South Dakota

The central stoneroller is reported in eastern tributaries to the Missouri River in South Dakota (i.e. Big Sioux, Vermillion, and James rivers) where it is rare (Hoagstrom et al. 2007). The central stoneroller is found in the headwaters of the Minnesota River in South Dakota (Hoagstrom et al. 2007). Neither species of stoneroller was found in the South Dakota portion of the Bios de Sioux River, a Red River tributary (Hoagstrom et al. 2007). However, the Bios de Sioux River is under sampled (Hoagstrom et al. 2007).

Minnesota

The central stoneroller is found in the Otter Tail River of the Red River drainage in Minnesota. It was collected from Straight River in the Crow Wing River drainage (Aadland and Kuitunen 2006), a tributary to the Mississippi River, and this collection represents the closest record to the Red River drainage. The central stoneroller has been sampled from Yellow Medicine River (Aadland et al. 1991; Aadland and Kuitunen 2006), a tributary to the Minnesota River. This species was also collected from Rock River (Aadland and Kuitunen 2006) and tributaries to the Rock River (Ash, Mound, Elk, and Champepadan Creeks). Rock River is the only drainage in Minnesota that is part of the Missouri River drainage. Central stonerollers have been sampled from Zumbro River (Aadland et al. 1991; Aadland and Kuitunen 2006) and Whitewater River (Aadland and Kuitunen 2006), tributaries to the Mississippi River in southeastern Minnesota.

The largescale stoneroller has been reported from two rivers in the Minnesota River drainage: the Minnesota River (Aadland and Kuitunen 2006) and Yellow Medicine River (Aaland et al. 1991; Aadland and Kuitunen 2006). Largescale stonerollers have not been collected in the Red River basin in Minnesota (Koel and Peterka 2003; Simons et al. 2001; Aadland and Kuitunen 2006).

Taxonomy

The largescale stoneroller was first described by Hubbs and Green (1935) as a subspecies of the central stoneroller. It was classified as a species in 1971 (Pflieger 1971). The largescale stoneroller and central stoneroller can be distinguished by a number of minor morphometric differences, which in some cases may overlap (Burr and Smith 1976; Table 1). Isozyme analysis also revealed differences between the two species (Buth and Burr 1978).

Table 1. Meristic measures of largescale (*Campostoma oligolepis*) and central (*C. anomalum*) stonerollers (Burr and Smith 1976).

Character	*C. oligolepis*	*C. anomalum*
Circumferential scales	Usually 31-36	Usually 39-46
Scales above the lateral line	Usually 13-16	Usually 18-20
Predorsal scales	Usually 16-20	Usually 21-25
Lateral line scales	Usually 43-47	Usually 47-55
Sum of lateral and circumferential scales	Usually 74-82	Usually 87-102
Snout shape	Longer and more globose, projecting noticeably (in ventral view)	More flat with no noticeable projection
Black band in anal fin of breeding males	Absent or slight	Present and intense (males longer than 75mm)
Crescent-shaped row of 1-3 tubercles along inner margin of nostril	Absent or slight	Present (males longer than 75mm)
Predorsal profile	Relatively flat (in lateral view)	Arched at nape
Gill rakers	19-26	26-35

Ecology

In addition to morphological differences, the two species exhibit different habitat preferences. Largescale stonerollers prefer faster deep rocky riffles, whereas central stonerollers prefer smaller riffles and slower waters in headwaters (Burr and Smith 1976; Rakocinski 1984). The central stoneroller is tolerant of turbid silty waters, whereas the largescale stoneroller is intolerant of silty waters (Lee et al. 1980). However, Niemela et al. (1998) refers to both stonerollers as pioneer species, which are the first to colonize sections of headwater streams after desiccation, and species that tend to predominate in unstable environments affected by anthropogenic stress.

Largescale stonerollers probably differentiated from central stonerollers in the glacial refugia in the Ozark region (Burr and Smith 1976). Following retreat of the glaciers, both species dispersed northward, reoccupying the streams in the recently glaciated landscape. Human modification has reduced optimal habitat for the largescale stoneroller and enabled species that are ecologically more tolerant to supplant it (i.e. central stoneroller). Burr and Smith (1976) speculated that largescale stonerollers would be lost from agricultural areas where there are not clear, cool water refuges.

Appendix III. Ecoregions within study area

Drift Prairie/ Glaciated Plains

The drift prairie is rolling glaciated landscape. More than 80% of the area is gently sloping (<0.1 percent; Goldstein 1995) with local relief generally less than 100 feet in most places but ranging up to 300 feet (Bluemle 2000). Stream substrates are comprised of cobble, sand and silt and pools, riffles and runs are common geomorphologic stream units. Many of the small streams in this region are intermittent, and cease to flow during the summer (Stoner et al. 1993) and are typically considered headwaters. Land use is dominated by pasture, rangeland, and crops. Three associations of soils are hilly steep land with thin erodible soils, black, limey clayey soils, and black loamy soils (Goldstein 1995).

Pembina escarpment

The Pembina escarpment is a steep glacially modified escarpment that marks the boundary between the Red River Valley and the Glaciated Plains (Bluemle 2000). This landform rises 300 to 400 feet, is only a few miles wide (Bluemle 1988) and cool water and forested riparian zones are typical.

Red River Valley Lake Plain

The red river valley is a flat plain (mostly < 0.04 percent; Goldstein 1995) resulting from sedimentation on the floor of glacial Lake Agassiz. More than 95% of the area is gently sloping with relief less than 25 feet in most places (Bluemle 2000). Substrates are comprised of silt, sand, and clay. The most abundant geomorphologic stream unit is a run, whereas, pools and riffles are rare (Goldstein 1995). Streams in this ecoregion are very low gradient, meandering streams (Stoner et al. 1993; Goldstein 1995). Crops are the dominant land use. Soils are comprised of black, limey, clayey soils, clayey Lake Plain soils, and sandy soils (Goldstein 1995).

Some differences are evident in water-quality conditions between the two ecoregions. Both ecoregions tend to have high specific conductivity, total suspended-solids concentrations, and turbidity. Mean specific conductance, total suspended solids, nitrates, fecal coli form bacteria, and turbidity values are higher in the northern glaciated plains region than in the Red River valley region (Goldstein 1995), whereas total ammonia nitrogen and total phosphorous mean values are higher in the Red River Valley than in the Northern Glaciated Plains (Goldstein 1995).

Appendix IV. Sampling locations for summer 2006 in Red River tributaries with associated site numbers, drainage, river name, county, date sampled, latitude and longitude (if available) and locality information. * indicate a site that was sampled historically

Site Number	Drainage	River	County	Date	Latitude	Longitude	Locality Information
036	Pembina	Little Pembina	Cavalier	18-Jul-06	48.8502	-98.0001	100th street at bridge crossing, 3.6 miles W of Hwy 32, SW of Walhalla
065		Little Pembina	Cavalier	26-Jul-06	48.8336	-97.9836	99th ave S of Walhalla, to end of road
032	Tongue	Tongue	Pembina	18-Jul-06	48.7501	-97.8335	0.3 miles S of CR5, 5 miles W of Akra
039		Tongue	Pembina	20-Jul-06	48.7836	-97.6335	1 mile W of Cavalier @ 140th ave bridge crossing
040		Tongue	Pembina	20-Jul-06	48.8001	-97.6003	Hwy 18 NE of Cavalier
063		Tongue	Pembina	26-Jul-06	48.9167	-97.3167	on 104th street, 3 miles W of Interstate 29, SW of Pembina
061		Tongue cutoff	Pembina	26-Jul-06	48.8836	-97.3334	on 154th ave between 103rd and 104th street NE. Approximately 5 miles SW of Pembina
064		Tongue	Pembina	26-Jul-06	48.8668	-97.3336	CR 1 crossing, 6.5 miles E of Bathgate
008	Park	Middle Branch Park River	Pembina	18-Jul-06	48.5835	-97.8833	0.5 miles W of Gardar on 128th ave
068		Middle Branch Park River	Walsh	27-Jul-06	48.4667	-97.6168	on Hwy 18 just S of 74th ave
042		Middle Branch Park River	Walsh	27-Jul-06	48.4836	-97.6335	On 139th ave approximately 2.6 miles S of Hoople
067		Middle Branch Park River	Walsh	27-Jul-06	48.5167	-97.6834	on 139 ave, 5 miles W of Crystal
008		North Branch Park	Pembina	12-Jul-06	48.5835	-97.8833	0.5 miles W of Gardar on 128th ave
007		North Branch Park	Pembina	26-Jul-06	48.5835	-97.8502	7 miles N of Edinburg on Hwy 32, 0.5 miles E of Gardar
041		North Branch Park	Pembina	20-Jul-06	48.5668	-97.7668	1.5 miles S of Hwy 66 on 133rd ave. 5 miles W of Crystal
006		South Branch Park	Walsh	18-Jul-06	48.4003	-97.8502	1st bridge crossing after 32/17 intersection to the North. Sampled in the Church Camp
043		South Branch Park	Walsh	20-Jul-06	48.4001	-97.7002	1 mile E of city Park River, N on 136th street. First bridge crossing
044		South Branch Park	Walsh	27-Jul-06	48.4002	-97.6834	138th street
017	Forest	Forest	Walsh	12-Jul-06	48.1833	-97.5501	34th street NE of County Line
058		Forest	Walsh	25-Jul-06	48.2001	-97.7835	CR 12B, S of Fordville
071		Forest	Walsh	28-Jul-06	48.2000	-97.7500	Crossing on 133rd, 1.5 Miles SE of Fordville
060		Forest	Walsh	1-Aug-06	48.2500	-97.4168	148th ave, 2 miles S and 3 miles W of Minto
059		Forest	Walsh	1-Aug-06	48.2002	-97.4835	CR 19, 1 mile west of Forest River

Appendix IV cont. Sampling locations for summer 2006 in Red River tributaries with associated site numbers, drainage, river name, county, date sampled, latitude and longitude (if available) and locality information. * indicate a site that was sampled historically

Site Number	Drainage	River	County	Date	Latitude	Longitude	Locality Information
004	Forest	North Branch Forest	Walsh	18-Jul-06	48.3669	-98.0001	2.1 miles south of 220th ave and Hwy 17 intersection near Adams
076	Turtle	North Branch Turtle	Grand Forks	1-Aug-06	48.0167	-97.6834	24th ave @ strange intersection
075		Turtle	Grand Forks	1-Aug-06	48.0168	-97.1835	CR 5, 3.5 miles S of Manvel
077		Turtle	Grand Forks	1-Aug-06	47.9336	-97.4835	Turtle River State Park
020	Goose	Goose	Traill	13-Jul-06	47.5334	-97.4501	Hwy 18
220		Goose	Traill	2-Aug-06	47.4335	-96.9167	170th ave off 3rd street NE. 2 miles SW of Caledonia at old bridge crossing
051	Maple	Maple	Ransom	16-Aug-06	46.6169	-97.6000	Hwy 46 at Enderlin
309		Maple	Cass	17-Aug-06			46th street, 3 miles E and 1 mile S of Alice
224	Sheyenne	Dead Colt Creek	Ransom	15-Aug-06			4.5 miles S and 3.5 miles E of Lisbon
222		Sheyenne	Ransom	11-Aug-06	46.5167	-97.3335	147th ave bridge crossing, near Sheyenne National Grassland
223		Sheyenne	Ransom	11-Aug-06	46.5168	-97.3002	bridge crossing 0.5 miles west of 149th ave, 1.5 miles south of Mirror Pool WMA, in Sheyenne National Grassland
301		Sheyenne	Ransom	15-Aug-06			10 miles E of Lisbon on Hwy 27
304		Sheyenne	Ransom	16-Aug-06			on 122.5 ave, 2.5 miles E and 1 mile S of Ft Ransom
305		Sheyenne	Ransom/Barnes county line	16-Aug-06			bridge crossing off Hwy 46
307		Sheyenne	Barnes	16-Aug-06			45th street bridge crossing off CR 21, 12 miles S of Valley city
308		Sheyenne	Barnes	16-Aug-06			Riparian restoration area, off CR 21
302		Sheyenne	Ransom	15-Aug-06			1 mile N and 0.5 miles E of 63rd and 145th ave
303		Sheyenne tributary	Richland	15-Aug-06			151st ave, N of Sheyenne River, 2 miles S and 1 mile W of Power
025		Sheyenne	Richland	15-Aug-06	46.5667	-97.1168	CR 2 E of Hwy 18, near Barry
306		Sheyenne tributary	Ransom/Barnes county line	16-Aug-06			flows into Sheyenne near bridge crossing of Hwy 46
221	Wild Rice	Wild Rice	Sargent	11-Aug-06	46.0002	-97.4167	Tewaukon NWR, 141st street of CR5
029		Wild Rice	Richland	11-Aug-06	46.2002	-97.1334	Hwy 18 bridge crossing, 3.5 miles S of Wyndmere
310		Antelope	Richland	17-Aug-06			1.5 miles N of Dwight on 75th street
311		Antelope	Richland	17-Aug-06			173rd ave, 9 miles W and 1 mile N of Wahpeton

Appendix V. Sampling locations for summer 2007 in Red River basin with associated site numbers, drainage, river name, county, date sampled, latitude and longitude and locality information.

Site Number	Drainage	River	County	Date	Latitude	Longitude	Locality
9	Pembina	Tongue River	Pembina	13-Jun-07	48.74358	-97.86211	River crossing @ Hwy 32
706		Little Pembina	Cavalier	12-Jun-07	48.8482	-98.1159	3.5 miles N and 4 miles W of Olga on 99th street NE
707		Tongue River	Pembina	13-Jun-07	48.779	-97.79587	Crossing on 133 ave, 2 miles S of Svold
708		Tongue tributary	Pembina	13-Jun-07	48.77324	-97.83993	130th crossing, 5 miles W of Akra
708		Tongue tributary	Pembina	12-Jul-07	48.06321	-97.11365	130th crossing, 5 miles W of Akra
7	Park	North Branch Park River	Pembina	13-Jun-07	48.59074	-97.8623	Hwy 32 crossing
43		Park River	Walsh	31-Jul-07	48.40614	-97.70987	1 mile N and 1.3 miles E of Park River on 136th street
701		Park River	Walsh	4-Jun-07	48.4389	-97.47004	2 miles North and 3 miles E of Grafton
702		South Branch Park Tributary	Walsh	5-Jun-07	48.4336	-98.02551	1 miles north and 2.1 miles E of Adams
703		South Branch Park Tributary	Walsh	5-Jun-07	48.46642	-98.01467	122nd ave and 72.5 st NE
704		South Branch Park River	Walsh	5-Jun-07	48.51127	-98.01414	CR 7 and 122nd
705		Park unnamed tributary	Pembina	6-Jun-07	48.56587	-98.94983	.75 miles N of Union on 125th ave
709		Middle Branch Park River	Walsh	14-Jun-07	48.50885	-97.73161	CR 12 crossing, 3/4 miles N of CR9
754		Salt Lake Outlet	Walsh	31-Jul-07	48.4556	-97.27906	2 miles N and 0.8 miles E of Oakwood, outlet from Salt Lake
755		Park River	Walsh	31-Jul-07	48.45394	-97.27812	156th crossing of Park River near Salt Lake
58	Forest	Forest River	Walsh	2-Aug-07	48.20736	-97.79527	1/2 mile S of Fordville on 12B
71		Forest River	Walsh	6-Aug-07	48.20115	-97.75209	2 miles E and 1.5 miles S of Fordville on 133rd ave
208		Forest River	Walsh	8-Aug-07	48.20821	-97.49744	1 mile W, 0.5 miles S of Forest River on 55th st NE
756		Forest River	Walsh	1-Aug-07	48.32383	-97.16407	63rd street crossing, 2 miles S of exit 172
757		Middle Branch Forest River	Walsh	1-Aug-07	48.21916	-97.96191	123rd and 55.5 @ Matejcek reservoir @ Western end
758		Forest River	Walsh	2-Aug-07	48.23754	-97.29666	just below Lake Ardoch, 154th and 57th st NE
759		Forest River	Walsh	2-Aug-07	48.22532	-97.92406	Below Matejcek dam
760		Forest River	Nelson	3-Aug-07	48.18235	-98.0451	Below Whitman Dam
761		Forest River	Walsh	7-Aug-07	48.16718	-97.69057	Forest River Biology area
762		Forest River	Grand Forks	8-Aug-07	48.18612	-97.60109	2 miles E, 2.5 miles N of Inkster on 36th st NE

Appendix V continued. Sampling locations for summer 2007 in Red River basin with associated site numbers, drainage, river name, county, date sampled, latitude and longitude and locality information.

Site Number	Drainage	River	County	Date	Latitude	Longitude	Locality
763	Forest	Forest River	Walsh	8-Aug-07	48.20326	-97.51479	2 miles West, 1 mile South of Forest River on 149th ave
766		Forest River	Grand Forks	14-Aug-07	48.18124	-97.75783	Fordville Recreation Area below dam
767		Forest River	Walsh	16-Aug-07	48.22407	-97.89472	S of bridge on 56th street, 4 miles W of Fordville
768		Forest River	Walsh	16-Aug-07	48.21330	-97.83433	1.25 miles E of State Hwy 32 on CR 19
769		Forest River	Walsh	17-Aug-07	48.21680	-97.98959	T155N, R57N SEC 28 @ 122nd crossing
1201		Forest River	Walsh	9-Aug-07	48.25201	-97.42786	2.5 miles N, 2 miles E of Forest River just S of 58th st NE and 148th ave intersection on 148th
1202		Forest River	Grand Forks	15-Aug-07	48.19750	-97.72993	USGS station on 134th ave
8	Turtle	North Branch Park River	Pembina	12-Jul-07	48.12731	-97.16965	0.5 miles W of Gardar
77		Turtle River	Grand Forks	11-Jul-07	47.94679	-97.49594	Turtle River State Park
78		Turtle River	Grand Forks	11-Jul-07	48.00526	-97.39818	1.5 miles W and 0.5 miles S of Mekinock on CR11
728		Turtle River	Grand Forks	11-Jul-07	46.35274	-96.94614	5.2 miles N and 6 miles W of Grand Forks on 18th st NE
729		Turtle River	Grand Forks	11-Jul-07	47.96157	-97.46652	3 miles N and 4.8 miles E of Emerado
730		North Branch Turtle River	Grand Forks	11-Jul-07	47.97618	-97.61248	21st ave and 0.5 miles E of highway 18
731		Turtle River	Grand Forks	12-Jul-07	48.59255	-97.88413	16th st NE and 0.5 miles S of 32nd ave; 1 mile E of interstate 29
733		Saltwater Coulee	Grand Forks	12-Jul-07	48.00591	-97.20863	1.5 miles N and 1.5 miles E of Kelly on CR 11 crossing
734	Goose	Spring Creek	Grand Forks	13-Jul-07	47.68238	-97.66789	39th ave NE, 1.2 miles N of county line
735		Middle Branch Goose tributary	Steele	13-Jul-07	47.54736	-97.77238	2.5 miles N and 3 miles W of Finley on CR 4
743		South Branch Goose River	Steele	26-Jul-07	47.35371	-97.58871	on 4th street, 1.2 miles N of Fullers Lake
750		Goose River	Traill	30-Jul-07	47.42043	-97.01744	2.5 miles E and 1.5 miles N of Hillsboro @ bridge out
751		South Branch Goose River	Traill	30-Jul-07	47.50118	-97.43179	5 miles west of Mayville
752		South Branch Goose River	Traill	31-Jul-07	47.44062	-97.5313	6.8 miles W of Roseville on 2nd street NE
753		Middle Branch Goose River	Steele	31-Jul-07	47.49837	-97.53274	8 miles W of Portland on 6th street NE
744	Elm	Elm River	Traill	26-Jul-07	47.28235	-97.36488	1 mile N and 2.1 miles E of Galesburg at washed our road/bridge

Appendix V continued. Sampling locations for summer 2007 in Red River basin with associated site numbers, drainage, river name, county, date sampled, latitude and longitude and locality information.

Site Number	Drainage	River	County	Date	Latitude	Longitude	Locality
745	Elm	Elm River	Traill	26-Jul-07	47.2609	-97.36709	2 miles E and 1.5 miles South of Galesburg @ closed bridge
746		Elm River	Traill	26-Jul-07	47.28257	-96.92243	Intersection of 169th ave SE and 9th street SE
747		Elm tributary	Traill	30-Jul-07	47.25328	-97.09848	4.4 miles W and 1 mile north of Grandin, on 11th Street SE
748		Elm River	Traill	30-Jul-07	47.30701	-97.13403	7th street and 159th ave; 4 miles E and 3.5 miles S of Blanchard
749		Elm River	Traill	30-Jul-07	47.35229	-97.28348	153 ave SE, just South of Hwy 18, 3 miles west of Blanchard, near NA largest structure
710	Sheyenne	Sheyenne unnamed tributary	Richland	27-Jun-07	46.55055	-97.21868	0.3 Miles S on 151st from 59th st SE
712		Sheyenne unnamed tributary	Ransom	27-Jun-07	46.53569	-97.28738	149.5 and 60.5 intersection
713		Lower Branch Rush River	Cass	28-Jun-07	46.94931	-97.0945	161st ave and 32nd st intersection; 3 miles N and 5.5 miles E of Casselton
714		Rush River	Cass	28-Jun-07	47.00642	-97.18534	1.5 miles E of Amenia on 28th street NE
716		Rush tributary	Cass	28-Jun-07	47.09676	-97.40921	Below outlet @ Brewer Lake; 146 st and 21.5 st
718		Buffalo Creek	Cass	29-Jun-07	46.8137	-97.20009	156th ave. and 45.5 st
719		Buffalo Creek	Cass	29-Jun-07	46.82106	-97.45086	1 mile W of Embden; 144th ave SE and 42nd st
720		Maple tributary	Cass	29-Jun-07	46.996667	-97.658056	136th ave and just S of 38th st; 1.2 miles S of interstate 94
721		Baldhill Creek	Griggs	30-Jun-07	47.38437	-98.32394	2nd street SE and .25 miles E of 104th ave
722		Baldhill Creek	Griggs	30-Jun-07	47.35671	-98.26485	108th ave and 0.25 miles N of 4th
723		Sheyenne tributary	Barnes	30-Jun-07	46.8193	-98.07686	41st SE; 1st crossing East of State Route 1; 6.5 miles S and 3 miles E of valley city
770		Maple River	Cass	21-Aug-07	46.68565	-97.47032	4 miles N Highway 46 on 143 ave
771		Maple River	Cass	21-Aug-07	46.69672	-97.38825	Hamilton Will WMA, 147th ave, 4.5 miles N of ND Highway 46
772		Maple River	Cass	22-Aug-07	46.67957	-97.43074	CR 7 crossing; 6.3 miles N and 3 miles E of Sheldon, just downstream from dam
773		Maple River	Cass	22-Aug-07	46.73541	-97.26297	2.8 miles S of Lynchburg
726	Wild Rice	Antelope Creek	Richland	10-Jul-07	46.30182	-96.90428	168th ave; 2 miles N and 1 mile W of Mooreton
725		Elk Creek	Richland	10-Jul-07	46.23852	-97.14681	2 miles S and 0.5 miles W of Wyndmere on 81st NE
727		Antelope Creek	Richland	10-Jul-07	46.35274	-96.94614	5.2 miles N and 3.5 miles W of Mooreton, CR 25 crossing

Appendix V continued. Sampling locations for summer 2007 in Red River basin with associated site numbers, drainage, river name, county, date sampled, latitude and longitude and locality information.

Site Number	Drainage	River	County	Date	Latitude	Longitude	Locality
738	Wild Rice	Wild Rice River	Richland	24-Jul-07	46.19098	-96.74142	CR9, going south, 2nd crossing. 6 miles west and 5 miles S of Wahpeton
739		Wild Rice River	Sargent	24-Jul-07	46.16649	-97.28314	86th street in Hamlin
740		Shortfoot Creek	Sargent	24-Jul-07	46.07962	-97.36521	1 mile E of Cayuga on ND 11
741		Wild Rice River	Sargent	25-Jul-07	46.02105	-97.35277	96th street NE and 145.5 ave SE; 3.7 miles South and 1.5 miles E of Cayuga; WMA
742		Wild Rice River	Sargent	25-Jul-07	46.02913	-97.57115	North of Silver Lake Recreation Area
736	Bios de Sioux	Bios de Sioux River	Richland	24-Jul-07	46.05097	-93.56744	At ND/MN border at bridge crossing on ND Hwy 11
764		Bios de Sioux River	Richland	9-Aug-07	46.15191	-96.58018	CR16 crossing at USGS site
765		Bios de Sioux River	Richland	9-Aug-07	46.00780	-96.57590	97th street
774		Bios de Sioux River	Richland	23-Aug-07	45.97855	-96.57347	99th street @ bridge out, 1 mile E of Blackner
732	Red River	South Marais River	Grand Forks	12-Jul-07	48.77324	-97.83993	1.5 miles W of the Red River on 27th ave, 0.3 miles W of 43 street NE
800		Red River	Richland	31-Aug-07	46.36936	-96.65698	Brushvale Bridge recreation area
801		Red River	Pembina	28-Aug-07	48.95625	-97.23154	Fort Daer Campground, in Pembina
802		Red River	Pembina	29-Aug-07	48.55384	-97.13786	Hastings landing boat ramp, downtown Drayton
803		Red River	Walsh/ Grand Forks line	29-Aug-07	48.11645	-97.0843	Oslo Boat ramp, on CR 54
804		Red River	Grand Forks	30-Aug-07	47.54523	-97.01413	Lincoln Park landing, just south of Grand Forks
805		Red River	Trail	30-Aug-07	47.62187	-96.87717	Belmont Park, Frog Point, located east of Buxton, off CR 2
806		Red River	Cass	31-Aug-07	46.79782	-96.8017	Iwen Park, Convent Landing, South of Fargo

Appendix VI. Seining CPUE (#/100m^2) by species and site number in the Red River Basin during 2006 and 2007 surveys. Effort refers to the distance sampled times seine length or stream width (whichever is less). A "P" indicates the species was observed at the site, but was not collected. A (-) indicates the species was not collected at that site. Total individuals and CPUE are reported for each site.

	Site Number, Year, Field Number, and Drainage								
Species	36 2006 060718_05 Pembina	706 2007 070612_01 Pembina	32 2006 060718_04 Tongue	39 2006 060720_02 Tongue	40 2006 060720_03 Tongue	63 2006 060726_01 Tongue	8 2006 060712_02 Park	42 2006 060727_02 Park	43 2007 070731_03 Park
Banded killifish	-	-	-	-	-	-	-	-	-
Bigmouth buffalo	-	-	-	-	-	-	-	-	-
Bigmouth shiner	-	27.56	-	-	-	-	-	-	76.55
Black bullhead	-	-	-	0.11	-	2.19	-	-	-
Black crappie	-	-	-	-	-	-	-	-	-
Blacknose dace	-	-	-	-	-	-	1.31	-	2.19
Blackside darter	-	-	-	0.22	2.00	-	-	2.00	-
Bluegill	-	-	-	-	-	-	-	-	-
Bluntnose minnow	-	-	-	-	-	-	-	-	-
Brassy minnow	-	-	-	-	-	-	-	-	-
Brook stickleback	-	-	-	-	-	-	-	-	-
Channel catfish	-	-	-	-	-	-	-	-	-
Chestnut lamprey	-	-	-	-	-	-	-	-	-
Common carp	-	-	-	-	-	0.87	-	-	-
Common shiner	-	11.37	2.62	-	2.50	-	0.87	72.00	275.59
Creek chub	-	4.37	10.50	-	-	-	2.19	110.00	184.46
Emerald shiner	-	-	-	-	-	-	-	-	-
Fathead minnow	8.75	38.93	-	-	-	-	P	5.00	48.85
Freshwater drum	-	-	-	-	-	-	-	-	-
Goldeye	-	-	-	-	-	-	-	-	-
Hornyhead chub	-	-	-	-	-	-	-	-	8.75
Johnny darter	2.04	12.25	23.62	3.61	5.00	-	0.44	19.00	2.19
Largescale stoneroller	-	-	-	-	-	-	-	-	-
Longnose dace	-	-	-	-	-	-	-	-	-
Mississippi silvery	-	-	-	-	-	-	-	-	-
Northern pike	0.29	-	-	-	-	-	-	2.00	-
Orangespotted sunfish	-	-	-	-	-	-	-	-	-
Pearl dace	-	-	-	-	-	-	-	-	-

Appendix VI continued. Seining CPUE (#/100m^2) by species and site number in the Red River Basin during 2006 and 2007 surveys. Effort refers to the distance sampled times seine length or stream width (whichever is less). A "P" indicates the species was observed at the site, but was not collected. A (-) indicates the species was not collected at that site. Total individuals and CPUE are reported for each site.

	Site Number, Year, Field Number, and Drainage								
Species	**36 2006 060718_05 Pembina**	**706 2007 070612_01 Pembina**	**32 2006 060718_04 Tongue**	**39 2006 060720_02 Tongue**	**40 2006 060720_03 Tongue**	**63 2006 060726_01 Tongue**	**8 2006 060712_02 Park**	**42 2006 060727_02 Park**	**43 2007 070731_03 Park**
Quillback	-	-	-	-	-	-	-	-	-
River shiner	-	-	-	-	-	-	-	-	-
Rock bass	-	-	-	-	-	-	-	-	-
Sand shiner	-	-	-	-	-	0.87	-	-	-
Sauger	-	-	-	-	-	-	-	-	-
Shorthead redhorse	-	-	-	-	-	0.87	-	-	-
Silver chub	-	-	-	-	-	-	-	-	-
Silver redhorse	-	-	-	-	-	-	-	-	-
Smallmouth bass	-	-	-	-	-	-	-	-	-
Spotfin shiner	-	-	-	-	-	2.62	-	-	-
Stonecat	-	-	-	-	-	-	-	-	-
Tadpole madtom	-	-	-	-	-	3.50	-	-	-
Trout-perch	-	-	-	-	-	1.75	-	-	-
Walleye	-	-	-	-	-	1.31	-	-	-
White bass	-	-	-	-	-	-	-	-	-
White crappie	-	-	-	-	-	-	-	-	-
White sucker	7.87	7.00	-	31.61	68.50	0.44	0.44	200.00	17.50
Yellow bullhead	-	-	-	-	-	-	-	-	-
Yellow perch	-	-	-	-	-	-	-	-	0.73
Effort (m^2)	342.9	228.6	114.3	914.4	200	228.6	228.6	100	137.16
Total Individuals	65	232	42	325	156	33	12	410	846
Site CPUE (#/100 m^2)	18.96	101.49	36.75	35.54	78.00	14.44	5.25	410.00	616.80

Appendix VI continued. Seining CPUE (#/100m^2) by species and site number in the Red River Basin during 2006 and 2007 surveys. Effort refers to the distance sampled times seine length or stream width (whichever is less). A "P" indicates the species was observed at the site, but was not collected. A (-) indicates the species was not collected at that site. Total individuals and CPUE are reported for each site.

	Site Number, Year, Field Number, and Drainage								
Species	**44 2006 060727_04 Park**	**67 2006 060727_03 Park**	**704 2007 070605_04 Park**	**4 2006 060712_01 Forest**	**4 2006 060718_01 Forest**	**17 2006 060712_03 Forest**	**58 2006 060725_01 Forest**	**58 2007 070802_03 Forest**	**59 2006 060801_03 Forest**
Banded killifish	-	-	-	-	-	-	-	-	-
Bigmouth buffalo	-	-	-	-	-	-	-	-	-
Bigmouth shiner	115.49	-	6.00	-	-	28.43	48.56	2.37	121.57
Black bullhead	-	3.33	-	-	-	-	-	0.26	-
Black crappie	-	-	-	-	-	-	-	-	-
Blacknose dace	17.50	-	3.33	-	-	3.06	2.19	-	0.73
Blackside darter	5.25	6.67	-	-	-	0.44	2.41	-	-
Bluegill	-	-	-	-	-	-	-	-	-
Bluntnose minnow	-	-	-	-	-	8.31	4.59	5.80	1.64
Brassy minnow	-	-	-	-	-	-	-	-	-
Brook stickleback	-	-	-	-	-	-	-	-	-
Channel catfish	-	-	-	-	-	-	-	-	-
Chestnut lamprey	-	-	-	-	-	-	-	-	-
Common carp	-	-	-	-	-	-	-	-	-
Common shiner	469.82	10.00	18.67	-	-	72.18	109.58	36.37	43.20
Creek chub	76.99	16.67	0.67	-	-	23.62	86.83	2.37	34.45
Emerald shiner	-	-	-	-	-	-	-	-	-
Fathead minnow	-	-	8.00	1012.00	92.89	-	-	-	-
Freshwater drum	-	-	-	-	-	-	-	-	-
Goldeye	-	-	-	-	-	-	-	-	-
Hornyhead chub	-	-	-	-	-	-	2.41	2.37	-
Johnny darter	25.37	66.67	0.67	-	-	1.75	24.93	1.05	4.56
Largescale stoneroller	-	-	-	-	-	1.31	0.44	-	-
Longnose dace	-	-	-	-	-	0.44	-	-	-
Mississippi silvery	-	-	-	-	-	-	-	-	-
Northern pike	-	-	-	-	-	-	-	-	-
Orangespotted sunfish	-	-	-	-	-	-	-	-	-
Pearl dace	-	-	-	-	-	-	-	-	-

Appendix VI continued. Seining CPUE (#/100m^2) by species and site number in the Red River Basin during 2006 and 2007 surveys. Effort refers to the distance sampled times seine length or stream width (whichever is less). A "P" indicates the species was observed at the site, but was not collected. A (-) indicates the species was not collected at that site. Total individuals and CPUE are reported for each site.

	Site Number, Year, Field Number, and Drainage								
Species	**44 2006 060727_04 Park**	**67 2006 060727_03 Park**	**704 2007 070605_04 Park**	**4 2006 060712_01 Forest**	**4 2006 060718_01 Forest**	**17 2006 060712_03 Forest**	**58 2006 060725_01 Forest**	**58 2007 070802_03 Forest**	**59 2006 060801_03 Forest**
Quillback	-	-	-	-	-	-	-	-	-
River shiner	-	-	-	-	-	-	-	-	-
Rock bass	-	-	-	-	-	-	0.66	-	-
Sand shiner	-	-	-	-	-	-	-	-	-
Sauger	-	-	-	-	-	-	-	-	-
Shorthead redhorse	-	-	-	-	-	-	-	-	-
Silver chub	-	-	-	-	-	-	-	-	-
Silver redhorse	-	-	-	-	-	-	-	-	-
Smallmouth bass	-	-	-	-	-	-	-	-	-
Spotfin shiner	-	-	-	-	-	-	-	-	-
Stonecat	-	-	-	-	-	-	-	-	-
Tadpole madtom	-	-	-	-	-	0.44	0.22	-	-
Trout-perch	-	-	-	-	-	-	-	-	-
Walleye	-	-	-	-	-	-	-	-	-
White bass	-	-	-	-	-	-	-	-	-
White crappie	-	-	-	-	-	-	-	-	-
White sucker	75.24	-	-	-	-	0.87	21.22	3.95	20.23
Yellow bullhead	-	-	-	-	-	-	-	-	-
Yellow perch	-	-	-	-	-	-	-	0.26	-
Effort (m^2)	114.3	30	150	50	225	228.6	457.2	379.476	548.64
Total Individuals	898	31	56	506	209	322	1390	208	1242
Site CPUE (#/100 m^2)	785.65	103.33	37.33	1012.00	92.89	140.86	304.02	54.81	226.38

Appendix VI continued. Seining CPUE (#/100m^2) by species and site number in the Red River Basin during 2006 and 2007 surveys. Effort refers to the distance sampled times seine length or stream width (whichever is less). A "P" indicates the species was observed at the site, but was not collected. A (-) indicates the species was not collected at that site. Total individuals and CPUE are reported for each site.

	Site Number, Year, Field Number, and Drainage								
	60 2006 060801_02	71 2006 060728_01	71 2007 070806_01	208 2007 070808_03	757 2007 070801_03	758 2007 070802_01	761 2007 070807_01	762 2007 070808_01	763 2007 070808_02
Species	**Forest**	**Forest**	**Forest**	**Forest**	**Forest**	**Forest**	**Forest**	**Forest**	**Forest**
Banded killifish	-	-	-	-	-	-	-	-	-
Bigmouth buffalo	-	-	-	-	-	-	-	-	-
Bigmouth shiner	6.12	-	-	60.11	-	5.19	-	75.28	10.87
Black bullhead	-	P	-	-	-	-	-	-	-
Black crappie	-	-	-	-	-	-	-	-	-
Blacknose dace	-	6.56	0.27	-	-	-	-	1.25	0.25
Blackside darter	-	-	-	-	-	-	-	0.28	0.62
Bluegill	-	-	-	-	-	8.20	-	-	-
Bluntnose minnow	1.75	11.37	5.60	5.51	-	-	27.46	22.92	10.50
Brassy minnow	-	-	-	-	-	-	-	-	-
Brook stickleback	-	0.87	-	-	-	-	-	-	-
Channel catfish	-	-	-	-	-	0.27	-	-	-
Chestnut lamprey	-	-	-	-	-	-	-	-	-
Common carp	-	-	-	-	-	36.64	-	-	-
Common shiner	78.74	107.61	13.07	227.15	-	-	60.03	109.17	53.12
Creek chub	1.97	22.31	2.93	6.16	-	1.09	0.57	8.47	2.00
Emerald shiner	-	-	-	-	-	-	-	-	-
Fathead minnow	-	1.31	-	-	124.58	41.83	-	-	-
Freshwater drum	-	-	-	-	-	-	-	-	-
Goldeye	-	-	-	-	-	-	-	-	-
Hornyhead chub	-	9.19	5.33	0.32	-	-	1.70	3.89	1.62
Johnny darter	13.78	48.99	1.87	0.65	0.42	-	2.03	1.39	0.87
Largescale stoneroller	-	2.62	-	-	-	-	0.08	-	-
Longnose dace	-	0.44	-	-	-	-	-	0.42	-
Mississippi silvery	-	-	-	-	-	-	-	-	-
Northern pike	0.22	-	1.60	0.16	0.83	-	0.73	0.69	-
Orangespotted sunfish	-	-	-	-	-	-	-	-	-
Pearl dace	-	-	-	-	-	-	-	-	-

Appendix VI continued. Seining CPUE (#/100m^2) by species and site number in the Red River Basin during 2006 and 2007 surveys. Effort refers to the distance sampled times seine length or stream width (whichever is less). A "P" indicates the species was observed at the site, but was not collected. A (-) indicates the species was not collected at that site. Total individuals and CPUE are reported for each site.

	Site Number, Year, Field Number, and Drainage								
Species	**60 2006 060801_02 Forest**	**71 2006 060728_01 Forest**	**71 2007 070806_01 Forest**	**208 2007 070808_03 Forest**	**757 2007 070801_03 Forest**	**758 2007 070802_01 Forest**	**761 2007 070807_01 Forest**	**762 2007 070808_01 Forest**	**763 2007 070808_02 Forest**
Quillback	-	-	-	-	-	1.91	-	-	-
River shiner	-	-	-	-	-	-	-	-	-
Rock bass	-	-	-	-	-	-	-	-	-
Sand shiner	-	-	-	-	-	-	-	-	-
Sauger	-	-	-	-	-	-	-	-	-
Shorthead redhorse	-	-	-	-	-	-	-	-	-
Silver chub	-	-	-	-	-	-	-	-	-
Silver redhorse	-	-	-	-	-	-	-	-	-
Smallmouth bass	-	-	-	-	-	-	-	-	-
Spotfin shiner	-	-	-	-	-	4.10	-	-	-
Stonecat	-	-	-	-	-	-	-	-	-
Tadpole madtom	-	-	-	-	-	-	0.24	0.14	-
Trout-perch	-	-	-	-	-	-	-	-	-
Walleye	-	-	-	-	-	-	-	-	-
White bass	-	-	-	-	-	-	-	-	-
White crappie	-	-	-	-	-	-	-	-	-
White sucker	46.15	12.69	3.73	4.54	7.92	-	7.78	2.92	5.25
Yellow bullhead	-	-	-	-	-	-	-	-	-
Yellow perch	-	-	-	-	3.75	-	0.08	-	-
Effort (m^2)	457.2	228.6	374.904	617.22	240	365.76	1234.44	720	800.1
Total Individuals	680	512	129	1880	330	363	1243	1633	681
Site CPUE (#/100 m^2)	148.73	223.97	34.41	304.59	137.50	99.25	100.69	226.81	85.11

Appendix VI continued. Seining CPUE (#/100m^2) by species and site number in the Red River Basin during 2006 and 2007 surveys. Effort refers to the distance sampled times seine length or stream width (whichever is less). A "P" indicates the species was observed at the site, but was not collected. A (-) indicates the species was not collected at that site. Total individuals and CPUE are reported for each site.

	Site Number, Year, Field Number, and Drainage								
	766 2007 070814_01	767 2007 070816_01	768 2007 070817_01	769 2007 070817_01	1201 2007 070809_01	1202 2007 070815_01	75 2006 060801_01	76 2006 060801_04	77 2006 060801_05
Species	**Forest**	**Forest**	**Forest**	**Forest**	**Forest**	**Forest**	**Turtle**	**Turtle**	**Turtle**
Banded killifish	-	-	-	-	-	-	-	-	-
Bigmouth buffalo	-	-	-	-	-	-	-	-	-
Bigmouth shiner	-	-	0.31	-	5.35	-	-	1.33	82.09
Black bullhead	6.56	-	-	-	-	-	-	-	-
Black crappie	-	-	-	-	-	-	-	-	-
Blacknose dace	-	-	-	-	-	-	-	-	10.06
Blackside darter	-	0.36	-	-	0.12	-	0.57	-	0.58
Bluegill	113.46	-	-	-	-	1.56	-	-	-
Bluntnose minnow	2.19	7.66	-	-	14.58	30.41	-	-	-
Brassy minnow	-	-	-	-	-	-	-	-	-
Brook stickleback	0.27	-	-	-	-	-	-	-	-
Channel catfish	-	-	-	-	-	-	-	-	-
Chestnut lamprey	-	-	-	-	-	-	-	-	-
Common carp	-	-	-	-	-	-	0.57	-	-
Common shiner	30.62	40.65	19.06	-	19.56	38.75	-	-	51.18
Creek chub	44.56	1.46	8.75	1.75	0.49	0.10	-	-	8.60
Emerald shiner	-	-	-	-	-	-	1.71	-	-
Fathead minnow	0.55	-	-	4.37	-	-	-	8.67	1.60
Freshwater drum	-	-	-	-	-	-	-	-	-
Goldeye	-	-	-	-	-	-	-	-	-
Hornyhead chub	6.29	4.19	3.75	-	-	7.71	-	-	-
Johnny darter	-	1.46	1.87	-	0.61	10.52	1.71	2.67	2.33
Largescale stoneroller	-	-	-	-	-	-	-	-	-
Longnose dace	-	-	-	-	-	-	-	-	0.15
Mississippi silvery	-	-	-	-	-	-	-	-	-
Northern pike	-	0.36	-	-	0.12	0.62	-	-	-
Orangespotted sunfish	-	-	-	-	-	-	-	-	-
Pearl dace	-	-	-	-	-	-	-	-	-

Appendix VI continued. Seining CPUE (#/100m^2) by species and site number in the Red River Basin during 2006 and 2007 surveys. Effort refers to the distance sampled times seine length or stream width (whichever is less). A "P" indicates the species was observed at the site, but was not collected. A (-) indicates the species was not collected at that site. Total individuals and CPUE are reported for each site.

	Site Number, Year, Field Number, and Drainage								
	766 2007 070814_01	767 2007 070816_01	768 2007 070817_01	769 2007 070817_01	1201 2007 070809_01	1202 2007 070815_01	75 2006 060801_01	76 2006 060801_04	77 2006 060801_05
Species	**Forest**	**Forest**	**Forest**	**Forest**	**Forest**	**Forest**	**Turtle**	**Turtle**	**Turtle**
Quillback	-	-	-	-	-	-	-	-	-
River shiner	-	-	-	-	-	-	-	-	-
Rock bass	-	-	-	-	-	-	-	-	-
Sand shiner	-	-	-	-	-	-	117.14	-	25.96
Sauger	-	-	-	-	-	-	-	-	-
Shorthead redhorse	-	-	-	-	-	-	16.00	-	-
Silver chub	-	-	-	-	-	-	-	-	-
Silver redhorse	-	-	-	-	-	-	-	-	-
Smallmouth bass	-	-	-	-	-	-	-	-	-
Spotfin shiner	-	-	-	-	-	-	30.29	-	1.60
Stonecat	-	-	-	-	-	-	-	-	-
Tadpole madtom	19.14	3.46	0.31	-	-	-	-	-	-
Trout-perch	-	-	-	-	-	-	-	-	-
Walleye	-	-	-	-	-	-	-	-	-
White bass	-	-	-	-	-	-	-	-	-
White crappie	-	-	-	-	-	-	-	-	-
White sucker	27.89	4.19	0.31	9.62	5.10	2.29	2.86	39.33	9.04
Yellow bullhead	-	-	-	-	-	-	-	-	-
Yellow perch	4.10	1.09	-	1.75	-	-	-	-	-
Effort (m^2)	365.76	548.64	320.04	114.3	822.96	960.12	175	150	685.8
Total Individuals	935	356	110	20	378	883	299	78	1325
Site CPUE (#/100 m^2)	255.63	64.89	34.37	17.50	45.93	91.97	170.86	52.00	193.21

Appendix VI continued. Seining CPUE (#/100m^2) by species and site number in the Red River Basin during 2006 and 2007 surveys. Effort refers to the distance sampled times seine length or stream width (whichever is less). A "P" indicates the species was observed at the site, but was not collected. A (-) indicates the species was not collected at that site. Total individuals and CPUE are reported for each site.

	Site Number, Year, Field Number, and Drainage								
	77 2007 070711_04	78 2007 070711_02	728 2007 070711_01	729 2007 070711_03	731 2007 070712_03	20 2006 060713_01	220 2006 060802_01	734 2007 070713_01	743 2007 070726_01
Species	**Turtle**	**Turtle**	**Turtle**	**Turtle**	**Turtle**	**Goose**	**Goose**	**Goose**	**Goose**
Banded killifish	-	-	0.94	-	-	-	-	-	-
Bigmouth buffalo	-	-	-	-	0.22	-	-	-	-
Bigmouth shiner	111.11	103.24	-	-	-	-	-	-	-
Black bullhead	-	-	-	-	-	-	-	-	-
Black crappie	-	-	-	-	-	-	-	-	-
Blacknose dace	12.22	-	-	-	-	-	-	20.00	-
Blackside darter	-	0.29	1.25	-	-	-	-	-	-
Bluegill	-	-	-	-	-	-	-	-	-
Bluntnose minnow	-	-	-	-	-	-	-	-	-
Brassy minnow	-	-	-	-	-	-	-	-	-
Brook stickleback	-	-	-	-	-	6.67	-	-	-
Channel catfish	-	-	-	-	0.22	-	1.46	-	-
Chestnut lamprey	-	-	-	-	-	-	-	-	-
Common carp	-	-	4.06	-	6.56	-	-	-	-
Common shiner	424.44	36.16	0.62	8.75	-	1.25	-	60.00	-
Creek chub	20.00	1.75	-	-	-	7.08	-	256.67	5.00
Emerald shiner	-	-	-	-	-	-	0.87	-	-
Fathead minnow	2.22	-	-	-	1.75	5.83	-	-	6.67
Freshwater drum	-	-	-	-	0.66	-	-	-	-
Goldeye	-	-	-	-	-	-	0.29	-	-
Hornyhead chub	-	-	-	-	-	-	-	-	-
Johnny darter	-	0.29	0.94	-	-	32.92	0.29	33.33	-
Largescale stoneroller	-	-	-	-	-	-	-	-	-
Longnose dace	3.33	-	-	-	-	-	-	-	-
Mississippi silvery	-	-	-	-	-	-	-	-	-
Northern pike	-	-	0.31	-	-	-	-	-	-
Orangespotted sunfish	-	-	-	-	-	-	-	-	-
Pearl dace	-	-	-	-	-	-	-	-	-

Appendix VI continued. Seining CPUE (#/100m^2) by species and site number in the Red River Basin during 2006 and 2007 surveys. Effort refers to the distance sampled times seine length or stream width (whichever is less). A "P" indicates the species was observed at the site, but was not collected. A (-) indicates the species was not collected at that site. Total individuals and CPUE are reported for each site.

	Site Number, Year, Field Number, and Drainage								
Species	**77 2007 070711_04 Turtle**	**78 2007 070711_02 Turtle**	**728 2007 070711_01 Turtle**	**729 2007 070711_03 Turtle**	**731 2007 070712_03 Turtle**	**20 2006 060713_01 Goose**	**220 2006 060802_01 Goose**	**734 2007 070713_01 Goose**	**743 2007 070726_01 Goose**
Quillback	-	-	-	-	-	-	-	-	-
River shiner	-	-	-	-	-	-	-	-	-
Rock bass	-	-	-	-	-	-	-	-	-
Sand shiner	95.56	21.58	7.81	2.19	0.22	155.00	4.37	16.67	-
Sauger	-	-	-	-	-	-	-	-	-
Shorthead redhorse	-	-	1.87	-	-	-	0.58	-	-
Silver chub	-	-	-	-	-	-	-	-	-
Silver redhorse	1.11	-	-	-	-	-	-	-	-
Smallmouth bass	-	-	-	-	-	-	-	-	-
Spotfin shiner	-	3.50	10.62	-	2.19	-	9.33	-	-
Stonecat	-	-	-	-	-	-	-	-	-
Tadpole madtom	-	-	-	-	-	-	-	-	-
Trout-perch	-	-	-	-	-	-	5.25	-	-
Walleye	-	-	0.31	-	-	-	-	-	-
White bass	-	-	-	-	-	-	-	-	-
White crappie	-	-	-	-	-	-	-	-	-
White sucker	24.44	11.67	1.25	-	-	30.00	0.29	23.33	-
Yellow bullhead	-	-	-	-	-	-	-	-	-
Yellow perch	-	-	-	-	-	-	-	-	-
Effort (m^2)	90	342.9	320.04	45.72	457.2	240	342.9	30	60
Total Individuals	625	612	96	5	54	573	78	123	7
Site CPUE (#/100 m^2)	694.44	178.48	30.00	10.94	11.81	238.75	22.75	410.00	11.67

Appendix VI continued. Seining CPUE (#/100m^2) by species and site number in the Red River Basin during 2006 and 2007 surveys. Effort refers to the distance sampled times seine length or stream width (whichever is less). A "P" indicates the species was observed at the site, but was not collected. A (-) indicates the species was not collected at that site. Total individuals and CPUE are reported for each site.

	Site Number, Year, Field Number, and Drainage								
	750 2007 070730_04	753 2007 070731_02	744 2007 070726_02	746 2007 070726_04	748 2007 070730_02	51 2006 060816_02	309 2006 060817_01	718 2007 070629_01	770 2007 070821_01
Species	**Goose**	**Goose**	**Elm**	**Elm**	**Elm**	**Maple**	**Maple**	**Maple**	**Maple**
Banded killifish	-	-	-	-	-	-	-	-	-
Bigmouth buffalo	-	-	-	-	-	-	-	-	-
Bigmouth shiner	-	-	-	-	-	1.64	-	-	0.35
Black bullhead	-	-	-	6.71	12.15	-	30.62	-	-
Black crappie	-	-	-	-	-	-	-	-	-
Blacknose dace	-	1.75	-	-	-	-	-	-	-
Blackside darter	-	-	-	-	-	100.07	4.67	-	1.40
Bluegill	-	-	-	-	-	-	-	-	-
Bluntnose minnow	-	-	-	-	-	-	-	-	-
Brassy minnow	-	-	-	-	-	-	-	-	-
Brook stickleback	-	-	50.67	-	-	-	-	-	-
Channel catfish	-	-	-	17.06	2.92	2.73	0.87	-	-
Chestnut lamprey	-	-	-	-	-	-	-	-	-
Common carp	-	-	-	0.58	-	-	1.46	-	-
Common shiner	-	48.99	-	-	-	182.63	-	-	8.40
Creek chub	-	9.84	-	-	0.49	112.64	0.29	-	2.27
Emerald shiner	-	-	-	-	-	-	-	-	-
Fathead minnow	-	13.78	288.89	3.35	-	27.34	114.03	1.33	26.42
Freshwater drum	-	-	-	-	-	-	-	-	-
Goldeye	-	-	-	-	-	-	-	-	-
Hornyhead chub	-	-	-	-	-	-	-	-	-
Johnny darter	-	2.19	-	1.60	-	-	-	-	-
Largescale stoneroller	-	-	-	-	-	-	-	-	-
Longnose dace	-	-	-	-	-	-	-	-	-
Mississippi silvery	-	-	-	-	-	-	-	-	-
Northern pike	-	-	-	-	-	-	-	1.33	P
Orangespotted sunfish	-	-	-	-	-	-	-	-	-
Pearl dace	-	-	-	-	-	-	-	-	-

Appendix VI continued. Seining CPUE (#/100m^2) by species and site number in the Red River Basin during 2006 and 2007 surveys. Effort refers to the distance sampled times seine length or stream width (whichever is less). A "P" indicates the species was observed at the site, but was not collected. A (-) indicates the species was not collected at that site. Total individuals and CPUE are reported for each site.

	Site Number, Year, Field Number, and Drainage								
	750 2007 070730_04	**753 2007 070731_02**	**744 2007 070726_02**	**746 2007 070726_04**	**748 2007 070730_02**	**51 2006 060816_02**	**309 2006 060817_01**	**718 2007 070629_01**	**770 2007 070821_01**
Species	**Goose**	**Goose**	**Elm**	**Elm**	**Elm**	**Maple**	**Maple**	**Maple**	**Maple**
Quillback	-	-	-	-	-	-	-	-	-
River shiner	-	-	-	-	-	-	-	-	-
Rock bass	-	-	-	-	-	-	-	-	-
Sand shiner	-	39.37	-	10.94	7.78	309.49	5.25	-	16.97
Sauger	-	-	-	-	-	-	-	-	-
Shorthead redhorse	-	-	-	0.58	-	12.03	0.29	-	-
Silver chub	-	-	-	-	-	-	-	-	-
Silver redhorse	-	-	-	-	-	-	-	-	-
Smallmouth bass	-	-	-	-	-	-	-	-	-
Spotfin shiner	5.69	-	-	9.92	-	-	-	6.67	2.10
Stonecat	-	-	-	-	-	-	-	-	-
Tadpole madtom	-	-	-	1.75	3.89	-	2.92	-	-
Trout-perch	0.44	-	-	-	-	4.92	0.87	-	1.57
Walleye	-	-	-	-	-	-	-	-	-
White bass	-	-	-	-	-	-	-	-	-
White crappie	-	-	-	-	-	-	-	-	-
White sucker	-	24.06	-	0.44	2.92	121.94	5.83	-	4.20
Yellow bullhead	-	-	-	-	-	-	-	-	-
Yellow perch	-	-	-	-	-	-	-	-	-
Effort (m^2)	228.6	457.2	112.5	685.8	205.74	182.88	342.9	75	571.5
Total Individuals	14	640	382	363	62	1601	573	7	364
Site CPUE (#/100 m^2)	6.12	139.98	339.56	52.93	30.14	875.44	167.10	9.33	63.69

Appendix VI continued. Seining CPUE (#/100m^2) by species and site number in the Red River Basin during 2006 and 2007 surveys. Effort refers to the distance sampled times seine length or stream width (whichever is less). A "P" indicates the species was observed at the site, but was not collected. A (-) indicates the species was not collected at that site. Total individuals and CPUE are reported for each site.

	Site Number, Year, Field Number, and Drainage								
Species	772 2007 070822_01 Maple	773 2007 070822_02 Maple	25 2006 060815_05 Sheyenne	222 2006 060811_03 Sheyenne	223 2006 060811_04 Sheyenne	301 2006 060815_02 Sheyenne	302 2006 060815_03 Sheyenne	304 2006 060816_03 Sheyenne	305 2006 060816_04 Sheyenne
Banded killifish	-	-	-	-	-	-	-	-	-
Bigmouth buffalo	-	-	-	-	-	-	-	-	-
Bigmouth shiner	0.82	-	2.62	-	-	-	-	-	-
Black bullhead	-	-	-	-	-	-	-	-	-
Black crappie	-	-	-	-	-	-	-	-	-
Blacknose dace	-	-	-	-	-	-	-	-	-
Blackside darter	1.09	0.52	-	-	-	-	-	0.66	8.31
Bluegill	-	-	-	-	-	-	-	-	-
Bluntnose minnow	-	-	-	1.46	0.15	0.55	31.93	10.28	12.03
Brassy minnow	-	-	0.44	-	0.15	-	-	-	-
Brook stickleback	-	-	-	-	-	-	-	-	-
Channel catfish	1.37	4.02	10.94	-	0.15	4.16	5.25	12.90	2.19
Chestnut lamprey	-	-	-	-	-	-	-	-	-
Common carp	0.27	-	-	-	-	-	-	-	-
Common shiner	15.31	-	-	-	-	0.55	-	4.59	12.25
Creek chub	1.64	-	-	-	-	0.87	0.44	-	1.53
Emerald shiner	-	-	-	-	-	-	-	1.53	-
Fathead minnow	46.75	0.17	10.94	-	5.54	2.19	5.25	-	0.44
Freshwater drum	-	-	-	-	-	-	-	-	-
Goldeye	-	-	-	-	-	-	-	-	-
Hornyhead chub	-	-	-	-	-	-	-	-	-
Johnny darter	-	-	-	-	-	0.44	-	0.66	3.50
Largescale stoneroller	-	-	-	-	-	-	-	-	-
Longnose dace	-	-	-	-	-	0.77	-	-	14.44
Mississippi silvery	-	-	0.44	-	-	0.11	-	-	-
Northern pike	-	-	-	-	-	-	0.44	-	0.22
Orangespotted sunfish	-	-	0.44	-	-	-	-	2.41	-
Pearl dace	-	-	-	-	-	0.22	-	-	-

Appendix VI continued. Seining CPUE (#/100m^2) by species and site number in the Red River Basin during 2006 and 2007 surveys. Effort refers to the distance sampled times seine length or stream width (whichever is less). A "P" indicates the species was observed at the site, but was not collected. A (-) indicates the species was not collected at that site. Total individuals and CPUE are reported for each site.

	Site Number, Year, Field Number, and Drainage								
Species	**772 2007 070822_01 Maple**	**773 2007 070822_02 Maple**	**25 2006 060815_05 Sheyenne**	**222 2006 060811_03 Sheyenne**	**223 2006 060811_04 Sheyenne**	**301 2006 060815_02 Sheyenne**	**302 2006 060815_03 Sheyenne**	**304 2006 060816_03 Sheyenne**	**305 2006 060816_04 Sheyenne**
Quillback	-	-	-	-	-	-	-	-	-
River shiner	-	-	17.06	-	-	-	-	17.28	2.41
Rock bass	-	-	-	-	-	-	-	-	-
Sand shiner	119.75	4.72	3.50	-	0.58	14.76	0.87	10.72	36.75
Sauger	-	-	-	-	-	-	-	-	-
Shorthead redhorse	0.82	0.35	-	-	-	0.77	7.44	1.09	2.19
Silver chub	-	-	-	-	-	-	-	-	-
Silver redhorse	1.09	-	-	-	-	-	-	-	-
Smallmouth bass	-	-	-	-	-	-	-	-	-
Spotfin shiner	20.51	17.85	45.49	29.16	16.33	19.58	123.80	20.34	5.25
Stonecat	-	-	-	-	-	-	-	-	-
Tadpole madtom	-	-	-	-	-	-	-	-	5.91
Trout-perch	6.56	1.05	-	-	-	0.11	-	4.16	1.31
Walleye	-	-	-	-	-	-	-	-	-
White bass	-	-	-	-	-	-	-	-	-
White crappie	-	-	-	-	-	-	-	-	-
White sucker	6.01	-	0.44	-	-	2.73	1.31	5.47	1.97
Yellow bullhead	-	-	-	-	-	-	-	-	-
Yellow perch	-	-	-	-	-	-	-	-	-
Effort (m^2)	365.76	571.5	228.6	68.58	685.8	914.4	228.6	457.2	457.2
Total Individuals	812	164	211	21	157	437	404	421	506
Site CPUE (#/100 m^2)	222.00	28.70	92.30	30.62	22.89	47.79	176.73	92.08	110.67

Appendix VI continued. Seining CPUE (#/100m^2) by species and site number in the Red River Basin during 2006 and 2007 surveys. Effort refers to the distance sampled times seine length or stream width (whichever is less). A "P" indicates the species was observed at the site, but was not collected. A (-) indicates the species was not collected at that site. Total individuals and CPUE are reported for each site.

	Site Number, Year, Field Number, and Drainage								
Species	308 2006 060816_07 Sheyenne	713 2007 070628_01 Sheyenne	714 2007 070628_02 Sheyenne	721 2007 070630_01 Sheyenne	722 2007 070630_02 Sheyenne	29 2006 060811_02 Wild Rice	221 2006 060811_01 Wild Rice	310 2006 060817_02 Wild Rice	311 2006 060817_03 Wild Rice
Banded killifish	-	-	-	-	-	-	-	-	-
Bigmouth buffalo	-	-	-	-	-	-	-	-	-
Bigmouth shiner	-	-	-	-	-	-	-	-	-
Black bullhead	-	0.22	4.37	-	-	6.34	0.15	9.62	223.10
Black crappie	-	-	-	-	-	-	2.62	-	-
Blacknose dace	-	-	-	-	14.76	-	-	-	-
Blackside darter	2.19	-	1.09	-	10.48	-	-	-	-
Bluegill	-	-	-	-	-	-	-	-	-
Bluntnose minnow	0.62	-	-	-	-	-	-	-	-
Brassy minnow	-	-	-	-	-	-	-	-	-
Brook stickleback	-	-	-	-	-	-	-	-	-
Channel catfish	-	-	-	-	-	-	-	-	-
Chestnut lamprey	-	-	-	-	-	-	-	-	-
Common carp	-	-	-	-	-	0.44	0.73	-	-
Common shiner	-	-	10.94	-	24.29	-	-	-	-
Creek chub	-	0.22	42.65	-	3.33	-	-	-	-
Emerald shiner	-	-	-	-	-	-	-	-	-
Fathead minnow	-	0.44	967.85	-	0.95	-	5.25	-	-
Freshwater drum	-	-	-	-	-	-	-	-	-
Goldeye	-	-	-	-	-	-	-	-	-
Hornyhead chub	-	-	-	-	-	-	-	-	-
Johnny darter	0.31	-	-	-	-	-	-	0.87	0.87
Largescale stoneroller	-	-	-	-	-	-	-	-	-
Longnose dace	-	-	-	-	-	-	-	-	-
Mississippi silvery	-	-	-	-	-	-	-	-	-
Northern pike	-	6.12	5.47	-	1.43	-	-	-	-
Orangespotted sunfish	-	-	2.19	-	-	-	-	55.12	5.25
Pearl dace	-	-	-	-	-	-	-	-	-

Appendix VI continued. Seining CPUE (#/100m^2) by species and site number in the Red River Basin during 2006 and 2007 surveys. Effort refers to the distance sampled times seine length or stream width (whichever is less). A "P" indicates the species was observed at the site, but was not collected. A (-) indicates the species was not collected at that site. Total individuals and CPUE are reported for each site.

	Site Number, Year, Field Number, and Drainage								
Species	**308 2006 060816_07 Sheyenne**	**713 2007 070628_01 Sheyenne**	**714 2007 070628_02 Sheyenne**	**721 2007 070630_01 Sheyenne**	**722 2007 070630_02 Sheyenne**	**29 2006 060811_02 Wild Rice**	**221 2006 060811_01 Wild Rice**	**310 2006 060817_02 Wild Rice**	**311 2006 060817_03 Wild Rice**
Quillback	-	-	-	-	-	-	-	-	0.87
River shiner	7.19	-	-	-	-	-	-	-	-
Rock bass	-	-	-	-	-	-	-	-	-
Sand shiner	9.69	-	2.19	-	5.71	-	-	18.37	5.25
Sauger	-	-	-	-	-	-	-	-	-
Shorthead redhorse	4.37	-	-	-	-	-	-	0.87	-
Silver chub	-	-	-	-	-	-	-	-	-
Silver redhorse	-	-	-	-	-	-	-	-	-
Smallmouth bass	1.25	-	-	-	-	-	-	-	-
Spotfin shiner	11.56	-	91.86	-	-	-	-	7.87	1.75
Stonecat	-	-	-	-	-	-	-	-	-
Tadpole madtom	0.31	-	1.09	-	-	-	-	0.44	-
Trout-perch	0.94	-	1.09	-	-	-	-	-	-
Walleye	-	-	-	-	-	-	0.29	-	-
White bass	-	-	-	-	-	-	-	-	-
White crappie	-	-	-	-	-	-	-	-	-
White sucker	0.62	-	453.85	-	2.86	-	0.15	2.19	4.37
Yellow bullhead	-	-	-	-	-	-	-	-	-
Yellow perch	-	-	-	-	-	-	0.58	-	-
Effort (m^2)	320.04	457.2	91.44	75	210	457.2	685.8	228.6	114.3
Total Individuals	125	32	1449	0	134	31	67	218	276
Site CPUE (#/100 m^2)	39.06	7.00	1584.65	0.00	63.81	6.78	9.77	95.36	241.47

Appendix VI continued. Seining CPUE (#/100m^2) by species and site number in the Red River Basin during 2006 and 2007 surveys. Effort refers to the distance sampled times seine length or stream width (whichever is less). A "P" indicates the species was observed at the site, but was not collected. A (-) indicates the species was not collected at that site. Total individuals and CPUE are reported for each site.

	Site Number, Year, Field Number, and Drainage								
Species	739 2007 070724_03 Wild Rice	740 2007 070724_04 Wild Rice	742 2007 070725_03 Wild Rice	736 2007 070724_01 Bois de	764 2007 070809_02 Bois de	765 2007 070809_03 Bois de	774 2007 070823_01 Bois de	800 2007 070831_02 Red River	801 2007 070828_01 Red River
Banded killifish	-	-	-	-	-	-	-	-	-
Bigmouth buffalo	-	-	-	0.60	-	-	-	-	-
Bigmouth shiner	-	-	-	-	-	0.08	P	-	-
Black bullhead	39.73	49.65	4.48	28.54	4.69	0.33	10.50	-	-
Black crappie	1.09	-	0.11	0.55	0.08	-	P	-	-
Blacknose dace	-	-	-	-	-	-	-	-	-
Blackside darter	-	-	-	-	-	-	-	-	-
Bluegill	-	-	-	0.11	0.23	0.08	-	-	-
Bluntnose minnow	-	-	-	-	-	-	-	-	-
Brassy minnow	-	-	-	-	-	-	-	-	-
Brook stickleback	-	-	-	-	-	-	-	-	-
Channel catfish	3.65	-	-	0.93	2.81	0.33	P	0.22	-
Chestnut lamprey	-	-	-	0.05	-	-	-	-	-
Common carp	12.03	18.37	0.87	5.09	2.58	1.42	0.50	-	-
Common shiner	-	-	-	-	-	-	-	-	-
Creek chub	-	-	-	-	-	-	0.12	-	-
Emerald shiner	-	-	-	2.90	9.14	0.83	5.12	0.11	1.09
Fathead minnow	47.39	99.30	-	0.05	0.55	0.25	4.37	-	-
Freshwater drum	0.36	-	-	1.09	0.78	-	-	-	-
Goldeye	-	-	-	-	-	-	-	-	-
Hornyhead chub	-	-	-	-	-	-	-	-	-
Johnny darter	-	-	-	-	-	-	-	-	-
Largescale stoneroller	-	-	-	-	-	-	-	-	-
Longnose dace	-	-	-	-	-	-	-	-	-
Mississippi silvery	-	-	-	-	-	-	-	-	-
Northern pike	0.36	-	-	P	0.08	-	-	-	-
Orangespotted sunfish	-	-	-	0.22	0.55	0.33	-	-	-
Pearl dace	-	-	-	-	-	-	-	-	-

Appendix VI continued. Seining CPUE (#/100m^2) by species and site number in the Red River Basin during 2006 and 2007 surveys. Effort refers to the distance sampled times seine length or stream width (whichever is less). A "P" indicates the species was observed at the site, but was not collected. A (-) indicates the species was not collected at that site. Total individuals and CPUE are reported for each site.

	Site Number, Year, Field Number, and Drainage								
Species	**739 2007 070724_03 Wild Rice**	**740 2007 070724_04 Wild Rice**	**742 2007 070725_03 Wild Rice**	**736 2007 070724_01 Bois de**	**764 2007 070809_02 Bois de**	**765 2007 070809_03 Bois de**	**774 2007 070823_01 Bois de**	**800 2007 070831_02 Red River**	**801 2007 070828_01 Red River**
Quillback	1.82	87.05	-	0.38	-	-	-	-	-
River shiner	-	-	-	-	-	-	-	-	-
Rock bass	-	-	-	-	-	-	-	-	-
Sand shiner	2.55	-	-	0.71	0.55	2.25	10.37	-	-
Sauger	-	-	-	-	0.08	-	-	-	-
Shorthead redhorse	-	-	-	-	-	0.17	-	0.11	-
Silver chub	-	-	-	-	-	-	-	-	3.28
Silver redhorse	-	-	-	-	0.16	-	-	-	-
Smallmouth bass	-	-	-	-	-	-	-	-	-
Spotfin shiner	17.86	0.87	-	0.55	1.80	4.17	11.75	7.66	10.94
Stonecat	-	-	-	P	-	-	-	-	1.09
Tadpole madtom	-	-	-	-	-	-	-	-	-
Trout-perch	-	-	-	-	-	-	-	-	-
Walleye	-	-	-	0.05	-	-	-	-	-
White bass	-	-	-	5.69	1.56	2.08	2.50	-	-
White crappie	-	-	-	0.11	-	-	-	-	-
White sucker	-	0.22	-	-	-	-	-	-	-
Yellow bullhead	-	-	-	0.05	-	-	-	-	-
Yellow perch	-	-	-	-	-	-	-	-	-
Effort (m^2)	274.32	457.2	914.4	1828.8	1280.16	1200	800.1	914.4	91.44
Total Individuals	348	1168	50	872	328	148	362	74	15
Site CPUE (#/100 m^2)	126.86	255.47	5.47	47.68	25.62	12.33	45.24	8.09	16.40

Appendix VII. Backpack electrofishing CPUE (#/minute) by species and site number in the Red River Basin during 2006 and 2007 surveys. Total individuals and CPUE are reported for each site. A "P" indicates the species was observed at the site, but was not collected. A (-) indicates the species was not collected at that site.

	Site Number, Year, Field Number, and Drainage						
	36 2006 060718_05	65 2006 060726_04	706 2007 070612_01	9 2007 070613_01	61 2006 060726_02	707 2007 070613_02	708 2007 070613_03
Species	**Pembina**	**Pembina**	**Pembina**	**Tongue**	**Tongue**	**Tongue**	**Tongue**
Bigmouth buffalo	-	-	-	-	-	-	-
Bigmouth shiner	0.59	0.91	0.47	-	-	-	-
Black bullhead	-	-	-	0.04	0.30	-	-
Black crappie	-	-	-	0.08	-	0.55	-
Blacknose dace	1.08	9.31	2.41	0.70	-	0.27	0.63
Blackside darter	-	-	0.05	-	-	-	0.06
Bluegill	-	-	-	-	-	-	-
Bluntnose minnow	-	-	-	-	-	-	-
Brassy minnow	-	-	0.09	-	-	-	-
Brook stickleback	-	-	-	0.08	-	-	0.23
Central mudminnow	-	-	-	-	-	-	0.34
Channel catfish	-	-	-	-	0.10	-	-
Common carp	-	-	-	-	0.15	-	-
Common shiner	7.84	0.65	4.30	0.35	0.15	1.92	0.80
Creek chub	6.67	2.20	2.31	0.86	-	0.55	0.23
Fathead minnow	-	0.65	3.07	0.43	0.30	-	1.66
Freshwater drum	-	-	-	-	-	-	-
Green sunfish	-	-	-	-	-	-	-
Hornyhead chub	-	-	-	-	-	-	-
Iowa darter	-	-	-	-	-	-	-
Johnny darter	0.29	1.42	0.14	0.16	0.05	-	0.11
Largescale stoneroller	-	-	-	-	-	-	-
Longnose dace	2.35	0.26	0.57	-	0.05	-	-
Northern pike	-	-	-	-	0.10	-	-
Northern redbelly dace	-	-	-	-	-	-	-
Pearl dace	-	-	-	-	-	-	0.23
Quillback	-	-	-	-	-	-	-
Rock bass	-	-	-	-	-	-	-
Sand shiner	-	-	-	-	2.23	-	-
Shorthead redhorse	0.10	0.78	-	-	0.15	-	-
Spotfin shiner	-	-	-	-	1.94	-	-
Stonecat	-	-	-	-	0.05	-	-
Tadpole madtom	-	-	-	-	0.40	-	-
Trout-perch	-	-	-	-	0.05	-	-
Walleye	-	-	-	-	0.05	-	-
White sucker	0.29	0.65	1.46	0.70	-	-	0.06
Yellow bullhead	-	-	-	-	-	-	-
Yellow perch	-	-	-	0.08	-	-	0.11
Effort (seconds)	612	464	1271	1536	1209	219	1049
Total Individuals	196	130	315	89	122	12	78
Site CPUE	19.22	16.81	14.87	3.48	6.05	3.29	4.46

* Indicates a site where effort was estimated based off another site with similar stream

Appendix VII continued. Backpack electrofishing CPUE (#/minute) by species and site number in the Red River Basin during 2006 and 2007 surveys. Total individuals and CPUE are reported for each site. A "P" indicates the species was observed at the site, but was not collected. A (-) indicates the species was not collected at that site.

	Site Number, Year, Field Number, and Drainage						
	708 2007 070712_02	6 2006 060718_02	7 2006 060726_05	7 2007 070613_04	8 2006 060718_03	8 2007 070712_01	41 2006 060720_04
Species	**Tongue**	**Park**	**Park**	**Park**	**Park**	**Park**	**Park**
Bigmouth buffalo	-	-	-	-	-	-	-
Bigmouth shiner	-	0.04	-	-	-	-	-
Black bullhead	-	-	-	-	-	-	-
Black crappie	-	-	-	-	-	-	-
Blacknose dace	0.49	2.94	5.63	2.00	7.96	3.12	5.62
Blackside darter	0.05	0.35	-	-	-	-	-
Bluegill	-	-	-	-	-	-	-
Bluntnose minnow	-	-	-	-	-	-	-
Brassy minnow	-	-	-	-	-	-	-
Brook stickleback	0.39	-	1.28	-	-	0.08	-
Central mudminnow	0.05	-	-	-	-	-	-
Channel catfish	-	-	-	-	-	-	-
Common carp	-	-	-	-	-	-	-
Common shiner	0.59	5.99	3.60	0.77	1.21	0.15	1.66
Creek chub	0.69	1.59	4.58	0.27	2.63	0.90	9.67
Fathead minnow	0.79	0.11	-	0.53	-	0.45	1.87
Freshwater drum	-	-	-	-	-	-	-
Green sunfish	-	-	-	-	-	-	-
Hornyhead chub	-	0.46	-	-	-	-	0.10
Iowa darter	-	-	-	-	-	-	-
Johnny darter	0.44	1.31	0.83	0.27	0.61	0.64	0.73
Largescale stoneroller	-	-	-	-	-	-	-
Longnose dace	-	3.61	-	-	0.07	-	-
Northern pike	-	-	-	-	-	-	-
Northern redbelly dace	-	-	-	-	-	-	-
Pearl dace	-	-	-	-	0.07	0.19	-
Quillback	-	-	-	-	-	-	-
Rock bass	-	-	-	-	-	-	-
Sand shiner	-	-	-	-	-	-	-
Shorthead redhorse	-	-	-	-	-	-	-
Spotfin shiner	-	-	-	-	-	-	-
Stonecat	-	-	-	-	-	-	-
Tadpole madtom	-	-	-	-	-	-	-
Trout-perch	-	-	-	-	-	-	-
Walleye	-	-	-	-	-	-	-
White sucker	0.35	0.25	1.73	0.37	2.43	0.08	2.29
Yellow bullhead	-	-	-	-	-	-	-
Yellow perch	0.05	-	-	-	-	-	-
Effort (seconds)	1217	1693	800	1803	889	1598	577
Total Individuals	79	470	235	126	222	149	211
Site CPUE (#/minute)	3.89	16.66	17.63	4.19	14.98	5.59	21.94

* Indicates a site where effort was estimated based off another site with similar stream characteristics.

Appendix VII continued. Backpack electrofishing CPUE (#/minute) by species and site number in the Red River Basin during 2006 and 2007 surveys. Total individuals and CPUE are reported for each site. A "P" indicates the species was observed at the site, but was not collected. A (-) indicates the species was not collected at that site.

	Site Number, Year, Field Number, and Drainage						
	67 2006 060727_03	702 2007 070605_02	703 2007 070605_03	704 2007 070605_04	705 2007 070606_02	709 2007 070614_01	58 2007 070802_03
Species	**Park**	**Park**	**Park**	**Park**	**Park**	**Park**	**Forest**
Bigmouth buffalo	-	-	-	-	-	-	-
Bigmouth shiner	-	0.22	-	1.04	-	-	-
Black bullhead	-	-	-	-	-	-	-
Black crappie	-	-	-	-	-	-	-
Blacknose dace	-	3.02	1.73	4.76	-	-	-
Blackside darter	0.23	-	-	-	-	-	0.19
Bluegill	-	-	-	-	-	-	-
Bluntnose minnow	-	-	-	-	-	-	0.47
Brassy minnow	-	-	-	-	-	-	-
Brook stickleback	-	0.11	-	-	0.22	-	-
Central mudminnow	-	-	-	-	-	-	-
Channel catfish	-	-	-	-	-	-	-
Common carp	-	-	-	-	-	-	-
Common shiner	0.11	4.99	-	1.89	-	-	2.44
Creek chub	0.57	0.55	0.24	1.83	-	0.17	0.75
Fathead minnow	-	12.83	1.18	6.07	0.15	0.17	-
Freshwater drum	-	-	-	-	-	-	-
Green sunfish	-	-	-	-	-	-	-
Hornyhead chub	-	-	-	-	-	-	-
Iowa darter	-	-	-	-	-	-	-
Johnny darter	0.57	1.15	-	0.13	-	-	0.47
Largescale stoneroller	-	-	-	-	-	-	-
Longnose dace	-	-	-	-	-	-	-
Northern pike	-	-	-	-	-	-	-
Northern redbelly dace	-	-	-	-	-	-	-
Pearl dace	-	-	-	-	-	-	-
Quillback	-	-	-	-	-	-	-
Rock bass	-	-	-	-	-	-	-
Sand shiner	-	-	-	-	-	-	-
Shorthead redhorse	-	-	-	-	-	-	-
Spotfin shiner	-	-	-	-	-	-	-
Stonecat	-	-	-	-	-	-	-
Tadpole madtom	-	-	-	-	-	-	0.19
Trout-perch	-	-	-	-	-	-	-
Walleye	-	-	-	-	-	-	-
White sucker	0.57	0.66	-	0.85	-	0.35	-
Yellow bullhead	-	-	-	-	-	-	-
Yellow perch	-	-	-	-	-	-	-
Effort (seconds)	524	1094	763	920	821	346	640
Total Individuals	18	429	40	254	5	4	48
Site CPUE (#/minute)	2.06	23.53	3.15	16.57	0.37	0.69	4.50

* Indicates a site where effort was estimated based off another site with similar stream characteristics.

Appendix VII continued. Backpack electrofishing CPUE (#/minute) by species and site number in the Red River Basin during 2006 and 2007 surveys. Total individuals and CPUE are reported for each site. A "P" indicates the species was observed at the site, but was not collected. A (-) indicates the species was not collected at that site.

	Site Number, Year, Field Number, and Drainage						
	71 2007 070806_01	208 2007 070808_03	757 2007 070801_03	759 2007 070802_02	760 2007 070803_02	761 2007 070807_01	766 2007 070814_01
Species	**Forest**	**Forest**	**Forest**	**Forest**	**Forest**	**Forest**	**Forest**
Bigmouth buffalo	-	-	-	-	-	-	-
Bigmouth shiner	-	0.37	-	-	-	0.24	-
Black bullhead	-	-	-	0.04	-	-	-
Black crappie	-	-	-	-	0.19	-	-
Blacknose dace	-	1.42	-	-	-	0.60	4.77
Blackside darter	0.24	0.31	-	0.09	-	0.36	0.92
Bluegill	-	-	-	-	-	-	16.92
Bluntnose minnow	-	0.19	-	-	-	0.53	0.31
Brassy minnow	-	-	-	-	-	-	-
Brook stickleback	-	-	-	-	0.04	-	-
Central mudminnow	-	-	-	-	-	-	-
Channel catfish	-	-	-	-	-	-	-
Common carp	-	-	-	-	-	-	-
Common shiner	-	1.11	-	-	-	6.79	1.23
Creek chub	-	1.86	-	-	21.87	1.74	10.31
Fathead minnow	-	-	15.97	-	214.71	-	0.15
Freshwater drum	-	-	-	-	-	-	-
Green sunfish	-	-	-	-	-	-	-
Hornyhead chub	0.48	0.12	-	0.13	-	1.00	3.85
Iowa darter	-	-	-	-	-	-	-
Johnny darter	3.81	0.31	0.10	0.04	-	0.58	0.62
Largescale stoneroller	-	-	-	-	-	0.52	-
Longnose dace	0.48	0.56	-	-	-	2.08	0.46
Northern pike	1.43	0.06	0.19	0.17	0.07	0.05	-
Northern redbelly dace	-	-	-	-	-	-	-
Pearl dace	-	-	-	-	-	-	-
Quillback	-	-	-	-	-	-	-
Rock bass	-	-	-	-	-	0.07	-
Sand shiner	-	-	-	-	-	-	-
Shorthead redhorse	-	-	-	-	-	-	-
Spotfin shiner	-	-	-	-	-	-	-
Stonecat	-	-	-	-	-	-	-
Tadpole madtom	0.48	0.12	-	0.26	-	1.03	0.46
Trout-perch	-	-	-	-	-	-	-
Walleye	-	-	0.10	-	-	-	-
White sucker	-	0.50	1.45	1.00	63.61	0.28	9.23
Yellow bullhead	-	-	-	-	-	-	-
Yellow perch	-	-	0.48	0.96	0.11	-	2.15
Effort (seconds)	252	969	620	1374	1613*	3490	390*
Total Individuals	29	112	189	62	8081	923	334
Site CPUE (#/minute)	6.90	6.93	18.29	2.71	300.60	15.87	51.38

* Indicates a site where effort was estimated based off another site with similar stream characteristics.

Appendix VII continued. Backpack electrofishing CPUE (#/minute) by species and site number in the Red River Basin during 2006 and 2007 surveys. Total individuals and CPUE are reported for each site. A "P" indicates the species was observed at the site, but was not collected. A (-) indicates the species was not collected at that site.

	Site Number, Year, Field Number, and Drainage						
	767 2007 070816_01	768 2007 070817_01	769 2007 070817_01	1201 2007 070809_01	729 2007 070711_03	730 2007 070711_05	733 2007 070712_05
Species	**Forest**	**Forest**	**Forest**	**Forest**	**Turtle**	**Turtle**	**Turtle**
Bigmouth buffalo	-	-	-	-	-	-	-
Bigmouth shiner	-	-	-	-	0.78	-	-
Black bullhead	-	-	-	-	-	-	0.11
Black crappie	-	-	-	-	-	-	-
Blacknose dace	0.14	1.34	-	-	1.01	3.55	-
Blackside darter	0.05	0.28	-	0.55	0.47	0.61	-
Bluegill	-	-	-	-	-	-	-
Bluntnose minnow	-	0.07	-	0.03	-	-	-
Brassy minnow	-	-	-	-	-	-	-
Brook stickleback	-	-	-	-	-	0.12	0.21
Central mudminnow	-	-	-	-	-	-	-
Channel catfish	-	-	-	-	-	-	-
Common carp	-	-	-	-	-	-	5.14
Common shiner	0.23	3.03	-	0.31	1.24	5.27	-
Creek chub	0.27	1.34	0.24	0.62	0.78	2.69	0.11
Fathead minnow	-	-	0.36	-	-	-	-
Freshwater drum	-	-	-	-	-	-	-
Green sunfish	-	-	-	-	-	-	-
Hornyhead chub	-	1.97	-	0.07	-	-	-
Iowa darter	-	-	-	-	-	-	-
Johnny darter	0.05	0.35	-	1.16	0.54	1.22	0.43
Largescale stoneroller	-	0.28	-	-	-	-	-
Longnose dace	0.05	0.28	-	-	0.23	-	-
Northern pike	-	-	0.12	0.03	-	P	-
Northern redbelly dace	-	-	-	-	-	-	-
Pearl dace	-	-	-	-	-	-	-
Quillback	-	-	-	-	-	-	0.11
Rock bass	-	-	-	-	-	-	-
Sand shiner	-	-	-	-	1.79	0.61	0.11
Shorthead redhorse	-	-	-	-	-	-	-
Spotfin shiner	-	-	-	-	-	-	0.11
Stonecat	-	-	-	-	-	-	-
Tadpole madtom	0.05	2.18	-	-	-	0.12	-
Trout-perch	-	-	-	-	-	-	-
Walleye	-	-	-	-	-	-	-
White sucker	0.05	0.07	1.32	0.24	0.78	0.24	0.11
Yellow bullhead	-	-	-	-	-	-	-
Yellow perch	0.05	-	-	-	-	-	-
Effort (seconds)	1318	852	1000*	1756	772	490	560
Total Individuals	20	159	34	88	98	118	60
Site CPUE (#/minute)	0.91	11.20	2.04	3.01	7.62	14.45	6.43

* Indicates a site where effort was estimated based off another site with similar stream characteristics.

Appendix VII continued. Backpack electrofishing CPUE (#/minute) by species and site number in the Red River Basin during 2006 and 2007 surveys. Total individuals and CPUE are reported for each site. A "P" indicates the species was observed at the site, but was not collected. A (-) indicates the species was not collected at that site.

	Site Number, Year, Field Number, and Drainage						
	734 2007 070713_01	735 2007 070713_02	751 2007 070730_05	752 2007 070731_01	745 2007 070726_03	747 2007 070730_01	748 2007 070730_02
Species	**Goose**	**Goose**	**Goose**	**Goose**	**Elm**	**Elm**	**Elm**
Bigmouth buffalo	-	-	-	-	-	-	-
Bigmouth shiner	-	-	-	-	-	-	-
Black bullhead	-	-	-	-	-	-	-
Black crappie	-	-	-	-	-	-	-
Blacknose dace	5.76	1.33	-	5.13	-	-	-
Blackside darter	-	-	0.20	0.41	-	-	-
Bluegill	0.26	-	-	-	-	-	-
Bluntnose minnow	-	-	-	-	-	-	-
Brassy minnow	-	-	-	-	-	-	-
Brook stickleback	-	-	-	-	11.80	-	-
Central mudminnow	-	-	-	-	-	-	-
Channel catfish	-	-	-	-	-	-	-
Common carp	-	-	-	-	-	0.29	-
Common shiner	3.67	1.18	1.02	0.73	-	-	-
Creek chub	8.12	1.57	0.41	2.66	-	-	-
Fathead minnow	1.05	2.12	3.06	1.88	4.00	2.35	-
Freshwater drum	-	-	-	-	-	-	-
Green sunfish	-	-	-	-	-	-	-
Hornyhead chub	-	-	-	-	-	-	-
Iowa darter	-	-	-	-	-	-	-
Johnny darter	1.44	2.04	-	0.50	-	0.29	-
Largescale stoneroller	-	-	-	-	-	-	-
Longnose dace	-	-	-	-	-	-	-
Northern pike	0.39	-	-	-	-	-	-
Northern redbelly dace	-	-	-	-	-	-	-
Pearl dace	-	-	-	-	-	-	-
Quillback	-	-	-	-	-	-	-
Rock bass	-	-	-	-	-	-	-
Sand shiner	0.26	0.08	-	0.55	-	2.49	-
Shorthead redhorse	-	-	-	-	-	-	-
Spotfin shiner	-	-	-	-	-	0.29	2.50
Stonecat	-	-	-	-	-	-	-
Tadpole madtom	-	-	-	0.09	-	0.44	-
Trout-perch	-	-	-	-	-	-	-
Walleye	-	-	-	-	-	-	-
White sucker	3.93	1.02	-	1.42	-	-	-
Yellow bullhead	-	-	-	-	-	-	-
Yellow perch	-	-	-	-	-	-	-
Effort (seconds)	458	765	294	1309	600	409	120
Total Individuals	190	119	23	292	158	42	5
Site CPUE (#/minute)	24.89	9.33	4.69	13.38	15.80	6.16	2.50

* Indicates a site where effort was estimated based off another site with similar stream characteristics.

Appendix VII continued. Backpack electrofishing CPUE (#/minute) by species and site number in the Red River Basin during 2006 and 2007 surveys. Total individuals and CPUE are reported for each site. A "P" indicates the species was observed at the site, but was not collected. A (-) indicates the species was not collected at that site.

	Site Number, Year, Field Number, and Drainage						
	749 2007 070730_03	719 2007 070629_02	772 2007 070822_01	224 2006 060815_01	303 2006 060815_04	306 2006 060816_05	710 2007 070627_01
Species	**Elm**	**Maple**	**Maple**	**Sheyenne**	**Sheyenne**	**Sheyenne**	**Sheyenne**
Bigmouth buffalo	-	-	-	-	-	-	-
Bigmouth shiner	-	-	-	-	-	-	-
Black bullhead	-	-	-	-	-	-	-
Black crappie	-	-	-	-	-	-	-
Blacknose dace	-	-	-	0.07	0.12	3.73	-
Blackside darter	-	-	0.89	-	-	-	-
Bluegill	-	-	-	0.51	-	-	-
Bluntnose minnow	-	-	-	-	-	-	-
Brassy minnow	-	-	-	-	-	-	0.05
Brook stickleback	0.06	12.94	-	0.80	-	1.24	1.30
Central mudminnow	-	-	-	-	-	-	-
Channel catfish	-	-	-	-	-	-	-
Common carp	-	-	-	-	-	-	-
Common shiner	-	-	-	-	-	-	-
Creek chub	0.13	-	-	1.74	-	-	-
Fathead minnow	1.44	4.35	-	0.14	0.71	-	4.78
Freshwater drum	-	-	-	-	-	-	-
Green sunfish	-	-	-	-	-	-	-
Hornyhead chub	-	-	-	-	-	-	-
Iowa darter	-	-	-	-	-	-	0.05
Johnny darter	-	-	-	-	-	-	-
Largescale stoneroller	-	-	-	-	-	-	-
Longnose dace	-	-	-	-	0.59	3.73	-
Northern pike	-	-	-	-	-	-	-
Northern redbelly dace	-	-	-	-	0.12	-	0.45
Pearl dace	-	-	-	-	-	-	-
Quillback	-	-	-	-	-	-	-
Rock bass	-	-	-	-	-	-	-
Sand shiner	-	-	0.11	-	0.94	-	-
Shorthead redhorse	-	-	-	-	-	-	-
Spotfin shiner	-	-	0.22	0.07	0.12	-	4.93
Stonecat	-	-	-	-	0.12	-	-
Tadpole madtom	-	-	-	-	-	-	-
Trout-perch	-	-	-	-	-	-	-
Walleye	-	-	-	-	-	-	-
White sucker	0.06	-	0.33	1.38	-	-	-
Yellow bullhead	-	-	-	-	-	-	-
Yellow perch	-	-	-	-	-	-	-
Effort (seconds)	960	538	541	828	508	241	1204
Total Individuals	27	155	14	65	23	35	232
Site CPUE (#/minute)	1.69	17.29	1.55	4.71	2.72	8.71	11.56

* Indicates a site where effort was estimated based off another site with similar stream characteristics.

Appendix VII continued. Backpack electrofishing CPUE (#/minute) by species and site number in the Red River Basin during 2006 and 2007 surveys. Total individuals and CPUE are reported for each site. A "P" indicates the species was observed at the site, but was not collected. A (-) indicates the species was not collected at that site.

	Site Number, Year, Field Number, and Drainage						
	712 2007 070627_02	716 2007 070628_03	723 2007 070630_03	725 2007 070710_01	726 2007 070710_02	727 2007 070710_03	741 2007 070725_01
Species	**Sheyenne**	**Sheyenne**	**Sheyenne**	**Wild Rice**	**Wild Rice**	**Wild Rice**	**Wild Rice**
Bigmouth buffalo	-	-	-	-	-	-	0.01
Bigmouth shiner	-	-	-	-	-	-	-
Black bullhead	-	-	-	0.15	0.10	-	8.28
Black crappie	-	-	-	-	-	-	0.59
Blacknose dace	-	-	-	-	-	-	-
Blackside darter	-	-	-	-	-	-	-
Bluegill	-	-	-	-	-	-	-
Bluntnose minnow	-	-	-	-	-	-	-
Brassy minnow	-	-	-	-	-	-	-
Brook stickleback	0.40	-	0.88	-	0.10	-	0.03
Central mudminnow	-	-	-	-	-	-	-
Channel catfish	-	-	-	-	-	-	-
Common carp	-	-	-	3.85	0.10	-	5.04
Common shiner	-	-	-	-	-	-	-
Creek chub	-	-	-	-	-	-	-
Fathead minnow	5.25	-	0.76	1.48	0.39	0.13	5.85
Freshwater drum	-	-	-	-	-	-	0.01
Green sunfish	-	-	-	-	-	-	0.01
Hornyhead chub	-	-	-	-	-	-	-
Iowa darter	-	-	-	-	-	-	4.72
Johnny darter	-	-	-	-	-	-	-
Largescale stoneroller	-	-	-	-	-	-	-
Longnose dace	-	-	-	-	-	-	-
Northern pike	-	-	-	-	-	-	-
Northern redbelly dace	0.47	-	-	-	-	-	-
Pearl dace	-	-	-	-	-	-	-
Quillback	-	-	-	-	-	-	0.03
Rock bass	-	-	-	-	-	-	-
Sand shiner	-	-	-	-	-	-	-
Shorthead redhorse	-	-	-	-	-	-	-
Spotfin shiner	0.27	-	-	-	-	-	0.22
Stonecat	-	-	-	-	-	-	-
Tadpole madtom	-	-	-	-	-	-	-
Trout-perch	-	-	-	-	-	-	-
Walleye	-	-	-	-	-	-	-
White sucker	-	-	-	-	-	-	0.28
Yellow bullhead	-	-	-	-	-	-	0.01
Yellow perch	-	-	-	-	-	-	0.03
Effort (seconds)	892	189	952	405	609	451	4092
Total Individuals	95	0	26	37	7	1	1714
Site CPUE	6.39	0.00	1.64	5.48	0.69	0.13	25.13

* Indicates a site where effort was estimated based off another site with similar stream characteristics.

Appendix VIII. Trap CPUE (#/24 hours) by species and site number in the Red River Basin during 2006 and 2007 surveys. Counts associated with individual traps were not kept from these sampling occasions. Total individuals and CPUE are reported for each site. A (-) indicates the species was not collected at that site.

	Site Number, Year and Drainage							
	32	**63**	**64**	**43**	**68**	**759**	**25**	**307**
	2006	**2006**	**2006**	**2006**	**2006**	**2007**	**2006**	**2006**
Species	**Tongue**	**Tongue**	**Tongue**	**Park**	**Park**	**Forest**	**Sheyenne**	**Sheyenne**
Black bullhead	-	-	36.00	-	144.37	-	-	-
Blacknose dace	34.99	-	-	3.09	-	-	-	-
Blackside darter	1.35	-	-	10.82	-	-	-	-
Bluegill	-	-	-	-	-	1.91	-	-
Channel catfish	-	-	-	-	-	-	2.13	-
Common shiner	28.94	-	-	1.55	-	-	-	-
Creek chub	67.29	-	-	3.09	-	-	-	-
Fathead minnow	0.67	0.50	-	-	1.12	-	-	-
Johnny darter	0.67	-	-	10.82	-	-	-	-
Longnose dace	-	-	-	1.55	-	-	-	-
Pearl dace	10.09	-	-	-	-	-	-	-
Spotfin shiner	-	-	-	-	-	-	1.07	1.63
Stonecat	-	0.50	-	-	-	-	0.53	-
Tadpole madtom	-	1.00	-	-	-	1.09	-	26.55
Trout-perch	-	-	-	-	-	-	-	1.08
White sucker	4.04	-	-	-	-	1.09	-	-
Yellow perch	-	-	-	10.82	-	2.74	-	-
Effort (hrs)	35.666	48.132	20	15.533	64.5	87.75*	45.0498	44.298
Total Individuals	220	4	30	27	391	25	7	54
Site CPUE (#/24hrs)	148.04	1.99	36.00	41.72	145.49	6.84	3.73	29.26

* Indicates a site where effort was estimated based off of start time and drive time to the next site completed that day.

Appendix IX. Cloverleaf minnow trap CPUE (#/24 hours) by species and site number in the Red River Basin during 2007 surveys. Total individuals and CPUE are reported for each site. A (-) indicates the species was not collected at that site.

	Site Number and Drainage											
Species	**707 Tongue**	**701 Park**	**709 Park**	**755 Park**	**208 Forest**	**756 Forest**	**748 Elm**	**720 Maple**	**771 Maple**	**714 Sheyenne**	**738 Wild Rice**	**732 Red River**
Black bullhead	-	0.82	-	-	-	-	3.58	-	-	5.82	121.39	-
Black crappie	17.71	-	-	-	-	-	-	-	-	-	-	-
Blackside darter	-	-	-	-	1.59	-	-	-	-	2.33	-	-
Channel catfish	-	-	-	-	-	6.40	-	-	-	-	-	-
Common carp	-	-	-	-	-	2.13	-	-	-	-	-	-
Common shiner	90.90	-	1.14	-	-	-	-	-	-	-	-	-
Creek chub	23.61	-	8.01	-	-	-	-	-	-	5.82	-	-
Fathead minnow	4.72	-	1.14	-	-	-	-	-	-	3.49	-	-
Hornyhead chub	-	-	-	-	1.59	-	-	-	-	-	-	-
Johnny darter	10.62	0.82	-	-	-	-	-	-	-	-	-	-
Northern pike	-	-	4.58	-	-	-	-	5.11	-	-	-	-
Pearl dace	3.54	-	-	-	-	-	-	-	-	-	-	-
Sand shiner	-	-	-	-	-	-	-	-	-	1.16	-	-
Stonecat	-	-	-	-	-	-	1.19	-	-	-	1.28	-
Tadpole madtom	-	-	-	-	1.59	-	-	-	-	-	-	-
White sucker	3.54	-	-	-	-	-	1.19	-	-	-	-	-
Yellow perch	28.33	-	-	-	-	-	-	-	-	-	-	-
Effort (hrs)	20.33	29.266*	20.98	11.8	15.083	22.5	20.1	14.08	16.15	20.633	18.783	13.63
Total Individuals	155	2	13	0	3	8	5	3	0	16	96	0
Site CPUE	182.98	1.64	14.87	0.00	4.77	8.53	5.97	5.11	0.00	18.61	122.66	0.00

* Indicates a site where effort was estimated based off of start time and drive time to the next site completed that day.

Appendix X. Cloverleaf predator trap CPUE (#/24 hours) by species and site number in the Red River Basin during 2007 surveys. Total individuals and CPUE are reported for each site. A (-) indicates the species was not collected at that site.

	Site Number and Drainage										
Species	**707 Tongue**	**709 Park**	**701 Park**	**755 Park**	**208 Forest**	**756 Forest**	**748 Elm**	**720 Maple**	**771 Maple**	**738 Wild Rice**	**732 Red River**
Black bullhead	-	-	-	-	-	-	1.19	-	-	-	-
Black crappie	-	-	-	-	-	-	-	-	-	-	1.76
Common carp	-	-	-	-	-	-	-	-	-	1.28	-
Common shiner	-	1.14	-	-	-	-	-	-	-	-	-
Creek chub	-	8.01	-	-	-	-	-	-	-	-	-
Fathead minnow	-	1.14	-	-	-	-	-	-	-	-	-
Freshwater drum	-	-	-	4.07	-	-	-	-	-	-	-
Northern pike	-	4.58	-	-	-	-	-	1.70	-	-	-
White sucker	-	-	-	-	1.59	-	1.19	-	-	-	-
Effort (hrs)	20.33	20.98	29.266*	11.8	15.083	22.5	20.1	14.08	16.15	18.783	13.63
Total Individuals	0	13	0	2	1	0	2	1	0	1	1
Site CPUE (#/24hrs)	0.00	14.87	0.00	4.07	1.59	0.00	2.39	1.70	0.00	1.28	1.76

* Indicates a site where effort was estimated based off of start time and drive time to the next site completed that day.

Appendix XI. Cylindrical minnow trap CPUE (#/24 hours) by species and site number in the Red River Basin during 2007 surveys. Total individuals and CPUE are reported for each site. A (-) indicates the species was not collected at that site.

	Site Number and Drainage										
Species	**709 Park**	**754 Park**	**755 Park**	**208 Forest**	**756 Forest**	**748 Elm**	**720 Maple**	**771 Maple**	**714 Sheyenne**	**738 Wild Rice**	**732 Red River**
Black bullhead	-	-	-	-	-	-	-	-	-	52.39	-
Channel catfish	-	2.52	-	-	2.84	-	-	-	-	1.28	-
Common carp	-	0.84	-	-	0.71	-	-	-	-	-	-
Common shiner	2.29	-	-	-	-	-	-	-	-	-	-
Creek chub	1.14	-	-	-	-	-	-	-	46.53	-	-
Fathead minnow	-	-	-	-	-	-	-	-	247.76	-	-
Freshwater drum	-	0.84	-	-	-	-	-	-	-	-	-
Sand shiner	-	-	2.03	-	-	-	-	-	-	-	-
Spotfin shiner	-	-	-	-	-	-	-	-	1.16	-	-
Tadpole madtom	-	1.68	-	-	-	-	-	-	-	-	-
White sucker	-	-	-	-	-	-	-	-	2.33	-	-
Effort (hrs)	20.98	28.533	11.8	45.249	67.5	60.3	42.24	48.45	20.633	56.349	40.89
Total Individuals	3	7	1	0	10	0	0	0	256	126	0
Site CPUE (#/24hrs)	3.43	5.89	2.03	0.00	3.56	0.00	0.00	0.00	297.78	53.67	0.00

Appendix XII. Boat electrofishing CPUE (#/minute) by species and site number in the Red River mainstem during 2007 surveys. Total individuals and CPUE are reported for each site. A (-) indicates the species was not collected at that site.

	Site Number					
Species	**801**	**802**	**803**	**804**	**805**	**806**
Black bullhead	-	-	-	-	0.01	-
Black crappie	0.02	0.04	0.02	-	0.01	0.04
Bluegill	-	-	-	-	-	0.10
Brassy minnow	-	-	0.01	-	-	-
Channel catfish	0.06	0.04	0.06	0.04	0.36	0.11
Common carp	0.01	-	0.04	0.02	0.04	0.04
Emerald shiner	0.95	-	0.02	0.01	0.01	-
Fathead minnow	0.01	0.11	-	0.06	0.06	0.02
Freshwater drum	0.04	-	0.01	0.02	0.06	0.04
Goldeye	0.06	-	0.05	-	0.04	-
Green sunfish	-	-	-	0.01	-	-
Mooneye	-	-	0.01	-	-	-
Northern pike	0.01	-	0.02	0.01	0.01	-
Orangespotted sunfish	-	-	-	0.02	-	0.09
Quillback	0.01	-	-	0.03	0.04	-
River shiner	0.01	-	-	-	-	-
Rock bass	0.04	0.02	-	0.01	-	0.06
Sand shiner	0.01	0.04	-	0.01	0.24	0.04
Sauger	0.06	-	-	-	-	-
Shorthead redhorse	0.01	0.02	0.01	0.04	0.05	0.06
Silver chub	0.02	-	-	0.01	0.01	-
Silver redhorse	0.02	-	-	0.02	-	0.01
Smallmouth bass	-	-	-	-	0.02	-
Spotfin shiner	0.09	0.24	0.16	0.96	1.56	1.24
Stonecat	-	-	-	-	0.01	-
Trout-perch	0.01	0.02	-	0.07	0.55	0.07
Walleye	0.01	-	-	0.01	0.03	0.01
White bass	0.02	-	0.01	0.04	0.01	0.02
White crappie	-	-	-	-	-	0.01
White sucker	0.01	-	-	0.02	0.01	-
Yellow perch	0.01	-	-	-	-	0.01
Effort (seconds)	9646	2706	7639	5967	5975	5779
Total Individuals	238	25	53	140	312	192
Site CPUE (#/ minute)	1.48	0.55	0.42	1.41	3.13	1.99

Appendix XIII. Historical collections of species of concern in the Red River Drainage.

Species	Year	Description	River
Chestnut lamprey	1983	Minnesota Department of Natural Resources	Red River
	1984	Minnesota Department of Natural Resources	Red River
	1984	Minnesota Department of Natural Resources	Red River
	1984	Minnesota Department of Natural Resources	Red River
	1994	North Dakota Health Dept Fish Distribution Data	Goose River
Silver lamprey	1984	Minnesota Department of Natural Resources	Red River
	1984	Minnesota Department of Natural Resources	Red River
	1994	Minnesota Department of Natural Resourses and Minnesota Pollution Control Agency	Red River
Blackchin shiner	1994	North Dakota Game and Fish Department. 1994. Unpublished fish survey data for the Red River basin. North Dakota Game and Fish Department, Bismarck, ND.	Sheyenne River
Blacknose shiner	1962	Feldmann, R. M. 1963. Distribution of fish in the Forest River of North Dakota. Procedings of North Dakota Acedemy of Science. Vol. XVII. pp. 11-19.	Forest River
	1977	Peterka, J. J. 1978. Fishes and Fisheries of the Sheyenne River, North Dakota. Annual Procedings of the North Dakota Academy of Science. 32: 29-44.	Sheyenne River
	1977	Peterka, J. J. 1978. Fishes and Fisheries of the Sheyenne River, North Dakota. Annual Procedings of the North Dakota Academy of Science. 32: 29-44.	Sheyenne River
	1977	Peterka, J. J. 1978. Fishes and Fisheries of the Sheyenne River, North Dakota. Annual Procedings of the North Dakota Academy of Science. 32: 29-44.	Sheyenne River
	1985	Duerre, D. C. 1988. 1987 Ecological Investigations of lakes, rivers, and impoundments in North Dakota (Surveys). Statewide Fisheries Investigations. Report No. A-1145. North Dakota Game and Fish Department, Bismarck, ND.	Sheyenne River
	1987	Duerre, D. C. 1988. 1987 Ecological Investigations of lakes, rivers, and impoundments in North Dakota (Surveys). Statewide Fisheries Investigations. Report No. A-1145. North Dakota Game and Fish Department, Bismarck, ND.	Mirror Pool Spring Creek
	1987	Duerre, D. C. 1988. 1987 Ecological Investigations of lakes, rivers, and impoundments in North Dakota (Surveys). Statewide Fisheries Investigations. Report No. A-1145. North Dakota Game and Fish Department, Bismarck, ND.	Mirror Pool Spring Creek
Carmine shiner	1964	Copes, F. A., and R. A. Tubb. 1966. Fishes of the Red River tributaries in ND. Institute for Ecological Studies, Univ. North Dakota. Research Report No 1. 26 pp.	Sheyenne River
	1964	Copes, F. A., and R. A. Tubb. 1966. Fishes of the Red River tributaries in ND. Institute for Ecological Studies, Univ. North Dakota. Research Report No 1. 26 pp.	Sheyenne River
	1974	Duerre, D. C. 1975. Ecological Investigations of Lakes, Streams, and Impoundments in North Dakota (Surveys). North Dakota State Game and Fish Department. Report no. A-1036.	Heart River
	1977	Peterka, J. J. 1978. Fishes and Fisheries of the Sheyenne River, North Dakota. Annual Procedings of the North Dakota Academy of Science. 32: 29-44.	Sheyenne River
	1977	Peterka, J. J. 1978. Fishes and Fisheries of the Sheyenne River, North Dakota. Annual Procedings of the North Dakota Academy of Science. 32: 29-44.	Sheyenne River
	1994	North Dakota Health Dept Fish Distribution Data	Sheyenne River
Finescale dace	1964	UND Museum Collection	Tongue River
	1964	Copes, F. A., and R. A. Tubb. 1966. Fishes of the Red River tributaries in ND. Institute for Ecological Studies, Univ. North Dakota. Research Report No 1. 26 pp.	Tongue River
	1991	Peterka, J. J. 1992. Survey of fishes in six streams in Northeastern North Dakota, 1991. NDSU Zoology Dept., Fargo, ND. 18 pages.	Tongue River
	1991	Peterka, J. J. 1992. Survey of fishes in six streams in Northeastern North Dakota, 1991. NDSU Zoology Dept., Fargo, ND. 18 pages.	Tongue River
Hornyhead chub	1962	UND Museum Collection	Forest River
	1962	UND Museum Collection	Forest River
	1962	UND Museum Collection	Forest River
	1962	UND Museum Collection	Forest River
	1962	Feldmann, R. M. 1963. Distribution of fish in the Forest River of North Dakota. Procedings of North Dakota Acedemy of Science. Vol. XVII. pp. 11-19.	Forest River
	1964	UND Museum Collection	Forest River
	1964	UND Museum Collection	Forest River
	1964	UND Museum Collection	Forest River

Appendix XIII continued. Historical collections of species of concern in the Red River Drainage.

Species	Year	Description	River
Hornyhead chub	1964	Copes, F. A., and R. A. Tubb. Fishes of the Red River tributaries in North Dakota. Institute for Ecological Studies, Univ. North Dakota. Research Report No 1. 26 pp.	Forest River
	1964	Copes, F. A., and R. A. Tubb. Fishes of the Red River tributaries in North Dakota. Institute for Ecological Studies, Univ. North Dakota. Research Report No 1. 26 pp.	Forest River
	1993	North Dakota Health Dept Fish Distribution Data	Forest River
	1994	North Dakota Health Dept Fish Distribution Data	Forest River
	1994	Minnesota Department of Natural Resourses and Minnesota Pollution Control Agency	Red River
	1996	North Dakota Health Dept Fish Distribution Data	Forest River
	1996	North Dakota Health Dept Fish Distribution Data	Forest River
	1996	North Dakota Health Dept Fish Distribution Data	Forest River
	1996	North Dakota Health Dept Fish Distribution Data	Park River
	1997	North Dakota Health Dept Fish Distribution Data	Forest River
	1997	DeKrey, David C. 1998. A comparison of fish community structure in relation to habitat variation in three North Dakota streams. Masters Thesis. University of North Dakota, Grand Forks, ND	Park River
	1997	DeKrey, David C. 1998. A comparison of fish community structure in relation to habitat variation in three North Dakota streams. Masters Thesis. University of North Dakota, Grand Forks, ND	Park River
	1997	DeKrey, David C. 1998. A comparison of fish community structure in relation to habitat variation in three North Dakota streams. Masters Thesis. University of North Dakota, Grand Forks, ND	Forest River
	1997	DeKrey, David C. 1998. A comparison of fish community structure in relation to habitat variation in three North Dakota streams. Masters Thesis. University of North Dakota, Grand Forks, ND	Forest River
	1997	DeKrey, David C. 1998. A comparison of fish community structure in relation to habitat variation in three North Dakota streams. Masters Thesis. University of North Dakota, Grand Forks, ND	Forest River
	1997	DeKrey, David C. 1998. A comparison of fish community structure in relation to habitat variation in three North Dakota streams. Masters Thesis. University of North Dakota, Grand Forks, ND	Forest River
	1997	DeKrey, David C. 1998. A comparison of fish community structure in relation to habitat variation in three North Dakota streams. Masters Thesis. University of North Dakota, Grand Forks, ND	Forest River
	1997	DeKrey, David C. 1998. A comparison of fish community structure in relation to habitat variation in three North Dakota streams. Masters Thesis. University of North Dakota, Grand Forks, ND	Forest River
Largescale stoneroller	1964	UND Museum Collection	Forest River
	1964	Copes, F. A., and R. A. Tubb. 1966. Fishes of the Red River tributaries in North Dakota. Institute for Ecological Studies, Univ. North Dakota. Research Report No 1. 26 pp.	Forest River
	1993	North Dakota Health Dept Fish Distribution Data	Forest River
	1994	North Dakota Health Dept Fish Distribution Data	Forest River
	1996	North Dakota Health Dept Fish Distribution Data	Elm River
	1996	North Dakota Health Dept Fish Distribution Data	Forest River
	1996	North Dakota Health Dept Fish Distribution Data	Forest River
	1997	North Dakota Health Dept Fish Distribution Data	Duck Creek
	1997	North Dakota Health Dept Fish Distribution Data	Forest River
	1997	DeKrey, David C. 1998. A comparison of fish community structure in relation to habitat variation in three North Dakota streams. Masters Thesis. University of North Dakota, Grand Forks, ND	Forest River
	1997	DeKrey, David C. 1998. A comparison of fish community structure in relation to habitat variation in three North Dakota streams. Masters Thesis. University of North Dakota, Grand Forks, ND	Forest River
	1997	DeKrey, David C. 1998. A comparison of fish community structure in relation to habitat variation in three North Dakota streams. Masters Thesis. University of North Dakota, Grand Forks, ND	Forest River

Appendix XIII continued. Historical collections of species of concern in the Red River Drainage.

Species	Year	Description	River
Northern redbelly dace	1962	UND Museum Collection	Antelope Creek
	1964	Copes, F. A., and R. A. Tubb. 1966. Fishes of the Red River tributaries in ND. Institute for Ecological Studies, Univ. North Dakota. Research Report No 1. 26 pp.	Renwick Reservoir
	1964	Copes, F. A., and R. A. Tubb. 1966. Fishes of the Red River tributaries in ND. Institute for Ecological Studies, Univ. North Dakota. Research Report No 1. 26 pp.	Park River
	1964	Copes, F. A., and R. A. Tubb. 1966. Fishes of the Red River tributaries in ND. Institute for Ecological Studies, Univ. North Dakota. Research Report No 1. 26 pp.	Goose River
	1973	Duerre, D. C. 1975. Ecological Investigations of Lakes, Streams, and Impoundments in North Dakota (Surveys). North Dakota State Game and Fish Department. Report no. A-1036.	Green River
	1973	Duerre, D. C. 1975. Ecological Investigations of Lakes, Streams, and Impoundments in North Dakota (Surveys). North Dakota State Game and Fish Department. Report no. A-1036.	Green River
	1973	Duerre, D. C. 1975. Ecological Investigations of Lakes, Streams, and Impoundments in North Dakota (Surveys). North Dakota State Game and Fish Department. Report no. A-1036.	Green River
	1973	Duerre, D. C. 1975. Ecological Investigations of Lakes, Streams, and Impoundments in North Dakota (Surveys). North Dakota State Game and Fish Department. Report no. A-1036.	Green River
	1976	Reigh, R. C., and J. B. Owen. 1979. Fishes of the western tributaries of the Missouri River in ND. Report No. 79-2, North Dakota Regional Environmental Assessment Program, Bismarck, ND.	Cannonball River
	1976	Reigh, R. C., and J. B. Owen. 1979. Fishes of the western tributaries of the Missouri River in ND. Report No. 79-2, North Dakota Regional Environmental Assessment Program, Bismarck, ND.	Knife River
	1976	Reigh, R. C., and J. B. Owen. 1979. Fishes of the western tributaries of the Missouri River in ND. Report No. 79-2, North Dakota Regional Environmental Assessment Program, Bismarck, ND.	Knife River
	1976	Reigh, R. C., and J. B. Owen. 1979. Fishes of the western tributaries of the Missouri River in ND. Report No. 79-2, North Dakota Regional Environmental Assessment Program, Bismarck, ND.	Little Knife River
	1976	Reigh, R. C., and J. B. Owen. 1979. Fishes of the western tributaries of the Missouri River in ND. Report No. 79-2, North Dakota Regional Environmental Assessment Program, Bismarck, ND.	Knife River
	1976	Reigh, R. C., and J. B. Owen. 1979. Fishes of the western tributaries of the Missouri River in ND. Report No. 79-2, North Dakota Regional Environmental Assessment Program, Bismarck, ND.	Green River
	1976	Reigh, R. C., and J. B. Owen. 1979. Fishes of the western tributaries of the Missouri River in ND. Report No. 79-2, North Dakota Regional Environmental Assessment Program, Bismarck, ND.	Green River
	1976	Reigh, R. C., and J. B. Owen. 1979. Fishes of the western tributaries of the Missouri River in ND. Report No. 79-2, North Dakota Regional Environmental Assessment Program, Bismarck, ND.	Heart River
	1977	Reigh, R. C., and J. B. Owen. 1979. Fishes of the western tributaries of the Missouri River in ND. Report No. 79-2, North Dakota Regional Environmental Assessment Program, Bismarck, ND.	Knife River
	1977	Peterka, J. J. 1978. Fishes and Fisheries of the Sheyenne River, North Dakota. Annual Procedings of the North Dakota Academy of Science. 32: 29-44.	Sheyenne River
	1977	Peterka, J. J. 1978. Fishes and Fisheries of the Sheyenne River, North Dakota. Annual Procedings of the North Dakota Academy of Science. 32: 29-44.	Sheyenne River
	1977	Peterka, J. J. 1978. Fishes and Fisheries of the Sheyenne River, North Dakota. Annual Procedings of the North Dakota Academy of Science. 32: 29-44.	Sheyenne River
	1984	North Dakota Game and Fish Department. 1984. Big Beaver Creek. Emmons, Logan, and McIntosh Counties. North Dakota Game and Fish Department. Bismarck, ND. 21 pages.	Spring Creek

Appendix XIII continued. Historical collections of species of concern in the Red River Drainage.

Species	Year	Description	River
Northern redbelly dace	1987	Duerre, D. C. 1988. 1987 Ecological Investigations of lakes, rivers, and impoundments in North Dakota (Surveys). Statewide Fisheries Investigations. Report No. A-1145. North Dakota Game and Fish Department, Bismarck, ND.	Sheyenne River
	1987	Duerre, D. C. 1988. 1987 Ecological Investigations of lakes, rivers, and impoundments in North Dakota (Surveys). Statewide Fisheries Investigations. Report No. A-1145. North Dakota Game and Fish Department, Bismarck, ND.	Mirror Pool Spring Creek
	1987	Duerre, D. C. 1988. 1987 Ecological Investigations of lakes, rivers, and impoundments in North Dakota (Surveys). Statewide Fisheries Investigations. Report No. A-1145. North Dakota Game and Fish Department, Bismarck, ND.	Mirror Pool Spring Creek
	1993	Kelsh, S. W. 1994. Lotic Fish-Community Structure Following Transition From Severe Drought to High Discharge. Journal of Freshwater Ecology. 9(4): 331-341.	Little Missouri River
	1993	Kelsh, S. W. 1994. Lotic Fish-Community Structure Following Transition From Severe Drought to High Discharge. Journal of Freshwater Ecology. 9(4): 331-341.	Little Missouri River
	1994	North Dakota Health Dept Fish Distribution Data	Rush River
	1994	North Dakota Health Dept Fish Distribution Data	Rush River
	1994	Peterka, J. J. 1994. Survey of fishes in the Heart River drainage, North Dakota, 1994. Zoology Dept, NDSU. 12 pages.	Antelope Creek
	1994	Kreft, B. 1995. Apple Creek, Burleigh County, July 1994. North Dakota Game and Fish Department, Bismarck, ND. 24 pages.	Apple Creek
	1994	Kreft, B. 1995. Apple Creek, Burleigh County, July 1994. North Dakota Game and Fish Department, Bismarck, ND. 24 pages.	Apple Creek
	1994	North Dakota Game and Fish Department. 1994. Apple Creek, miscellaneous population summary, 1994. North Dakota Game and Fish Department, Bismarck, ND. 11 pages.	Apple Creek
	1994	North Dakota Game and Fish Department. 1994. Apple Creek, miscellaneous population summary, 1994. North Dakota Game and Fish Department, Bismarck, ND. 11 pages.	Apple Creek
	1994	North Dakota Game and Fish Department. 1994. Apple Creek, miscellaneous population summary, 1994. North Dakota Game and Fish Department, Bismarck, ND. 11 pages.	Apple Creek
	1995	North Dakota Health Dept Fish Distribution Data	Rush River
	1995	North Dakota Health Dept Fish Distribution Data	Rush River
	1995	Peterka, J. J. 1995. Survey of fishes in the Elm, Maple, and Wild Rice Rivers, North Dakota, 1995. Zoology Dept., NDSU. 20 pages.	Rush River
	1995	missellaneous catch records from North Dakota Game and Fish Department	Paulson Creek
	1997	North Dakota Health Dept Fish Distribution Data	Antelope Creek
	1997	North Dakota Health Dept Fish Distribution Data	Antelope Creek
	1997	North Dakota Health Dept Fish Distribution Data	Antelope Creek
	1997	North Dakota Health Dept Fish Distribution Data	Brush Creek
	1997	North Dakota Health Dept Fish Distribution Data	Brush Creek
	1997	North Dakota Game and Fish Department. 1997. Antelope Creek, miscellaneous population summary. North Dakota Game and Fish Department. Bismarck, ND. 3 pages.	Antelope Creek
	1997	North Dakota Game and Fish Department. 1997. Apple Creek, miscellaneous population summary, 1997. North Dakota Game and Fish Department, Bismarck, ND. 5 pages.	Apple Creek
Pearl dace	1955	Carufel, L. H. 1955. Stream Survey Report No. 5. North Dakota Game and Fish Department, Fisheries Department. 8 pages.	White Earth Creek
	1964	UND Museum Collection	Park River
	1964	Copes, F. A., and R. A. Tubb. 1966. Fishes of the Red River tributaries in ND. Institute for Ecological Studies, Univ. North Dakota. Research Report No 1. 26 pp.	Park River
	1964	Copes, F. A., and R. A. Tubb. 1966. Fishes of the Red River tributaries in ND. Institute for Ecological Studies, Univ. North Dakota. Research Report No 1. 26 pp.	Park River
	1964	Copes, F. A., and R. A. Tubb. 1966. Fishes of the Red River tributaries in ND. Institute for Ecological Studies, Univ. North Dakota. Research Report No 1. 26 pp.	Goose River

Appendix XIII continued. Historical collections of species of concern in the Red River Drainage.

Species	Year	Description	River
Pearl dace	1991	Peterka, J. J. 1992. Survey of fishes in six streams in Northeastern North Dakota, 1991. NDSU Zoology Dept., Fargo, ND. 18 pages.	Tongue River
	1991	Peterka, J. J. 1992. Survey of fishes in six streams in Northeastern North Dakota, 1991. NDSU Zoology Dept., Fargo, ND. 18 pages.	Park River
	1991	Peterka, J. J. 1992. Survey of fishes in six streams in Northeastern North Dakota, 1991. NDSU Zoology Dept., Fargo, ND. 18 pages.	Park River
	1994	North Dakota Health Dept Fish Distribution Data	Park River
	1996	North Dakota Health Dept Fish Distribution Data	Park River
	1996	North Dakota Health Dept Fish Distribution Data	Park River
	1996	North Dakota Game and Fish Department. 1997. Beaver Creek, Emmons, Logan, and McIntosh Counties. North Dakota Game and Fish Department, Bismarck, ND. 19 pages.	Spring Creek
	1996	North Dakota Game and Fish Department. 1996. Beaver Creek, miscellaneous population summary, 1996. North Dakota Game and Fish Department, Bismarck, ND. 10 pages.	Beaver Creek
	1997	North Dakota Health Dept Fish Distribution Data	Willow Creek
	1997	North Dakota Health Dept Fish Distribution Data	Willow Creek
	1997	DeKrey, David C. 1998. A comparison of fish community structure in relation to habitat variation in three North Dakota streams. Masters Thesis. University of North Dakota, Grand Forks, ND	Park River
	1997	DeKrey, David C. 1998. A comparison of fish community structure in relation to habitat variation in three North Dakota streams. Masters Thesis. University of North Dakota, Grand Forks, ND	Park River
	1998	North Dakota Health Dept Fish Distribution Data	Willow Creek
	1998	North Dakota Health Dept Fish Distribution Data	Spring Creek
	1998	North Dakota Health Dept Fish Distribution Data	Spring Creek
Pugnose shiner	1964	UND Museum Collection	Turtle River
Silver chub	1964	UND Museum Collection	Forest River
	1964	UND Museum Collection	Turtle River
	1964	Copes, F. A., and R. A. Tubb. 1966. Fishes of the Red River tributaries in ND. Institute for Ecological Studies, Univ. North Dakota. Research Report No 1. 26 pp.	Turtle River
	1977	Peterka, J. J. 1978. Fishes and Fisheries of the Sheyenne River, North Dakota. Annual Procedings of the North Dakota Academy of Science. 32: 29-44.	Sheyenne River
	1984	Minnesota Department of Natural Resources	Red River
	1984	Minnesota Department of Natural Resources	Red River
	1984	Minnesota Department of Natural Resources	Red River
	1984	Minnesota Department of Natural Resources	Red River
	1984	Minnesota Department of Natural Resources	Red River
	1984	Minnesota Department of Natural Resources	Red River
	1984	Minnesota Department of Natural Resources	Red River
	1984	Minnesota Department of Natural Resources	Red River
	1984	Minnesota Department of Natural Resources	Red River
	1984	Minnesota Department of Natural Resources	Red River
	1984	Minnesota Department of Natural Resources	Red River
	1987	Duerre, D. C. 1988. 1987 Ecological Investigations of lakes, rivers, and impoundments in North Dakota (Surveys). Statewide Fisheries Investigations. Report No. A-1145. North Dakota Game and Fish Department, Bismarck, ND.	Red River
	1987	Duerre, D. C. 1988. 1987 Ecological Investigations of lakes, rivers, and impoundments in North Dakota (Surveys). Statewide Fisheries Investigations. Report No. A-1145. North Dakota Game and Fish Department, Bismarck, ND.	Red River
	1994	North Dakota Health Dept Fish Distribution Data	Red River
	1994	North Dakota Health Dept Fish Distribution Data	Red River
	1994	Minnesota Department of Natural Resourses and Minnesota Pollution Control Agency	Red River
Yellow bullhead	1983	Minnesota Department of Natural Resources	Red River
Trout-perch	1960	UND Museum Collection	Forest River

Appendix XIII continued. Historical collections of species of concern in the Red River Drainage.

Species	Year	Description	River
Trout-perch	1960	Sprague, J. W. 1960. Stream survey, Souris River. Report No. 1054. North Dakota Game and Fish Department. Bismarck, ND.	Souris River
	1962	Feldmann, R. M. 1963. Distribution of fish in the Forest River of North Dakota. Procedings of North Dakota Acedemy of Science. Vol. XVII. pp. 11-19.	Forest River
	1964	UND Museum Collection	Pembina River
	1964	Tubb, R. A., F. A. Copes, and C. Johnston. 1965. Fishes of the Sheyenne River of North Dakota. Proceedings of the North Dakota Academy of Science 19: 120-128.	Sheyenne River
	1964	Tubb, R. A., F. A. Copes, and C. Johnston. 1965. Fishes of the Sheyenne River of North Dakota. Proceedings of the North Dakota Academy of Science 19: 120-128.	Sheyenne River
	1964	Tubb, R. A., F. A. Copes, and C. Johnston. 1965. Fishes of the Sheyenne River of North Dakota. Proceedings of the North Dakota Academy of Science 19: 120-128.	Sheyenne River
	1964	Copes, F. A., and R. A. Tubb. 1966. Fishes of the Red River tributaries in North Dakota. Institute for Ecological Studies, Univ. North Dakota. Research Report No 1. 26 pp.	Pembina River
	1964	Copes, F. A., and R. A. Tubb. 1966. Fishes of the Red River tributaries in North Dakota. Institute for Ecological Studies, Univ. North Dakota. Research Report No 1. 26 pp.	Pembina River
	1964	Copes, F. A., and R. A. Tubb. 1966. Fishes of the Red River tributaries in North Dakota. Institute for Ecological Studies, Univ. North Dakota. Research Report No 1. 26 pp.	Pembina River
	1964	Copes, F. A., and R. A. Tubb. 1966. Fishes of the Red River tributaries in North Dakota. Institute for Ecological Studies, Univ. North Dakota. Research Report No 1. 26 pp.	Tongue River
	1964	Copes, F. A., and R. A. Tubb. 1966. Fishes of the Red River tributaries in North Dakota. Institute for Ecological Studies, Univ. North Dakota. Research Report No 1. 26 pp.	Park River
	1964	Copes, F. A., and R. A. Tubb. 1966. Fishes of the Red River tributaries in North Dakota. Institute for Ecological Studies, Univ. North Dakota. Research Report No 1. 26 pp.	Forest River
	1964	Copes, F. A., and R. A. Tubb. 1966. Fishes of the Red River tributaries in North Dakota. Institute for Ecological Studies, Univ. North Dakota. Research Report No 1. 26 pp.	Goose River
	1964	Copes, F. A., and R. A. Tubb. 1966. Fishes of the Red River tributaries in North Dakota. Institute for Ecological Studies, Univ. North Dakota. Research Report No 1. 26 pp.	Wild Rice River
	1964	Copes, F. A., and R. A. Tubb. 1966. Fishes of the Red River tributaries in North Dakota. Institute for Ecological Studies, Univ. North Dakota. Research Report No 1. 26 pp.	Sheyenne River
	1964	Copes, F. A., and R. A. Tubb. 1966. Fishes of the Red River tributaries in North Dakota. Institute for Ecological Studies, Univ. North Dakota. Research Report No 1. 26 pp.	Sheyenne River
	1964	Copes, F. A., and R. A. Tubb. 1966. Fishes of the Red River tributaries in North Dakota. Institute for Ecological Studies, Univ. North Dakota. Research Report No 1. 26 pp.	Sheyenne River
	1974	Russell, G. W. 1975. Distribution of fishes in North Dakota drainages affected by the Garrison Diversion Project. Master's Thesis. University of North Dakota. Grand Forks, ND. 100pp.	Sheyenne River
	1974	Russell, G. W. 1975. Distribution of fishes in North Dakota drainages affected by the Garrison Diversion Project. Master's Thesis. University of North Dakota. Grand Forks, ND. 100pp.	Sheyenne River
	1974	Russell, G. W. 1975. Distribution of fishes in North Dakota drainages affected by the Garrison Diversion Project. Master's Thesis. University of North Dakota. Grand Forks, ND. 100pp.	Sheyenne River
	1974	Russell, G. W. 1975. Distribution of fishes in North Dakota drainages affected by the Garrison Diversion Project. Master's Thesis. University of North Dakota. Grand Forks, ND. 100pp.	Sheyenne River
	1974	Russell, G. W. 1975. Distribution of fishes in North Dakota drainages affected by the Garrison Diversion Project. Master's Thesis. University of North Dakota. Grand Forks, ND. 100pp.	Souris River
	1975	Duerre, D. C. 1977. Ecological Investigations of Lakes, Streams, and Impoundments in North Dakota (Surveys). North Dakota State Game and Fish Department. Report no. A-1046.	Souris River
	1977	Peterka, J. J. 1978. Fishes and Fisheries of the Sheyenne River, North Dakota. Annual Procedings of the North Dakota Academy of Science. 32: 29-44.	Sheyenne River
	1977	Peterka, J. J. 1978. Fishes and Fisheries of the Sheyenne River, North Dakota. Annual Procedings of the North Dakota Academy of Science. 32: 29-44.	Sheyenne River
	1977	Peterka, J. J. 1978. Fishes and Fisheries of the Sheyenne River, North Dakota. Annual Procedings of the North Dakota Academy of Science. 32: 29-44.	Sheyenne River

Appendix XIII continued. Historical collections of species of concern in the Red River Drainage.

Species	Year	Description	River
Trout-perch	1977	Peterka, J. J. 1978. Fishes and Fisheries of the Sheyenne River, North Dakota. Annual Procedings of the North Dakota Academy of Science. 32: 29-44.	Sheyenne River
	1983	Minnesota Department of Natural Resources	Red River
	1983	Minnesota Department of Natural Resources	Red River
	1983	Minnesota Department of Natural Resources	Red River
	1983	Minnesota Department of Natural Resources	Red River
	1983	Minnesota Department of Natural Resources	Red River
	1984	Minnesota Department of Natural Resources	Red River
	1984	Minnesota Department of Natural Resources	Red River
	1985	Duerre, D. C. 1988. 1987 Ecological Investigations of lakes, rivers, and impoundments in North Dakota (Surveys). Statewide Fisheries Investigations. Report No. A-1145. North Dakota Game and Fish Department, Bismarck, ND.	Sheyenne River
	1985	Duerre, D. C. 1988. 1987 Ecological Investigations of lakes, rivers, and impoundments in North Dakota (Surveys). Statewide Fisheries Investigations. Report No. A-1145. North Dakota Game and Fish Department, Bismarck, ND.	Sheyenne River
	1985	Duerre, D. C. 1988. 1987 Ecological Investigations of lakes, rivers, and impoundments in North Dakota (Surveys). Statewide Fisheries Investigations. Report No. A-1145. North Dakota Game and Fish Department, Bismarck, ND.	Sheyenne River
	1985	Kreil, R. L., and L. F. Ryckman. 1987. A fisheries inventory of the upper Pembina River in North Dakota. The Prairie Naturalist. 19(2): 121-127.	Pembina River
	1985	Kreil, R. L., and L. F. Ryckman. 1987. A fisheries inventory of the upper Pembina River in North Dakota. The Prairie Naturalist. 19(2): 121-127.	Pembina River
	1985	Kreil, R. L., and L. F. Ryckman. 1987. A fisheries inventory of the upper Pembina River in North Dakota. The Prairie Naturalist. 19(2): 121-127.	Pembina River
	1985	Kreil, R. L., and L. F. Ryckman. 1987. A fisheries inventory of the upper Pembina River in North Dakota. The Prairie Naturalist. 19(2): 121-127.	Pembina River
	1986	Duerre, D. C. 1988. 1987 Ecological Investigations of lakes, rivers, and impoundments in North Dakota (Surveys). Statewide Fisheries Investigations. Report No. A-1145. North Dakota Game and Fish Department, Bismarck, ND.	Red River
	1987	Duerre, D. C. 1988. 1987 Ecological Investigations of lakes, rivers, and impoundments in North Dakota (Surveys). Statewide Fisheries Investigations. Report No. A-1145. North Dakota Game and Fish Department, Bismarck, ND.	Elm River
	1987	Duerre, D. C. 1988. 1987 Ecological Investigations of lakes, rivers, and impoundments in North Dakota (Surveys). Statewide Fisheries Investigations. Report No. A-1145. North Dakota Game and Fish Department, Bismarck, ND.	Rush River
	1987	Duerre, D. C. 1988. 1987 Ecological Investigations of lakes, rivers, and impoundments in North Dakota (Surveys). Statewide Fisheries Investigations. Report No. A-1145. North Dakota Game and Fish Department, Bismarck, ND.	Maple River
	1987	Duerre, D. C. 1988. 1987 Ecological Investigations of lakes, rivers, and impoundments in North Dakota (Surveys). Statewide Fisheries Investigations. Report No. A-1145. North Dakota Game and Fish Department, Bismarck, ND.	Red River
	1987	Duerre, D. C. 1988. 1987 Ecological Investigations of lakes, rivers, and impoundments in North Dakota (Surveys). Statewide Fisheries Investigations. Report No. A-1145. North Dakota Game and Fish Department, Bismarck, ND.	Red River
	1991	Peterka, J. J. 1992. Survey of fishes in six streams in Northeastern North Dakota, 1991. NDSU Zoology Dept., Fargo, ND. 18 pages.	Pembina River
	1993	North Dakota Health Dept Fish Distribution Data	Pembina River
	1993	North Dakota Health Dept Fish Distribution Data	Pembina River
	1994	North Dakota Health Dept Fish Distribution Data	Sheyenne River
	1994	North Dakota Health Dept Fish Distribution Data	Pembina River
	1994	North Dakota Health Dept Fish Distribution Data	Pembina River
	1994	North Dakota Health Dept Fish Distribution Data	Red River
	1994	North Dakota Health Dept Fish Distribution Data	Red River
	1994	North Dakota Health Dept Fish Distribution Data	Red River
	1994	Minnesota Department of Natural Resourses and Minnesota Pollution Control Agency	Red River

Appendix XIII continued. Historical collections of species of concern in the Red River Drainage.

Species	Year	Description	River
Trout-perch	1994	Minnesota Department of Natural Resourses and Minnesota Pollution Control Agency	Red River
	1994	Minnesota Department of Natural Resourses and Minnesota Pollution Control Agency	Red River
	1995	North Dakota Health Dept Fish Distribution Data	Sheyenne River
	1995	North Dakota Health Dept Fish Distribution Data	Sheyenne River
	1995	North Dakota Health Dept Fish Distribution Data	Red River
	1995	Peterka, J. J. 1995. Survey of fishes in the Elm, Maple, and Wild Rice Rivers, North Dakota, 1995. Zoology Dept., NDSU. 20 pages.	Wild Rice River
	1995	Peterka, J. J. 1995. Survey of fishes in the Elm, Maple, and Wild Rice Rivers, North Dakota, 1995. Zoology Dept., NDSU. 20 pages.	Wild Rice River
	1995	Peterka, J. J. 1995. Survey of fishes in the Elm, Maple, and Wild Rice Rivers, North Dakota, 1995. Zoology Dept., NDSU. 20 pages.	Wild Rice River
	1996	North Dakota Health Dept Fish Distribution Data	Goose River
	1996	North Dakota Health Dept Fish Distribution Data	Sheyenne River
	1996	North Dakota Health Dept Fish Distribution Data	Sheyenne River
	1996	North Dakota Health Dept Fish Distribution Data	Sheyenne River
	1996	North Dakota Health Dept Fish Distribution Data	Sheyenne River
	1996	North Dakota Health Dept Fish Distribution Data	Sheyenne River
	1996	North Dakota Health Dept Fish Distribution Data	Sheyenne River
	1996	North Dakota Health Dept Fish Distribution Data	Sheyenne River
	1996	North Dakota Health Dept Fish Distribution Data	Pembina River
	1996	North Dakota Health Dept Fish Distribution Data	Pembina River
	1996	North Dakota Health Dept Fish Distribution Data	Pembina River
	1996	North Dakota Health Dept Fish Distribution Data	Red River
	1996	North Dakota Health Dept Fish Distribution Data	Red River
	1996	DeKrey, David C. 1998. A comparison of fish community structure in relation to habitat variation in three North Dakota streams. Masters Thesis. University of North Dakota, Grand Forks, ND	Pembina River
	1996	DeKrey, David C. 1998. A comparison of fish community structure in relation to habitat variation in three North Dakota streams. Masters Thesis. University of North Dakota, Grand Forks, ND	Pembina River
	1996	DeKrey, David C. 1998. A comparison of fish community structure in relation to habitat variation in three North Dakota streams. Masters Thesis. University of North Dakota, Grand Forks, ND	Pembina River
	1996	DeKrey, David C. 1998. A comparison of fish community structure in relation to habitat variation in three North Dakota streams. Masters Thesis. University of North Dakota, Grand Forks, ND	Pembina River
	1996	DeKrey, David C. 1998. A comparison of fish community structure in relation to habitat variation in three North Dakota streams. Masters Thesis. University of North Dakota, Grand Forks, ND	Pembina River
	1996	DeKrey, David C. 1998. A comparison of fish community structure in relation to habitat variation in three North Dakota streams. Masters Thesis. University of North Dakota, Grand Forks, ND	Pembina River
	1996	DeKrey, David C. 1998. A comparison of fish community structure in relation to habitat variation in three North Dakota streams. Masters Thesis. University of North Dakota, Grand Forks, ND	Pembina River
	1996	DeKrey, David C. 1998. A comparison of fish community structure in relation to habitat variation in three North Dakota streams. Masters Thesis. University of North Dakota, Grand Forks, ND	Pembina River
	1996	DeKrey, David C. 1998. A comparison of fish community structure in relation to habitat variation in three North Dakota streams. Masters Thesis. University of North Dakota, Grand Forks, ND	Pembina River
	1997	North Dakota Health Dept Fish Distribution Data	Sheyenne River
	1997	North Dakota Health Dept Fish Distribution Data	Souris River
	1997	North Dakota Health Dept Fish Distribution Data	Souris River

Appendix XIII continued. Historical collections of species of concern in the Red River Drainage.

Species	Year	Description	River
Trout-perch	1997	North Dakota Health Dept Fish Distribution Data	Pembina River
	1997	North Dakota Health Dept Fish Distribution Data	Souris River
	1997	North Dakota Health Dept Fish Distribution Data	Souris River
	1997	North Dakota Health Dept Fish Distribution Data	Souris River
	1997	North Dakota Health Dept Fish Distribution Data	Wild Rice River
Logperch	1964	UND Museum Collection	Goose River
	1964	Copes, F. A., and R. A. Tubb. 1966. Fishes of the Red River tributaries in North Dakota. Institute for Ecological Studies, Univ. North Dakota. Research Report No 1. 26 pp.	Pembina River
	1964	Copes, F. A., and R. A. Tubb. 1966. Fishes of the Red River tributaries in North Dakota. Institute for Ecological Studies, Univ. North Dakota. Research Report No 1. 26 pp.	Pembina River
	1964	Copes, F. A., and R. A. Tubb. 1966. Fishes of the Red River tributaries in North Dakota. Institute for Ecological Studies, Univ. North Dakota. Research Report No 1. 26 pp.	Goose River
	1983	Minnesota Department of Natural Resources	Red River
	1983	Minnesota Department of Natural Resources	Red River
	1995	North Dakota Health Dept Fish Distribution Data	Red River
	1996	North Dakota Health Dept Fish Distribution Data	Red River