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Area 315
Study 3
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Minnesota Department of Natural Resources
Division of Fish and Wildlife
Section of Fisheries

Stream Survey Report

Clearwater River
2005

By

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Your purchase of fishing equipment and motor boat fuel supports boating access and Sport Fish Restoration.

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Table of Contents

Figures

Tables

General Information

Stream Name:	Clearwater River
Alternate Name:	None
Tributary Number:	M-071
Counties:	Wright, Meeker, Stearns
Nearest Town(s):	Clearwater, Annandale, Kimball, Watkins
Source of flow:	Wetlands, Stearns County, MN
Waterway sequence:	Wetlands /Clearwater River (CD 46) /Betsy Lake/ Scott Lake/ Lake Louisa/ Lake Marie/ Lake Caroline/ Lake Augusta/ Clearwater Lake/Grass Lake/Wiegand Lake/ Clearwater River/Mississippi River
Classification:	Class III (warm water feeder)

Watershed Name and Number

USGS HUC-8:	7010203
Major:	Mississippi River – St. Cloud 17
Minor:	Clearwater River 17049

Metric	*Feet*	*Miles*
Watershed Area	109,077.5 Ac	170.43^2
Basin Length	127,945	24.23
Basin Relief	333.12	
Basin Relief Ratio	0.003	
Basin Shape Rf =	7.05E-06	
Re =	0.003	
Basic Drainage Pattern	Dendritic	
Stream Order (see Figure)	4	
Bifurcation Ratio	4	
Main Stem Stream Length	231,216.48	43.8
Total Channel Length	738,408.00	139.9
Mean Stream Slope	0.001	7.61 ft/mi
Longitudinal Elevation Profile (See Figure)		
Drainage Density	6,805.29	
Valley length	135,665.00	25.69
Sinuosity	1.70	
Bifurcation ratio	4	

Summary

The Clearwater River is a warm water stream with the headwater near the town of Watkins Minnesota in Meeker County. The main stem of the Clearwater River represents 31 % of the drainage network and flows 43 miles to the confluence with the Mississippi River. The Clearwater River watershed (109,077 acres) is located in central Minnesota within Wright, Stearns and Meeker counties and has varying land uses, although the majority of the land use includes agriculture (53%).

An assessment of the fish population in the Clearwater River was performed in 2005. The survey included barge electrofishing at eight stations between Clearwater and Watkins for a total effort of 3.13 hours. The Clearwater River is a cool to warm water stream system with northern pike and largemouth bass as top level predators. Overall, 1,692 fish were captured, representing 11 families and 29 species. Bluegill were the most abundant game species.

A noticeable lack of smallmouth bass, walleye and several species of redhorse from the lower portions of the Clearwater River suggest that the Clearwater Dam (near Clearwater) placement has limited movement of these species for some time. The Clearwater dam was originally constructed sometime between 1936 and 1939. A lack of abundant, riverine adapted, game species , a scenic river corridor, quality habitat, and a highly functioning stream channel upstream of the Clearwater Dam and downstream of the Grass lake dam would be an ideal environment for reestablishing smallmouth bass. If brood stock or fingerlings are available, an initial stocking should be considered in 2007.

Access and morphology changes due to human interventions appear to affect many river systems in Minnesota. The Clearwater River is no different in this regard. Limited access points, particularly on the lower eight miles of river and the use of culverts that constrict natural stream processes affect portions of the Clearwater River. Efforts will be made to work with DNR Trails and Waterways to investigate additional canoe access points along the lower eight miles of the Clearwater River in 2006. Efforts will also be made to educate constituents on the effects of dams, land use, roads, bridges and culverts on natural stream systems.

Watershed

The Clearwater River watershed is located in central Minnesota within Wright, Stearns and Meeker counties (Figure 1). The drainage area (109,077.5 acres, 170.43 square miles) has estimated land uses of 53% agricultural, 15% grassland/pasture, 13% forested, and 3.5 % wetland (Table 1 and Figure 2). The headwater of the Clearwater River is near the town of, Watkins Minnesota in Meeker County. The main stem of the Clearwater River represents 31% of the drainage network and flows 43 miles to the confluence with the Mississippi River in Clearwater, MN. Tributaries and ditches encompass 139 miles of stream channel within the entire watershed.

The Clearwater River watershed is relatively wide (16 miles maximum) although, it does have a unique narrowing near the Wright/Stearns/Meeker county line (Figure 1). The watershed is 24 miles long along an axis oriented southwest to northeast, with a southerly aspect. Wetlands and springs influence the groundwater inputs to the main stem channel. The main stem channel has four designated trout streams and at least three other springs (within lake areas) that were noted (Figure 1). The watershed has a moderate basin relief for central Minnesota (333 ft) (Figure 3) and a significant portion of the Clearwater River (10.5 miles) flows through a series of nine lake basins. Lakes include: Betsy, Scott, Louisa, Marie, Caroline, Augusta, Clearwater, Grass and Wiegand. These lakes along with other water bodies within the watershed represent a total of 9,133 acres. Five different categories make up the bedrock superficial geology within the watershed (Figure 4). However, within the watershed the soils and impervious surfaces likely have more influence on the water quality and quantity in the Clearwater River.

Initial surveys of the Clearwater River were performed in 1981 and 1982 by Hutchinson and Montrose DNR Fisheries staff , with follow up population assessments in 1997. During initial surveys, information on fish communities, physical and chemical characteristics and invertebrate species composition and abundance was collected. In 2005, stream classification, watershed analysis, hydrologic analysis and electrofishing were performed in an effort to further describe the river geomorphology and sample the fish population in eight locations. Analysis of land use was performed using Arcview® 3.3, and the 1991 land use/land cover layer. Locations of sampling stations and streamline were identified with a Global Positioning System

(GPS) receiver or digitized at the 1:5,000 scale from 2003 aerial photography.

Hydrology

The Clearwater River has an overall gradient of 7.61 ft/mi and a sinuosity of 1.7 between the headwater and the confluence with the Mississippi River. The uniquely semi-hourglass shaped watershed coupled with the low gradient, broad flood plain, and the nine lake basins throughout most of the watershed would suggest that the hydrograph should gradually rise and fall. Land use practices such as ditching, installation of tile, residential development and direct channel modification have likely changed the annual hydrograph. The Clearwater River has two operational gages; however, they have only been in place since 2004. The two gages have had limited actual flow measurements to correlate with stage measurements, but can give insight to the hydrograph of the Clearwater River. The Clearwater River Watershed District in conjunction with the MN Pollution Control Agency (PCA) installed the gages on County Road 40 (near Clearwater) and Fairhaven Dam (near Fairhaven) in 2004. These gages were installed to monitor outflows and hydraulic conditions above and below Caroline, Augusta, Clearwater, Grass and Wiegand lakes. Daily mean, maximum and minimum discharges for 2005 for County Road 40 and Fairhaven Dam gaging stations are presented in Figure 5. Although there were gaps in the data through short periods of the summer, the hydrograph was similar to other streams in the region.

Geomorphology

Classification sites

The Clearwater River Watershed covers approximately 170 square miles with gently rolling to abrupt land forms along the upper and middle reaches. The middle to lower reaches of the Clearwater River have much less relief overall. The lowest portion of the watershed from the outlet of Wiegand Lake to the confluence with the Mississippi River gains appreciable slope and moderate sinuosity. Classification (Rosgen 1996) was conducted at two sites in the lower and middle portion of the Clearwater River watershed (Figure 6). Elevations were recorded with the aid of a laser level. Classification of these areas included calculation of slope, sinuosity, entrenchment (flood prone width relative to stream channel width), and substrates (particle count) within the sample area.

The lower site was located approximately 3.6 miles from the confluence with the Mississippi River in Clearwater. Channel morphology in the lower portion of this reach appeared relatively stable, with mildly altered riparian vegetation, although reed canary grass dominated the majority of the wetland fringe vegetation. The area had a flood prone width of 461 ft. The stream classification for this station was C5, moderately entrenched (7.3), with a high width/depth ratio (33.8)(Table 2, Figures 7-8). The predominant substrate type (D-50) was coarse sand and the sinuosity was 1.9. The area had a slope of 0.031. A C5 stream type is considered a slightly entrenched, meandering, sand dominated, riffle/pool channel with a well developed floodplain (Rosgen 1996). The C5 stream type can be relatively stable when there is significant riparian vegetation present. However, it can be highly subject to lateral movements if bank vegetation is not present, if the channel is manipulated, or if changes in sediment or flow regimes occur. Sediment supplies are typically high to very high unless the banks are well vegetated.

A rating of bank erodibility within the classification station evaluated four distinct areas with a comparison of bare bank, root depth, root density, bank angle, and surface protection in the form of vegetation. Erodibility ratings varied from low in highly vegetated low bank areas to extreme in an area of high bank (174 ft long) that was actively eroding in the upper third of the station. The majority of the bank areas (3,081 ft) within the station were classified as low to moderate erodibility while a total of 381 ft was classified as high to extreme erodibility.

The second classification cross section was 1.2 miles upstream of Lake Louisa on the A Shau Valley Wildlife Management Area (WMA) in Wright County. This station was classified as a C4. The area had a relatively broad flood prone area (415 ft) and an entrenchment ratio of 4.0. The width/depth ratio was 91.6, while the D-50 was 8 mm gravel. The sinuosity was slightly lower than Station 1 (1.6) and the slope was 0.016 (Table 3, Figures 9-10)

This area had relatively low impact from development and housing, although, road and bridge density within the local area had an effect on channel sinuosity. The highway 55 bridge, railroad bridge, two crossings on Rockwood avenue and one on 90th street NW have confined the channel to some extent and decreased sinuosity in places where the flood prone area is wide. While roads and crossings in the area have relative impacts, the riparian corridor was relatively intact. Riparian vegetation was represented by trees, shrubs and grasses with relatively solid root complexes throughout the station.

Water Chemistry

The Clearwater River passes through substantial amounts of agricultural and residential land throughout its 43 mile length. Because of increased amounts of runoff due to impervious surfaces and generally high nutrient supplies, the Clearwater River has a higher concentration of phosphorous than other streams in the area. The MN PCA listed the Clearwater River in 1996 for inclusion on the 303D listing with Total Maximum Daily Load (TMDL) for low oxygen and fecal coliform on the stretch of river upstream of Lake Betsy. In 2006, the Clearwater River from Clearwater Lake to the Mississippi River was listed for low oxygen as well.   A monitoring plan will be in place for this stretch from 2008-2011.

The Clearwater River Watershed District (CRWD) annually reports volunteer and state agency results of water quality monitoring efforts throughout the watershed. Most sampling has been performed in the nine lakes in the watershed, while limited samples have been taken from stream. Results from Grass Lake (downstream end of Clearwater Lake) 1981-1996 are presented in Table 4.

Biological

Electrofishing

An assessment of the fish population in the Clearwater River was performed in 2005. The survey included barge electrofishing at eight stations between Clearwater and Watkins for a total effort of 3.13 hours (Figure 11). Barge electrofishing was performed using a Smith Root model 1.5KVA electrofisher equipped with two hand-held anodes and a Honda 5000 watt generator. Barge electrofishing was performed in an upstream direction, attempting to cover all available habitat within each run. All fish were captured using pulsed DC current with typical amperages between 4 and 8. Start and end locations of electrofishing sites were recorded using a Global Positioning System (Trimble GeoExplorer 3c, Trimble Inc.) and plotted using Arcview® 3.3. Fish were measured and either individually or bulk weighed to the nearest gram and species-appropriate scales, spines and/or otoliths were removed from a sub-sample of game fish for estimating age and growth. Length ranges of non-game species were recorded and number of individuals were counted and bulk weighed per MNPCA guidelines for the Upper Mississippi River Index of Biotic Integrity (Niemela and Feist 2002).

Based on electrofishing results, the Clearwater River is a cool to warm water stream system with northern pike and largemouth bass as top level piscivores. Overall, 1,692 fish were captured representing eleven families and 29 species (Tables 5-6). Bluegill were the most abundant game species; 382 were captured over all stations. Lengths for bluegill ranged from 27 mm TL (1.05 in) to 287 mm TL (11.2 in) with an average length of 155.7 mm TL (6.1 in) (Table 7). The next most abundant species overall were fathead minnow (361), white sucker (201) and hornyhead chub (141).

Species richness varied across stations from a low of eight species (EF7) to a high of 21 species in EF8 (Table 5). IBI scores also varied among stations throughout the Clearwater River. Electrofishing station EF8 had the highest IBI rating of excellent (82). This area was unique with high sinuosity (1.6), relatively complex habitat and slope was moderate (0.016). Substrates were more coarse than in downstream stations, which may offer some species better habitat. The electrofishing stations with the lowest IBI ratings were EF5 (42) and EF6 (44). Both of these stations were in areas of extensive ditching and variable water quality and quantity.

Electrofishing revealed an abundance of channel catfish in the two stations above Lake Louisa (EF8 and EF 4). Channel catfish had been reported in previous surveys in Lake Betsy; however, the current lake survey (Lake Louisa and Marie Surveys 2005 MNDNR) for Lake Louisa and Marie sampled six channel catfish. This was the first time that channel catfish have been sampled in Lake Louisa or Marie. These fish probably migrated downstream from Betsy Lake, which was first stocked with channel catfish in 1983. In the 1997 Clearwater River survey three young-of-the-year channel catfish were found in the same area.

Smallmouth bass and walleye, common to the Mississippi River, were absent between Grass Lake Dam and above Clearwater Dam (the lower eight miles) on the Clearwater River. The lack of these and several species of redhorse from the lower portion of the Clearwater River suggest that dam placement has limited movement of these species for some time. The Clearwater dam was originally constructed sometime between 1936 and 1939. A lack of game species, a scenic river corridor, quality habitat, and a highly functioning stream channel upstream of the Clearwater Dam and downstream of the Grass lake dam would be an ideal environment for re-establishing smallmouth bass. The abundant forage and sufficient habitat has the potential to support a substantial fishery. Comparable stream types such as the Otter Tail River (Fergus Falls MN) have had reintroductions of smallmouth bass achieve a high level of success. If brood stock or fingerlings are available, an initial stocking should be considered in 2007.

A fish trap was constructed at the upstream end of Lake Louisa in 1997 (Figure 6) in an effort to attempt physical reduction of carp. The trap has removed 93,000 pounds of carp between 1997 and 2004. The average annual harvest between 1997 and 2004 was 11,625 pounds. In spite of these efforts, lake surveys and the stream surveys have found carp. While carp removal may make sportsmen's groups and lake associations feel better about their lake, it seems to have little biological value. Current research into removal tools and techniques may shed light on better methods for managing carp within lake and stream systems.

Connectivity issues and discussion

The Clearwater River flows nearly 44 river miles through various terrain and levels of development such as rural households, farmsteads and fields to almost complete urbanized areas such as the City of Clearwater. Road crossings can affect streams and rivers by constricting the flood plain, preventing natural channel migration and increasing water velocities The main stem of the river has 24 road crossings, of which, 10 are culverts and 14 are actual bridges (Figure 12). For most streams, if the culverts are placed properly (correct alignment, slope and diameter), fish passage and sediment transport are minor issues. However, both culverts and bridges effectively lock the stream channel into a given position and can effect the sinuosity of the stream. This change in stream sinuosity is usually observed above and below culverts and bridges.

By looking at aerial photos of areas with road crossings, one of two characteristics can usually be observed: The stream channel is either highly sinuous above the crossing or the stream channel has been ditched to accommodate the stream crossing. A streams' sinuosity travels downstream along with the water and sediment it carries. Over time, the ribbon-like bends travel longitudinally downstream until a blockage or constriction is reached. In this case, road crossings offer that constriction. In the case of the Clearwater River, the area just upstream of I-94 and CR 145 (near Clearwater) is highly sinuous above the road crossings (1.9), but has considerably lower sinuosity (1.4) below the crossings (Figure 13). This change in sinuosity can result in an increase or decrease in the amount of adequate fish habitat. When stream channels are more complex, they generally offer more fish habitat. In contrast, straight channels usually offer minimal fish habitat.

Dams effectively prevent fish passage and sediment transportation from taking place. Interruption of sediment supplies by dams generally causes the stream channel to have abundant sediment supplies upstream of the dam and be sediment deficient downstream of the dam. Sediment deposition and transport are important processes in channel formation, particularly in "C" channel streams. Since "C" channel streams have relatively wide flood plains, sediment deposition and transport are important factors in maintaining the unique channel shape and broad flood plain areas.

The Clearwater River has three constructed dams and one fish barrier along the main stem channel (Figure 6). The Dam near the mouth has approximately nine feet of head and was constructed between 1936 and 1939. While the dam at the outlet of Grass lake only drops approximately two feet. Fairhaven dam drops nearly 15 feet and has a significant impact on potential movement of fish throughout the upper portion of the watershed.

Land use practices and patterns have changed considerably since the 1991 land use layer was developed. Residential development within Wright County has been increasing at rates ranked among the highest in Minnesota. While some of these developments may not directly impact the river or its floodplain, there is potential for new road development that could. Development pressure may also be seen in the river through an increase in flashy flows. Increased housing and commercial development results in increased amounts of impervious surfaces (roofs, driveways, and parking lots). More runoff can be attributed to residential housing development and impervious surfaces than to typical farm fields in most cases. This increase in runoff can cause increases in peak flow events and more flashy hydrographs. A useful tool to measure the effects of development on the Clearwater River would be a permanent stage and discharge logging device near the mouth of the river. Accurately measuring and modeling the discharge of the river could serve as a valuable tool for future decisions made by local units of government. Continually monitoring discharge may provide evidence of development impacts and other changes in the watershed over time.

In the interest of providing recreational and fisheries potential on the Clearwater River, two recommendations are offered. Efforts will be made to work with DNR Trails and Waterways staff to develop access sites along the Clearwater River to allow more usable canoe access. The unique character of the Clearwater River between Grass Lake and the Clearwater Dam (eight miles) would be an ideal recreational float. In addition, the reintroduction of smallmouth bass to this portion of the river may also offer a unique river angling opportunity. Additional efforts will also be made to educate constituents on the effects of road crossings, land use, bridges and culverts on stream morphology and ecology.

References

Clearwater River Survey. 1997, 1981. Minnesota Department of Natural Resources, Division of Fish and Wildlife, Section of Fisheries, St Paul.

Niemela, S. and M. D. Feist. 2002. Index of Biological Integrity (IBI) Guidance for Coolwater Rivers and Streams of the Upper Mississippi River Basin. Minnesota Pollution Control Agency, Biological Monitoring Program, St. Paul.

Rosgen, D. 1996. Applied River Morphology. Wildland Hydrology, Pagosa Springs, Colorado.

Acknowledgements

The author would like to thank Mark Pelham, Jason Neuman, and Brad Maas for their work in field collection and logistical support. The author would also like to thank the Stream Survey Manual Committee members for field assistance, sharing of data and processing of information.

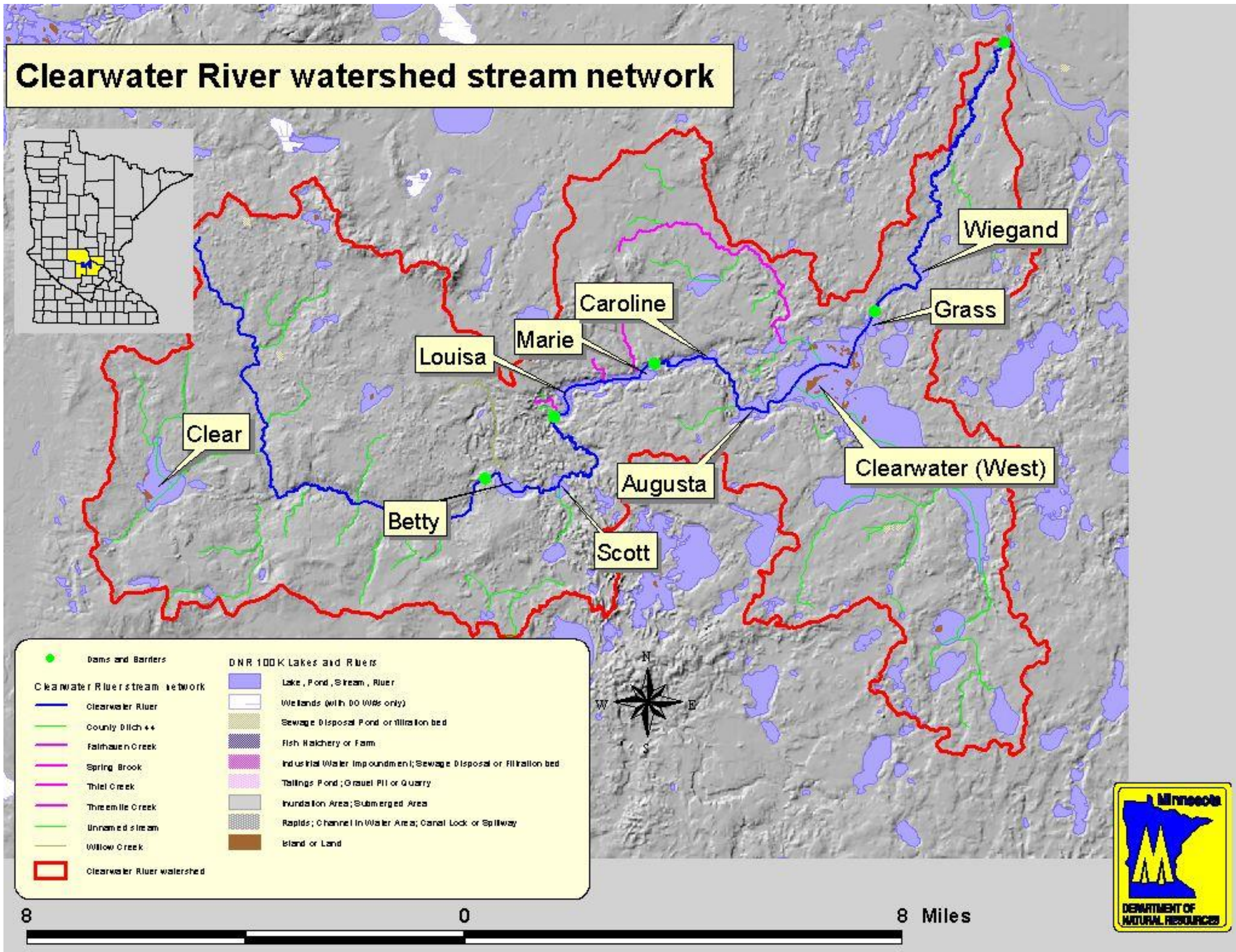


Figure 1. Location of Clearwater River (M-71) watershed, Minnesota.

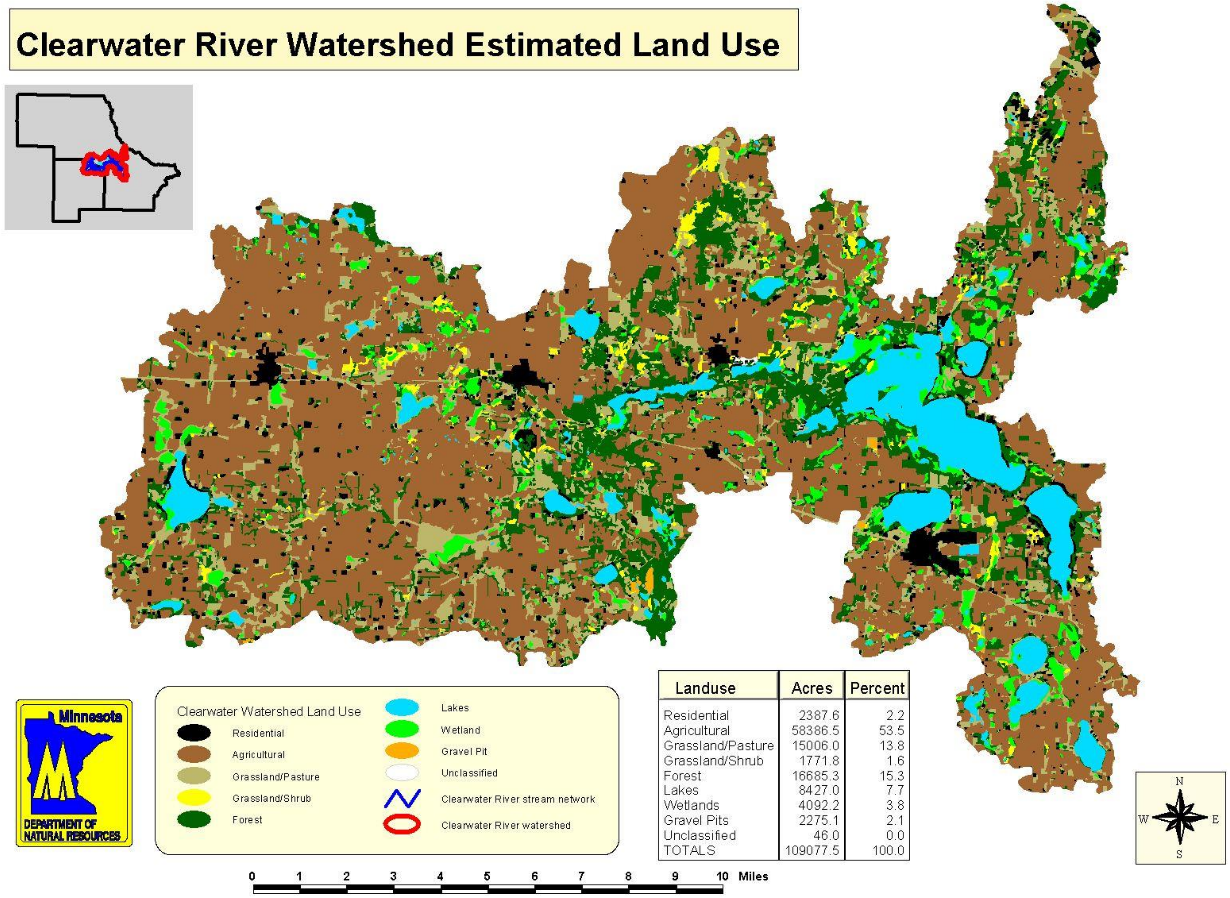


Figure 2. Estimated 1991 land use within the Clearwater River (M-71) major watershed.

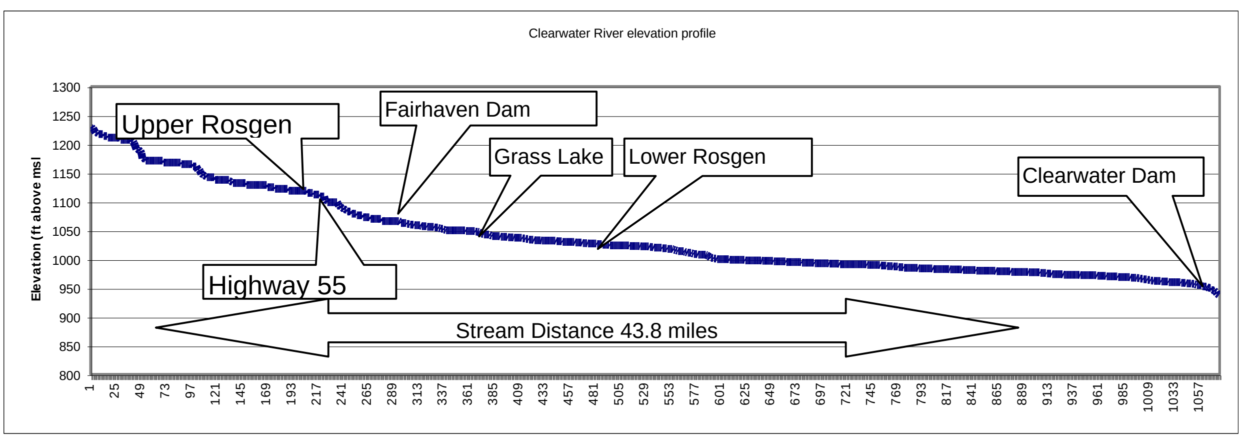


Figure 3. Elevation profile and select sample points of the Clearwater River within the three county area, MN 2005.

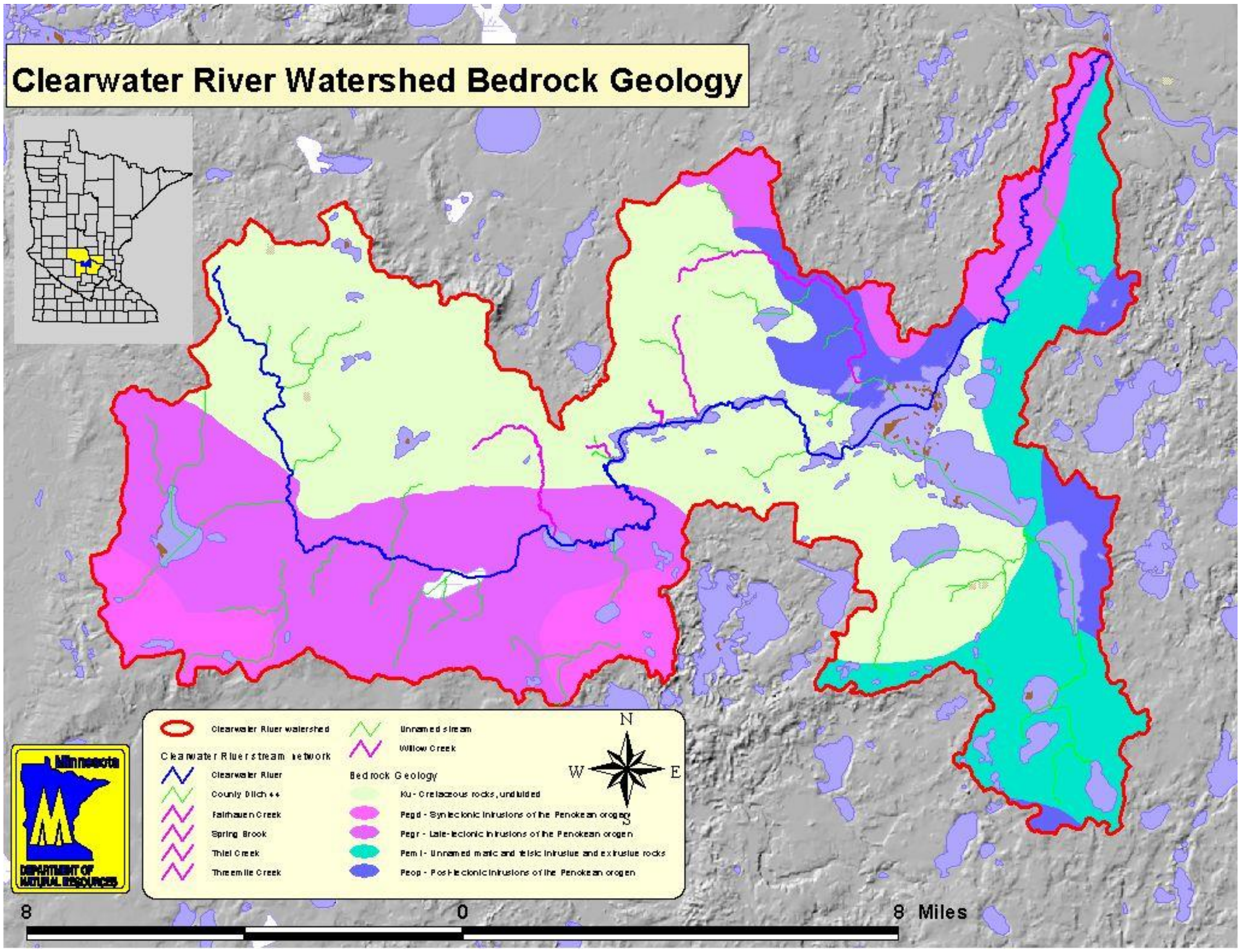
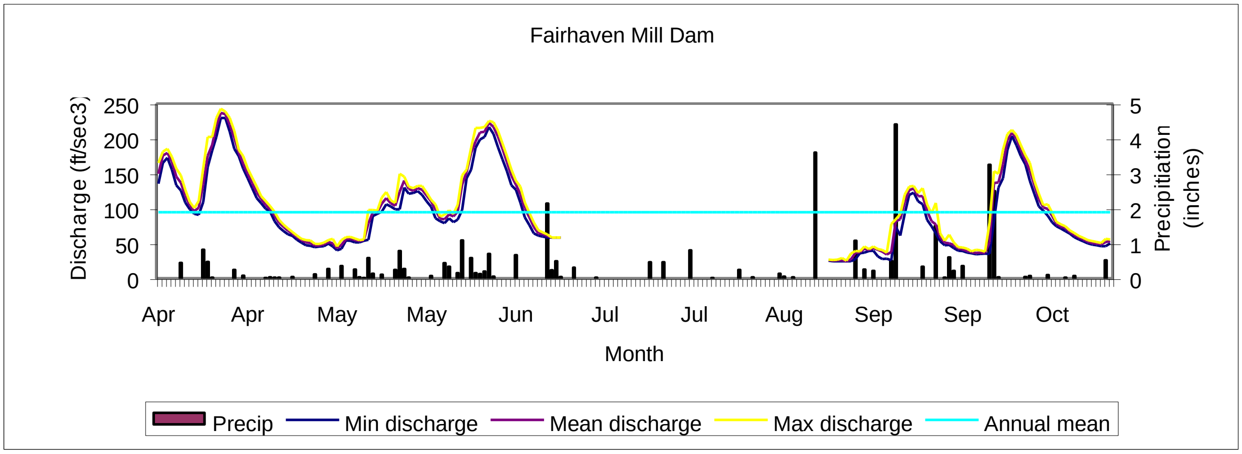


Figure 4. Bedrock geology for Clearwater River (M-71) major watershed.



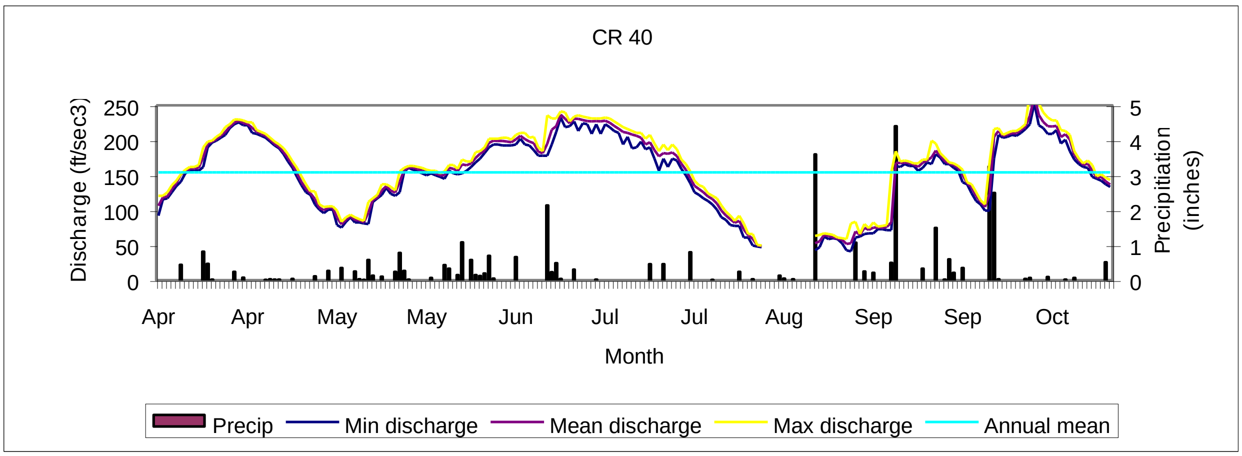


Figure 5. Discharge recorded at two locations on the Clearwater River during 2005. The Fairhaven station is located upstream of Lake Caroline south of the Town Fairhaven, MN. The CR 40 station is located near the Town of Clearwater , MN (Data provided by MPCA).

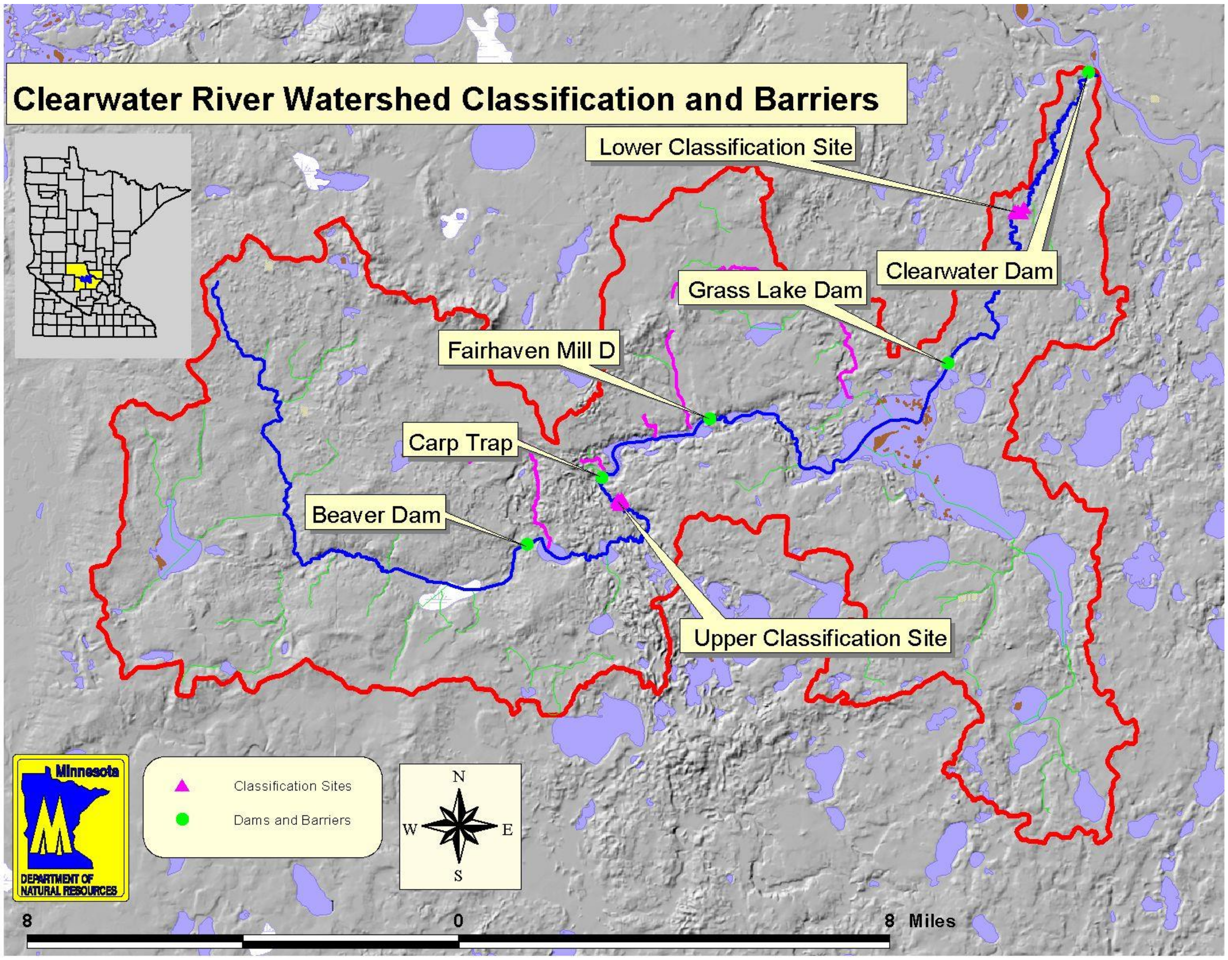


Figure 6. Barriers and locations of classification sites in the Clearwater River (M-71) major watershed.

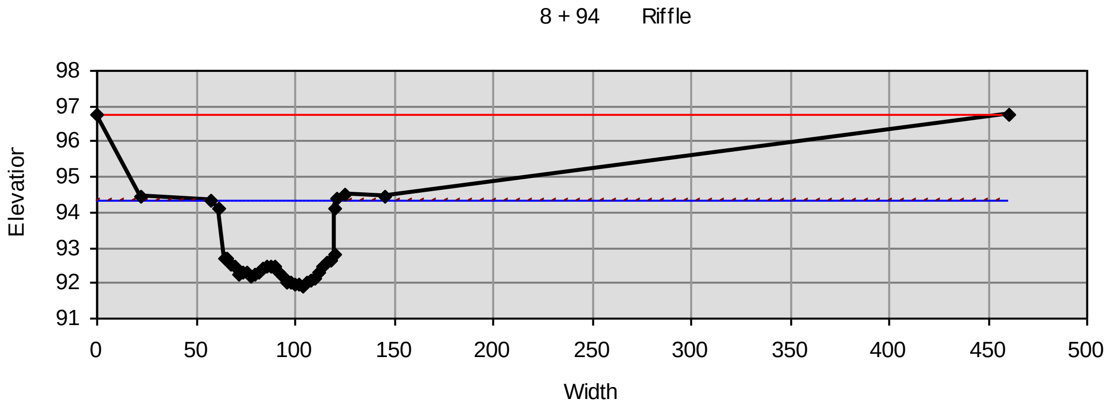


Figure 7. Cross section profile of the lower classification site, Clearwater River, near Clearwater MN, June 2005.

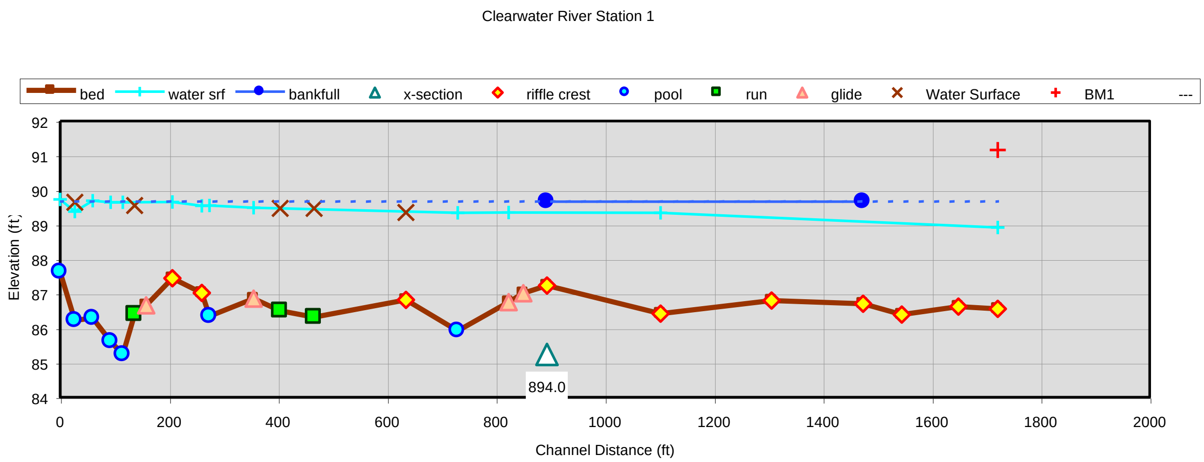


Figure 8. Longitudinal profile of the lower classification site, Clearwater River, near Clearwater MN, June 2005.

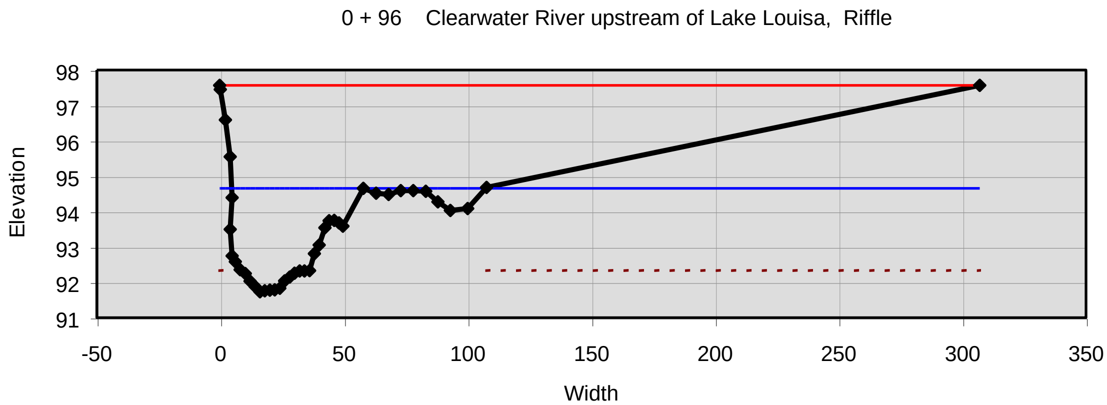


Figure 9. Cross section profile of the upper classification site, Clearwater River near Kimball MN, October 2005.

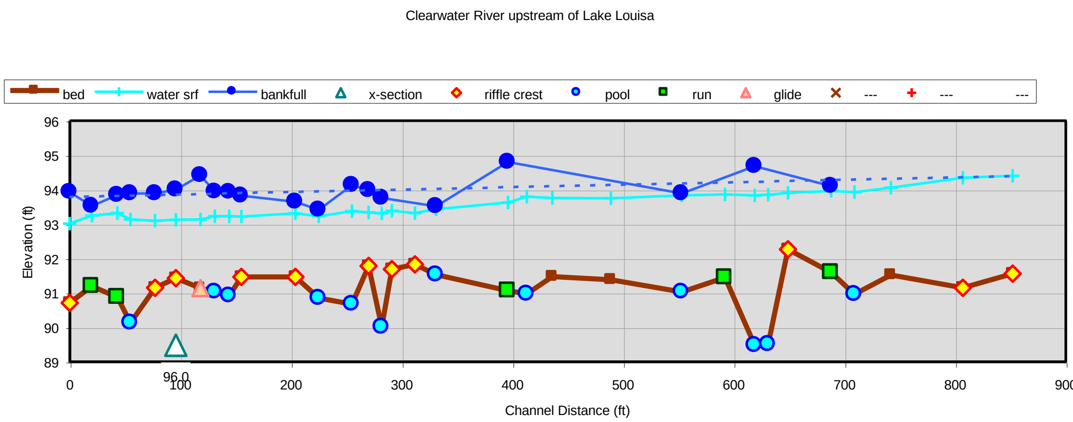


Figure 10. Longitudinal profile of the upper classification site, Clearwater River, near Clearwater MN, October 2005.

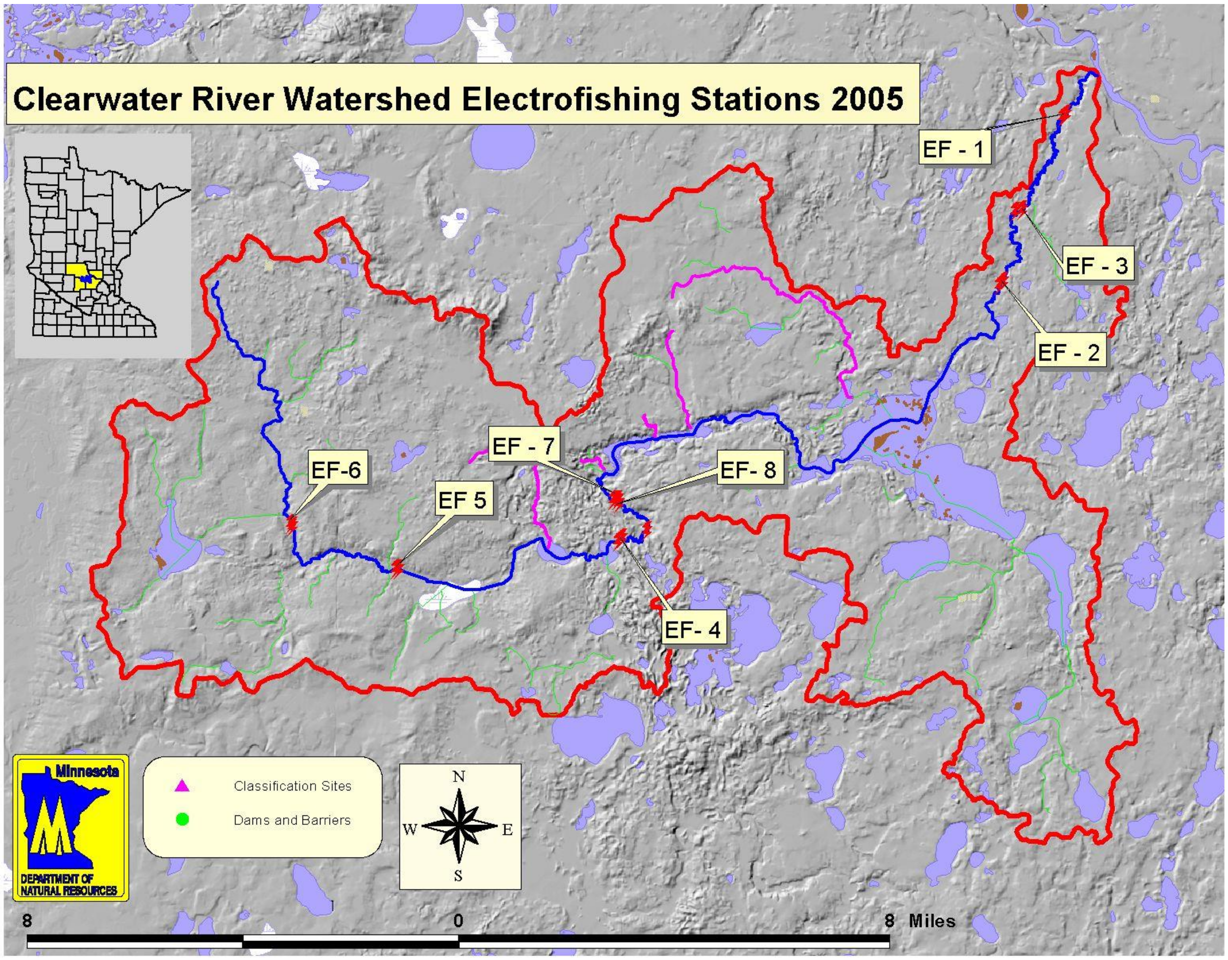


Figure 11. Location of Electrofishing stations on the Clearwater River 2005.

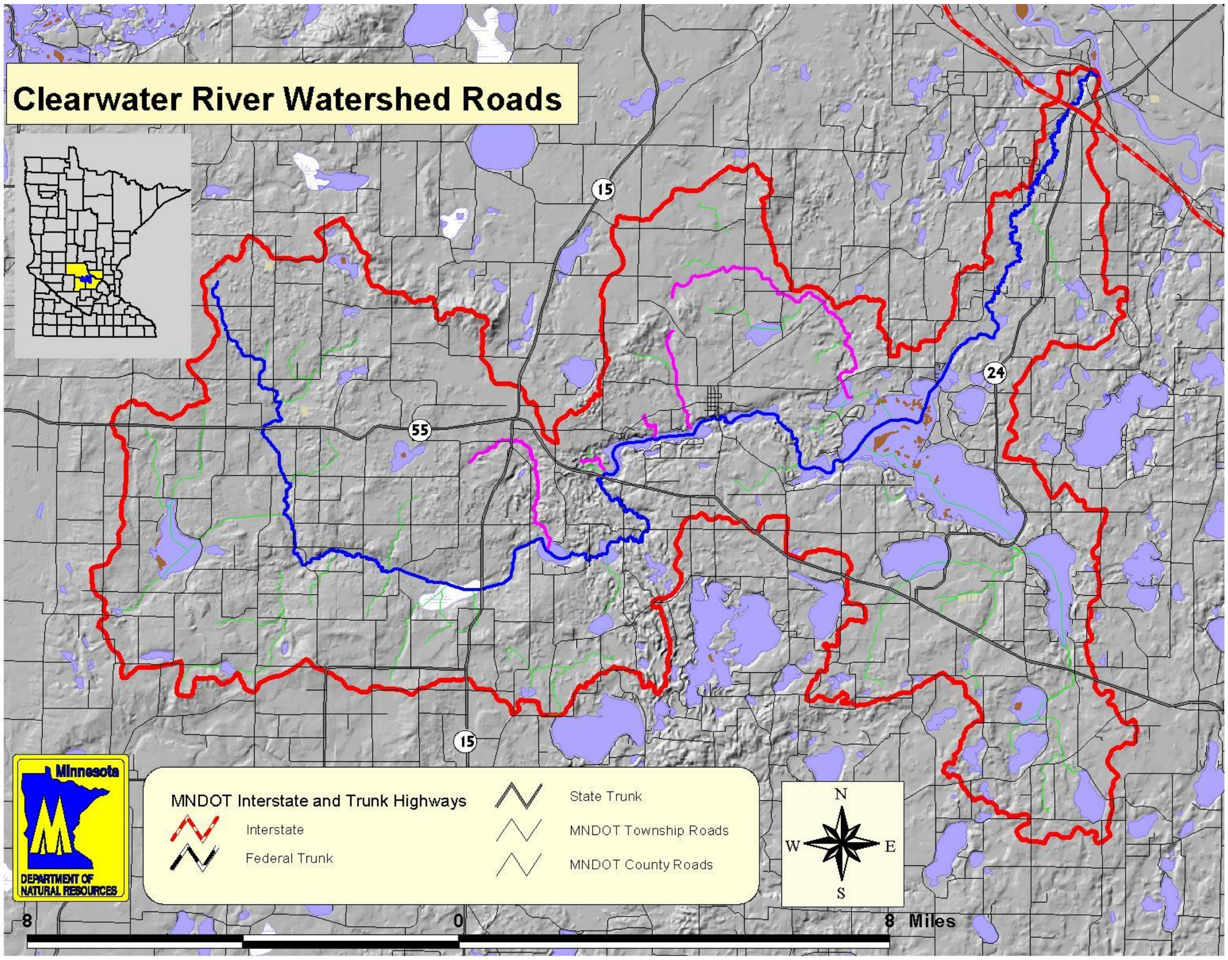


Figure 12. Road network for the Clearwater River (M-71) major watershed.

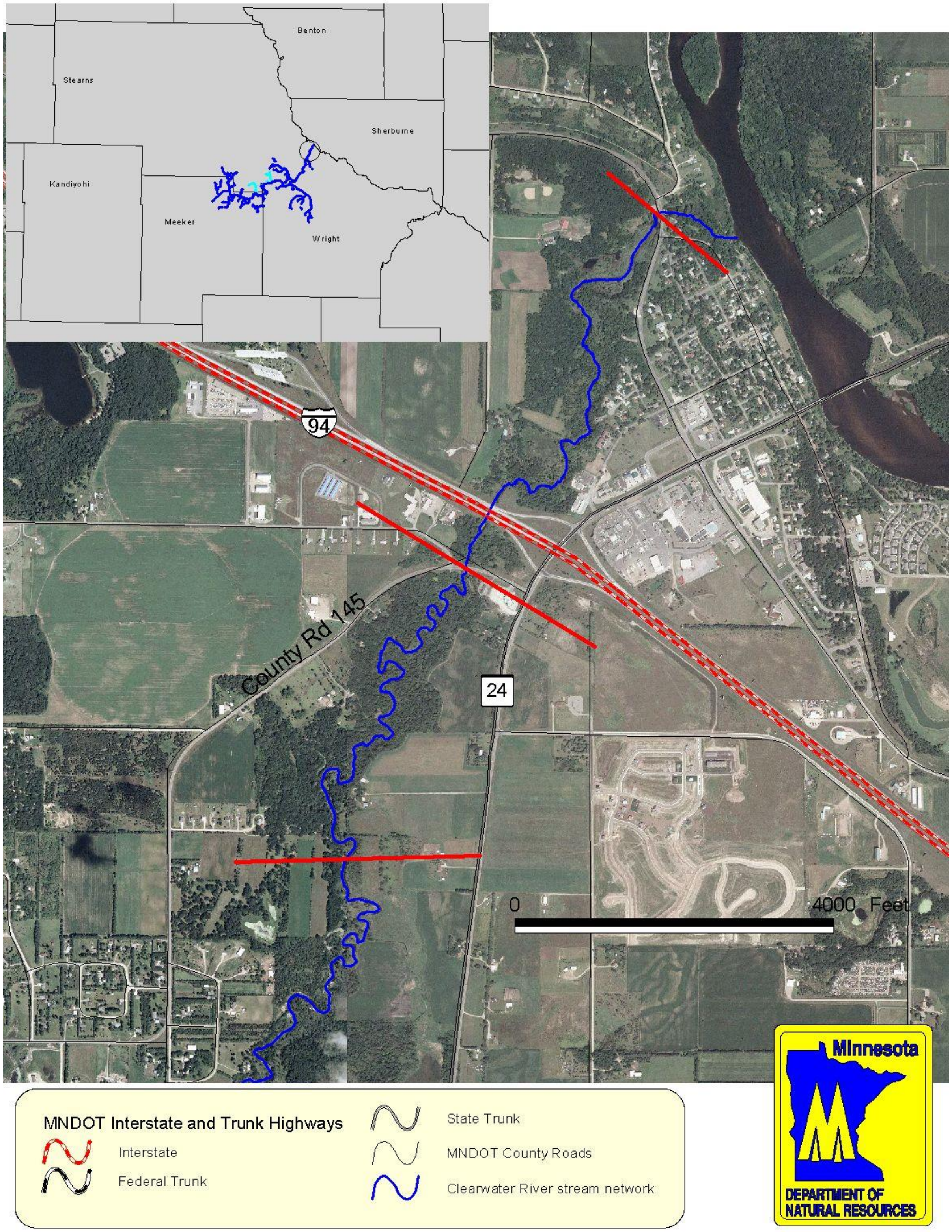


Figure 13. Sinuosity comparison between two sections of the Clearwater River above and below two road crossings (I-94 , County Road 145) near Clearwater, MN.

Table 1. Clearwater River (M–71) major watershed estimated land use by acres and percent (1991 data).

Land use	*Acres*	*Percent*
Agricultural	58,386.5	53.5
Forest	16,685.3	15.3
Grassland/Pasture	15,006.0	13.8
Lakes	8,427.0	7.7
Wetlands	4,092.2	3.8
Residential	2,387.6	2.2
Gravel Pits	2,275.1	2.1
Grassland/Shrub	1,771.8	1.6
Unclassified	46.0	0.0
Total	109,077.5	

Table 2. Results of classification on the Clearwater River at the lower site (upstream of CR 40/46 near Clearwater) in 2005.

Bankfull Dimensions		*Flood Dimensions*		*Materials*	
117.3	x-section area (ft.sq.)	461.0	W flood prone area (ft)	38	D50 Bed (mm)
62.9	width (ft)	7.3	entrenchment ratio	43	D84 Bed (mm)
1.9	mean depth (ft)	2.4	low bank height (ft)	2	threshold grain size (mm):
2.4	max depth (ft)	1.0	low bank height ratio		
64.4	wetted parimeter (ft)				
1.8	hyd radi (ft)				
33.8	width-depth ratio				
Bankfull Flow		**Flow Resistance**		**Forces & Power**	
1.3	velocity (ft/s)	0.031	Manning's roughness	0.031	channel slope (%)
149.0	discharge rate (cfs)	0.09	D'Arcy-Weisbach fric.	0.04	shear stress (lb/sq.ft.)
0.17	Froude number	9.5	resistance factor u/u	0.13	shear velocity (ft/s)
		13.2	relative roughness	0.046	unit strm power (lb/ft/s)

Table 3. Results of classification on the Clearwater River at the upper site (upstream of Lake Louisa near Kimball MN) in 2005.

Bankfull Dimensions		*Flood Dimensions*		*Materials*	
114.9	x-section area (ft.sq.)	415.0	W flood prone area (ft)	8	D50 Bed (mm)
102.6	width (ft)	4.0	entrenchment ratio	32	D84 Bed (mm)
1.1	mean depth (ft)	0.6	low bank height (ft)	5	threshold grain size (mm):
2.9	max depth (ft)	0.2	low bank height ratio		
105.3	wetted parimeter (ft)				
1.1	hyd radi (ft)				
91.6	width-depth ratio				
Bankfull Flow		**Flow Resistance**		**Forces & Power**	
2.3	velocity (ft/s)	0.028	Manning's roughness	0.16	channel slope (%)
258.6	discharge rate (cfs)	0.09	D'Arcy-Weisbach fric.	0.11	shear stress (lb/sq.ft.)
0.38	Froude number	9.5	resistance factor u/u	0.24	shear velocity (ft/s)
		10.7	relative roughness	0.25	unit strm power (lb/ft/s)

Table 4. Average values for selected water chemistry parameters on the Clearwater River in Grass Lake 1981-1995.

PARAMETER	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1995
Dissolved oxygen (DO)	12.02	10.62	10.35	11.19	10.24	9.80	10.19	9.87	9.09	12.49	11.40
PH	8.42	8.34	8.17	8.09	8.14	8.21	8.67			8.38	
Phosphorus as P	0.05	0.07	0.17	0.06	0.12	0.12	0.03	0.03	0.07	0.03	
Specific conductance	388.85	360.91	363.57	560.83	378.00	339.60	336.67			322.50	
Temperature, water	13.03	10.45	11.56	9.96	12.56	15.52	17.38	16.24	17.48	13.50	11.95

Table 5. Electrofishing station sampling and Index of Biotic Integrity (IBI) information, Clearwater River, 2005.

Station	EF1	EF3	EF2	EF7	EF8	EF4	EF5	EF6
Effort	1953	1541	900	2202	694	1816	1512	1300
Gear	Barge EF							
Location	Upstream of CR 145	Upstream of CR 40-46	Down stream of Wiegand Lake	Upstream of Lake Louisa	Upstream of Lake Louisa (above RR)	Upstream of Rock - wood Ave.	Upstream of 704th Ave.	Upstream of Meeker Cty. Hwy 17
Station length (ft)	834	953	835	790	346	528	384	335
# species	11	16	12	8	21	11	11	12
Species Richness and Composition Metrics								
Number DSM[1]	1	2	2	0	2	1	1	1
Number WE[2]	3	4	4	1	5	3	4	5
Number INT[3]	2	1	1	0	2	0	0	0
Percent TO[4]	19	61	12	16	11	10	60	98
Trophic and Reproductive Function Metrics								
Number INS[5] Species	4	6	7	2	10	4	3	3
Number PI[6] Species	2	2	1	3	5	4	2	2
Percent of SL[7] Individuals	22	54	3	16	26	5	25	2
Fish Abundance and Condition Metrics								
Number of fish /100 m	42	80	42	71	224	212	91	384
Percent DELT Anomalies	0	0	0	0	0	0	0	0
Overall IBI Score	61	68	61	46	82	56	48	44
IBI Rating	Good	Good	Good	Fair	Excellent	Fair	Fair	Fair
Range for Rating	79-60	79-60	79-60	59-40	100-80	59-40	59-40	59-40

[1] DSM- Darter, sculpin and madtom species, [2] WE- Wetland species, [3] INT – Intolerant species, [4] TO – Tolerant species, [5] INS – Invertivore, [6] PI- Piscivore, [7] SL – Simple lithophil

Table 6. Species composition by electrofishing station collected from the Clearwater River, September 2005.

Species	EF1	EF3	EF2	EF7	EF8	EF4	EF5	EF6	Sum of Species
Bluegill			2	99	34	247			382
Fathead minnow							12	349	361
White Sucker	17	104	3	26	7	18	25	1	201
Hornyhead chub	64	37	2		38				141
Yellow bullhead	2		83						85
Largemouth bass	10	11		16	3	33	1	3	77
Common shiner	1	11		2	49		1		64
Central mudminnow		10	5		4	1	14	15	49
Mimic shiner					16		28		44
Johnny darter		5	1		22	2	10	2	42
Tadpole madtom	1	21	2		6				30
Black bullhead		1	4		8	15		1	29
Channel catfish					22	7			29
Northern pike	1	2		14	2	6	2	1	28
Creek chub	2	2					11	8	23
Blacknose dace		9			6			6	21
Yellow perch				12	7				19
Bluntnose minnow		14	1						15
Black crappie			1	2	4	5			12
Hybrid sunfish		1			1	6			8
Pumpkinseed sunfish	1	1	3		2	1			8
Brook silverside			1		2			3	6
Green sunfish	2						1	2	5
Longnose dace	5								5
Common carp		1		1			1		3
Golden shiner					1			1	2
Banded killifish					1				1
Bowfin					1				1
Spotfin shiner		1							1
Sum	106	231	108	172	236	341	106	392	1692

Table 7. Length range of fish sampled in all stations from the Clearwater River, September 2005.

Species	N	Min length (mm)	Max length (mm)	Mean length (mm)
Bluegill	382	27	287	155.7
Fathead minnow	361	48	68	50.5
White Sucker	201	65	435	192.9
Horny head chub	141	36	148	85.7
Yellow bullhead	85	49	165	111.0
Largemouth bass	77	61	230	125.9
Common shiner	64	93	189	127.1
Central mudminnow	49	49	109	65.6
Mimic shiner	44	31	108	67.7
Johnny darter	42	36	72	51.1
Tadpole madtom	30	24	78	48.1
Black bullhead	29	59	188	98.6
Channel catfish	29	52	520	172.7
Northern pike	28	202	485	265.2
Creek chub	23	86	229	118.6
Blacknose dace	21	36	106	52.5
Yellow perch	19	72	181	120.7
Bluntnose minnow	15	34	74	43.6
Black crappie	12	74	237	114.1
Hybrid sunfish	8	82	180	113.8
Pumpkinseed sunfish	8	76	106	88.0
Brook silverside	6	40	76	58.5
Green sunfish	5	50	84	69.7
Longnose dace	5	65	91	65.0
Common carp	3	110	180	151.6
Golden shiner	2	51	126	88.5
Banded killifish	1	76	76	76.0
Bowfin	1	186	186	186.0
Spotfin shiner	1	53	64	53.0

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Author	Date
Area Fisheries Supervisor	Date
Regional Fisheries Supervisor	Date