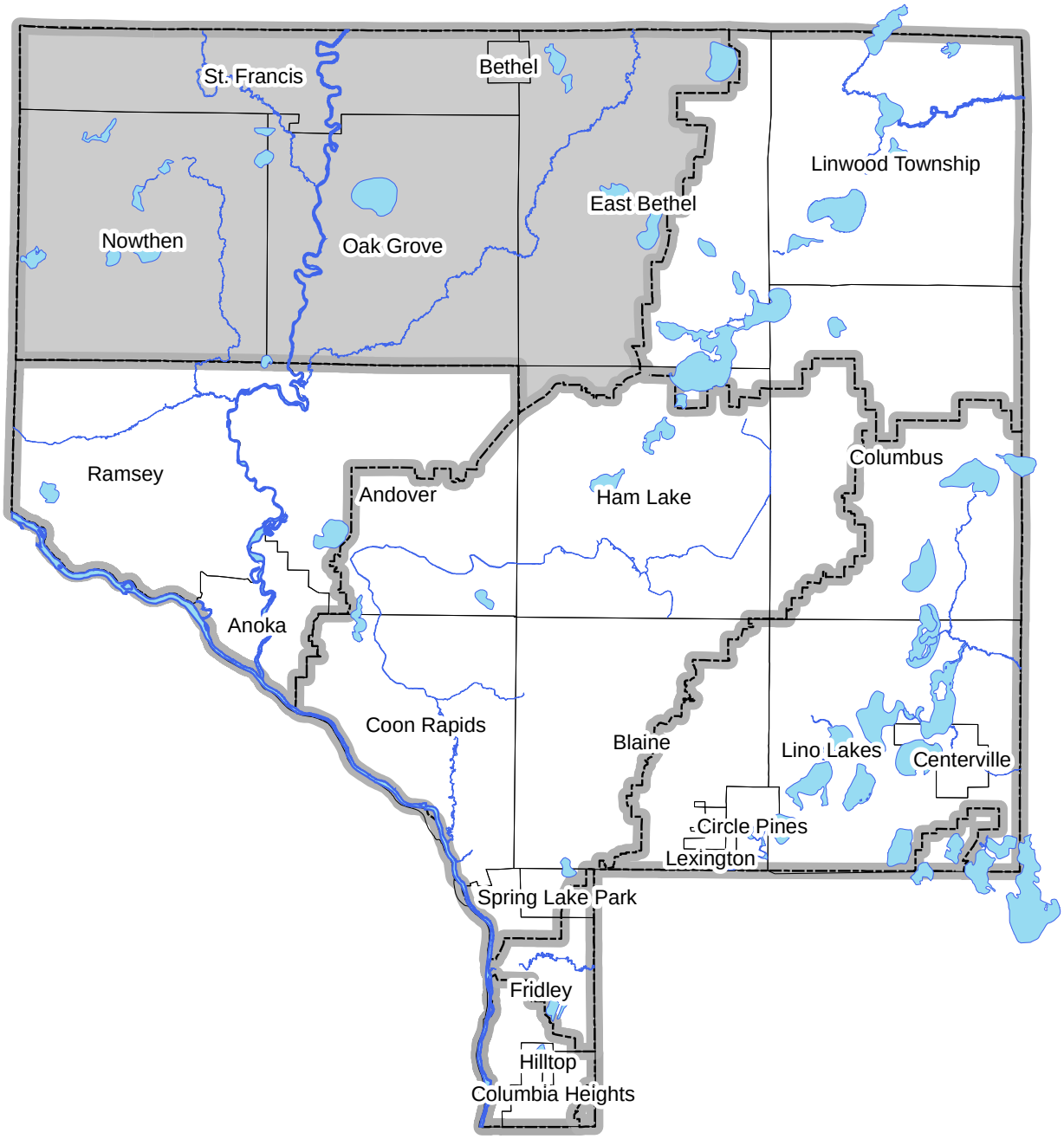
Upper Rum River Watershed



Contact Info: Upper Rum River Watershed Management Organization
www.urrwmo.org
763-753-1920

Anoka Conservation District
www.AnokaSWCD.org
763-434-2030

CHAPTER 3:
UPPER RUM RIVER WATERSHED

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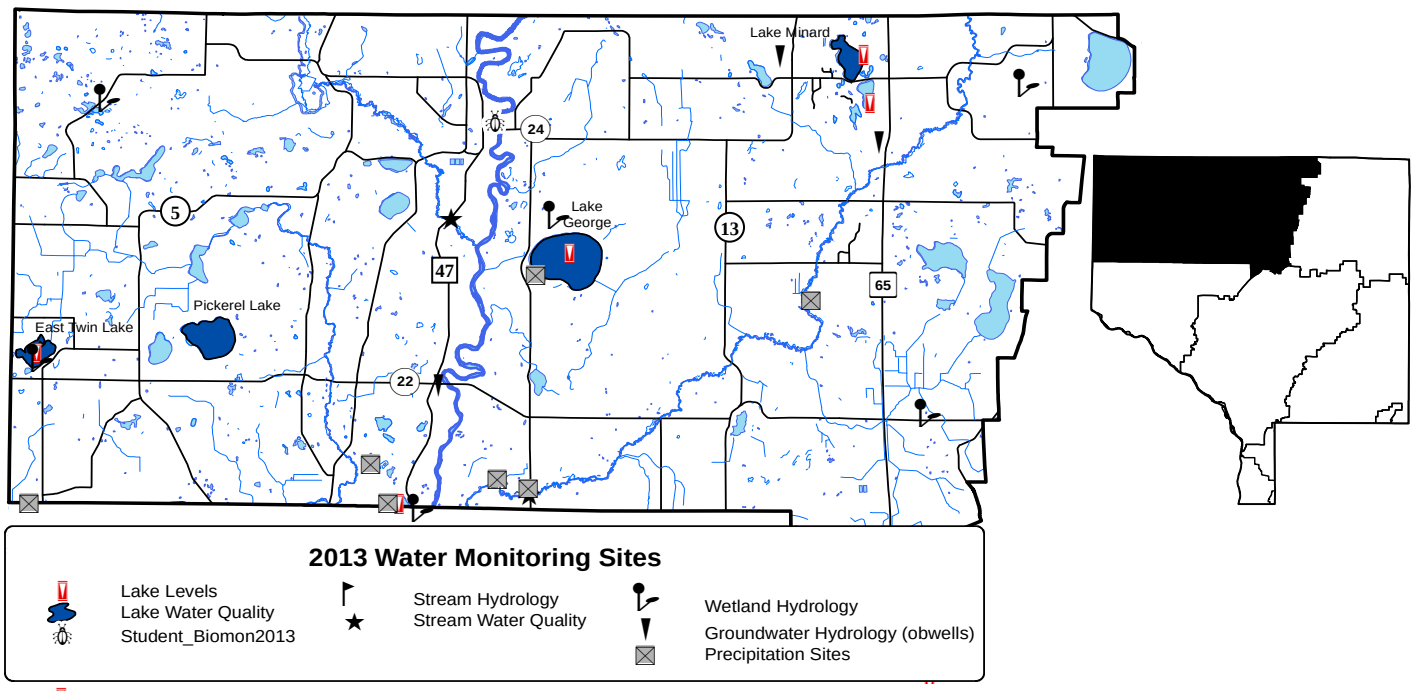
Precipitation	ACD, volunteers	Chapter 1

ACAP = Anoka County Ag Preserves, ACD = Anoka Conservation District,
LRRWMO = Lower Rum River Watershed Mgmt. Org, MC = Metropolitan Council
MNDNR = Minnesota Dept. of Natural Resources, URRWMO = Upper Rum River Watershed Mgmt. Org



Lake Levels

Description: Weekly water level monitoring in lakes. The past five years are shown below, and all historic data are available on the Minnesota DNR website using the "LakeFinder" feature (www.dnr.mn.us.state\lakefind\index.html).

Purpose: To understand lake hydrology, including the impact of climate or other water budget changes. These data are useful for regulatory, building/development, and lake management decisions.

Locations: East Twin Lake, Lake George, Rogers Lake, Minard Lake, Coopers Lake

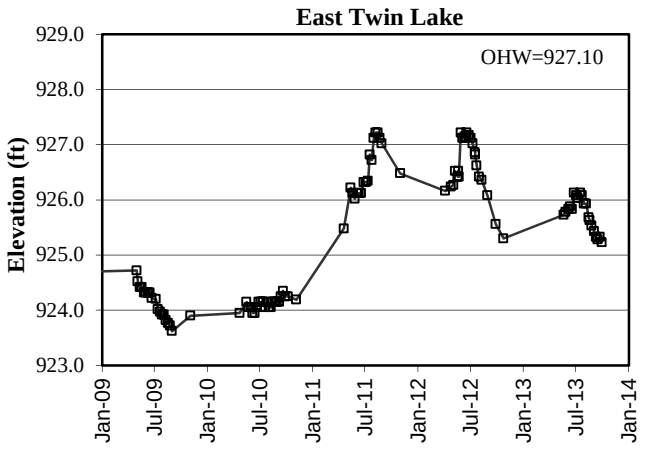
Results: Lake levels were measured by volunteers throughout the 2013 open water season. Lake gauges were installed and surveyed by the Anoka Conservation District and MN DNR. Lakes had sharply increasing water levels in spring and early summer 2013 when heavy rainfall occurred. Little rainfall fell later in the year and lake levels fell dramatically.

All lake level data can be downloaded from the MN DNR website's Lakefinder feature. Ordinary High Water Level (OHW), the elevation below which a DNR permit is needed to perform work, is listed for each lake on the corresponding graphs below.

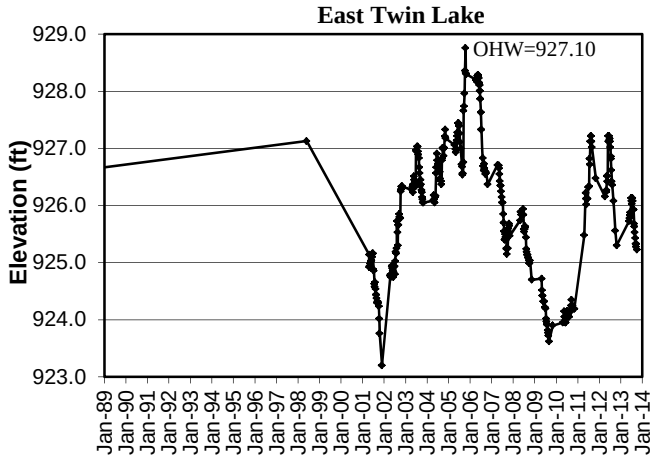
2011 and 2012 were the first years for monitoring Coopers and Minard Lakes. In recent years, there had been complaints about disproportionately low water in Coopers Lake and questions about why Minard Lake did not seem to have this problem. Indeed, both lakes have had similar maximum water levels in spring (Minard slightly higher because it is upstream). But Coopers Lake level drops rapidly by several feet in dry conditions, while Minard Lake is maintained higher. Additionally in 2013 Minard Lake saw a quick and dramatic late season rise in elevation due to dewatering projects to the east sending groundwater into the lake.

The reasons for differences between Minard and Coopers Lake are likely due to both the elevation of the culvert between the lakes, as well as differences in geology and groundwater interaction. Minard Lake can flow into Coopers Lake through a road culvert when the water is high enough. More often, Minard Lake does not outflow. It therefore maintains higher water even during drought. Coopers Lake can have surface water outflows at lower elevations; it drains to wetlands south of the lake. At very low water levels surface water runout from Coopers Lake also ceases but lake levels continue to drop. Anoka County LiDAR confirms this, suggesting geology and groundwater connections also are important.

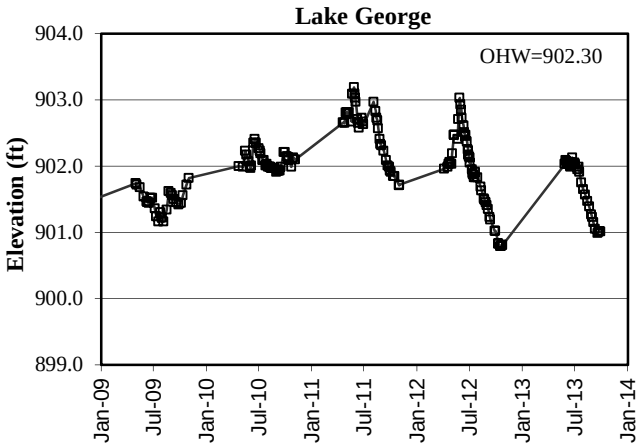
East Twin Lake Levels – last 5 years



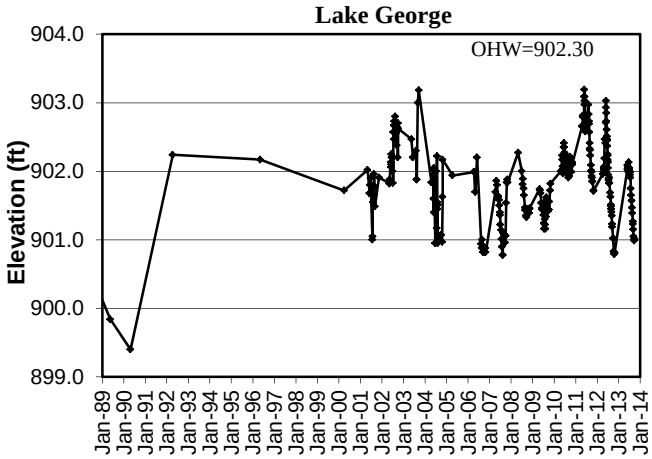
East Twin Lake Levels – last 25 years



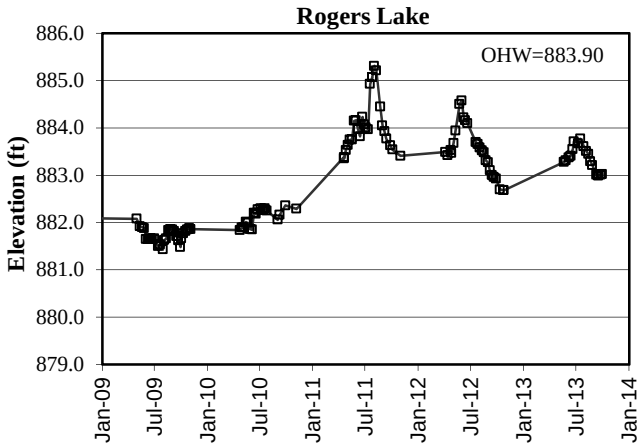
Lake George Levels – last 5 years



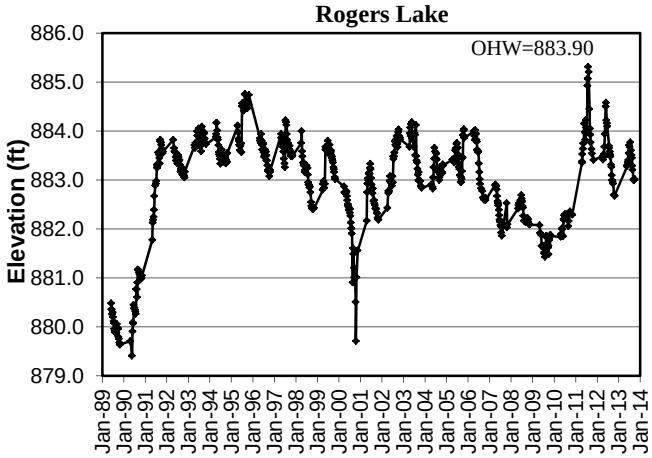
Lake George Levels – last 25 years



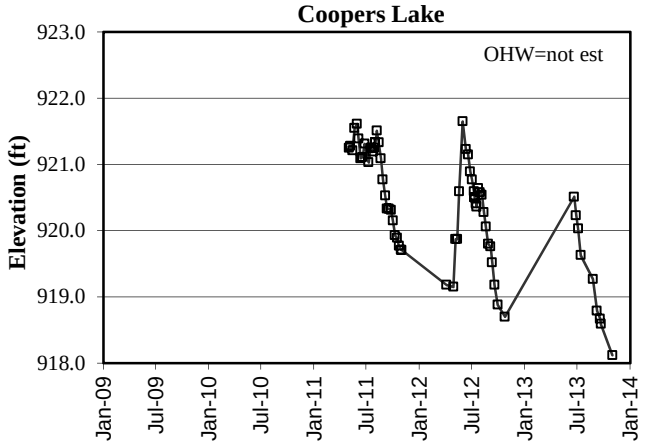
Rogers Lake Levels – last 5 years



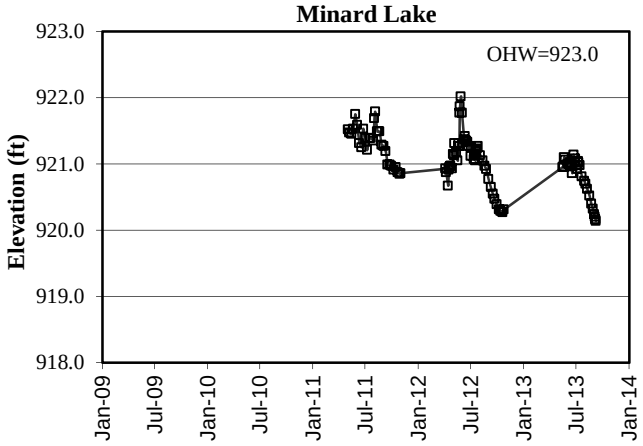
Rogers Lake Levels – last 25 years



Coopers Lake Levels – last 5 years



Minard Lake Levels – last 5 years



Lake Water Quality

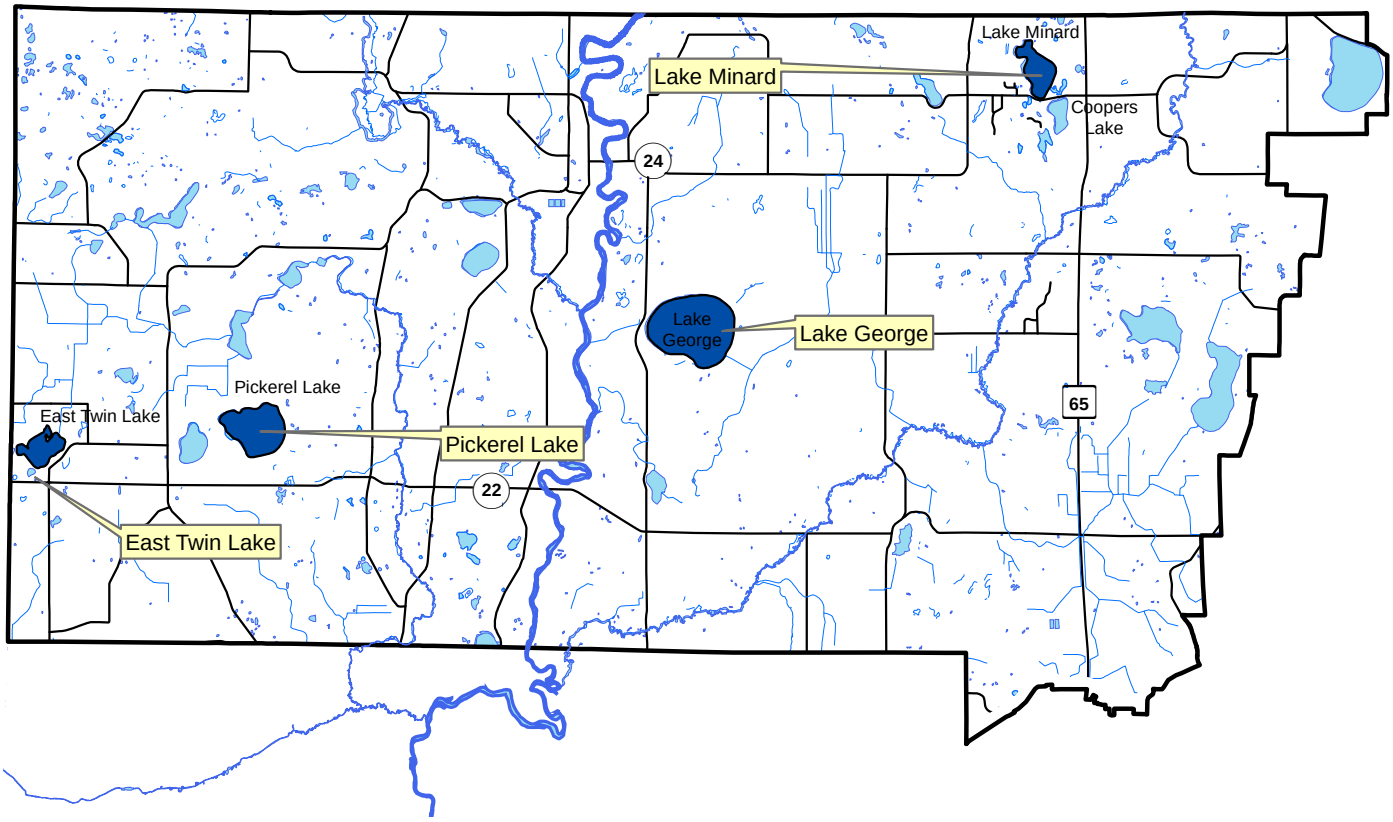
Description: May through September twice-monthly monitoring of the following parameters: total phosphorus, chlorophyll-a, Secchi transparency, dissolved oxygen, turbidity, temperature, conductivity, pH, and salinity.

Purpose: To detect water quality trends and diagnose the cause of changes.

Locations: East Twin Lake
Lake George
Lake Minard
Pickerel Lake

Results: Detailed data for each lake are provided on the following pages, including summaries of historical conditions and trend analysis. Previous years' data are available at the MPCA's electronic data access website. Refer to Chapter 1 for additional information on interpreting the data and on lake dynamics.

Upper Rum River Watershed Lake Water Quality Monitoring Sites



East Twin Lake

City of Nowthen, Lake ID # 02-0133

Background

East Twin Lake is located on Anoka County's western boarder in the City of Nowthen. The lake has a surface area of 116 acres with a maximum depth of 77 feet (20.1 m), making it Anoka County's deepest lake. Public access is from East Twin Lake City Park, where there is both a swimming beach and boat launch. The lakeshore is only moderately developed, with residences being mostly of low density and encompassing about half of the lake. The watershed is >75% undeveloped, with low-density residential areas. This lake is one of the clearest in the county. One exotic invasive plant is known to this lake, curly-leaf pondweed.

2013 Results

In 2013 East Twin Lake had excellent water quality for this region of the state (NCHF Ecoregion), receiving an overall A grade; the same as in 13 of the previous 14 years monitored. The lake is mesotrophic. Of particular notability is the 19.1 ft. Secchi transparency on June 12, 2013 and other exceptional clarity readings of 18.7 ft. in May of 2011, 22 ft. on May 28, 2008 and 20 ft. in spring 2002; these are the deepest at any Anoka County lake since at least 1996. Even later in summer, transparency is sometimes >10 ft. In 2013 Secchi transparency readings never fell below 10 ft. Throughout summer total phosphorus started high (>30 ug/L), then fell gradually to a summer low (17 ug/L) until late summer when it bounced back upward (28 ug/L). Chlorophyll-a was consistently at <5 ug/L. These are low and considered excellent. Subjective observation by ACD staff ranked physical and recreational conditions optimal.

Trend Analysis

Thirteen years of water quality data have been collected by the Metropolitan Council (1980, '81,'83, '95, and '98), the Minnesota Pollution Control Agency (1989), and the Anoka Conservation District (1997, '99, 2000, 2002, 2005, 2008, 2011, and 2013). Trend analyses up to 2008 found water quality significantly improved since 1980 (repeated measures MANOVA with response variables TP, Cl-a, and Secchi depth, $F_{2,9}= 7.31$, $p=0.01$). The most obvious differences are from the 1980's data and the post-1980's data. One-way ANOVAs revealed that reduction in chlorophyll-a continues to be the most important factor in this trend, but total phosphorus reductions also occurred. Secchi transparency changes have been minimal. The analysis with 2013 data finds that the trend is continuing to be statistically significant ($F_{2,11}= 4.14$, $p=0.046$). This suggests that water quality in East Twin is improving.

Discussion

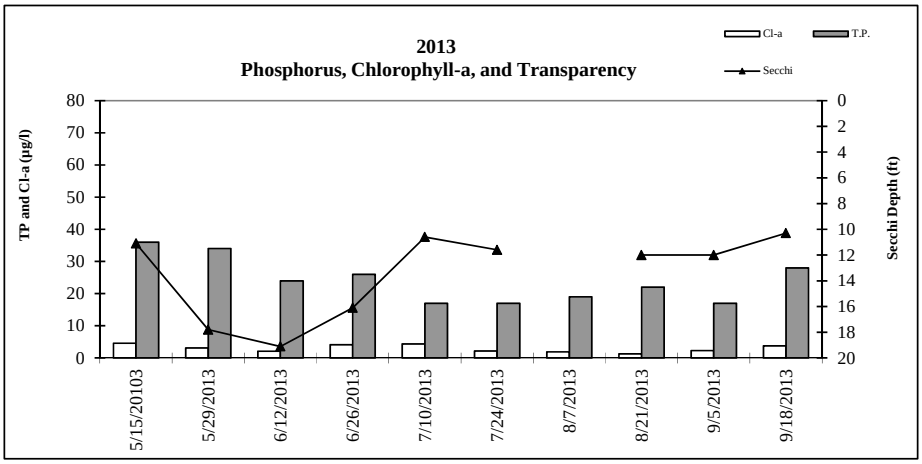
The ecology of this lake is different from that of many other Anoka County Lakes because it is deep. Sediment and dead algae can sink to the bottom and are essentially lost from the system because resuspension by wind, rough fish, and other forces is minimal. In shallower lakes, these nutrients circulate within the lake much more readily and the lake sediments can be a source of nutrients and turbidity that affect water quality. Additionally, East Twin Lake's direct watershed is small, so there is a small area from which polluted runoff might enter the lake. Aquatic vegetation is also healthy, but not so prolific as to be a nuisance, further contributing to high water quality. One exotic invasive plant is present in the lake, curly leaf pondweed (CLP), though its growth is moderate and restricted in extent due to lake depth. CLP however, unlike most vegetation does not contribute to increasing water quality.

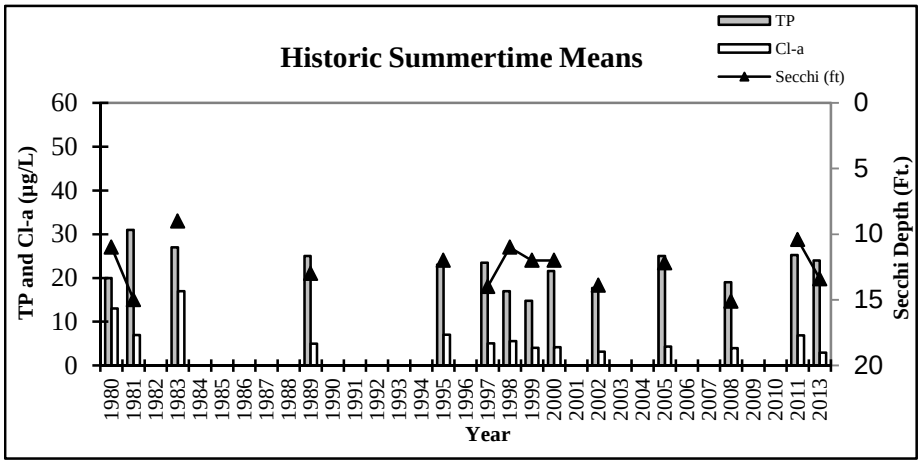
East Twin Lake Water Quality Results

East Twin Lake
2013 Water Quality Data

	Units	R.L.*	5/15/20103 Results	5/29/2013 Results	6/12/2013 Results	6/26/2013 Results	7/10/2013 Results	7/24/2013 Results	8/7/2013 Results	8/21/2013 Results	9/5/2013 Results	9/18/2013 Results	Average	Min	Max
pH		0.1	8.25	8.14	8.39	8.72	8.32	7.77	8.13	8.23	8.00	7.91	8.19	7.77	8.72
Conductivity	mS/cm	0.01	0.142	0.186	0.177	0.170	0.171	0.169	0.165	0.196	0.206	0.210	0.179	0.142	0.210
Turbidity	NTU	1	2.00	0.00	0.50	0.00	0.30	0.04	1.20	0.00	0.00	0.90	0.49	0.00	2.00
D.O.	mg/L	0.01	12.11	8.66	9.06	9.27	8.50	6.93	7.94	8.86	7.97	8.04	8.73	6.93	12.11
D.O.	%	1	121%	92%	98%	118%	107%	84%	93%	111%	98%	89%	101%	84%	121%
Temp.	°C	0.1	14.8	17.1	18.8	26.7	25.8	25.4	23.2	25.3	24.1	19.3	22.0	14.8	26.7
Temp.	°F	0.1	58.6	62.8	65.8	80.1	78.4	77.7	73.7	77.5	75.4	66.8	71.7	58.6	80.1
Salinity	%	0.01	0.00	0.09	0.09	0.08	0.08	0.08	0.08	0.10	0.10	0.10	0.08	0.00	0.10
Cl-a	ug/L	0.5	4.6	3.1	2.1	4.1	4.4	2.2	1.9	1.3	2.3	3.8	3.0	1.3	4.6
T.P.	mg/L	0.010	0.036	0.034	0.024	0.026	0.017	0.017	0.019	0.022	0.017	0.028	0.024	0.017	0.036
T.P.	ug/L	10	36	34	24	26	17	17	19	22	17	28	24	17	36
Secchi	ft	0.1	11.1	17.8	19.1	16.1	10.6	11.6		12.0	12.0	10.3	13.4	10.3	19.1
Secchi	m	0.1	3.4	5.4	5.8	4.9	3.2	3.5	0.0	3.7	3.7	3.1	4.1	3.1	5.8
Physical			1.0	1.0	1.0	1.0	1.0	2.0	1.0	1.0	1.0	1.0	1.1	1.0	2.0
Recreational			1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

*reporting limit





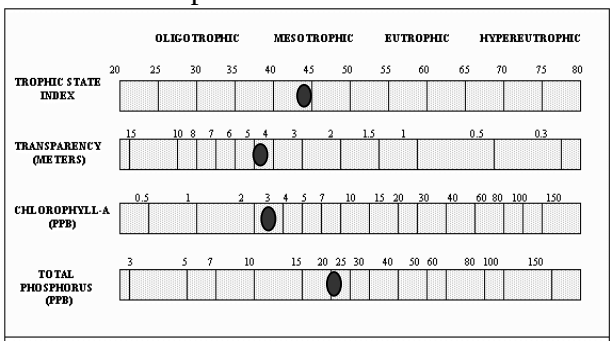
East Twin Lake Summertime Annual Mean

Agency	MC	MC	MC	MPCA	MC	ACD	MC	ACD	ACD	ACD	ACD	ACD	ACD	ACD
Year	1980	1981	1983	1989	1995	1997	1998	1999	2000	2002	2005	2008	2011	2013
TP	20.0	31.0	27.0	25.0	23.0	23.5	17.0	14.8	21.6	17.7	25.0	19.0	25.2	24.0
Cl-a	13.0	7.0	17.0	5.0	7.1	5.1	5.6	4.1	4.2	3.2	4.3	4.0	6.9	3.0
Secchi (m)	3.3	4.7	2.7	4.1	3.5	4.2	3.4	3.6	3.7	4.3	3.7	4.6	3.2	4.1
Secchi (ft)	11.0	15.0	9.0	13.0	12.0	14.0	11.0	12.0	12.0	13.9	12.2	15.1	10.4	13.4
Carlson's Tropic State Indices														
TSIP	47	54	52	51	49	50	45	43	48	45	51	47	51	50
TSIC	56	50	58	46	50	47	48	44	45	40	45	44	50	41
TSIS	43	38	46	40	42	39	42	42	41	40	41	38	43	40
TSI	49	47	52	46	47	45	45	43	45	42	46	43	48	44

East Twin Lake Water Quality Report Card

Year	80	81	83	89	95	97	98	99	2000	2002	2005	2008	2011	2013
TP	A	B	B	B	B	B	B	A	A	A	B	A	B	B
Cl-a	B	A	B	A	A	A	A	A	A	A	A	A	A	A
Secchi	A	A	B	A	A	A	A	A	A	A	A	A	A	A
Overall	**A**	**A**	**B**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**

Carlson's Trophic State Index



Lake George

CITY OF OAK GROVE, LAKE ID # 02-0091

Background

Lake George is located in north-central Anoka County. The lake has a surface area of 535 acres with a maximum depth of 32 feet (9.75 m). Public access is from Lake George County Park on the lake's north side, where there is both a swimming beach and boat launch. About 70% of the lake is circumscribed by homes; the remainder is county parkland. The watershed is mostly undeveloped or vacant, with some residential areas, particularly on the lakeshore and in the southern half of the watershed. Two invasive exotic aquatic plants are established in this lake, Curly-leaf pondweed and Eurasian Water Milfoil. The lake improvement district treats both with herbicide.

2013 Results

In 2013 Lake George had good water quality for this region of the state (NCHF Ecoregion), receiving an overall B grade, however it was the poorest water quality of all years monitored. The lake is mesotrophic or mildly eutrophic. Total phosphorus averaged 30.3 ug/L, the highest observed in 16 monitored years. Secchi transparency was over 15 feet in mid-May, but dropped to as low as 5.0 feet in late July. Average Secchi transparency was 8.6 feet, the second poorest observed. Chlorophyll-a averaged 6.1 mg/L, which is below the average of all years monitored. Total Phosphorous, Chlorophyll-a, and transparency were poorest in August. Phosphorus also saw a significant spike (77 ug/L) in early June following the treatment of Curly Leaf Pondweed and natural die-off. This is also observable, though not as extreme, in 2011. All other sampled years we see phosphorus levels climb gradually through the season.

2013 water quality was poorer than the Upper Rum River WMO's water quality standards. Those standards are limits which trigger further action from the organization. At this point, their standards call for another season of monitoring. Additional action may be advisable.

Trend Analysis

Fifteen years of water quality data have been collected by the Metropolitan Council (between 1980 and '94, 1998 and 2009) and the Anoka Conservation District (1997, 1999, 2000, 2002, 2005, 2008, 2011 and 2013). Water quality has not significantly changed from 1980 to 2013 (repeated measures MANOVA with response variables TP, Cl-a, and Secchi depth, $F_{2,13}= 0.77$, $p>0.05$). Superficially, it appears that transparency is slowly declining across years.

Discussion

Lake George remains one of the clearest of Anoka County Lakes. Lake George and nearby East Twin Lake are valuable resources because of their condition, size, suitability for many types of recreation, and public access. Lake George is especially valuable to Anoka County due to its unique ecosystem. Most metro area lakes have a biodiversity of 10-12 different aquatic plant species; Lake George is home to 24. These will be under continued or increasing stresses from recreational usage and/or development. Continued efforts are needed to maintain the lakes' quality including monitoring, education, and lakeshore and nutrient best management practices. One example is residential lakeshore restorations which have occurred on several properties. Still, many properties on Lake George aggressively manicure their lakeshore in ways that are detrimental to lake health. Around any developed lake failing septic systems can also be a threat to water quality. This concern exists at Lake George, but is reduced because many homes are served by a community sewer system.

Two exotic invasive plants are present in Lake George, Curly leaf pondweed and Eurasian Water milfoil. A Lake Improvement District has been formed to orchestrate control of these plants and multiple years of localized treatments have occurred. Concern has been voiced that plant treatments may have a negative impact on water quality. We can only speculate what the impact may be. Perhaps earlier treatment, a reduction in overall treatment area, or spreading treatments out over a period of time could be used in order to limit any impact the treatment is having. Future monitoring and modified herbicide treatments may provide insight. The lake improvement district, DNR, and Anoka Conservation District are formulating a plan that includes additional water quality monitoring especially before and after herbicide treatments, annual plant surveys, sediment coring to determine internal nutrient loading, examining fish data to determine any possible water quality impacts of fish and management strategies, and treating curly leaf pondweed earlier to minimize water quality impacts that are more likely when water is warmer.

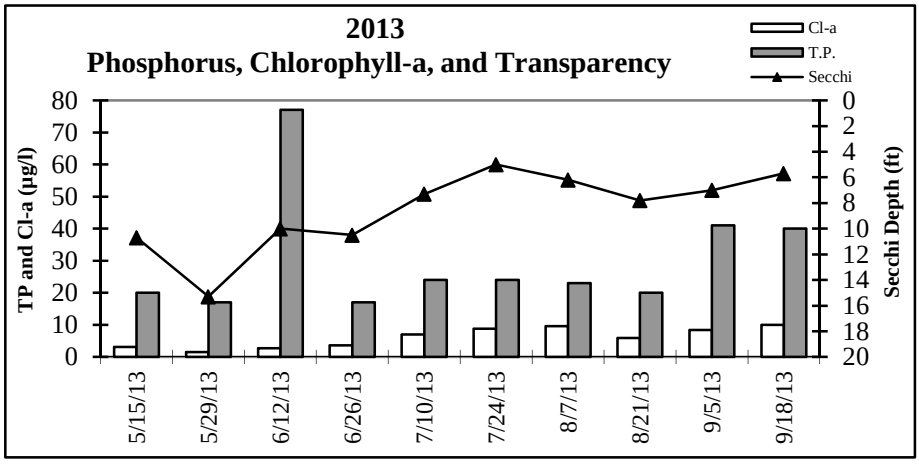
2013 Lake George Water Quality Data

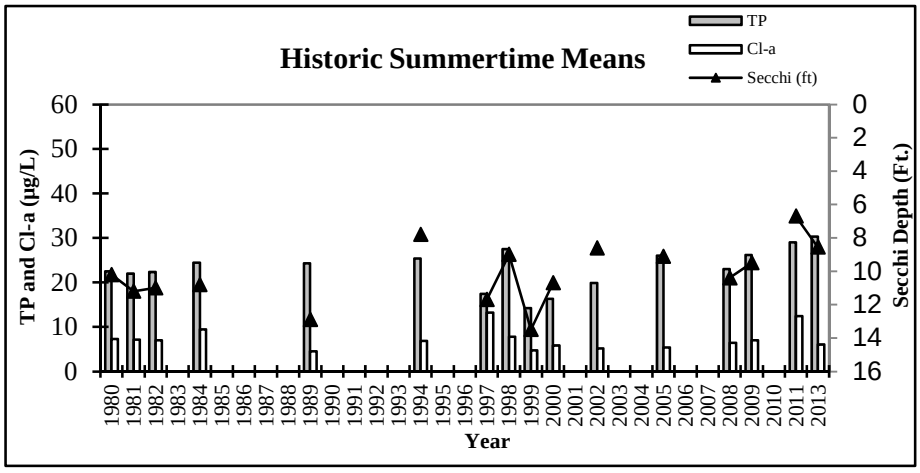
Lake George
2013 Water Quality Data

	Units	R.L.*	5/15/2013 Results	5/29/2013 Results	6/12/2013 Results	6/26/2013 Results	7/10/2013 Results	7/24/2013 Results	8/7/2013 Results	8/21/2013 Results	9/5/2013 Results	9/18/2013 Results	Average	Min	Max
pH		0.1	8.1	8.2	8.56	8.53	8.37	8.86	9.12	9.22	8.96	8.46	8.64	8.10	9.22
Conductivity	mS/cm	0.01	0.154	0.201	0.19	0.188	0.192	0.192	0.186	0.216	0.222	0.229	0.197	0.154	0.229
Turbidity	NTU	1.00	3.00	0.00	1.90	0.00	2.90	5.70	6.60	3.10	3.60	4.60	3.14	0.00	6.60
D.O.	mg/L	0.01	11.85	8.89	9.49	8.57	7.68	8	8.82	9.19	8.81	8.14	8.94	7.68	11.85
D.O.	%	1	114.0%	92.1%	99.2%	105.4%	95.7%	96.6%	102.7%	116.4%	106.4%	91.0%	102%	91%	116%
Temp.	°C	0.1	13	16	18	26	25	25	23	26	23	19	21.4	13.1	25.7
Temp.	°F	0.1	55.6	60.7	64.9	78.2	77.4	77.3	72.9	78.0	74.2	66.4	70.6	55.6	78.2
Salinity	%	0.01	0	0.1	0.09	0.09	0.09	0.09	0.09	0.11	0.11	0.11	0.09	0.00	0.11
Cl-a	ug/L	0.5	3.1	1.5	2.7	3.6	7	8.8	9.6	5.9	8.4	10	6.1	1.5	10.0
T.P.	mg/L	0.010	0.02	0.017	0.077	0.017	0.024	0.024	0.023	0.02	0.041	0.04	0.030	0.017	0.077
T.P.	ug/L	10	20	17	77	17	24	24	23	20	41	40	30	17	77
Secchi	ft	0.1	10.7	15.3	10	10.5	7.3	5	6.2	7.8	7	5.7	8.6	5.0	15.3
Secchi	m	0.03	3.26	4.66	3.05	3.20	2.23	1.52	1.89	2.38	2.13	1.74	2.6	1.5	4.7
Physical			1.0	1.0	1.0	2.0	2.0	2.0	2.0	2.0	3.0	1.0	1.7	1.0	3.0
Recreational			1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

*reporting limit

		2013 Median
pH		8.55
Conductivity	mS/cm	0.192
Turbidity	FNRU	3.05
D.O.	mg/l	8.82
D.O.	%	100.95%
Temp.	°C	23.09
Temp.	°F	73.56
Salinity	%	0.09
Cl-a	ug/L	6.45
T.P.	mg/l	0.02
T.P.	ug/l	23.50
Secchi	ft	7.55
Secchi	m	2.30





Lake George Summertime Annual Means

Agency	MC	MC	MC	MC	MC	MC	ACD	MC	ACD	ACD	ACD	ACD	ACD	MC	MC	ACD
Year	1980	1981	1982	1984	1989	1994	1997	1998	1999	2000	2002	2005	2008	2009	2011	2013
TP	22.5	22.0	22.3	24.4	24.3	25.4	17.4	27.5	14.2	16.3	19.9	26.0	23.0	26.2	29.0	30.3
Cl-a	7.3	7.1	7.0	9.5	4.5	6.9	13.2	7.8	4.8	5.8	5.2	5.4	6.4	7.0	12.4	6.1
Secchi (m)	3.1	3.4	3.4	3.3	3.9	2.4	3.6	2.7	4.1	2.8	2.6	2.8	3.2	2.9	1.8	2.6
Secchi (ft)	10.2	11.2	11.0	10.8	12.9	7.8	11.7	9.0	13.5	10.7	8.6	9.1	10.4	9.5	6.7	8.6

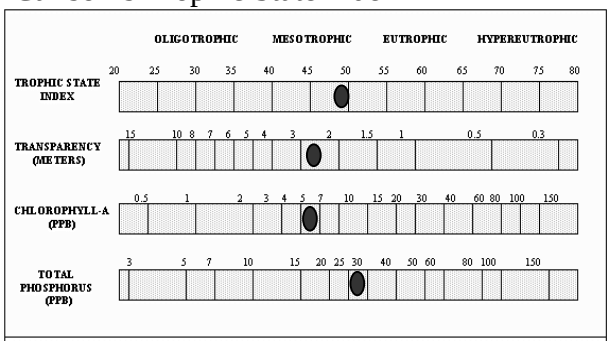
Carlson's Tropic State Indices

TSIP	49	49	49	50	50	51	45	52	42	44	47	51	49	51	53	53
TSIC	50	50	50	53	45	50	56	51	46	48	47	47	49	50	55	48
TSIS	44	42	43	43	40	48	42	45	40	45	46	45	43	45	52	46
TSI	48	47	47	49	45	49	48	49	43	46	47	48	47	49	53	49

Lake George Water Quality Report Card

Year	80	81	82	84	89	94	97	98	99	2000	2002	2005	2008	2009	2011	2013
TP	A	A	A	B	B	B	A	B	A	A	A	B	B+	B	B	B
Cl-a	A	A	A	A	A	A	B	A	A	A	A	A	A	A	B	A
Secchi	A	A	A	A	A	B	A	B	A	B	B	B	A	B	C	B
Overall	**A**	**A**	**A**	**A**	**A**	**B**	**A**	**B**	**A**	**A**	**A**	**B**	**A**	**B**	**B**	**B**

Carlson's Trophic State Index



MINARD LAKE
CITY OF EAST BETHEL, LAKE ID # 02-0067

Background

Minard Lake is located in the northern portion of the county near the City of Bethel. Public access is available only along the right of way of 237th Avenue. According to the MNDNR Lakes Database, Minard Lake has a surface area of 135 acres with a maximum depth of 7.0 feet (2.13 m). Aquatic plants grow to near the surface on much of the lake, though no invasive species were noted during 2013 sampling. The watershed is mostly undeveloped or vacant, with some residential areas on the East side of the watershed.

In 2013 this lake was monitored by the Anoka Conservation District as part of the MPCA's Rum River Watershed Restoration and Protection Project (WRAP).

2013 Results

In 2013, the overall water quality grade for Minard Lake was an A grade. The limited data available indicates that the lake is mesotrophic. In 2013 the average surface total phosphorus (TP) concentration was 23 µg/l (maximum of 35 µg/l and a minimum of 10 µg/l) receiving an A grade. The average Chlorophyll-a (Cl-a) concentration was 1.5 µg/l (maximum of 2.2 µg/l and a minimum of 1.0 µg/l) receiving an A grade. The average Secchi disk measurement was 4.7 feet (maximum of 5 ft. and a minimum of 4.2 ft.) receiving a D grade, though this is not an accurate measure of transparency because readings often could not be taken because transparency was greater than the depth at which plants obscured measurements. Therefore, Secchi transparency is not included in the overall grade for the lake.

Trend Analysis

Insufficient historical data available to conduct any trend analysis. Aside from 2013, the only available data are Secchi transparency readings from 1990, 1991, and 2008. Those readings are similar to 2013.

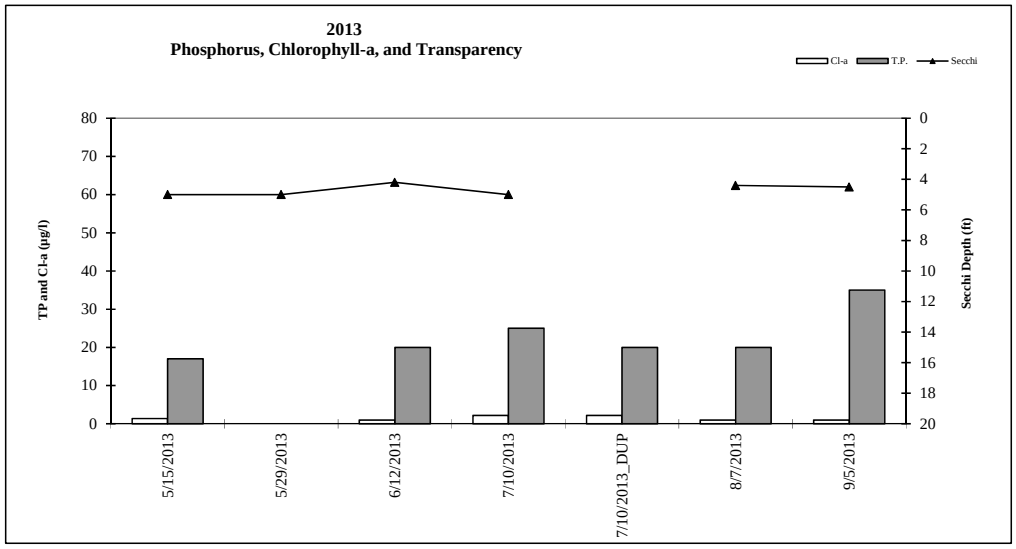
Discussion

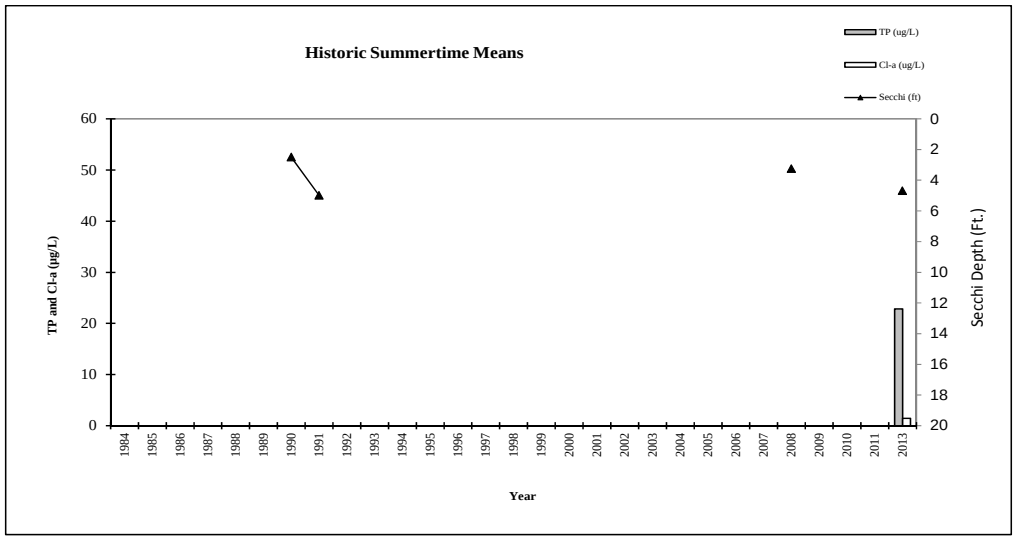
During each sampling event, the recreational suitability and physical conditions were evaluated. These rankings are based on the subjective perception of ACD staff regarding the appearance of the lake. The physical condition of the lake was consistently perceived as having an abundance of aquatic vegetation. This vegetation has a negative impact on recreation, but is indicative of a healthy shallow lake.

2013 Minard Lake Water Quality Data

Lake Minard	Units	R.L.*	5/15/2013 Results	5/29/2013 Results	6/12/2013 Results	7/10/2013 Results	7/10/2013_DUP Results	8/7/2013 Results	9/5/2013 Results	Average	Min	Max
pH		0.1	8.4	7.18	7.75	8.64		9.63	8.68	8.38	7.18	9.63
Conductivity	mS/cm	0.01	0.105	0	0.144	0.119		0.125	0.188	0.114	0.000	0.188
Turbidity	NTU	1	2	0.2	42.5	1.2		1.8	3	8	0	43
D.O.	mg/L	0.01	9.75	10.4	7.5	8.48		9.45	11.72	9.55	7.50	11.72
D.O.	%	1	98.0%	107.1%	35.2%	104.6%		112.1%	136.9%	99%	35%	137%
Temp.	°C	0.1	16	21	18	24		23	22	20.7	16.0	24.5
Temp.	°F	0.1	60.8	69.0	64.8	76.0		73.5	71.1	56.8	32.0	76.0
Salinity	%	0.01	0	0.01	0.07	0.06		0.06	0.09	0.05	0.00	0.09
Cl-a	ug/L	0.5	1.4		1	2.2	2.2	1	1	1.5	1.0	2.2
T.P.	mg/L	0.010	0.017		0.02	0.025	0.02	0.02	0.035	0.023	0.017	0.035
T.P.	ug/L	10	17	0	20	25	20	20	35	13.7	0.0	35.0
Secchi	ft	0.1	5	5	4.2	>5.0		4.4	>4.5	4.7	4.2	5.0
Secchi	m	0.1	1.52	1.52	1.28	>1.50		1.34	>1.40	1.43	0.00	1.52
Physical			1.0	1.0	1.0	1.0		2.0	1.0	1.2	1.0	2.0
Recreational			1.0	1.0	2.0	3.0		3.0	4.0	2.3	1.0	4.0

*reporting limit





Lake Minard Summertime Historic Mean

Agency	ACD	ACD	ACD	ACD	ACD	ACD	ACD	ACD	ACD
Year	1998	1999	2000	2002	2004	2007	2008	2010	2013
TP (µg/L)									22.8
Cl-a (µg/L)									1.5
Secchi (m)							1.0		1.4
Secchi (ft)							3.2		4.7

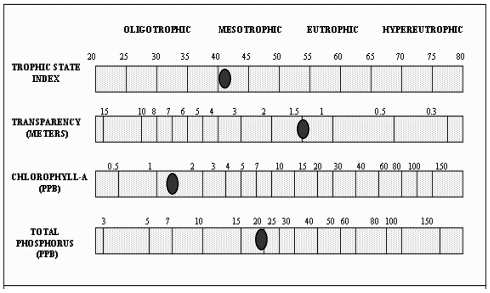
Carlson's Tropic State Indices

Year	1998	1999	2000	2003	2005	2007	2008	2010	2012
TSIP									49
TSIC									34
TSIS							60		55
TSI							60		42

Lake Minard Water Quality Report Card

Year	1998	1999	2000	2003	2005	2007	2008	2010	2013
TP (µg/L)									A
Cl-a (µg/L)									A
Secchi (m)									n/a
Overall									**A**

Carlson's Trophic State Index



The depth of Minard Lake and its aquatic vegetation prohibited representative Secchi disk measurements. This parameter was not included in the overall grade for the lake or the TSI for the data presented here.

PICKEREL LAKE
CITY OF NOWTHEN, LAKE ID # 02-0130

Background
Pickerel Lake is located in the northwest portion of the county. According to the MNDNR Lakes Database, Pickerel Lake has a surface area of 250 acres with a maximum depth of 5.5 feet (1.67 m). A public access is provided at the south end of the lake. Because of the shallow lake depth, recreation is limited to fishing and waterfowling.

In 2013 this lake was monitored by the Anoka Conservation District as part of the MPCA's Rum River Watershed Restoration and Protection Project (WRAP).

2013 Results
In 2013, Pickerel Lake had above average water quality, receiving a B+ grade. The average surface total phosphorus (TP) concentration was 29 μg/l (maximum of 78 μg/l and a minimum of 15 μg/l) receiving a B grade. TP was slightly above the historical average and the highest monitored since 2000. The average Chlorophyll-a (Cl-a) concentration was 4.1 μg/l (maximum of 9.4 μg/l and a minimum of 2.2 μg/l) falling well below the historical average and receiving an A grade. The average Secchi transparency measurement was 5.1 feet (maximum of 6 ft. and a minimum of 4.0 ft.) receiving a C grade. The shallow depth of the lake and aquatic vegetation prohibited representative Secchi disk measurements so this parameter was not included in the overall grade for the lake.

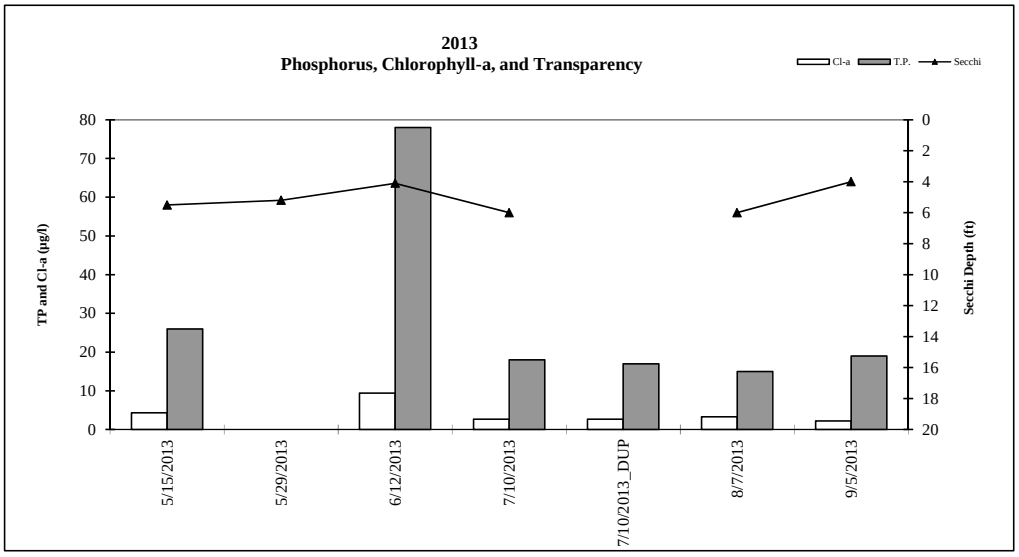
Trend Analysis
Nine years of water quality data have been collected by the Metropolitan Council (1980, 1995, 2010 and 2011) and the Anoka Conservation District (1997, 1998, 1999, 2000, and 2013). Water quality has not significantly changed from 1980 to 2013 (repeated measures MANOVA with response variables TP, Cl-a, and Secchi depth, $F_{2,6}$= 1.02, p>0.05).

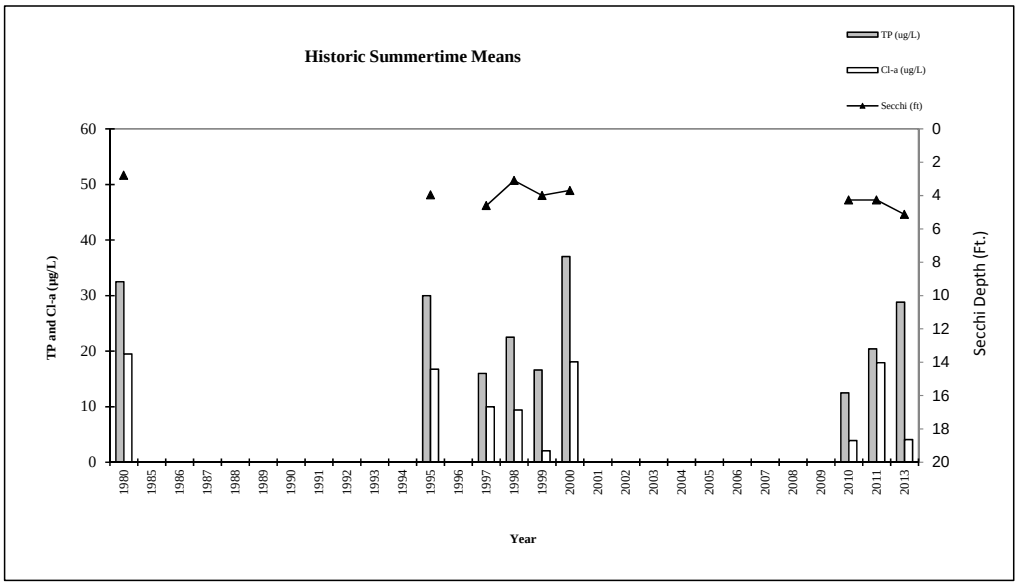
Discussion
In 2013 the physical condition of the lake was consistently perceived as beautiful with occasional aesthetic issues. In terms of recreational suitability, Pickerel Lake is limited due to the abundance of rooted aquatic vegetation. This is to be expected in a healthy shallow lake, and is not problematic.

2013 Pickerel Lake Water Quality Data

Pickerel Lake	Units	R.L.*	5/15/2013 Results	5/29/2013 Results	6/12/2013 Results	7/10/2013 Results	7/10/2013_DUP Results	8/7/2013 Results	9/5/2013 Results	Average	Min	Max
pH		0.1	8.27	8.53	8.71	8.82		9.38	9.36	8.85	8.27	9.38
Conductivity	mS/cm	0.01	0.171	0.221	0.213	0.182		0.152	0.186	0.188	0.152	0.221
Turbidity	NTU	1	4	3	6.3	4		4.5	1.3	4	1	6
D.O.	mg/L	0.01	10.34	9.225	9.25	8.48		8.78	11.47	9.59	8.48	11.47
D.O.	%	1	105	106	101.3	106.1		102.7	138.5	109.93	101.3	138.5
Temp.	°C	0.1	16	17	19	25		23	24	20.9	16.4	25.2
Temp.	°F	0.1	61.5	63.4	66.8	77.4		73.7	74.4	69.5	32.0	77.4
Salinity	%	0.01	0	0.11	0.1	0.09		0.07	0.09	0.08	0.00	0.11
Cl-a	ug/L	0.5	4.3		9.4	2.7	2.7	3.3	2.2	4.1	2.2	9.4
T.P.	mg/L	0.010	0.026		0.078	0.018	0.017	0.015	0.019	0.029	0.015	0.078
T.P.	ug/L	10	26	0	78	18	17	15	19	28.8	0.0	78.0
Secchi	ft	0.1	5.5	5.2	4.1	>6		>6	>4	5.1	4.0	6.0
Secchi	m	0.1	1.68	1.58	1.25	>1.83		>1.83	>1.22	1.56	0.00	1.83
Physical			1.0	1.0	1.0	2.0		2.0	1.0	1.3	1.0	2.0
Recreational			1.0	1.0	2.0	1.0		3.0	1.0	1.5	1.0	3.0

*reporting limit





Lake Pickerel Summertime Historic Mean (Used MPCA data collected at 1 meter or less only)

Agency	MC	MC	ACD	ACD	ACD	ACD	MC	CLMP	ACD
Year	1980	1995	1997	1998	1999	2000	2010	2011	2013
TP (µg/L)	32.5	30.0	16.0	22.5	16.6	37.0	12.5	20.4	28.8
Cl-a (µg/L)	19.5	16.7	10.0	9.4	2.1	18.1	3.9	17.9	4.1
Secchi (m)	0.9	1.2	1.4	0.9	1.2	1.1	1.3	1.3	1.6
Secchi (ft)	2.8	4.0	4.6	3.1	4.0	3.7	4.3	4.3	5.1

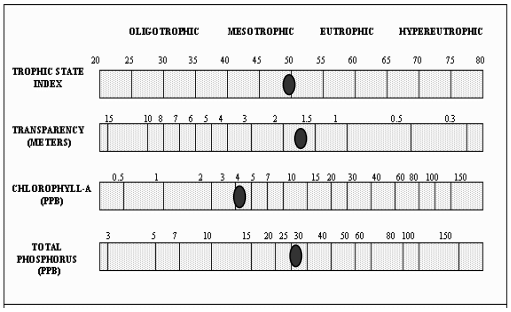
Carlson's Tropic State Indices

Year	1980	1995	1997	1998	1999	2000	2010	2011	2013
TSIP	54	53	44	49	45	56	41	48	53
TSIC	60	58	53	53	38	59	44	59	45
TSIS	62	57	55	61	57	58	56	56	54
TSI	59	56	51	54	47	58	47	54	50

Lake Pickerel Water Quality Report Card

Year	1980	1995	1997	1998	1999	2000	2010	2011	2013
TP (µg/L)	C	B	A	A	B	C	A	A	B
Cl-a (µg/L)	B	B	A	A	B	B	A	B	A
Secchi (m)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Overall	**C**	**B**	**A**	**A**	**B**	**C**	**A**	**B+**	**B+**

Carlson's Trophic State Index



Stream Water Quality - Chemical Monitoring

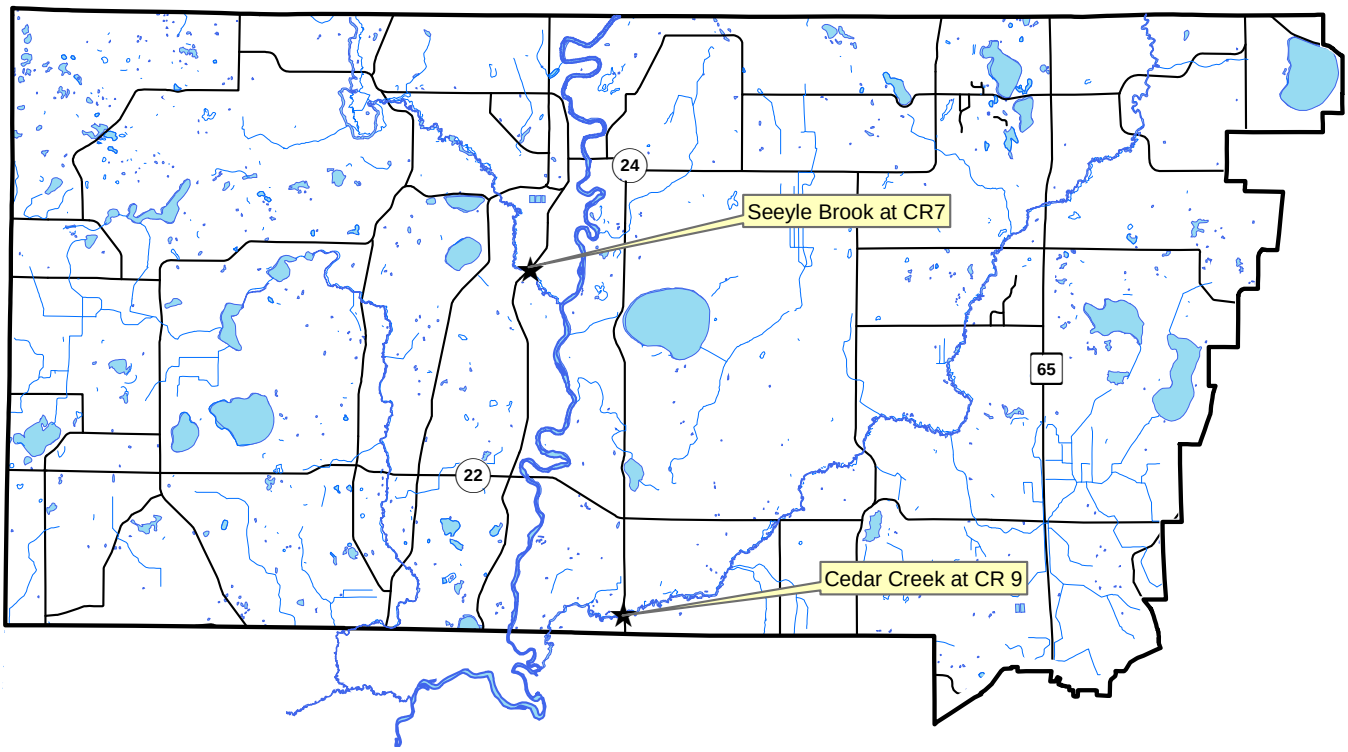
Description: The Anoka Conservation District (ACD) is conducting Surface Water Assessment Grant (SWAG) monitoring for the MPCA in 2013 and 2014. Monitoring events are scheduled May through September for of the following parameters: total suspended solids, chlorides, sulfate, hardness, calcium, magnesium, nitrogen-ammonia, total kjeldahl nitrogen, nitrate & nitrite, volatile suspended solids, e. coli, total phosphorus, Secchi tube transparency, dissolved oxygen, turbidity, temperature, conductivity, pH, and salinity.

Purpose: To provide an initial assessment of water quality to be used in the completion of the Rum River Watershed Restoration and Protection Plan (WRAPP).

Locations: Cedar Creek at CR 9
Seeyle Brook at CR 7

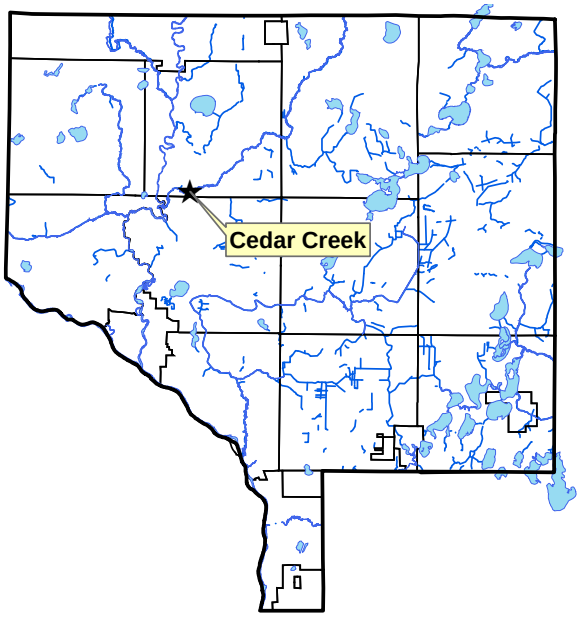
Results: Results are presented on the following pages.

Upper Rum River Watershed SWAG Water Quality Monitoring Sites



CEDAR CREEK

at Hwy 9, Oak Grove



Background

Cedar Creek originates in south-central Isanti County and flows south. Cedar Creek is a tributary to the Rum River. In north-central Anoka County it flows through some areas of high quality natural communities, including the Cedar Creek Ecosystem Science Reserve. Habitat surrounding the stream in other areas is of moderate quality overall.

Cedar Creek is one of the larger streams in Anoka County. Stream widths of 25 feet and depths greater than 2 feet are common at baseflow. The stream bottom is primarily silt. The watershed is moderately developed with scattered single family homes, and continues to develop rapidly.

Results and Discussion

This report includes data from 2013. A reason this monitoring is being performed is due to the lack of historical data for the state to determine if the creek is meeting state water quality standards. That assessment process is part of the Rum River Watershed Restoration and Protection Project (WRAPP). The following is a summary of results.

- Dissolved constituents, as measured by conductivity and chlorides, in Cedar Creek were average when compared to similar Anoka County streams. Conductivity averaged 0.362 mS/cm Maximum of 0.474 mS/cm and a minimum of 0.201 mS/cm). Chlorides averaged 26 mg/l (maximum of 32 mg/l and a minimum of 17 mg/l).
- Phosphorous averaged over the proposed MPCA water quality standard of 100 ug/l. If the proposed standard is approved Cedar Creek often exceeds the limit, even during baseflow periods. Phosphorous results in Cedar Creek averaged 130 ug/l (maximum of 239 ug/l and a minimum of 75 ug/l).
- Suspended solids and turbidity both stayed below the state standards each sampling event and averaged well below the standards. Total suspended solids averaged 13 mg/l (maximum of 26 mg/l and a minimum of 4 mg/l). Turbidity averaged 7.76 NTU (maximum of 16.30 NTU and a minimum of 1.60 NTU).
- pH and dissolved oxygen were with the range considered normal and healthy for streams in this area. However, on one sampling occasion DO fell below the 5.0 mg/l. While this sampling event did fall below the daily average standard, it did not exceed the daily minimum. pH averaged 8.15 (maximum of 8.67 and a minimum of 7.54). DO averaged 7.60 mg/l (maximum of 10.25 mg/l and a minimum of 4.51 mg/l).

For a significant number of the results below there are no current state standards. However, this data will be used as a baseline for future assessments of the watershed.

Grey Columns indicate events with E.coli samples only.

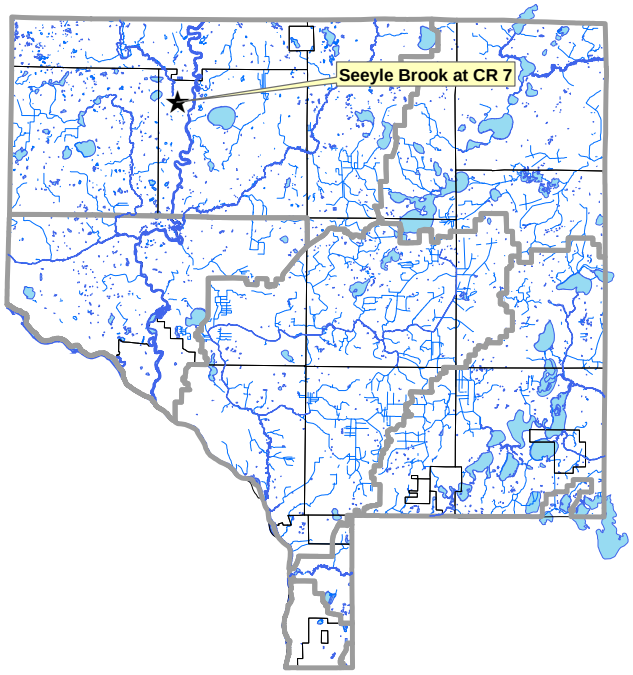
Cedar Creek at CR 9			4/30/2013	5/21/2013	6/5/2013	6/17/2013	6/25/2013	7/2/2013	7/15/2013	7/23/2013
	Units	R.L.*	Results	Results	Results	Results	Results	Results	Results	Results
pH		0.1	7.76	8.00	7.99	8.67	7.54	7.92	7.83	8.14
Conductivity	mS/cm	0.01	0.201	0.210	0.358	0.365	0.286	0.354	0.372	0.394
Turbidity	NTU	1	3.0	8.0	16.3	14.2	8.5	14.1	10.6	10.3
D.O.	mg/L	0.01	6.28	6.10	7.93	7.12	4.51	6.97	7.40	7.97
D.O.	%	1	61.0	61.7	75.3	76.6	50.8	75.8	82.9	87.5
Temp.	°C	0.1	14.70	16.00	13.64	18.50	20.88	19.60	21.37	20.07
Salinity	%	0.01	0.00	0.00	0.17	0.12	0.14	0.17	0.18	0.19
T.P.	ug/L	10	75	132	201		194	239		163
TSS	mg/L	2	13	20	24		26	23		13
Cl	mg/L		19.1	23.2	26.9		17.1	22.0		26.2
Sulfate	mg/L		22.2	20.7	20.5		14.8	15.2		14.6
Hardness CaCO3	mg/L		125	133	171		142	194		205
Calcium	mg/L		36.20	39.00	50		41	56		58
Magnesium	mg/L		8.39	8.55	11.20		9.57	13.10		14.90
Secchi-tube	cm		>100	>100	77	67	>100	61	86	78
Nitrogen, Ammonia	mg/L		<0.16	0.37	<0.16		<0.16	<0.16		0.23
TKN	mg/L		1.0	2.0	1.5		2.4	1.8		1.3
Nitrate plus Nitrite	mg/L		0.24	0.62	0.54		0.30	0.41		0.43
VSS	mg/L	2	4	10	15		14	15		10
E coli	MPN				260.0	178.9	172.2	235.9	547.5	344.8
Appearance			1B	1B	3	1B	1B	2	1B	2
Recreational			2	2	2	2	1	1	1	1

			8/6/2013	8/6/2013_DUP	8/19/2013	8/27/2013	9/4/2013	9/25/2013			
	Units	R.L.*	Results	Results	Results	Results	Results	Results	Average	Min	Max
pH		0.1	8.32		8.51	8.44	8.38	8.46	8.15	7.54	8.67
Conductivity	mS/cm	0.01	0.382		0.380	0.467	0.474	0.464	0.362	0.201	0.474
Turbidity	NTU	1	5.2		3.1	1.6	2.5	3.5	7.76	1.60	16.30
D.O.	mg/L	0.01	8.35		8.89	7.29	9.73	10.25	7.60	4.51	10.25
D.O.	%	1	86.9		99.1	91.1	102.7	102.3	81.1	50.8	102.7
Temp.	°C	0.1	17.08		19.24	24.75	16.67	14.06	18.2	13.6	24.8
Salinity	%	0.01	0.18		0.18	0.23	0.23	0.22	0.15	0.00	0.23
T.P.	ug/L	10	81	79		88	94	86	130	75	239
TSS	mg/L	2	4	6		4	5	5	13.0	4.0	26.0
Cl	mg/L		29.2	29.3		31.0	31.2	32.4	26	17	32
Sulfate	mg/L		17.6	18.5		15.9	16.3	18.7	17.7	14.6	22.2
Hardness CaCO3	mg/L		203	203		204	211	206	182	125	211
Calcium	mg/L		56.1	55		54.7	58.3	58.2	51.14	36.20	58.30
Magnesium	mg/L		15.40	15.80		16.30	15.80	14.700	13.06	8.39	16.30
Secchi-tube	cm		>100		>100	>100	>100	>100	>90	61	>100
Nitrogen, Ammonia	mg/L		<0.16	0.23		<.16	<0.16	<0.16	<0.19	<0.16	0.37
TKN	mg/L		0.7	0.7		1.1	0.4	0.6	1.23	0.40	2.40
Nitrate plus Nitrite	mg/L		0.41	0.42		0.66	0.78	0.95	0.52	0.24	0.95
VSS	mg/L	2	4	4		4	5	4	8.1	4.00	15.00
E coli	MPN		156.5	204.6	141.4				249.1	141.4	547.5
Appearance			1A		1A	1A	1A	1A			
Recreational			1		1	1	1	1	1	1	2

*reporting limit

SEEYLE BROOK

Seeyle Brook at Co. Rd. 7, St. Francis STORET SiteID = S003-204



Background

Seelye Brook originates in southwestern Isanti County and flows south through northwest Anoka County, draining into the Rum River just east of the sampling site. This stream is low-gradient, like most other streams in the area. It has a silty or sandy bottom and lacks riffle-pool sequences. It is a moderate to large stream for Anoka County, with a typical baseflow width of 20-25 feet.

The sampling site is in the road right of way of the Highway 7 crossing. The bridge footings and poured concrete are significant features of the sampling site, which is otherwise sandy-bottom. This site also experiences scour during high flow because flow is constricted under the bridge. Banks are steep and undercut.

Results

This report includes data from 2013. A reason this monitoring is being performed is due to the lack of historical data to assess. The following is a summary of results.

- Dissolved constituents, as measured by conductivity and chlorides. Conductivity results in Seeyle Brook are considered average when compared to similar Anoka County streams. However, chlorides were significantly lower than any other stream monitored (5 mg/l). Conductivity averaged 0.375 mS/cm (maximum of 0.586 mS/cm and a minimum of 0.202 mS/cm). Chlorides averaged 5.0 mg/l (maximum of 14 mg/l and a minimum of 2 mg/l)
- Phosphorous averaged over the proposed MPCA water quality standard of 100 ug/L. If the proposed standard is approved Seeyle Brook often exceeds the limit, even during baseflow periods. Phosphorous is Seeyle Brook averaged 139 ug/l (maximum of 211 ug/l and a minimum of 92 ug/l).
- Suspended solids and turbidity both stayed below the state standards early in the season. While turbidity continued to stay very low TSS increased dramatically often exceeding the limit and raising the average over 30 mg/l. Suspended solids averaged 31.5 mg/l (maximum of 58.7 mg/l and a minimum of 8.6 mg/l). Turbidity averaged 3.37 NTU's (maximum of 7.10 NTU's and a minimum of 0.00 NTU's)
- pH and dissolved oxygen averaged within the range considered normal and healthy for streams in this area. However, on three sampling occasions DO fell below the 5.0 mg/l and on one occasion even fell below the 4.0 mg/l daily minimum. pH averaged 8.04 (maximum of 8.82 and a minimum of 7.27). DO averaged 7.30 mg/l (maximum of 10.16 mg/l and a minimum of 3.04 mg/l).

For a significant number of the results below there are no current state standards. However, this data will be used as a baseline for future assessments of the watershed.

Grey Columns indicate events with E.coli samples only.

Seeyle Brook at CR 7			4/30/2013	5/21/2013	6/5/2013	6/17/2013	6/25/2013	7/2/2013	7/15/2013
	Units	R.L.*	Results	Results	Results	Results	Results	Results	Results
pH		0.1	7.75	7.74	7.93	8.82	7.48	7.73	7.27
Conductivity	mS/cm	0.01	0.202	0.202	0.345	0.367	0.234	0.367	0.268
Turbidity	NTU	1	2.0	7.0	7.1	5.6	1.2	5.3	1.5
D.O.	mg/L	0.01	7.19	6.92	7.66	7.26	3.04	4.93	4.22
D.O.	%	1	74.1	69.1	73.6	78.2	34.6	54.7	48.9
Temp.	°C	0.1	14.4	15.4	13.7	18.8	21.8	20.1	21.7
Salinity	%	0.01	0.00	0.00	0.16	0.18	0.11	0.18	0.13
T.P.	ug/L	10	118	110	129		141	211	
TSS	mg/L	2	16.7	19.7	23.3		8.6	15.4	
Cl	mg/L		8	14	7		<2	3	
Sulfate	mg/L		25.6	19.2	17		10.2	13.6	
Hardness CaCO3	mg/L		130	128	176		119	209	
Calcium	mg/L		34.60	34.60	48.20		32.00	56.70	
Magnesium	mg/L		10.50	10.00	13.40		9.57	16.40	
Secchi-tube	cm		>100	>100	>100	>100	>100	94	>100
Nitrogen, Ammonia	mg/L		0.29	0.23	0.23		<0.16	0.23	
TKN	mg/L		1.2	1.6	1.8		2.6	2.4	
Nitrate plus Nitrite	mg/L		<0.2	0.36	0.38		<0.2	0.23	
VSS	mg/L	2	2	10	6		<2	3	
E coli	MPN				93.0	161.6	224.7	86.7	488.4
Appearance			1B	1B	1B	1A	1B	2	1A
Recreational			2	2	2	1	1	1	1

*reporting limit

			7/23/2013	8/6/2013	8/19/2013	8/27/2013	9/4/2013	9/25/2013			
			Results	Results	Results	Results	Results	Results	Average	Min	Max
pH		0.1	7.91	8.26	8.52	8.44	8.37	8.35	8.04	7.27	8.82
Conductivity	mS/cm	0.01	0.413	0.419	0.431	0.504	0.586	0.539	0.375	0.202	0.586
Turbidity	NTU	1	6.2	3.2	1.3	0.0	1.3	2.1	3.37	0.00	7.10
D.O.	mg/L	0.01	7.12	8.04	10.16	8.44	10.07	9.83	7.30	3.04	10.16
D.O.	%	1	78.1	83.8	113.1	102.1	104.3	97.7	77.9	34.6	113.1
Temp.	°C	0.1	20.0	17.1	19.1	23.2	16.0	14.2	18.1	13.7	23.2
Salinity	%	0.01	0.20	0.20	0.20	0.24	0.28	0.26	0.16	0.00	0.28
T.P.	ug/L	10	181	97		133	137	134	139	97	211
TSS	mg/L	2	27.0	39.9		57.3	58.7	48.4	31.5	8.6	58.7
Cl	mg/L		4	2		2	5	2	5	2	14
Sulfate	mg/L		15	15.3		14.5	14.2	20.2	16.4	10.2	25.6
Hardness CaCO3	mg/L		220	203		224	210	176	180	119	224
Calcium	mg/L		58.00	52.90		56.10	53.90	46.7	47.37	32.00	58.00
Magnesium	mg/L		18.30	17.30		20.40	18.30	14.5	14.87	9.57	20.40
Secchi-tube	cm		>100	>100	>100	>100	>100	>100	>100	94	94
Nitrogen, Ammonia	mg/L		<0.16	<0.16		<0.16	<0.16	<0.16	<0.19	0.23	0.29
TKN	mg/L		1.3	0.7		0.9	0.4	0.7	1.36	0.40	2.60
Nitrate plus Nitrite	mg/L		0.52	0.52		0.94	0.85	0.76	0.57	0.23	0.94
VSS	mg/L	2	4	2		<2	5	2	<3.8	2.00	10.00
E coli	MPN		127.4	141.4	79.4				175.3	79.4	488.4
Appearance			1B	1A	1A	1A	1A	1A			
Recreational			1	1	1	1	1	1	1	1	2

Stream Water Quality – Biological Monitoring

Description: This program combines environmental education and stream monitoring. Under the supervision of ACD staff, high school science classes collect aquatic macroinvertebrates from a stream, identify their catch to the family level, and use the resulting numbers to gauge water and habitat quality. These methods are based upon the knowledge that different families of macroinvertebrates have different water and habitat quality requirements. The families collectively known as EPT (Ephemeroptera, or mayflies; Plecoptera, or stoneflies; and Trichoptera, or caddisflies) are pollution intolerant. Other families can thrive in low quality water. Therefore, a census of stream macroinvertebrates yields information about stream health.

Purpose: To assess stream quality, both independently as well as by supplementing chemical data.
To provide an environmental education service to the community.

Locations: Rum River at Hwy 24, Rum River North County Park, St. Francis

Results: Results for each site are detailed on the following pages.

Tips for Data Interpretation

Consider all biological indices of water quality together rather than looking at each alone, as each gives only a partial picture of stream condition. Compare the numbers to county-wide averages. This gives some sense of what might be expected for streams in a similar landscape, but does not necessarily reflect what might be expected of a minimally impacted stream. Some key numbers to look for include:

Families — Number of invertebrate families. Higher values indicate better quality.

EPT — Number of families of the generally pollution-intolerant orders Ephemeroptera (mayflies), Plecoptera (stoneflies), Trichoptera (caddisflies). Higher numbers indicate better stream quality.

Family Biotic Index (FBI) — An index that utilizes known pollution tolerances for each family. Lower numbers indicate better stream quality.

FBI	Stream Quality Evaluation
0.00-3.75	Excellent
3.76-4.25	Very Good
4.26-5.00	Good
5.01-5.75	Fair
5.76-6.50	Fairly Poor
6.51-7.25	Poor
7.26-10.00	Very Poor

% Dominant Family — High numbers indicates an uneven community, and likely poorer stream health.

RUM RIVER

at Hwy 24, Rum River North County Park, St. Francis

Last Monitored

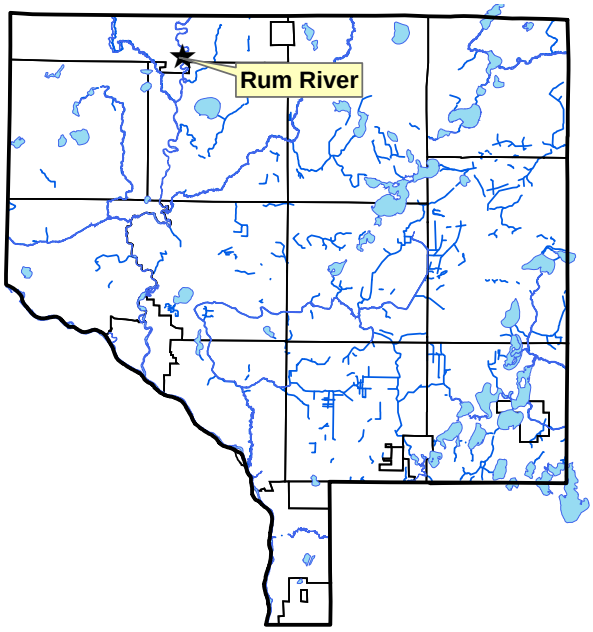
By St. Francis High School in 2013

Monitored Since

2000

Student Involvement

64 students in 2013, approximately 1,288 since 2000



Background

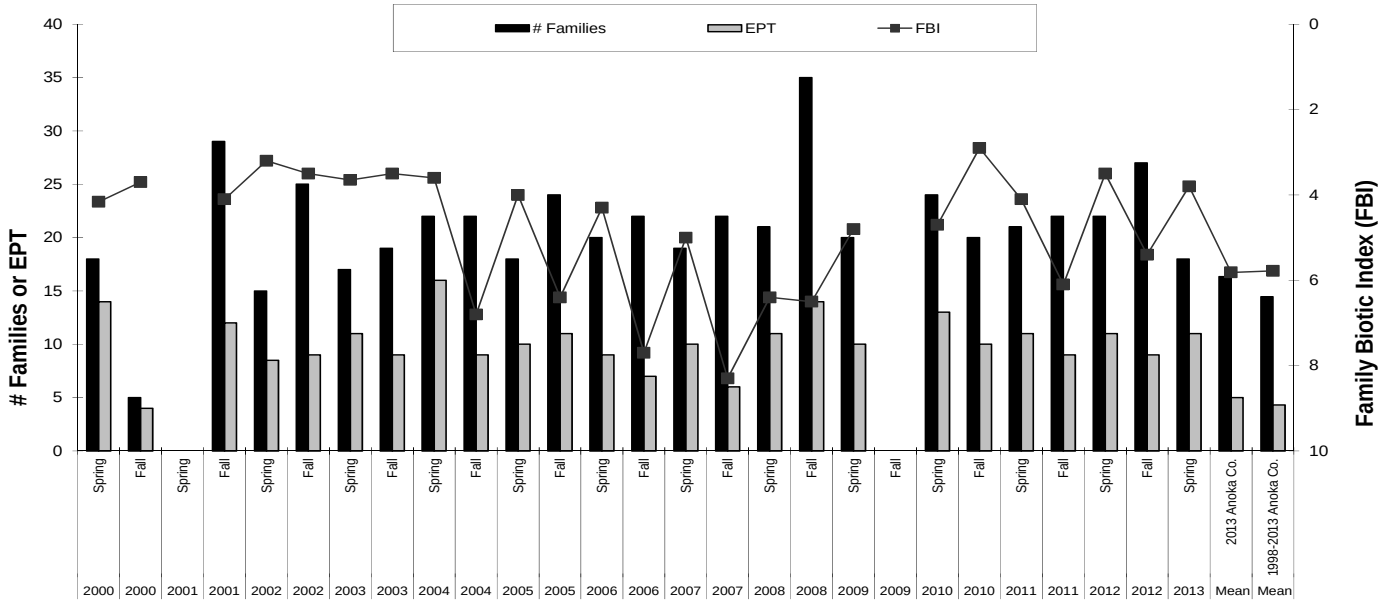
The Rum River originates from Lake Mille Lacs, and flows south through western Anoka County where it joins the Mississippi River in the City of Anoka. Other than the Mississippi, this is the largest river in the county. In Anoka County the river has both rocky riffles as well as pools and runs with sandy bottoms. The river's condition is generally regarded as excellent. Portions of the Rum in Anoka County have a state "scenic and recreational river" designation.

The sampling site is in Rum River North County Park. This site is typical of the Rum in northern Anoka County, having a rocky bottom with numerous pool and riffle areas.

Results

St. Francis High School classes monitored the Rum River in spring 2013, with Anoka Conservation District (ACD) oversight. Biological data for 2013, and historically, indicate the Rum River in northern Anoka County has the best conditions of all streams and rivers monitored throughout Anoka County. In fall 2013, 18 families were found which is the 2nd most of any site in Anoka County, the highest amount also being on the Rum River but at another location. The number of families and number of EPT families were substantially above the county averages.

Summarized Biomonitoring Results for Rum River at Hwy 24, St. Francis (samplings by St. Francis High School and Crossroads Schools in 2002-2003 are averaged)



Biomonitoring Data for Rum River at Rum River North County Park, St. Francis

Data presented from the most recent five years. Contact the ACD to request archived data.

Year	2008	2008	2009	2009	2010	2010	2011	2011	2012	2012	2013	Mean	Mean
Season	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	2013 Anoka Co.	1998-2013 Anoka Co.
FBI	6.40	6.50	4.80	Unusable	4.7	2.9	4.1	6.1	3.5	5.4	3.8	5.8	5.8
# Families	21	35	20	Sample	24	20	21	22	22	27	18	16.3	14.5
EPT	11	14	10		13	10	11	9	11	9	11	5.0	4.3
Date	27-May	30-Sep	29-Apr	13-Oct	27-Apr	29-Oct	10-Jun	28-Sep	22-May	27-Sep	20-May		
Sampled By	SFHS	SFHS	SFHS	SFHS	SFHS	ACD	ACD	SFHS	SFHS	SFHS	SFHS		
Sampling Method	MH	MH	MH	MH	MH	MH	MH	MH	MH	MH	MH		
Mean # Individuals/Rep.	348	156	267		142	274	418	443	144	333	247.5		
# Replicates	2	4	2		3	1	1	2	2	1	2		
Dominant Family	Corixidae	Corixidae	Corixidae		Nemouridae	Leptophlebiidae	baetidae	hydrophilidae	hydropsy	veliidae	Baetiscida		
% Dominant Family	57.5	61.4	24.3		28.1	39.4	66.3	21.4	36.6	13.8	33.5		
% Ephemeroptera	11.9	17.9	18.7		23.9	51.1	81.3	3.6	43.2	34.2	52.1		
% Trichoptera	5.9	6.9	20.2		10.8	6.2	6.0	4.3	41.1	4.2	9.1		
% Plecoptera	17.1	2.1	27.7		32.8	26.6	3.8	9.7	5.2	11.1	29.3		

Supplemental Stream Chemistry Readings

Data presented from the most recent five years. Contact the ACD to request archived data.

Parameter	4/29/2009	10/13/2009	4/27/2010	10/29/2010	4/27/2010	9/28/2011	5/22/2012	9/27/2012	5/21/2013
pH	7.62	7.87	na	7.51	na	8.35	8.14	7.87	7.70
Conductivity (mS/cm)	0.266	0.291	0.324	0.249	0.324	0.228	0.275	0.239	0.193
Turbidity (NTU)	6	na	2	na	2	na	18	2	9
Dissolved Oxygen (mg/L)	10.53	12.22	9.14	na	9.14	8.7	8.24	8.17	7.98
Salinity (%)	0.01	0.01	0.01	0	0.01	0	0.01	0	0
Temperature (°C)	12.2	5.2	12	7.2	12	13.8	17.5	10.3	17.3

Discussion

Both chemical and biological monitoring indicate the good quality of this river. Habitat is ideal for a variety of stream life, and includes a variety of substrates, plenty of woody snags, riffles, and pools. Water chemistry monitoring done at various locations on the Rum River throughout Anoka County found that water quality is also good. Both habitat and water quality decline, but are still good, in the downstream reaches of the Rum River where development is more intense and the Anoka Dam creates a slow moving pool.

Water resource management should be focused upon protecting the Rum's quality. Some steps to protect the Rum River could include:

- Enforce the building and clear cutting setbacks from the river required by state scenic river laws.
- Retrofit stormwater conveyance systems to provide better water quality treatment in cities including St. Francis and Anoka. Older areas of some communities lack or have little stormwater treatment.
- Use the best available technologies to reduce pollutants delivered to the river and its tributaries through the storm sewer system. This should include all of the watershed, not just those adjacent to the river.
- Education programs to encourage actions by residents that will benefit the river's health.
- Continue water quality monitoring programs.

URRWMO Teacher Wins State Award for Biomonitoring!

Teacher DC Randle from St. Francis High School won a state-wide teaching award in 2013, primarily for his efforts in the stream biomonitoring program. On December 2 he accepted the MN Association of Soil and Water Conservation District's Teacher Award. The award goes to a teacher who provides outstanding natural resources instruction.

Mr. Randle's lessons are often hands on. For the last 15 years he has taken 1,224 students wading in the Rum River to monitor river health, primarily through monitoring macroinvertebrates. This was done in partnership with the URRWMO and Anoka Conservation District. He also takes students on annual float trips of the Rum River, to the Carlos Avery Wildlife Management Area, and Cedar Creek Ecosystem Science Reserve. For advanced students, he offers summer research trips to the Peruvian rain forest.

Wetland Hydrology

Description: Continuous groundwater level monitoring at a wetland boundary, to a depth of 40 inches. County-wide, the ACD maintains a network of 23 wetland hydrology monitoring stations.

Purpose: To provide understanding of wetland hydrology, including the impact of climate and land use. These data aid in delineation of nearby wetlands by documenting hydrologic trends including the timing, frequency, and duration of saturation.

Locations: Alliant Tech Reference Wetland, Alliant Tech Systems property, St. Francis

Cedar Creek, Cedar Creek Natural History Area, East Bethel

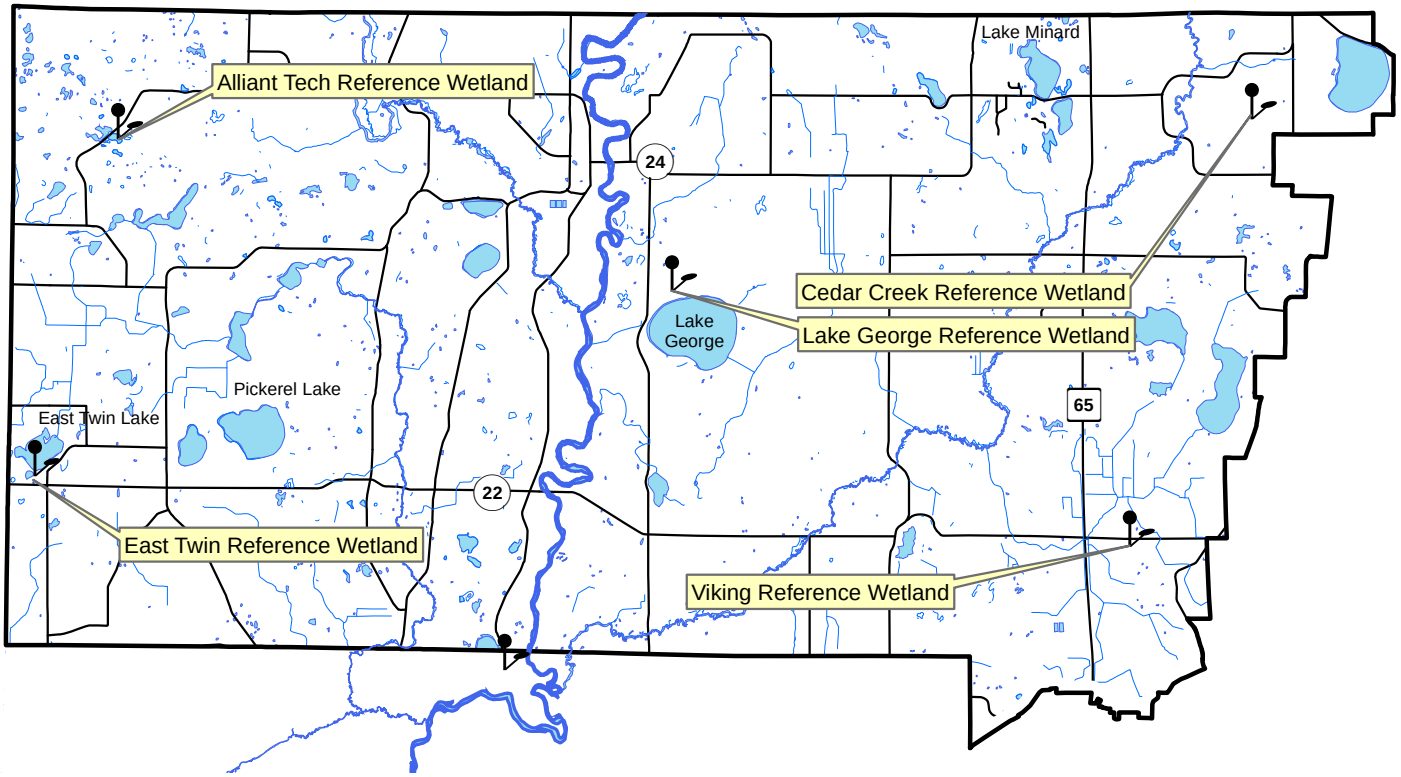
East Twin Reference Wetland, East Twin Township Park, Nowthen

Lake George Reference Wetland, Lake George County Park, Oak Grove

Viking Meadows Reference Wetland, Viking Meadows Golf Course, East Bethel

Results: See the following pages. Raw data and updated graphs can be downloaded from www.AnokaNaturalResources.com using the Data Access Tool.

Upper Rum River Watershed Wetland Hydrology Monitoring Sites



Wetland Hydrology Monitoring

ALLIANT TECH REFERENCE WETLAND

Alliant Techsystems Property, St. Francis

Site Information

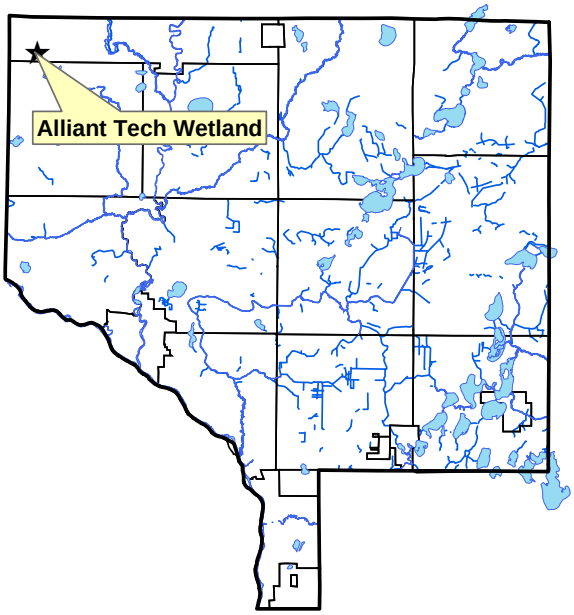
Monitored Since: 2001

Wetland Type: 5

Wetland Size: ~12 acres

Isolated Basin? Yes

Connected to a Ditch? No



Soils at Well Location:

Horizon	Depth	Color	Texture	Redox
A	0-8	N2/0	Mucky loam	-
Bg	8-35	5y5/1	Sandy loam	-

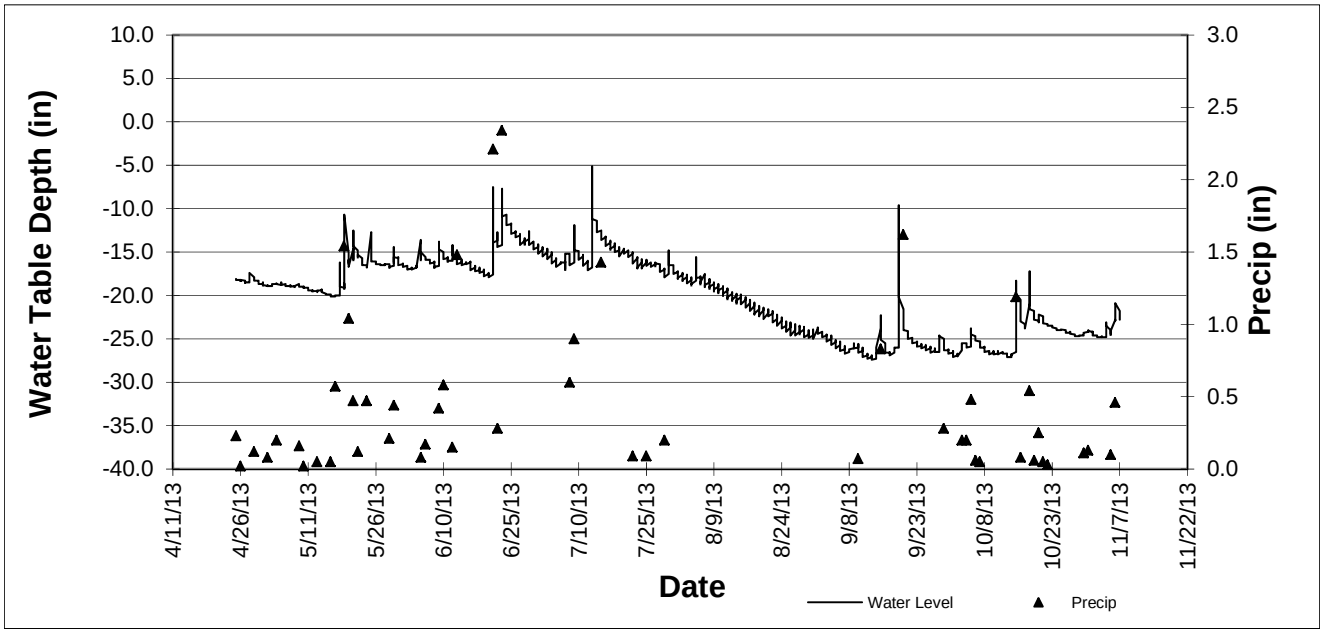
Surrounding Soils: Emmert

Vegetation at Well Location:

Scientific	Common	% Coverage
Carex Spp	Sedge undiff.	90
Lycopus americanus	American Bungleweed	20
Phalaris arundinacea	Reed Canary Grass	5

Other Notes: This wetland lies next to the highway, in a low area surrounded by hilly terrain. It holds water throughout the year, and has a beaver den.

2013 Hydrograph



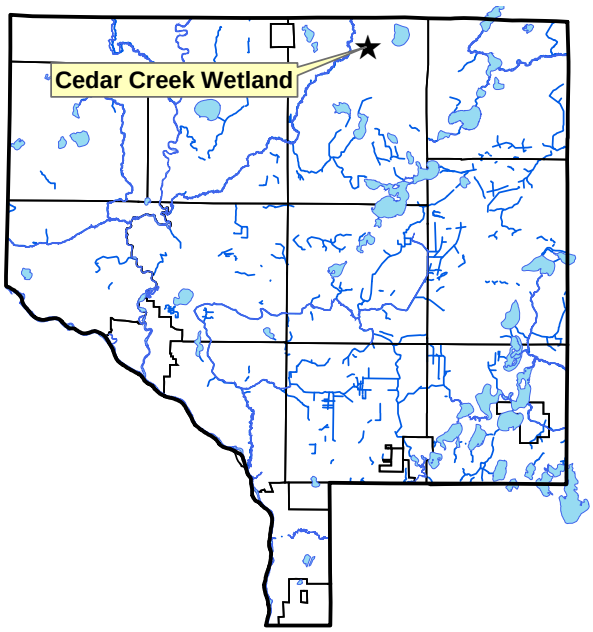
Well depth was 40 inches, so a reading of –40 indicates water levels were at an unknown depth greater than or equal to 40 inches.

Wetland Hydrology Monitoring

CEDAR CREEK REFERENCE WETLAND

Univ. of Minnesota Cedar Creek Natural History Area, East Bethel

Site Information



Monitored Since: 1996

Wetland Type: 6

Wetland Size: unknown, likely >150 acres

Isolated Basin? No

Connected to a Ditch? No

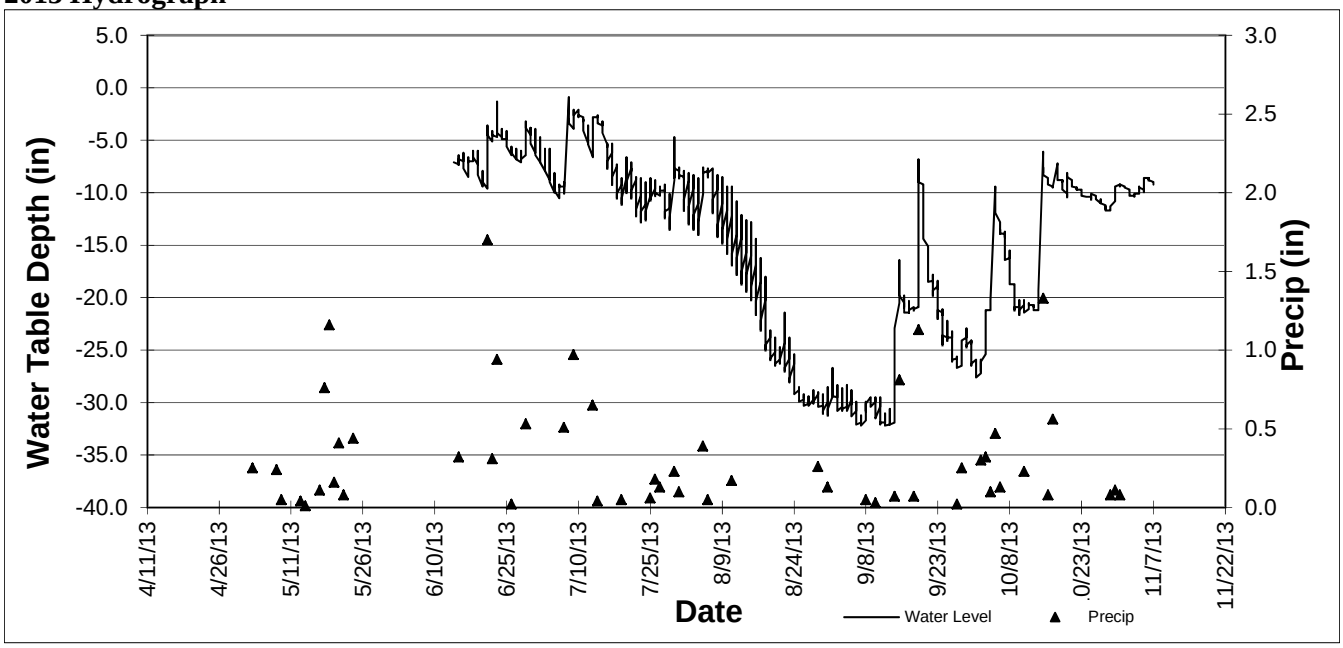
Soils at Well Location: not yet available

Surrounding Soils: Zimmerman

Vegetation at Well Location: not yet available

Other Notes: The Cedar Creek Ecosystem Science Reserve, where this wetland is located, is a University of Minnesota research area. Much of this area, including the area surrounding the monitoring site, is in a natural state. This wetland probably has some hydrologic connection to the floodplain of Cedar Creek, which is 0.7 miles from the monitoring site.

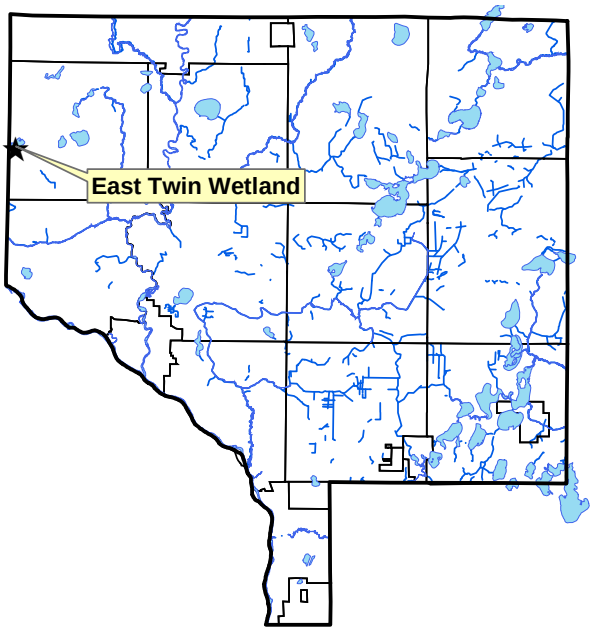
2013 Hydrograph



Well depth was 37 inches, so a reading of –37 indicates water levels were at an unknown depth greater than or equal to 37 inches.

EAST TWIN REFERENCE WETLAND

East Twin Lake Township Park, Nowthen



Site Information

Monitored Since: 2001

Wetland Type: 5

Wetland Size: ~5.9 acres

Isolated Basin? Yes

Connected to a Ditch? No

Soils at Well Location:

Horizon	Depth	Color	Texture	Redox
A	0-8	10yr 2/1	Mucky Loam	-
Oa	Aug-40	N2/0	Organic	-

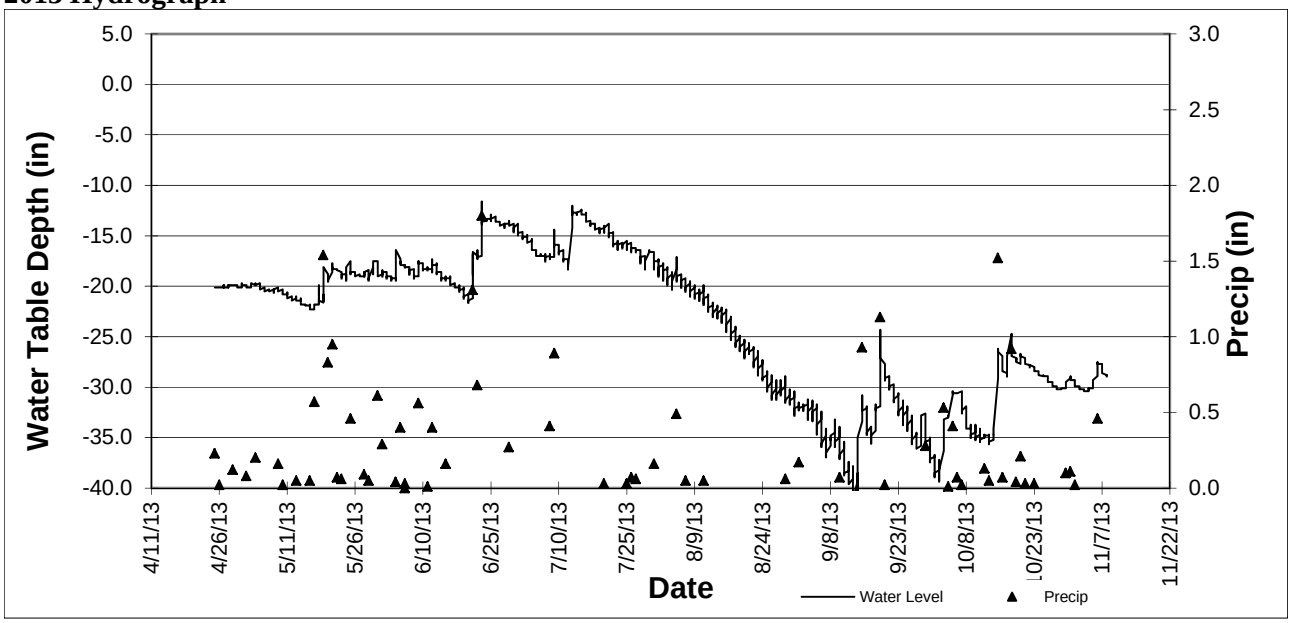
Surrounding Soils: Lake Beach, Growton and Heyder fine sandy loams

Vegetation at Well Location:

Scientific	Common	% Coverage
Phalaris arundinacea	Reed Canary Grass	100
Cornus amomum	Silky Dogwood	30
Fraxinus pennsylvanica	Green Ash	30

Other Notes: This wetland is located within East Twin Lake County Park, and is only 180 feet from the lake itself. Water levels in the wetland are influenced by lake levels.

2013 Hydrograph



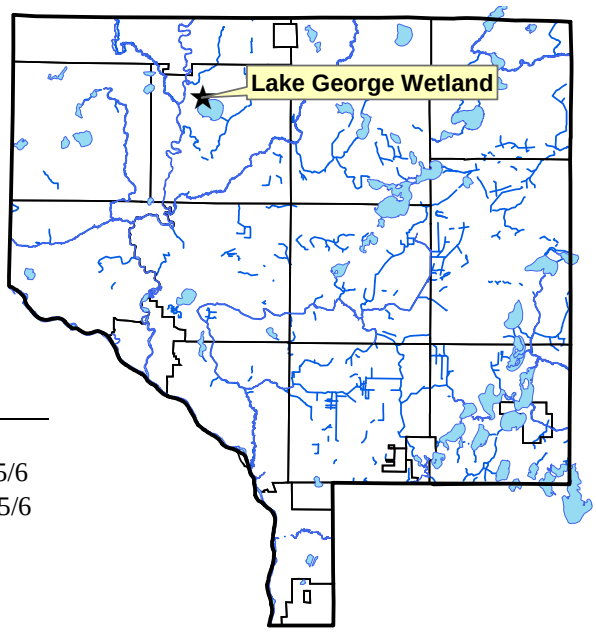
Well depth was 40 inches, so a reading of –40 indicates water levels were at an unknown depth greater than or equal to 40 inches.

Wetland Hydrology Monitoring

LAKE GEORGE REFERENCE WETLAND

Lake George County Park, Oak Grove

Site Information



Monitored Since: 1997

Wetland Type: 3/4

Wetland Size: ~9 acres

Isolated Basin? Yes, but only separated from wetland complexes by roadway.

Connected to a Ditch? No

Soils at Well Location:

Horizon	Depth	Color	Texture	Redox
A	0-8	10yr2/1	Sandy Loam	-
Bg	8-24	2.5y5/2	Sandy Loam	20% 10yr5/6
2Bg	24-35	10gy 6/1	Silty Clay Loam	10% 10yr 5/6

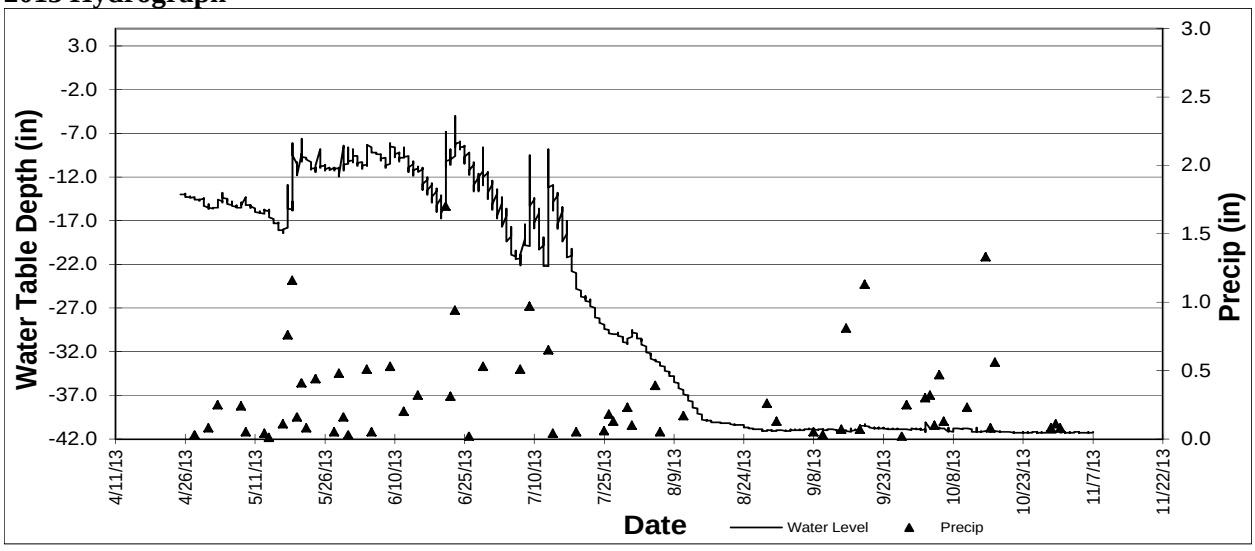
Surrounding Soils: Lino loamy fine sand and Zimmerman fine sand

Vegetation at Well Location:

Scientific	Common	% Coverage
Cornus stolonifera	Red-osier Dogwood	90
Populus tremuloides	Quaking Aspen	40
Quercus rubra	Red Oak	30
Onoclea sensibilis	Sensitive Fern	20
Phalaris arundinacea	Reed Canary Grass	10

Other Notes: This wetland is located within Lake George County Park, and is only about 600 feet from the lake itself. Much of the vegetation within the wetland is cattails.

2013 Hydrograph



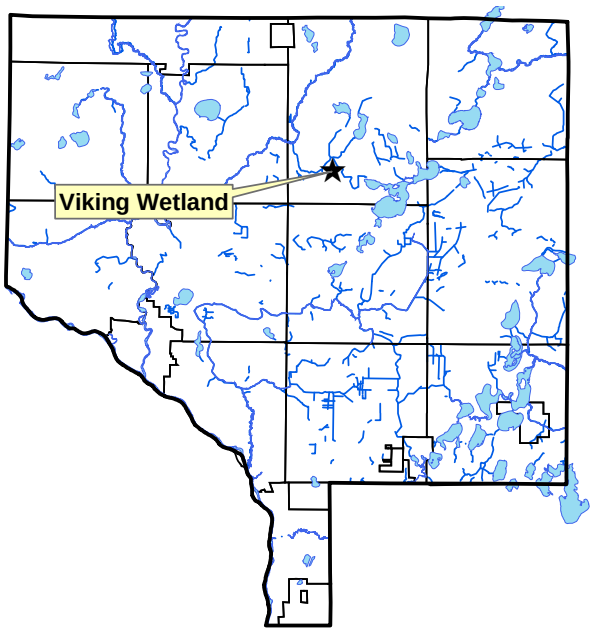
Well depth was 40 inches, so a reading of –40 indicates water levels were at an unknown depth greater than or equal to 40 inches.

Wetland Hydrology Monitoring

VIKING MEADOWS REFERENCE WETLAND

Viking Meadows Golf Course, East Bethel

Site Information



Monitored Since: 1999

Wetland Type: 2

Wetland Size: ~0.7 acres

Isolated Basin? No

Connected to a Ditch? Yes, highway ditch is tangent to wetland

Soils at Well Location:

Horizon	Depth	Color	Texture	Redox
A	0-12	10yr2/1	Sandy Loam	-
Ab	12-16	N2/0	Sandy Loam	-
Bg1	16-25	10yr4/1	Sandy Loam	-
Bg2	25-40	10yr4/2	Sandy Loam	5% 10yr5/6

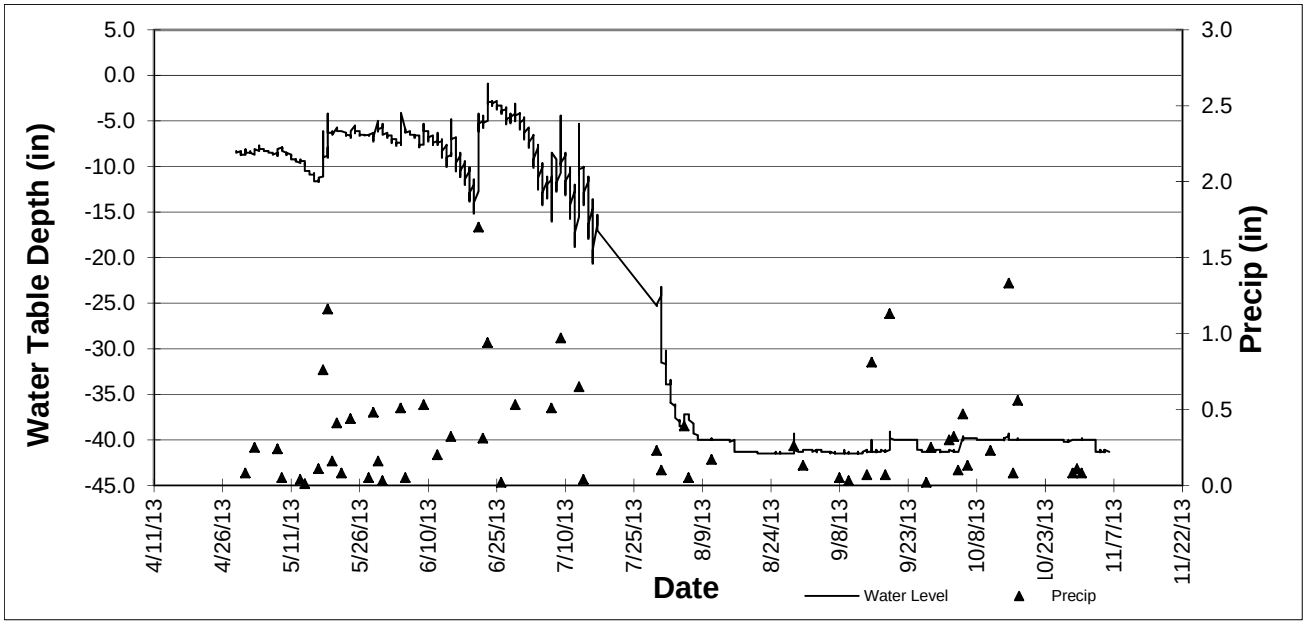
Surrounding Soils: Zimmerman fine sand

Vegetation at Well Location:

Scientific	Common	% Coverage
Phalaris arundinacea	Reed Canary Grass	100
Acer rubrum (T)	Red Maple	75
Acer negundo (T)	Boxelder	20

Other Notes: This wetland is located at the entrance to Viking Meadows Golf Course, and is adjacent to Viking Boulevard (Hwy 22).

2013 Hydrograph



Well depth was 40 inches, so a reading of –40 indicates water levels were at an unknown depth greater than or equal to 40 inches.

Water Quality Grant Fund

Description: The Upper River Watershed Management Organization (URRWMO) partners with the Anoka Conservation District's (ACD) Water Quality Cost Share Program. The URRWMO contributes funds to be used as cost share grants for projects that improve water quality in lakes, streams, or rivers within the URRWMO area. The ACD provides administration of the grants. Grant awards follow ACD policies and generally cover 50% or 70% of materials (see ACD website for full policies). The ACD Board of Supervisors approves any dispersements.

Grant administration is through the Anoka Conservation District for efficiency and simplicity. The ACD administers a variety of other similar grants, thus providing a one-stop-shop for residents. Additionally, the ACD's technical staff provides project consultation and design services at low or no cost, which is highly beneficial for grant applicants. ACD staff also has expertise to process and scrutinize grant requests. Lastly, the ACD Board meets monthly, and can therefore respond to grant requests rapidly, while URRWMO meetings are much less frequent.

The Anoka Conservation District (ACD) and Upper Rum River WMO have both undertaken efforts to promote these types of projects and the availability of grants. The ACD mentions the grants during presentations to lake associations and other community groups, in newsletters, and in website postings. In order to promote these types of projects the ACD also assists landowners throughout projects, including design, materials acquisition, installation, and maintenance.

Purpose: To improve water quality in area lakes, streams and rivers.

Locations: Throughout the watershed.

Results: Projects are reported in the year they are installed. In 2013 Lake George shoreline restorations were approved and funds allocated to the Daml and Stitt properties on Lake George. These projects are to be installed in 2014.

URRWMO Cost Share Fund Summary

2006 URRWMO Contribution	+	$ 990.00
2006 Expenditures		$ 0.00
2007 URRWMO Contribution	+	$ 1,000.00
2007 Expenditures		$ 0.00
2008 Expenditures		$ 0.00
2009 Expenditures		$ 0.00
2010 URRWMO Contribution	+	$ 500.00
2011 URRWMO Contribution	+	$ 567.00
2010-11 Expenditure Petro streambank stabilization	-	$1,027.52
2011 Expenditure Erickson lakeshore restoration	-	$ 233.63
2012 Expenditure Erickson lakeshore restoration	-	$ 137.97
2012 URRWMO Contribution	+	$1,000.00
2013 URRWMO Contribution	+	$ 0
2014 Expenditure – Stitt lakeshore restoration (encumbered)	-	$1,135.50
2014 Expenditure – Daml lakeshore restoration (encumbered)	-	$ 690.00
Fund Balance		**$ 832.38**

Special note: For all funds contributed after 2013, the URRWMO has asked to re-evaluate how these grants are administered. The WMO may choose to administer the funds themselves or with other oversight of the ACD's process.

URRWMO Website

Description: The Upper Rum River Watershed Management Organization (URRWMO) contracted the Anoka Conservation District (ACD) to design and maintain a website about the URRWMO and the Upper Rum River watershed. The original website had been in operation since 2003. A new website and domain for the URRWMO was created by ACD in 2013.

Purpose: To increase awareness of the URRWMO and its programs. The website also provides tools and information that helps users better understand water resources issues in the area.

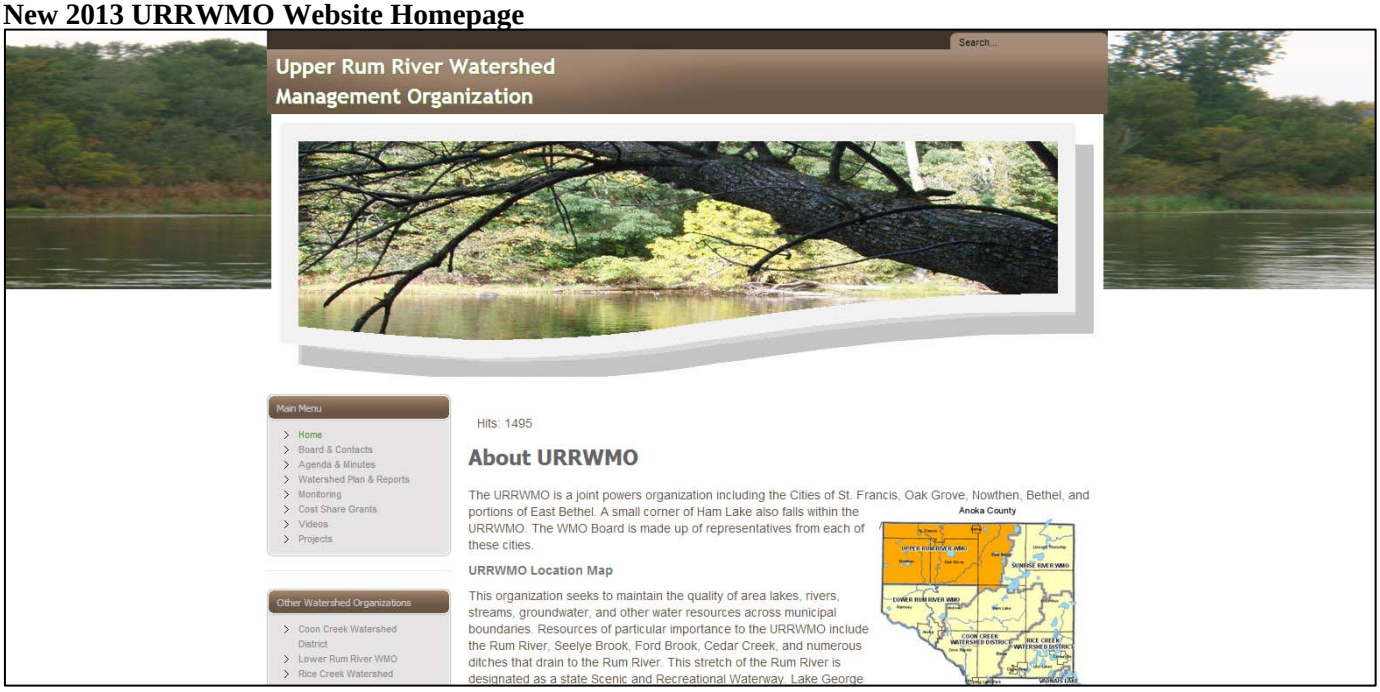
Location: www.URRWMO.org

Results: In 2013 the upgraded, redesigned, and re-launched the URRWMO website. These updates were necessary because the old website platform was incompatible with certain tablet computers and smartphones. Additionally, the old website was hosted with in the ACD website, while the new website is completely independent, offering the WMO future management choices.

The URRWMO website contains information about both the URRWMO and about natural resources in the area. Information about the URRWMO includes:

- a directory of board members,
- meeting minutes and agendas,
- watershed management plan and annual reports,
- descriptions of work that the organization is directing,
- highlighted projects.

New 2013 URRWMO Website Homepage



URRWMO Annual Newsletter

Description: The URRWMO Watershed Management Plan and state rules call for an annual URRWMO newsletter in addition to the website. The URRWMO will produce a newsletter article including information about the URRWMO, its programs, related educational information, and the URRWMO website address. This article will be provided to each member city, and they will be asked to include it in their city newsletters.

Purpose: To increase public awareness of the URRWMO and its programs.

Locations: Watershed-wide.

Results: The Anoka Conservation District (ACD) assisted the URRWMO by drafting the annual newsletter article. The URRWMO discussed topics to be covered in the article. It was decided that the newsletter article would be about the Rum River Watershed Restoration and Protection Project (WRAPP).

ACD staff drafted the newsletter article and sent it to the URRWMO Board for review. The URRWMO Board reviewed and edited the draft article. The finalized article was sent to each member community in July 2013, as well as to the Independent School District 15 publication, "The Courier." It was printed in The Courier.

2013 URRWMO Newsletter Article

Rum River Watershed Gets Check-up, Plan

An effort is underway to protect and improve water quality in the almost one million acre Rum River watershed. With its beginning at Lake Mille Lacs, most of the Rum River is a State Scenic and Recreational Waterway. The Rum is known for canoeing, smallmouth bass fishing, and high water quality. Many of the watershed's tributaries and lakes, including lakes George and East Twin, are also of high quality.

The Rum River Watershed Restoration and Protection Project (WRAP), which just began, aims to protect all of this. Some lakes and streams in the watershed are "impaired" and fail to meet state water quality standards. For these, a plan for improvement, or Total Maximum Daily Load (TMDL) study will be completed.

The WRAP will include:

- Water quality monitoring (2013-14).
- Special investigations of water quality problems (2014).
- Computer modeling to answer "what if" questions (2013-15).
- Total Maximum Daily Load (TMDL) planning (2015-16).
- A WRAP report that prescribes future management approaches (2015-16).

After completion of the WRAP, local agencies will implement projects to protect and improve water quality. State funding, including the State Clean Water Fund from the Clean Water, Land and Legacy Amendment, will ensure financial support exists for these projects.

At the most local level, the Upper Rum River Watershed Management Organization (URRWMO) will be working for the Rum River and our lakes. The URRWMO is a joint powers organization of the Cities of Bethel, East Bethel, Ham Lake, Nowthen, Oak Grove and St. Francis. Learn more at www.URRWMO.org.

The WRAP is funded and overseen by the Minnesota Pollution Control Agency, and the Anoka Conservation District is the project lead. Nine other counties in the watershed are also involved. For more information on the Rum River WRAP project visit www.pca.state.mn.us and search for "Rum River WRAP."

URRWMO 2012 Annual Reports to the State

Description: The Upper Rum River Watershed Management Organization (URRWMO) is required by law to submit an annual report to the Minnesota Board of Water and Soil Resources (BWSR). This report consists of an up-to-date listing of URRWMO Board members, activities related to implementing the URRWMO Watershed Management Plan, the status of municipal water plans, financial summaries, and other work results. The report is due annually 120 days after the end of the URRWMO's fiscal year (April 30th).

Additionally, the URRWMO is required to perform annual financial reporting to the State Auditor. This includes submitting a financial report and filling out a multi-worksheet form.

Purpose: To document required progress toward implementing the URRWMO Watershed Management Plan and to provide transparency of government operations.

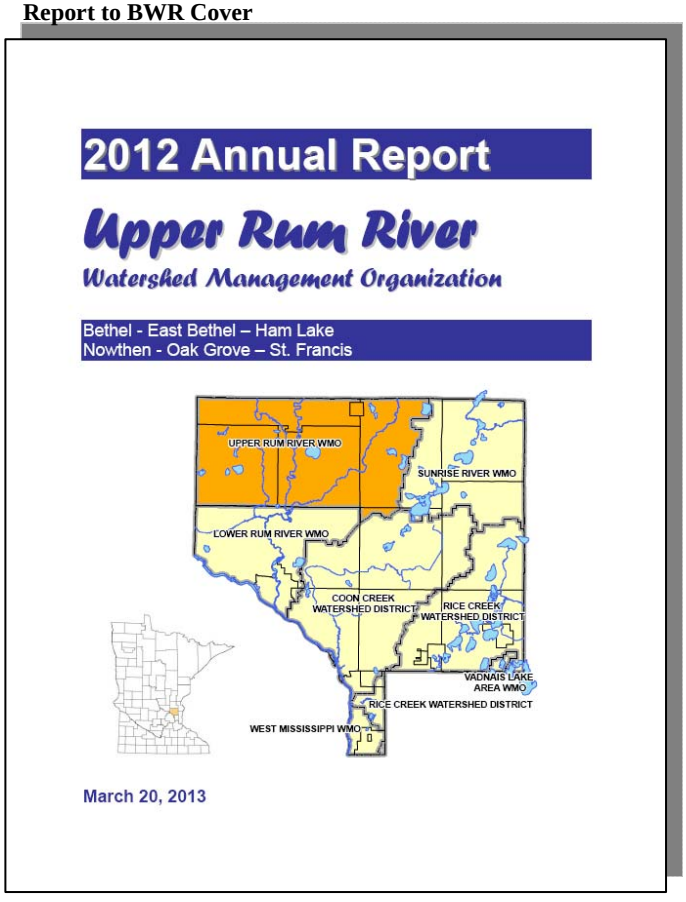
Locations: Watershed-wide

Results: The Anoka Conservation District assisted the URRWMO with preparation of a 2012 Upper Rum River WMO Annual Report to BWSR and reporting to the State Auditor. This included:

- preparation of an unaudited financial report,
- a report to BWSR meeting MN statutes
- and the State Auditor's reporting forms through the State's SAFES website.

All were completed by the end of April 2013. The report to BWSR and financial report are available on the URRWMO website.

Report to BWR Cover



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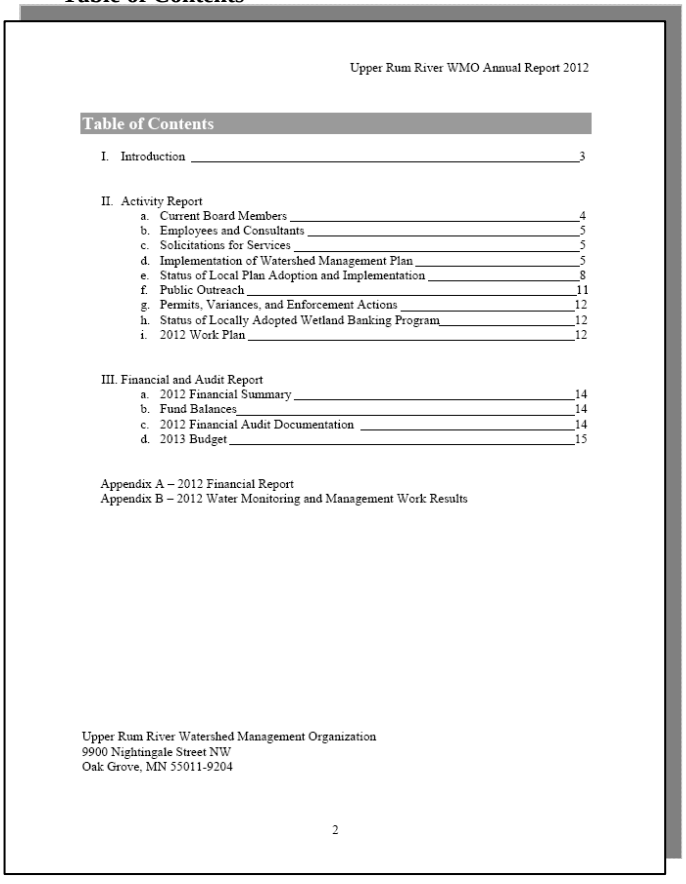

Upper Rum River WMO Annual Report 2012

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Upper Rum River Watershed Management Organization
9900 Nightingale Street NW
Oak Grove, MN 55011-9204

Financial Summary

ACD accounting is organized by program and not by customer. This allows us to track all of the labor, materials and overhead expenses for a program. We do not, however, know specifically which expenses are attributed to monitoring which sites. To enable reporting of expenses for monitoring conducted in a specific watershed, we divide the total program cost by the number of sites monitored to determine an annual cost per site. We then multiply the cost per site by the number of sites monitored for a customer.

Upper Rum River Watershed Financial Summary

Upper Rum River Watershed	Volunteer Precip	Ref Wet	Ob Well	Lake Lvl	Lake WQ	Lake WQ - SWAG	Stream WQ - SWAG	SWAG Admin/Reporting	WOMP	Student Biomon	URRWMO Admin	WMO Annual Rpts to State	URRWMO Outreach/Promo	WMO Website Maint	WMO Website Migration	Anoka Nat. Pres. Restoration	Rum River WRAPP	Projects	Cost Share - Local/State	Total
Revenues																				
URRWMO	0	1680	0	800	2500	0	0	0	0	825	0	1000	350	405	800	0	0	0	0	8498
State	0	0	392	0	0	2954	11545	796	0	0	0	0	0	0	0	94254	7459	0	0	117400
Anoka Conservation District	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anoka Co. General Services	0	0	530	0	0	0	0	544	0	0	1313	0	0	0	51	3692	0	0	0	6131
County Ag Preserves	0	0	0	0	759	0	0	0	0	349	0	0	0	0	0	0	0	48	0	1156
Regional/Local	0	0	0	0	0	0	0	0	720	0	0	0	0	0	0	0	0	0	0	720
Other Service Fees	0	0	0	0	264	0	0	0	0	0	0	0	0	0	0	0	0	404	0	669
BWSR Cons Delivery	0	0	0	0	0	0	0	0	38	0	0	0	0	0	0	0	0	0	0	38
BWSR Cost Share TA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	441	0	441
Local Water Planning	354	0	98	5	438	0	0	0	0	0	0	0	0	0	0	0	0	0	0	895
TOTAL	354	1680	1019	805	3961	2954	11545	1340	758	1174	1313	1000	350	405	851	97947	7459	893	0	135946
Expenses-																				
Capital Outlay/Equip	2	26	13	10	48	39	4607	21	7	11	12	4	4	5	9	47	34	14	0	4912
Personnel Salaries/Benefits	295	1689	853	686	2744	2096	3273	1114	629	992	1091	502	203	316	451	7753	2211	740	0	27639
Overhead	32	111	68	47	183	135	204	77	61	67	102	47	14	28	29	927	209	53	0	2393
Employee Training	1	7	3	4	15	7	16	5	1	8	5	0	0	1	1	7	6	3	0	91
Vehicle/Mileage	4	28	13	13	48	32	56	19	8	20	17	6	3	5	6	91	31	12	0	412
Rent	18	77	44	31	124	96	144	52	37	43	61	29	10	18	21	531	127	36	0	1498
Program Participants	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	138
Program Supplies	0	2	0	0	700	470	3114	0	0	32	0	0	0	0	312	88513	4727	1	0	97871
McKay Expenses	1	31	25	15	99	80	131	52	14	0	25	0	8	13	22	79	112	36	0	743
TOTAL	354	1971	1019	805	3961	2954	11545	1340	758	1174	1313	590	242	385	851	97947	7459	893	0	135698
NET	0	-291	0	0	0	0	0	0	0	0	0	410	108	20	0	0	0	0	0	248

Recommendations

- **Actively participate in the MPCA Rum River WRAPP (Watershed Restoration and Protection Plan) which began in 2013.** This WRAPP is an assessment of the entire Rum River watershed. This is an opportunity for the URRWMO to prioritize and coordinate efforts with upstream entities and state agencies.
- **Consider coordinating multi-county water planning efforts thought the state's new One Watershed-One Plan initiative.** Planning funding will be available to the first watersheds that participate.
- **Add more frequent Lake George water quality monitoring.** Declining water quality is being observed, but the reason remains a mystery.
- **Consider a St. Francis stormwater assessment** that is aimed at identifying and installing cost effective stormwater treatment opportunities before water is discharged into the Rum River. The assessment should be focused on those portions of the city that are generally lacking sufficient stormwater treatment. A large portion of the funding may be available through ACD.
- **Promote groundwater conservation.** Metropolitan Council models predict 3+ft