Clearwater River Watershed District
2010 Watershed Management Plan

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Wenck File #0002-156

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January 2011

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Minnesota Board of Water and Soil Resources
520 Lafayette Road North
Saint Paul, MN 55155

In the Matter of prescribing a Revised Watershed Management Plan for the **Clearwater River Watershed District** pursuant to Minnesota Statutes Sections 103D.405	**ORDER PRESCRIBING WATERSHED MANAGEMENT PLAN**

Whereas, the Board of Managers of the Clearwater River Watershed District (CWRWD) filed a proposed Revised Watershed Management (Plan) dated January 2011 with the Board of Water and Soil Resources (Board) on February 17, 2011 pursuant to Minn. Stat. § 103D.405, and;

Whereas, the Board has completed its review of the Plan;

Now Therefore, the Board hereby makes the following Findings of Fact, Conclusions, and Order.

FINDINGS OF FACT

1. **District Establishment.** The District was established on April 9, 1975 by Order of the Minnesota Water Resource Board. The District is located in the central portion of Minnesota and includes parts of, Meeker, Stearns, and Wright Counties and encompasses the Clearwater Chain of Lakes. The mission of the District is to promote, preserve, and protect water resources within the District.

2. **Requirement to Plan.** A watershed district is required to revise their watershed management plan at least once every ten years pursuant to Minnesota Statutes Section 103D.405, Subd. 1 (a). The latest Water Management Plan of the District was prescribed by the Board in 2003. The Plan includes an inventory of the District's physical features and water resources, describes water-related problems and possible solutions, describes activities and projects that the District has completed, and states objectives for current and future water resources management.

3. **Nature of the Watershed.** The Clearwater River Watershed District lies in central Minnesota and occupies land within Meeker, Stearns, and Wright Counties. The headwaters of the district are located in northeastern Meeker County, southeastern Stearns County, and northern Wright County. The Clearwater River runs into Clearwater Lake and then outlets into the Mississippi River. The upper portions of the watershed are dominated by

agricultural land use while the lower portions of the watershed trend towards suburban developments.

4. **Territory.** The CWRWD is approximately 159 square miles in size and is located in central Minnesota. Lands within the District are distributed in the following counties: Meeker (29%), Stearns (34%), and Wright (37%).

5. **Local Review.** The CWRWD sent a copy of the draft Plan to local units of government for their review pursuant to Minn. Stat. § 103D.405.

6. **Department of Natural Resources Review.** The DNR had no objections nor comments to the Plan.

7. **Department of Agriculture Review.** Not required by law to review.

8. **Department of Health Review.** Not required by law to review.

9. **Pollution Control Agency Review.** Not required by law to review.

10. **Other review comments.** No other review comments received.

11. **Highlights of the Plan.** The Clearwater River Watershed District plan contains a series of "Lake Report Cards" that provide a historical sampling of the conditions of each of the lakes within the district. In addition to the status of the lakes, these report cards also provide recommendations for either maintaining lake quality or improving water quality in lakes that are seeing a decline in quality. The plan also provides broader management recommendations for land use and best management changes throughout the watershed district. Finally, as the watershed district maintains several wastewater treatment facilities, the plan does a good job of looking at the long term maintenance of these facilities.

12. **Hearing Notice.** The Legal Notice of Filing on the Plan, pursuant to Minn. Stat. § 103D.105 Subd. 2, was published in the Annadale Advocate and Eden Valley Journal Patriot on May 11, and 18, 2011, and in the Tri County News on May 12 and 19, 2011. Further, a copy of the notice of filing was mailed to several addresses notifying them of the legal notice of filing, including the Meeker, Stearns, and Wright County Auditors, Administrators, and Soil and Water Conservation Districts; all of the cities within the watershed district; and representative for the Watershed District.

13. **Public Hearing.** The Legal Notice of Filing was published pursuant to Minn. Stat. § 103D.105 Subd. 2, which requires within 30 days of the last date of publication of the Notice of Filing of the Revised Water Management Plan that a least one request for hearing be received by the Board before a hearing will be held. No request for hearing and no comments were received during the specified period of time and no hearing was held.

14. **Board Staff Report.** The Clearwater River Watershed District board and contract staff held several planning sessions that included both members of the public and interested government officials. Once the plan was developed, the District sent a preliminary draft to the board conservationist for review and to ensure compliance with State statute and policy. The overall plan of the Clearwater River Watershed District meets the requirements of M.S. 103D.405 and follows the guidelines provided by the Board of Water and Soil Resources.

15. **North Region Water Plan Review Committee.** The committee met on June 15, 2011 those in attendance from the Board's Committee were Fairbanks, Brutlag, Tiedermann, and Mykleseth. Board staff in attendance were Ron Shelito, Jason Weinerman, Brian Dwight and Peter Waller. Board staff recommended approval of the plan. After discussion, the committee unanimously voted to recommend approval of the Plan pending the June 17th closing of the notice of filing with no recommendation for a formal board hearing.

CONCLUSIONS

1. The proposed Revised Plan is valid in accordance with Minn. Stat. § 103D.405.

2. Proper notice of filing was given in accordance with applicable laws.

3. All relevant, substantive and procedural requirements of law and rule have been fulfilled.

4. The Board has proper jurisdiction in the matter of approving a Plan for the CWRWD pursuant to Minn. Stat. § 103D.405.

5. The attached Plan is in conformance with the requirements of Minn. Stat. Chapter 103D, Board guidelines for Watershed District Plan content, and is consistent with the affected counties' comprehensive water plans.

ORDER

The Board hereby prescribes the attached Plan dated January 2011 as the Revised Watershed Management Plan for the Clearwater River Watershed District.

Dated at Saint Paul, Minnesota this 22 day of June, 2011..

MINNESOTA BOARD OF WATER AND SOIL RESOURCES

By: _____
Brian Napstad, Chair

Minnesota Board of Water & Soil Resources

June 22, 2011

Clearwater River Watershed District
Board of Managers
Box 481
Annandale, MN 56302

Dear Clearwater River Watershed District Managers,

The Minnesota Board of Water and Soil Resources (BWSR) is pleased to inform you it approved the Clearwater River Watershed District (NFCRWD) Management Plan (Plan) at its regular meeting held on June 22, 2011. Attached is the signed Findings of Fact, Conclusion, and Order that documents approval of the Plan and indicates it meets all relevant statutory requirements. The CRWD Management Plan is effective for a ten-year period until June 22, 2021.

The CRWD staff and Board, local partner agencies, and plan advisory members are to be commended for writing a plan that clearly presents water management goals, actions, and priorities. With continued implementation of this management plan, the protection and management of the Clearwater River Watershed will be greatly enhanced. The BWSR looks forward to working with you as your develop rules, implement this Plan, and document its outcomes.

Sincerely,

John Jaschke
Executive Director

cc: Ron Shelito, Northern Region Supervisor
Jason Weinerman, Board Conservationist

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1.0 Introduction

The Clearwater River Watershed District (CRWD) was established in 1975 after a nominating petition was filed with the Minnesota Water Resources Board. The original petition cited concerns over poor water quality in Clearwater Lake and in other lakes on the Clearwater River Chain of Lakes.

The Clearwater River Chain of Lakes Restoration Project began in 1980 as an effort to improve water quality in Clearwater Lake and several smaller lakes on the Clearwater River. Eight restoration projects were completed as part of the 1980 Chain of Lakes Restoration Project. The project continued until 1993 and resulted in a phosphorus load reduction and improved water quality in the lakes. Monitoring data illustrate the on-going success of this project.

The CRWD's original Watershed Management Plan (Plan) was developed in 1975. The Plan was updated by the managers and approved by the Minnesota Board of Water and Soil Resources in 2003.

In 2003, the CRWD began a Total Maximum Daily Load (TMDL) study on waters that were listed as impaired according to state standards. As of 2010, the TMDL studies are complete, TMDLs have been approved for 7 of the 14 impairments, and the remaining TMDLs are nearing final approval. The CRWD has developed a Watershed Protection and Improvement Plan (TMDL Implementation Plan) which identifies strategies in the watershed that are needed to protect water quality and meet water quality goals.

On February 10, 2010, the CRWD managers authorized the revision of the District's Watershed Management Plan in order to accommodate changing conditions and position the District to receive grant funding from the state to implement the TMDLs and protect water quality. On March 24, 2010, the CRWD conducted a retreat during which managers and staff established District priorities to be identified in the Plan.

The Watershed Protection and Improvement Plan (TMDL Implementation Plan) is the basis for the updated Watershed Management Plan. The 2010 Watershed Management Plan details the conditions of the District's water bodies, identifies CRWD policies, sets District goals, and identifies proposed activities to meet water quality goals. The Watershed Management Plan also outlines funding sources and identifies partnerships to conduct activities to meet water quality goals.

2.0 District's Mission

2.1 DISTRICT ESTABLISHMENT

The area encompassed by the Clearwater River Watershed District (CRWD) is rich in soil and water resources. The presence of these resources has encouraged the growth of farming and tourism, two main economic mainstays in this region of central Minnesota. Around these basics the communities have grown that support their needs. As population and industry grow, those priceless resources, which we often take for granted, may deteriorate.

A number of years ago, those who fished and enjoyed the waters of the Clearwater Chain of Lakes began to notice a decrease in the clarity of those waters, an increase in the number of rough fish (bullheads and carp), and an increase in the growth of algae on the surface of the water. Studies showed that the lakes were nutrient-rich with phosphorus concentrations many times greater than normal.

The lakes, through which the Clearwater River flowed, were aging much too quickly. That biological process, known as "eutrophication," was being helped along at an alarming rate via discharge and runoff from cities, lawns, farmland, private septic systems, and industry.

The CRWD was established as a unit of local government on April 9, 1975, by order of the Minnesota Water Resources Board, acting under authority of Chapter 112, MSA (the Minnesota Watershed Act). The waters of Clearwater Lake were first monitored in 1946. In the late 1960s and early 1970s, because water clarity seemed to be diminishing, property owners sought new tests from scientists interested in water quality. Those tests revealed that the nutrient content of the water had increased substantially since 1946, as it was concluded that phosphorus was coming into the lake at a rate almost double the rate considered damaging.

Further reports concluded that the rate of phosphorus input could be reduced by as much as 50 percent if the cities of Watkins, Kimball, and Annandale, and the Modern Craftsmen's Milk Association of Watkins installed on-land waste treatment systems instead of discharging sewage and industrial effluents into the Clearwater River and Warner Creek. If, in addition, the phosphorus input from all nonpoint sources, such as septic tanks, agricultural wastes, storm water runoff, and soil erosion could be significantly reduced, the water quality in the watershed could be restored to an acceptable level.

After a lengthy series of meetings and legal research, those concerned came to the conclusion that only a watershed district, with its powers of enforcement and its abilities to assess and to obtain federal and state funding, could tackle the pollution problem in the Chain of Lakes. The CRWD was the culmination of years of hard work and the beginning of many more years of work aimed at undoing some of the damage done over a long period of time to one of our most important resources, our lakes and streams.

Though the original thrust of the CRWD and its five-member Board of Managers was the improvement of water quality in the Clearwater River and Chain of Lakes, its scope has grown into a complete program of water management within its boundaries.

2.2 DISTRICTS MISSION STATEMENT

The mission of the Clearwater River Watershed District is to promote, preserve and protect water resources within the boundaries of the district in order to maintain property values and quality of life as authorized by MS103D.

2.3 DISTRICT PURPOSE

The purpose of the CRWD is to protect and improve surface waters of the district and enhance the ecosystem. The Petition for Establishment of the CRWD, presented in Appendix A, provides a complete description of the fourteen specific purposes of the District identified at the time of establishment.

2.4 HISTORY OF DISTRICT PROJECTS AND ACCOMPLISHMENTS

2.4.1 District Projects

The District has completed several water quality improvement projects. Notable projects include the 1980 Clearwater River Chain of Lakes Restoration Project, which included wetland treatment systems on County Ditch 20, Kingston Wetland, Annandale Wetland, and Upper Watkins Wetland. Other projects include lake aeration, erosion control projects, rough fish removal, invasive aquatic plant management, lake restoration projects, lake outlet construction, and detention basins.

The District's projects are described in greater detail in Section 4.0.

2.4.2 District TMDLS

Section 303(d) of the Federal Clean Water Act (CWA) requires the Minnesota Pollution Control Agency (MPCA) to identify water bodies that do not meet water quality standards and to develop total maximum daily pollutant loads for those water bodies. A total maximum daily load (TMDL) is the amount of a pollutant that a water body can assimilate without exceeding the established water quality standard for that pollutant.

The CRWD, in partnership with the MPCA, began a TMDL study in 2003 to address the District's impaired waters. The TMDL process establishes the amount of a given pollutant that the water body can assimilate while still meeting its designated uses, and allocates the pollutant load to existing and future sources within the watershed. Table 2.3.1 identifies impaired waters in the District identified to date and summarizes the status of the TMDL on each water body. As of 2010, the TMDL studies are either approved or nearing final approval and the target load reductions have been quantified. The CRWD has identified a suite of implementation strategies in the watershed needed to meet water quality goals for impaired waters and to protect water quality of all CRWD waters. TMDL Implementation strategies are identified in the CRWD's Watershed Protection and Improvement Plan (TMDL Implementation Plan), which was

approved by the MPCA in May 2010. TMDL reports can be found at the MPCA website at http://www.pca.state.mn.us/water/tmdl.

The TMDL studies show that to meet lake water quality goals nutrient loads must be managed from watershed sources, and in some cases, internal nutrient cycling sources. Several of the watershed management strategies identified for lakes will also assist with meeting water quality goals in the Clearwater River for bacteria and dissolved oxygen. Projects and programs to achieve water quality goals have been identified in the Watershed Protection and Improvement Plan. The CRWD has applied for grants to fund five of the projects identified so far.

2.5 EVALUATION OF PROJECT EFFECTIVENESS

2.5.1 Monitoring Results

The CRWD has conducted a hydrologic, hydraulic and water quality monitoring program since 1980. The monitoring program is an important component of evaluating project effectiveness. Ongoing monitoring is critical to establish baseline water quality and hydrologic data, to assess long-term water quality trends within the CRWD and to help identify opportunities to protect and improve water quality.

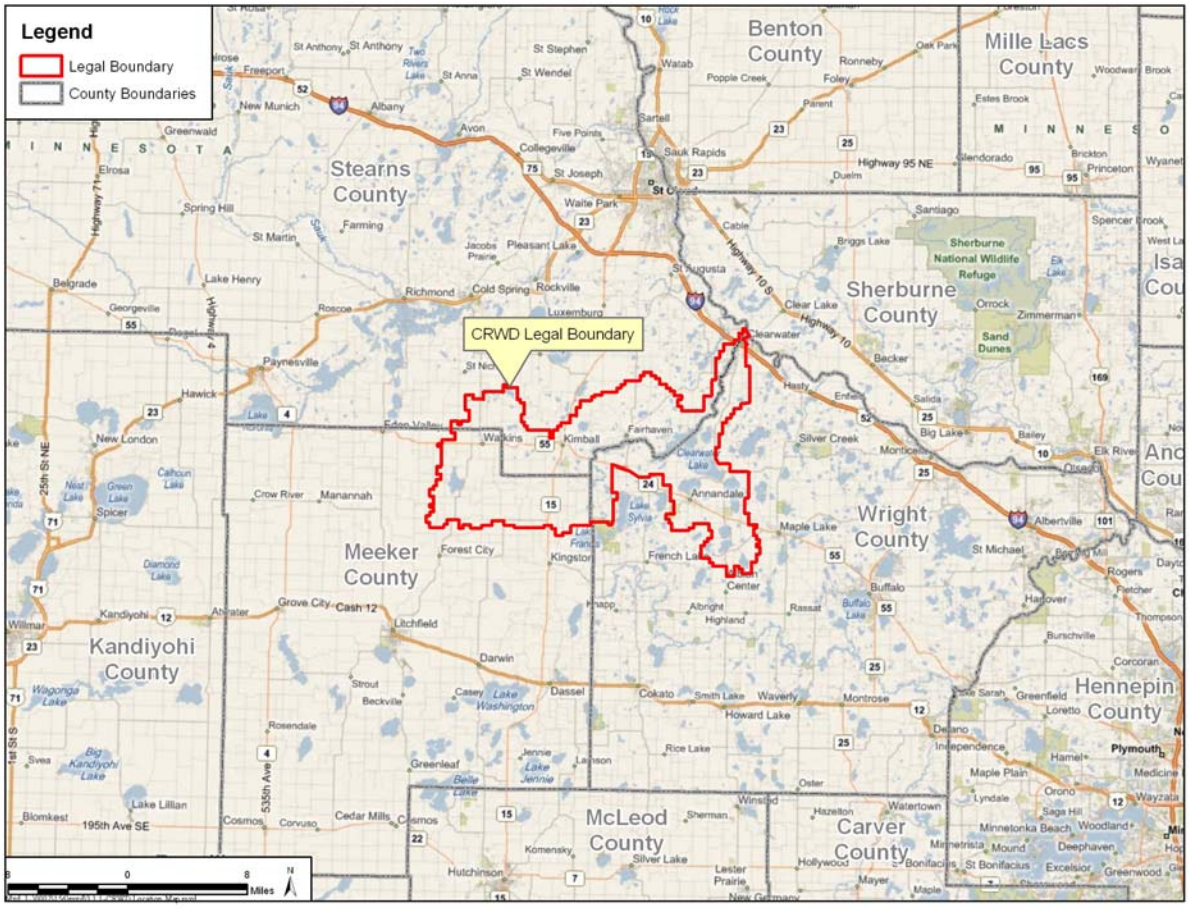
A summary of lake and stream water quality monitoring data is found in Section 5.0.

3.0 Description of the District

3.1 GENERAL WATERSHED CHARACTERISTICS

The watershed has its eastern boundary located about 40 miles northwest of the west edge of the Twin Cities Metropolitan Area (See Figure 3.1).

Figure 3.1 Clearwater River Watershed District Location



The Clearwater River Watershed District encompasses the entire drainage area of the Clearwater River. It includes portions of Meeker, Stearns and Wright Counties in Central Minnesota and the municipalities of Watkins, Kimball and Annandale, as well as all or parts of various townships.

The lakes through which the Clearwater River flows are divided into an Upper and Lower Chain by the Fairhaven dam. The Upper Chain includes Lakes Betsy, Union, Scott, Louisa, Marie and Mill Pond. The Lower Chain includes Lakes Caroline, Augusta, Clearwater, Grass and Wiegand. Other major lakes in the District are: Clear Lake, Willow Lake, School Section Lake, Pleasant

Lake, Cedar Lake, Bass Lake, Swartout Lake, Albion Lake, Henshaw Lake, Little Mud Lake, and Otter Lake.

The Clearwater River begins southwest of Watkins and is joined by a tributary known as County Ditch 20 as it meanders south, then east; where it enters the Upper Chain of Lakes. It flows north and under State Highway 55 between Kimball and South Haven, then the general direction of flow through the chain is east, then northeast out of Clearwater Lake, through Grass and Wiegand Lakes, and discharges into the Mississippi River at the City of Clearwater.

The following political units are located totally or in part within the boundary of the CRWD:

Wright County	South Side Township
Stearns County	Forest Prairie Township
Meeker County	Maine Prairie Township
City of Watkins	Kingston Township
City of Kimball	Fair Haven Township
City of South Haven	Corinna Township
City of Annandale	Clearwater Township
Lynden Township	Luxemburg Township

The District is situated generally in northeastern Meeker County, southeastern Stearns County and northern Wright County. The area of the District is 158.8 square miles with 46.1 square miles in Meeker County; 54.2 square miles in Stearns County, and 58.5 square miles in Wright County. The District extends approximately 22.5 miles from east to west and 16.5 miles from north to south.

The headwaters of the Clearwater River are located in Meeker County at an elevation of about 1,160 feet, and the flow is generally easterly and northeasterly to Clearwater Lake, thence northeasterly to its outlet into the Mississippi River at the City of Clearwater. The river is about 39 miles long with a channel gradient of about 10 feet per mile between Clear Lake and Betsy Lake in Meeker County. From Betsy Lake to the outlet into the Mississippi River, the channel has a gradient of about 3.8 feet per mile.

The Sauk River watershed is adjacent to the west end and to the western portion of the north side of the CRWD. Adjacent to the south of the CRWD is the watershed of the North Fork Crow River. The watersheds of Fish Creek and Silver Creek, which are small direct tributaries to the Mississippi River, border the eastern boundary of the CRWD.

3.2 TOPOGRAPHY

The topography of the area is dominated by rolling glacial moraines. The western portion of the watershed is composed of morainal hills, which have a high clay content. The area to the east is flatter and consists of sandier outwash and less clay. The elevation of the area ranges from 1,220 feet in the western portion of the watershed to 940 feet at the Mississippi River.

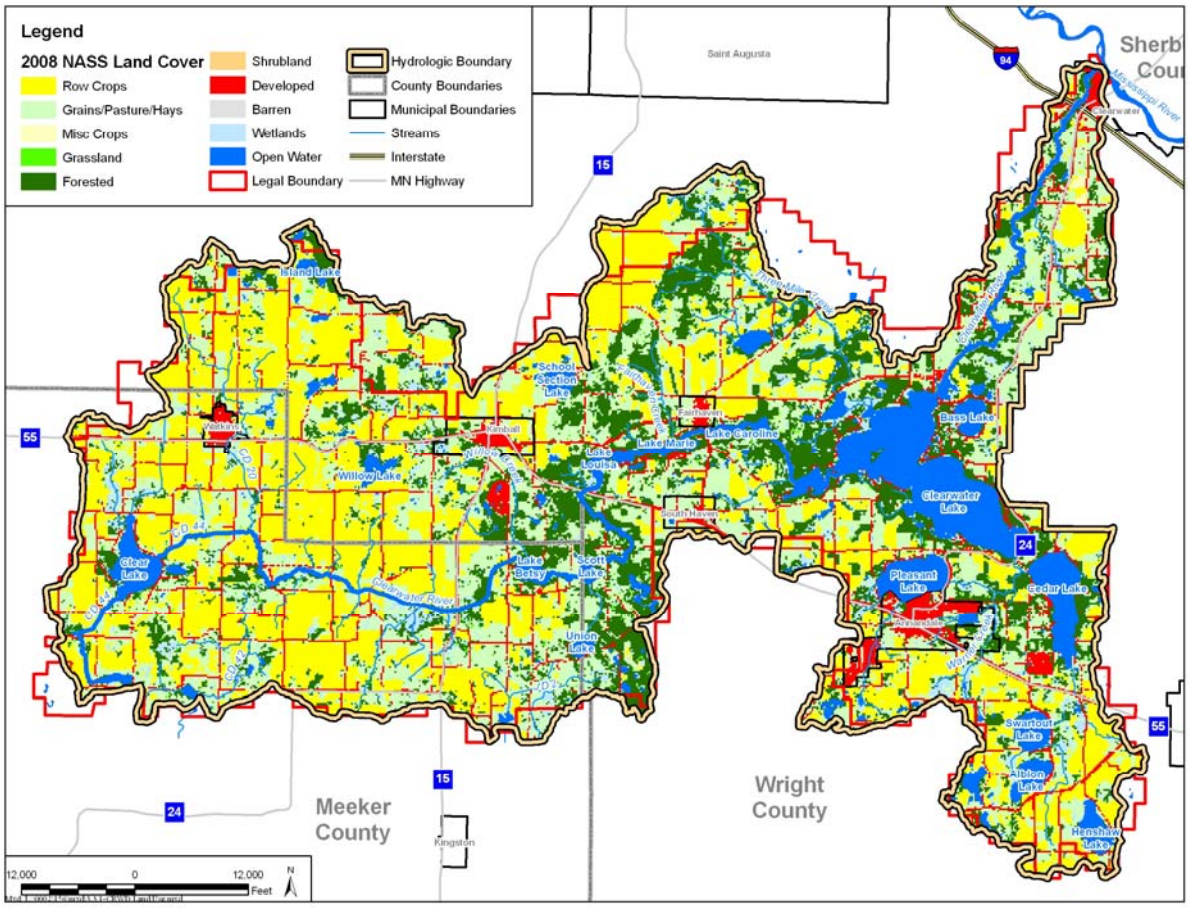
3.3 LAND USE

Figure 3.2 shows the land use of the CRWD, according to the 2008 National Agricultural Statistics Service (NASS). In very general demographic and geographic terms, the CRWD can be divided into two diverse areas. The eastern portion of the district is primarily urban/recreational in nature with forested areas and scattered agricultural use. The land use in the western area is predominantly agricultural, consisting of cash crop, dairy, beef, hog and turkey operations.

The overall NASS land use in the District is summarized in Table 3.1.

Population trends follow these same area distinctions. Population is greater per square mile in the eastern area with an expected 10-15 percent increase in growth per 10-year period. The western area population will likely remain somewhat constant or decrease slightly.

Figure 3.2 CRWD Land Use



Source: 2008 National Agricultural Statistics Service

Table 3.1 CRWD Land Use

Land Use	Acres	% of Total
Barren	29	0.0%
Developed	9,571	8.8%
Forested	20,563	18.8%
Grains/Pasture/Hay	31,161	28.5%
Grassland	872	0.8%
Misc. Crops	79	0.1%
Open Water	8,626	7.9%
Row Crops	32,955	30.1%
Shrubland	63	0.1%
Wetlands	5,443	5.0%

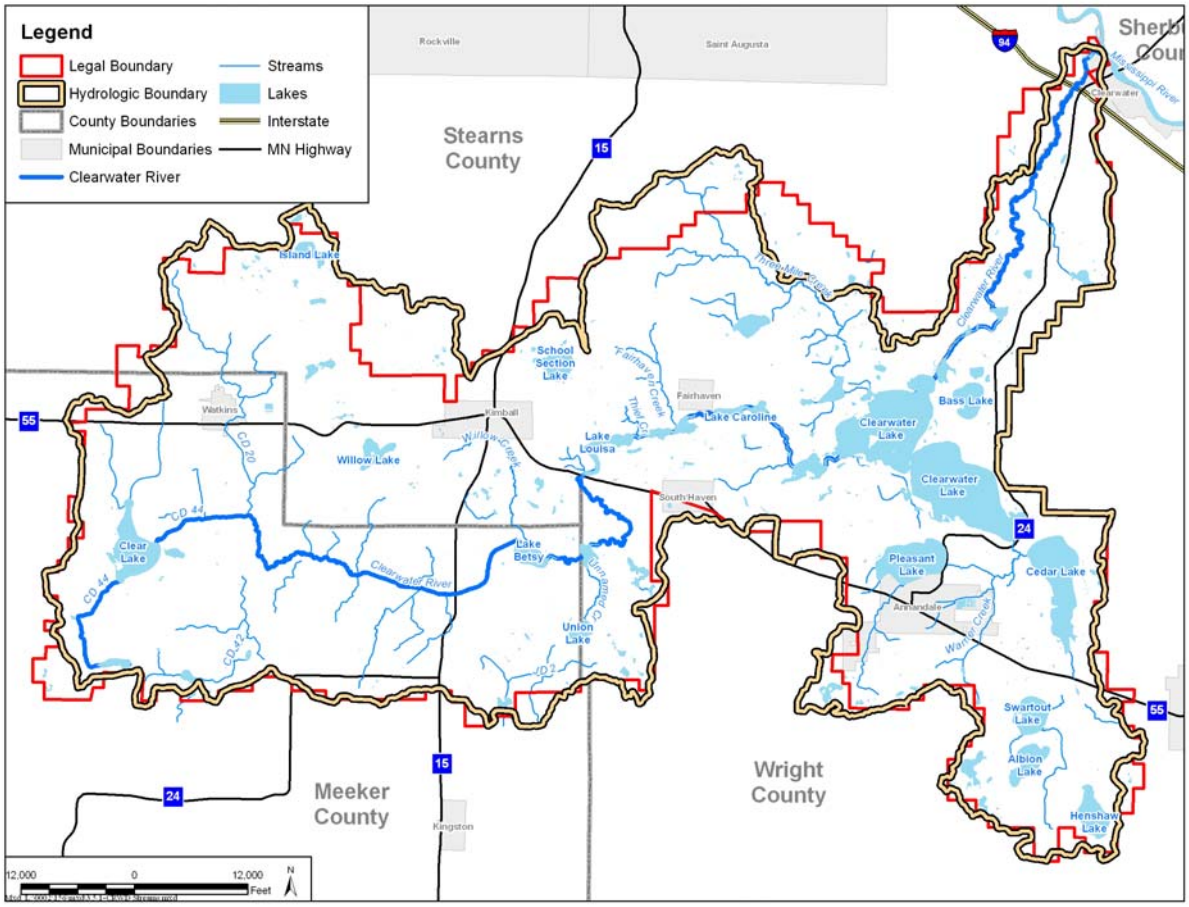
Source: 2008 National Agricultural Statistics Service

3.4 STREAMS AND LEGAL DRAINAGE SYSTEMS

Streams and drainage systems found in the CRWD are shown in Figure 3.3. There are five principal tributaries of the Clearwater River: county Ditch 20, which passes through Watkins; Willow Creek, which passes through Kimball; an unnamed creek from Union Lake; Three Mile Creek, which enters Clearwater Lake; and Warner Creek, which also flows into Clearwater Lake. Minor tributaries are Fairhaven Creek and an unnamed creek one mile West of Fairhaven, both trout streams, and Thief Creek, which flows into Lake Marie. Much of the Clearwater River has little or no flow at times. The upper reaches of the river receive little flow from lakes or groundwater during the summer months and tributaries are often dry.

As shown in Figure 3.3, there are also numerous other unnamed tributary streams which flow into lakes and the Clearwater River within the District.

Figure 3.3 CRWD Streams



3.5 GEOLOGY

The watershed lies in the Alexandria Moraine area. The great belt of lake-dotted moraine extending northward in an arc through west central Minnesota is the Alexandria Moraine complex - a complex because it is 10-20 miles broad, is interrupted by extensive areas of outwash, and contains the drifts of two different ice lobes. The bulk of the moraine is believed to have been produced at the terminus of the Wadena lobe, concurrent with formation of the Wadena drumlin field. Later, during the last phase of the Wisconsin Ice Stage, the moraine was subsequently overridden from the west by the Des Moines lobe.

The CRWD consists of coarse-textured soils in the eastern area to fine-textured soils in the western area. Geologic events occurring during the Early Proterozoic eon (2,500-1,600 million years) and Early and Middle Archean eon (over 3,000 million years) established the bedrock structure of CRWD. Glacial events during the Late-Wisconsin period as early as 10,000 years ago have provided the surficial structure of the CRWD. Combined, these geologic characteristics provide insight into the functional aspects of the land and allow informed land use decisions to be made based on the opportunities and constraints of the physical landscape. Geologic information is particularly important in determining groundwater susceptibility to contamination and for identifying potential mineral extract opportunities.

The underlying bedrock geology of the CRWD consists primarily of metamorphic rocks; granite and gneiss that are overlain by weathered metamorphic and sedimentary rocks; and shale and siltstones. While some of these formations may be visible as outcrops at various points of the CRWD, the majority of bedrock is overlain by 50 to 150 feet of glacial outwash and till. Two hundred fifty to 450 feet of glacial outwash and till overlie bedrock in the southwestern portion of the CRWD.

The oldest bedrock consists of three gneiss groups (Undivided, Richmond and Sartell) and is located primarily in the northern and western portions of the CRWD. The next oldest bedrock formations consist of the various granite formations concentrated in the CRWD. These granite formations have provided the CRWD with building supplies and economic opportunities.

The majority of bedrock in the CRWD, now overlain by glacial till, was at one time exposed. This exposed bedrock underwent weathering, resulting in the mantling of weathered and kaolinite rock over bedrock. Another layer of sedimentary rock (siltstone and shale) was overlain as a result of rising seas.

Together, the above geologic events provide the foundation of the bedrock complex within the CRWD. Glacial events further shaped the geology of the CRWD.

The most visible surficial geologic formations took form in the last glaciation of the Late Wisconsin period. The Wisconsin glaciation consisted of multiple advances and retreats of the Laurentide ice sheet. The Rainy Lobe, the Superior Lobe and the Des Moines Lobe of this ice sheet crossed paths frequently and carved the landscape of the CRWD that is visible today. These events deposited primarily glacial outwash in the CRWD. These deposits provide the CRWD with an abundance of prime agricultural land and highly productive agricultural soils.

Associated with all glacial activity and providing many of the distinct features of the CRWD glacial landscape are the glacial moraine features. A series of these moraines were formed by the activity of the Rainy and Superior Lobes. The St. Croix Moraine, while heavily weathered, provides CRWD with its rolling hills and landforms.

Topography of CRWD was formed as a result of glacial events, the formation of the bedrock foundation and the process of erosion. The topography of CRWD ranges from rolling hills in the eastern part of CRWD to flat in the western part.

3.6 SOILS

The Natural Resource Conservation Service (NRCS) has identified numerous soil classifications in the CRWD. The majority of these soils provide a good foundation for agricultural activities, the principal land use in the CRWD. Detailed soils information is available from the NRCS located in each county in the CRWD.

In very general demographic and geographic terms, the CRWD can be divided into three diverse areas. The eastern area is primarily residential, recreational; the central area is a mixture of residential, recreational and agricultural; the western area is predominantly agricultural consisting of cash crops, beef, dairy, turkey, and pork operations.

The various soil associations found within the CRWD (according to general soil maps of Meeker, Stearns and Wright Counties compiled by the Soil Conservation Service) include Lester-Hayden, Estherville-Hubbard, Burnsville-Hayden, Hayden-Peat-Marsh, Emmert-Flak, Hayden-Lester-Peat, and Lester-Le Sueur-Cordova. A description of the characteristics of each of these soil associations is found in Appendix B.

3.7 CLIMATE

3.7.1 Temperature

Temperature at St. Cloud, the closest long term climate data collection station to the CRWD, has ranged from a low of 40 degrees below zero in 1951 to a high of 103 degrees above zero in 1947. The normal annual precipitation at St. Cloud is about 26.8 inches and has ranged from a minimum of 14.64 inches in 1910 to a maximum of 41.01 inches in 1897.

3.7.2 Precipitation

As part of the 1980 Clearwater Chain of Lakes Restoration Project, precipitation monitoring was initiated in 1981. Precipitation is measured at four precipitation sampling stations distributed throughout the District. Area weighted average precipitation during 1981-2009 was 29.32 inches. The precipitation by year from 1981 to 2009 within the District is shown in Table 3.2.

Table 3.2 CRWD Precipitation

Precipitation (inches of water)					
YEAR	**Watkins**	**Kingston**	**Maine Prairie**	**Corinna**	**Area-Weighted Precipitation**
1981	--	--	--	--	19.76
1982	--	--	--	--	24.58
1983	46.54	--	42.32	35.02	41.78
1984	32.23	30.13	32.37	36.07	32.95
1985	40.72	39.49	45.28	--	42.22
1986	40.02	35.63	39.68	33.40	37.26
1987	18.97	15.40	19.41	16.16	17.52
1988	16.57	18.98	15.96	15.01	16.48
1989	22.13	22.68	21.80	16.96	20.68
1990	40.35	39.18	41.36	32.18	37.94
1991	41.30	45.11	43.41	36.28	41.01
1992	23.06	18.41	20.47	24.35	22.01
1993	40.17	35.27	37.54	33.33	36.71
1994	34.77	--	30.13	30.26	31.98
1995	33.80	--	33.65	28.66	32.21
1996	31.31	--	24.32	26.13	27.59
1997	24.18	--	21.90	27.37	24.43
1998	30.03	--	29.39	27.43	29.05
1999	22.08	--	22.31	27.71	23.84
2000	23.83	--	20.56	19.91	21.22
2001	31.00	--	33.56	29.57	31.28
2002	37.50	--	40.27	44.72	40.57
2003	22.63	--	21.34	26.77	23.02
2004	33.58	--	33.58	31.67	33.10
2005	32.30	--	--	41.47	36.89
2006	20.95	--	--	23.38	22.17
2007	26.58	--	--	27.82	27.20
2008	26.19	--	--	25.00	25.58
2009	28.86	--	--	27.65	28.26
				Long Term Area Weighted Average	29.32

Source: CRWD

3.8 WATER SUPPLY AND USE

3.8.1 Clearwater River Flow

Mean normal stream flow at the inlet to Clearwater Lake is 31.07 cfs with normalized flows as high as 85.20 cfs during the month of April.

The U.S. Army Corps of Engineers estimated the discharges for the Clearwater River and elevations for specified lakes were determined using the HEC-1 Flood Hydrograph Package. The entire watershed above the mouth at the Mississippi River was modeled. Thirteen (13) sub basins, nine (9) reservoir routings and eleven (11) combining units were used.

The model was calibrated to an U.S. Geological Survey peak discharge estimate based on a discharge measurement made on the Clearwater River upstream of the State Highway 55 bridge following the June 21, 1983 storm. This site is just upstream of the inlet to Lake Louisa. A discharge of 2,150 cfs was recorded on June 23, 1983 and is believed to be within 0.2 feet of the peak stage with an estimated peak discharge of 2,610 cfs. This storm produced an average rainfall over the watershed of 9.19 inches.

Selected Lake Elevations and Discharges from HEC-1 Model for the 10-, 50-, 100- and 500-Year Events for Various Locations in the Clearwater River Basin are shown below.

Table 3.3 Lake Elevations and Discharges for 10- 50- 100-and 500-Year Events

RECURRENCE INTERVAL YEARS	DISCHARGE LAKE LOUISA INLET HWY 55 cfs ft	FAIRHAVEN DAM FAIRHAVEN, MN ELEV. DISCH. NGVD ft	cfs ft	LAKE CAROLINE OUTLET ELEV DISCH. NGVD ft	cfs ft	BRIDGE BELOW WEIGAND LAKE ELEV. DISCH. RIVER NGVD ft	cfs ft	DISCHARGE MOUTH CLEARWATER cfs ft
10	610	1007.75	640	993.70	670	990.91	730	740
50	1010	1008.47	1070	995.15	1110	992.09	1280	1310
100	1190	1008.79	1280	995.70	1320	992.62	1530	1560
500	1790	1009.66	1940	997.20	2020	994.21	2290	2340

NOTE: Data from U.S. Army Corps of Engineers, Interim Hydrology Report
NGVD=National Geodetic Vertical Datum

3.8.2 Groundwater

The watershed lies almost entirely in glacial drift over igneous and metamorphic rocks. Thickness of the drift averages 200 feet. In glacial drift aquifers, specific capacity of small yield wells (less than 30 gpm) averages 1.31 gpm per foot of drawdown.

Locally, groundwater is discharged to small streams and lakes. Most recharge is from snowmelt in the spring, although excessive precipitation in the summer or fall can result in high water levels. Extreme high water levels in 1972 and 1984-1986 are attributed to record-breaking rainfall. Regional groundwater movement in the glacial drift is from upland areas toward the Mississippi and Clearwater rivers.

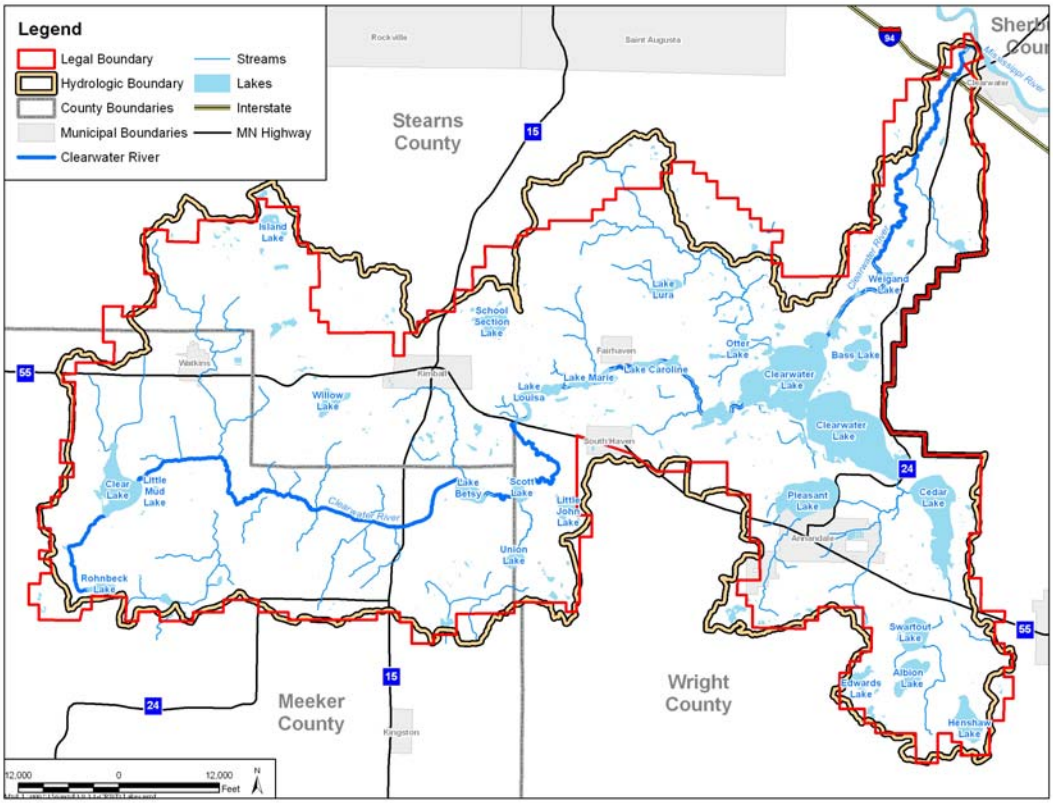
An area of surficial outwash lying a short distance to the north of Clearwater River and north of Kimball has soils of low water-holding capacity and is the primary area in the watershed with a probability of future irrigation development.

A situation developed in School Section Lake during 1984, which resulted from the heavy rainstorms beginning in the summer of 1983. School Section Lake is a land-locked lake in southeastern Stearns County, just north of Kimball. The lake level increased approximately seven feet, which caused 14 houses and cabins around the lake to be flooded. The lakeshore owners petitioned the Clearwater River Watershed District to install an outlet and the outlet was completed in September 1984.

3.8.3 Lakes

Lakes in the District are shown on Figure 3.4. In addition to the meandered lakes in the watershed, there are several non-meandered bodies of water. Some of these have names. The named, non-meandered lakes include several through which the Clearwater River flows. These non-meandered lakes on the Clearwater River are Wiegand, Augusta, Caroline, Marie, and Louisa. There are also several other non-meandered lakes including Rohrbeck and Round Lakes in Meeker County, and Island, Willow, Swamp and Otter Lakes in Stearns County.

Figure 3.4 CRWD Lakes



3.8.4 Recreational Waters

All lakes in the watershed are used for recreational purposes, with intensive use at times on certain lakes.

3.9 WASTE TREATMENT SYSTEMS

3.9.1 Municipal

The cities of Kimball, Watkins, and Annandale upgraded their waste treatment plants in the 1980's to include spray irrigation of the treated effluent.

The city of Watkins treatment system is located on the north edge of the CRWD, but the spray irrigation sites are located outside the CRWD. Similarly, the City of South Haven waste treatment system is located near the south boundary of the CRWD, but the spray irrigation sites are also outside of the CRWD. Therefore, there are no discharges from either of these systems to the Clearwater River.

The Kimball waste treatment system is located east of Kimball, but there is no point discharge from this system. However, runoff from this system would eventually reach Lake Louisa, which is part of the Clearwater River.

The Annandale waste treatment system is combined with the city of Maple Lake and discharges to the North Fork Crow River basin.

The city of Fairhaven does not have a public sewage disposal system and the residents utilize private sewage systems.

3.9.2 Industrial

The only industry in the District that discharged to a stream historically was the Mid-America Dairyman's Association facility located in Watkins. This facility was engaged in the manufacture of cheese products. This facility closed in mid-1986.

The Upper Watkins Wetland Isolation Project was completed in 1985 to capture and retain large quantities of nutrients, which had previously been discharged to this wetland by Mid-America. The facility had attempted several treatment systems to meet the requirements of their NPDES permit before closing.

Various institutional contributors are connected to the municipal sewage treatments systems in each city, including the public schools, laundromats, senior citizen homes, trailer parks and other such contributors.

3.9.3 Residential

There are several "cluster" wastewater treatment systems serving residences adjacent to District lakes. Residential cluster systems operated by the District include Clearwater Harbor, Hidden River, Rest-a-While Shores, and Wandering Ponds. There are several other cluster systems in the District that are operated by residents or entities other than CRWD.

3.10 ECONOMY

3.10.1 Population

According to U.S. Census data, the population has increased by approximately 30 percent in Wright County and approximately 10 percent in Stearns County in the time period from 2000 to 2008. Growth in the portions of these counties likely occurred adjacent to larger cities and actual population growth within the CRWD is actually less than this total growth percentage. The population in Meeker County experienced almost zero growth during this same time period.

3.10.2 Agriculture

The small family farm predominates in the CRWD, with no major visible trend towards corporate operation. In Wright County there is a steady shift towards cash grain production and away from dairy farming. Stearns, Wright, and Meeker counties maintain inventories of feedlots within each of their jurisdictions.

As the metropolitan area expands to the northwest, there is a growing trend toward working in the city and managing the farm as a secondary source of income. In the Stearns and Meeker portions of the District, some dairy facilities are still present. .

The most common cash grain crops are corn, soybeans, oats, and wheat, with wheat replacing oats in areas of intensive grain production as world market demand increases for this commodity.

Irrigation is emerging as a common agricultural practice north of the Clearwater River, near Kimball. A large area of soils of low water-holding capacity in the vicinity of Kimball indicates the potential for future irrigation development.

3.10.3 Industry

Industrial development in the District is agriculturally oriented with some light manufacturing.

3.10.4 Transportation

Interstate Highway No. 94 and State Highway No. 55 pass or enter the District generally from east to west providing quick, ready access to the lakes from the Twin Cities. State Highways Nos. 15 and 24 pass through the District generally from north to south.

The Soo Line Railroad provides rail transportation from Twin City terminals to points west.

Facilities are provided for bus and private aircraft transportation within and near the District.

3.10.5 Property Valuation

The 2010 total taxable market value of the District is $1,416,059,000.

Lakeshore property contributes significantly to the tax base of the communities.

3.10.6 Recreation and Tourism

Recreation and tourism are important industries in portions of the CRWD, with resorts and seasonal camps located on District lakes. The total recreational tourism of the District is difficult to assess. However, it would be fair to state that considering the permanent and seasonal residents, their families and friends, the tourists availing themselves of the resort, the individuals utilizing the four camps and the state and privately owned public accesses, the individuals using the facilities of the District would measure in the tens of thousands annually.

4.0 Completed Projects

The District has designed and constructed numerous projects intended to improve water quality. The District monitors the condition of on-going restoration projects annually and conducts maintenance repairs as needed.

Projects with an asterisk after their title were a component of the 1980 Clearwater River Chain of Lakes Restoration Project.

4.1 LAKE AUGUSTA EROSION CONTROL PROJECT*

The Lake Augusta Erosion Control Project successfully stopped a severe bank erosion problem, thereby reducing sediment and nutrient loading to the lake at a cost of approximately $133,000. The estimated phosphorus removal capacity of the project was determined to be 42 pounds per year.

4.2 AUGUSTA-CLEARWATER-GRASS LAKE BOG CONTROL PROJECT

The Augusta-Clearwater-Grass Lake Bog Control Project was implemented after two years of very high water caused severe floating bog problems in these lakes. The bog control project was set up with the cooperation of the lake property owners involved. The project includes acquisition and improvement of access areas for bog removal, and the funding process for removal of floating bogs deemed harmful. Cost for the project was $17,000 for the removal of approximately 12 acres of bogs, which contained an estimated 14,000 pounds of phosphorus.

4.3 UPPER WATKINS WETLAND ISOLATION PROJECT*

The Upper Watkins Wetland Isolation Project successfully isolates a wetland that had previously received nutrient enriched effluent from a cheese plant. This wetland was the largest nutrient source in the entire watershed. The project diverts runoff and channel flow around the edge of the wetland and includes more than 11,000 feet of isolation dikes and channels, plus overflow structures and ditch crossings. Project expense was approximately $460,000.

4.4 COUNTY DITCH 20 WETLAND TREATMENT SYSTEM*

The County Ditch 20 Wetland Treatment System contains approximately 40 acres of wetlands, which are served by a diversion structure and two channels. A total of approximately 7,000 feet of diversion canals distributes the contaminated runoff over the wetland. The system's estimated removal rate of phosphorus is 1,000 pounds annually. Costs for this project was approximately $200,000.

4.5 KINGSTON WETLAND TREATMENT SYSTEM*

The Kingston Wetland Treatment System contains nearly 300 acres of wetland. Over 19,000 feet of diversion channels and more than 150 distribution pipes were installed along the length of the channel. Project cost was approximately $394,000. The average phosphorus load reduction from the system is estimated to be 5,600 pounds per year.

4.6 ANNANDALE WETLAND TREATMENT SYSTEM*

The Annandale Wetland Treatment System consists of approximately 40 acres of wetlands in two locations, with 4,600 feet of diversion ditches. The system's load reduction is estimated to be 750 pounds per year at a construction expense of $120,000.

4.7 UPPER LAKES MECHANICAL FISH REMOVAL PROJECT*

The harvesting of 79,300 pounds of carp, bullheads, and other rough fish, which disturb the sediments and uproot sediment-filtering plants while foraging is equivalent to removing approximately 1,500 pounds of phosphorus per year from the lakes. Rough fish harvesting helps to eliminate lake bottom destruction and prevents the mixing of large amounts of nutrients into the water from the sediments. This also potentially allows other fish species to fill the void left by the rough fish removal.

4.8 UPPER LAKES AERATION PROJECT*

The Upper Lakes Aeration Project involved the oxygenation of the hypolimnion in Lakes Louisa and Marie and reduced the in-lake phosphorus loading substantially by preventing anoxic conditions, which release sediment bound phosphorus. Estimated cost of the project was $285,000. It is estimated that this project removed approximately 300 pounds of phosphorus annually. However, this project is no longer in operation.

4.9 PLEASANT LAKE OUTLET PROJECT

The Pleasant Lake Outlet Project was initiated by local petition to increase the outflow capacity of the outlet in order to alleviate excessively high lake levels. Reconstruction of the outlet cost approximately $48,000.

4.10 SCHOOL SECTION LAKE OUTLET PROJECT

The School Section Lake Outlet Project was undertaken to alleviate flooding of homes and farmland by creating an outlet on this land-locked lake. Approximate cost of the outlet was $155,000.

4.11 NONPOINT SOURCE POLLUTION ABATEMENT PROJECT*

The Nonpoint Source Pollution Abatement Project aimed to institute farming practices that will protect the public from water quality degradation while at the same time reduce soil loss, lower farm operating costs, and increase profits. The project cost was approximately $500,000. The estimated total load reduction from the project was 2,100 pounds of phosphorus per year.

4.12 LAKE AUGUSTA HYPOLIMNETIC AERATION PROJECT*

The Lake August Hypolimnetic Aeration Project involved the oxygenation of the hypolimnion in Lake Augusta and was expected to further reduce the in-lake phosphorus loading substantially by preventing anoxic conditions, which release sediment bound phosphorus. The estimated phosphorus load reduction from this project was approximately 280 pounds per year.

4.13 CLEAR LAKE PROJECT

Accelerated reduction of water quality in Clear Lake during mid 1980s prompted the property owners around Clear Lake to file a petition in 1987 with the District to correct the problem. In response, the District began a diagnostic and feasibility study in 1988 to investigate the causes of the lake's problems and determine the appropriate remedial action. The estimated project cost was $46,000.

4.14 CEDAR LAKE PROJECT #06-1

Project #06-1 was initiated in 2007 in response to a petition by lake shore residents to address the declining water quality and severe algae blooms in Cedar Lake.

The project goals were to reduce phosphorus concentrations in Cedar Lake and the accompanying nuisance algae blooms. More specifically, the goal of the project was to reduce the annual phosphorus load to Cedar Lake from 3,000 lbs to 1,000 lbs and reduce the in-lake summer average phosphorus concentration in Cedar Lake to 20 µg/l. An additional goal of the project was to further reduce phosphorus loading from upstream lakes through a reduction of the carp population of the lakes.

Overall, the external phosphorus load to Cedar Lake from the upstream watershed ranged from approximately 500 lbs to 1,000 lbs with an average of 797 lbs, compared to the Project goal of 1,000 lbs over the three years of monitoring during the Project.

Watershed BMPs, including drain tile inlet replacement, buffering of tile inlets, and ditch and stream buffer strips were implemented as part of the Project. Rough fish management activities including constructing carp barriers and rough fish harvest were implemented as part of the Project as well. It is anticipated that these efforts will be ongoing following the completion of the Project.

Summer average phosphorus concentrations in Albion and Henshaw Lakes have decreased and water clarity has improved since the start of the Project. The suspected cause of improved water quality in these two lakes is the apparent improved ecological health. Summer average phosphorus concentrations remained high in Swartout Lake but were relatively stable since the start of the Project. Summer average phosphorus concentrations in Cedar Lake have decreased since 2006 but still remain above the Project goal of 20 µg/L.

4.15 CLEARWATER-AUGUSTA LAKES EURASIAN WATER MILFOIL CONTROL PROJECT

The lake associations on Clearwater and Augusta Lakes treat milfoil in these two lakes annually. The District assists with the funding of the milfoil treatment.

4.16 HIDDEN RIVER WASTEWATER PROJECT

This wastewater treatment system was constructed to service a 31 single family home development located adjacent to Grass Lake and the Clearwater River. This system uses a recirculating sand filter and a drainfield to treat sewage.

4.17 NISSLER SEDIMENTATION POND

The District constructed a sedimentation basin on a tributary stream to Clear Lake to reduce particulate phosphorus and sediment loading to the Lake.

4.18 FOREST PRAIRIE WASTEWATER PROJECT

The District assisted the Clear Lake Association by providing funds to get a grant for a wastewater treatment system for residents on Clear Lake.

4.19 MAINE PRAIRIE EROSION CONTROL PROJECT

CRWD provided technical assistance to facilitate the design and construction of the project, which provided bank stabilization as part of a road construction project.

4.20 CLEARWATER RIVER ROUGH FISH TRAP

The District installed a rough fish trap on the Clearwater River just upstream of Lake Louisa and utilizes the services of a commercial fisherman to facilitate rough fish removal from the river annually.

4.21 REST-A-WHILE SHORES WASTEWATER PROJECT

This wastewater treatment system was constructed to treat sewage from a 6 single family home development located adjacent to Lake Louisa.

4.22 CLEARWATER HARBOR WASTEWATER PROJECT

This system was constructed to service an 82 single family home development located adjacent to Grass and Clearwater Lakes. The system uses a recirculating sand filter and drainfield to treat sewage from the residences.

4.23 NORTON AVE SEDIMENTATION BASIN

The District designed and constructed a sedimentation basin adjacent to Lake Augusta to reduce erosion and sedimentation to the lake.

5.0 Water Quality

5.1 ANNUAL MONITORING PROGRAM

The Clearwater River Watershed District (CRWD) has conducted a stream, precipitation, and lake monitoring program since 1980. Ongoing monitoring is critical to establish baseline water quality and hydrologic data and to assess long-term water quality trends within the CRWD.

The District has monitored 20 lakes since the early 1980s. Generally, the District has sampled ten of its lakes each year on a rotating basis, resulting in each lake being sampled once out of every two to three years. In 2009, the District sampled all 20 lakes to provide a baseline for water quality across the District, provide a full watershed data set for model calibration, and better characterize internal nutrient cycling through measuring the anoxic period explicitly through collection of additional temperature and dissolved profile data as well as bottom phosphorus and iron.

Routine monitoring includes the collection of surface samples that are analyzed for total phosphorus, ortho phosphorus and Chlorophyll-a. Secchi depth measurements are taken and dissolved oxygen and temperature profile data is also collected during each routine lake monitoring event. Surface samples have also been analyzed for nitrogen during some monitoring years. Expanded monitoring activities to better characterize internal nutrient cycling in lakes have also included the collection of samples to be analyzed for bottom phosphorus and total iron concentrations, the collection of additional temperature and dissolved oxygen profile data, and the collection of lake sediment cores to measure phosphorus release rates from bottom sediments.

Monitoring data is compiled in an Annual Monitoring Report which is prepared each year.

The monitoring program going forward will:

1. Track progress towards water quality goals for impaired waters,
2. Fill data gaps identified in the TMDLs, and evaluate water quality through annual monitoring program,
3. Continue to provide baseline water quality data and calibration data sets to refine TMDL load reductions, and
4. Track long-term trends in all CRWD waters monitored ensuring early detection of declining trends.

5.2 WATER QUALITY SUMMARY

Though in-stream and lake water quality in the District generally has improved by an order of magnitude since the 1980 Chain of Lakes Restoration Project, water quality still does not meet

state standards in several waterbodies identified on the 303(d) list of impaired waters. For example, summer average total phosphorus concentrations in some District lakes have decreased dramatically since the monitoring program began in 1981, but still remain above the state water quality standards for total phosphorus.

5.2.1 Lake Water Quality

As shown in Table 5.1, water quality observed in lakes monitored during the most recent monitoring year (2009) is within ranges seen in recent years. Total phosphorus and chlorophyll-a concentrations were at the low end of historical ranges in several lakes, including Henshaw, Little Mud, Nixon, School Section, Union, and Wiegand. However, as noted in Table 5.1, the most recent summer average water quality parameters remained above TMDL goals in several of the lakes.

Table 5.1 2009 Mean In-Lake Total Phosphorus, Chlorophyll-a, and Secchi Depth, and Historical Ranges

	Total Phosphorus ug/l		Chlorophyll-a ug/l		Secchi Depth (meters)	
LAKE	2009 Mean	Historical Range Mean	2009 Mean	Historical Range Mean	2009 Mean	Historical Range Mean
Albion	173	130-296	38	60-204	1.2	0.5-1.2
Augusta	31	28-300	13	4-73	1.8	1.1-1.9
Bass	17	13-28	4	2-5	3.2	3.1-4.2
Betsy	235	120-700	14	4-170	2.0	0.5-2.4
Caroline	50	36-300	29	3-55	1.4	0.8-1.9
Cedar	32	19-58	12	3-20	1.9	1.1-3.0
Clear	197	80-307	85	17-134	0.3	0.3-1.2
Clearwater East	25	22-130	9	3-85	2.2	1.2-3.0
Clearwater West	29	25-160	10	4-77	1.9	1.4-2.6
Grass	26	17-38	7	1-14	3.4	1.9-3.4
Henshaw	90	90-390	25	25-278	0.6	0.2-0.9
Little Mud	28	28-62	8	5-36	3.4	1.4-3.4
Louisa	52	33-440	28	4-101	1.5	0.6-1.5
Marie	84	69-360	42	4-153	0.9	0.6-2.3
Nixon	16	15-39	4	2-8	3.2	1.8-3.3
Otter	21	13-34	5	1-8	2.7	1.9-3.0
Pleasant	32	15-51	8	4-12	2.3	2.0-3.0
School Section	20	20-50	4	3-14	3.1	1.0-3.1
Scott	151	82-660	69	3-223	0.7	0.5-1.9
Swartout	354	200-421	184	144-832	0.2	0.2-1.0
Union	25	25-88	9	7-39	1.8	1.0-2.3
Wiegand	28	28-61	7	3-12	2.6	1.7-3.4

T:\0002\129\[mean in lake_tp_chla_secchi_09.xls]Table

2009 Mean Values Above TMDL Goals

Table 5.2 compares CRWD lakes to MPCA impairment standards and identifies phosphorus trends in each lake. Overall, based on the most recent monitoring data for all lakes within CRWD, water quality in most lakes is generally good and appears to be remaining stable or improving.

Since many of the water bodies in the District are connected by the Clearwater River, an improvement in lake water quality will lead to an improvement in the water quality in the Clearwater River.

Table 5.2 2009 Lake Trend and Impairment Summary

Lake	Last Monitored	Phosphorus Trend	Use
Albion	2009	Decreasing Trend	Impaired
Augusta	2009	Recent Stable Trend	Full Use
Bass	2009	Stable Trend	Full Use
Betsy	2009	Recent Increasing Trend	Impaired
Caroline	2009	Recent Stable Trend	Impaired
Cedar	2009	Recent Stable Trend	Full Use
Clear	2009	Stable to Decreasing Trend	Impaired
Clearwater East	2009	Recent Stable Trend	Full Use
Clearwater West	2009	Recent Stable Trend	Full Use
Grass	2009	Decreasing Trend	Full Use
Henshaw	2009	Recent Decreasing Trend	Impaired
Little Mud	2009	Decreasing Trend	Full Use
Louisa	2009	Recent Stable Trend	Impaired
Marie	2009	Recent Stable Trend	Impaired
Nixon	2009	Recent Stable Trend	Full Use
Otter	2009	Stable Trend	Full Use
Pleasant	2009	Stable Trend	Full Use
School Section	2009	Stable Trend	Full Use
Scott	2009	Stable to Decreasing Trend	Impaired
Swartout	2009	Stable to Increasing Trend	Impaired
Union	2009	Decreasing Trend	Full Use
Wiegand	2009	Decreasing Trend	Full Use

T:\0002\129\[LAKE_WQ_09.xls]Summary

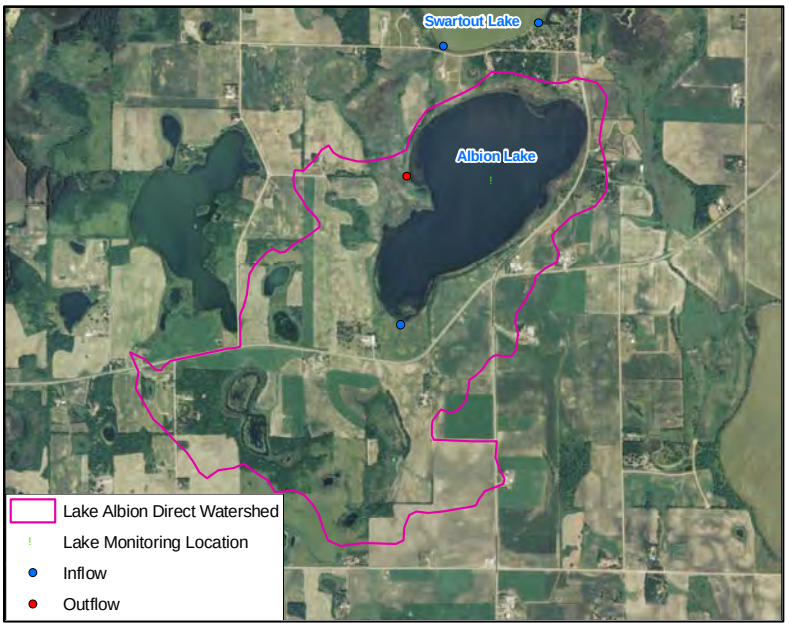
5.2.2 Lake Report Cards

Lake report cards are presented for each District lake that is monitored annually. The lake report cards summarize recent and historical total phosphorus concentrations, chlorophyll-a concentrations, and Secchi disk depth and compare the values to TMDL water quality goals for each lake.

Besides providing a summary of water quality, the report cards for impaired lakes in the District also quantify the existing sources of phosphorus loading to the lake and identify the necessary reductions identified in the approved TMDLs for each source in order to meet water quality goals. Activities that have been proposed in the approved TMDL Implementation Plan that would improve the water quality in the lake are also identified on the lake report cards.

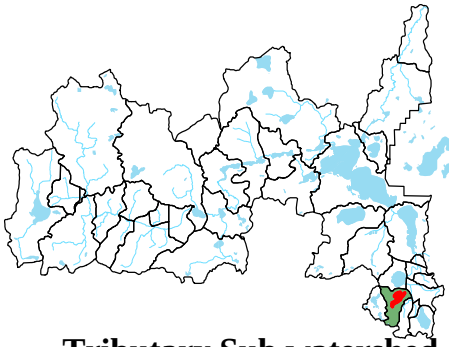
5.2.2.1 Albion Lake

Albion Lake Report Card

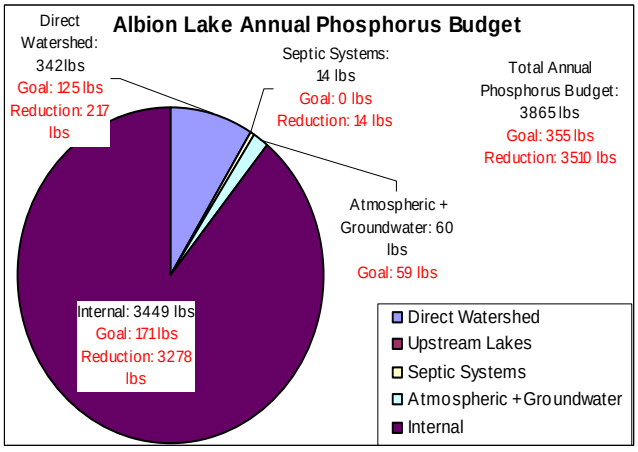


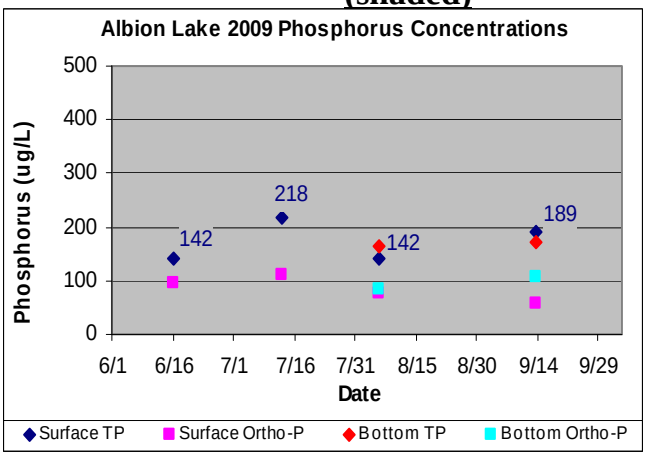
Lake Data

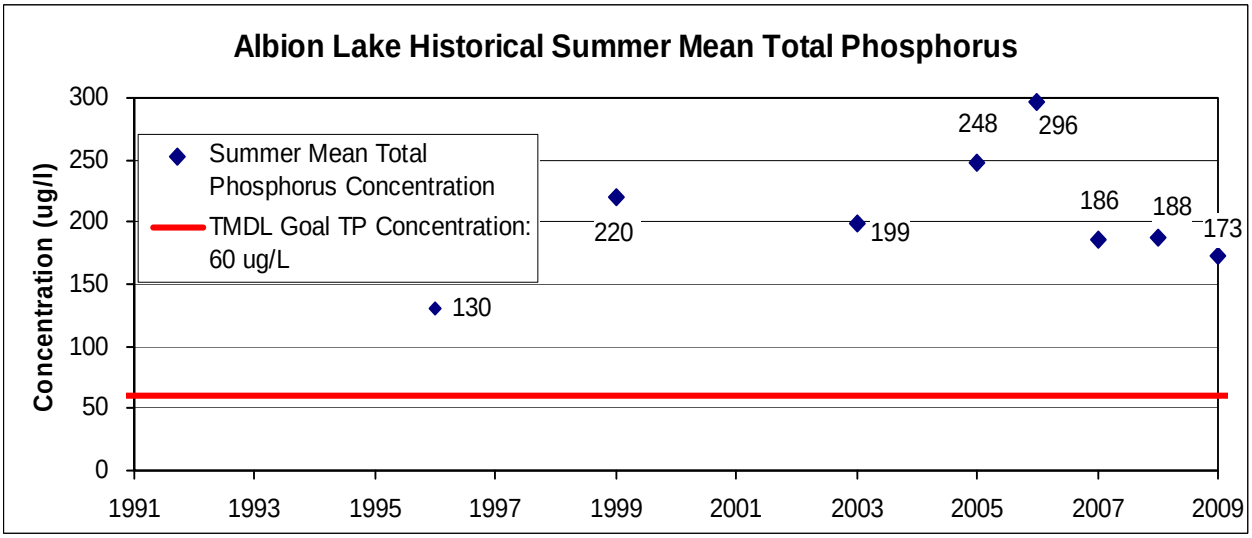
Surface Area:	**251 Acres**
Maximum Depth:	**9 Feet**
Contributing Subwatershed Area:	**1,094 acres**



Tributary Sub watershed (shaded)





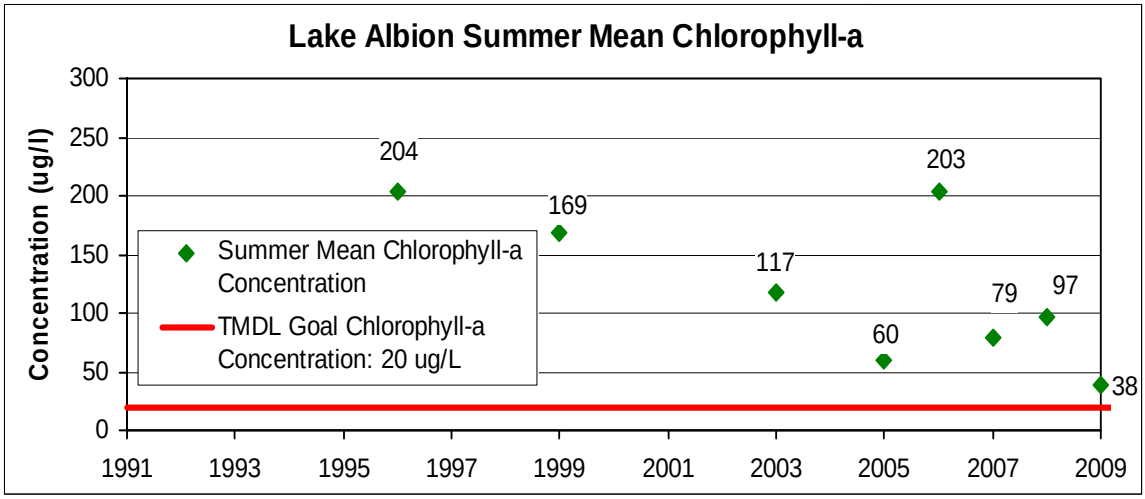


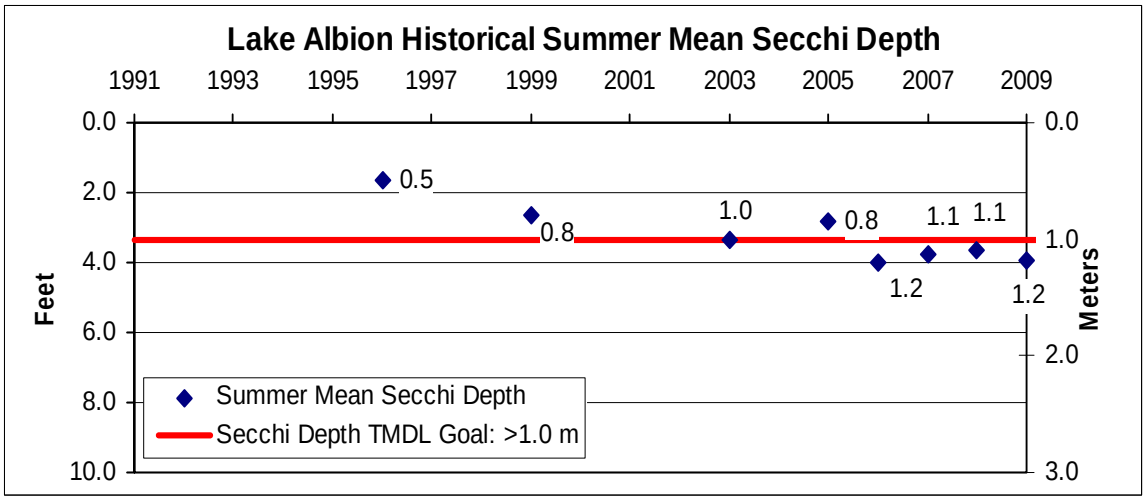
Clearwater River Watershed District	Wenck Associates, Inc. Environmental Engineers — 1800 Pioneer Creek Center Maple Plain, MN 55359	April 2010
Albion Lake		

Albion Lake

2009 Lake Report Card

MPCA Standards for Shallow Lakes in the North Central Hardwood Forest:
Total Phosphorus (TP): ≤ 60 ug/L
Chlorophyll-a: ≤ 20 ug/L
Secchi Depth: ≥ 1.0 meter





Summary

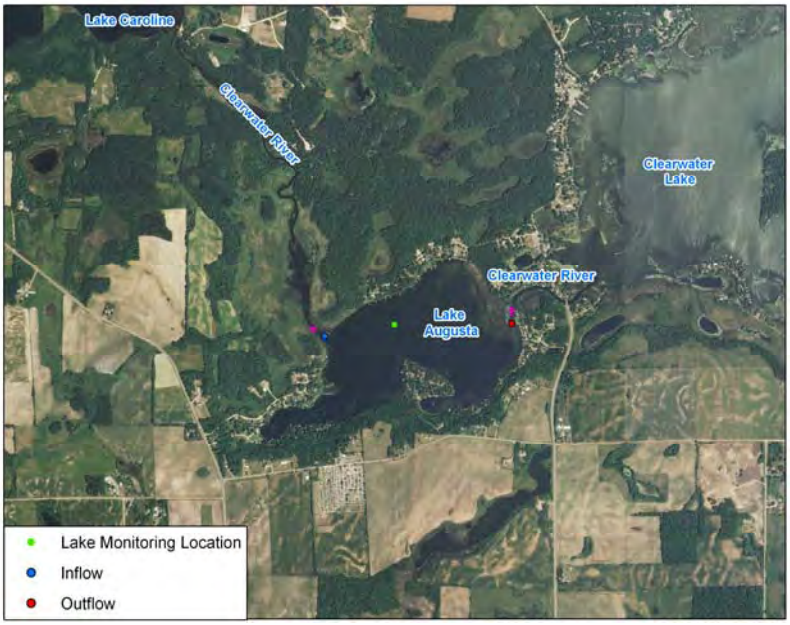
- Water clarity has recently improved in the lake and a diverse aquatic vegetation community has been observed in the lake in recent years.
- While the summer mean Secchi depth met the TMDL goal in 2009, summer mean phosphorus and chlorophyll-a concentrations remained above TMDL goals.
- In-lake phosphorus concentrations have exceeded TMDL goals during all monitoring years, but have recently declined.
- Internal loads in Albion Lake are the major nutrient source to the lake.

TMDL Activities

- Due to Lake Albion's small tributary watershed, the reduction of watershed loads alone will not be sufficient to achieve water quality targets for the lake.
- A significant reduction in the internal nutrient source will be required to meet water quality targets in the lake.
- Management strategies should be implemented carefully in order to maintain the lake's current state of ecological integrity.
- Nutrient reduction strategies implemented as part of the Cedar Lake Improvement Project have included watershed BMPs and rough fish management.
- Shallow Lake Management Plan should be developed for the lake

5.2.2.2 Lake Augusta

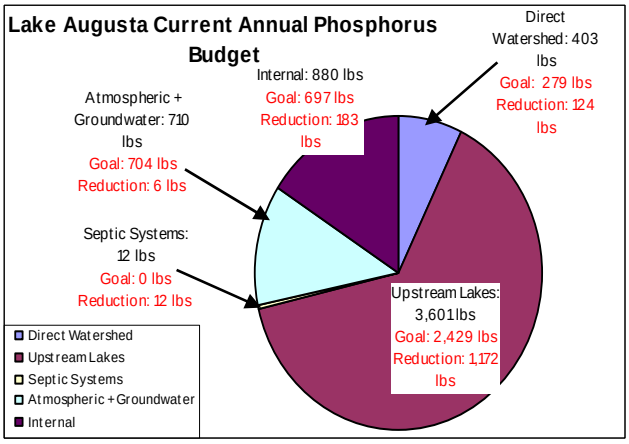
Lake Augusta Lake Report Card

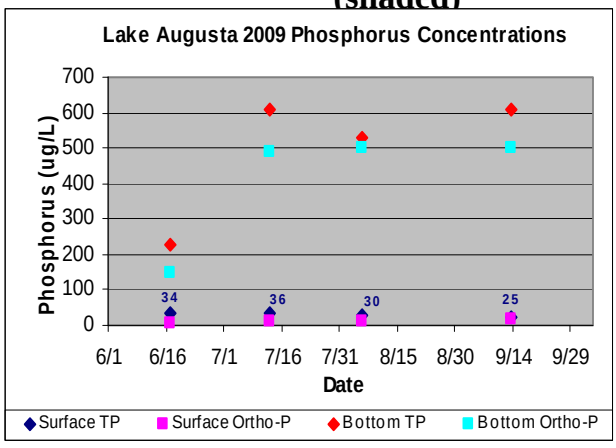


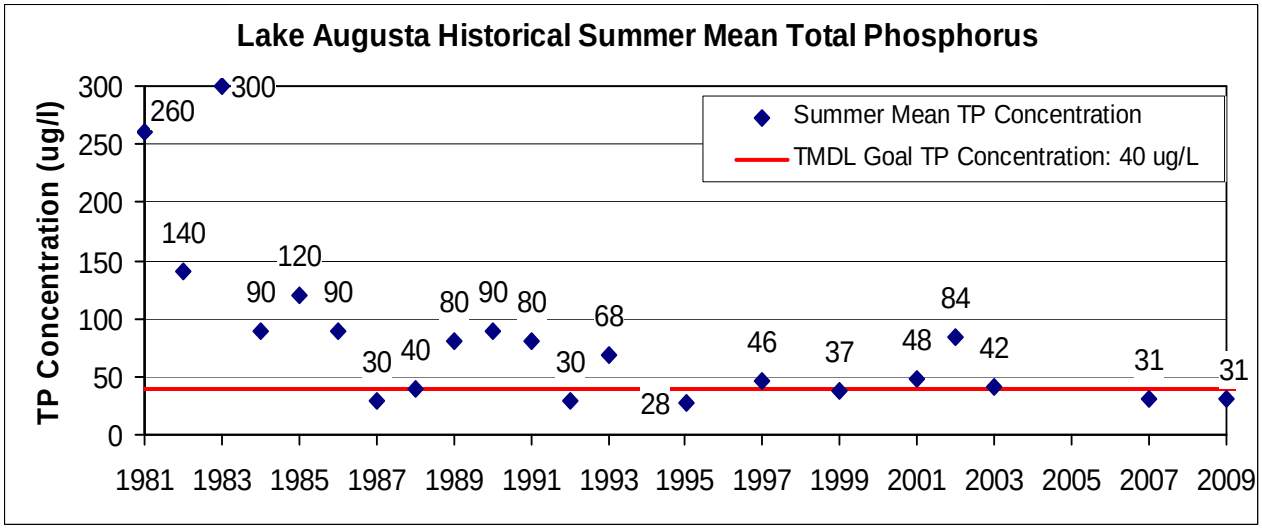
Lake Data

Surface Area:	**177 Acres**
Maximum Depth:	**82 Feet**
Subwatershed Area:	**62,936 acres**

Tributary Sub watershed (shaded)





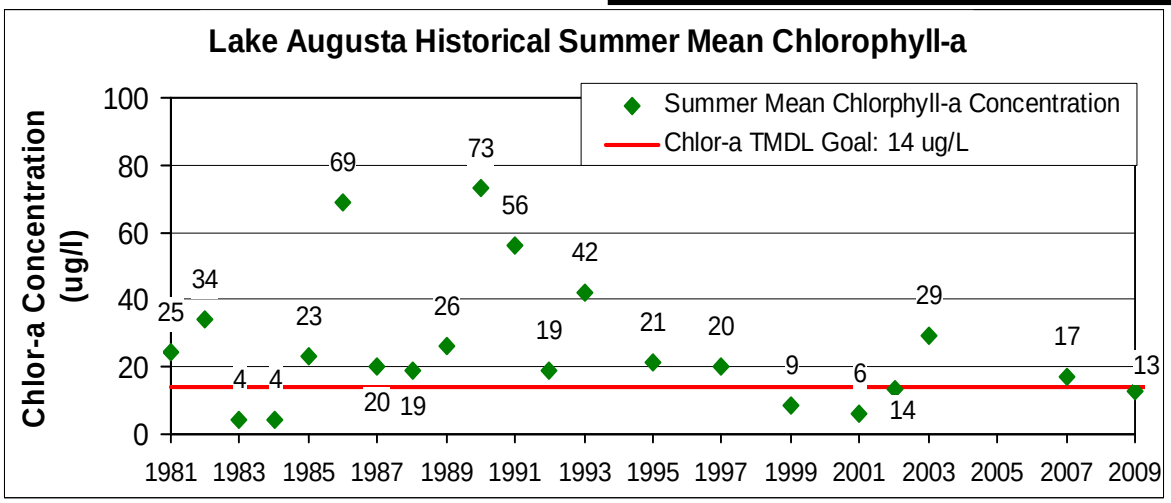


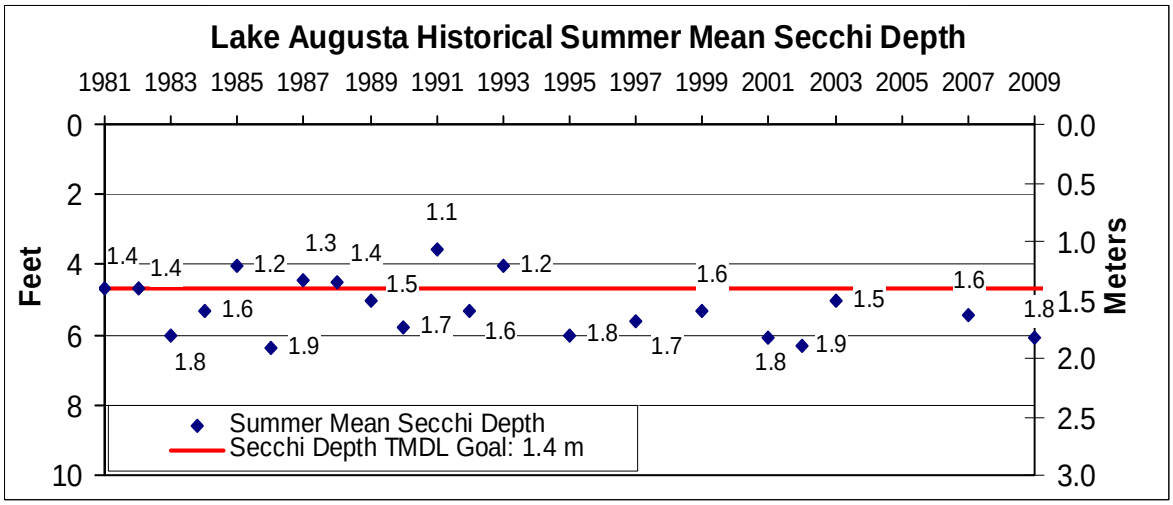
Clearwater River Watershed District	Wenck Associates, Inc. Environmental Engineers — 1800 Pioneer Creek Center Maple Plain, MN 55359	Feb 2010
Lake Augusta		

Lake Augusta

2009 Lake Report Card

MPCA Proposed Deep Lake Standards for the North Central Hardwood Forest:
Total Phosphorus (TP): ≤ 40 ug/L
Chlorophyll-a: ≤ 14 ug/L
Secchi Depth: ≥ 1.4 meter





Summary

- Water quality has improved significantly in comparison to monitoring conducted in the early 1980s as TMDL goals have been met in some recent years, but the lake technically remains impaired.
- Summer mean phosphorus and chlorophyll-a concentrations, as well as summer mean Secchi depth met TMDL goals in 2009.
- Water quality is dominated by loads from the Clearwater River and is buffered by upstream lakes.
- With a short residence time, the summer water quality in the lake is very similar to that in the river.
- Monitoring data indicates a potential for high internal loads.

TMDL Activities

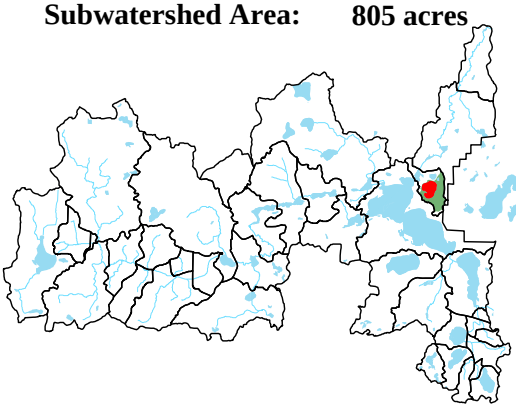
- TMDL calls for a combination of watershed load reductions and internal load reductions in order to meet water quality goals.
- Activities implemented in the upstream watersheds (Clear Lake and Lake Betsy) will have a cumulative impact on downstream lakes.
- Phosphorus reduction activities identified for implementation by the TMDL Implementation Plan in the watersheds tributary to Lake Betsy and Clear Lake include BMP's, hypolimnetic withdrawal, targeted soil testing and GPS fertilizer application, and the construction of sedimentation ponds.

5.2.2.3 Bass Lake

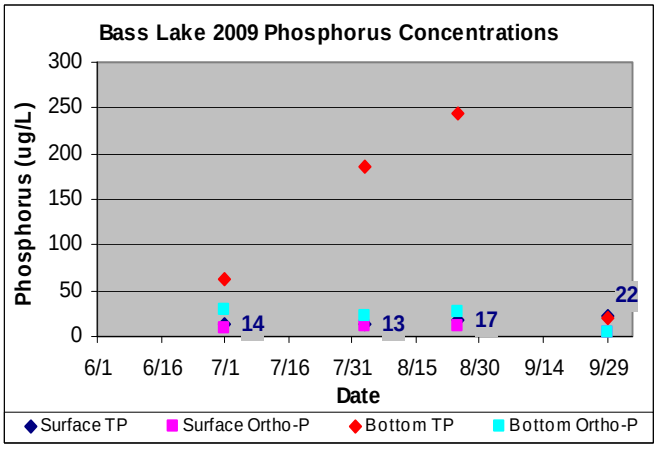
Bass Lake Report Card

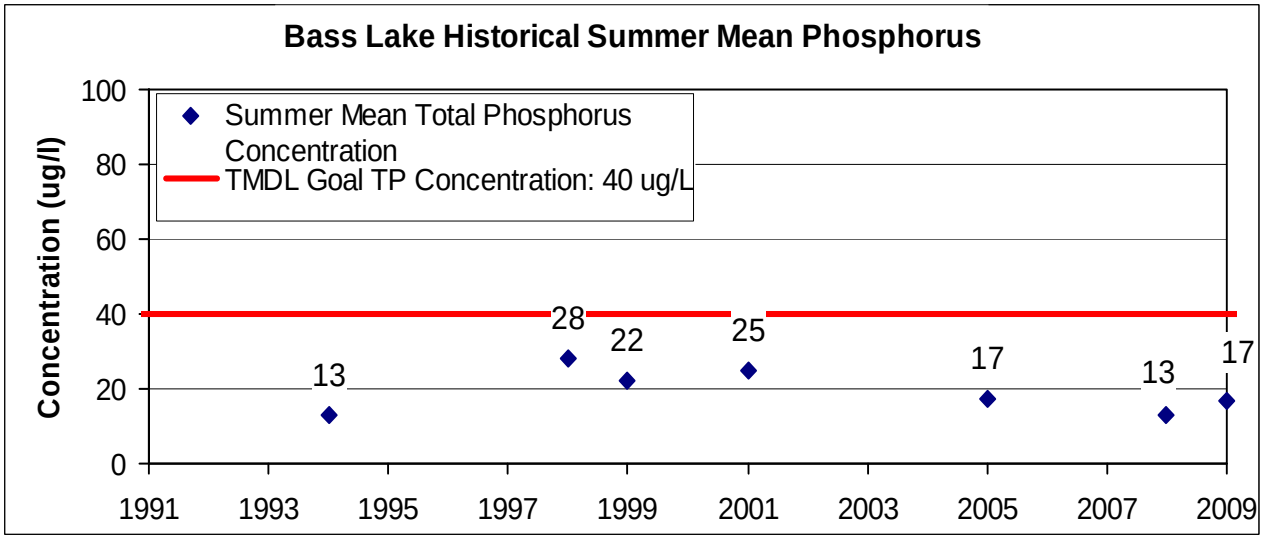
Lake Data

Surface Area:	**218 Acres**
Maximum Depth:	**34 Feet**
Subwatershed Area:	**805 acres**



Tributary Sub watershed (shaded)



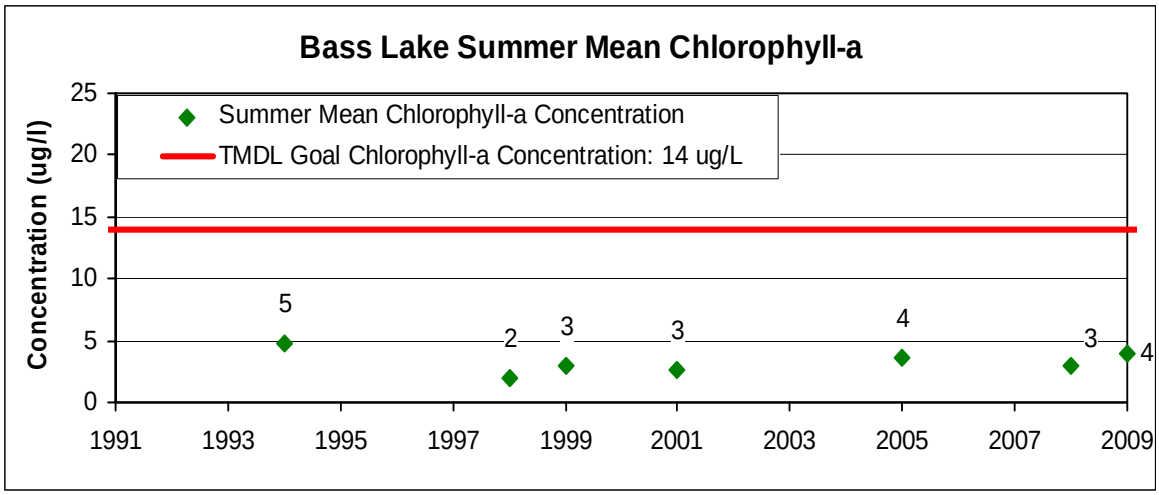


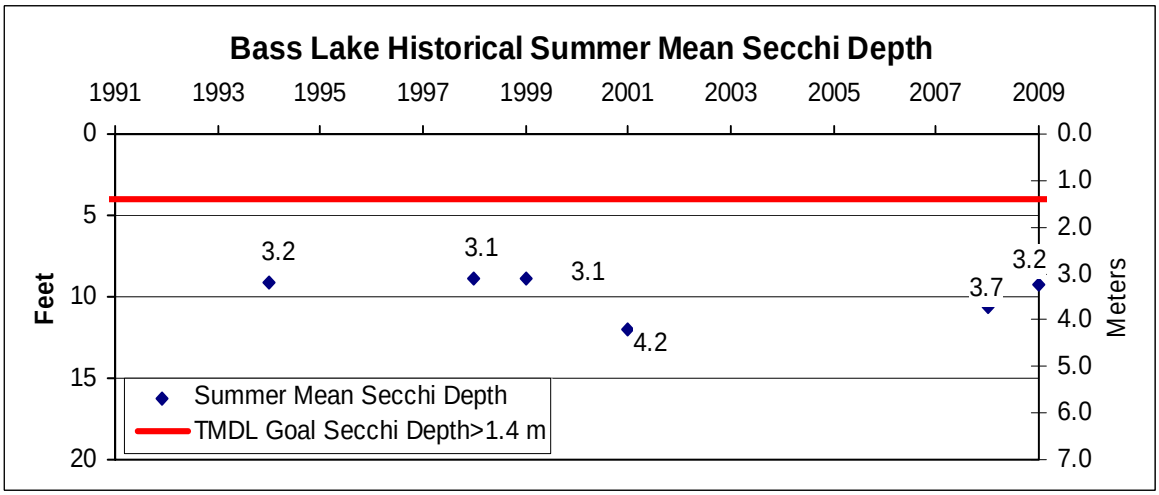
Clearwater River Watershed District	Wenck Associates, Inc. Environmental Engineers — 1800 Pioneer Creek Center Maple Plain, MN 55359	June 2010
Bass Lake		

Bass Lake

2009 Lake Report Card

MPCA Proposed Deep Lake Standards for the North Central Hardwood Forest:
Total Phosphorus (TP): ≤ 40 ug/L
Chlorophyll-a: ≤ 14 ug/L
Secchi Depth: ≥ 1.4 meter





Summary

- Current water quality is good in Bass Lake as phosphorus concentrations, chlorophyll-a, and Secchi depth have met MPCA standards since monitoring of the lake began in 1994.
- Bass Lake is managed by the DNR for largemouth bass, northern pike and bluegill.

Water Quality Improvement Activities

- Good land management practices adjacent to the lakeshore and in the upstream watershed will help to maintain the good water quality in Bass Lake.

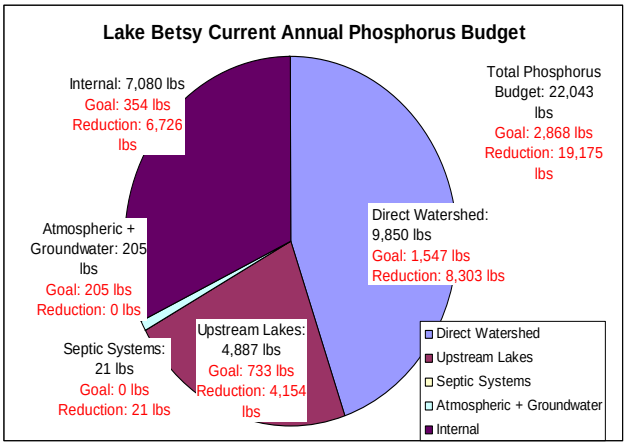
5.2.2.4 Lake Betsy

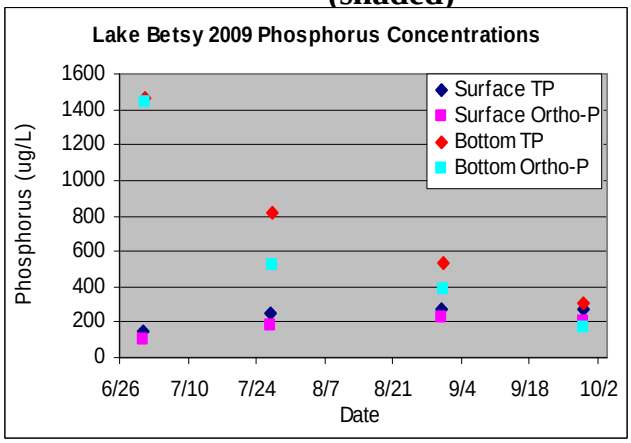
Lake Betsy 2009 Lake Report

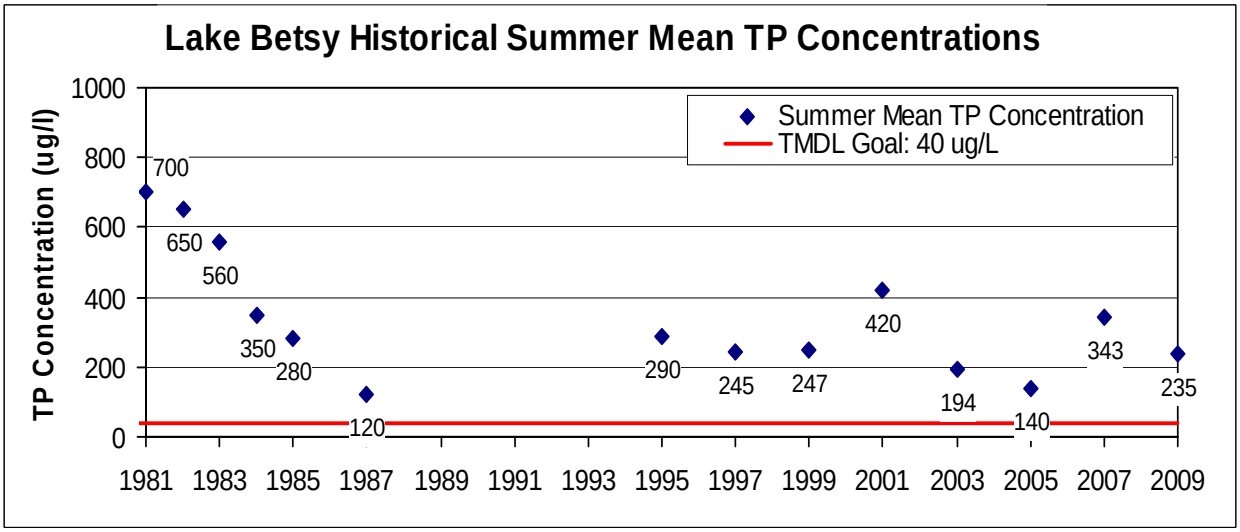
Lake Data

Surface Area:	**153 Acres**
Maximum Depth:	**23 Feet**
Subwatershed Area:	**43,789 acres**
Mean Depth:	**10 Feet**

Tributary Sub watershed (shaded)





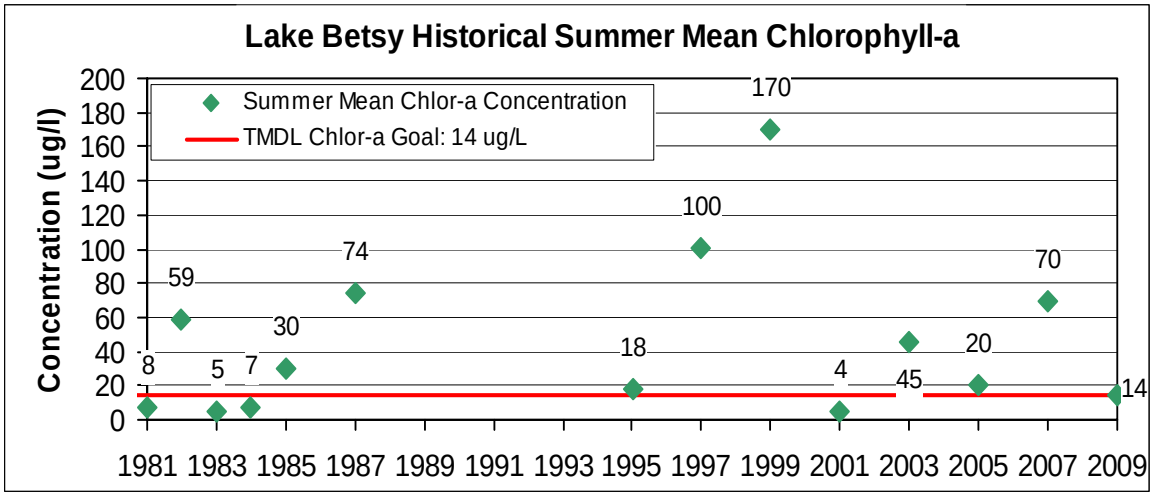


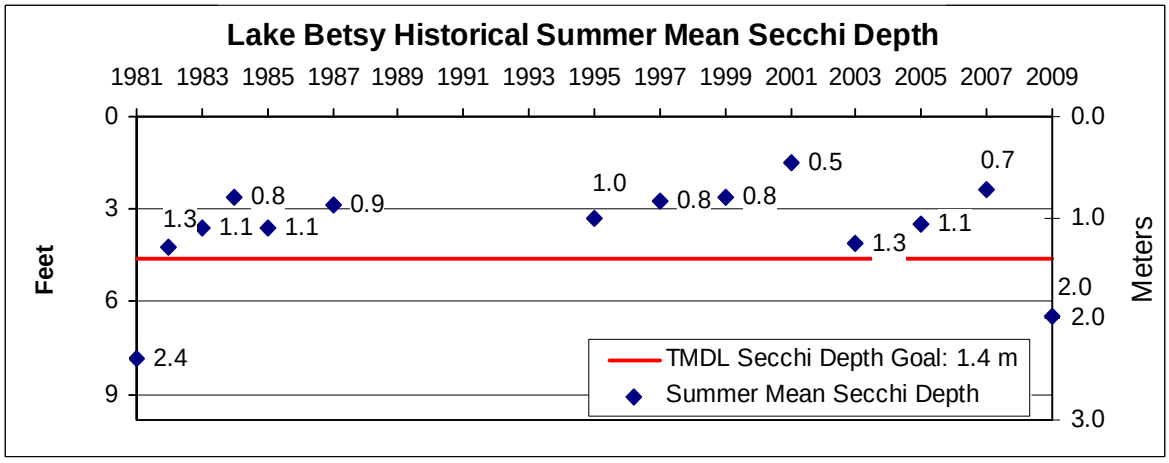
Clearwater River Watershed District	Wenck Associates, Inc. 1800 Pioneer Creek Center Environmental Engineers Maple Plain, MN 55359	Jan 2010
Lake Betsy		Fig 4.3

Lake Betsy

2009 Lake Report Card

MPCA Proposed Deep Lake Standards for the North Central Hardwood Forest:
Total Phosphorus (TP): ≤ 40 ug/L
Chlorophyll-a: ≤ 14 ug/L
Secchi Depth: ≥ 1.4 meter





Summary

- Although phosphorus concentrations in Lake Betsy have declined historically, recent trends show an increase in phosphorus concentrations.
- Water quality is dominated by loads from Clearwater River.
- Additional monitoring efforts in 2009, including sediment core analysis, verified that internal loading of phosphorus contributes significantly to overall phosphorus load in the lake during anoxic conditions.

TMDL Activities

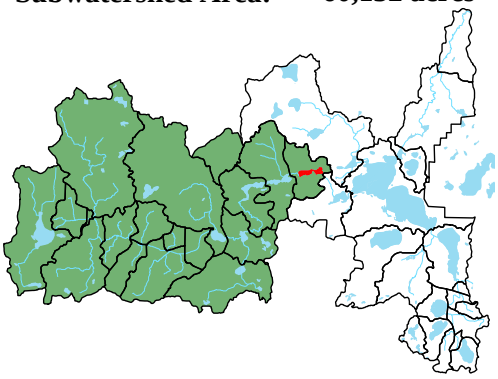
- In 2009, summer mean chlorophyll-a and Secchi depth met TMDL goals, while phosphorus concentrations remained well above the TMDL goal.
- TMDL calls for significant phosphorus reductions in watershed runoff and internal loading in order for Lake Betsy to meet state standards.
- The TMDL Implementation Plan identifies activities to be implemented in the watershed tributary to Lake Betsy, including BMP's, hypolimnetic withdrawal (potential 480 lb reduction), and targeted soil testing and GPS fertilizer application (potential 600 lb reduction).

5.2.2.5 Lake Caroline

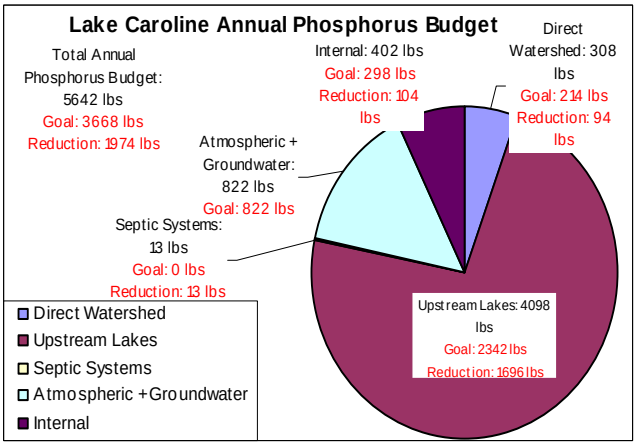
Lake Caroline Report Card

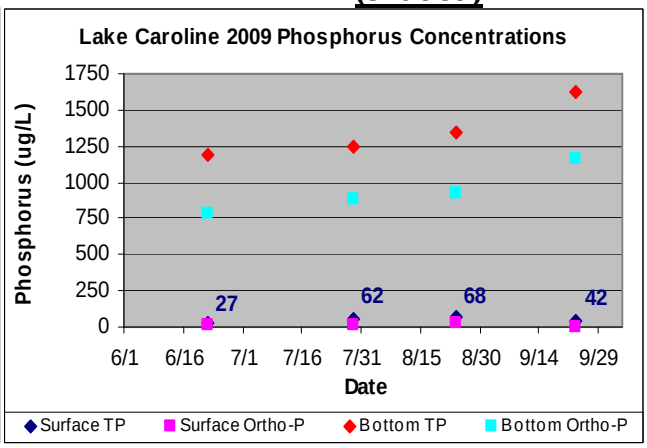
Lake Data

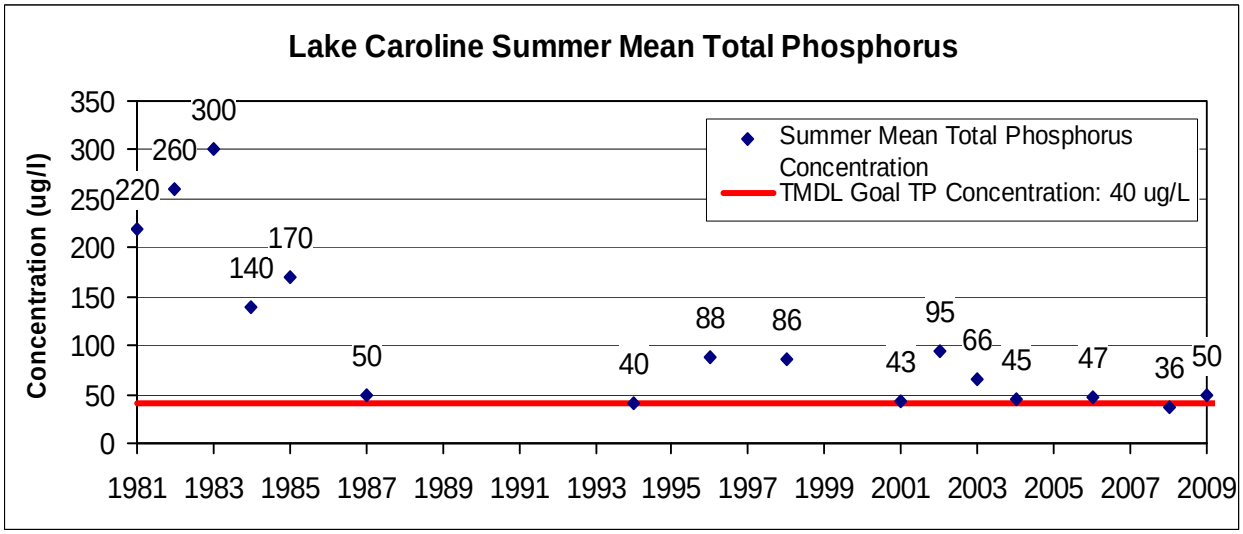
Surface Area:	**126 Acres**
Maximum Depth:	**45 Feet**
Subwatershed Area:	**60,132 acres**



Tributary Sub watershed (shaded)





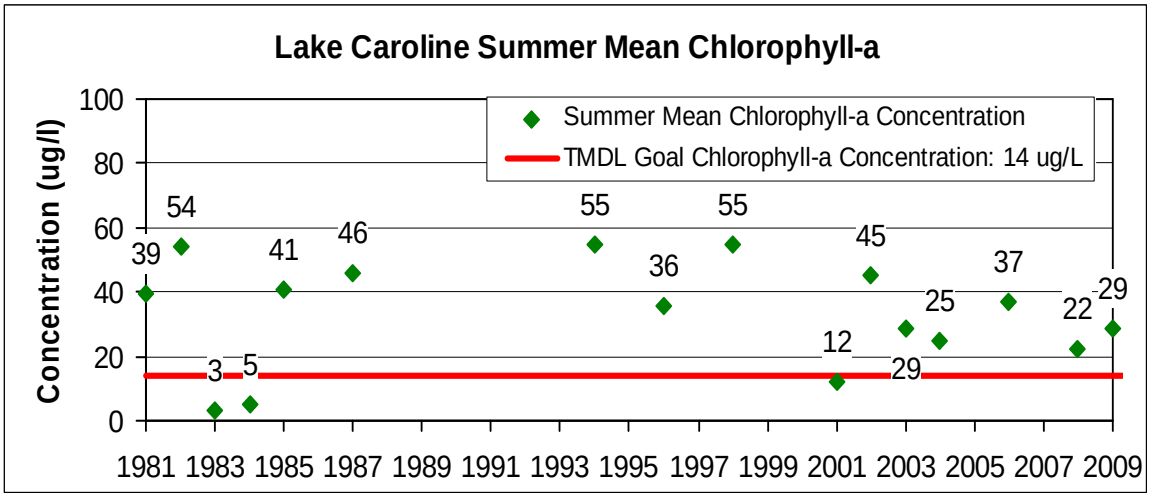


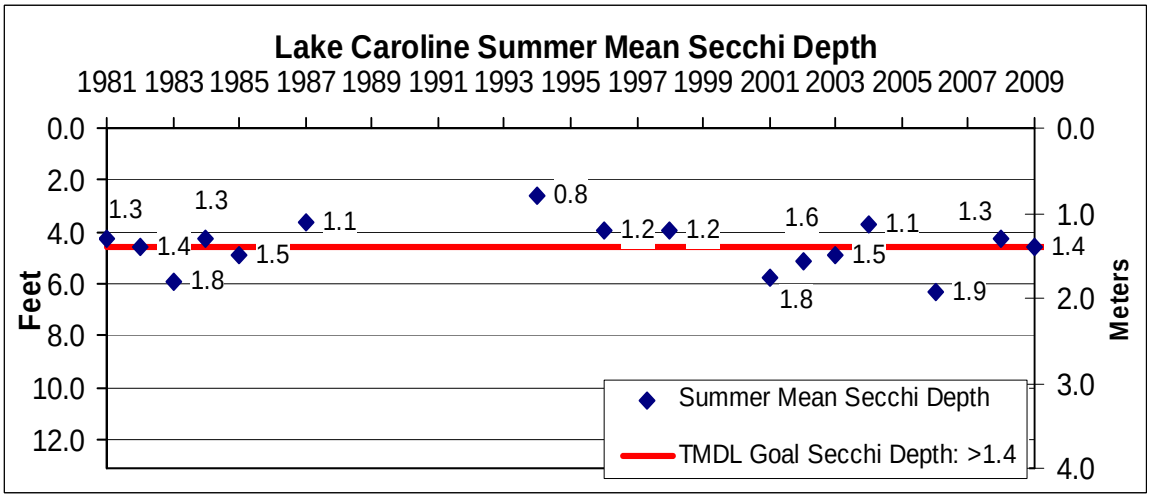
Clearwater River Watershed District	Wenck Associates, Inc. Environmental Engineers — 1800 Pioneer Creek Center Maple Plain, MN 55359	June 2010
Lake Caroline		

Lake Caroline

2009 Lake Report Card

MPCA Proposed Deep Lake Standards for the North Central Hardwood Forest:
Total Phosphorus (TP): ≤ 40 ug/L
Chlorophyll-a: ≤ 14 ug/L
Secchi Depth: ≥ 1.4 meter





Summary

- Although they remain above the TMDL goal of 40ug/L, phosphorus concentrations have decreased significantly since the 1980s and have remained stable in recent years.
- Chlorophyll-a concentrations and Secchi depth have not met TMDL goals in most recent years but have remained stable.
- Water quality is dominated by loads from the Clearwater River and Lake Marie.

TMDL Activities

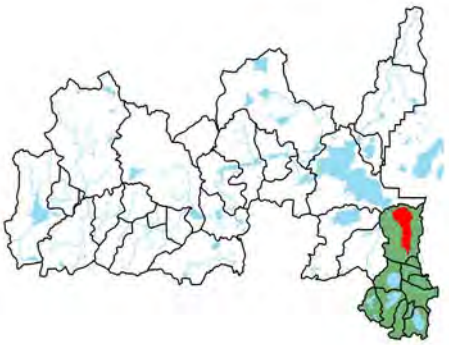
- Measures recommended by the TMDL Implementation plan for the upper watershed will help decrease the load of phosphorus to Lake Caroline.
- It appears that water quality goals can be met through a combination of watershed and internal load reductions and management.

5.2.2.6 Cedar Lake

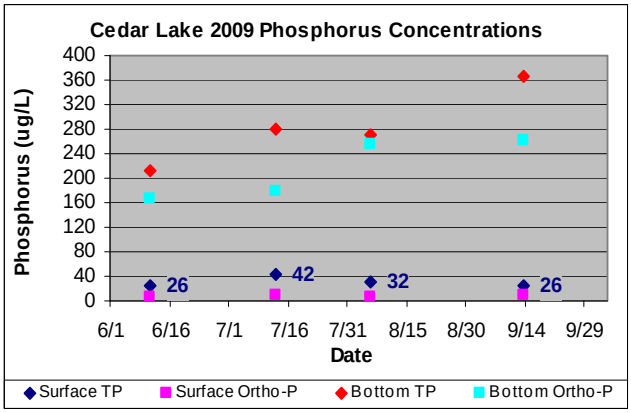
Cedar Lake Report Card

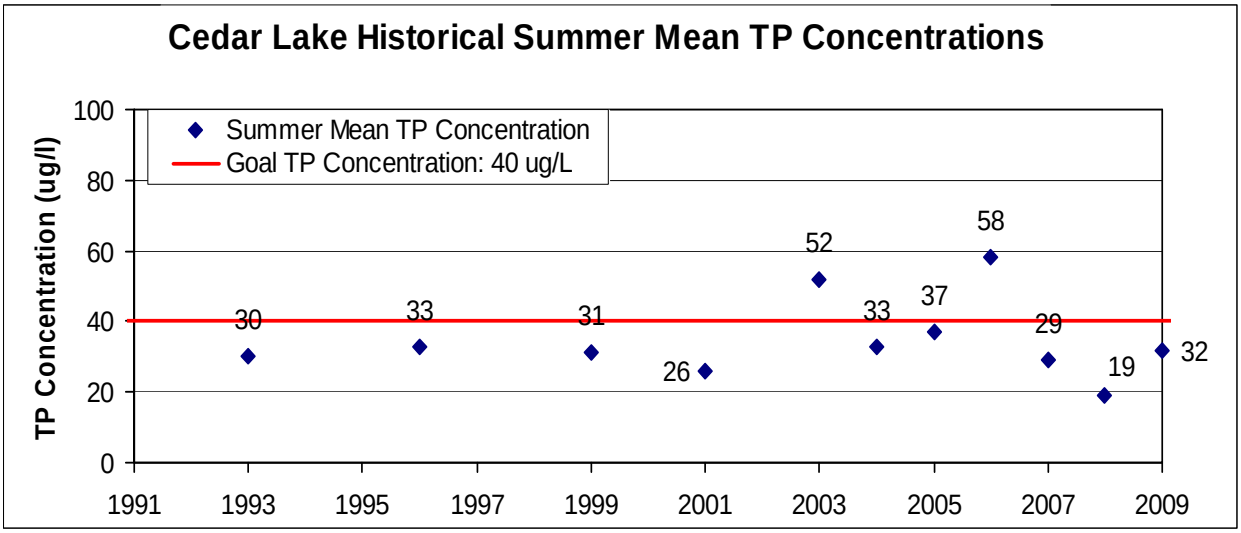
Lake Data

Surface Area:	**783 Acres**
Maximum Depth:	**108 Feet**
Subwatershed Area:	**9,715 acres**



Tributary Sub watershed (shaded)



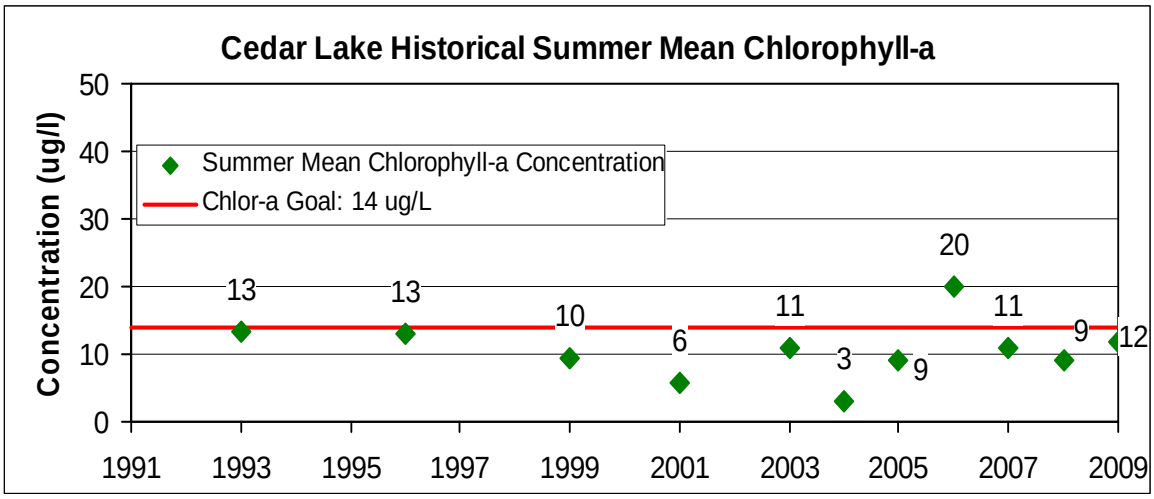


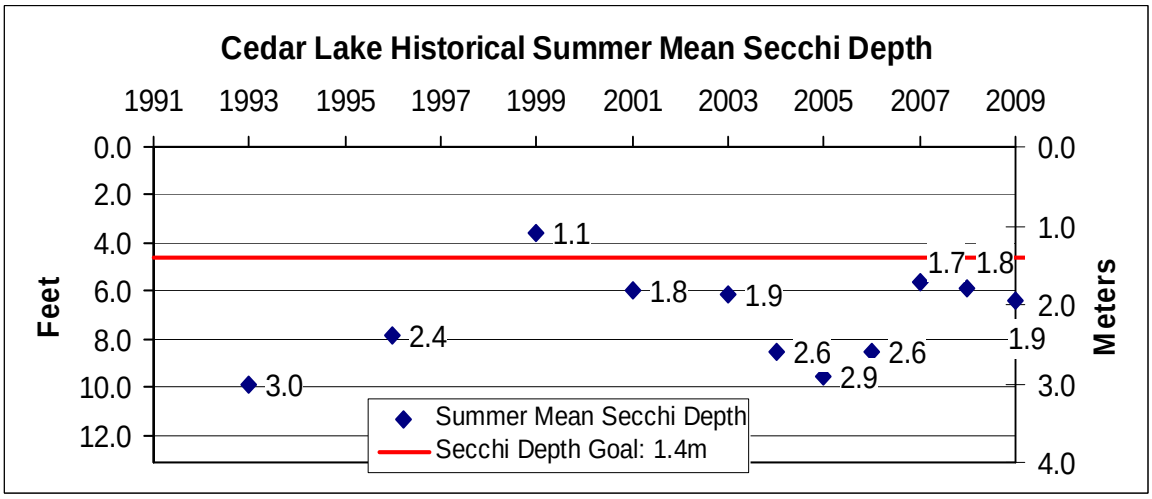
Clearwater River Watershed District	Wenck Associates, Inc. Environmental Engineers — 1800 Pioneer Creek Center Maple Plain, MN 55359	Feb 2010
Cedar Lake		

Cedar Lake

2009 Lake Report Card

MPCA Proposed Deep Lake Standards for the North Central Hardwood Forest:
Total Phosphorus (TP): ≤ 40 ug/L
Chlorophyll-a: ≤ 14 ug/L
Secchi Depth: ≥ 1.4 meter





Summary

- Although there have been concerns of recent declining water quality, phosphorus and chlorophyll-a concentrations and Secchi depth have met water quality goals in most years.
- The primary phosphorus source is from the upper watersheds and Swartout, Albion, and Henshaw Lakes.
- Lake residents have noted that periodic algal blooms have become increasingly more common throughout the summer in recent years.

Water Quality Improvement Activities

- Cedar Lake Restoration Project #06-1 was implemented in 2007.
- Since 2007, the project has implemented the construction of rough fish barriers, buffers, tile inlet replacement, and the construction of Segner Pond, a wetland treatment basin.
- The anticipated goal of the Project is to reduce the phosphorus load to Cedar Lake from the upper watershed.
- Measures recommended by the TMDL Implementation plan for the impaired Swartout, Albion, and Henshaw Lakes will also serve to improve water quality in Cedar Lake.

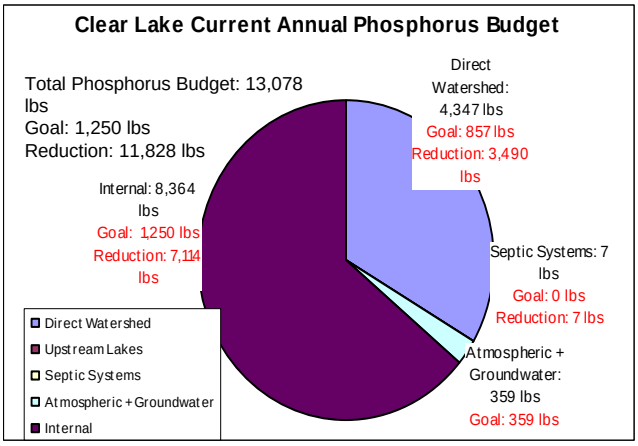
5.2.2.7 Clear Lake

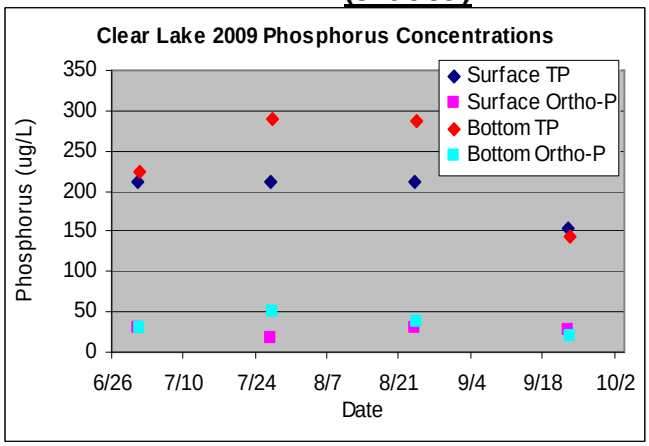
Clear Lake 2009 Lake Report Card

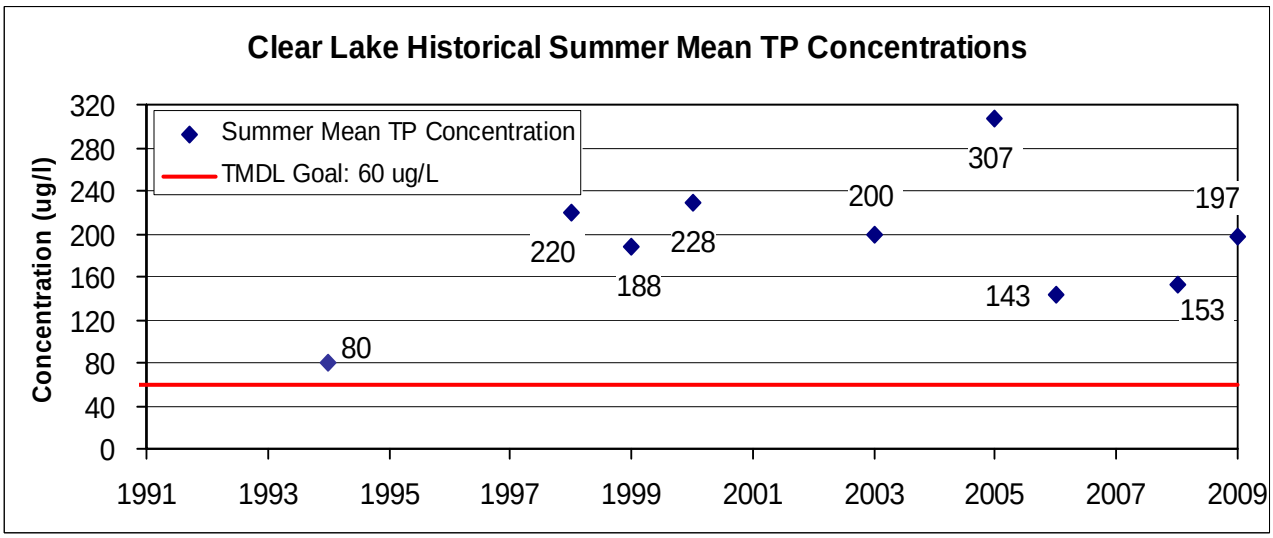
Lake Data

Surface Area:	**515 Acres**
Maximum Depth:	**17 Feet**
Subwatershed Area:	**6,801 acres**
Mean Depth:	**9 Feet**

Tributary Sub watershed (shaded)



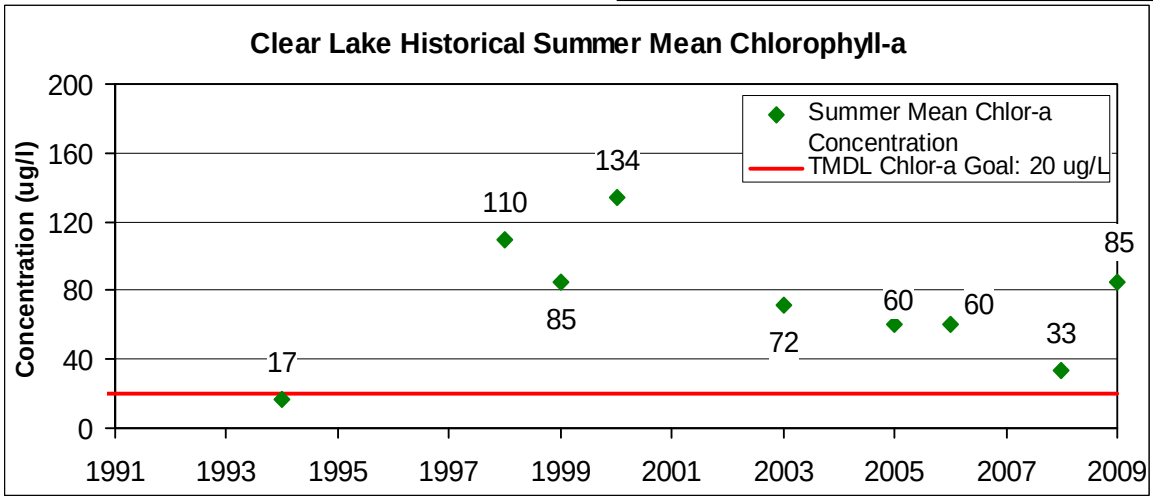


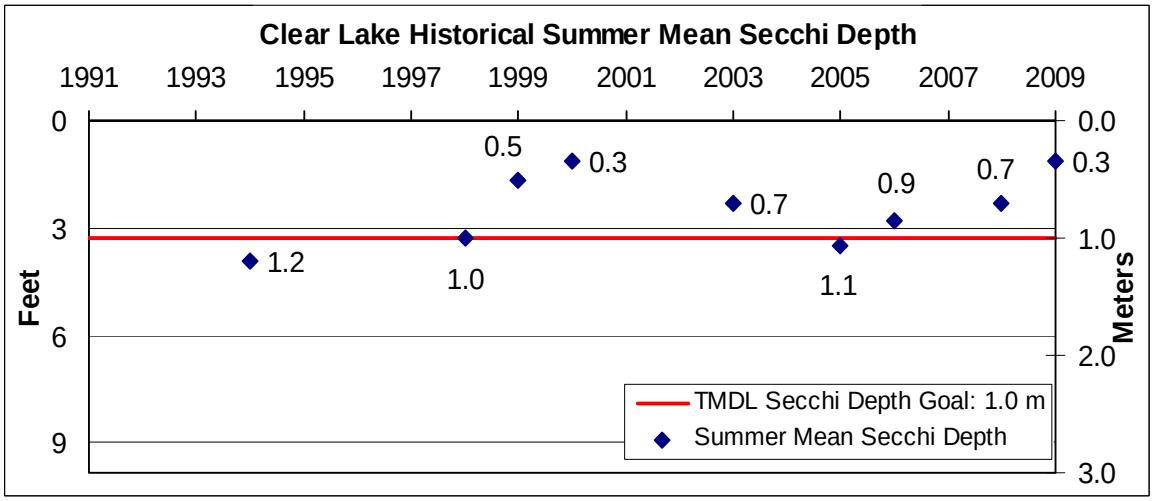


Clear Lake

2009 Lake Report Card

MPCA Shallow Lake Standards for the North Central Hardwood Forest:
Total Phosphorus (TP): ≤ 60 ug/L
Chlorophyll-a: ≤ 20 ug/L
Secchi Depth: ≥ 1.0 meter





Summary

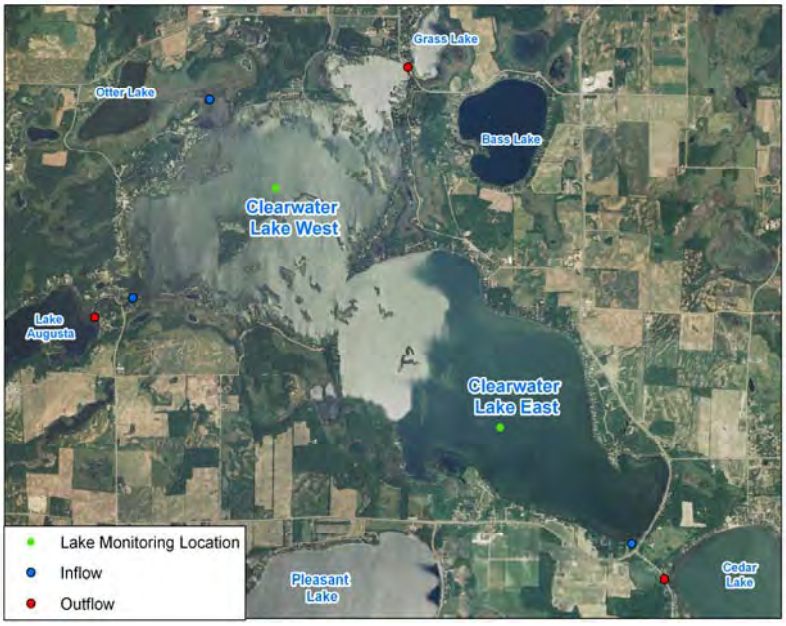
- Clear Lake is located at the headwaters of the Clearwater River.
- Water quality has declined overall compared to monitoring conducted in the early 1980's, but appears to be improving recently.
- Sediment core analysis quantified phosphorus release rates from sediment and verified that internal loading may contribute to overall phosphorus load in the lake during anoxic conditions.
- Poor water clarity and nuisance algae blooms are common in the lake.

TMDL Activities

- In 2009, summer mean phosphorus, chlorophyll-a and Secchi depth did not meet TMDL goals.
- TMDL calls for significant phosphorus reductions in direct watershed runoff and internal loading in order for Clear Lake to meet state standards.
- All but 7 of the ISTSs on the lake have been routed to the City of Watkins WWTP, resulting in an approximately 100 lb TP reduction to the lake.
- Sedimentation ponds were installed at two inlets to the lake.
- Clear Lake Association has implemented curly leaf pondweed treatment and rough fish removal.
- TMDL Implementation Plan identifies construction of additional sedimentation ponds and watershed BMPs as potential phosphorus reduction strategies.

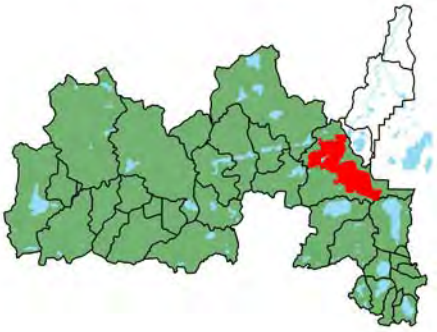
5.2.2.8 Clearwater Lake

Clearwater Lake Report Card

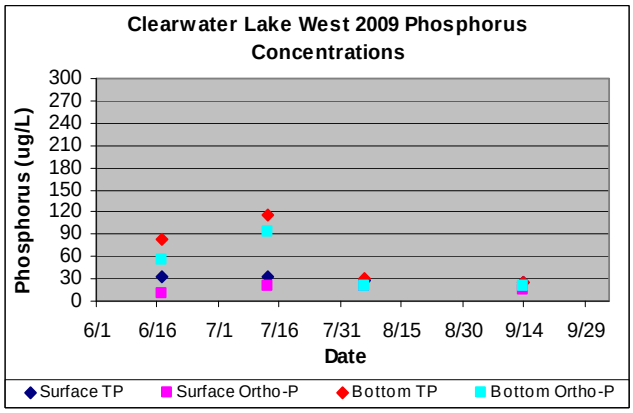


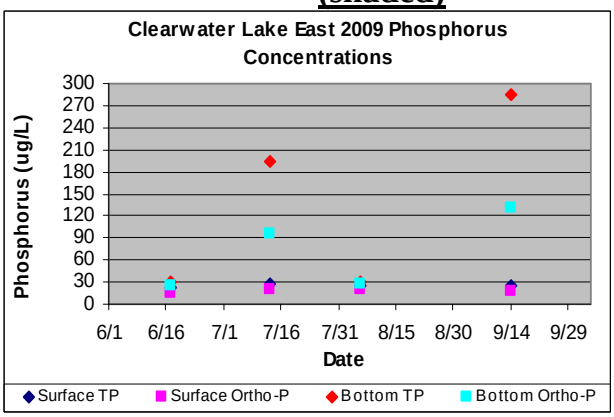
Lake Data

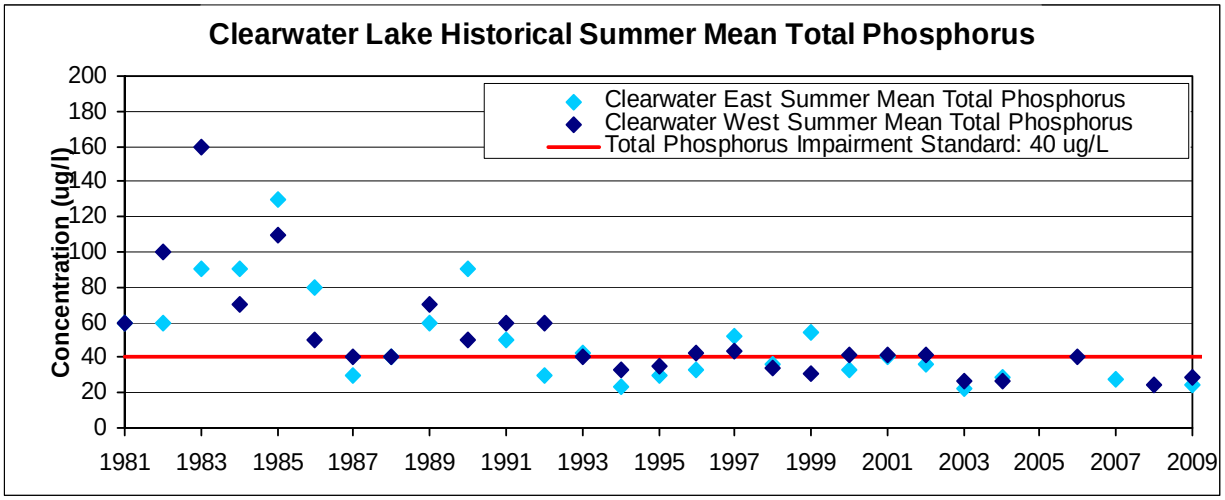
Surface Area:	**3,158 Acres**
Maximum Depth:	**73 Feet**
Subwatershed Area:	**100,232 acres**



Tributary Sub watershed (shaded)





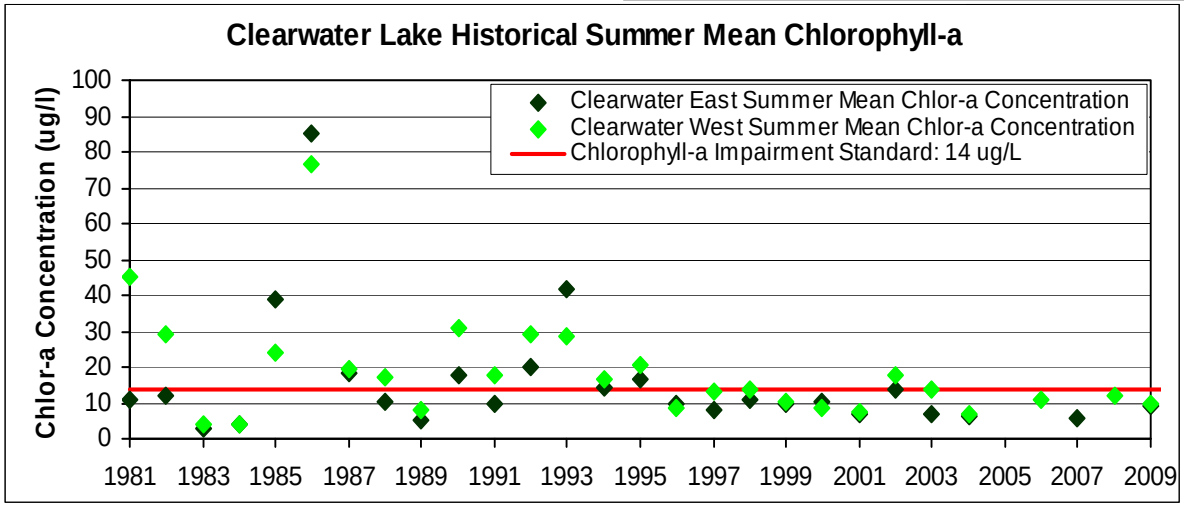


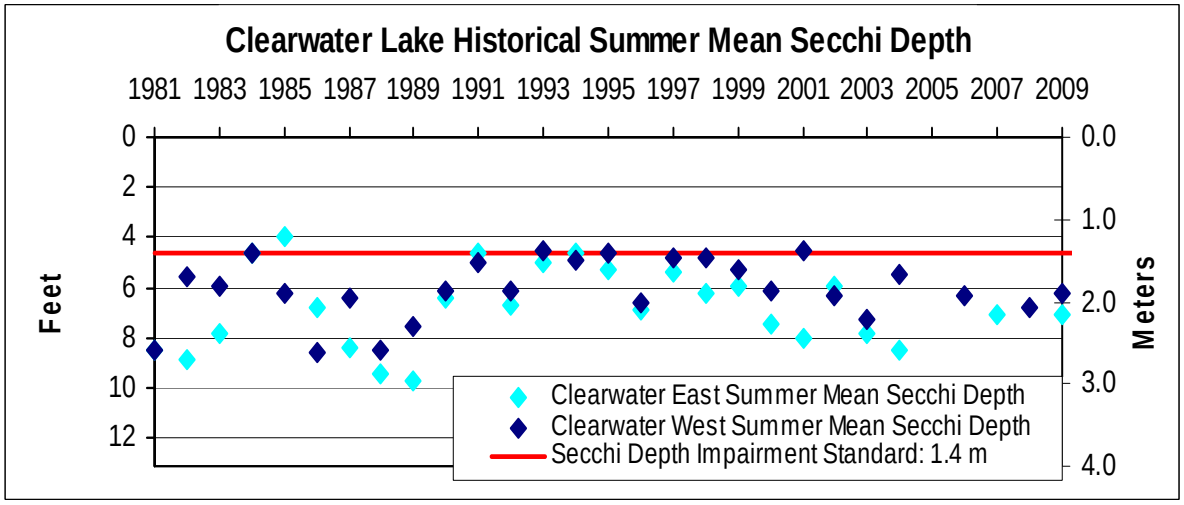
Clearwater River Watershed District	Wenck Associates, Inc. 1800 Pioneer Creek Center Environmental Engineers Maple Plain, MN 55359	Feb 2010
Clearwater Lake		

Clearwater Lake

2009 Lake Report Card

MPCA Standards for Deep Lakes in the North Central Hardwood Forest:
Total Phosphorus (TP): ≤ 40 ug/L
Chlorophyll-a: ≤ 14 ug/L
Secchi Depth: ≥ 1.4 meter





Summary

- Water quality has improved significantly in Clearwater Lake since the early 1990s, as summer mean phosphorus and chlorophyll-a concentrations have decreased significantly and the lake meets recreational water quality goals.
- Summer mean phosphorus and chlorophyll –a concentrations and Secchi depth have been relatively stable in recent years and remain below impairment standards.
- Water quality appears to be similar in both monitored basins (Clearwater East and Clearwater West).
- The majority of the phosphorus load to Clearwater Lake comes from the upstream watershed.

Lake Management Activities

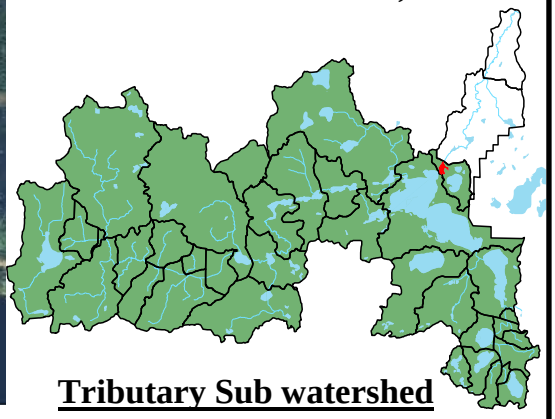
- Watershed loads to Clearwater Lake have been below the established phosphorus loading goal of 5,000 lbs in most of the recent years. However, increased phosphorus loads in excess of the goal were observed in 2009.
- Measures that are put in place in the upper watershed as part of the TMDL Implementation Plan will also help to maintain or improve water quality in Clearwater Lake in the future. Specifically, BMP's, hypolimnetic withdrawal, targeted soil testing and GPS fertilizer application, and the construction of sedimentation ponds are identified for implementation in upstream watersheds.

5.2.2.9 Grass Lake

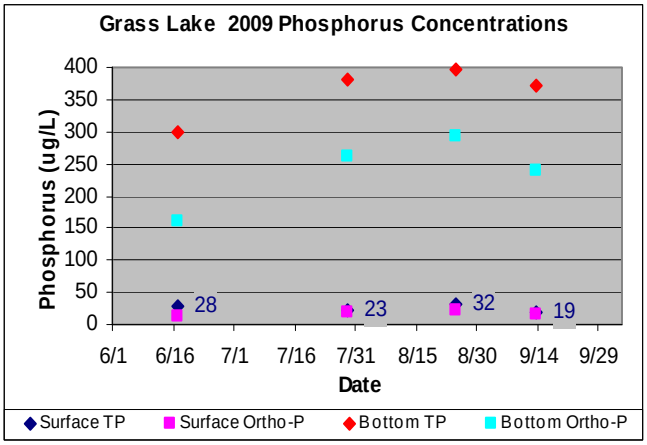
Grass Lake Report Card

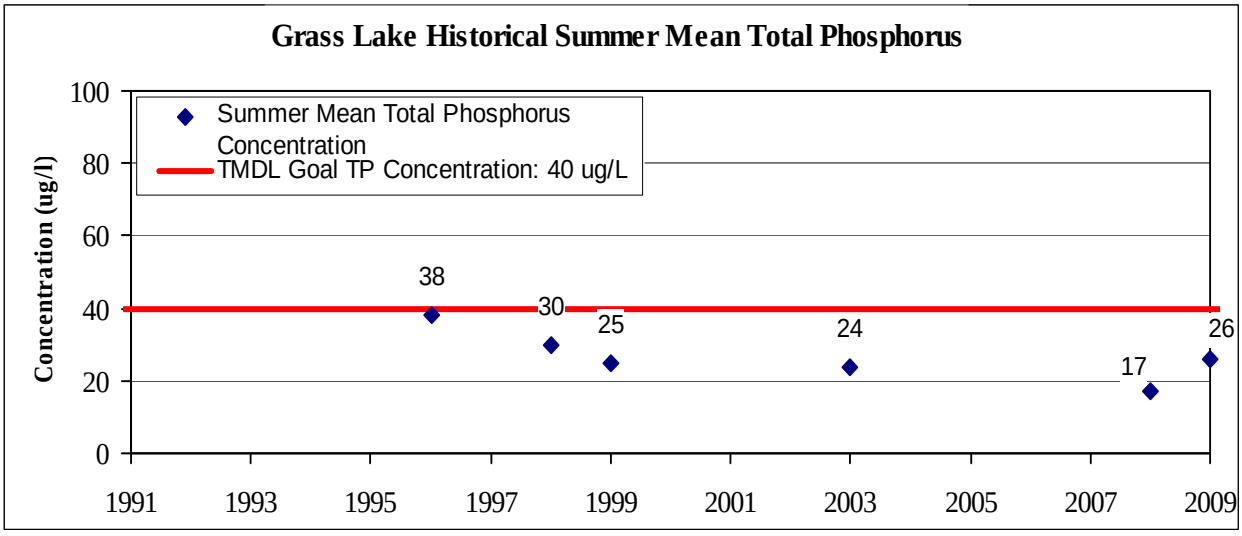
Lake Data

Surface Area:	**92 Acres**
Maximum Depth:	**35 Feet**
Subwatershed Area:	**101,508 acres**



Tributary Sub watershed (shaded)



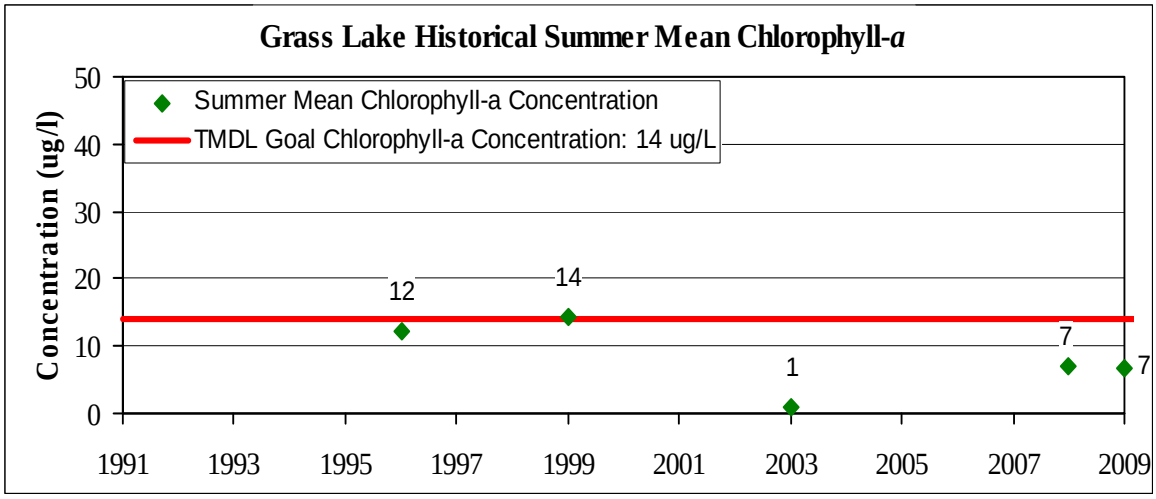


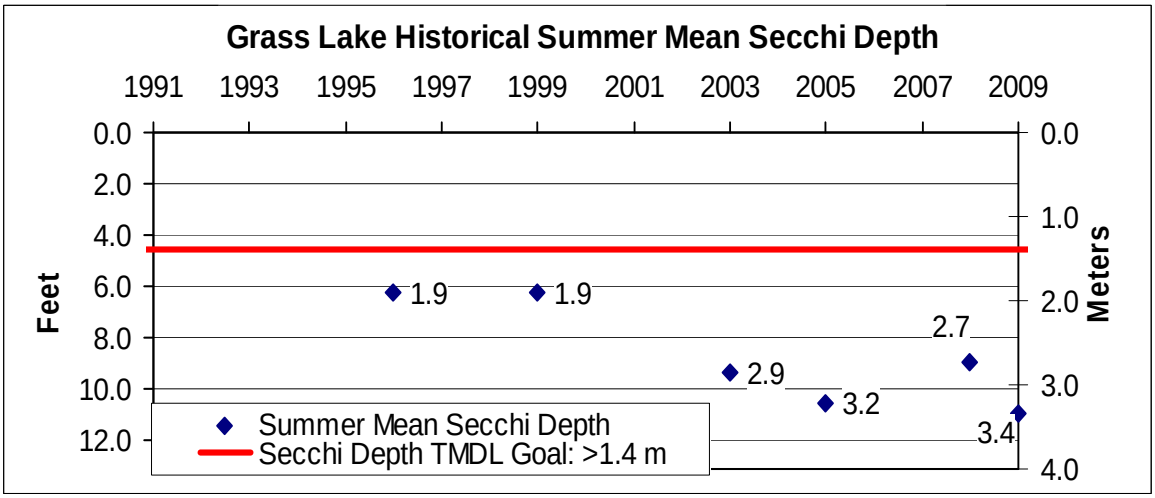
Clearwater River Watershed District	Wenck Associates, Inc. Environmental Engineers — 1800 Pioneer Creek Center Maple Plain, MN 55359	June 2010
Grass Lake		

Grass Lake

2009 Lake Report Card

MPCA Proposed Deep Lake Standards for the North Central Hardwood Forest:
Total Phosphorus (TP): ≤ 40 ug/L
Chlorophyll-a: ≤ 14 ug/L
Secchi Depth: ≥ 1.4 meter





Summary

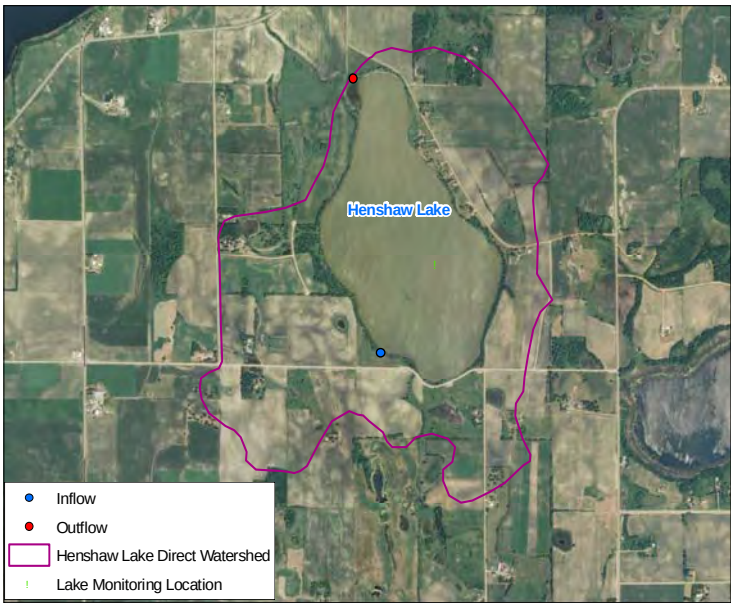
- Current water quality is good in Grass Lake as phosphorus concentrations, chlorophyll-a, and Secchi depth have met MPCA standards since monitoring of the lake began in 1994.

Water Quality Improvement Activities

- Good land management practices along the lakeshore and in the upstream watershed that are implemented to improve the water quality in upstream lakes will also help to maintain the good water quality in Grass Lake.

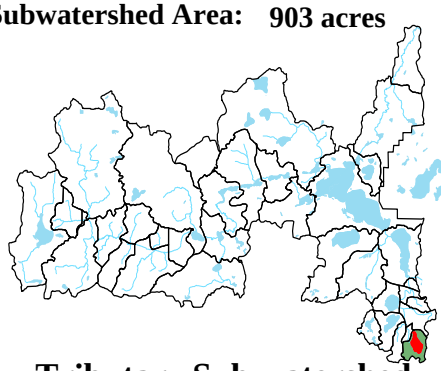
5.2.2.10 Henshaw Lake

Henshaw Lake Report Card

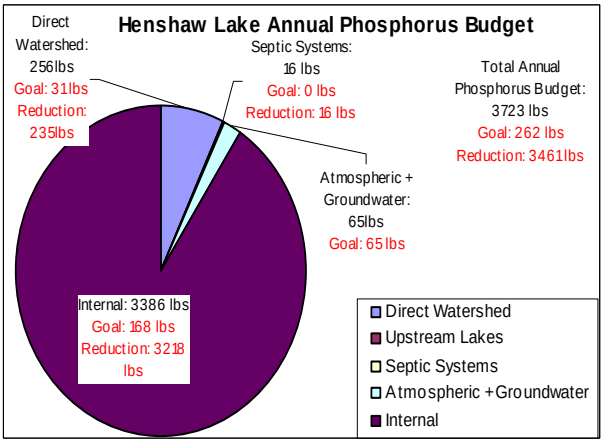


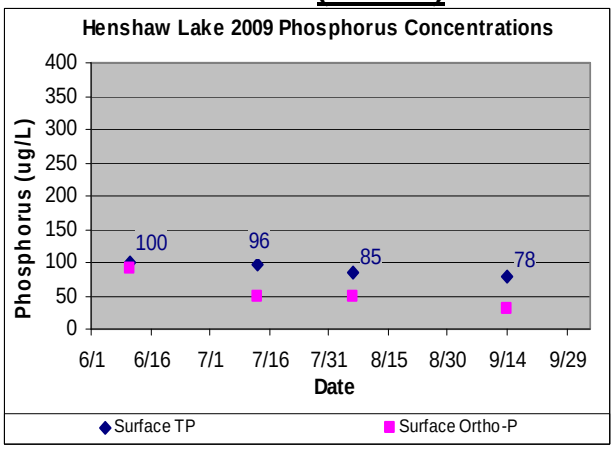
Lake Data

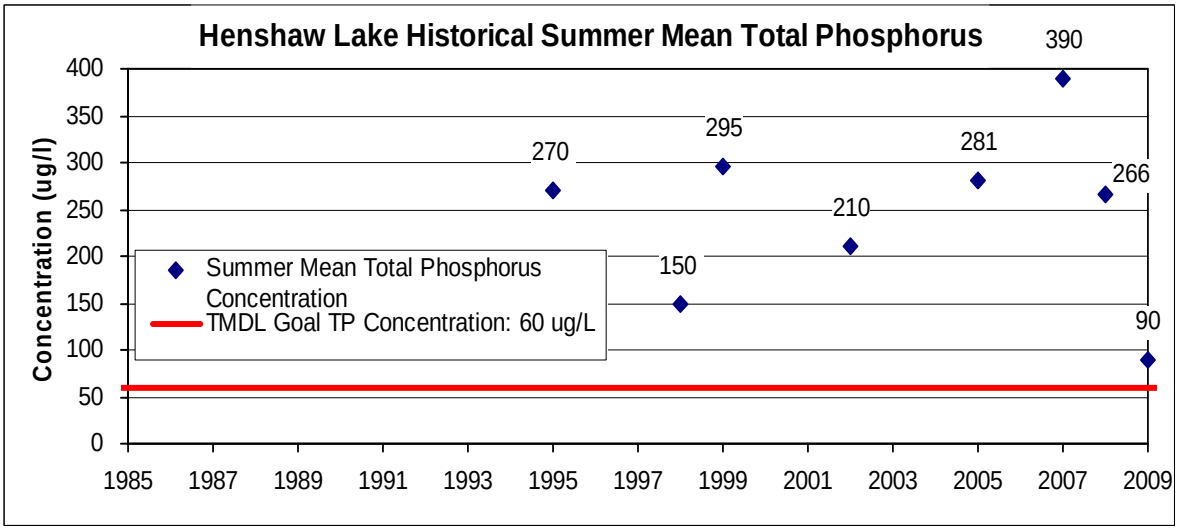
Surface Area: 271 Acres
Maximum Depth: 8 Feet
Contributing Subwatershed Area: 903 acres



Tributary Sub watershed (shaded)





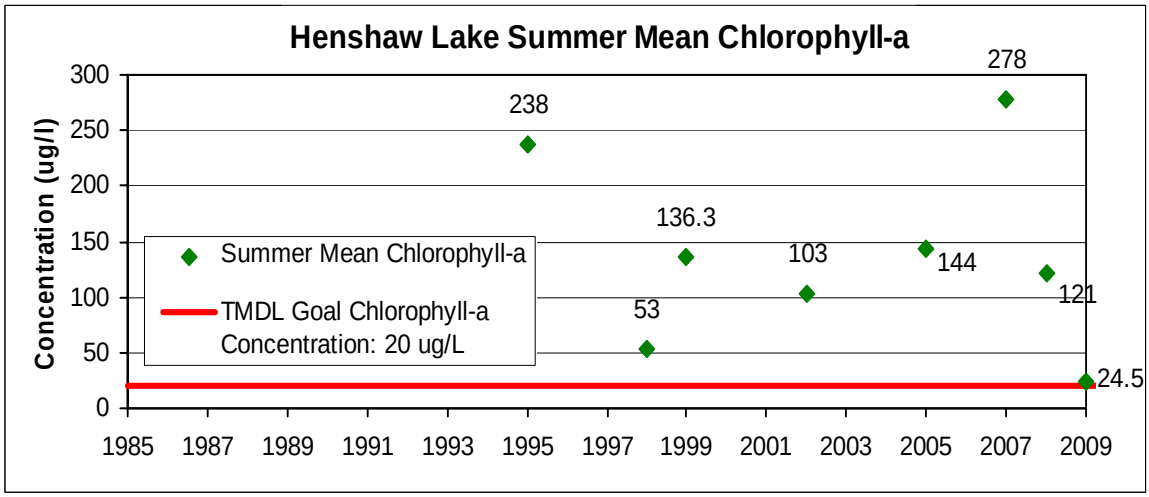


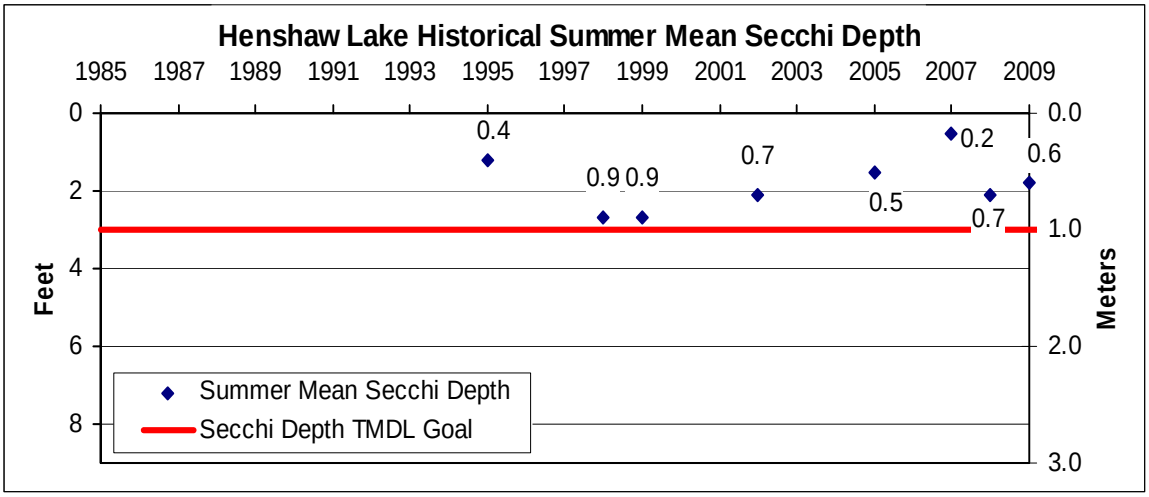
Clearwater River Watershed District	Wenck Associates, Inc. 1800 Pioneer Creek Center Environmental Engineers Maple Plain, MN 55359	April 2010
Henshaw Lake		

Henshaw Lake

2009 Lake Report Card

MPCA Standards for Shallow Lakes in the North Central Hardwood Forest:
Total Phosphorus (TP): ≤ 60 ug/L
Chlorophyll-a: ≤ 20 ug/L
Secchi Depth: ≥ 1.0 meter





Summary

- In-lake phosphorus and chlorophyll-a concentrations have exceeded TMDL goals during all monitoring years, but have recently declined following a major fish kill in the lake in 2009.
- Secchi depth has been below the TMDL goal in all years monitored.
- Artificial maintenance of lake level and rough fish have likely contributed to turbid water conditions.
- Internal loads in Henshaw Lake are the major nutrient source to the lake.

TMDL Activities

- Due to Henshaw Lake's small tributary watershed, the reduction of watershed loads alone will not be sufficient to achieve water quality targets for the lake.
- Hydrologic and ecological restorations will be required to improve water quality in the lake.
- A significant reduction in the internal nutrient source will be required to meet water quality targets in the lake.
- Nutrient reduction strategies implemented as part of the Cedar Lake Improvement Project have included watershed BMPs and rough fish management.

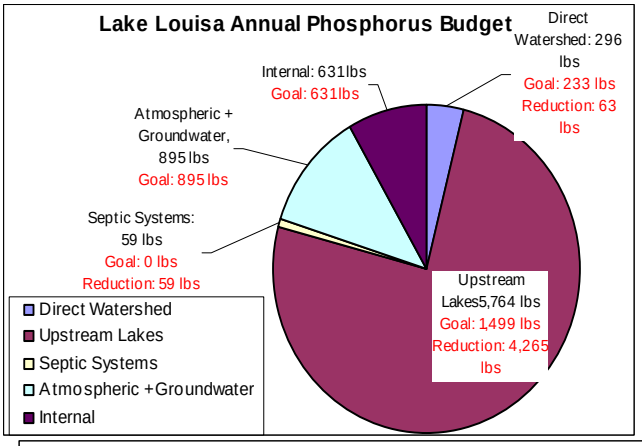
5.2.2.11 Lake Louisa

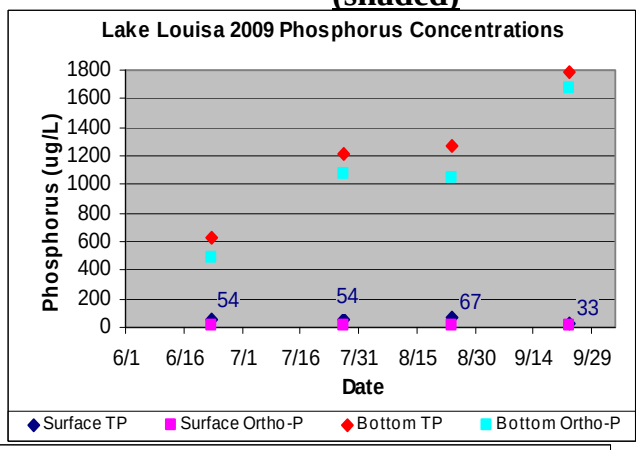
Lake Louisa Lake Report Card

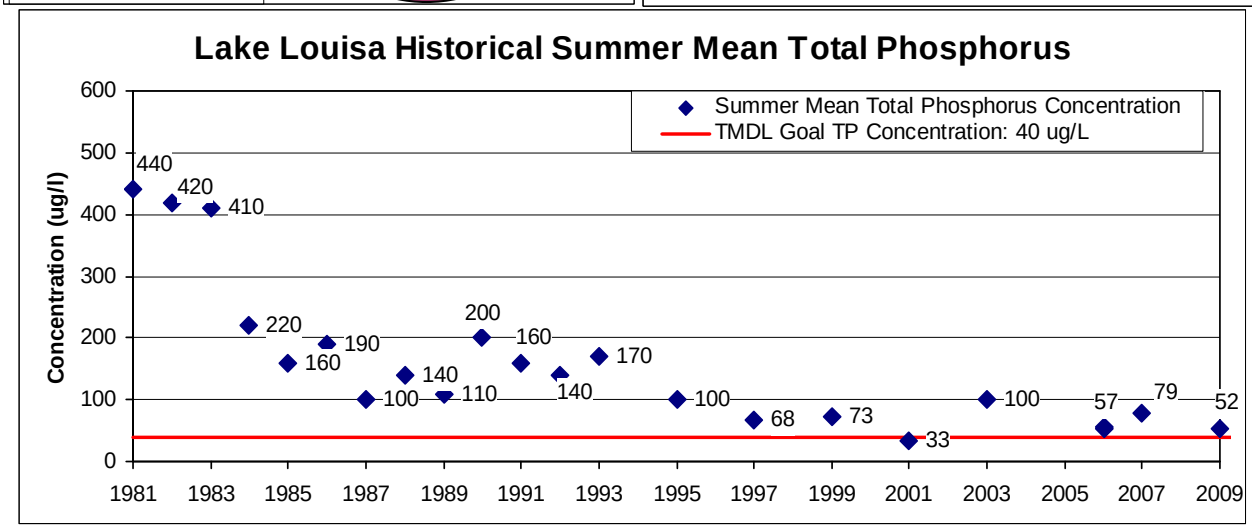
Lake Data

Surface Area:	**193 Acres**
Maximum Depth:	**44 Feet**
Subwatershed Area:	**53,881 acres**

Tributary Sub watershed (shaded)





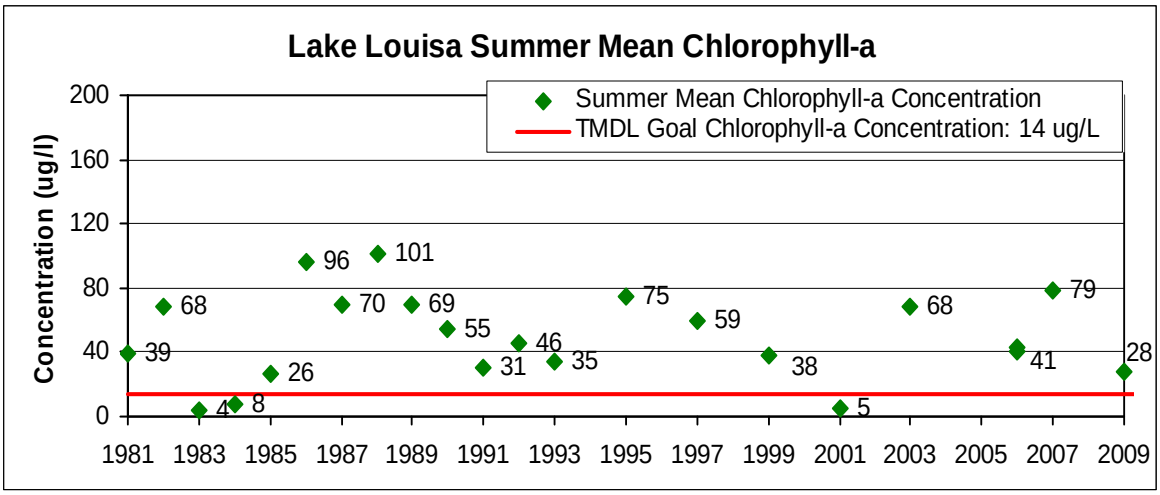


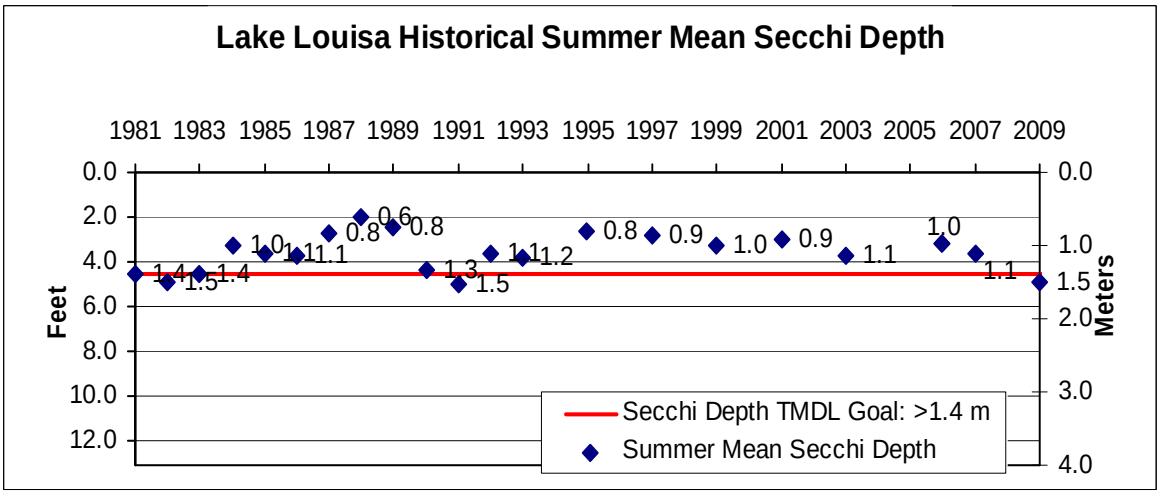
Clearwater River Watershed District	Wenck Associates, Inc. Environmental Engineers — 1800 Pioneer Creek Center Maple Plain, MN 55359	Feb 2010
Lake Louisa		

Lake Louisa

2009 Lake Report Card

MPCA Standards for Deep Lakes in the North Central Hardwood Forest:
Total Phosphorus (TP): ≤ 40 ug/L
Chlorophyll-a: ≤ 14 ug/L
Secchi Depth: ≥ 1.4 meter





Summary

- Water quality has improved significantly since the early 1980s, likely due to the reduction of phosphorus loads in the Clearwater River.
- While the summer mean Secchi depth met the TMDL goal in 2009, summer mean phosphorus and chlorophyll-a concentrations did not meet TMDL goals.
- In-lake phosphorus concentrations have remained relatively stable since 1995.
- Monitoring data indicates the potential for high internal loads in the lake.

TMDL Activities

- Reducing phosphorus loads from upstream lakes and the direct tributary watershed will have the greatest impact on improving the water quality in Lake Louisa.
- Phosphorus reduction strategies including BMP's, hypolimnetic withdrawal, targeted soil testing and GPS fertilizer application, and the construction of sedimentation ponds are identified by the TMDL Implementation Plan for implementation in upstream watersheds.
- Lake management strategies have included rough fish removal since 1984 and aerators from 1985 to 1995.

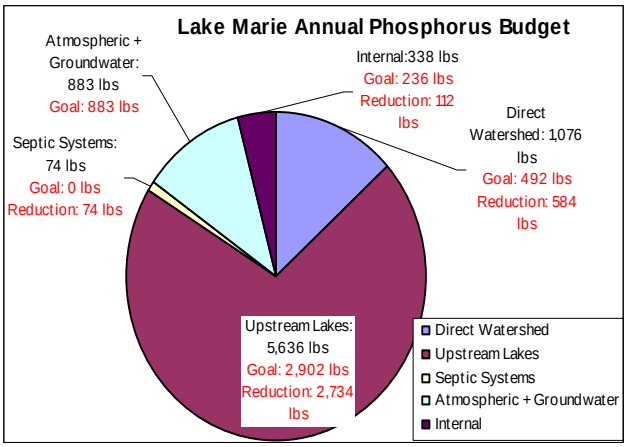
5.2.2.12 Lake Marie

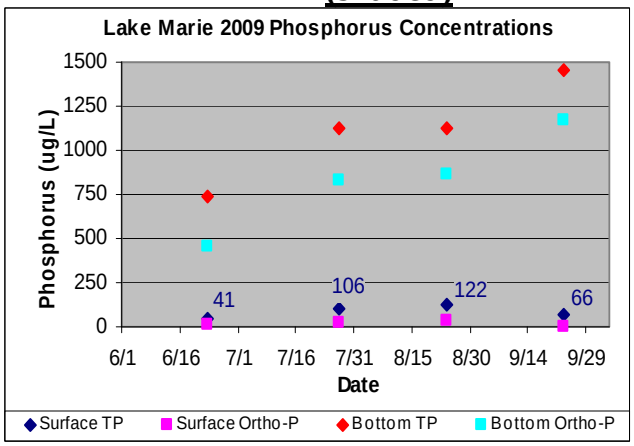
Lake Marie Report Card

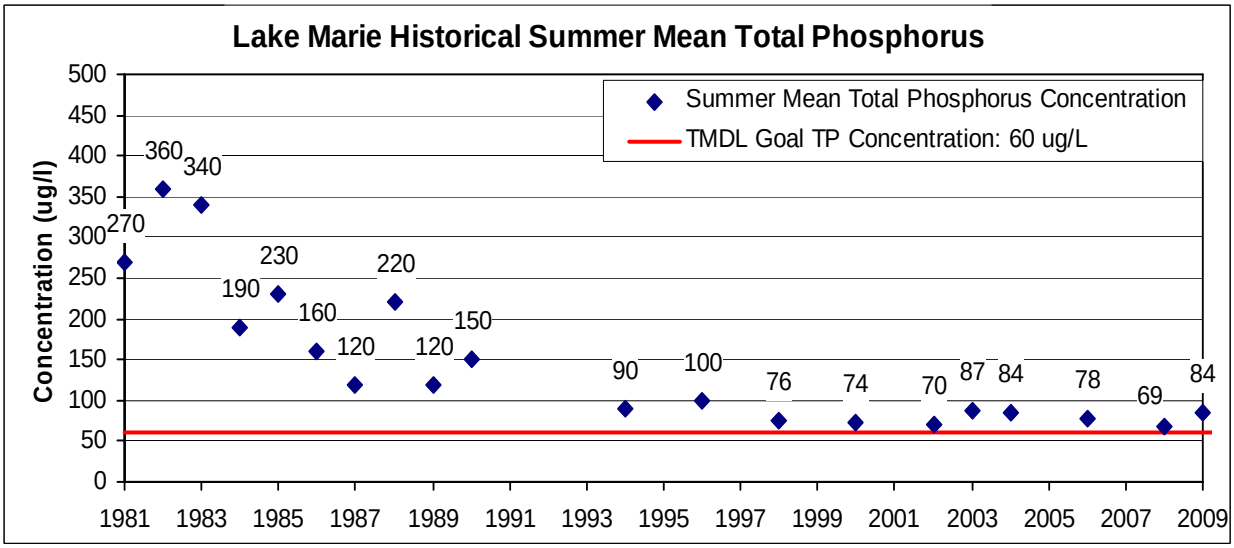
Lake Data

Surface Area:	**140 Acres**
Maximum Depth:	**36 Feet**
Subwatershed Area:	**59,837 acres**

Tributary Sub watershed (shaded)





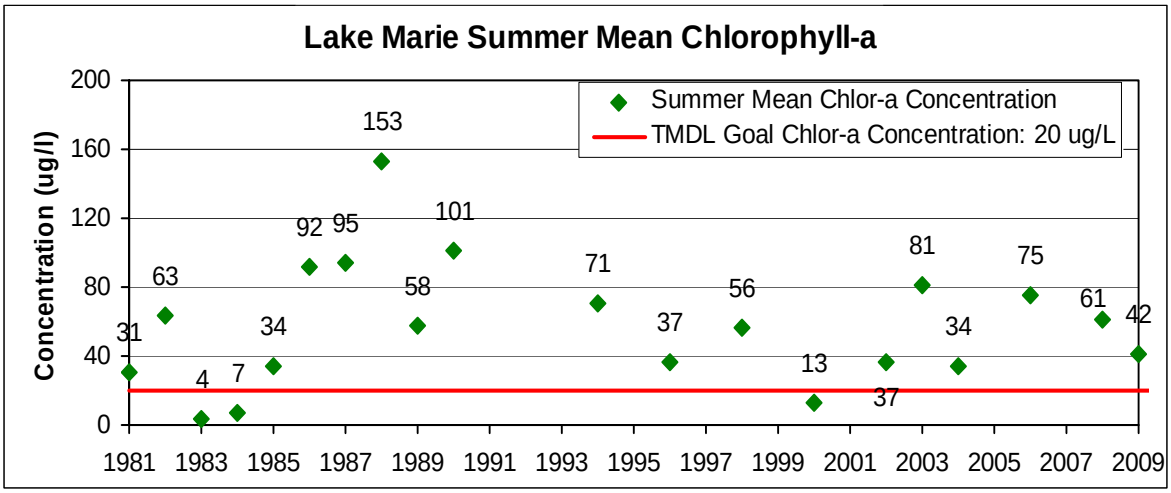


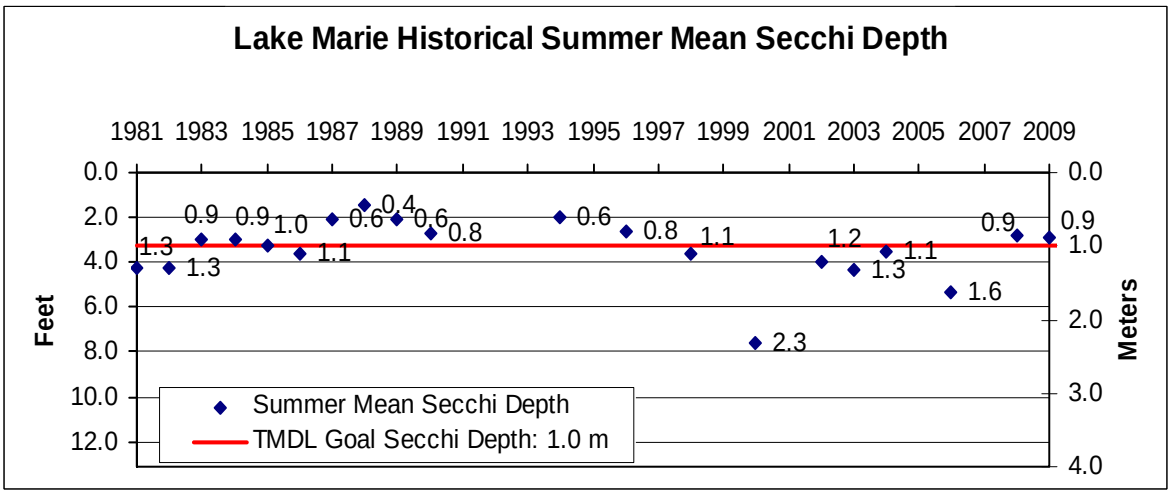
Clearwater River Watershed District	Wenck Associates, Inc. Environmental Engineers — 1800 Pioneer Creek Center Maple Plain, MN 55359	Feb 2010
Lake Marie		

Lake Marie

2009 Lake Report Card

MPCA Standards for Shallow Lakes in the North Central Hardwood Forest:
Total Phosphorus (TP): ≤ 60 ug/L
Chlorophyll-a: ≤ 20 ug/L
Secchi Depth: ≥ 1.0 meter





Summary

- Water quality has improved significantly and phosphorus and chlorophyll-a concentrations have remained relatively stable since the early 1990s.
- Summer mean phosphorus and chlorophyll-a concentrations and secchi depths measured in 2009 did not meet TMDL goals, but are close to the respective goals for each parameter.
- The reduction of phosphorus loads in the Clearwater River is likely the cause of the improved water quality.
- Monitoring data indicates a potential for high internal loads.

TMDL Activities

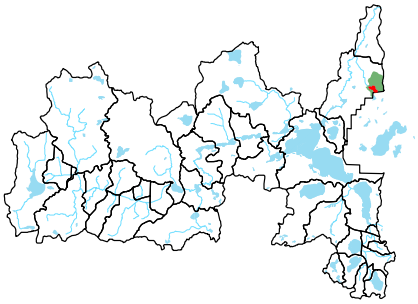
- Lake management strategies have included rough fish removal since 1984 and aerations from 1985 to 1995.
- The reduction of phosphorus loads from upstream lakes and the direct tributary watershed will have the greatest impact on improving lake water quality.
- Phosphorus reduction activities identified for implementation by the TMDL Implementation Plan in the upstream watersheds tributary to Lake Betsy and Clear Lake include BMP's, hypolimnetic withdrawal, targeted soil testing and GPS fertilizer application, and the construction of sedimentation ponds.

5.2.2.13 Nixon Lake

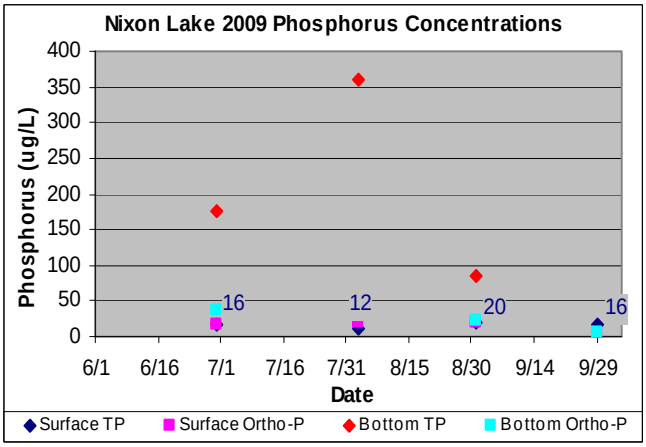
Nixon Lake Report Card

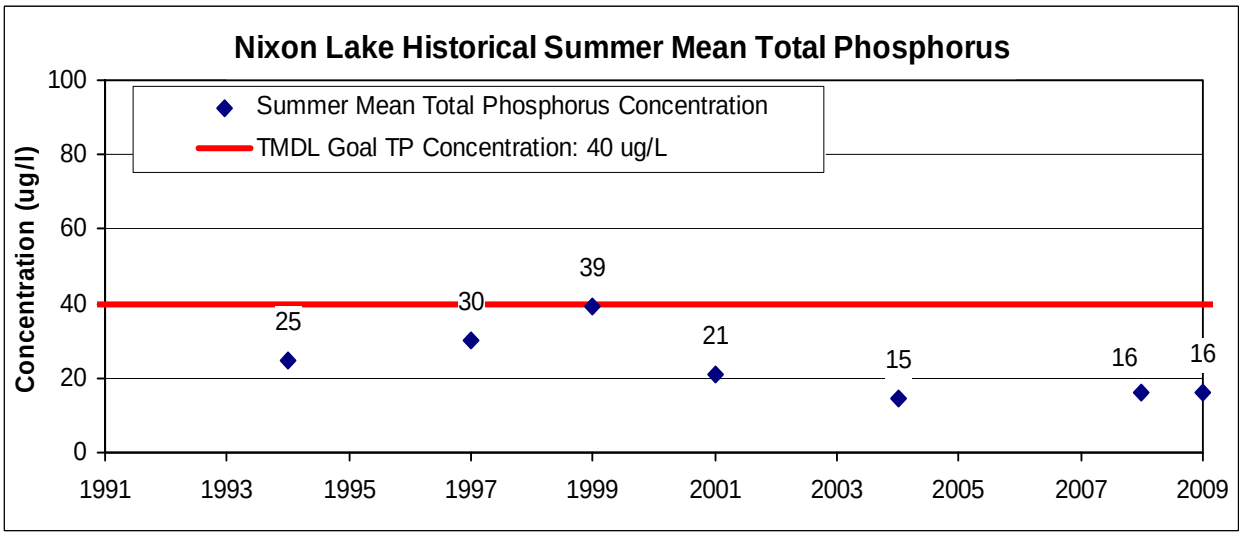
Lake Data

Surface Area:	**56 Acres**
Maximum Depth:	**67 Feet**
Subwatershed Area:	**570 acres**



Tributary Sub watershed (shaded)



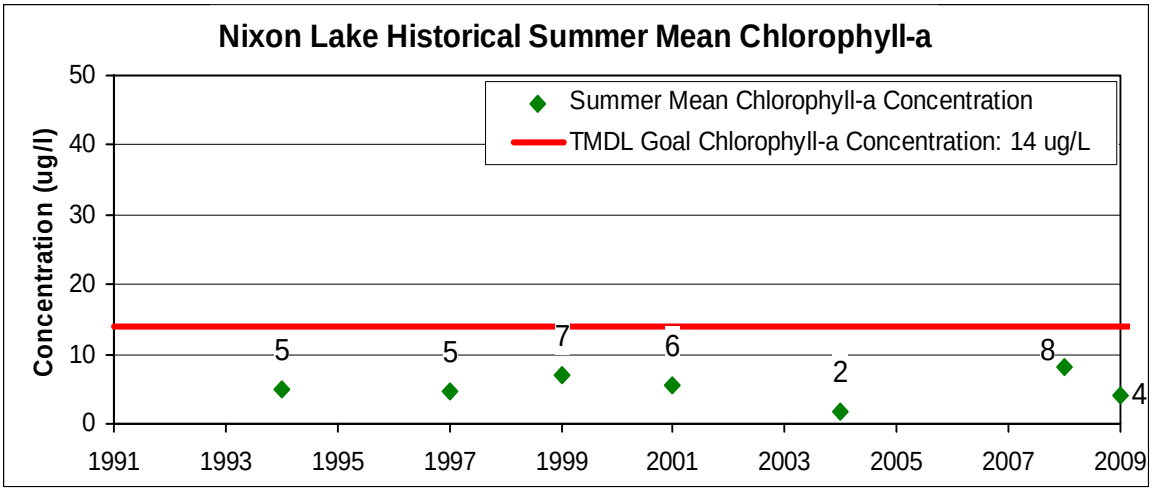


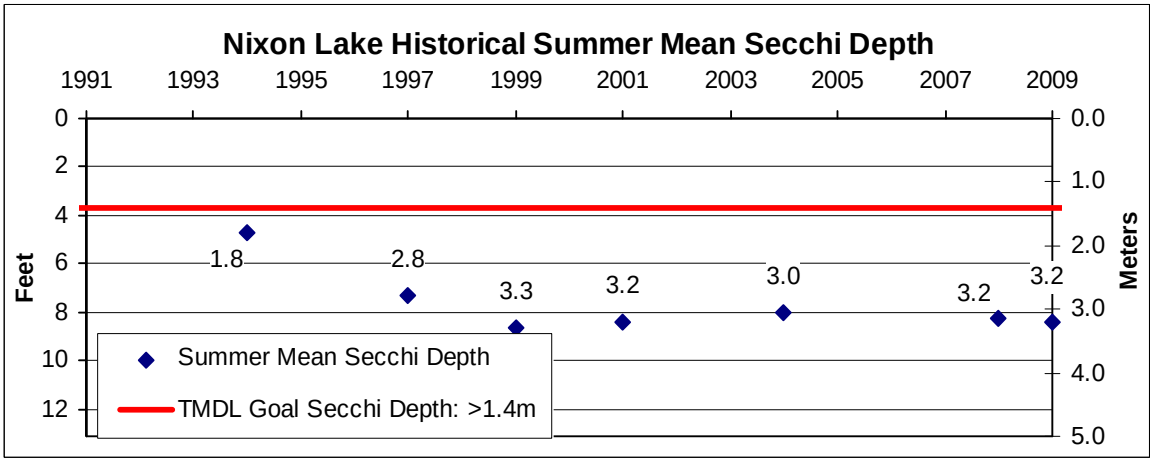
Clearwater River Watershed District	Wenck Associates, Inc. Environmental Engineers — 1800 Pioneer Creek Center Maple Plain, MN 55359	June 2010
Nixon Lake		

Nixon Lake

2009 Lake Report Card

MPCA Proposed Deep Lake Standards for the North Central Hardwood Forest:
Total Phosphorus (TP): ≤ 40 ug/L
Chlorophyll-a: ≤ 14 ug/L
Secchi Depth: ≥ 1.4 meter





Summary

- Current water quality is good in Nixon Lake as phosphorus concentrations, chlorophyll-a, and Secchi depth have met MPCA standards since monitoring of the lake began in 1994.
- A small watershed with limited development contribute to good water quality in the lake.
- Nixon Lake has a diverse aquatic plant community and wetlands and cattail fringe surround most of the lake.

Water Quality Improvement Activities

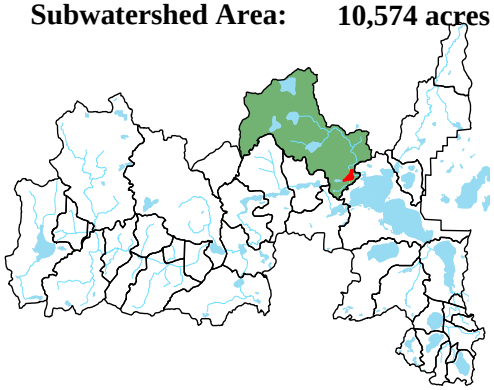
- Good land management practices along the lakeshore and in the lake's small watershed will help to maintain the good water quality in Nixon Lake.

5.2.2.14 Otter Lake

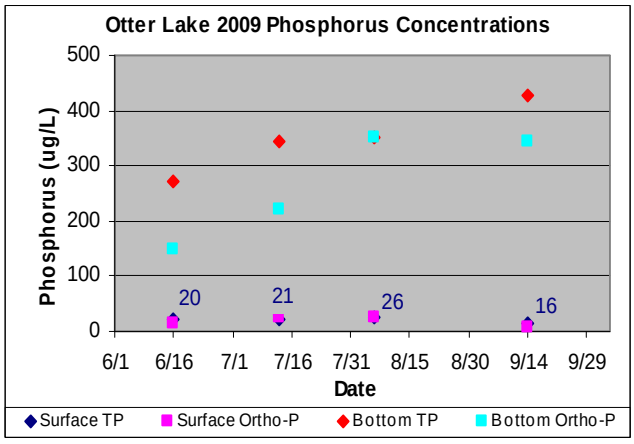
Otter Lake Report Card

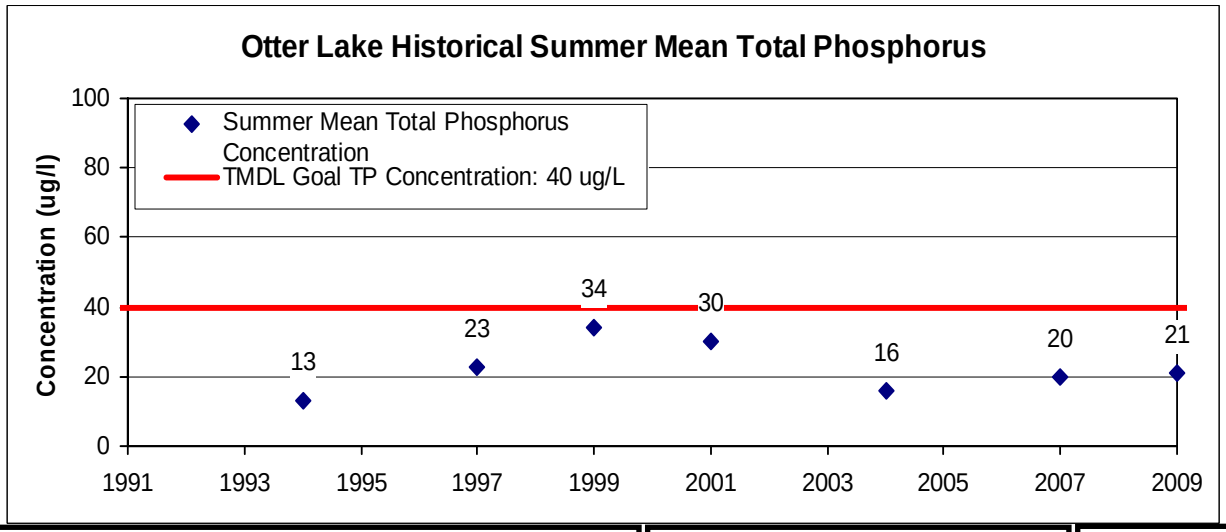
Lake Data

Surface Area:	**96 Acres**
Maximum Depth:	**51 Feet**
Subwatershed Area:	**10,574 acres**



Tributary Sub watershed (shaded)



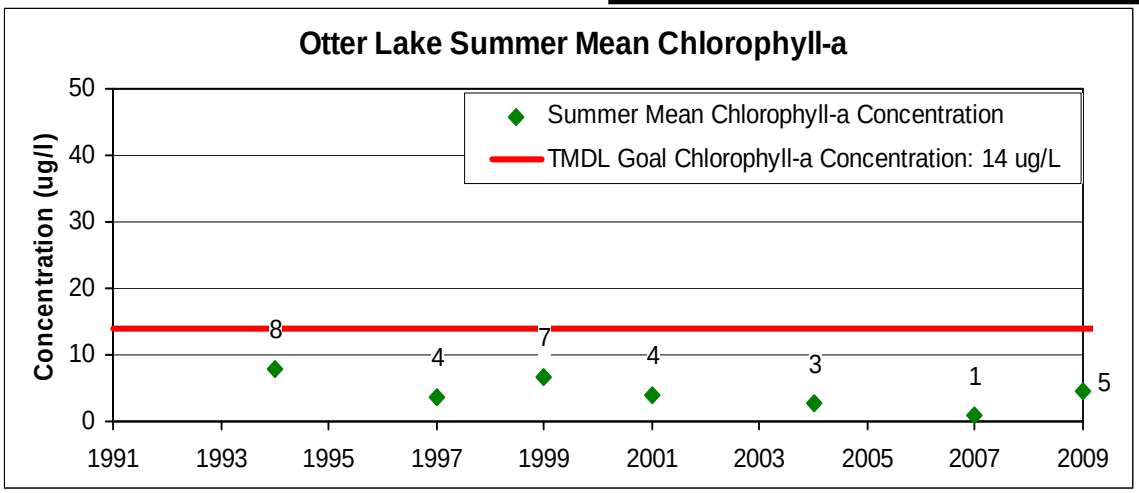


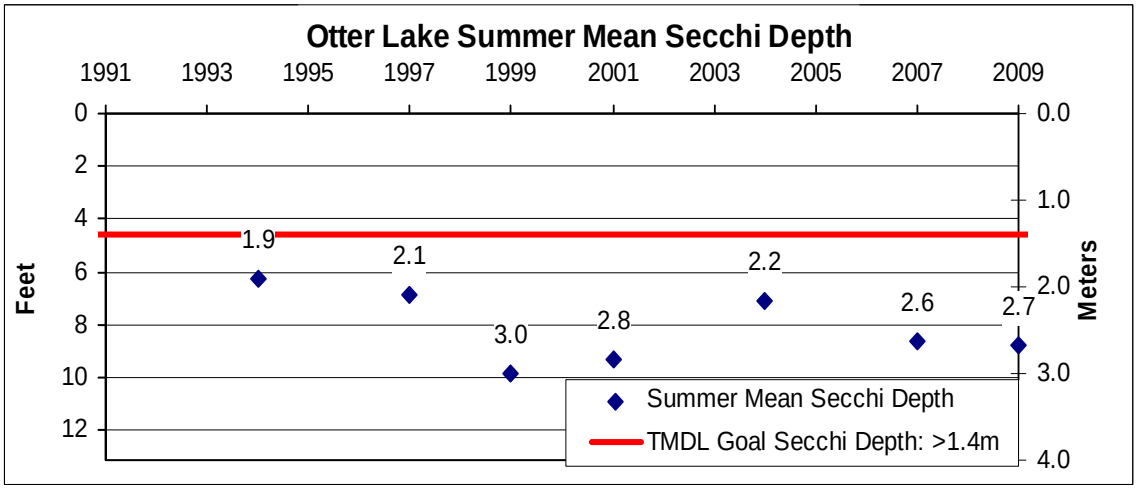
Clearwater River Watershed District	Wenck Associates, Inc. 1800 Pioneer Creek Center Environmental Engineers Maple Plain, MN 55359	June 2010
Otter Lake		

Otter Lake

2009 Lake Report Card

MPCA Proposed Deep Lake Standards for the North Central Hardwood Forest:
Total Phosphorus (TP): ≤ 40 ug/L
Chlorophyll-a: ≤ 14 ug/L
Secchi Depth: ≥ 1.4 meter





Summary

- Overall water quality is good in Otter Lake as phosphorus concentrations, chlorophyll-a, and Secchi depth have met MPCA standards since monitoring of the lake began in 1994.
- A small direct watershed with limited development contributes to good water quality in Otter Lake.
- Otter Lake is connected to Clearwater Lake by a channel, and a high quality fishery exists for both northern pike and walleye in the lake.*

Water Quality Improvement Activities

- Good land management practices adjacent to the lakeshore and throughout the lake's watershed will help to maintain the good water quality in Otter Lake.

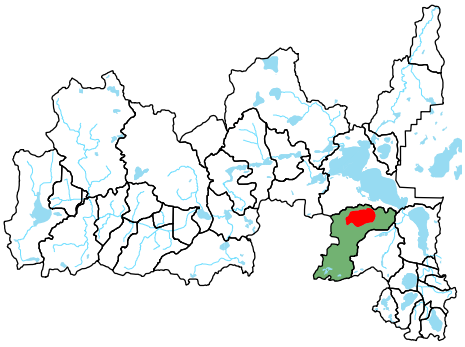
*Source: MN DNR Lake Finder

5.2.2.15 Pleasant Lake

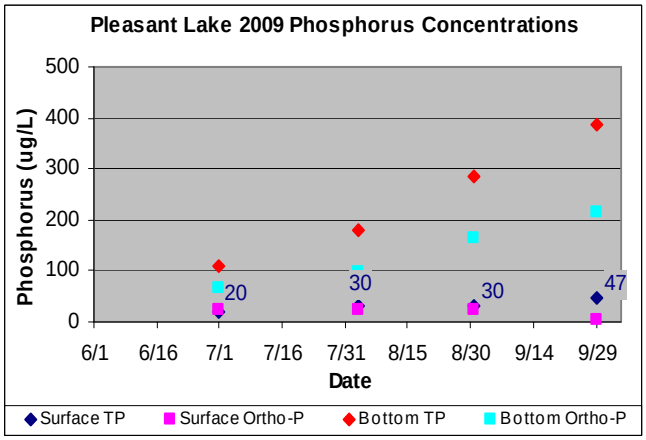
Pleasant Lake Report Card

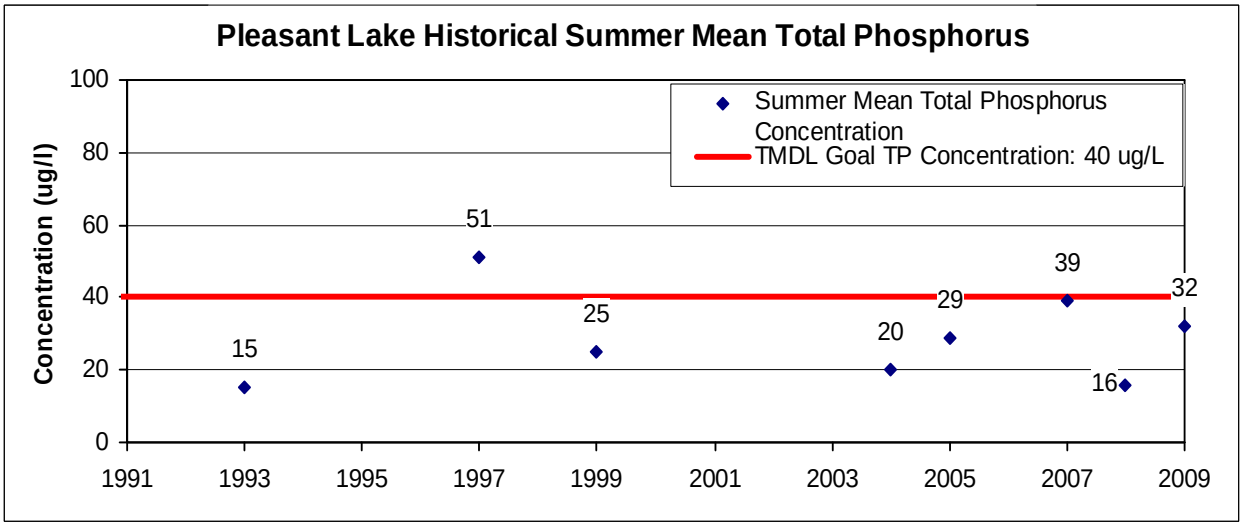
Lake Data

Surface Area:	**571 Acres**
Maximum Depth:	**74 Feet**
Subwatershed Area:	**4,325 acres**



Tributary Sub watershed (shaded)



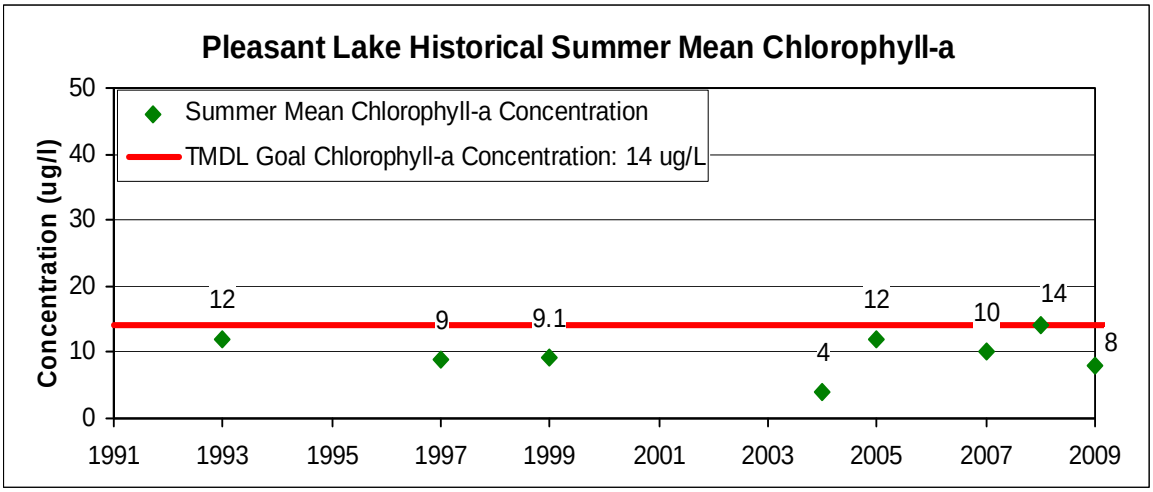


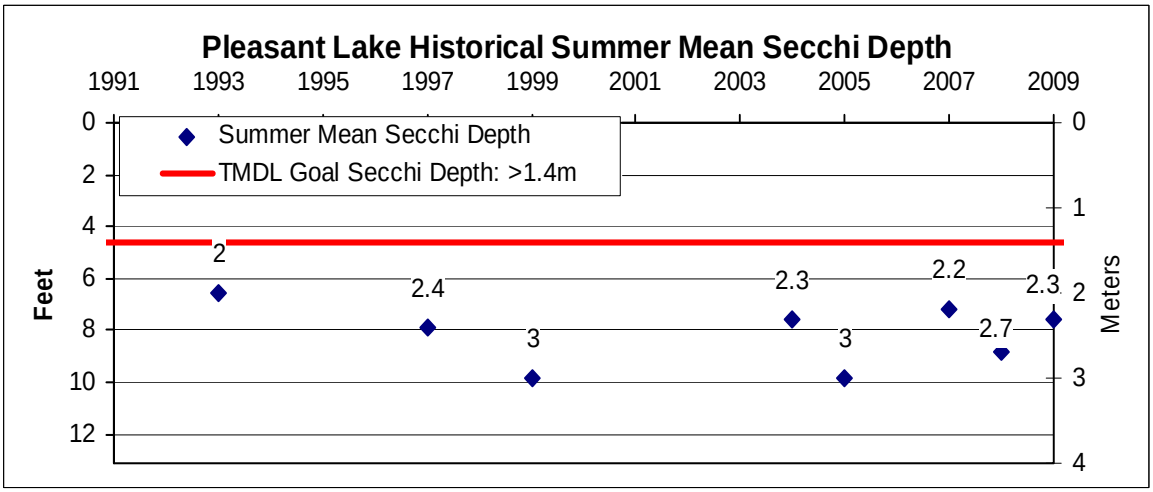
Clearwater River Watershed District	Wenck Associates, Inc. Environmental Engineers — 1800 Pioneer Creek Center Maple Plain, MN 55359	June 2010
Pleasant Lake		

Pleasant Lake

2009 Lake Report Card

MPCA Proposed Deep Lake Standards for the North Central Hardwood Forest:
Total Phosphorus (TP): ≤ 40 ug/L
Chlorophyll-a: ≤ 14 ug/L
Secchi Depth: ≥ 1.4 meter





Summary

- Current water quality is good in Pleasant Lake as phosphorus concentrations, chlorophyll-a, and Secchi depth have met MPCA standards since monitoring of the lake began in 1993.

Water Quality Improvement Activities

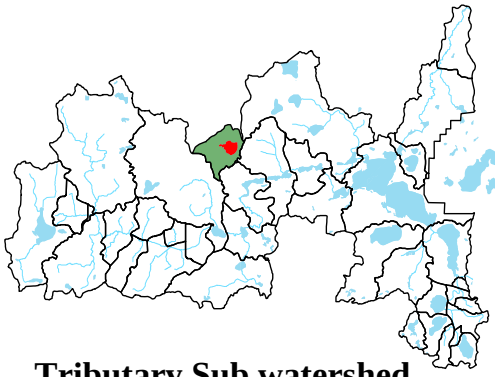
- Good land management practices adjacent to the lakeshore, the upstream watershed, and in the City of Annandale will help to maintain the good water quality in Pleasant Lake.

5.2.2.16 School Section Lake

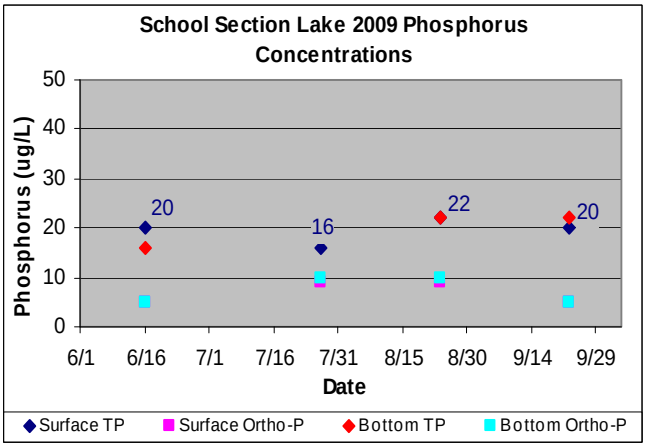
School Section Lake Report Card

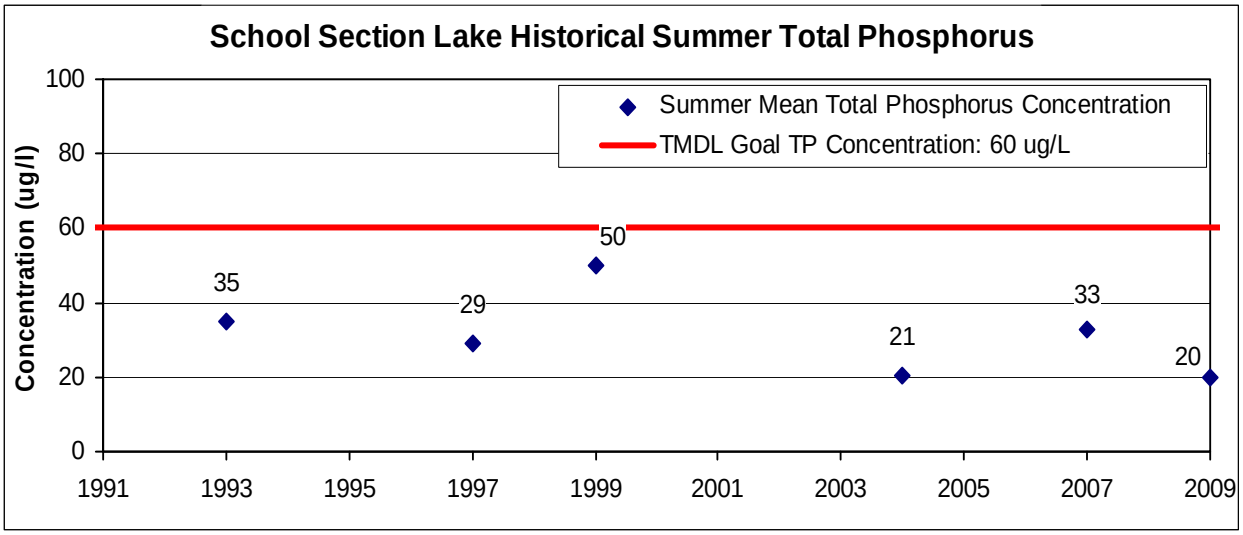
Lake Data

Surface Area:	**192 Acres**
Maximum Depth:	**12 Feet**
Subwatershed Area:	**1,843 acres**



Tributary Sub watershed (shaded)



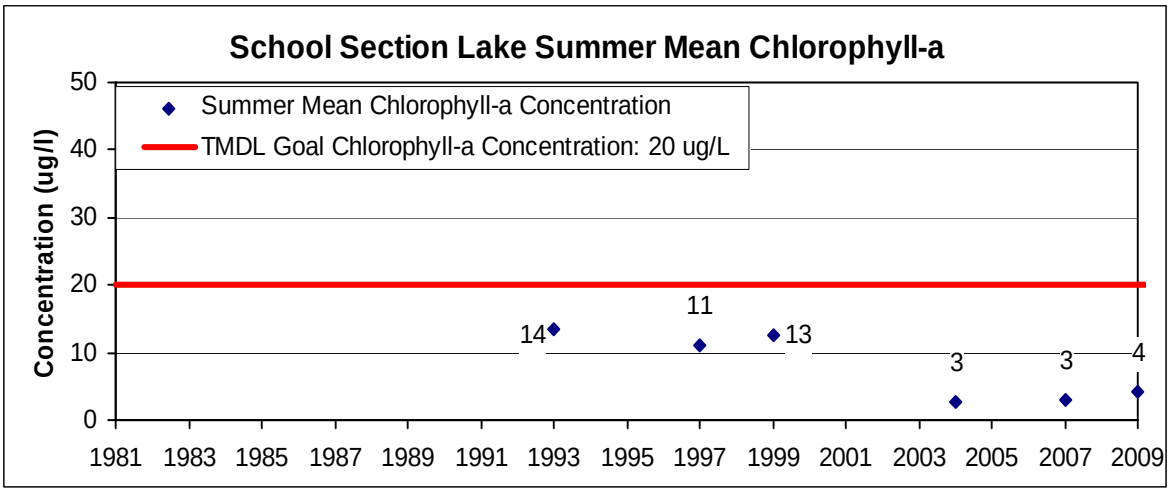


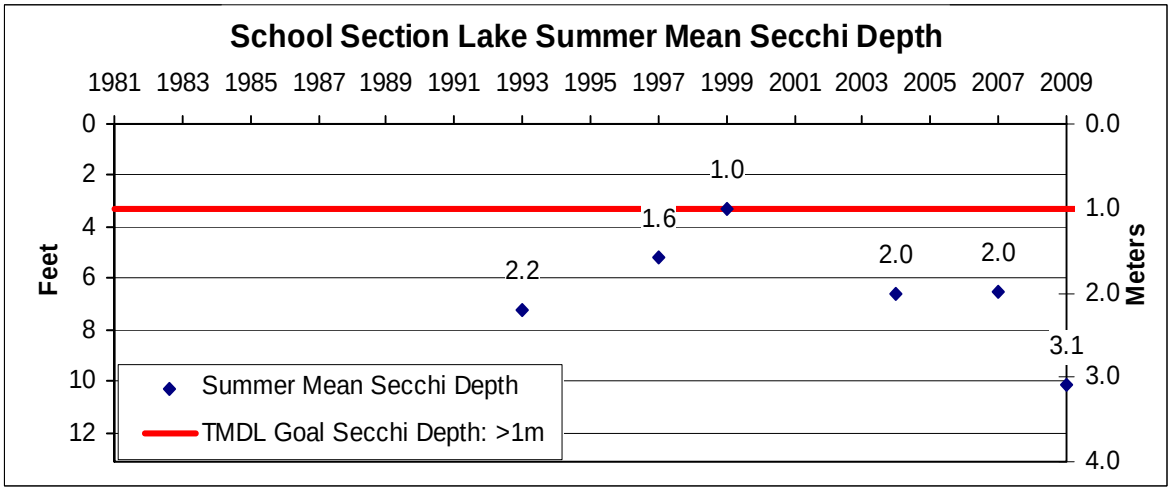
Clearwater River Watershed District	Wenck Associates, Inc. Environmental Engineers — 1800 Pioneer Creek Center Maple Plain, MN 55359	June 2010
School Section Lake		

School Section Lake

2009 Lake Report Card

MPCA Standards for Shallow Lakes in the North Central Hardwood Forest:
Total Phosphorus (TP): ≤ 60 ug/L
Chlorophyll-a: ≤ 20 ug/L
Secchi Depth: ≥ 1.0 meter





Summary

- Current water quality is good in School Section Lake as phosphorus concentrations, chlorophyll-a, and Secchi depth have met MPCA standards since monitoring of the lake began in 1993.
- School Section Lake is a shallow natural environment lake with a diverse aquatic plant community comprised primarily of native species. Invasive curly leaf pondweed was abundant in 1990 but was rare in 2008, covering less than one tenth of an acre.*
- The fishery in School Section Lake is subject to periodic winterkill and is dominated by black bullhead and bluegill with northern pike, largemouth bass, and black crappie also present.*

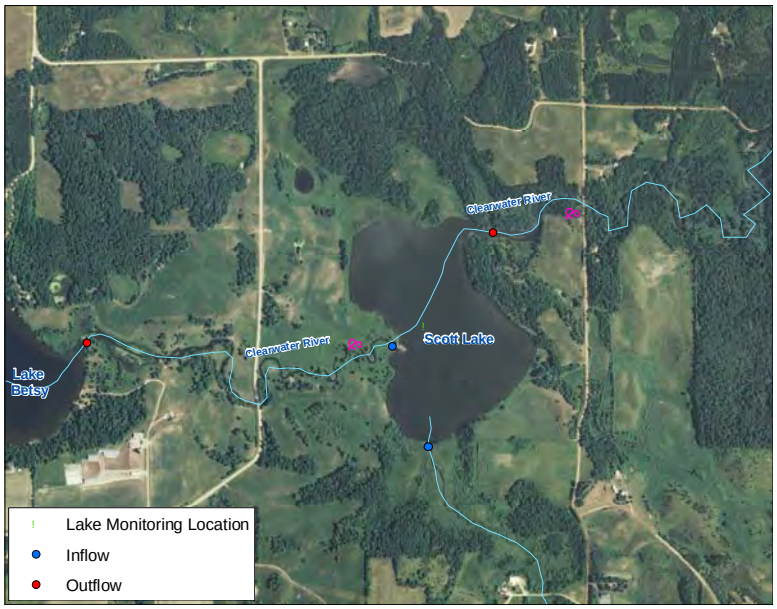
* Source: MN DNR Lake Finder

Water Quality Improvement Activities

- Good land management practices along the lakeshore and in the upstream watershed that are implemented to improve the water quality in upstream lakes will also help to maintain the good water quality in School Section Lake.

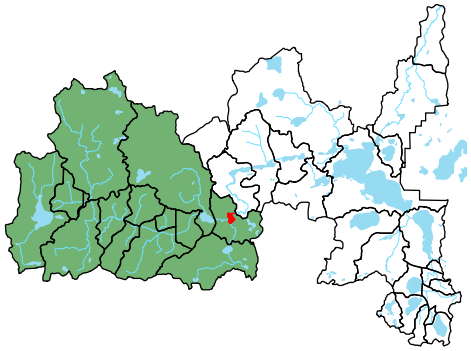
5.2.2.17 Scott Lake

Scott Lake Lake Report Card

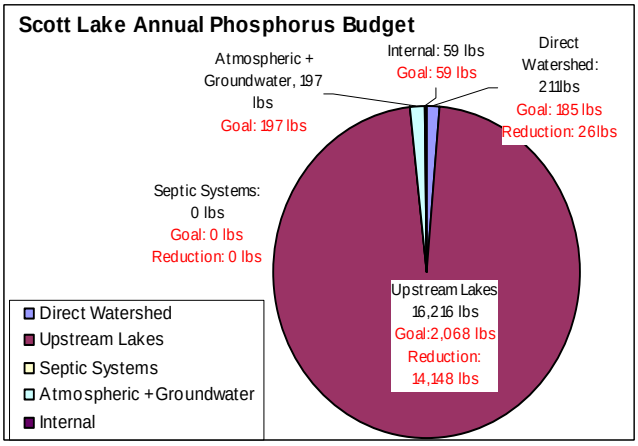


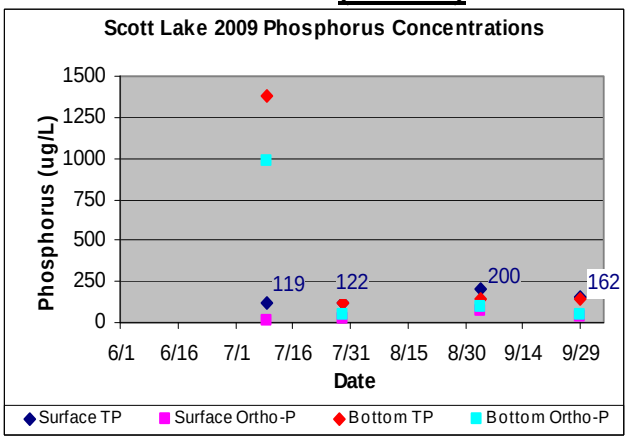
Lake Data

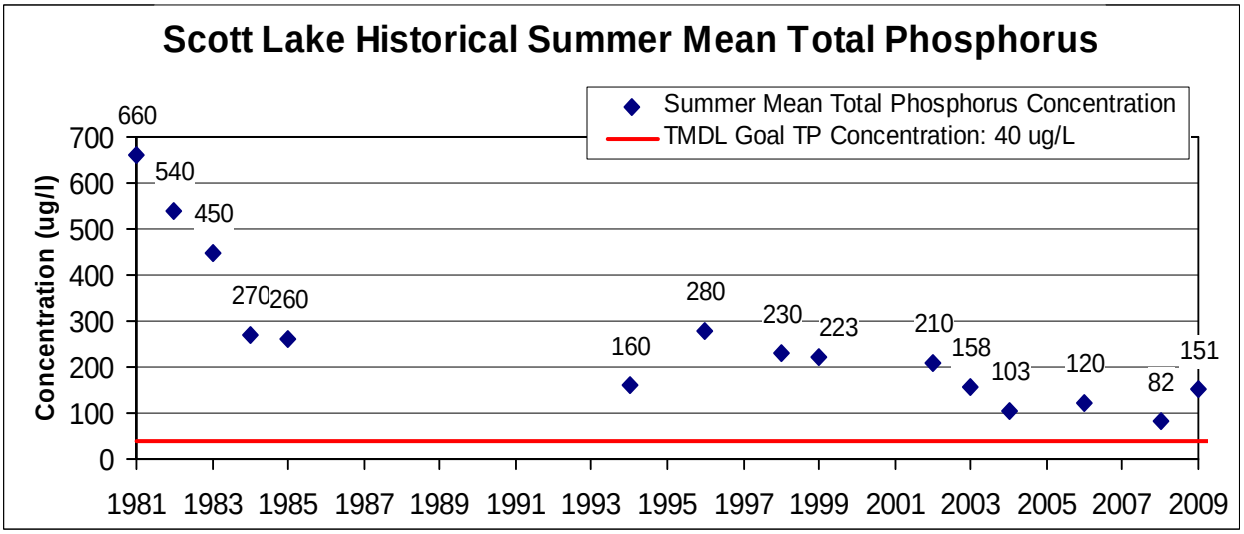
Surface Area:	**80 Acres**
Maximum Depth:	**23 Feet**
Subwatershed Area:	**51,000 acres**



Tributary Sub watershed (shaded)





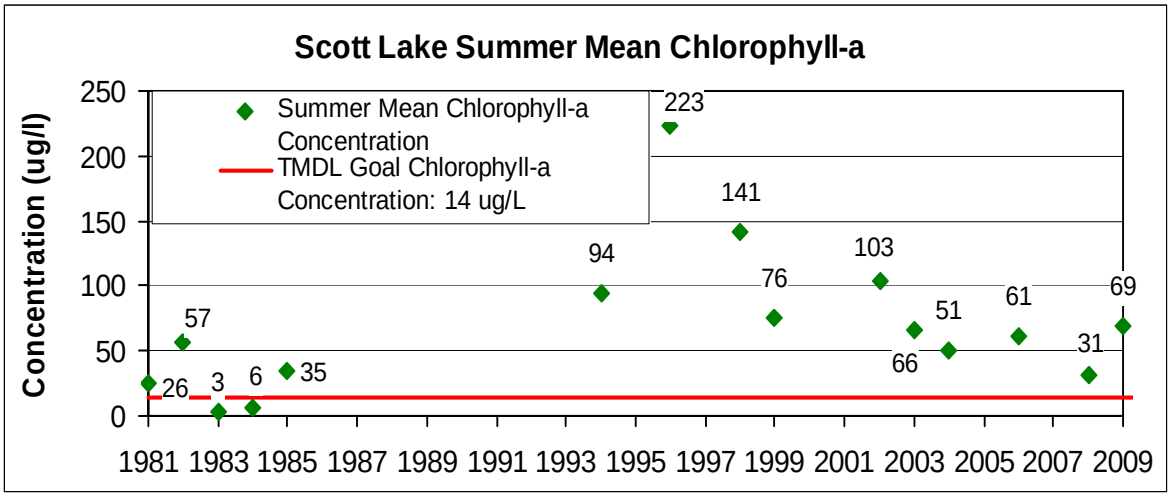


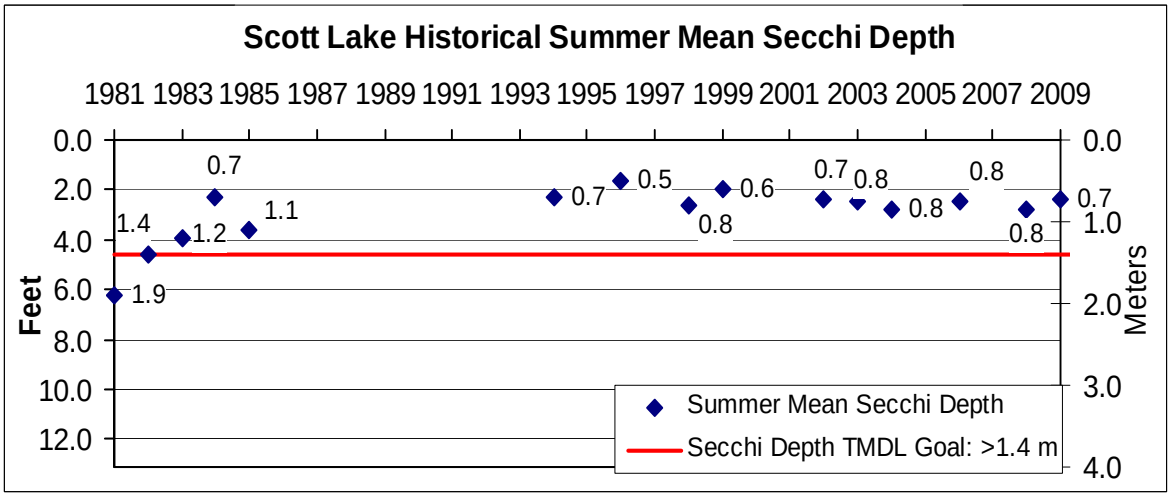
Clearwater River Watershed District	Wenck Associates, Inc. Environmental Engineers — 1800 Pioneer Creek Center Maple Plain, MN 55359	April 2010
Scott Lake		

Scott Lake

2009 Lake Report Card

MPCA Standards for Deep Lakes in the North Central Hardwood Forest:
Total Phosphorus (TP): ≤ 40 ug/L
Chlorophyll-a: ≤ 14 ug/L
Secchi Depth: ≥ 1.4 meter





Summary

- Water quality has improved since the 1980s in Scott Lake, as a decreasing trend in summer average phosphorus concentrations has been observed. This correlates strongly with a decrease in total phosphorus loads in the Clearwater River upstream of the lake.
- Summer mean Secchi depth, phosphorus and chlorophyll-a concentrations did not meet TMDL goals.
- Water quality in Scott Lake is dominated by inflow from Lake Betsy.

TMDL Activities

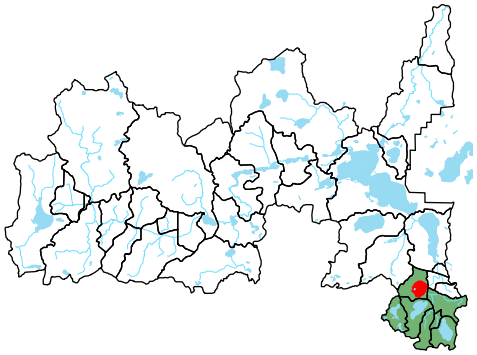
- Reducing phosphorus loads from upstream lakes and the direct tributary watershed will have the greatest impact on improving the water quality in Scott Lake.
- Phosphorus reduction strategies including BMP's, hypolimnetic withdrawal, targeted soil testing and GPS fertilizer application, and the construction of sedimentation ponds are identified by the TMDL Implementation Plan for implementation in upstream watersheds.
- Controlling loads to Lake Betsy is the key to improving water quality in Scott Lake.

5.2.2.18 Swartout Lake

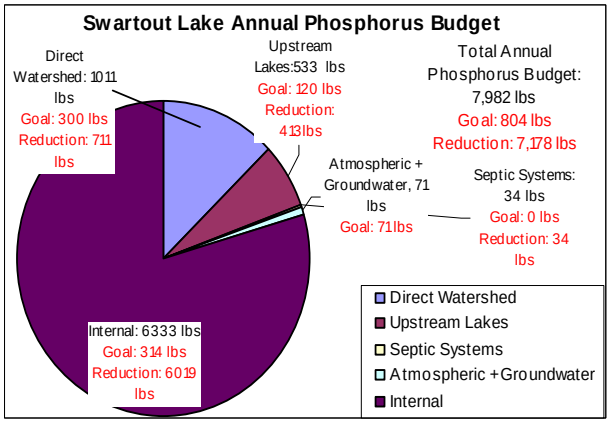
Swartout Lake Report Card

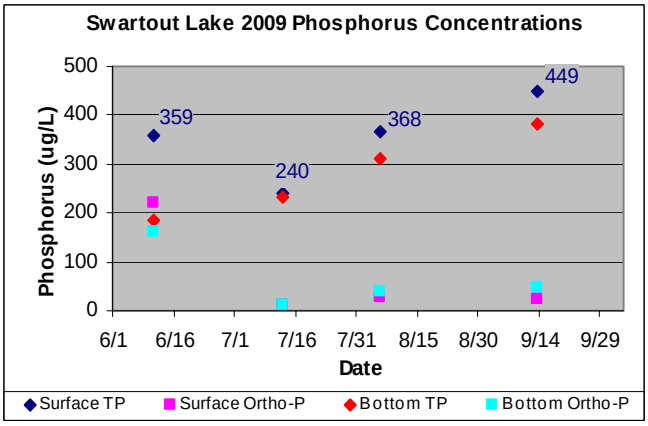
Lake Data

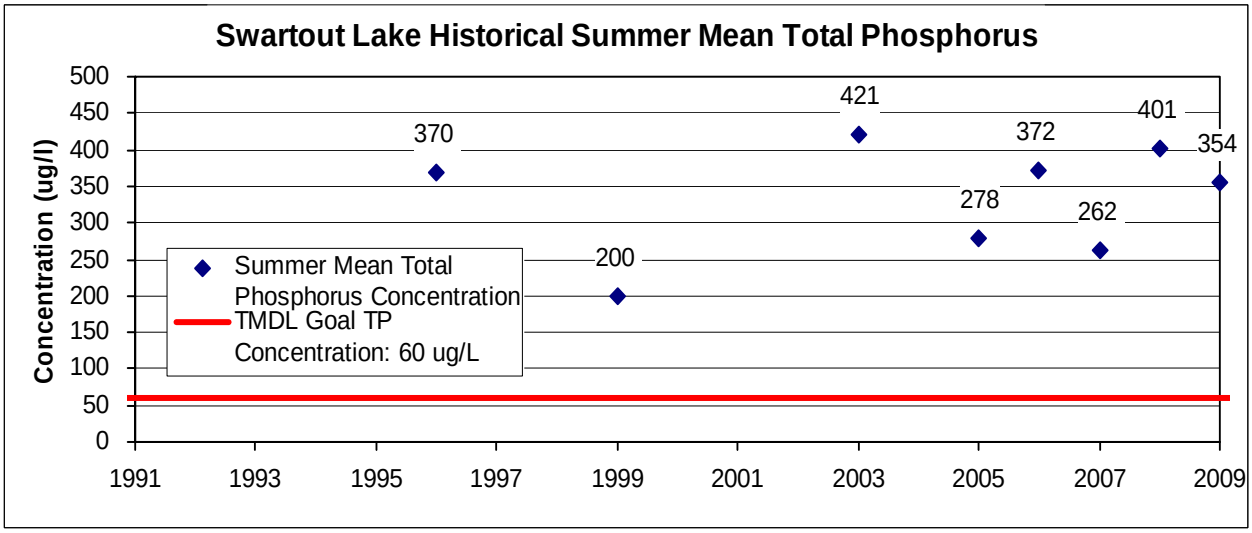
Surface Area:	**296 Acres**
Maximum Depth:	**12 Feet**
Subwatershed Area:	**5,551 acres**



Tributary Sub watershed (shaded)





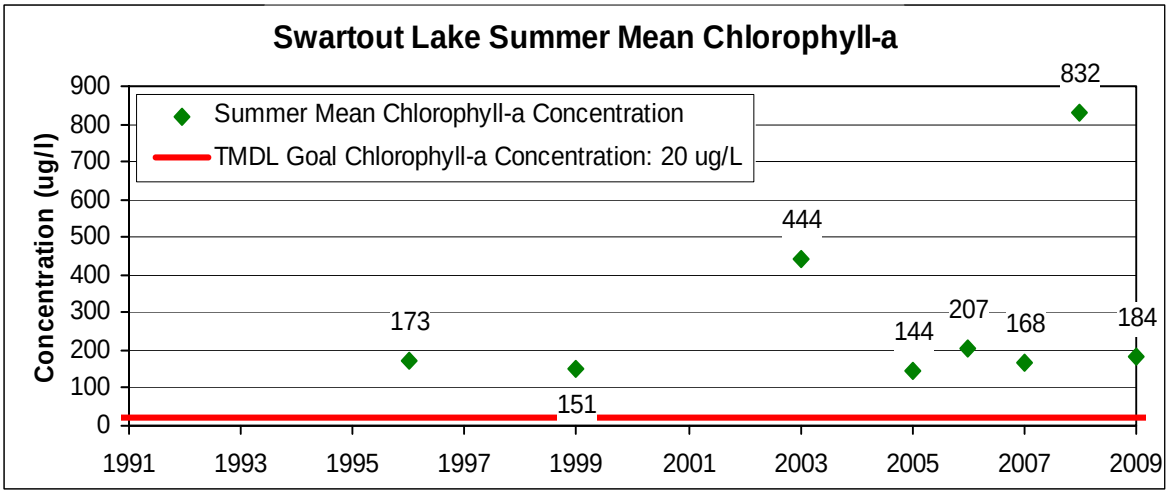


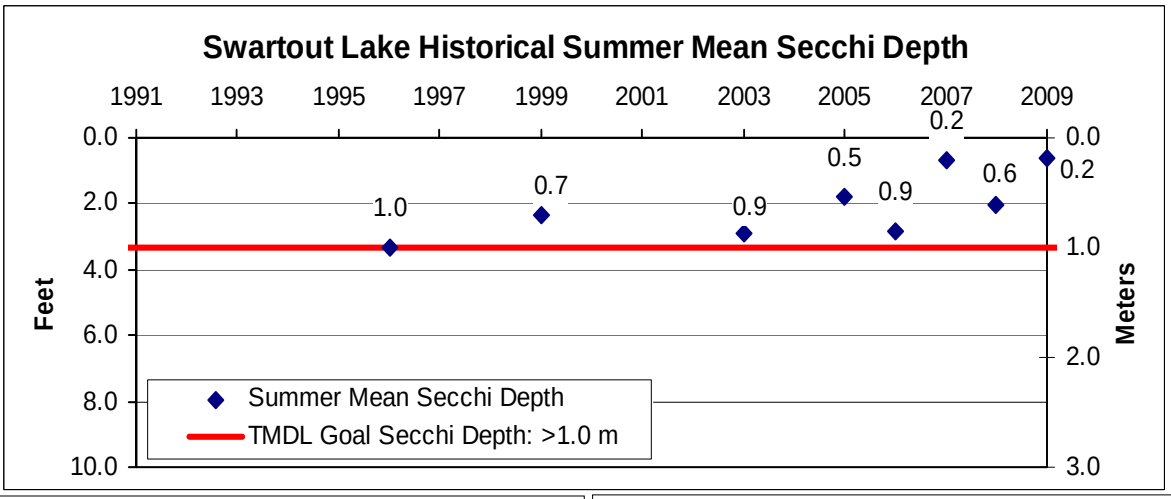
Clearwater River Watershed District	Wenck Associates, Inc. 1800 Pioneer Creek Center Environmental Engineers Maple Plain, MN 55359	April 2010
Swartout Lake		

Swartout Lake

2009 Lake Report Card

MPCA Standards for Shallow Lakes in the North Central Hardwood Forest:
Total Phosphorus (TP): ≤ 60 ug/L
Chlorophyll-a: ≤ 20 ug/L
Secchi Depth: ≥ 1.0 meter





Summary

- Water quality is poor in Swartout Lake, with observed total phosphorus and chlorophyll-a concentrations exceeding TMDL goals during all monitoring years.
- Water clarity is also very low in Swartout Lake, with recent Secchi depth values averaging approximately 2 feet.
- Internal loads are the major nutrient source to the lake.
- Monitoring data indicates the potential for high internal loads in the lake.

TMDL Activities

- Swartout Lake receives significant nutrient loads from upstream lakes Albion and Henshaw. A reduction in these external loads as well as a significant reduction in internal nutrient cycling will be required to meet TMDL goals in Swartout Lake.
- Rough fish migration control and removal is an important element of lake management. Fish barriers have been installed on tributary streams to inhibit carp from reaching spawning wetlands. Rough fish harvest has been conducted during the winter as well.

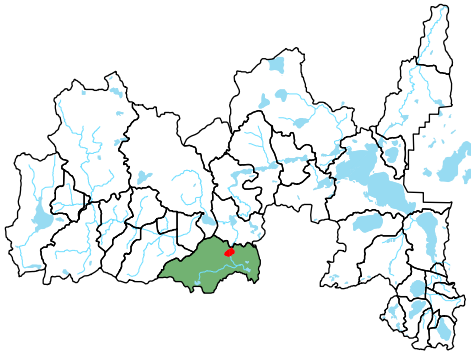
Clearwater River Watershed District	Wenck Associates, Inc. 1800 Pioneer Creek Center Environmental Engineers Maple Plain, MN 55359	April 2010
Swartout Lake		

5.2.2.19 Union Lake

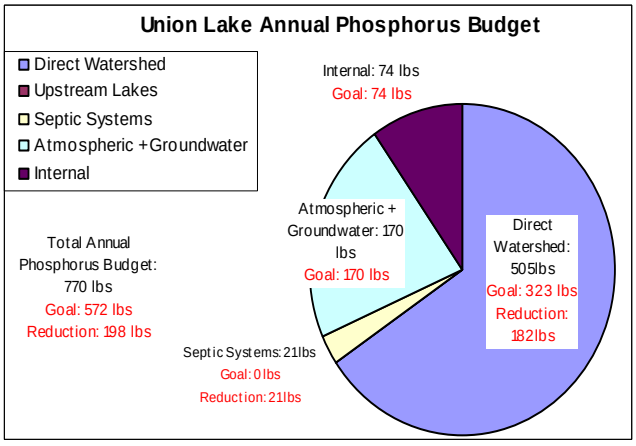
Union Lake Lake Report Card

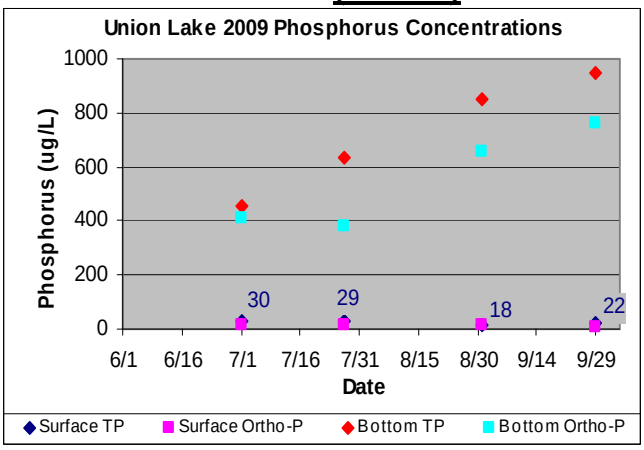
Lake Data

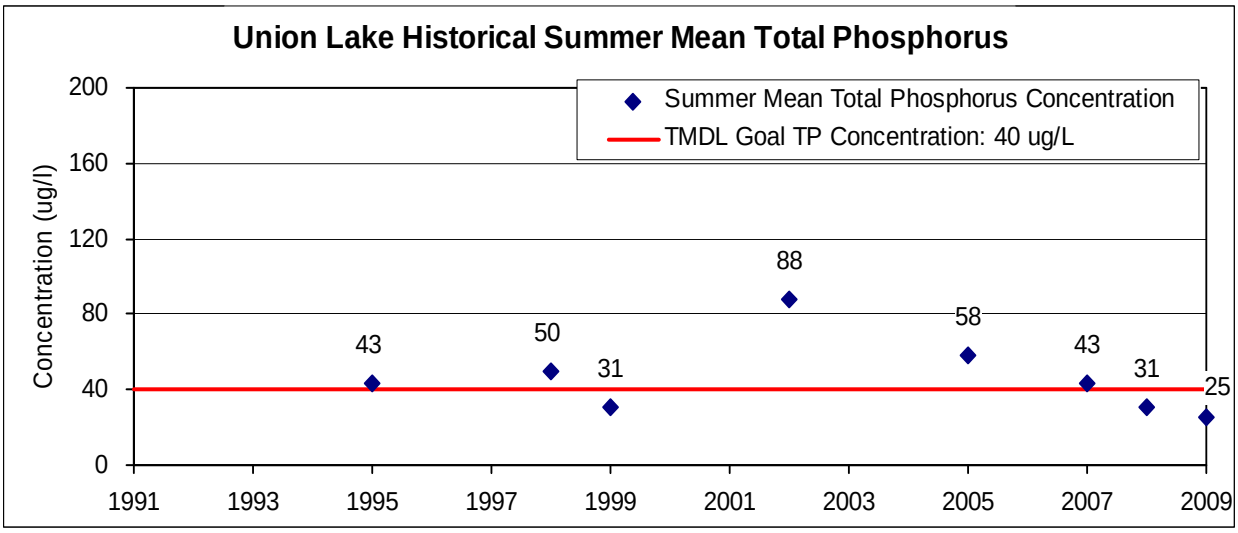
Surface Area:	**93 Acres**
Maximum Depth:	**35 Feet**
Subwatershed Area:	**4,741 acres**



Tributary Sub watershed (shaded)





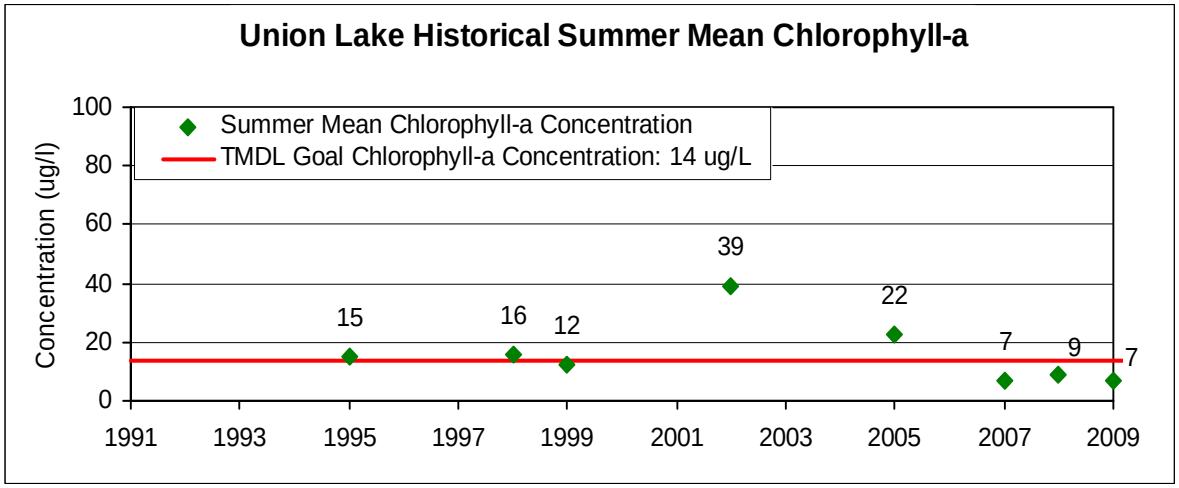


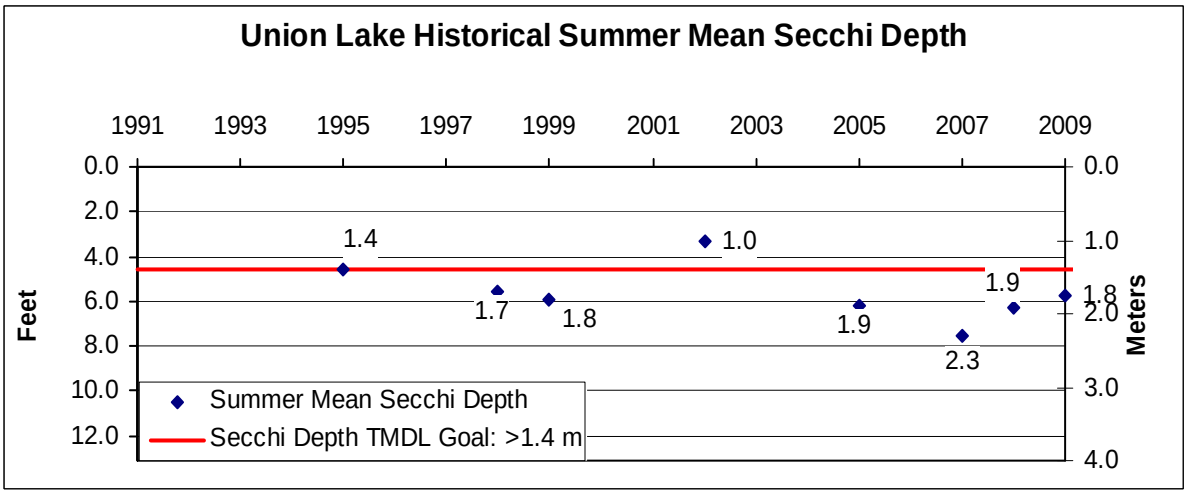
Clearwater River Watershed District	Wenck Associates, Inc. Environmental Engineers — 1800 Pioneer Creek Center Maple Plain, MN 55359	April 2010
Union Lake		

Union Lake

2009 Lake Report Card

MPCA Standards for Deep Lakes in the North Central Hardwood Forest:
Total Phosphorus (TP): ≤ 40 ug/L
Chlorophyll-a: ≤ 14 ug/L
Secchi Depth: ≥ 1.4 meter





Summary

- Water quality is Union Lake is relatively good in comparison to Scott Lake downstream, primarily due to a small tributary watershed to the lake.
- Summer mean Secchi depth, phosphorus and chlorophyll-a concentrations have all met TMDL goals in recent years.
- In-lake phosphorus concentrations have declined since 2002.

TMDL Activities

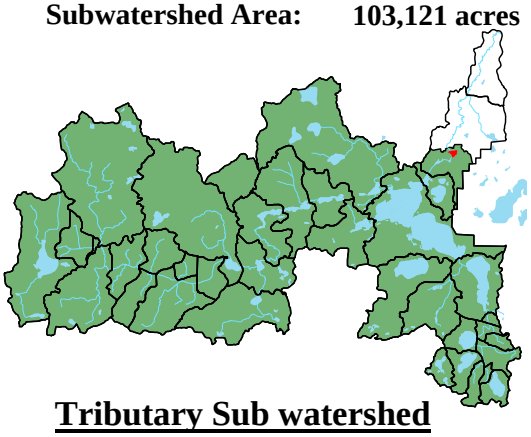
- Watershed loads appear to be the only reduction necessary for Union Lake to meet its water quality goal.
- Reducing phosphorus loads from upstream lakes and the direct tributary watershed will have the greatest impact on improving the water quality in Union Lake.
- Phosphorus reduction strategies including BMP's, hypolimnetic withdrawal, targeted soil testing and GPS fertilizer application, and the construction of sedimentation ponds are identified by the TMDL Implementation Plan for implementation in upstream watersheds.

5.2.2.20 Wiegand Lake

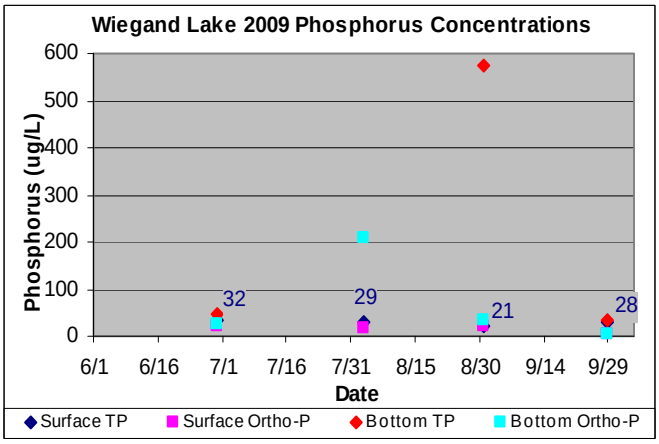
Wiegand Lake Report Card

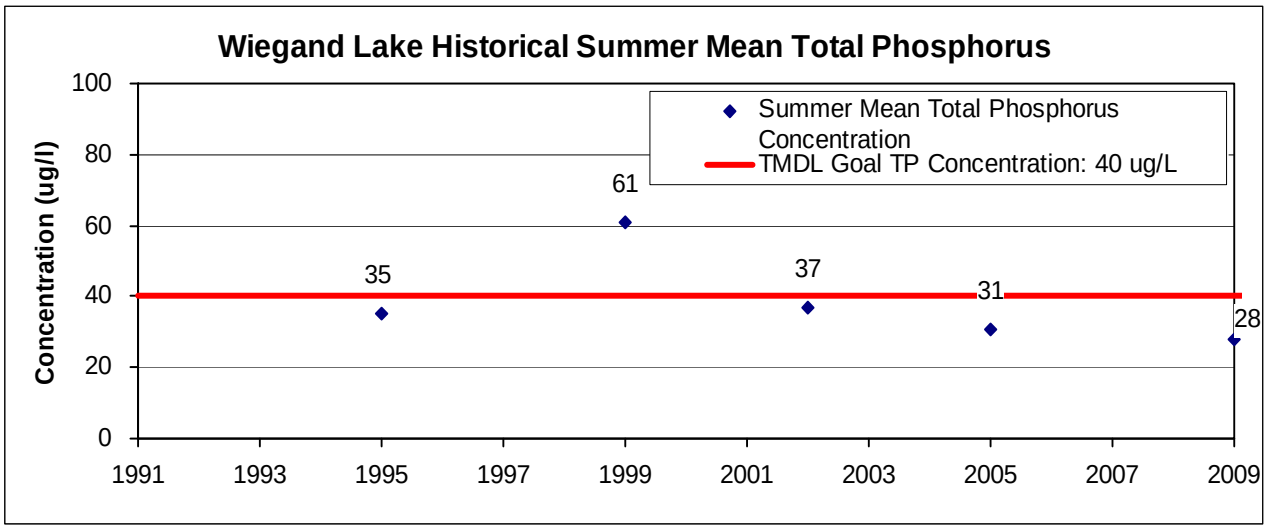
Lake Data

Surface Area:	**92 Acres**
Maximum Depth:	**35 Feet**
Subwatershed Area:	**103,121 acres**



Tributary Sub watershed (shaded)



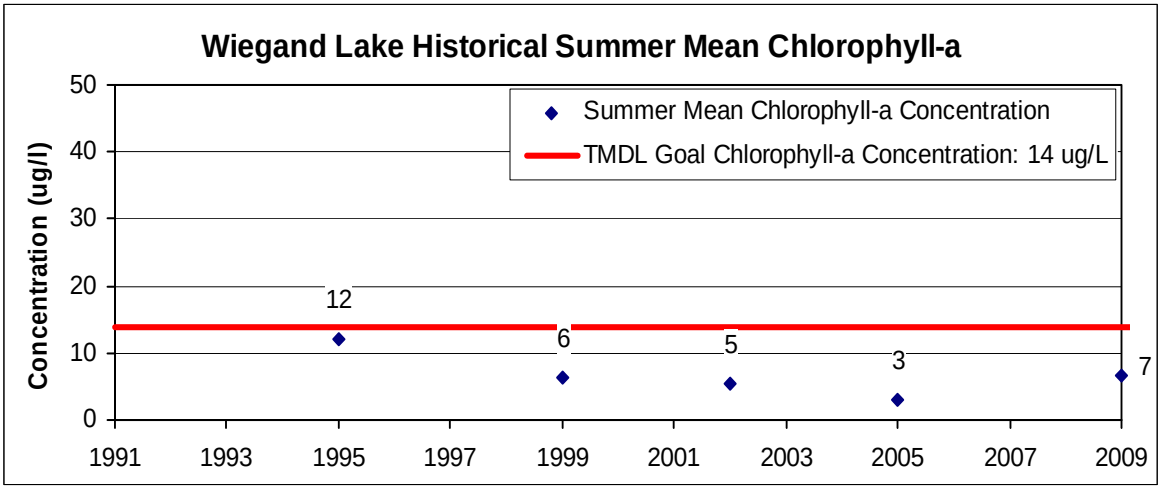


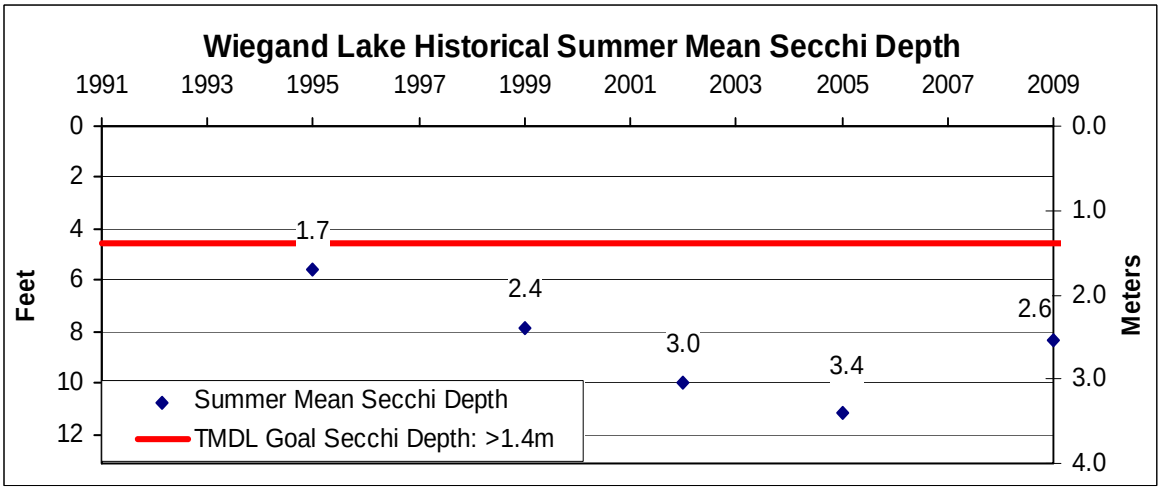
Clearwater River Watershed District	Wenck Wenck Associates, Inc. 1800 Pioneer Creek Center Environmental Engineers Maple Plain, MN 55359	June 2010
Wiegand Lake		

Wiegand Lake

2009 Lake Report Card

MPCA Proposed Deep Lake Standards for the North Central Hardwood Forest:
Total Phosphorus (TP): ≤ 40 ug/L
Chlorophyll-a: ≤ 14 ug/L
Secchi Depth: ≥ 1.4 meter





Summary

- Current water quality is good in Wiegand Lake as phosphorus concentrations, chlorophyll-a, and Secchi depth have met MPCA standards in most years since 1995.

Water Quality Improvement Activities

- Good land management practices along the lakeshore and in the upstream watershed that are implemented to improve the water quality in upstream lakes will also help to maintain the good water quality in Wiegand Lake.

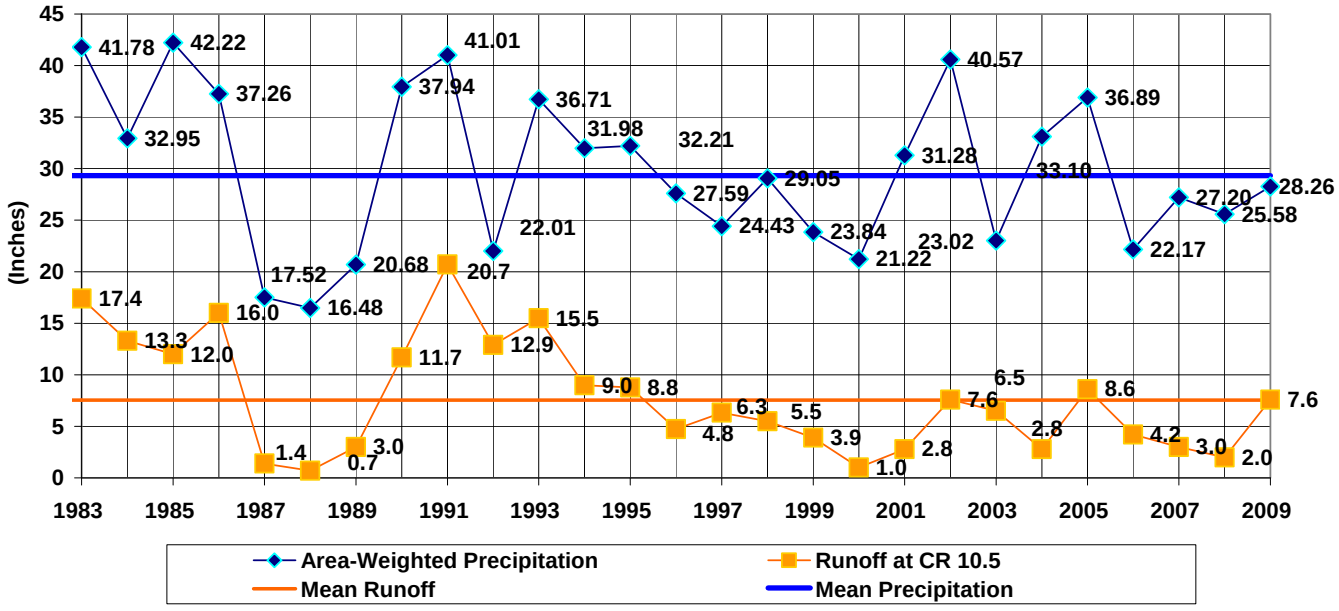
5.2.3 Stream Water Quality

5.2.3.1 Runoff

The annual stream monitoring program has included two long term stations on the Clearwater River that have been monitored since the 1980s. The stations are located at river mile 28.2 (CR 28.2) south of the City of Kimball and at river mile 10.5 (CR 10.5) at the outlet of Grass Lake.

Figure 5.1 compares historic area-weighted annual precipitation from precipitation monitoring locations in the District and runoff calculated at CR 10.5. As shown in the figure, runoff is generally closely correlated to precipitation in most years. Below normal runoff typically occurs due to below average precipitation and storage of runoff in upstream lakes.

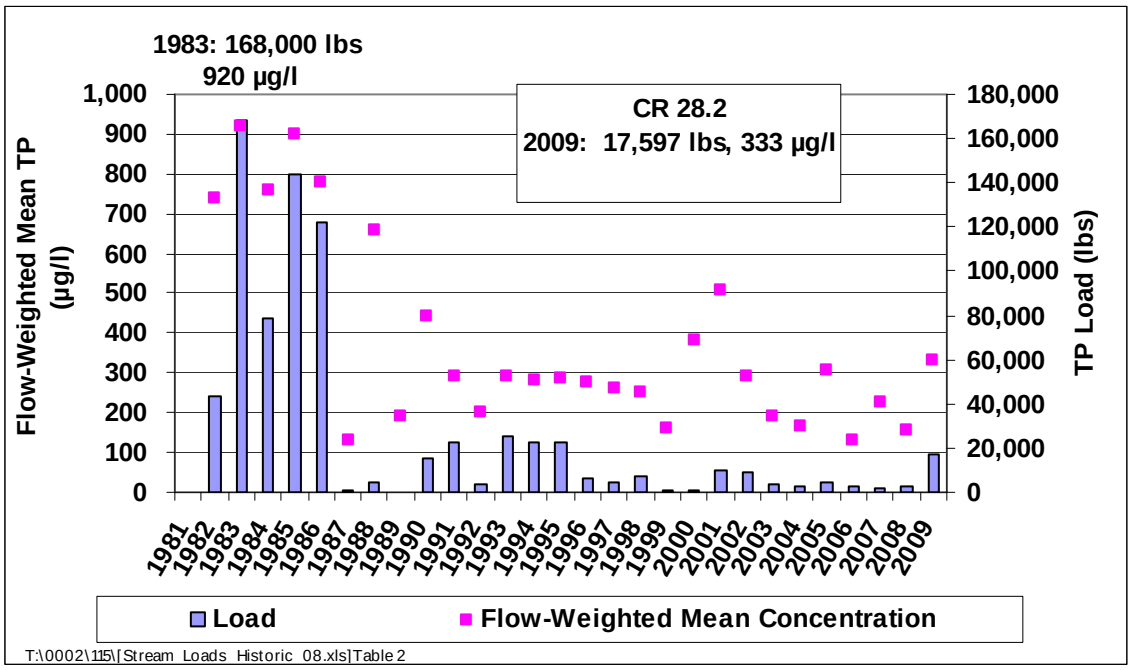
Figure 5.1 CRWD Historical Precipitation and Historical Runoff at CR 10.5



5.2.3.2 Water Quality

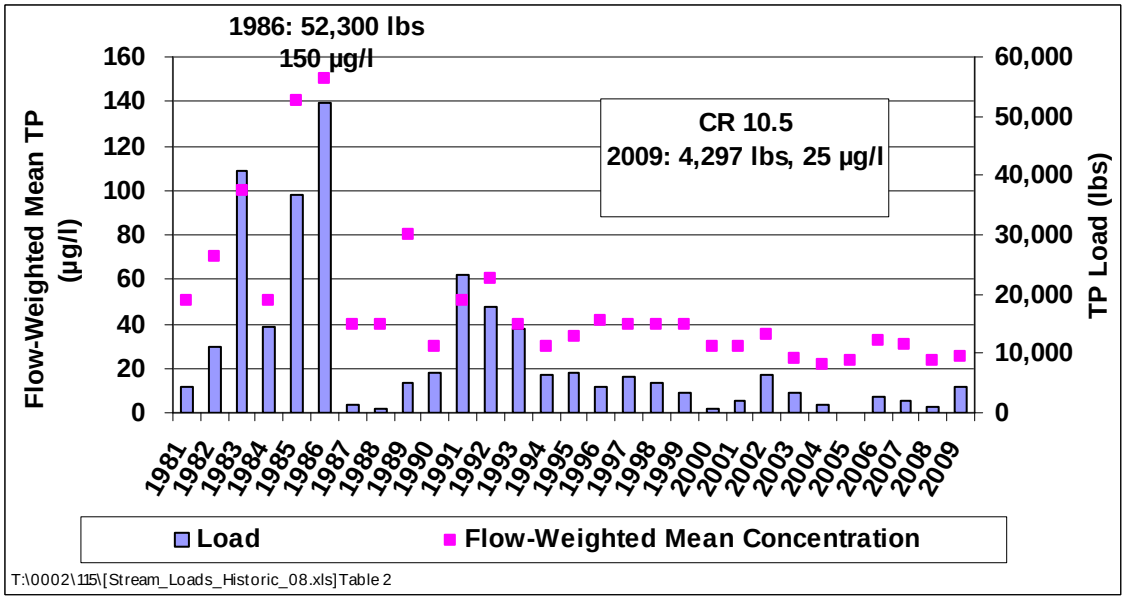
Baseline total phosphorus (TP) concentrations in the Clearwater River remain low as compared with conditions monitored in the early 1980s. Flow-weighted mean total phosphorus concentrations at CR 28.2 ranged from 740 to 920 µg/l in the early 1980s but ranged from just 130 to 333 µg/l in recent years. The TP load at CR 28.2 in 1983 was 168,000 lbs in 1983, compared to a load of less than 10,000 lbs in most recent years. Although concentrations are influenced by and fluctuate with annual precipitation, TP concentrations at CR 28.2 have generally continued on a downward trend. Figure 5.2 shows the historical phosphorus load and flow-weighted mean concentration at CR 28.2.

Figure 5.2 Historical Total Phosphorus Loading and Mean Concentration at CR 28.2



As demonstrated in Figure 5.3, flow-weighted mean TP concentrations at CR 10.5 reached a high of 150 µg/l in 1986 with an annual phosphorus load of 52,300 lbs. By comparison, total phosphorus concentrations have been below 40 µg/l with total phosphorus loads below 10,000 lbs since the mid 1990s.

Figure 5.3 Historical Total Phosphorus Loading and Mean Concentrations at CR 10.5



Additional stream monitoring efforts were conducted on reaches of the Clearwater River as part of the TMDL studies on listed reaches of the river. A synoptic survey and additional biweekly monitoring was conducted on the impaired reaches of the Clearwater River to collect additional data that was used during the TMDL.

6.0 Potential Problems

6.1 WATER QUALITY

6.1.1 Water Quality Summary

Though in-stream and lake water quality in the District has improved by an order of magnitude since the 1980 Chain of Lakes Restoration Project, water quality still does not meet state standards in several waterbodies identified on the 303(d) list of impaired waters. For example, summer average total phosphorus concentrations in Lake Louisa have decreased dramatically from 440 ug/l in 1981 to 79 ug/l in 2007, but still remain above the state standard for total phosphorus.

6.1.2 Water Quality Standards

The Clearwater River is classified as a Class 2B, 3C, 4A, 4B, 5 and 6 water and is protected for aquatic life (warm and cool water fisheries and associated biota) and recreation (all water recreation activities including bathing). The Minnesota standards for class 2B waters are as follows:

Dissolved Oxygen
Minn. R. ch. 7050.0222 subp. 4: Dissolved oxygen concentrations of 5.0 mg/L as a daily minimum. This dissolved oxygen standard may be modified on a site-specific basis according to part 7050.0220, subpart 7, except that no site-specific standard shall be less than 5 mg/L as a daily average and 4 mg/L as a daily minimum.

Bacteria
The Minnesota bacteria standard for class 2B waters is as follows:

Minn. R. ch. 7050.0222 subp. 4, *E. Coli* water quality standard for class 2B and 2C waters states that *E. coli* shall not exceed 126 organisms per 100 milliliters as a geometric mean of not less than five samples in any calendar month, nor shall more than ten percent of all samples taken during any calendar month individually exceed 1,260 organisms per 100 milliliters. The standard applies between April 1 and October 31.

Nutrients
The numeric target used to list the District's impaired lakes was the numeric translator threshold phosphorus standard for Class 2B waters in the North Central Hardwood Forest ecoregion (40 µg/L) prior to adoption of new standards in 2008 (Table 6.1). Under the new standards, Clear Lake, Lake Marie, Swartout Lake, Albion Lake and Henshaw Lake are considered shallow lakes with a numeric target of 60 µg/L for total phosphorus. Shallow lakes are defined as lakes with a

maximum depth of 15 feet or a less, or with 80% or more of the lake area shallow enough to support emergent and submerged rooted aquatic plants (littoral zone).

The remainder of District lakes that are monitored would be considered deep lakes with a numeric target of 40 μg/L for total phosphorus.

Table 6.1 Numeric targets for Lakes in the North Central Hardwood Forest Ecoregion

Parameters	North Central Hardwood Forest	
	Shallow	**Deep**
Phosphorus Concentration (μg/L)	60	40
Chlorophyll-a Concentration (μg/L)	20	14
Secchi disk transparency (m)	>1	>1.4

6.1.3 Impaired Waters

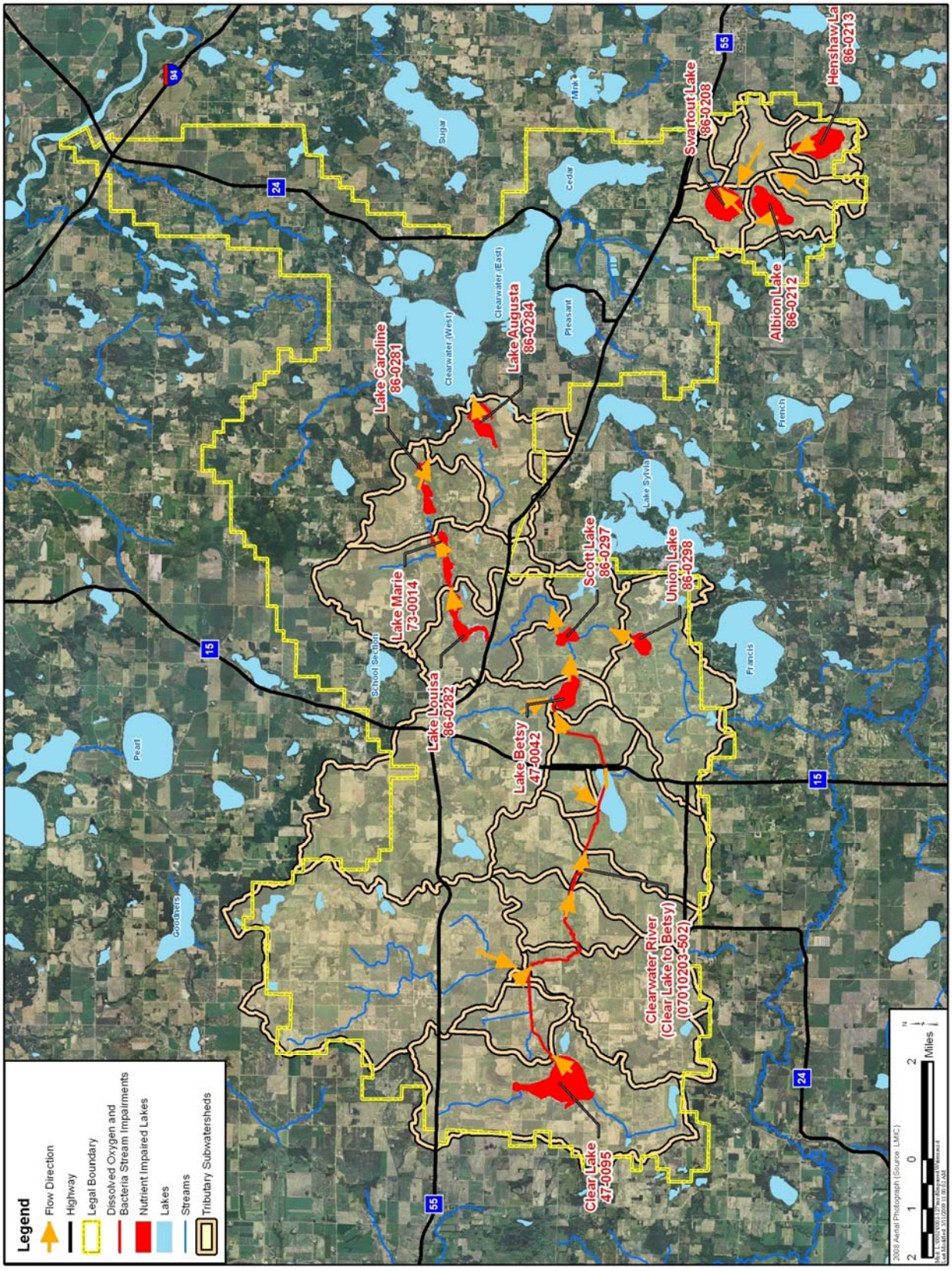
Two reaches of the Clearwater River and 11 District Lakes are considered impaired according to State standards as shown in Figure 6.1. Current water quality for each impaired water is summarized with respect to the impaired parameter in the following sections.

A description of each impaired water body as well as an updated status of the TMDL on each water body is shown in Table 6.2

Table 6.2 Impaired Waters in CRWD and TMDL Status

WATER	IMPAIRMENT AND IMPAIRED USE	TMDL STATUS
Clear Lake (47-0095) Lake Betsy (47-0042) Union Lake (86-0298) Scott Lake (86-0297) Lake Louisa (86-0282) Lake Marie (73-0014)	Nutrients, aquatic life and recreation	At EPA awaiting final approval, implementation has begun except for DO listing, which still requires public notice and final EPA review.
The Clearwater River, Clear Lake to Lake Betsy	Dissolved Oxygen and bacteria, aquatic life and recreation	
Lake Caroline (86-0281) Lake Augusta (86-0284) Swartout Lake (86-0208) Lake Albion (86-0212) Henshaw Lake (86-0213)	Nutrients, aquatic life and recreation	Under EPA review
The Clearwater River, Grass Lake to the Mississippi	Dissolved Oxygen, aquatic life and recreation	Proposed de-listed

Figure 6.1 CRWD Impaired Waters



6.1.3.1 Clearwater River - Dissolved Oxygen (DO) and Bacteria

The Clearwater River is impaired for DO between Clear Lake and Lake Betsy (approximate river miles 35.0 and 25.0). Monitoring conducted for this TMDL showed that DO concentrations in the Clearwater River sometimes fall below the state standard of 5 mg/L in the downstream-most portion of the listed reach between river mile 29.0 and 25. 0, or Kingston Wetland and Lake Betsy. This reach of the Clearwater River is listed as impaired due to a DO sag caused by sediment oxygen demand in the Kingston Wetland and downstream wetland complex, coupled with flat topography, and some watershed impacts.

The same reach of the Clearwater River is impaired for bacteria. Bacteria concentrations in the reach sometimes exceed the state's chronic and acute standards for bacteria. Data shows that acute exceedances of the state standard of 2,000 CFU/ mL are generally driven by near shore sources and can be mitigated through riparian pasture management and feedlot upgrades. Chronic exceedances must be dealt with in the watershed through agricultural BMPs, feedlot management, and buffering.

An additional reach of the Clearwater River from Clearwater Lake to the Mississippi River was listed as impaired for dissolved oxygen but has been proposed to be delisted.

6.1.3.2 Nutrient Impaired District Lakes

A listing of the nutrient impaired lakes and the current water quality presented as an average of the last ten years of data through 2008, which was used as the listing criteria is found in Table 6.2. Historical water quality data can be found in the lake report card for each lake in Section 4.2. Addressing water quality impairments in the District's lakes will require a combination of watershed BMPs and control of in-lake nutrient cycling.

Table 6.3 Water Quality in 11 Nutrient Impaired Lakes (Ten Year Average)

Lake	Last Monitored	Mean TP (µg/L)	Mean Chla (µg/L)	Mean Secchi (m)
Albion	2008	210	133	0.9
Augusta	2007	48	16	1.7
Betsy	2007	265	68	0.9
Caroline	2008	60	32	1.5
Clear	2008	206	79	0.7
Henshaw	2008	265	139	0.6
Louisa	2007	66	48	1.0
Marie	2008	77	51	1.4
Scott	2008	161	75	0.8
Swartout	2008	322	324	0.6
Union	2008	50	18	1.8

T:\0002\127\Implementation Plan\[Lake Data.xls]Lake Data_10 yr avg

6.2 WATER QUANTITY

Water levels vary seasonally and annually throughout the system. Complaints of flooding adjacent to the Clearwater River and lakes coincide with above average precipitation periods. Complaints of low water levels in the District are common during drought periods. This is also true for groundwater tables.

6.3 EROSION AND SEDIMENTATION

Erosion of lake shorelines, stream banks and ditches has been a reoccurring problem in the CRWD. Wave action from wind and powerboats continually wear away the base of lake shorelines. Lake and stream access for recreation and livestock result in the destabilization of stream banks and shorelines from sand slides, gullies, trails, and destruction of riparian vegetation. Natural phenomenon (i.e., wind, frost, ice action, and fluctuating water levels) also contribute greatly to erosion. The combined effect of the erosion is decreased aesthetic value, increased pollutant loading, and sedimentation. The latter is evident in the wetland treatment systems where sediment buildup periodically has to be removed in order to increase or maintain the effectiveness of the projects.

The enormous loading of suspended solids may have an impact on the upper lakes. A reduction in runoff proportionally decreases the suspended solid concentrations in the lakes and likely increases the water transparency of the upper lakes.

Many of the CRWD lakes, streams, and ditches still have severe erosion problems. The erosion and sedimentation problems are associated with poor agricultural conservation practices, steep slopes, and unstable soils and will likely remain an on-going problem within the District. Some of the erosion problems may be corrected through improved agricultural conservation practices. A program to assess various agricultural conservation management practices is underway and was completed in 1989. Through this program it is envisioned that the District's farmers will adopt tillage practices, which prevent erosion.

6.4 PUBLIC HEALTH STATEMENT AND HEALTH HAZARDS

Fecal Coliform bacteria, indicators of recent fecal contamination, have declined for the most part to within acceptable state standards during 1986 in most of the monitored waters. Intermittent violations of the 200 organisms per milliliter state standard still exist in some reaches of the Clearwater River and in tributaries with low flows during warm months.

Instances of swimmer’s itch (Schistosome dermatitis) have been reported in District lakes in the past. Swimmers itch causes dermatitis in swimmers, fishermen, boaters, etc. Swimmers itch is more an annoyance than a serious threat to health; but there have probably been economic losses to the District’s resort and vacation trade around infested lakes.

Serious blooms of blue green algae persist in the District's waters due to high nutrient concentrations in lakes. These blooms may be toxic to fish, wildlife and humans. Fish and wildfowl kills have occurred in the past. At the very least, the algal blooms are associated with

noxious odors, surface scum, decreased aesthetic value, and a marked decrease in recreation on the affected lakes.

The Minnesota Department of Health and MN DNR have issued fish consumption advisories for some District lakes. This was initiated because traces of mercury have been found statewide in bluegills, walleye and northern pike. The advisory does not preclude the fish from consumption but suggests a reduction in consumption.

6.5 NAVIGATION AND RECREATION OBSTRUCTIONS

The lakes and waterways of the District are in need of periodic maintenance to maintain navigation. Fallen trees, floating bogs, sediment buildup, and dense stands of invasive aquatic plants impede navigation and recreation throughout the District. Many lakeshore property owners have limited access to the lakes due of submerged and rooted floating aquatic vegetation. Bogs break away and float up in lakeshore owner's shorelines and boat docks where they either cause damage or become lodged.

6.6 IMPAIRED ECOLOGICAL INTEGRITY

The ecological integrity of some water bodies, wetlands, and terrestrial habitats has been compromised due to various issues such as the invasion of exotic species, development, and other disturbances.

6.7 OTHER PROBLEMS

Most of the problems on the District's initial list are still valid today. However, inadequately treated municipal sewage that once was discharged into the District's lakes and streams have been eliminated and the major point source of phosphorus loading, the Watkins cheese plant, is no longer in business; The major projects and efforts to reduce sources of phosphorus causing the hypereutrophic nature of the system shows the degree of effort to which the District has put forth to rectify the District's problems. Clearly, there are still problems to be faced in the future; but they are minor in contrast. Problems the District faces today are primarily from non-permitted sources.

7.0 Policies

The CRWD Board of Managers realizes that solutions to water-related issues must be scientifically based. This, along with utilization of our partnerships with state agencies and local units of government, provides a solid base for implementation of this plan. The following actions will be used to implement this plan:

1. Assist in the identification and regulation of sources of pollution and assure their compliance with permits, laws, and regulations by working in cooperation with the Minnesota Pollution Control Agency.
2. Support the Wright, Stearns and County Soil and Water Conservation Districts to help promote projects directed toward reduction of nonpoint sources of pollution, including soil erosion and sedimentation.
3. Develop education programs relative to providing adequate waste treatment systems.
4. Build adequate waste treatment systems or collector systems for high-density populated areas of lakeshore.
5. Identify sources of pollution from dumps and certain road grading practices and cooperate with the townships, counties and other agencies in helping to reduce this type of pollution.
6. Continue the comprehensive program of hydrological monitoring to evaluate water quality problems, show progress of the projects, and to assure compliance with all applicable regulations.
7. Maintain the works of the District so they are able to achieve their intended objectives.
8. Evaluate potential methods, both structural and non-structural, to alleviate flood damage and control District lake levels.
9. Cooperate with the Department of Natural Resources to develop and improve the habitat for the conservation of fisheries and wildlife.
10. Identify sources of funding, both public and private, for the financing required for projects of the District.

7.1 WATER QUANTITY MANAGEMENT

The CRWD will provide assistance to residents of the district in maintaining wetlands and other water retention features on the landscape.

7.2 WATER QUALITY MANAGEMENT

The CRWD will partner with entities that provide water quality improvement guidance to residents of the district as they conduct their daily activities. This partnership will provide both technical and financial assistance to residents of the district when possible. This effort will result in improved water quality in the CRWD.

7.3 PLANNING

County water plans incorporate the CRWD Watershed Management Plan in development of their plan.

7.4 WATERS AND WETLANDS

Counties regulate wetland filling and shoreland alteration.

7.5 GROUNDWATER

The CRWD encourages residents of the district to comply with county zoning and other regulations that relate to wastewater treatment and stormwater runoff.

7.6 EROSION AND SEDIMENTATION CONTROL

The CRWD encourages all residents of the district to reduce erosion through the use of practices intended to protect the soil.

7.7 FLOODING

The CRWD cooperates with agencies and local units of government to stabilize surface water levels.

7.8 RECREATION, OPEN SPACE, AND WILDLIFE MANAGEMENT

The CRWD will incorporate recreation, open space, wildlife, and protection of the ecosystem into water resource improvement projects.

7.9 DRAINAGEWAY MAINTENANCE

The CRWD will rely on state, county, and township government to maintain water maintenance structures between water, wetlands, and regional retention basins.

7.10 INTERGOVERNMENTAL RELATIONS/INSTITUTIONAL ARRANGEMENTS

The CRWD will maintain open communications and continued cooperation with all governments in the development and implementation of water quality improvement plans.

7.11 ADMINISTRATION

The CRWD will notify, inform, and seek input from residents of the district during the planning process of this plan. Local units of government and interested individuals and groups will be provided access to a draft copy of this plan prior to Board of Water and Soil Resources approval.

7.12 FINANCING

The CRWD will seek funding from every available source to fund the implementation of this plan. The CRWD engineer must deem projects that become part of this effort feasible. See Section 12.0 for more information on funding sources.

7.13 MONITORING

Project effectiveness will be determined by monitoring the results of the project. Monitoring may include chemical analysis of water samples or by a survey of CRWD resident's views.

7.14 EFFECTIVENESS OF DISTRICT'S POLICIES AND RULES

The CRWD, since 2003 when the previous watershed management plan was developed, has provided assistance for the establishment of 7 lakescaping projects and several rain gardens. The district also funded 570 acres of stream, ditch, and tile intake buffers, three city stormwater management plans, and purchased 77.3 acres of land for wildlife and water quality improvement. This land has been sold to the United States Fish and Wildlife Service. The CRWD purchased 22.5 acres of land for stormwater ponds and wildlife benefit near the city of Watkins.

In the same time period, the District constructed a four-acre sediment basin upstream from Clear Lake and a treatment wetland upstream from Cedar Lake, assisted with two feedlot upgrades, and partnered with Meeker County Soil and Water Conservation District to install an erosion control structure on the Ostmark church property. The CRWD owns and operates four wastewater treatment systems serving over 100 properties, works with the Upper Mississippi Source Water Protection Group and is the ditch authority for Meeker County Ditch #20 North. The District also constructed a sediment basin on Norton Avenue.

8.0 Criteria for Management

8.1 WATER QUANTITY MANAGEMENT

8.1.1 General Hydrology

Hydrologic analysis of storm water runoff for the planning and design of flows in storm sewers and drainage ways as well as, streams and channels to lakes and wetlands shall be made using generally accepted hydrograph methods.

"Design storms" or storm volumes for hydrologic analyses shall be based upon U.S. Weather Bureau Rainfall Frequency Atlas of the United States, Technical Publication Number 40 (TP 40), 1961 and Five to 60-Minute Precipitation Frequency for the Eastern and Central United States, NOAA Technical Memorandum NWS HYDRO-35, office of Hydrology, Silver Spring, Maryland.

8.1.2 Flood Protection

Consistent with Federal and State regulations, the District requires that the level of protection along all retention basins, waters and wetlands, be established based upon the critical duration 100-year (regional) flood. Land use within floodplains shall be regulated in accordance with State floodplain zoning regulations, including freeboard surcharge and, where appropriate, floodway surface.

8.1.3 Storm Sewers

The level of service to be provided by storm sewers shall be a local government policy, subject to the District requirement that the primary capacity shall at all times be adequate for the proper performance of affected retention basins.

Storm sewers shall be designed to provide for primary capacity of short-duration (one hour) rainfalls with frequencies generally from five to 10-years with an evaluation of secondary capacity for the critical duration 100-year rainfall event.

8.1.4 Drainageways

The level of service provided by drainage ways shall be District policy such that proper performance of affected retention basins is maintained.

Drainageways shall be designed to provide for primary capacity of, at least a 10-year frequency rainfall event with an evaluation of secondary capacity for the critical duration 100-year frequency event.

The relation between flood storage volume and flow capacity with respect to drainage way size shall be optimized to provide the best balance between volume and capacity considering not only the specific site, but also the water quality impacts on downstream retention basins and waters.

8.1.5 Sub-Basin Hydrology

In those areas where the storm water runoff drainage ways have not been fully developed, the normal levels and flood levels, as determined by the District, are generally intended to guide detailed design. These levels must assure that adequate storage volume can be provided, outlet discharge requirements can be met, an adequate level of protection results, and there is not a conflict with water quality management criteria.

8.1.6 Retention Basins

Retention basins shall, as a minimum, be designed based upon runoff events having a one percent probability of recurrence (100-year frequency event).

Flood levels and storage volumes for retention basins shall be determined based on the range of rainfall and snowmelt events to identify the duration that produces the critical (highest) flood level.

Outflow hydrograph routing shall be undertaken to determine optimal storage-discharge rates for retention basins and thus maximize water quality protection.

All retention basins shall be designed with sufficient capacity to accommodate all runoff caused by existing or future development from upstream sub basin(s) in excess of the runoff from these drainage areas if they were to remain in their natural, undeveloped condition.

8.2 WATER QUALITY MANAGEMENT

8.2.1 TMDL Water Quality Goals

The District's water quality objectives are to meet the goals set forth in the TMDLs completed in the District.

8.2.2 Development Review

To maintain and improve water quality, the District may exercise interim review over developments and improvements constructed in the share lands of the District.

8.2.3 Water Quality Levels

The District shall establish and define specifications and quality levels for waters and wetlands through a consistent and uniform water quality database implemented on a watershed basis.

8.2.4 Storm Sewers

Storm sewers shall not discharge directly into waters or wetlands without either primary sedimentation in natural or man-made structures (e.g. catch-basins, grit chambers, etc.) and/or an established program of street maintenance or housekeeping practices implemented to reduce the inflow of pollutants.

8.2.5 On-Site Detention

While it is the District's policy to manage water resources by incorporating the retention basin concept, it is recognized that occasionally physical site development proximity to waters or wetlands requires the use of on-site detention methods to best serve the water quantity and quality goals. On-site detention systems shall conform to the water quantity management criteria described above.

The design of water quality features shall require the prolonged storage of small storms of either a one year frequency 24-hour duration storm or a storm of one and one-half (1.5) inches of rainfall over a duration of two hours.

Outlet provisions shall be made for the storm water to be retained and released so as to evacuate 90 percent of the effective or "live" storage in approximately six hours for residential developments and 12 hours in the case of other developments. The outlet control structure shall effectively prevent floating debris from entering the downstream conveyor system.

8.2.6 Retention Basins

Conformance with the water quantity management criteria described above.

Retention basins shall be designed to control peak flows from 10-year frequency, 24-hour duration storms. Outlet control measures shall be provided so as to provide an average retention time of six hours for the 10-year storms and emergency spillway provision for the 100-year storm. Removable trash rack devices shall be provided for both horizontal and vertical riser outlets with anti-vortex device provided for the latter: Openings in the trash racks should not exceed one-half the area of the retention outlet(s) for mesh screens or one-third the outlet(s) diameter for bar screens.

8.3 WETLANDS

8.3.1 Dredging and Filling

While the District does not regulate wetland impacts directly, wetlands in the CRWD are regulated by the Wetland Conservation Act enforced by Wright, Stearns, and Meeker Counties.

Any filling shall not cause the total natural flood storage capacity of the wetland to fall below the projected volume that the wetland would hold following a 24-hour duration, one percent (100 year) frequency rainfall over the fully developed drainage area. Dredging may be allowed only when it will not have a substantial or adverse effect upon the ecological and hydrological characteristics of the wetland.

8.3.2 Stormwater Runoff Volume Increases

A minimum increase in the volume of storm water runoff to a wetland from a development over the natural volume of runoff may be allowed when necessary for use of the property only under the following conditions:

1) The proposed action shall not cause storm water runoff from the wetland to take place at a rate that would exceed the natural rate.
2) The allowed total increase in runoff, in combination with the total fill allowed, shall not cause the total natural flood storage capacity of the wetland to fall below the projected volume that the wetland would hold following a 24-hour duration, one percent (100 year) frequency rainfall over the fully developed drainage area.
3) The District will consider mitigative measures to reduce the effects of increased runoff or fill placement along with the loss of wildlife habitat.

8.4 GROUNDWATER MANAGEMENT

Guidelines will be developed which relate to groundwater recharge through infiltration of storm water runoff and protection of groundwater quality by control of land use.

8.5 SOIL EROSION AND SEDIMENTATION CONTROL

In conformance with the District policies for the control of erosion and sedimentation, each local government shall be encouraged to use the following criteria for applicable land disturbance activities: Conservation practices installed as; source or structural control measures shall be based upon site conditions and application of the Universal Soil Loss Equation (USLE). The USLE is applied to a given site to determine the need for structural or source control measures for the Worst Case Soil Loss condition. When the Post-disturbance Condition is determined, the USLE is again applied to evaluate whether permanent source or structural control measures will achieve the applicable soil loss limits.

8.5.1 Soil Loss Limits

Urban Land Use
In applying conservation practices to a site in any given year following development, the average annual soil loss, accumulated monthly in accordance with the Universal Soil Loss Equation shall not exceed two tons per acre per year.;

Agricultural Land Use
The District encourages practices that limit the average annual soil loss accumulated monthly in accordance with the Universal Soil Loss Equation to an average of five tons of soil loss per acre.

8.5.2 Conservation Principles

For applicable urban land disturbance activities, the developer is encouraged to implement the necessary erosion sedimentation prevention practices to insure effective control of soil losses within the tolerable limits previously identified. It is the developer's option to select a specific practice or combination of practices that will provide effective control of erosion and

sedimentation within the limits of generally accepted soil and water conservation practices and in concert with the particular development stage.

Developers should be guided by the conservation principles of erosion and sediment control which follow, or by other acceptable principles and practices devised by the District in cooperation with Soil and Water Conservation Districts. Developers are also required to follow National Pollutant Discharge Elimination System (NPDES) rules

Principle 1. Natural vegetation should be retained wherever possible.

Principle 2. Where inadequate natural vegetation exists, or where it becomes necessary to remove existing natural vegetation, the developer may leave the site in an exposed condition for a period of up to 30 calendar days as long at appropriate structural control measures have been implemented.

Principle 3. Where inadequate natural vegetation exists, or where it becomes necessary to remove existing natural vegetation and the site remains in a rough grade condition for a period of 30 to 90 days, then the developer should mulch as a source control measure to complement appropriate structural control measures.

Principle 4. Where inadequate natural vegetation exists, or where it becomes necessary to remove natural vegetation and the site remains in a rough grade condition for a period of 90 to 360 calendar days, the developer should mulch and install temporary (annual) seeding as an erosion source control measure to complement appropriate structural control measures.

Principle 5. Where inadequate natural vegetation exists, or where it becomes necessary to remove existing natural vegetation and the site remains in a rough grade condition for a period longer than one calendar year, the developer should mulch and install perennial seed as an erosion source control measure to complement appropriate structural control measures.

Principle 6. During any of the development stages in which final landscaping and turf establishment is to be implemented, the soil should not remain in an exposed condition for more than 10 calendar days:

Principle 7. Erosion and sediment control elements should be implemented as soon as practical in the development stage process, except that in the event that weather conditions or other factors beyond the control of the developer dictate that the above requirements cannot be met, the developer should be allowed sufficient time for compliance.

Principle 8. Appropriate provision should be made to accommodate increased storm water runoff and consequent soil loss occasioned by changed soil and surface conditions during and after development. Such provisions may include, in addition to the use of vegetation prescribed in Principles 1 through 6, but are not limited to:

A. The developer should schedule permanent improvements such as: streets, storm sewers, curb and gutters, and other features for control of storm runoff, before removing vegetative cover from the area.
B. The developer should install and maintain sediment basins, debris basins, desilting basin's or silt traps to substantially reduce sediment from runoff water.

8.6 RECREATION, OPEN SPACE, AND WILDLIFE MANAGEMENT

The District recognizes the need to integrate the protection and/or enhancement of fish and wildlife habitat and water recreational facilities as land use changes, and will develop guidelines to protect or enhance habitat as opportunities or needs arise.

9.0 Goals and Objectives

The goals of the CRWD as identified at the time of the establishment of the District are identified in Appendix A.

The primary goal of the CRWD is to maintain or improve water quality in CRWD water bodies.

A large component of this primary goal is to complete the TMDL process, in cooperation with the MPCA, for the District's waters as expeditiously as possible and to continue to pursue nonpoint source abatement within the TMDL framework.

In order to achieve this goal, the CRWD has developed a TMDL Implementation Plan dated April 2009 to set forth the activities that will be undertaken to improve water quality in the impaired waters. A summary of the Implementation Plan and the activities it proposes is found in Section 10.0. Components of the primary goals as well as District actions and proposed future actions to achieve each goal are listed below.

The CRWD Board of Managers recognizes that the following goals need to be implemented; however, other issues may arise from time to time and these goals will not prevent the CRWD from engaging in other efforts.

9.1 SURFACE WATER QUALITY IMPROVEMENT

9.1.1 REDUCE EXTERNAL LOAD

9.1.1.1 Shoreline Management and Restoration, Agricultural Buffers and Rain Gardens

Maintaining native vegetation in riparian areas along lakes and streams helps to reduce nutrient loading to water bodies. Similarly, the buffering of drainage ditches reduces nutrient loading from agricultural fields.

Opportunities for riparian restorations may be limited given that most riparian areas are currently buffered and the channels are primarily stable.

Future Action: The CRWD will work to promote the restoration of shoreline and riparian areas with native vegetation and lakescaping and bioengineering where opportunities present themselves.

Future Action: The CRWD will continue to provide funds for farmers to implement riparian and tile intake buffers.

9.1.1.2 Septic Upgrades

By law, no loads from septic systems are allowed to impaired waters. To that end, septic system upgrades may be required for some homes adjacent to impaired lakes. A septic system inventory and/or inspection will be necessary before instituting a septic system upgrade program.

Future Action: The District will evaluate funding options for providing low cost loans or potentially even some matching funds to upgrade septic systems.

The District will also stimulate citizen action to evaluate, maintain, and improve wastewater treatment. To this end, the District will provide leadership in presenting information regarding treatment options such as recent wastewater technology and neighbors collaborating for community treatment (See Section 10.0 Wastewater Treatment Policy and Program).

9.1.1.3 Management of Agricultural Runoff

Protect surface water from nutrient loading, fecal coliform loading, and sedimentation from agricultural runoff.

Soils in the CRWD vary widely in texture; topography varies from flat to steep, often times on the same parcel of land. The erosive nature of certain soils, coupled with the rainfall levels experienced locally, creates a situation whereby excessive erosion can take place in CRWD.

Future Action: The CRWD will partner with an area supplier to fund soil testing and fertilizer for area farmers. The soil testing will be conducted on a 2-acre grid. Fertilizer application will be based on the soil testing results using a GPS system to reduce the overall amount of fertilizer applied.

The District and area supplier staff estimate that based on existing information, these practices translate into a 10-50% reduction in watershed phosphorus, bacteria and oxygen demand load from these areas. This translates into a potential 1,812 lb load reduction to Lake Betsy, for example.

Future Action: The CRWD will inform agricultural owners and operators of available programs and practices, which will assist and facilitate implementation of practices to reduce erosion, thereby reducing sedimentation and nutrient loading in CRWD surface waters.

Future Action: The CRWD will encourage and facilitate property owners and operators as they seek technical and financial assistance from SWCDs, NRCS and MES to address erosion issues on their property.

9.1.1.4 Feedlots

Significant land use in CRWD is agricultural in nature, including livestock production. Agricultural feedlots can deliver large amounts of nutrients into surface water if the feedlots are

not protected from runoff. The improper spreading of animal waste on agricultural fields can also contribute to nutrient loading in surface water.

The CRWD will promote practices to protect surface water from nutrient loading and fecal coliform loading from feedlot runoff.

Future Action: The CRWD will encourage feedlot owners and operators to apply for and comply with MPCA and local feedlot permits and to develop and implement manure management plans for the disposal and application of animal waste.

Future Action: The CRWD will aid in the facilitation of solutions to specific feedlot issues with SWCDs, NRCS, and MPCA.

Future Action: The CRWD will assist SWCDs, NRCS, and MPCA in educating feedlot owners and operators regarding state and county feedlot rules and regulations.

9.1.1.5 Implement Urban Stormwater Management

Stormwater discharging directly into surface water throughout Clearwater River Watershed threatens aquatic life in the entire watershed. Provisions are required to increase travel time, thus providing time for the settling of sediment and filtering of nutrients and petro products.

Action: The CRWD funded stormwater management studies for Kimball, Watkins and Annandale within the watershed. Kimball and Watkins lie within the watersheds of the impaired waters, and therefore projects identified to control stormwater runoff from these two cities will reduce watershed loads to the impaired waters.

Future Action: Street sweeping has also been identified as a potential BMP for evaluation.

Future Action: CRWD will continue to cooperate with local units of government as they develop plans to adequately treat stormwater by providing technical assistance, recommendations, and concerns.

9.1.2 REDUCE INTERNAL LOAD

A significant portion of the phosphorus load to most of CRWD's impaired lakes is the result of internal loading. The internal load must be addressed to improve water quality.

The CRWD will work to reduce internal phosphorus loading in District lakes.

Future Action: Several options will be considered to manage internal sources of nutrients in the District's impaired lakes. Feasibility Studies and/or Pilot Studies of the following options will be completed:

Hypolimnetic withdrawal. This option would require pumping nutrient-rich water from the hypolimnion of Lake Betsy to an external location. The water will be land applied to grassed

areas north of Lake Betsy. If this is implemented on other lakes, the hypolimnetic water will require ponding and chemical treatment prior to discharge.

Hypolimnetic aeration. This option uses a specialized pump to circulate water from the hypolimnion to keep it aerated and reduce the potential for anoxic conditions that lead to sediment phosphorus release. The District currently owns three of these pumps that require maintenance, but could potentially be used.

Chemical treatment. Following implementation of BMPs to reduce external nutrient load sources, it may be feasible to chemically dose inflows to Lake Betsy with alum to remove phosphorus from the water column as well as bind it in sediments.

Aeration of Kingston Wetland. The aeration of Kingston Wetland may mitigate for the oxygen demand within the wetland itself. A 60% or greater reduction in the wetland sediment oxygen demand is necessary to achieve TMDL load reduction goals for oxygen demand (greater than 60% if watershed load reductions of 60% cannot be met).

9.2 MAINTAIN BIOLOGIC INTEGRITY

The CRWD recognizes the importance of maintaining healthy biological communities throughout the District, especially in shallow lakes, shallow near-shore areas of deep lakes, lake shorelines, streams, wetlands, and riparian areas.

9.2.1 Aquatic Plant Management

Aquatic plant management is a key aspect in maintaining a healthy shallow lake.

Invasive aquatic vegetation, most notably curly leaf pondweed and Eurasian water milfoil exist in a number of lakes in the CRWD. These invasive species outcompete native vegetation species, impede navigation, and may contribute to decreased water quality in some lakes.

Future Action: In order to establish and maintain a healthy lake ecosystem, the CRWD will develop an aquatic plant management plan for shallow lakes.

Future Action: The CRWD will support the control the spread of exotic plants in surface water in the CRWD by providing technical assistance and serving as the fiscal agent for aquatic plant management efforts that are conducted in the CRWD by lake associations.

9.3 GENERAL COORDINATION

9.3.1 Coordination

One of the primary CRWD roles in managing the watershed is serving as a coordinator of water resource policies and activities. The CRWD will continue in that role in the implementation of the TMDL and other improvement activities.

Future Action: General activities now undertaken by the CRWD will be continued or expanded as the CRWD moves from management planning to implementation coordination. These future activities may include:

- Providing advice and assistance to cities, townships, and counties on storm water management, development requirements;
- Researching and disseminating information on changing BMP technology and practices;
- Collecting annual implementation activity data;
- Recommending activities such as vegetation or fishery management, partnering with the DNR;
- Conducting public hearings on proposed projects; and
- Sharing the cost of qualifying improvement projects.

9.3.2 Annual Reporting on Monitoring and TMDL Activities

An annual report on phosphorus, oxygen demand and bacteria load reduction activities is necessary under the adaptive management approach established in the TMDL.

Future Action: Each year the CRWD will compile a listing of the activities undertaken in the previous year, quantify load reductions, review existing BMP strategies and make recommendations for new projects or practices. The annual monitoring report will summarize the BMP activities as well as annual monitoring, and track progress towards goals.

9.3.3 Rules and Standards

Future Action: The CRWD will continue to provide review and input to Counties in the watershed on new development projects and recommend stormwater management BMPs to reduce water quality impacts.

9.4 ENVIRONMENTAL EDUCATION

The CRWD recognizes the importance of creating public awareness of natural resources in CRWD and communicating with the public to make them aware of water quality issues and the TMDL process. The CRWD plans to educate and inform residents regularly on natural resource and water quality issues.

While natural resource education is vital to the basic understanding of why rules, regulations and guidelines have been developed for natural resource use, often times it is that lack of understanding that delays, prevents or otherwise reduces the effectiveness of efforts to improve water quality. It is difficult to measure the awareness that residents have about natural resource protection; yet, ongoing information distribution must be provided to residents to assist them in understanding why certain measures are necessary to protect our natural resources.

9.4.1 Public Education and Outreach

Future Action: As part of the TMDL process, the District Administrator has been meeting with stakeholders and the public to discuss the TMDLs and water quality improvement within the

District. Given the District's significant load reduction requirements, cooperation and buy in is necessary over a long period of time to ensure successful implementation of proposed load reduction activities.

Future Action: The CRWD will participate in Wright County 5th Grade Environmental Education Days.

Future Action: The CRWD will maintain an active website.

Future Action:
The CRWD will continue to provide natural resource information and an explanation of CRWD activities at the Annandale Expo on an annual basis and explore opportunities to attend other community gatherings.

Future Action:
The CRWD will develop and distribute brochures explaining CRWD activities.

9.4.2 Encourage Public official and Staff Education

There is a need for township, city, county and state officials and staff to understand the TMDL process and the proposed implementation activities so that they can effectively make regulatory, budget and programming decisions and conduct daily business. Resources such as self-study lake management background information from Water on the Web ("Understanding Lake Ecology"), Project NEMO (Nonpoint Education for Municipal officials), UW Extension ("Understanding Lake Data") and other sources would provide basic information about lake ecology to help staff and officials make informed decisions about lake management.

Future Action: The CRWD will facilitate the transfer of information and resources to educate public officials and staff.

9.4.3 Presentations at Meetings

Awareness of lake, stream, and watershed management can be raised through periodic presentations at meetings of lake associations, homeownership associations, block clubs, garden clubs, service organizations or other groups as well as displays at events such as remodeling fairs and yard and garden events. "Discussion kits" including more detailed information about topics and questions and points for topic discussion could be made available to interested parties.

Future Action: The CRWD will budget for 6 of these events annually.

9.4.4 Demonstration Projects

Property owners may be reluctant to adopt good lake, stream and watershed management practices without examples they can evaluate and emulate. Some demonstration projects have been completed in the watershed through CRWD funding.

Future Action: The CRWD will encourage demonstration projects so property owners can see how a project or practice is implemented and how it looks. Examples might include planting native plants; planting a rain garden; restoring a shoreline and agricultural BMPs. The estimated cost of this activity is highly variable. The CRWD will evaluate appropriate activities and develop guidelines for funding demonstration projects from this budget.

9.5 PERFORMANCE MONITORING

9.5.1 Water Quality Monitoring

The CRWD conducts an annual monitoring program which includes the monitoring of selected lakes and stations on the Clearwater River.

Future Action: The CRWD will use its annual monitoring program to track the effectiveness of activities implemented to reduce nutrient, bacteria, and oxygen demand loading in the watershed.

Future Action: In addition to the CRWD's annual monitoring plan, supplemental annual monitoring and special monitoring projects will be added to better track progress towards goals and to provide additional information and tools for adaptive management. The annual Water Quality Report published by the District will compile and interpret monitoring data from the lakes and streams in the watershed. The monitoring data collected will be analyzed annually to determine the linkage between BMP implementation and water quality and biotic integrity in impaired waters, and to assess progress toward meeting the TMDL goals. The CRWD will also provide additional evaluation to facilitate adaptive management. These additional activities include:

- Assess special monitoring needs annually based on implementation projects, report findings in the Annual Monitoring Reports.
- Evaluate the aquatic habitat and the impacts of the DO impairment on aquatic wildlife and periodically evaluate the options for mitigating wetland SOD.
- Add E. Coli to the parameter list for stream water quality samples to assess progress towards meeting bacteria TMDL. Consider adding two sampling stations along the impaired reach of the Clearwater River. This will require close coordination of District sampling technicians to ensure holding times are met.
- Install a continuous pressure transducer at the watershed outlet at the Clearwater Dam and either Fairhaven Dam or County Road 15 to measure flows and annual runoff.
- Increase sampling frequency for the station downstream of the Kingston Wetland. The site is currently sampled monthly. Increase frequency in early high flow spring conditions to weekly monitoring. Lower flow regimes can be sampled monthly with 2-4 rainfall sampling events throughout the season. Increased sampling provides better tracking of DO and bacteria concentrations and loads in the listed reach of the river and better quantification of nutrient loads to downstream impaired lakes. Both of which will allow better evaluation of progress made towards watershed goals.
- Quantify internal loads to lakes through sediment core analysis (phosphorus fractionation and oxic/anoxic release rates) and additional profile sampling. Thermocline and bottom sampling will be included. Bottom samples will be analyzed for total and soluble phosphorus as well as iron. Thermocline samples will be analyzed for total and soluble

phosphorus. The frequency of temperature and DO profiles will also be increased to better characterize internal loading.

- The CRWD will also periodically (every 3-5 years) conduct a more detailed analysis of water quality, collecting bi-weekly data on lake surface, water column, and bottom conditions for all lakes in the District (currently lakes are sampled on a rotating basis with a District-wide sampling event of all lakes every 10 years.). This data will provide a more detailed picture of lake response to BMP activities and will help determine necessary "course corrections" as part of the Adaptive Management philosophy guiding this Implementation Plan.

9.5.2 Other Monitoring

Future Action: A baseline aquatic vegetation survey should be completed and then updated every 4-5 years as part of the more detailed water quality assessment described above. Zooplankton sampling has not been conducted recently and should be periodically completed to assess overall biologic conditions.

Future Action: The CRWD will work together with the DNR to determine the optimum strategy for monitoring the fish community.

Future Action: The CRWD will explore funding opportunities to research or pilot monitoring of BMP effectiveness.

Future Action: The CRWD will conduct a sediment survey for shallow lakes and shallow areas of deep lakes along the shore to assess rates of sedimentation and the impact of areas of increased sedimentation on ecological integrity and internal loading.

10.0 Wastewater Treatment Policy and Program

A Wastewater Treatment Task Force (Task Force) group was assembled by assignment of the Board of Managers on December 23, 2009 to determine what wastewater treatment method or methods will best serve the citizens of the CRWD.

The Task Force's recommendations and findings were summarized in a Report to Managers prepared July 14, 2010.

Their findings are as follows:

1. *No Single Method Proposed* – The Task Force finds that no single method of wastewater treatment would best serve the citizens of the CRWD at this time.

2. *Need to Increase Systems Awareness* – In favoring no single method of wastewater treatment, the Task Force finds that the multiple methods of wastewater treatment currently serving the interests of citizens of the District reflect a need to increase property owner knowledge about the evaluation, maintenance, and upgrading options for improving their wastewater treatment systems.

3. *Need to Stimulate Citizen Action* – The Task Force finds that, while excellent information about property owner evaluation, maintenance and improvement options for wastewater treatment has been developed by the University of Minnesota Extension Service and other agencies of government, the awareness and utilization of such information by citizens needs to be stimulated, in cooperation with Counties, Townships, lake associations, and industry professionals in the District.

4. *CRWD Serving Citizen Interests* – The Task Force finds that by stimulating property owner initiated action to evaluate and explore their wastewater treatment improvement options, individually or collectively, the District will serve the economic interests of its citizens, while advancing its water quality objectives for the lakes, streams, and rivers in the District.

5. *Need for Long Term External Evaluation* – The Task Force finds that, while Counties in the District provide for mandatory individual wastewater system inspection and certification under specified conditions (such as when a building permit is issued or when a property is sold), such regulations providing for an exemption from certification when the property is sold to a family member or a trust may unreasonably perpetuate non-compliant systems to the degree that such "grandfather clause" exemptions may not be in the public interest.

Therefore, the Task Force recommends the following actions be taken by the CRWD:

1. *Self Evaluation* - The Task Force recommends that the CRWD - in consultation with the Counties of Wright, Stearns, Meeker, and District townships, lake associations, and wastewater treatment industry professionals – promote the development and implementation of a District-wide property owner information program to stimulate citizen awareness and action aimed at maintaining compliant wastewater systems through voluntary self evaluation, maintenance, and upgrading initiatives.

2. *Certification upon title transfer to family members* – The Task Force recommends that the CRWD, in consultation with the Counties of Wright, Stearns, and Meeker, propose that regulations be modified to eliminate existing exemptions from the inspection and certification of individual wastewater systems when a property is sold or transferred to a family member, so that such systems would be required to meet current standards.

3. *Certification upon title transfer to trusts* – The Task Force recommends that the CRWD, in consultation with the Counties of Wright, Stearns, and Meeker, propose that regulations be modified to eliminate existing exemptions from the inspection and certification of individual wastewater systems when a property is sold or transferred to a trust, so that such systems would be certified as meeting the current standards.

4. *Certification of all systems* – The Task Force recommends that the CRWD, in consultation with the Counties of Wright, Stearns, and Meeker, propose that regulations be modified to require inspection and certification of all individual wastewater treatment systems at least every thirty years, so that all systems would be required to meet the then current standards when they have not otherwise been certified for a period of thirty years or more.

11.0 District TMDL Implementation Plan

Impaired waters and potential water quality problems were identified in Section 5.0 and Section 6.0. Section 9.0 identified goals and summarized proposed actions to achieve those goals. This section provides an overview of the District TMDL Implementation Plan and discusses potential projects to be implemented.

11.1 TMDL IMPLEMENTATION PLAN SUMMARY

The CRWD TMDL Implementation Plan addresses dissolved oxygen (DO) and bacteria impairments in the Clearwater River and nutrient impairments in 11 lakes within the watershed.

The final step in the TMDL process is the development of an Implementation Plan that sets forth the activities that will be undertaken to reduce phosphorus, bacteria and oxygen demand loadings to the impaired waters.

The CRWD has agreed to take the lead on general coordination, implementation, stakeholder involvement, and ongoing monitoring. The CRWD will also report on implementation progress, new opportunities for implementation and update the plan as necessary to implement adaptive management. This information will be incorporated into the CRWD's Annual Water Quality Report.

The focus of the Implementation Plan is broad because the load reduction goals are significant to meet state standards. Load reductions will be required from urban, agricultural, and lake shore land uses as well as internal nutrient loading for lakes, and wetland sediment oxygen demand (SOD).

Because the watersheds of the impaired waters overlap in many cases, the District has an opportunity to address many impairments at once. For example, BMPs used to address the nutrient impairment to Lake Betsy will likely improve not only water quality upstream, but downstream as well. To that end, implementation efforts will be sequenced to have the most immediate impact. In other words, watershed and internal loads to Lake Betsy and Clear Lake will be targeted first to improve water quality in these lakes thereby reducing load to all but three of the downstream lakes. Implementation on a watershed level is appropriate due to the riverine nature of the system and overlapping watersheds.

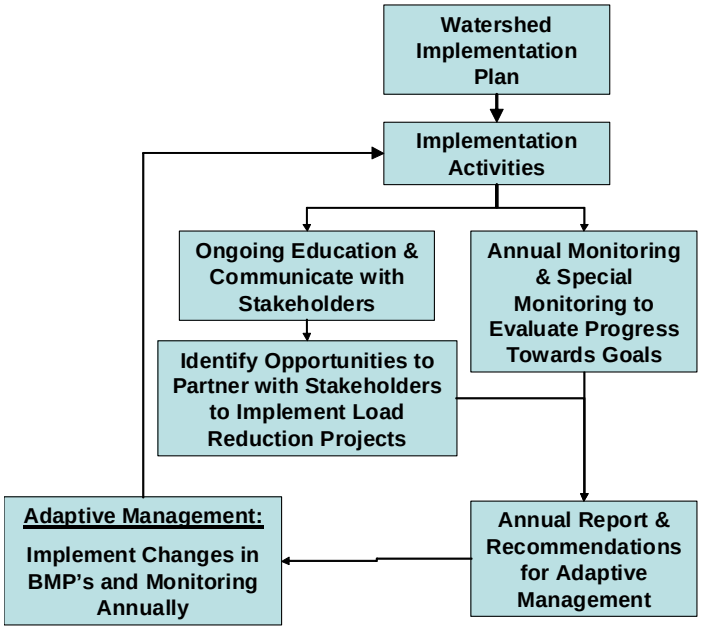
Table 11.1 provides a conceptual implementation plan (Source: CRWD Watershed-wide Implementation Plan, April 2009). Strategies are recommended based on their relative cost and effectiveness.

Table 11.1 Conceptual Implementation Plan

Practice	TMDL	Unit Cost	Units	Note	Qty	Cost
Promote Ag BMPs (P Testing and fertilizer application)	Nutrient, DO	$50,000	ls		1	$75,000
Replace Tile Intakes w/ Filters	Nutrient, DO, Bacteria	$500	per intake	*evaluate limestone/steel wool filter intakes to increase P removal	400	$200,000
Tile Intake Buffers	Nutrient, DO, Bacteria	$100	per intake		300	$30,000
Buffer Tributaries	Nutrient, DO, Bacteria	$350	ac		300	$105,000
Buffer Stream Banks	Nutrient, DO, Bacteria	$350	ac		200	$70,000
DO Augmentation for Clearwater River	DO		lf	*design and construct, operation		$500,000
Tile Discharge Management	Nutrient, DO, Bacteria	$130,000	ls	* Inventory, FS, design construct	1	$130,000
Riparian Pasture/ Grazing Management Grants	Nutrient, DO, Bacteria	$10,000	ea	*keep livestock out of stream	10	$100,000
Street Sweeping: Kimball, Southaven, Fairhaven & Watkins	Nutrient, DO, Bacteria	$40	per curb mile	* high efficiency, 55 curb miles for 15 years		1,125,000
Lakeshore Septic Upgrade Grants	Nutrient	$7,500	ea	All Impaired Lakes	130	$975,000
Lake shore restoration grants (Shore land Erosion)	Nutrient	$300	ea	*grants	300	$90,000
Shallow Lakes Management Plans for Marie, Clear, Swartout, Albion & Henshaw Lakes	Nutrient	$15,000	ea		5	$75,000
Carp Control	Nutrient	$25,000	average per year per lake	*Fish trap already installed at Louisa, harvesting under way in several impaired lakes (5 lakes, 6 yrs)	30	$750,000
Curly Leaf Pondweed Control	Nutrient			*Lake association cost, some cost share		$100,000
Lake Aeration	Nutrient			2 Existing aerators re-installed		$600,000
Alum dosing of Cleawater River upstream of Kingston	Nutrient, DO					$600,000
Hypolimnetic withdrawl (Betsy)	Nutrient					$350,000
Kingston Wetland Maintenance / Enhancement	Nutrient, DO					$250,000
South Haven Stormwater Enhancement	Nutrient, DO, Bacteria					$75,000
City of Kimball Stormwater Enhancement Per 2004 Kimball Area Stormwater Management Study	Nutrient, DO, Bacteria					$500,000
City of Watkins Stormwater Enhancement per 2006 Watkins Area Stormwater Management Study	Nutrient, DO, Bacteria					$800,000
Public Outreach	Nutrient, DO, Bacteria	$10,000	per year		10	$100,000
Implementation Project Management and Administration	Nutrient, DO, Bacteria	$30,000	per year		10	$300,000
Implementation Performance Monitoring, Recommendations for Adaptive Management	Nutrient, DO, Bacteria	$25,000	per year		10	$250,000
Implementation Engineering	Nutrient, DO, Bacteria	$15,000	per year		10	$150,000
T:\0002\127\[TMDL Implementation_FINAL.xls]August 08					**TOTAL:**	**$8,300,000**

The CRWD will work with stakeholders to identify opportunities for partnership in implementation plan activities. The CRWD will take responsibility for ongoing coordination of projects, education and outreach, monitoring activities, and evaluation for adaptive management. This framework is illustrated in Figure 11.1 below.

Figure 11.1 Implementation Framework



11.2 PROPOSED IMPLEMENTATION PLAN FOCUS

Specific focuses for each impairment are discussed below. Existing CRWD programs are typically aimed at phosphorus load reduction, however since the delivery mechanisms for phosphorus, bacteria and oxygen demand to surface waters are often the same, the same programs work for all impairments. Current CRWD phosphorus reduction programs that also target oxygen demand and bacteria are described, along with the additional work that will be needed to meet state water quality standards.

11.2.1 Clearwater River, Clear Lake to Lake Betsy, DO:

The implementation plan to address the DO impairment on the Clearwater River between Clear Lake and Lake Betsy relies primarily on watershed BMPs. While reductions in SOD load may not be feasible at this time, options for reducing SOD to be considered include:

- Rerouting the Clearwater River to circumvent the wetlands in this reach. This would eliminate the natural nutrient trap and buffer the wetlands provide to downstream lakes that are currently impaired, namely Lake Betsy, Scott Lake, Lake Louisa, Lake Marie,

Lake Augusta and Lake Caroline. Further it would destroy the hydroperiod of the wetlands.

- Dredging the existing wetland sediments to remove organic material. This strategy is not feasible due to the large size of the wetlands. Also, deeper wetlands soils may also exert oxygen demand which may leave the same problem or make it worse.
- Channel re-aeration. Opportunities are limited for this activity in this section of the river due to the naturally occurring flat topography.
- An alum dosing system upstream of Kingston may reduce nutrient load to downstream lakes and may have some additional benefit in terms of reducing SOD in the wetland over the long term by reducing productivity in the wetland by sequestering nutrients.

11.2.2 Clearwater River, Clear Lake to Lake Betsy, Bacteria:

The dominant bacteria sources to the Clearwater River are from riparian livestock and applied manure. While bacteria load reductions from all sources will be necessary, load reductions from these sources will be the most effective towards meeting water quality goals. To that end, the TMDL implementation plan for bacteria relies on three main strategies:

1. Riparian pasture management, feedlot upgrades, and pasture management grants.
2. Manure application BMPs.
3. Reduction of delivery potential from applied manure.

Many of the watershed BMPs implemented for addressing the DO and nutrient impairments serve multiple purposes in addressing the bacteria impairment as well, since the delivery mechanisms for bacteria, nutrient and oxygen demand to surface waters are often the same.

Specific BMPs implemented to address bacteria impairment include riparian pasture management grants and the restoration of riparian areas used as pasture or feedlots. Animal feedlot upgrade incentives and pasture management plan grants may be given to landowners adjacent to the Clearwater River. These incentives and grants would promote the management and rotation of grazing in the riparian zone. This program should be expanded to include a study to identify parcels for upgrade and approach land owners with incentives and education. Activities should be focused in the subwatersheds tributary to the listed reach.

11.2.3 Clear Lake, Lake Betsy, Scott Lake, Union Lake, Nutrients:

Watershed load reductions are required to meet water quality goals in all of these lakes. Additionally, internal load reductions are necessary in Clear Lake and Lake Betsy, since internal loading contributes significantly to the total nutrient load in these lakes. The focus in implementation will be on a combination of watershed BMPs and in-lake reductions.

Because of the nature of this flow through lake chain system, water quality and loads to upper watershed lakes are critical to maintaining good water quality downstream. Initially focusing on the most upstream lakes, Betsy and Clear, provides significant benefit to the Clearwater River and downstream lakes.

11.2.4 Lake Louisa, Lake Marie, Lake Caroline, and Lake Augusta, Nutrients:

The focus in implementation will be on reduction of the annual phosphorus loads to the lake from upstream waters and direct tributary watershed through structural and non-structural BMPs. Internal nutrient load reductions are also necessary to meet state standards in Lake Marie.

11.2.5 Swartout, Albion & Henshaw Lakes, Nutrients:

The Cedar Chain of Lakes Restoration project was started in 2007 in response to a petition by lake shore residents to address the declining water quality and severe algae blooms in Cedar Lake. The primary phosphorus source to Cedar Lake is phosphorus export from the upper watersheds routed through shallow upper watershed lakes namely Swartout, Albion and Henshaw Lakes. The primary phosphorus source to the upper watershed lakes is internal cycling of phosphorus.

To reduce the phosphorus concentrations in Cedar Lake it is necessary to reduce the nutrient load from the upper watershed, and to reduce the in-lake concentrations in the upper watershed lakes: Swartout, Albion, and Henshaw Lakes.

Several alternatives were considered, and in 2007 and 2008 several projects were implemented to reduce in lake phosphorus concentrations in Swartout, Albion, and Henshaw Lakes, thereby reducing the phosphorus load to Cedar Lake and improving lake water quality in Cedar, Swartout, Albion, and Henshaw Lakes. The original recommendation went further in terms of its load reductions to meet goals in Cedar Lake. However, the project as recommended met with significant resistance from land owners. The plan that was implemented was a portion of the original plan. Far more aggressive strategies are required to meet the load reduction goals for these lakes. In the following sections, the existing BMPs are discussed as well as additional implementation requirements to meet standards, and barriers to those proposed BMPs.

BMPs implemented in 2007 included installation of rough fish barriers, buffers, and tile inlet replacements. In 2008, the construction of Segner Pond, a wetland treatment basin, was completed, additional fish barriers were installed, and rough fish harvesting was conducted.

Rough fish management activities were undertaken in 2008 to help control rough fish populations in the upstream lakes. Fish barriers were installed in 2008 at two inlets to Swartout Lake and in the diversion channel upstream of Segner Pond. These fish barriers were constructed in addition to the three fish barriers that were installed during early spring 2007 on the Cedar Lake inlet upstream of Highway 55, and at the Swartout Lake and Henshaw Lake outlets. The fish barriers are intended to impede upstream migration of carp, which prevents adult carp from reaching their preferred spawning grounds in the wetlands adjacent to the lakes. This can help keep carp populations in check and also reduces carp damage to shallow upstream lakes. Carp can cause problems in shallow lakes by stirring up bottom sediments through their feeding activities. This makes the waters turbid which typically does not allow submerged aquatic vegetation to grow in the lake. The disturbance of the nutrient rich bottom sediments can also lead to an increase in internal cycling of nutrients from the bottom sediments, exacerbating the impairment of upstream lakes and therefore adding higher phosphorus loads to Cedar Lake.

In addition to the installation of fish barriers, rough fish harvesting was conducted on the upstream lakes in 2008. Approximately 57,000 lbs of carp were removed from Swartout Lake by two nettings performed by a commercial fishing operation in February 2008. An additional 4,760 lbs of rough fish were removed from the lake in December 2008. Netting was also performed on Henshaw Lake in 2008, removing 220 lbs of bullheads from the lake.

While it is difficult to completely eradicate carp from lakes, effective rough fish population management would likely result in a significant reduction in the internal loading in upstream watershed lakes, and a decrease in nutrient loading to waters downstream. A reduction in the carp population in the lakes grouped with improved water clarity may allow aquatic vegetation to grow in the lake, which would provide more suitable habitat for waterfowl and other wildlife. In short, with these improvements, Swartout and Henshaw Lakes could start to look more like Albion Lake, another shallow lake with better water quality than Swartout and Henshaw Lakes.

When addressing impairments in shallow lakes it is also necessary to address the health of biological communities. To improve the quality of shallow lakes, it is beneficial to restore the health of biological communities in the lake, including fish, plants, and zooplankton. Ideally, shallow lake management plans incorporating water level management to promote vegetation growth, and fish community management strategies, such as lake drawdowns or the application of Rotenone to promote rough fish kills, would be implemented. However, efforts to implement these strategies have been met with resistance from landowners so the implementation strategies will be limited to rough fish barriers and harvesting, and watershed BMPs.

11.3 PROPOSED PRIORITY IMPLEMENTATION PLAN PROJECTS

The CRWD has made progress towards water quality goals established in the TMDLs. Progress towards these goals is demonstrated by implementing additional monitoring which filled data gaps identified in the TMDL and which will assist in final design of capital improvement projects. The CRWD also has targeted BMPs and identified five projects for implementation. The CRWD has applied for funding through the Clean Water Partnership grant process for these projects. The CRWD will continue to pursue options for additional projects in the future.

In 2009, five projects for which grant applications were submitted were identified. Table 11.2 provides summary information for these projects and selected projects are described in more detail below. The five projects, which are located in the watersheds tributary to Clear Lake and Lake Betsy, vary in cost and potential TP load reduction. Selected projects are described in more detail below.

Table 11.2 Proposed Implementation Projects

Project	Potential TP Reduction (lbs/yr)	Cost of TP Reduction ($/lb)	Estimated Expense
Watkins Impoundment	147	$204/lb	$30,000
City of Kimball	257	$444/lb	$114,000
Fertilizer Field Trial	600	$295/lb	$177,000
Lake Betsy Hypolimnetic Withdrawal	480	$525/lb	$315,000
South Clear Lake V-Notch Weir	588	$128/lb	$75,000
Totals	**2,072 lbs**	**Avg: $320/lb**	**$711,000**

11.3.1 Watkins Impoundment

The proposed project is the construction of an impoundment on a 20-acre CRWD-owned parcel of land northeast of the city to treat runoff discharged from the city's storm drainage system. The impoundment would be created by constructing an earthen dike across the creek that runs west to east across the parcel. Two subwatersheds totalling 740 acres of urban and agricultural land drains through this creek to a nearby ditch. A sheet pile weir with a V-notch outlet point would control discharge from the impoundment. The impoundment is sized to store runoff form the 0.5 inch event, which would provide an annual nutrient removal efficiency of 25 percent. The impoundment would also potentially provide some removal of bacterial load from the agricultural land and biological oxygen demand currently stressing the Clearwater River.

The filter consists of 3/4 inch to 3 inch diameter limestone wrapped in geotextile fabric and staked in place at the outlet of the structure. As the water passes through the filter, the phosphorus comes in contact with and binds to the calcium in the limestone, and is removed from the water.

11.3.2 City of Kimball

This project targets phosphorus removal for Lake Betsy and protection of the Willow Creek trout habitat by infiltrating the 1.5-inch storm event off 428 acres in and around the City of Kimball. Stormwater runoff from the City of Kimball drains untreated into Willow Creek, a trout stream. Willow Creek is tributary to Lake Betsy, which is impaired by excess nutrients..

It is estimated that this project will reduce phosphorus discharged to Willow Creek and Lake Betsy by 244 pounds annually, or about 3 percent of the 8,300 pound annual load reduction required for Lake Betsy. Kimball is one of two urban areas tributary to Lake Betsy, making it a targeted area for load reduction in the TMDL.

11.3.3 Fertilizer Field Trial

The proposed soil testing and fertilizer application field trial includes systematic soil tests on up to 10,000 acres of critical cropland to determine the proper amount of fertilizer to be applied to each field. The applicator will use GPS to apply the correct amount of fertilizer in each grid of the fields based on the results of the soil tests.

Monitoring will be conducted at drain tile outlets from selected fields. Samples will also be collected from two tile outlets in fields that are not a part of the field trial to be used as background data for comparison. The results will be publicized to encourage wider application of this technique.

This field trial will demonstrate the feasibility and utility of systematic soil testing in reducing fertilizer application and thus phosphorus load in agricultural runoff. This technology can be implemented throughout the agricultural areas of the state to cut down on fertilizer costs and reduce runoff of nutrients into adjacent water bodies.

The outcomes of the field trial are a reduction in phosphorus from fertilizer exported to impaired waters from cropland, and a quantification, evaluation, and publication of the load reduction achieved.

11.3.4 Lake Betsy Hypolimnetic Withdrawal

This proposed project would pump nutrient-rich water from the lake hypolimnion and use it to irrigate a nearby farm field. Intensive monitoring will be completed to evaluate the effectiveness of the BMP in reducing internal load. Lake inflows and outflows will be monitored for flow and quality, while weekly temperature and dissolved oxygen profiles and bi weekly nutrient profiles will be taken to evaluate impact on lake water quality. Volume and timing of withdrawals will be tracked to estimate load reduction.

The proposed project will assess the cost-effectiveness of lake hypolimnetic withdrawal and irrigation as an internal phosphorus load management BMP, and evaluate its transferability to lakes in the Clearwater River Watershed District and elsewhere.

11.3.5 South Clear Lake V-notch Weir

The proposed project will impound water by installing a V-notch weir on a Clear Lake tributary. The resulting retention basin will allow phosphorus to settle out of agricultural runoff before discharging to Clear Lake. The targeted load reduction for this project is 600-800 pounds of phosphorus annually. The phosphorus load removed through the proposed project represents a significant component of the required load reduction from watershed sources to Clear Lake. The V-notch imoundment will catch water from smaller runoff events while allowing controlled overflow of stormwater during larger storm events.

12.0 Financing

12.1 FUNDING SOURCES

Funding of CRWD activities may include one or more of the following sources:

12.1.1 CRWD General Levy

Revenues from an annual district wide levy are used to fund general operating costs for the District.

12.1.2 Assessment of Benefit

Special projects may be initiated by petition or action of the Board of Managers and follow the procedures outlined in Minn. Stat. 103D.

12.1.3 District-wide Water Management District (WMD)

For projects that would result in benefits throughout the District, these components may be funded by a district-wide ad valorem tax, by cooperative agreements with other governmental units under Minn. Stat. 103D.605.

If a district-wide WMD is created, it is intended that it should be permanent. The costs of projects funded by a district-wide WMD would be underwritten by charges as provided for in Minn. Stat. 103.D.729 subd.2. The total cost of each project authorized under the district-wide WMD project would be collected as a stormwater charge apportioned among the landowners in the WMD on the basis of their relative contribution of nutrients and sediments to runoff. Rates may be differentiated on the basis of the amount of land and its usage in accordance with standard phosphorus loading factors, or by standard runoff coefficients.

12.1.4 Federal/State Cost Share

The CRWD may seek opportunities for cost sharing with Federal or State agencies.

12.1.5 Federal/State Grants

Applications for grants from Federal or State sources may be prepared and submitted to obtain funding for projects.

12.1.6 Legislative Funding Specifically for CRWD

The CRWD may pursue obtaining funding set aside through legislative action specifically for District projects.

12.1.7 Lake Associations

The CRWD may partner with Lake Associations such as has been done in the past with the Clear Lake Association or Cedar Lake Association to obtain funding to complete projects.

12.1.8 CRWD Foundation

The CRWD may receive funding from foundations set up for the purpose of providing financial support for District projects.

12.1.9 Special Taxing Districts

Special taxing districts may be established to secure funding for projects. Examples of special taxing districts are listed below.

Subordinate Service District
A Subordinate Service District (SSD) is a defined area within a town that will receive a government service financed through revenues received from the benefiting properties in the SSD. At least 50 percent of property owners in a defined area can petition the Township Board for the formation of the SSD. After a Public Hearing, and when the Township Board decides to approve the formation of the SSD, a Resolution is created defining the SSD area, the type of service to be provided, method of financing, and date of inception.

The Township Board will be the managing authority over the SSD and services provided. SSDs have the ability to incur debts, sue, exercise eminent domain, levy taxes, and initiate projects to achieve the purposes of the district. Typically SSD boundaries are small, encompassing an individual subdivision of land.

Sanitary Sewer District
A Sanitary Sewer District (SD) is a government authority created for the special purpose of resolving a regional pollution problem. A petition must be submitted to the MPCA with the governing bodies in the area signing the petition for the formation of the SD. No SD can be created within 25 miles of the boundary of any first class city without approval of the governing body of the city. An SD has the same ownership of infrastructure and tax levy/assessment abilities as other districts. SD's can be difficult to form when in close proximity to a city providing sanitary sewer service.

Lake Improvement District
A Lake Improvement District (LID) is a local unit of government that provides for greater landowner involvement in lake management activities. A petition of greater than 50 percent of the proposed LID property owners must be submitted to the county board. Once established, the county board would appoint the Board of Directors. As with all districts acting as a local unit of

government, the LID would have the ability to own and operate infrastructure, as well as levy special assessments against benefited property owners of a project. When a Watershed District is already in place, a county board is not likely to form a similar district, such as a LID.

12.1.10 Public Facilities Authority

The Minnesota Public Facilities Authority provides municipal financing programs and expertise to help communities build public infrastructure that preserves the environment, protects public health, and promotes economic growth.

Commonly known as the PFA, the authority administers and oversees the financial management of three revolving loan funds and other programs that help local units of government construct facilities for clean water (including wastewater, stormwater and drinking water) and other kinds of essential public infrastructure projects.

12.1.11 Special Water Management Districts

Projects not considered by the CRWD to have district-wide impact may be funded by one, or some combination of the following:

- Special assessment upon benefited property,
- by cooperative agreements with other governmental units under Minn. Stat. 103D.605 and 103D.611, or
- by the creation of up to eight other WMDs in accordance with Mann Stat. 103D.729 Subd.1.

It is intended that any such WMD would be permanent. The costs of projects funded by these WMDs will be underwritten by stormwater charges as provided for in Minn. Stat. 103D.729.subd.2. The total cost of each project authorized in this manner will be collected as a stormwater charge (fee) apportioned among the landowners in all or a portion of each WMD on the basis of their parcel's relative contribution of nutrients and sediments to runoff. There may be more than one project in a single WMD.

Rates charged to landowners will be differentiated on the basis of the amount of their land and its usage in accordance with standard phosphorus loading factors, or by standard runoff coefficients.

13.0 Partners

13.1 AGENCIES AND PROGRAMS

The CRWD will lead and coordinate implementation of the CRWD watershed wide TMDLs, but will seek input and technical assistance from other agencies.

13.1.1 USDA Natural Resources Conservation Service

USDA Natural Resources Conservation Service provides technical assistance for landowners in the CRWD. USDA Farm Service Agency administers cost share programs to address nutrient and soil erosion issues.

13.1.2 Minnesota Department of Natural Resources (MN DNR)

The MN DNR is responsible for fish and wildlife management as well as protecting ecological health in the state of Minnesota.

The MN DNR is also a stakeholder in the TMDL process. The MN DNR will likely be involved in the TMDL implementation process by reviewing grant applications, providing comments, feedback and necessary permits. Other involvement may include attending the CRWD's meetings, providing technical support and possibly funding support for implementation projects. Specialized assistance in surveying and managing aquatic habitat is also expected.

The Wright and Stearns County areas of the watershed lie in Region 3 of the Department of Natural Resources, with area fish management centered in Montrose and area wildlife management in Cold Spring. The Meeker County area is a part of Region 4, with fish management centered in Hutchinson and wildlife management in Willmar.

13.1.2.1 Fish Management

A fish stocking program is carried out annually, with walleye stocking programs on several rural northern pike spawning areas are maintained by means of water level control on Cedar and Pleasant Lakes. In addition, there are two controlled spawning areas for northern pike on Clearwater Lake. Brook trout, which are native to Minnesota, are stocked in Fairhaven, Theil, and Willow Creeks and in an unnamed creek near Fairhaven. Three Mile Creek is under consideration for addition to the trout stocking program.

13.1.2.2 Wildlife Management

A primary concern of those responsible for wildlife management is preservation and development of wetlands, because they provide winter habitat for deer and pheasant and nesting areas for waterfowl in the spring. In addition, they provide fish spawning areas for several species.

Wetlands are being purchased by the state as wildlife management areas for long-term preservation. Recent legislation provides for the inventory of public waters, which have multiple values as nutrient traps, wildlife habitat, and flood water storage areas and contributes to groundwater recharge.

There are four wildlife management areas in the Clearwater River Watershed District. These are the Corinna Wildlife Management Area, located in Wright County, two miles east of the north end of Swart Watts Lake; the Swartout Wildlife Management Area, located in Wright County immediately east of, the south end of Swartout Lake; A-Shau Valley Wildlife Management Area, located in Wright County near the south end of Lake Louisa; and the Albion Wildlife Management Area, located in Wright County northwest of Edwards Lake. This wildlife management area includes a large tract of land outside of the Clearwater River Watershed District and a small tract of land in the watershed district adjacent to Edwards Lake. These wildlife management areas provide floodwater storage, nutrient traps, and wildlife habitat.

13.1.3 MINNESOTA POLLUTION CONTROL AGENCY (MPCA)

The MPCA is involved in the implementation of TMDLs and enforcement of water quality standards.

13.1.4 MINNESOTA BOARD OF WATER AND SOIL RESOURCES (BWSR)

BWSR will review grant applications, provide comments feedback and funding for TMDL implementation. A 50 percent funding match will be required to implement the full range of TMDLs.

13.1.5 COUNTY SOIL AND WATER CONSERVATION DISTRICTS (SWCD)

SWCDs, a local unit of government, carry out educational, technical and planning assistance for owners and operators of agricultural land and feedlots. State cost share programs are administered locally by SWCDs.

13.1.6 MINNESOTA DEPARTMENT OF HEALTH (MDH)

The MDH will coordinate with the District on protecting groundwater near drinking water sources.

13.1.7 DEPARTMENT OF AGRICULTURE

The United States Department of Agriculture (USDA) and Minnesota Department of Agriculture (MDA) are available to advise the District on implementation of agricultural practices.

13.1.8 COUNTY PLANNING AND ZONING/ENVIRONMENTAL SERVICES

County water plans pull together existing water quality data, resident's perceptions of water quality data and establish goals and actions to protect surface and ground water. County zoning ordinances provide local regulations regarding land use.

Meeker, Stearns, and Wright Counties will be expected to review and comment on development projects. The recommendation of the TMDLs is no net increase in watershed export, and reductions will be necessary. The District expects to partner with the Counties early on in the process of development review to provide insight into reducing the impact of land development and redevelopment on water quality.

13.1.9 LAKE ASSOCIATIONS

Lake Associations, such as Chain of Lakes Association or the Clear Lake Association are expected to disseminate information to their members about septic system upgrades, shoreland restorations, and turf management for lake water quality. Representatives of each lake association will be contacted 2-4 times annually by District staff, to ascertain their needs and level of interest. Periodically the District will coordinate their annual meeting around the activities of one specific lake. During these events, District staff and engineers present material on the lake of interest and provide information to residents about the role they can play in improving water quality. The District counts on these lake associations to notify their members to attend. The District foresees this continued cooperation.

13.1.10 CITIES

Cities in the District will be expected to partner with the CRWD to implement the projects in each cities' stormwater management plan.

13.1.11 TOWNSHIPS

Elected township officials as well as township staff can play an important role in water quality improvement through ongoing communication with the District. This communication provides the District with information about current events in the township, as well as citizen concerns, potential problems, and opportunities to partner for improved water quality.

13.1.12 COUNTY BOARDS

County boards will provide assistance to the District where appropriate. Care is taken to conduct District projects in accordance with County policies.

13.1.13 SPORTSMENS CLUBS

Sportsmen's clubs may provide the District with assistance with funding and outreach efforts.

13.1.14 LIONS/VFWS

Local chapters of Lions and VFWs may assist the District with funding and outreach efforts.

13.1.15 UNITED STATES FISH AND WILDLIFE SERVICE (USFWS)

The USFWS would be available as a partner in ecological and water quality improvement projects.

13.1.16 OTHER ORGANIZATIONS

Partnerships with conservation organizations such as Ducks Unlimited, Trout Unlimited, Pheasants Forever or Nature Conservancy may be developed in the future.

While Ducks Unlimited is not a partner of the CRWD, we have attempted to partner to improve water quality and wildlife habitat in the past. Past attempts at shallow lakes management have been unsuccessful due to the objection of residents. The CRWD will continue to look for opportunities to partner with Ducks Unlimited or other conservation groups to improve water quality or ecological integrity in the District. These projects will likely be geared towards management of wetlands to improve downstream water quality or shallow lakes.

Opportunities for partnerships with non-conservation organizations may also be pursued in the future.

Appendix A

Petition for Establishment of Clearwater River Watershed District

Minnesota Water Resources Board
555 Wabasha Street
Room 206
St. Paul, Minnesota
55102

- -

In the Matter of the Petition for the Establishment of the Clearwater River Watershed District (Counties of Meeker, Stearns and Wright).

FINDINGS OF FACT, CONCLUSIONS OF LAW, ORDER

- -

A nominating petition, initiated and signed by more than 50 freeholders living in Meeker, Stearns and Wright Counties, having been filed with the Minnesota Water Resources Board, requested the establishment of a Clearwater River Watershed District, the appointment of a Board of Managers therefore, and the fixing of the boundary thereof, all pursuant to Chapter 799, Laws of Minnesota 1955, as amended, also known as the Minnesota Watershed Act, Chapter 112; for the purposes of providing a cohesive organization to manage and conserve the waters and natural resources within the Watershed District, to conserve and make provident use of the waters and natural resources of the state in the area to be included within the Watershed District; and

1. Provide for proper installation and maintenance of sewage disposal and sewage treatment facilities within the Watershed;

2. Provide a means to control pollution of all lakes and watercourses within the Watershed and control the growth of algae and other undesirable organic matter in said lakes and watercourses of the Watershed;

3. Promote and improve the recreational use of said lakes and watercourses, including but not limited to the construction and maintenance of fish-rearing ponds;

4. Regulate and control cesspools and disposal of waste;

5. Regulate and control construction of any buildings on the beds and along the banks and shores of the lakes and watercourses in the Watershed by permit or otherwise;

6. Obtain adequate records of pertinent hydrographic data;

7. Establish water storage areas to control the drainage of nutrients into the Clearwater River and its tributaries;

8. Preserve, maintain, protect and promote the natural beauty of the Clearwater River, its tributaries and other watercourses and lakes within the Watershed;

9. Develop fully the water resources of the area for recreation, fish and wildlife purposes;

10. Provide for overall water management because of growing and expanding urbanization of the Watershed;

11. Assist in planning the development of a coordinated system of water control for industrial, domestic, agricultural, recreational and other public and private uses in the Watershed;

12. Aid and assist municipalities in the Watershed to meet their respective needs for sewage treatment facilities, conservation of water, and other recreational and agricultural purposes;

13. Aid and assist farming and agricultural interests by the creation of improvements beneficial to agricultural uses of land within the Watershed;

14. And all other purposes for which a Watershed District may be established.

Appendix B

Soil Association Descriptions

Appendix B – Soil Association Description

Lester-Hayden Association
The Lester-Hayden soil association occupies rolling slopes and depressions. The soils formed in calcareous; gray colored loam glacial till.

Lester soils make up about 35 percent of the association and these well drained soils occupy gently sloping and rolling slopes.

Hayden soils make up about 30 percent of the association. These well drained soils occupy the steeper slopes near lakes and streams. The Lester-Hayden association is well suited to intensive cropping. Dairying predominates, with some cash grain farming of corn and soybeans. The low wet bogs and meadows are used for pasture and wild hay. Wooded pastures and woodlots are common.

Estherville-Hubbard Association
The Estherville-Hubbard soil association consists of nearly level and undulating slopes on plains and terraces that border the Mississippi, Clearwater and Sauk Rivers. These dark colored soils formed in one to two feet of loamy material above calcareous grayish colored sands and gravels.

Estherville soils make up about 50 percent of this association. These somewhat excessively drained soils occupy nearly level and undulating slopes with occasional steep escarpments between terraces.

Hubbard soils occupy nearly level to very steep slopes and make up about 30 percent of the association.

The Estherville-Hubbard association is mainly used as cropland with many small areas of oak and aspen scattered about. Fairly dense strands of hardwoods are in areas near Clearwater Lake. Most farms are growing cash grain crops of corn and soybeans. These soils are well suited to irrigation and it overcomes the major obstacles to crop production. Wind erosion is a problem where the soil is cultivated. The soils in this association are a good source of sand and gravel and some commercial pits are operating here. These soils have few limitations for most urban and recreational purposes, but steep slopes may severely limit their use for these purposes.

Burnsville-Hayden Association
This is a distinctive soil association, which occupies very steep, rough, and irregular topography. The light colored soils formed in calcareous, gray colored, moderately coarse textured drift and loam glacial till.

Burnsville soils occupy hilly to steep slopes that form about 60 percent of this association. They also occur as a complex with Hayden soils. Burnsville soils are somewhat excessively drained.

Hayden soils make up about 20 percent of this association. These well drained soils occupy sloping to steep irregular slopes.

The Burnsville-Hayden soil association is partly used as cropland with some in pasture or woodland. Cropland areas typically occur on the less sloping land. The slopes on the uplands severely limit the use of this association for most urban, recreational, and agricultural purposes.

Hayden-Peat-Marsh Association
The topography of this area is strongly rolling to hilly moraine with short, uneven slopes. The soils are light to moderately dark colored and medium textured. They formed under mixed northern hardwoods from limey, clay loam glacial till. Available moisture supplying capacity and natural fertility are moderate. Most of the soils are well drained, but large areas of very poorly drained soils occur in the depressions.

Sheet erosion is severe throughout the area and gully erosion is also a serious problem.

Emmert-Flak Association
It occupies rugged hills, steep slopes, and marshy depressions. The light colored soils formed from noncalcareous, brown colored glacial drift.

Emmert soils occur on rolling to very steep slopes and comprise about 50 percent of the association. They also occur as a complex with Flak soils and are excessively drained.

Flak soils make up about 40 percent of the association. These well drained soils occupy sloping and rolling slopes that are usually somewhat less sloping than the Emmert soils.

Dairy farming predominates and corn, oats, and alfalfa are the principal crops grown. Many lakes are present in the association to provide quality recreation. Several gravel pits are located in the area, which provide high quality aggregates. Limiting factors for urban development are mainly the problems associated with steep slopes.

Hayden-Lester-Peat Association
The Hayden-Lester-Peat soil association occupies strongly rolling and hilly areas. The mineral soils formed in calcareous, gray colored loam glacial till. The peaty soils formed in organic materials that vary in thickness and generally are underlain by loamy material.

Hayden soils make up about 60 percent of the association. These well drained soils occupy some of the roughest land and consist of strongly rolling and hilly slopes. Hayden soils are suited to intensive cropping. Features affecting non-farm uses include moderate shrink-swell potential and high susceptibility to frost action.

Lester soils make up about 20 percent of the association. These well drained soils occupy gently sloping and rolling slopes. Lester soils are well suited to intensive cropping. Features affecting non-farm uses include moderate shrink-swell potential and high susceptibility to frost action.

Peaty soils make up about 10 percent of the association. These very poorly drained organic soils occupy depressions. They vary in depth and generally are underlain by loamy material. Most of the peat is quite raw but in areas that have been drained and cultivated, the peat is more decomposed. Artificial drainage is needed before this soil can be used for growing crops. Large amounts of fertilizer are needed.

Summer frosts are a hazard. Features affecting non-farm uses include high water table, low bearing value, low shear strength and compacted permeability, high shrink-swell potential, and high susceptibility to frost action.

Minor soils occupy about 10 percent of this association and include the poorly drained Cordova and Webster soils and the very poorly drained Glencoe soils. Steep slopes and wet soils with lack of drainage outlets present problems for urban development.

Dairy farming predominates with corn, small grains, and hay grown on the less sloping soils. Wooded pastures and woodlots are common. The low wet bogs and meadows are used for pasture and wild hay.

Lester-Le Sueur-Cordova Association

The Lester-Le Sueur-Cordova soil association occupied nearly level and gently sloping areas. These dark colored soils formed in calcareous, gray colored loam glacial till. Lester soils make up about 40 percent of the association. These well drained soils occupy gently sloping slightly higher areas than the Le Sueur soils. Lester soils are well suited to intensive cropping. Features affecting non-farm uses include moderate shrink-swell potential and high susceptibility to frost action.

Le Sueur soils make up about 30 percent of the association. They are moderately well drained and occupy nearly level and gently sloping lower lying areas than the Lester soils. Le Sueur soils are well suited to intensive cropping. Features affecting non-farm uses include a slightly wet condition during periods of high rainfall because of its topographic position. Other features include moderate shrink-swell potential and high susceptibility to frost action.

Cordova soils make up about 20 percent of the association, are poorly drained, and occupy nearly level areas. They are well suited for use as cropland if artificially drained or as pasture. The normally high seasonal water table and susceptibility to frost heave severely limits these soils when used for urban and recreational purposes.
Minor soils nearby are Glencoe and peaty soils and others that make up about 10 percent of the association.

The Lester-Le Sueur-Cordova association is well suited and used for intensive cropping. Cash grain farming predominates with corn and soybeans being the main crops grown. Excess water can be removed with surface ditches and tile drains but for urban and recreational uses, wetness remains a limiting factor.

Appendix C

CRWD Board of Managers By-Laws

CLEARWATER RIVER WATERSHED DISTRICT
BOARD OF MANAGERS
BY-LAWS

These by-laws establish rules governing conduct and procedure of the managers of the Clearwater River Watershed District in Wright, Stearns, and Meeker Counties, Minnesota.

1. The Board of Managers shall meet the second Wednesday of each month at 7:30P.M. at the Annandale Middle School in Annandale, Minnesota. The Secretary shall give at least eight (8) days written notice of each regular meeting.

2. Any Manager may call special meetings of the Board of Managers. The Secretary will publish notice of each meeting in official publications of the CRWD during the week prior to the meeting. The Secretary shall mail a notice before the special meeting to all members stating the time and place of the meeting and the purpose thereof.

3. So far as may be practical, Robert's Rules of Order shall govern proceedings at all meetings. The following shall be the order of business to be conducted at the meeting:

a. Adopt agenda, including emergency requests
b. Minutes of previous meeting
c. Financial Report
d. Requests and Presentations
e. Old Business
f. New Business
g. Manager's Reports
h. Engineer and Attorney Reports
i. Administrator's Report
j. Other Business
k. Adjournment

4. When the Chairperson puts a question, every manager present shall vote unless for a special reason he shall be excused. If a manager has a personal interest in the matter, he shall not vote. In

doubtful cases, the Chairperson may direct, or any manager may call for a decision by the Board of a manager's personal interest.

5. Affirmative or negative votes of all members shall be entered in the minutes. Every manager shall so vote unless the managers, by majority vote, shall excuse a manager from voting.

6. All new business to be considered at the meeting shall be placed on the agenda for the meeting. To be included on the agenda, the request must be made in writing and signed by the party requesting its inclusion. The Secretary of the Board must receive the written request not later than the start of the meeting. The Board of Managers will consider only business properly placed on the agenda at the meeting.

7. A manager who is absent from a meeting may move to reconsider a motion acted upon at the previous meeting.

8. Minutes of the meeting shall be signed by the Chairperson and the Secretary and kept by the Secretary and a signed duplicate original filed in the office of the Board of Managers. They shall clearly record all motions and resolutions voted upon by the Board; and shall constitute the official record of proceedings at each meeting. Copies of the minutes of each meeting shall be mailed promptly by the Secretary to each manager.

9. The question of an annual audit required by Minnesota Statutes Section 103D.355 as amended, shall be placed on the agenda for the first regular meeting held in the first month of the calendar year.

Upon motion duly made by Roland Hogen and seconded by Rich Eckman, the foregoing by-laws were adopted by unanimous vote of the Board.

Dated: 6/9/99

By Richard Coleman
Secretary