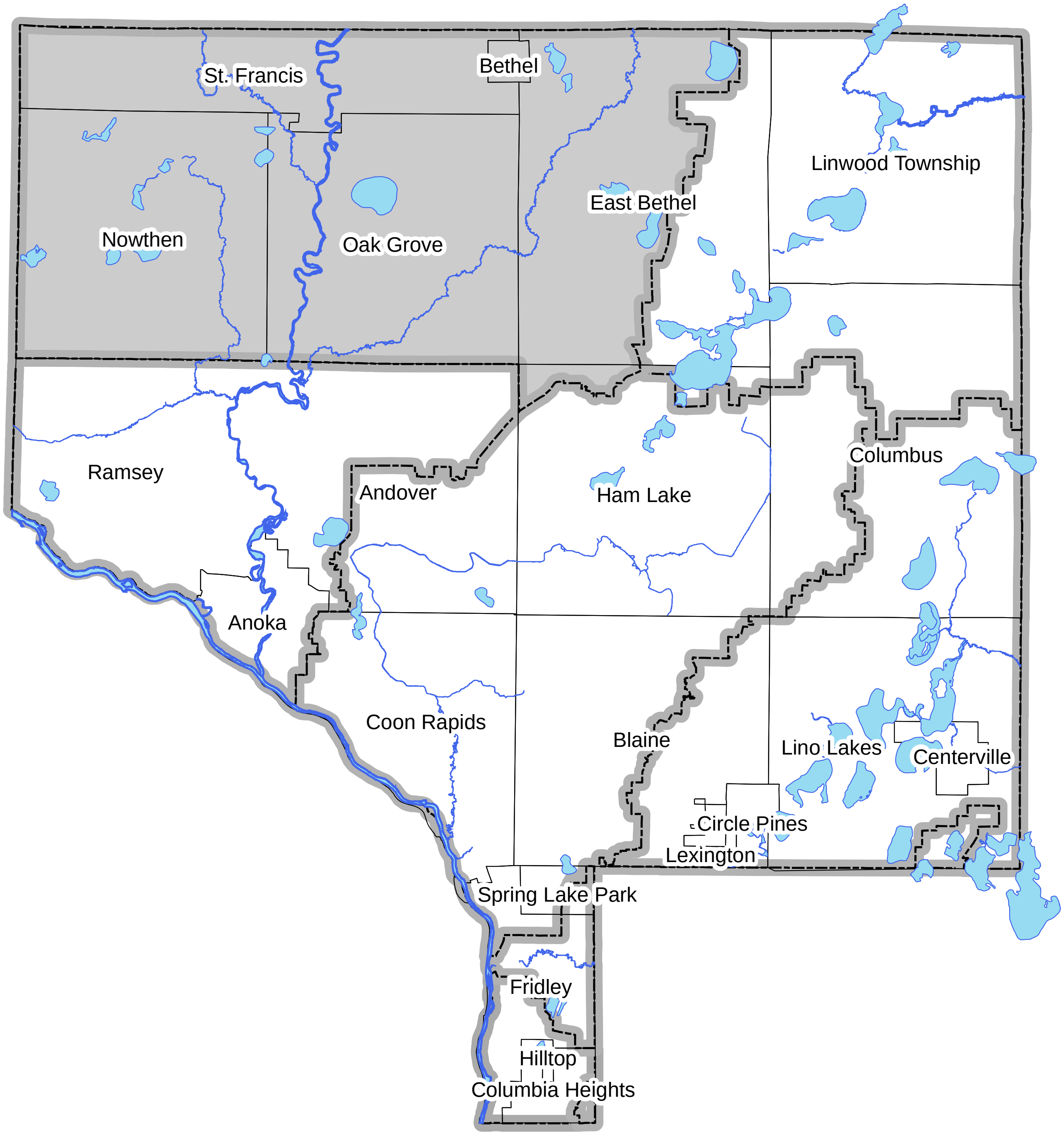
Excerpt from the
2015 Anoka Water Almanac

Chapter 3: Upper Rum River Watershed

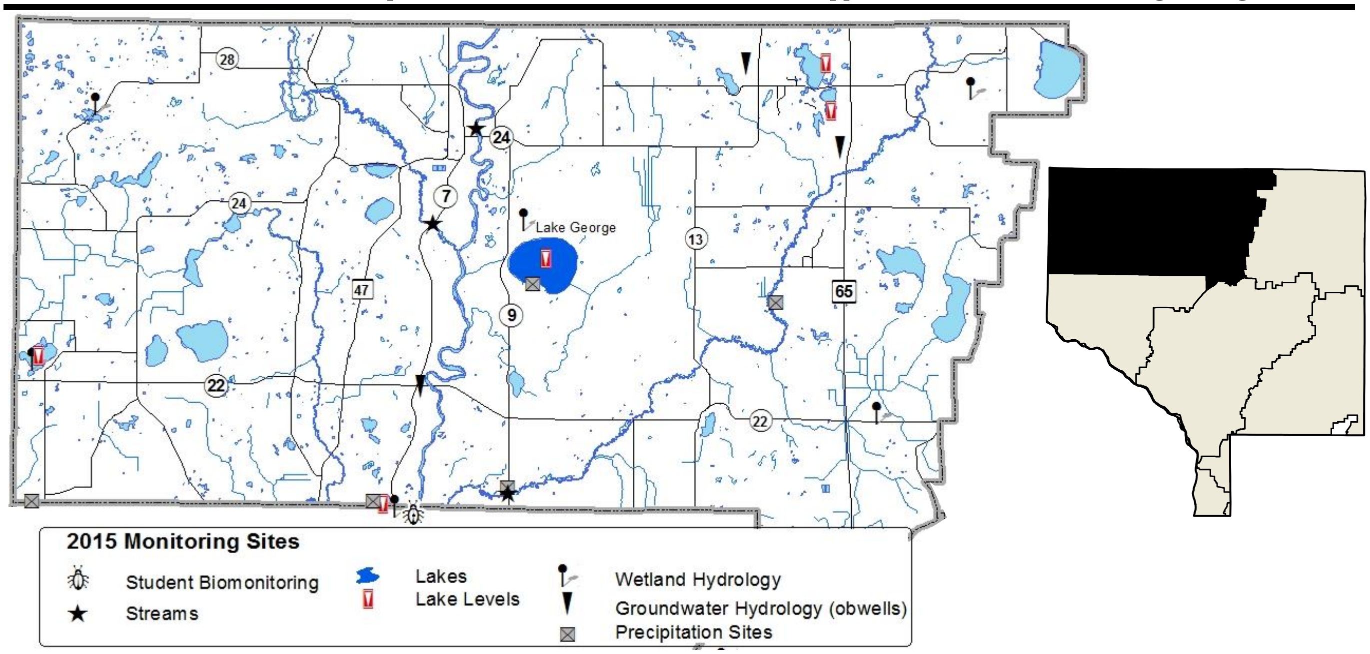


Prepared by the Anoka Conservation District

CHAPTER 3:
UPPER RUM RIVER WATERSHED

Task	Partners	Page
Lake Level Monitoring	URRWMO, ACD, MN DNR, volunteers	3-73
Lake Water Quality Monitoring	URRWMO, ACD, Lake George LID	3-75
Aquatic Invasive Vegetation Mapping	Lake George LID	3-79
Stream Water Quality – Chemical Monitoring	MPCA, ACD	3-80
Stream Water Quality – Biological Monitoring	ACD, URRWMO, ACAP, St. Francis High School, Anoka County 4-H	3-107
Wetland Hydrology	URRWMO, ACD	3-112
Water Quality Grant Fund	URRWMO, ACD	3-118
URRWMO Website	URRWMO, ACD	3-119
URRWMO Annual Newsletter	URRWMO, ACD	3-120
2014 Annual Reports to the State	URRWMO, ACD	3-121
Financial Summary		3-122
Recommendations		3-123
Groundwater Hydrology (obwells)	ACD, MNDNR	Chapter 1
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 and when available, past twenty five years are illustrated below, and all historic data are available on the Minnesota DNR website using the “LakeFinder” feature (www.dnr.mn.us.state\lakefind\index.html).

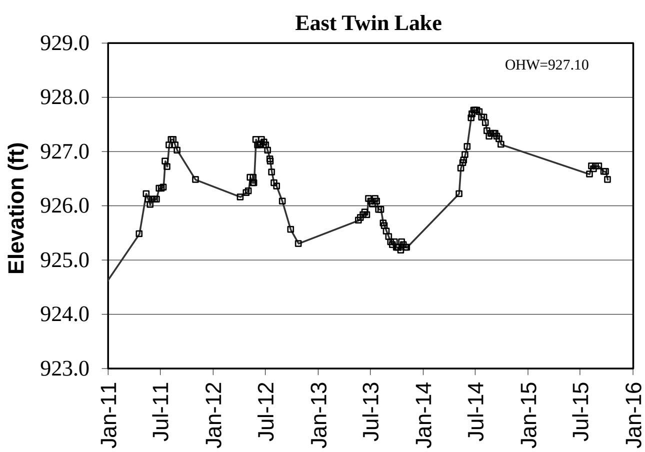
Purpose: To understand lake hydrology, including the impact of climate or other water budget changes. These data are useful for regulatory, building/development, and lake management decisions.

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

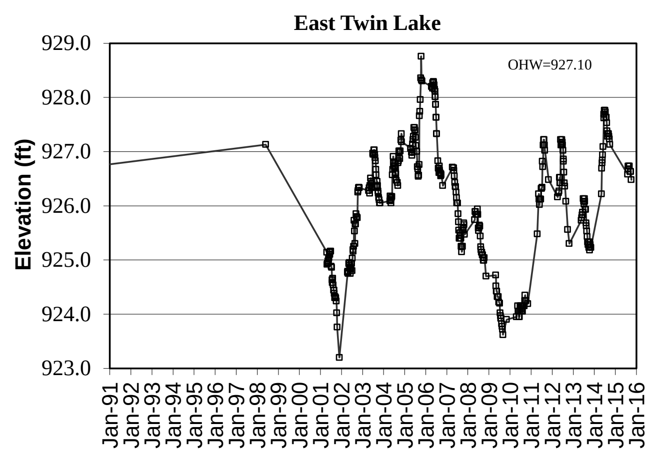
Results: Lake levels were measured by volunteers throughout the 2015 open water season. Lake gauges were installed and surveyed by the Anoka Conservation District and MN DNR. Lakes had increasing water levels in spring and early summer and dropped steadily by mid-summer. A resurgence of rainfall late into fall caused a spike in lake levels at the end of the year. Overall lake levels were lower than in 2014 when very heavy rainfall totals occurred.

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.

East Twin Lake Levels – last 5 years

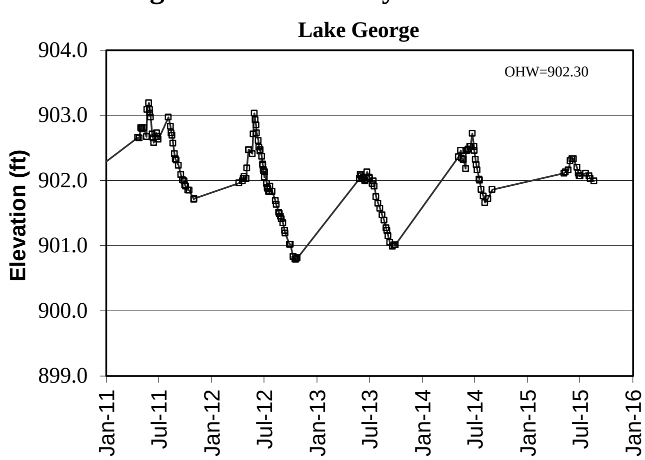


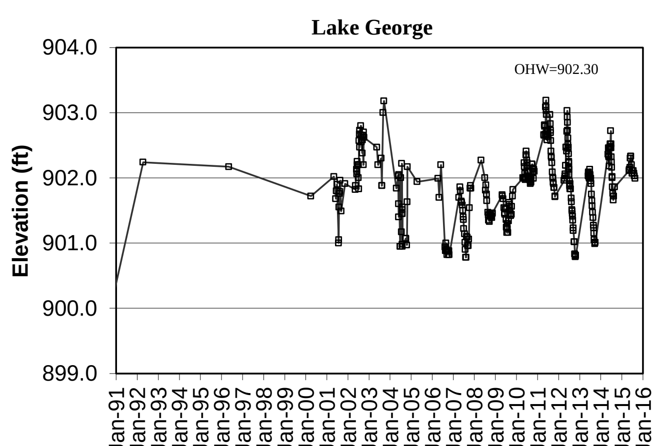
East Twin Lake Levels – last 25 years



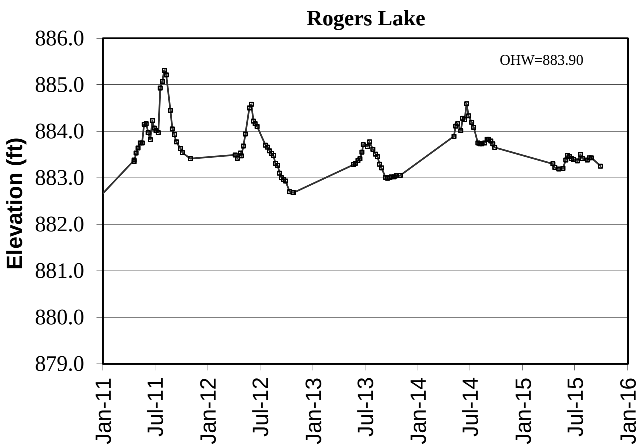
Lake George Levels – last 5 years

Lake George Levels – last 25 years

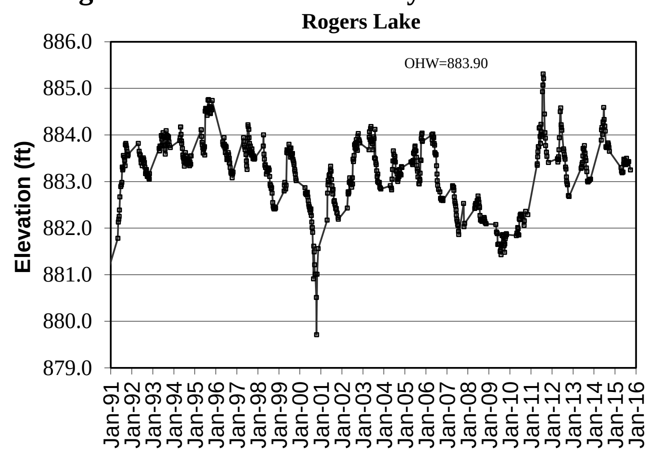




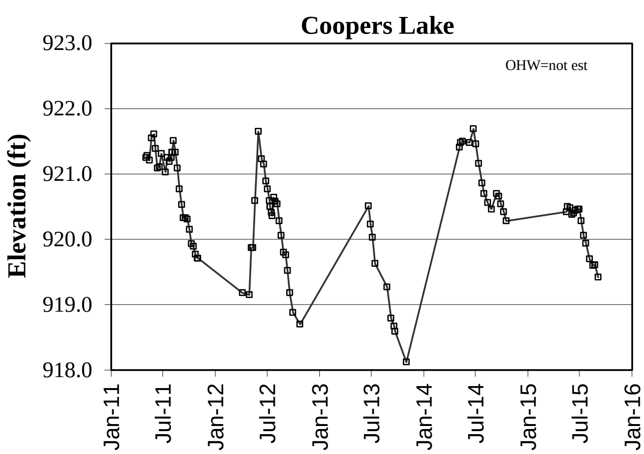
Rogers Lake Levels – last 5 years



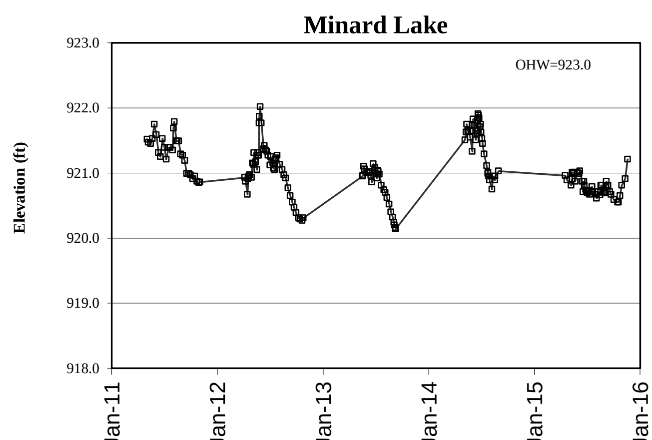
Rogers Lake Levels – last 25 years



Coopers Lake Levels – last 5 years



Minard Lake Levels – last 5 years



Lake Water Quality

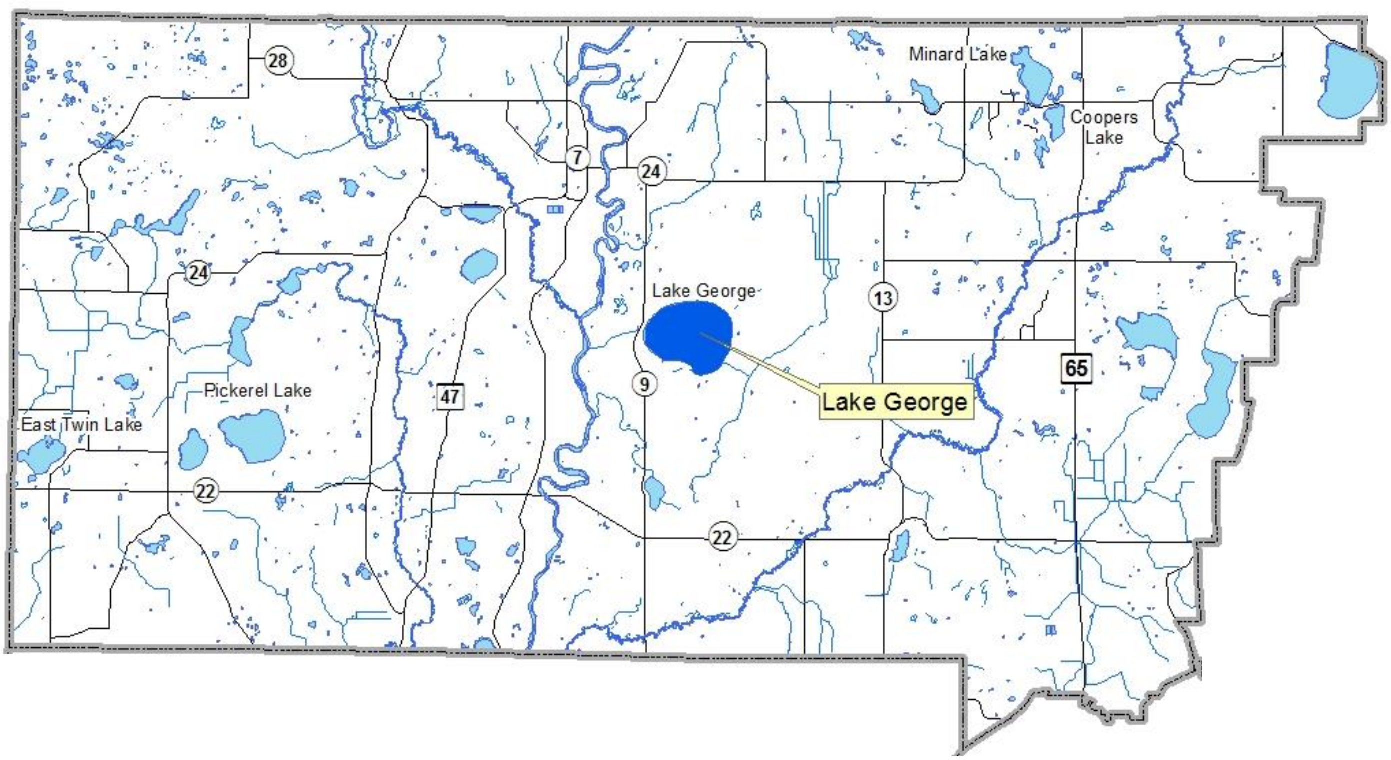
Description: May through September at least once-monthly monitoring of the following parameters: total phosphorus, chlorophyll-a, Secchi transparency, dissolved oxygen, turbidity, temperature, conductivity, pH, and salinity.

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

Locations: Lake George

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



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.

2015 Results

In 2015 Lake George had good water quality for this region of the state (NCHF Ecoregion), receiving an overall A grade. The lake is mesotrophic. Total phosphorus averaged 22.8 ug/L, lower from the previous year. Secchi transparency was over 12 feet in May, but dropped to as low as 4.0 feet in late-August. Average Secchi transparency was 7.7 feet, a slight improvement from 2014. Chlorophyll-a averaged 4.4 mg/L, which is lower than the total average of all years monitored. Total phosphorous, chlorophyll-a, and transparency were poorest in August.

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, 2013, 2014 and 2015). Water quality as a whole has not significantly changed from 1980 to 2015 (repeated measures MANOVA with response variables TP, Cl-a, and Secchi depth, $F_{2,15}$= 0.99, p=0.39). However, when analyzed individually Secchi transparency has significantly decreased (one-way ANOVA $F_{1,16}$= 8.44, p=0.01).

Discussion

Lake George remains one of the clearest of Anoka County Lakes, but its trend toward poorer water quality is seriously concerning. Lake George is a highly valued lake due to its recreational opportunities and ecological quality. The lake has a large park, many lakeshore homes, and a notably diverse plant community (most metro area lakes have 10-12 different aquatic plant species; Lake George is home to 24).

In 2015 the Lake George Improvement District and Anoka Conservation District are launching a project to identify causes of water quality degradation and projects that can be installed to fix it. The work will take 1-3 years.

In the meantime, continued efforts should include monitoring, education, and lakeshore and nutrient best management practices. Residential lakeshore restorations are one high priority, immediately actionable item. Several lakeshore properties have recently undertaken projects to correct erosion and restore native plant communities, but many properties on Lake George aggressively manicure their lakeshore in ways that are detrimental to lake health.

Two exotic invasive plants are present in Lake George, Curly leaf pondweed and Eurasian Water milfoil. A Lake Improvement District was formed to 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. In 2013 water quality monitoring showed a dramatic rise in phosphorus shortly after curly leaf pondweed treatment and it was suspected that the herbicide treatment may have caused the phosphorus increase. The 2014 and 2015 water quality data was collected immediately before and after herbicide treatment to determine if this was the case. No obvious causal relationship between weed treatment and water quality was observed.

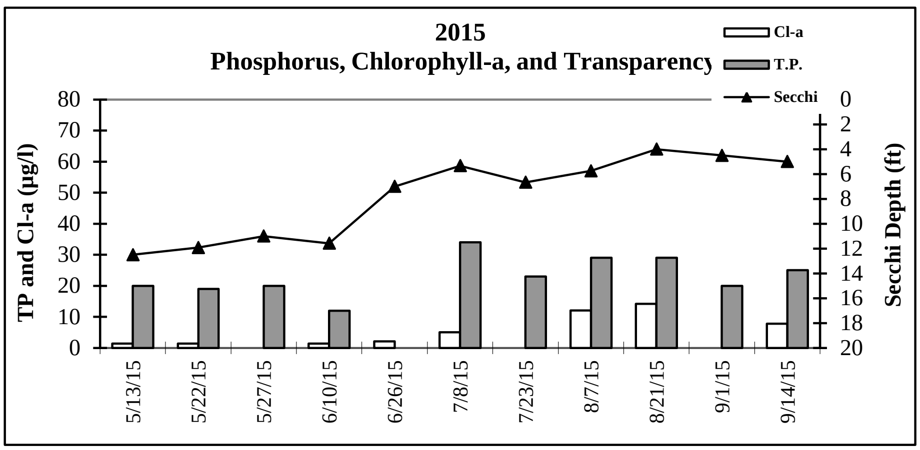
In 2015 the invasive plants were mapped out earlier in the season to allow for earlier treatment, hoping to reduce the chance of water quality impacts (decomposition of larger plants in warmer water). While immediate impacts were not observed in 2015 future monitoring and continued modified herbicide treatments may provide insight.

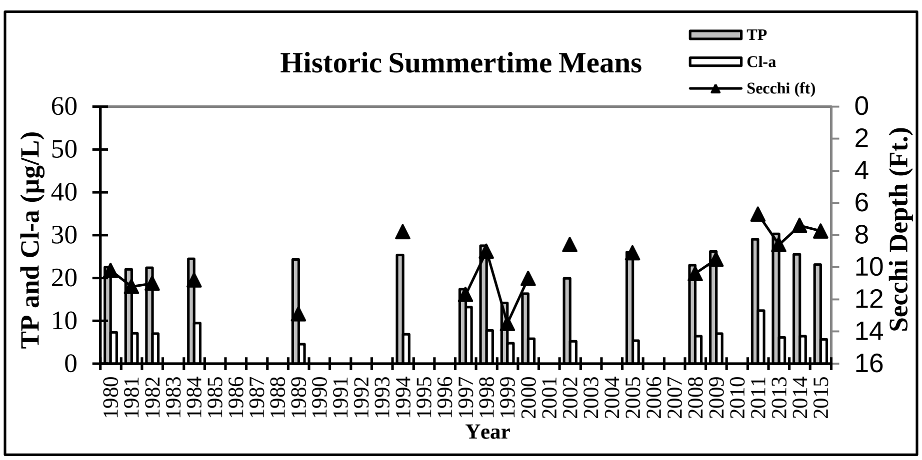
2015 Lake George Water Quality Data

Lake George			5/13/2015	5/22/2015	5/27/2015	6/10/2015	6/26/2015	7/8/2015	7/23/2015	8/7/2015	8/21/2015	9/1/2015	9/14/2015			
2015 Water Quality Data			13:00	11:15	11:00	11:30	11:10	11:10	11:20	9:15	10:35	10:45	11:40			
	Units	R.L.*	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Average	Min	Max
pH		0.1	8.04	8.09	8.56	8.65	8.78	8.58	8.66	8.66	8.04	8.26	8.26	8.42	8.04	8.78
Conductivity	mS/cm	0.01	0.228	0.228	0.232	0.233	0.252	0.255	0.219	0.245	0.273	0.236	0.261	0.24	0.219	0.273
Turbidity	NTU	1.00	0.60	1.30	1.50	0.70	2.30	6.20	4.80	12.50	9.40	9.90	7.00	5.11	0.60	12.50
D.O.	mg/L	0.01	10.32	11.2	10.01	8.79	8.67	7.24	8.26	8.07	7.95	9.11	8.78	8.95	7.24	11.20
D.O.	%	1	99.5%	114.1%	106.6%	106.3%	107.4%	88.6%	104.1%	95.8%	90.5%	109.7%	101.0%	102%	89%	114%
Temp.	°C	0.1	14	15	17	23	25	24	26	24	22	23	20	21.18	13.7	25.9
Temp.	°F	0.1	56.7	59.8	62.5	73.7	76.8	75.2	78.7	75.0	71.0	73.3	68.8	70.13	56.7	78.7
Salinity	%	0.01	0.11	0.11	0.11	0.11	0.12	0.12	0.1	0.12	0.13	0.11	0.12	0.11	0.10	0.13
Cl-a	ug/L	0.5	1.4	1.4	1	1.4	2.1	5	1	12.1	14.2	1	7.8	4.40	1.0	14.2
T.P.	mg/L	0.010	0.02	0.019	0.02	0.012	0.02	0.034	0.023	0.029	0.029	0.02	0.025	0.02	0.012	0.034
T.P.	ug/L	10	20	19	20	12	20	34	23	29	29	20	25	22.8	12	34
Secchi	ft	0.1	12.5	11.92	11	11.58	7	5.33	6.67	5.75	4	4.5	5	7.75	4.0	12.5
Secchi	m	0.03	3.81	3.63	3.35	3.53	2.13	1.62	2.03	1.75	1.22	1.37	1.50	2.36	1.2	3.8
Physical			1.0	2.0	2.0	2.0	2.0	2.0	3.0	1.0	1.0	2.0	2.0	1.82	1.0	3.0
Recreational			1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0	1.0	1.09	1.0	2.0

*reporting limit

		2015 Median
pH		8.56
Conductivity	mS/cm	0.236
Turbidity	FNRU	4.80
D.O.	mg/l	8.78
D.O.	%	104.00%
Temp.	°C	23.00
Temp.	°F	73.33
Salinity	%	0.11
Cl-a	ug/L	3.60
T.P.	mg/l	0.024
T.P.	ug/l	24.00
Secchi	ft	6.70
Secchi	m	2.03





Lake George Summertime Annual Means

Agency	MC	MC	MC	MC	MC	MC	ACD	MC	ACD	ACD	ACD	ACD	ACD	MC	MC	ACD	ACD	ACD
Year	1980	1981	1982	1984	1989	1994	1997	1998	1999	2000	2002	2005	2008	2009	2011	2013	2014	2015
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	25.5	23.1
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	6.4	5.7
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	2.2	2.4
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	7.4	7.7

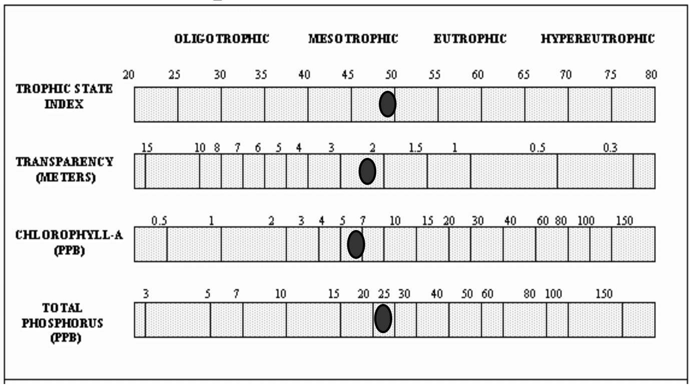
Carlson's Tropic State Indices

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

Lake George Water Quality Report Card

Year	80	81	82	84	89	94	97	98	99	2000	2002	2005	2008	2009	2011	2013	2014	2015
TP	A	A	A	B	B	B	A	B	A	A	A	B	B+	B	B	B	B	A
Cl-a	A	A	A	A	A	A	B	A	A	A	A	A	A	A	B	A	A	A
Secchi	A	A	A	A	A	B	A	B	A	B	B	B	A	B	C	B	B	B
Overall	**A**	**A**	**A**	**A**	**A**	**B**	**A**	**B**	**A**	**A**	**A**	**B**	**A**	**B**	**B**	**B**	**B**	**A**

Carlson's Trophic State Index



Aquatic Invasive Vegetation Mapping

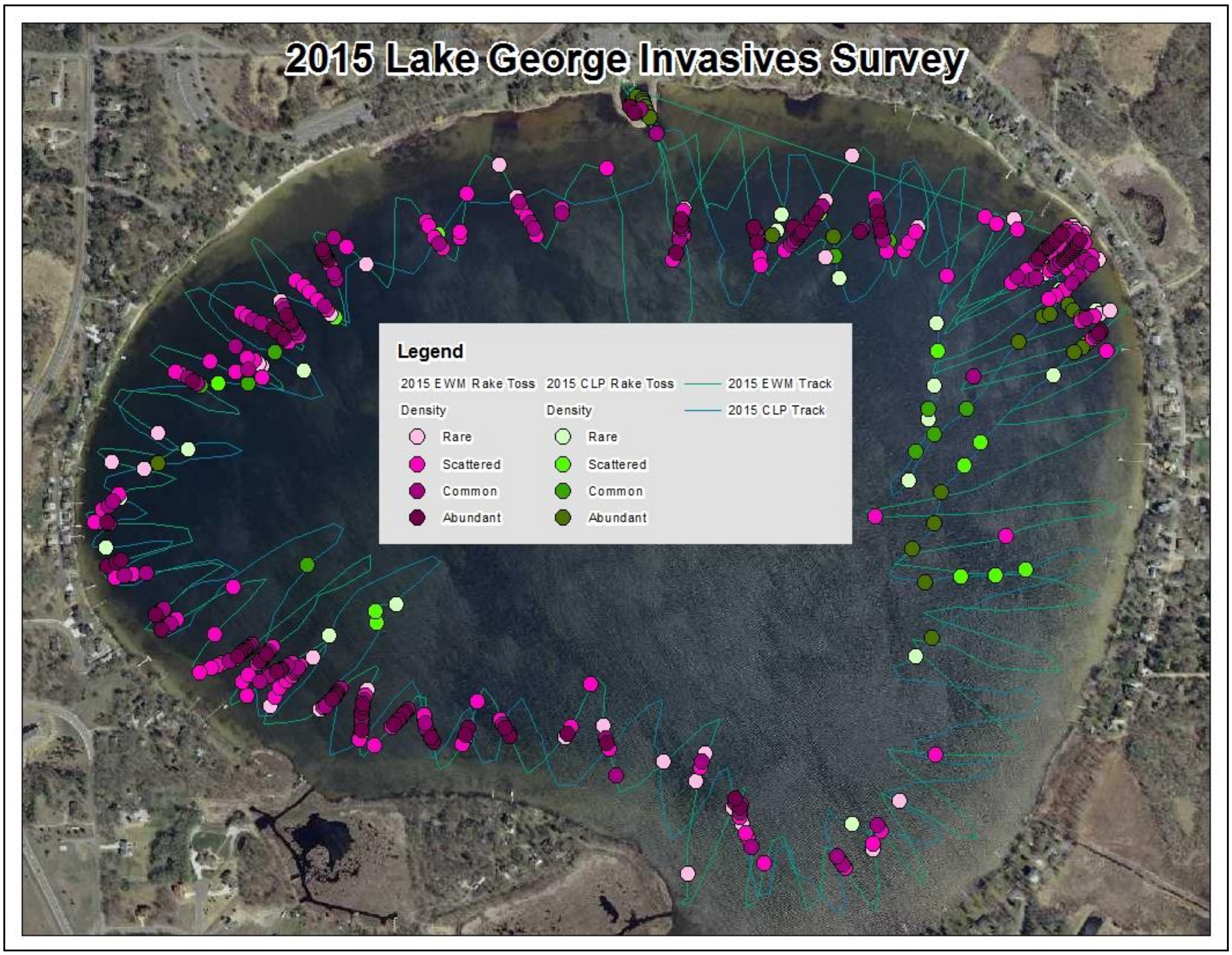
Description: The Anoka Conservation District (ACD) was contracted through the Lake George Lake Improvement District (LID) to conduct an aquatic invasive vegetation delineation.

Purpose: To map out the presence of Curly Leaf Pondweed (CLP) and Eurasian Water Milfoil (EWM) earlier in the season. This would allow for sooner chemical treatment with the goal of eliminating the bounce in nutrients following treatment seen in years past.

Locations: Lake George

Results: A map is presented below. These survey points were reviewed by the MNDNR and herbicide treatments occurred in areas with the greatest density of invasive plants.

2015 Lake George Curly Leaf Pondweed (CLP) and Eurasian Water Milfoil (EWM) Survey



Stream Water Quality - Chemical Monitoring

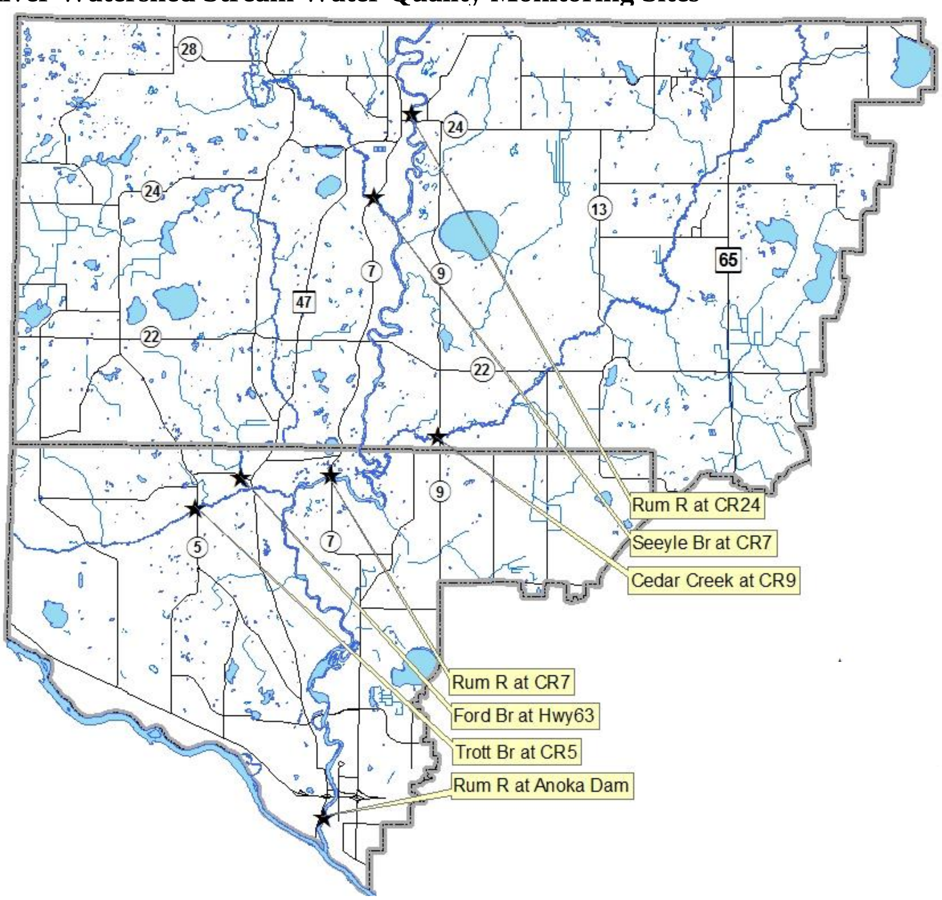
Description: The Rum River and several tributary streams were monitored in 2015. The locations of river monitoring include the approximate top and bottom of the Upper and Lower Rum River Watershed Management Organizations. Tributaries were monitored simultaneous with the Rum River monitoring for greatest comparability near their outfalls into the river. Collectively, these data allow for an upstream to downstream water quality comparison within Anoka County, as well as within each watershed organization. It also allows us to examine whether the tributaries degrade Rum River water quality. Monitoring occurred in May through September for of the following parameters: total suspended solids, e. coli, total phosphorus, Secchi tube transparency, dissolved oxygen, turbidity, temperature, conductivity, pH, and salinity.

Purpose: To detect water quality trends and problems, and diagnose the source as well as provide an initial assessment of water quality to be used in the completion of the Rum River Watershed Restoration and Protection Plan (WRAPP).

Locations:
Rum River at Co Rd 24
Rum River at Co Rd 7
Rum River at the Anoka Dam
Seelye Brook at Co Rd 7
Cedar Creek at Co Rd 9
Ford Brook at Co Rd 63

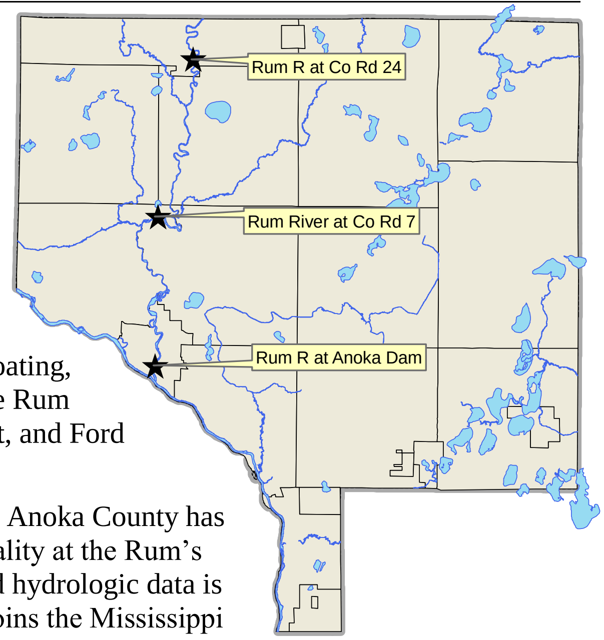
Results: Results are presented on the following pages.

Upper Rum River Watershed Stream Water Quality Monitoring Sites



RUM RIVER

Rum River at Co. Rd. 24 (Bridge St), St. Francis	STORET SiteID =	S000-066
Rum River at Co. Rd. 7 (Roanoke St), Ramsey	STORET SiteID =	S004-026
Rum River at Anoka Dam, Anoka	STORET SiteID =	S003-183



Years Monitored

At Co. Rd. 24 –	2004, 2009, 2010, 2011, 2014, 2015
At Co. Rd. 7 –	2004, 2009, 2010, 2011, 2014, 2015
At Anoka Dam –	1996-2011(MC WOMP), 2015

Background

The Rum River is regarded as one of Anoka County's highest quality and most valuable water resources. It is designated as a state scenic and recreational river throughout Anoka County, except south of the county fairgrounds in Anoka. It is used for boating, tubing, and fishing. Much of western Anoka County drains to the Rum River. Subwatersheds that drain to the Rum include Seelye, Trott, and Ford Brooks, and Cedar Creek.

The extent to which water quality improves or is degraded within Anoka County has been unclear. The Metropolitan Council has monitored water quality at the Rum's outlet to the Mississippi River since 1996. This water quality and hydrologic data is well suited for evaluating the river's water quality just before it joins the Mississippi River. Monitoring elsewhere has been sporadic and sparse. Water quality changes might be expected from upstream to downstream because land use changes dramatically from rural residential in the upstream areas of Anoka County to suburban in the downstream areas.

Methods

In 2004, 2009, 2010, 2011, 2014, and 2015 monitoring was conducted to determine if Rum River water quality changes in Anoka County, and if so, generally where changes occur. The data is reported together for a more comprehensive analysis of the river from upstream to downstream.

In 2015 the river was monitored during both storm and baseflow conditions by grab samples. Eight water quality samples were taken; half during baseflow and half following storms. Storms were generally defined as one-inch or more of rainfall in 24 hours or a significant snowmelt event combined with rainfall. In some years, particularly the drought year of 2009, smaller storms were sampled because of a lack of larger storms. All storms sampled were significant runoff events. Parameters tested with portable meters included pH, conductivity, turbidity, temperature, salinity, and dissolved oxygen. Parameters tested by water samples sent to a state-certified lab included total phosphorus, total suspended solids. During every sampling the water level (stage) was recorded. The monitoring station at the Anoka Dam includes automated equipment that continuously tracks water levels and calculates flows. Water level and flow data for other sites was obtained from the US Geological Survey, who maintains a hydrological monitoring site at Viking Boulevard.

The purpose of this report is to make an upstream to downstream comparison of Rum River water quality. It includes only parameters tested in 2015. It does not include additional parameters tested at the Anoka Dam or additional monitoring events at that site. For that information, see Metropolitan Council reports at http://www.metrocouncil.org/Environment/RiversLakes. All other raw data can be obtained from the Anoka Conservation District and is also available through the Minnesota Pollution Control Agency's EQuIS database, which is available through their website.

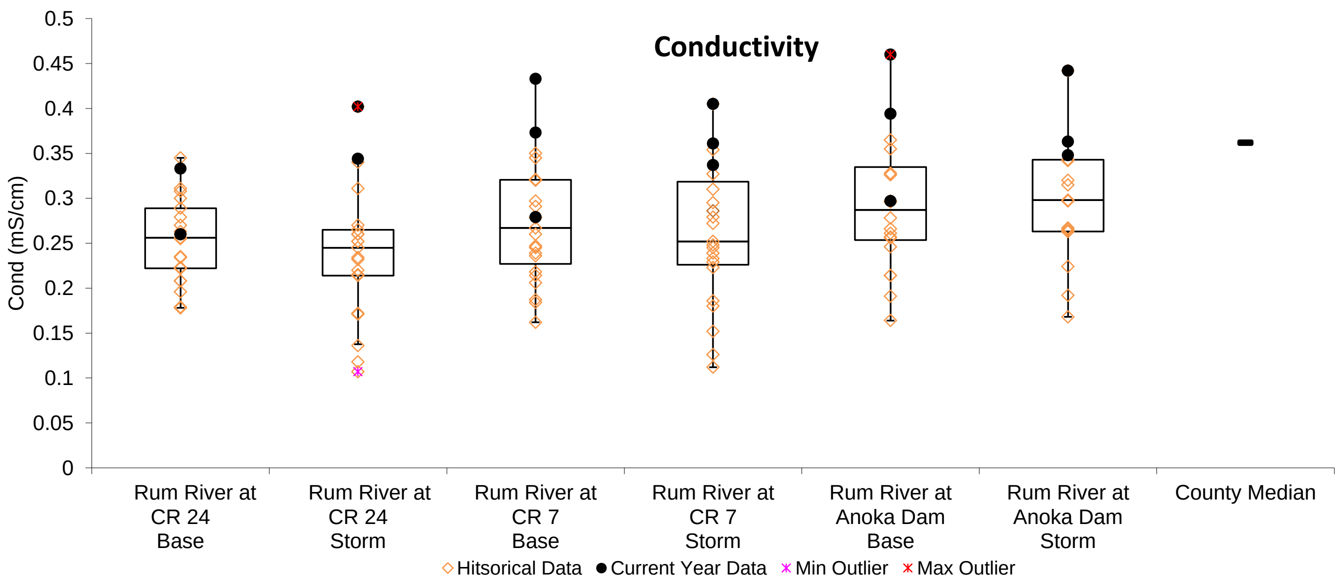
Results and Discussion

On the following pages data are presented and discussed for each parameter. Management recommendations will be included in the 2015 report at the conclusion of this monitoring project. The Rum River is an exceptional waterbody, and its protection and improvement should be a high priority.

Conductivity

Conductivity and chlorides are measures of dissolved pollutants. Dissolved pollutant sources include urban road runoff, industrial chemicals, and others. Metals, hydrocarbons, road salts, and others are often of concern in a suburban environment. Conductivity was the broadest measure of dissolved pollutants used. It measures electrical conductivity of the water; pure water with no dissolved constituents has zero conductivity. Chlorides were not sampled in 2015 and thus not displayed below. Historical chloride data can be obtained from the Anoka Conservation District and is also available through the Minnesota Pollution Control Agency's EQuIS database, which is available through their website. These pollutants are of greatest concern because of the effect they can have on the stream's biological community. They can also be of concern because the Rum River is upstream from the Twin Cities drinking water intakes on the Mississippi River.

Conductivity during baseflow and storm conditions Orange diamonds are historical data from previous years and black circles are 2015 readings. Box plots show the median (middle line), 25th and 75th percentile (ends of box), and 10th and 90th percentiles (floating outer lines).



Conductivity is acceptably low in the Rum River, but increases downstream (see figures above) and is usually higher during baseflow. Median conductivity from upstream to downstream of the sites monitored in 2015 (all conditions) was 0.338 mS/cm, 0.369 and 0.391 mS/cm, respectively. Two of the sites are higher than the median for 34 Anoka County streams of 0.362 mS/cm. The 2015 maximum observed conductivity in the Rum River was 0.46 mS/cm which is the highest on record.

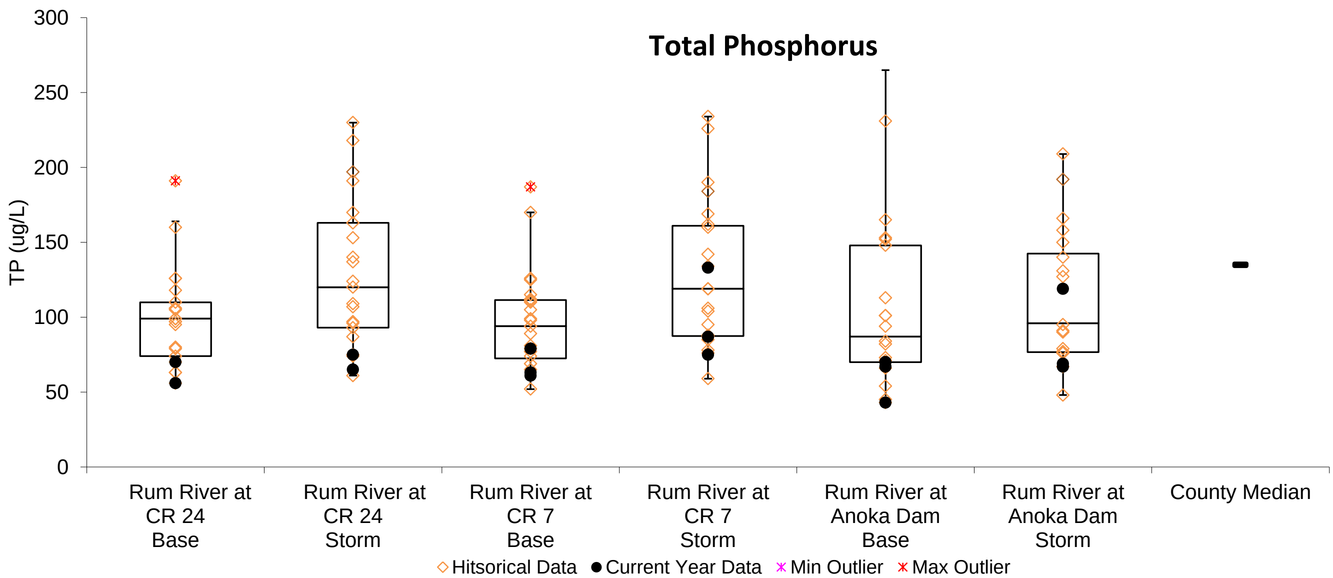
Conductivity was lowest at most sites during storms, suggesting that stormwater runoff contains fewer dissolved pollutants than the surficial water table that feeds the river during baseflow. High baseflow conductivity has been observed in most other nearby streams too, studied extensively, and the largest cause has been found to be road salts that have infiltrated into the shallow aquifer. Geologic materials also contribute, but to a lesser degree.

Conductivity increased from upstream to downstream. During baseflow this increase from upstream to downstream reflects greater road densities and deicing salt application. During storms, the higher conductivity downstream is reflective of greater stormwater runoff and pollutants associated with the more densely developed lower watershed.

Total Phosphorus

Total phosphorus in the Rum River is acceptably low and is similar to the median for all other monitored 34 Anoka County streams (see figure below). 2015 readings averaged much lower than 2014 results. This nutrient is one of the most common pollutants in our region, and can be associated with urban runoff, agricultural runoff, wastewater, and many other sources. The median phosphorus concentration in 2015 at the three monitored sites (all conditions) was 67.5, 77 and 69.5 ug/L. These upstream-to-downstream differences are negligible and there is no trend of increasing phosphorus downstream. All sites in 2015 had phosphorus concentrations lower than the median for Anoka County streams of 135 ug/L. In 2015 the highest observed total phosphorus reading was during one particular storm event, with a maximum of 133. In all, phosphorus in the Rum River is at acceptable levels but should continue to be an area of pollution control effort as the area urbanizes.

Total phosphorus during baseflow and storm conditions Orange diamonds are historical data from previous years and black circles are 2015 readings. Box plots show the median (middle line), 25th and 75th percentile (ends of box), and 10th and 90th percentiles (floating outer lines).



Turbidity and Total Suspended Solids (TSS)

Turbidity and total suspended solids (TSS) are two different measurements of solid material suspended in the water. Turbidity is measured by refraction of a light beam passed through a water sample. It is most sensitive to large particles. Total suspended solids are measured by filtering solids from a water sample and weighing the filtered material. The amount of suspended material is important because it affects transparency and aquatic life, and because many other pollutants are attached to particles. Many stormwater treatment practices such as street sweeping, sumps, and stormwater settling ponds target sediment and attached pollutants. In 2015 Suspended solids in the Rum River were low.

It is important to note the suspended solids can come from sources within and outside of the river channel. Sources on land include soil erosion, road sanding, and others. Riverbank erosion and movement of the river bottom also contributes to suspended solids. A moderate amount of this "bed load" is natural and expected.

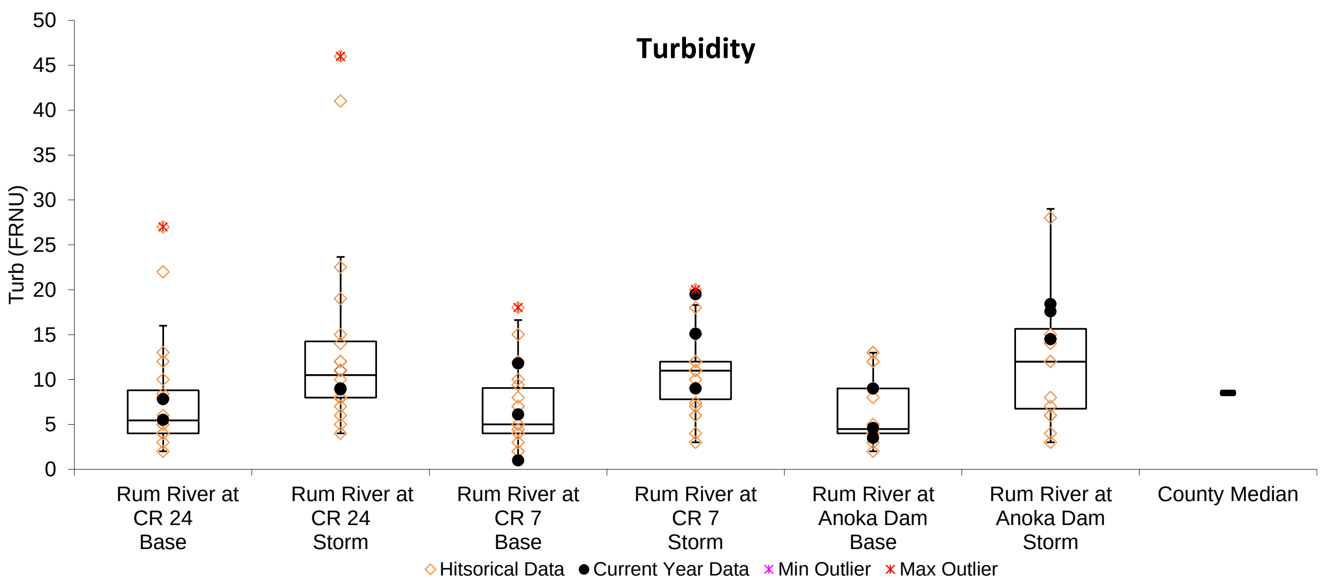
In the Rum River, turbidity was low with increases during storms and a very slight decrease at downstream monitoring sites (see figure below). The median turbidity, in 2015 (all conditions) was 8.35, 10.4 and 9.5 NTU (upstream to downstream), which is similar or higher than the median for Anoka County streams of 8.5 NTU. Turbidity was elevated on a few occasions, especially during storms. In 2015 the maximum observed was 19.5 NTU during a mid-season monitoring event.

TSS in 2015 was similar to 2014 results. The median TSS, in 2015 (all conditions) was 6, 5.5 and 5.5 (upstream to downstream). These are all much lower than the Anoka County stream median for TSS of 12.

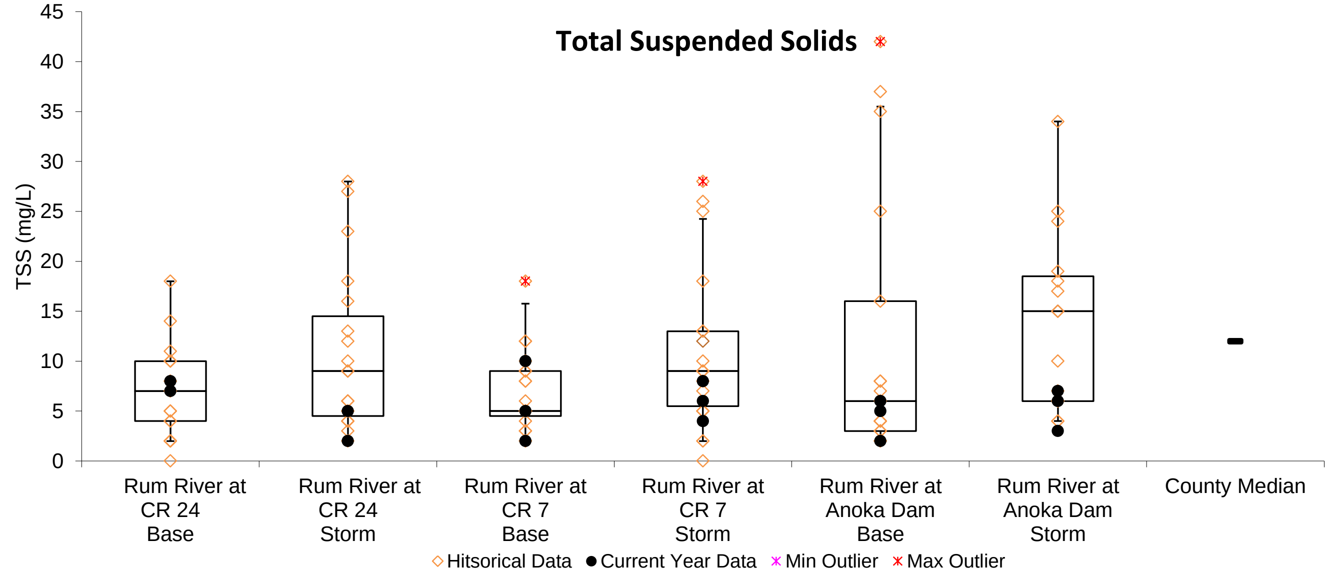
Rigorous stormwater treatment should occur as the Rum River watershed develops, or the collective pollution caused by many small developments will seriously impact the river. Bringing stormwater treatment up to date in older developments is also important.

Differences between TSS and turbidity lend insight into the nature of any problems. TSS showed increases at the downstream monitoring site, while turbidity did not. Turbidity is most sensitive to large particles. Therefore, the downstream increases are likely due to smaller particles. Other pollutants, such as phosphorus and metals, are most highly correlated with smaller particles. These other pollutants can "hitch a ride" on smaller particles because of their greater surface area and, in the case of certain soils, ionic charge. Furthermore, small particles stay suspended in the water column and therefore are more likely to be transported by stream flows and are more difficult to remove with stormwater practices like settling ponds.

Turbidity during baseflow and storm conditions Orange diamonds are historical data from previous years and black circles are 2015 readings Box plots show the median (middle line), 25th and 75th percentile (ends of box), and 10th and 90th percentiles (floating outer lines).



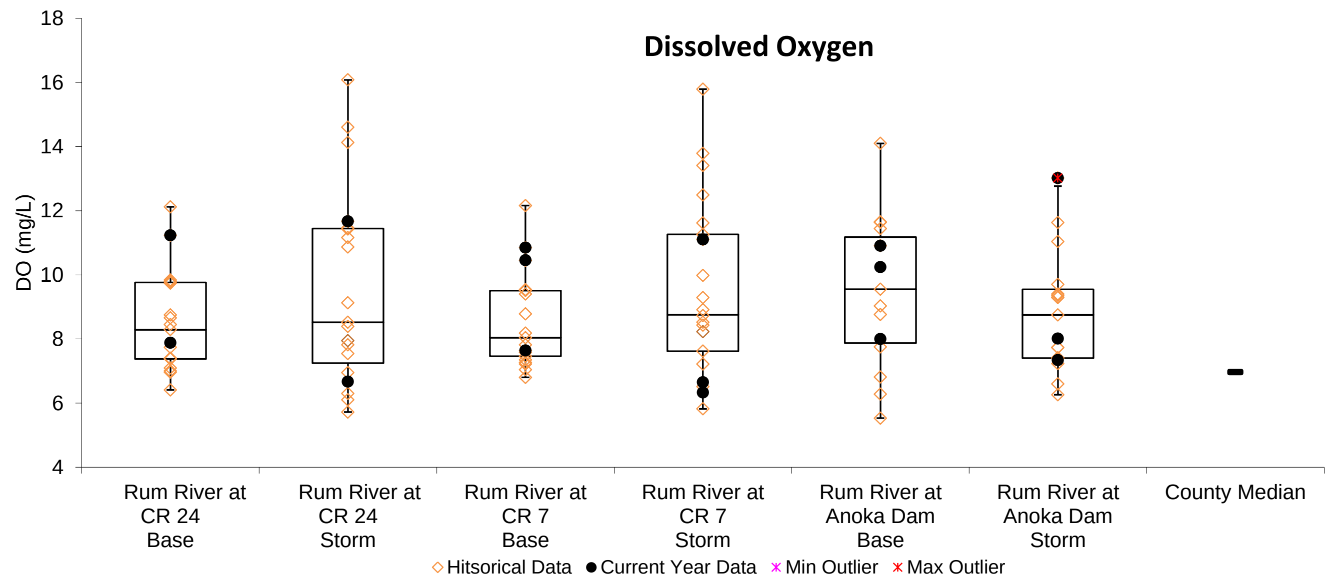
Total suspended solids during baseflow and storm conditions Orange diamonds are historical data from previous years and black circles are 2015 readings Box plots show the median (middle line), 25th and 75th percentile (ends of box), and 10th and 90th percentiles (floating outer lines).



Dissolved Oxygen

Dissolved oxygen is necessary for aquatic life, including fish. Organic pollution consumes oxygen when it decomposes. If oxygen levels fall below 5 mg/L aquatic life begins to suffer. In the Rum River dissolved oxygen was always above 5.5 mg/L at all monitoring sites.

Dissolved oxygen during baseflow and storm conditions Orange diamonds are historical data from previous years and black circles are 2015 readings Box plots show the median (middle line), 25th and 75th percentile (ends of box), and 10th and 90th percentiles (floating outer lines).

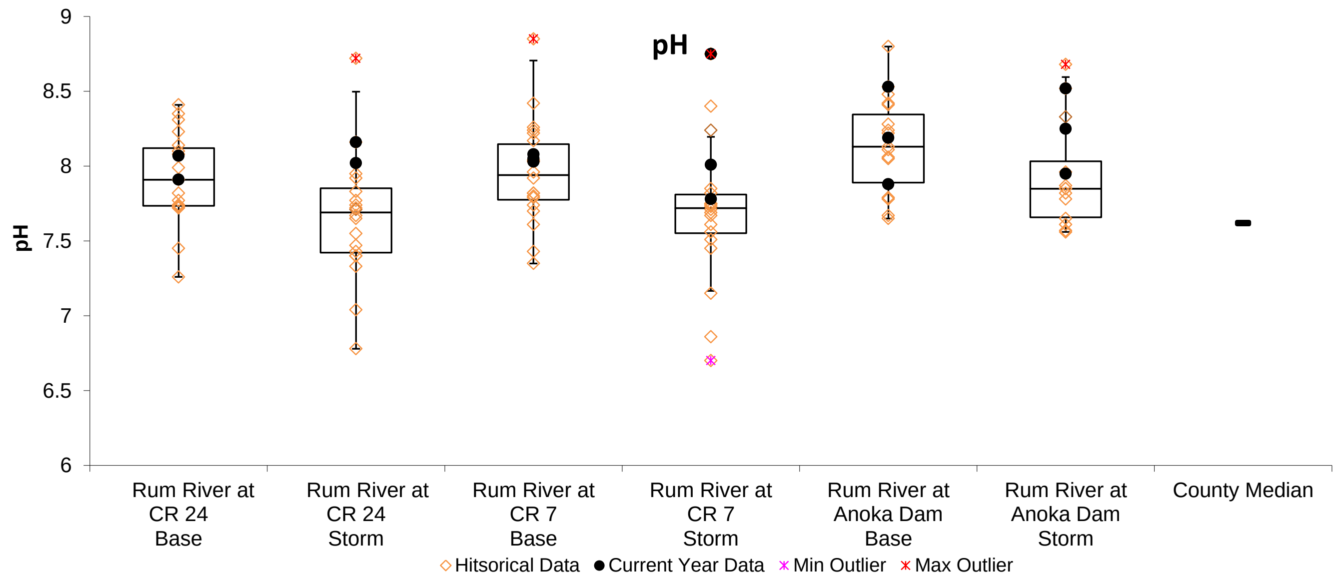


pH

pH refers to the acidity of the water. The Minnesota Pollution Control Agency's water quality standard is for pH to be between 6.5 and 8.5. The Rum River is generally within this range (see figure below).

It is interesting to note that pH is lower during storms than during baseflow. This is because the pH of rain is typically lower (more acidic). While acid rain is a longstanding problem, its effect on this aquatic system is small.

pH during baseflow and storm conditions Orange diamonds are historical data from previous years and black circles are 2015 readings Box plots show the median (middle line), 25th and 75th percentile (ends of box), and 10th and 90th percentiles (floating outer lines).

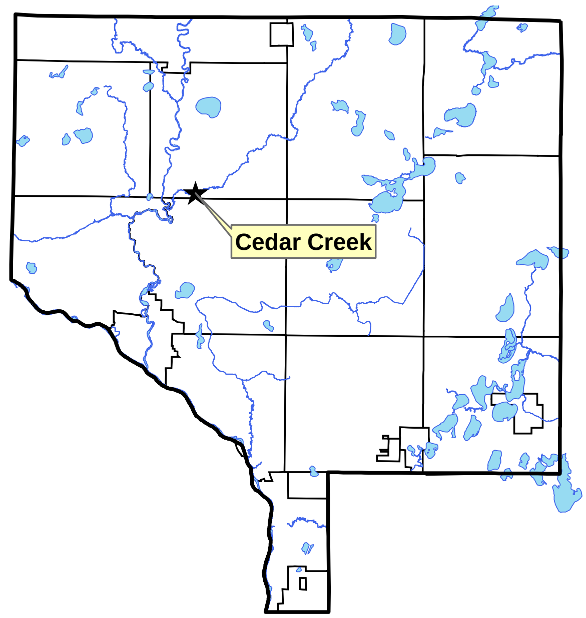


Summary and Recommendations

The Rum River's water quality is very good. It does show a slight increase in suspended solids and conductivity downstream. Protection of the Rum River should be a high priority for local officials. Large population increases are expected for the Rum River's watershed within Anoka County and have the potential to degrade water quality unless carefully sited and managed. Development pressure is likely to be especially high near the river because of its scenic and natural qualities.

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 2015. 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 higher than average when compared to similar Anoka County streams. Conductivity averaged 0.408 mS/cm Maximum of 0.498 mS/cm and a minimum of 0.328 mS/cm). Chlorides were last sampled in 2013 where they 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 135 ug/l. Cedar Creek often exceeds the state standard, even during baseflow periods. Phosphorous results in Cedar Creek averaged 209 ug/l (maximum of 324 ug/l and a minimum of 145 ug/l).
- Suspended solids and turbidity both were well above the state standards each sampling event. Total suspended solids averaged 35.8 mg/l (with a maximum of 64.0 mg/l and a minimum of 15 mg/l). Turbidity averaged 25.33 NTU (with a maximum of 41.90 NTU and a minimum of 15.0 NTU).
- pH and dissolved oxygen were within the range considered normal and healthy for streams in this area. However, on one sampling occasions pH exceeded the 6.5-8.5 range. pH averaged 7.83 (maximum of 8.63 and a minimum of 7.21). DO averaged 8.55 mg/l (maximum of 11.55 mg/l and a minimum of 6.46 mg/l).

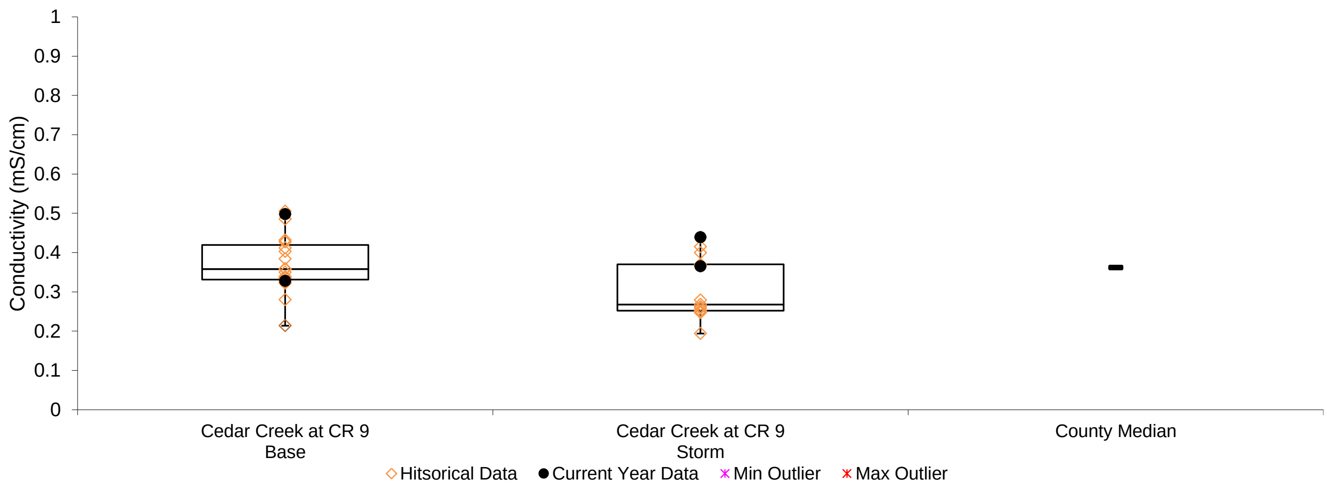
For a significant number of the results below there are no current state standards. However, this data will be used as a baseline for future assessments of the watershed.

Cedar Creek at CR 9			3/12/2015	4/13/2015	7/6/2015	7/10/2015				
	Units	R.L.*	Results	Results	Results	Results	Median	Average	Min	Max
pH		0.1	8.63	7.21	7.61	7.86	7.74	7.81	7.21	8.63
Conductivity	mS/cm	0.01	0.365	0.328	0.439	0.498	0.40	0.406	0.328	0.498
Turbidity	NTU	1	21.0	23.4	41.9	15.0	22.20	24.70	15.00	41.90
D.O.	mg/L	0.01	11.55	8.58	6.46	7.61	8.10	8.46	6.46	11.55
D.O.	%	1	88.7	78.7	74.2	90.1	83.70	83.1	74.2	90.1
Temp.	°C	0.1	3.48	10.34	20.42	22.30	15.38	14.4	3.5	22.3
Salinity	%	0.01	0.17	0.15	0.21	0.24	0.19	0.19	0.15	0.24
T.P.	ug/L	10	158	208	324	145	183.00	204	145	324
TSS	mg/L	2	15	45	64	19	32.00	35.0	15.0	64.0
Secchi-tube	cm		73.00	40.00	39	90	56.50	>90	39	>100
E coli	MPN								0.0	0.0
Appearance										
Recreational										

Conductivity

Conductivity and chlorides are measures of dissolved pollutants. Dissolved pollutant sources include urban road runoff, industrial chemicals, and others. Metals, hydrocarbons, road salts, and others are often of concern in a suburban environment. Conductivity was the broadest measure of dissolved pollutants used. It measures electrical conductivity of the water; pure water with no dissolved constituents has zero conductivity. Chlorides were not sampled in 2015 and thus not displayed below. Historical chloride data can be obtained from the Anoka Conservation District and is also available through the Minnesota Pollution Control Agency's EQuIS database, which is available through their website. These pollutants are of greatest concern because of the effect they can have on the stream's biological community.

Conductivity during baseflow and storm conditions Orange diamonds are historical data from previous years and black circles are 2015 readings. Box plots show the median (middle line), 25th and 75th percentile (ends of box), and 10th and 90th percentiles (floating outer lines).

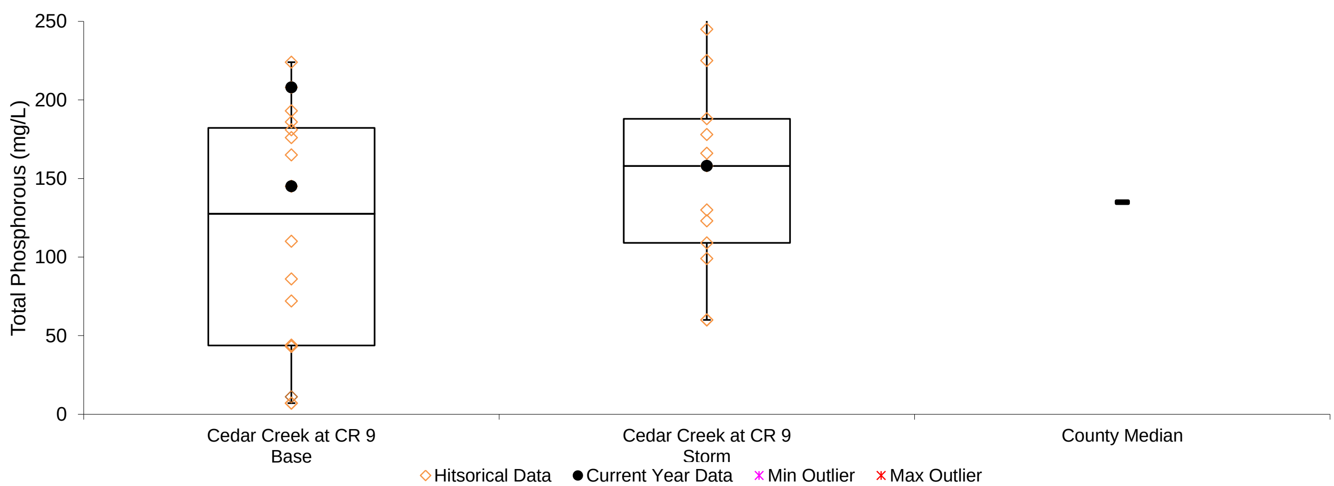


Conductivity is acceptably low in Cedar Creek at CR 9. Median conductivity (all years) is 0.358 mS/cm during baseflow and 0.268 mS/cm during storm events, respectively. Both were lower than the median for Anoka County streams of 0.362 mS/cm. The 2015 maximum observed conductivity in Cedar Creek was 0.505 mS/cm which is the highest on record.

Total Phosphorus

Total phosphorus in Cedar Creek was high and 2015 readings increased from 2014. This nutrient is one of the most common pollutants in our region, and can be associated with urban runoff, agricultural runoff, wastewater, and many other sources. The median phosphorus concentration at Cedar Creek at CR 9 (all years) was 127.5 ug/L during baseflow and 158 ug/L during storm events. All readings in 2015 had phosphorus concentrations higher than the median for Anoka County streams of 135 ug/L. In 2015 the highest observed total phosphorus reading was during one particular storm event, with a maximum of 324 ug/L. This is the highest reading on record. In all, phosphorus in Cedar Creek is at concerning levels and should be an area of pollution control efforts.

Total phosphorus during baseflow and storm conditions Orange diamonds are historical data from previous years and black circles are 2015 readings. Box plots show the median (middle line), 25th and 75th percentile (ends of box), and 10th and 90th percentiles (floating outer lines).

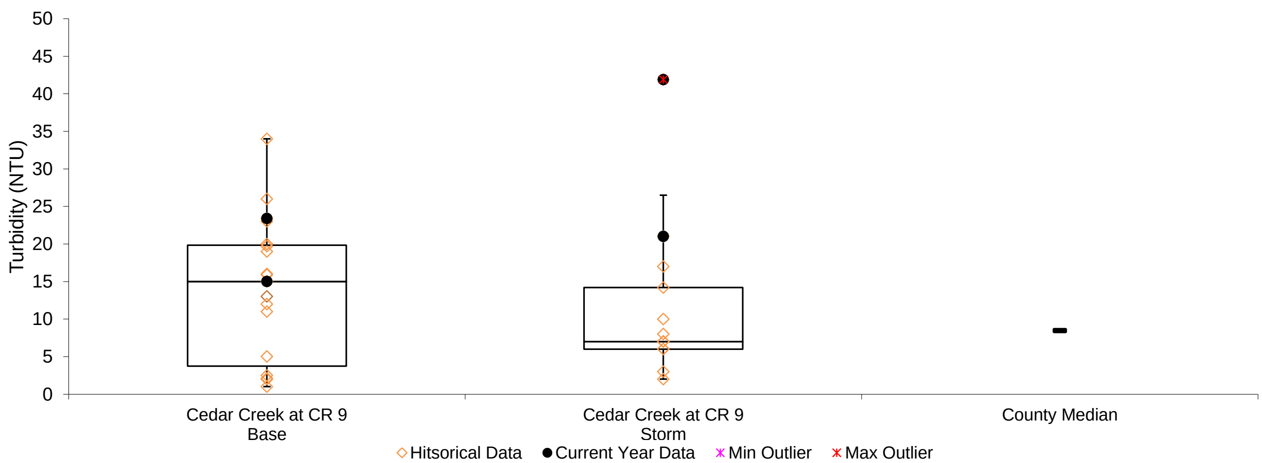


Turbidity and Total Suspended Solids (TSS)

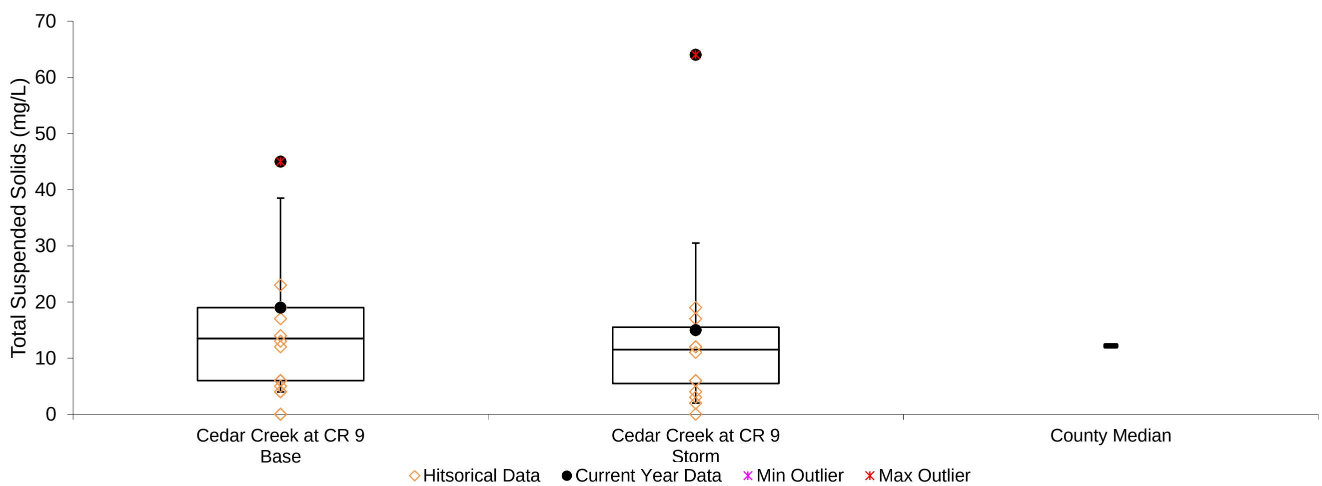
In Cedar Creek, turbidity was low overall with slight increases during storms events. The median turbidity (all years) is 15 NTU during baseflow and only 7 NTU during storm events, which is similar to the median for Anoka County streams of 8.5 FNRU. Turbidity was elevated on a few occasions, especially during storms. In 2015 the maximum observed was 41.5 NTU during a mid-season monitoring event. This is the highest reading on record.

TSS was high throughout 2015 with all readings being above the median for Anoka County streams which is 12 mg/L. In some cases TSS was over 10 times higher in 2015 than 2014. During one storm event an all-time high of 64 mg/L was recorded. Even with high 2015 results median TSS (all years) is 13.5 mg/L during baseflow and 11.5 mg/L during storm events.

Turbidity during baseflow and storm conditions   Orange diamonds are historical data from previous years and black circles are 2015 readings. Box plots show the median (middle line), 25th and 75th percentile (ends of box), and 10th and 90th percentiles (floating outer lines).



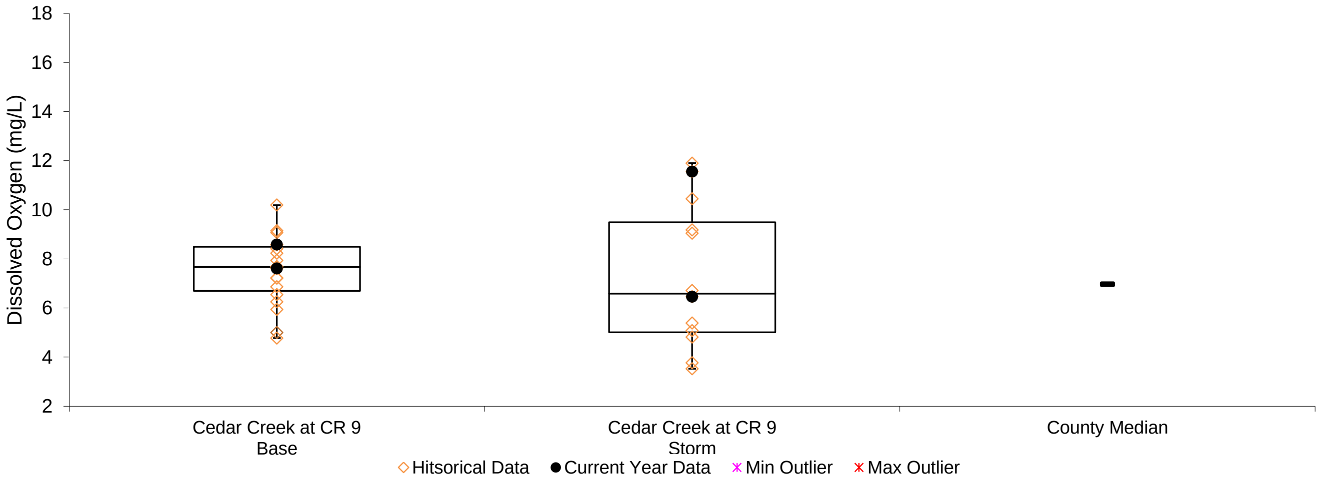
Total Suspended Solids during baseflow and storm conditions   Orange diamonds are historical data from previous years and black circles are 2015 readings. Box plots show the median (middle line), 25th and 75th percentile (ends of box), and 10th and 90th percentiles (floating outer lines).



Dissolved Oxygen

Dissolved oxygen is necessary for aquatic life, including fish. Organic pollution consumes oxygen when it decomposes. If oxygen levels fall below 5 mg/L aquatic life begins to suffer. In 2015 Cedar Creek dissolved oxygen was always above 6.0 mg/L. Median dissolved oxygen of all years of data is 6.7mg/L during baseflow and 5.0 mg/L during storm events.

Dissolved oxygen during baseflow and storm conditions Orange diamonds are historical data from previous years and black circles are 2015 readings Box plots show the median (middle line), 25th and 75th percentile (ends of box), and 10th and 90th percentiles (floating outer lines).

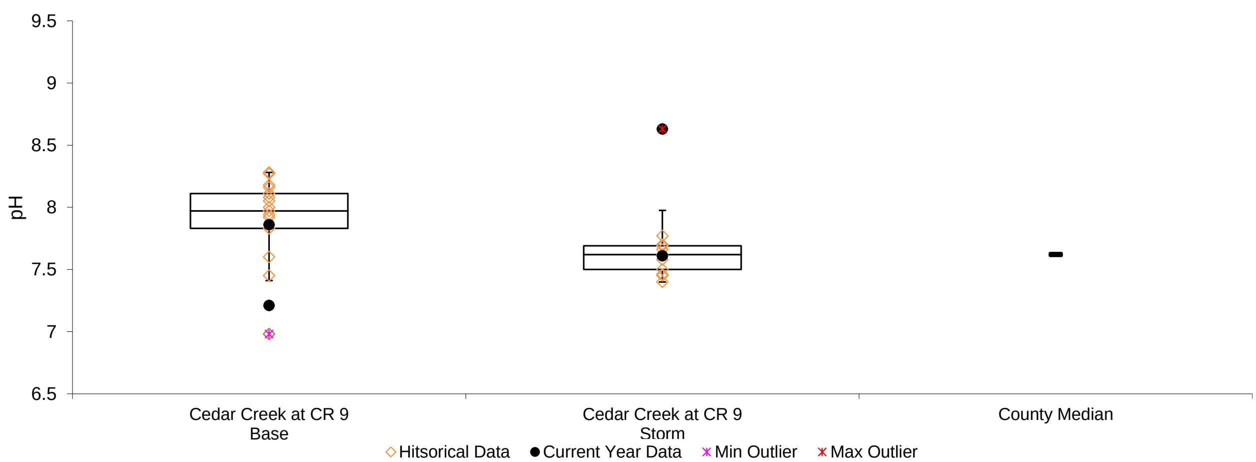


pH

pH refers to the acidity of the water. The Minnesota Pollution Control Agency's water quality standard is for pH to be between 6.5 and 8.5. Cedar Creek is generally within this range (see figure below).

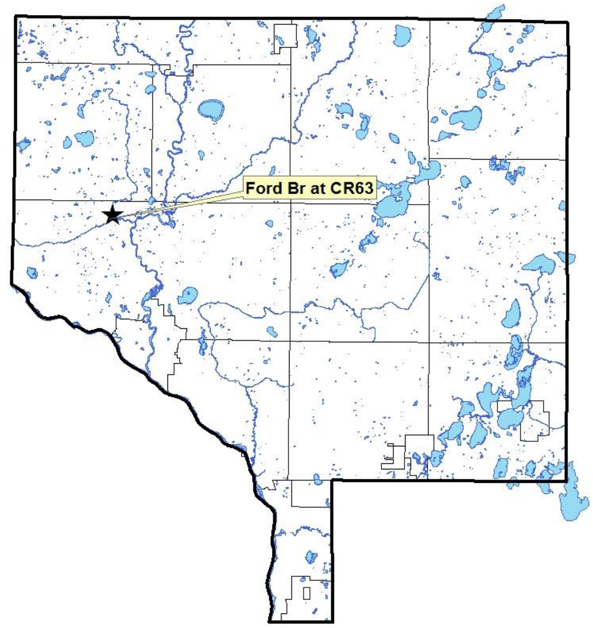
pH is generally lower during storms than during baseflow. This is because the pH of rain is typically lower (more acidic). While acid rain is a longstanding problem, its effect on this aquatic system is small.

pH during baseflow and storm conditions Orange diamonds are historical data from previous years and black circles are 2015 readings Box plots show the median (middle line), 25th and 75th percentile (ends of box), and 10th and 90th percentiles (floating outer lines).



FORD BROOK

At CR 63, Nowthen



Background

Ford Brook originates at Goose Lake in north-western Anoka County and flows south. Ford Brook is a tributary to the Rum River. In north-western Anoka County it flows through the relatively undisturbed community of Nowthen before joining Trott Brook just prior to the Rum River.

Ford Brook is one of the smaller streams in Anoka County. The watershed is moderately developed with scattered single family homes, but continues to grow.

Results and Discussion

This report includes data from 2015. 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, in Ford Brook were above average when compared to similar Anoka County streams. Conductivity averaged 0.419 mS/cm (maximum of 0.505 mS/cm and a minimum of 0.328 mS/cm).
- Phosphorous averaged above the MPCA water quality standard of 135 ug/l. Ford Brook often exceeds the limit, even during baseflow periods. Phosphorous results in Ford Brook averaged 181 ug/l (maximum of 215ug/l and a minimum of 110 ug/l).
- Suspended solids and turbidity both stayed below the state standards each sampling event. Total suspended solids averaged 22.5 mg/l (maximum of 35.0 mg/l and a minimum of 8.0 mg/l). Turbidity averaged 29.70 NTU (maximum of 49.0 NTU and a minimum of 6.60 NTU). Water flow during the 49.0 NTU reading was extremely fast and turbulent due to abnormal rainfall.
- pH and dissolved oxygen were with the range considered normal and healthy for streams in this area. pH averaged 7.85 (maximum of 8.68 and a minimum of 7.51). DO averaged 8.62 mg/l (maximum of 11.60 mg/l and a minimum of 6.65 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.

FordBrook at CR63	Units	R.L.*	3/12/2015 Results	4/13/2015 Results	7/6/2015 Results	7/10/2015 Results	Median	Average	Min	Max
pH		0.1	8.68	7.51	7.55	7.64	7.595	7.80	7.51	8.68
Conductivity	mS/cm	0.01	0.328	0.395	0.448	0.505	0.4215	0.420	0.328	0.505
Turbidity	NTU	1	19.4	43.8	49.0	6.6	31.6	30.08	6.60	49.00
D.O.	mg/L	0.01	11.6	8.83	6.65	7.38	8.105	8.51	6.65	11.60
D.O.	%	1	80.4	79	77.3	87.7	79.7	80.8	77.3	87.7
Temp.	°C	0.1	0.2	9.2	21.0	22.5	15.105	13.6	0.2	22.5
Salinity	%	0.01	0.15	0.19	0.12	0.24	0.17	0.17	0.12	0.24
T.P.	ug/L	10	215	198	201	110	199.5	185	110	215
TSS	mg/L	2	13	35	34.0	8	23.5	22.7	8.0	35.0
Secchi-tube	cm		77	38	21	87	57.5	>100	21	87
E coli	MPN									
Appearance										
Recreational										

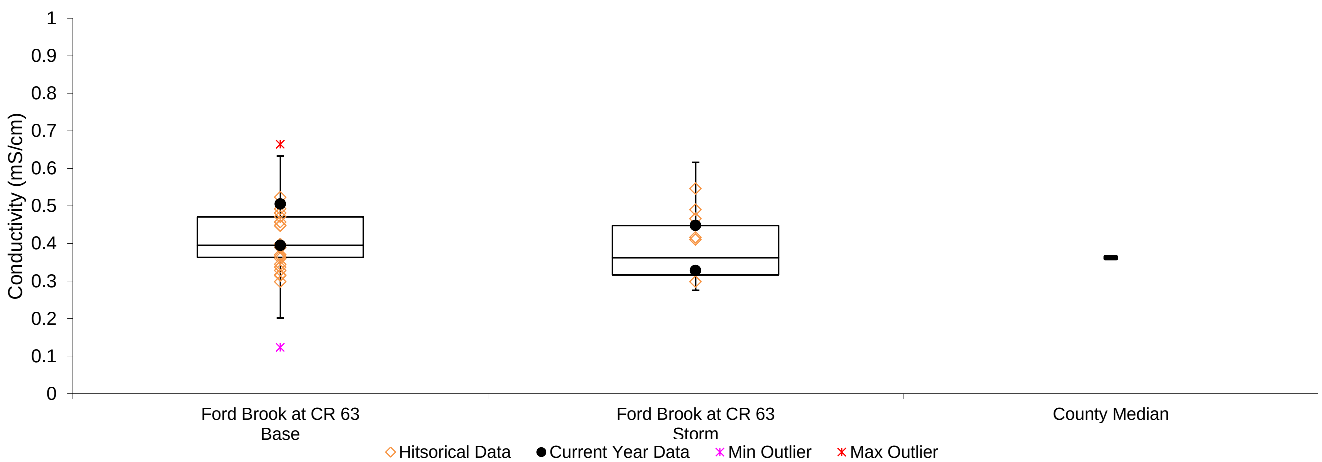
*reporting limit

Conductivity

Median conductivity results in Ford Brook were low overall and just slightly higher than the median for other Anoka County streams (see table and figures below). Median conductivity in Ford Brook (all years, all conditions) was 0.391 mS/cm compared to the countywide median of 0.362 mS/cm.

This lends some insight into the pollutant sources. If dissolved pollutants were only elevated during storms, stormwater runoff would be suspected as the primary contributor. If dissolved pollutants were highest during baseflow, pollution of the shallow groundwater which feeds the stream during baseflow would be suspected to be a primary contributor. In Ford Brook we find similar, but slightly lower dissolved pollutants during storms. In other words, both stormwater runoff and groundwater are sources of dissolved pollutants, with shallow groundwater being slightly worse. While storms dilute some of the baseflow pollutants, they also carry additional pollutants which somewhat offset the dilution. From a management standpoint, it is important to remember that the sources of both stormwater and baseflow dissolved pollutants are generally the same; it is only the timing of delivery to the stream that is different. Preventing their release into the environment and treating them before infiltration should be a high priority.

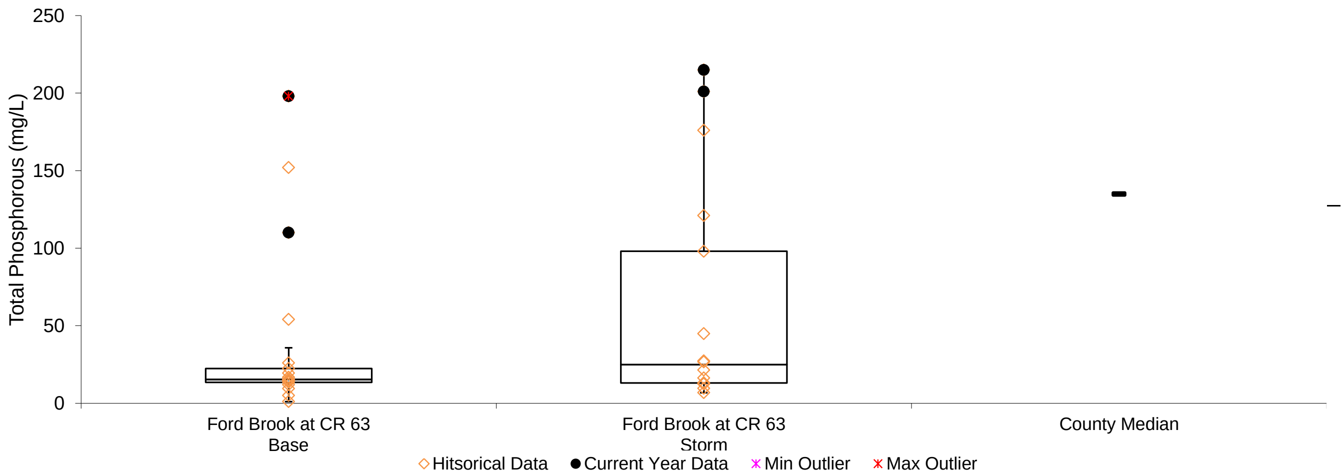
Conductivity at Ford Brook. Orange diamonds are historical data from previous years and black circles are 2015 readings. Box plots show the median (middle line), 25th and 75th percentile (ends of box), and 10th and 90th percentiles (floating outer lines).



Total Phosphorus

Total phosphorus (TP) is a common nutrient pollutant. It is limiting for most algae growth. Total phosphorus in Ford Brook has traditionally been low during baseflow conditions and increased during storms (see figures below). In 2015 TP levels in Ford Brook were much higher than the county median and were an increase from past results. TP was higher during storm events then baseflow. Even with high 2015 results, the median TP for Ford Brook (all years) is 15.3 ug/L during baseflow and 24.9 ug/L during storm events. This is substantially lower than the countywide median for streams of 135ug/L, as well as the state water quality standard of 100 ug/L, although 20% of measurements at Ford Brook have been above 100 mg/L.

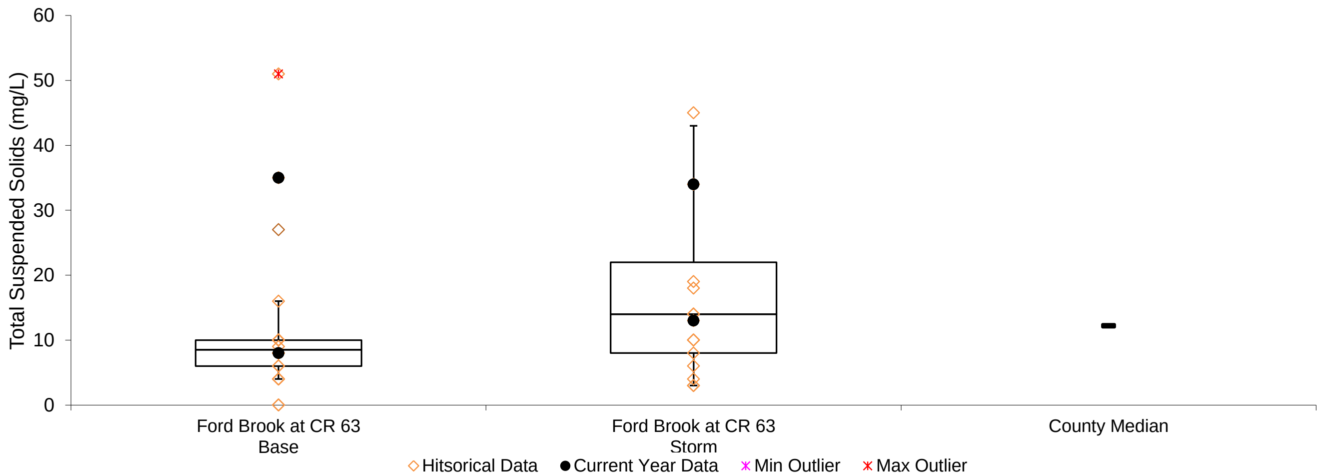
Total Phosphorus at Ford Brook. Orange diamonds are historical data from previous years and black circles are 2015 readings. Box plots show the median (middle line), 25th and 75th percentile (ends of box), and 10th and 90th percentiles (floating outer lines).



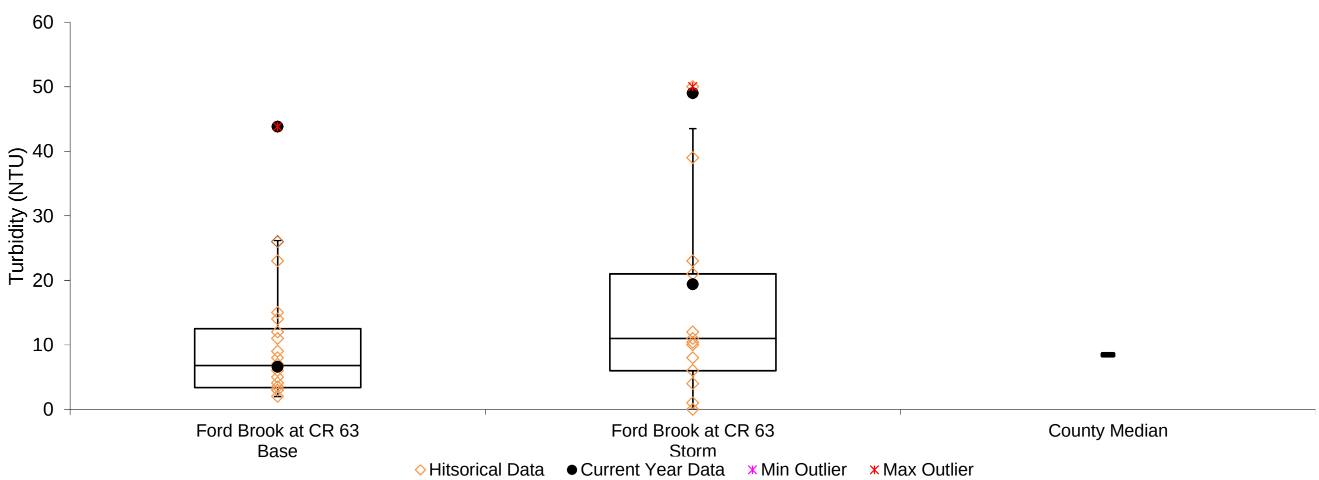
Total Suspended Solids and Turbidity

In Ford Brook both TSS and turbidity were generally low and have been slightly higher during storm events. Median turbidity for Ford Brook (all years, all conditions) was 9 NTU, respectively. This is similar to the countywide median of 8.5 NTU. Only 4 of 33 (12%) measurements at Ford Brook are greater than MPCA's present water quality standard of 25 NTU. Median TSS was 10 mg/L. This is lower than the median for streams county-wide of 12 mg/L. Only 4 of 34 (12%) of TSS measurements exceeded the new water quality standard of 30 mg/L.

Total Suspended Solids at Ford Brook. Orange diamonds are historical data from previous years and black circles are 2015 readings. Box plots show the median (middle line), 25th and 75th percentile (ends of box), and 10th and 90th percentiles (floating outer lines).



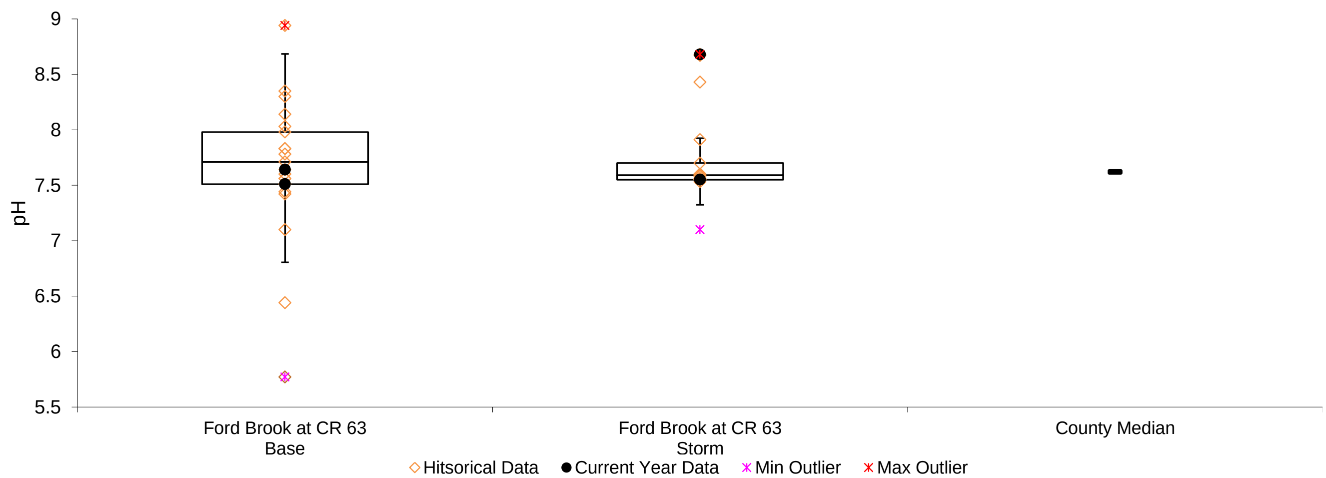
Turbidity at Ford Brook. Orange diamonds are historical data from previous years and black circles are 2015 readings. Box plots show the median (middle line), 25th and 75th percentile (ends of box), and 10th and 90th percentiles (floating outer lines).



pH

pH was generally within the expected range at all sites for 2015. pH is to be between 6.5 and 8.5 according to MPCA water quality standards. While occasional readings outside of this range have occurred in previous years, they were not large departures that generate concerns. On one monitoring event pH exceeded 8.5. pH was similar during baseflow and storm events.

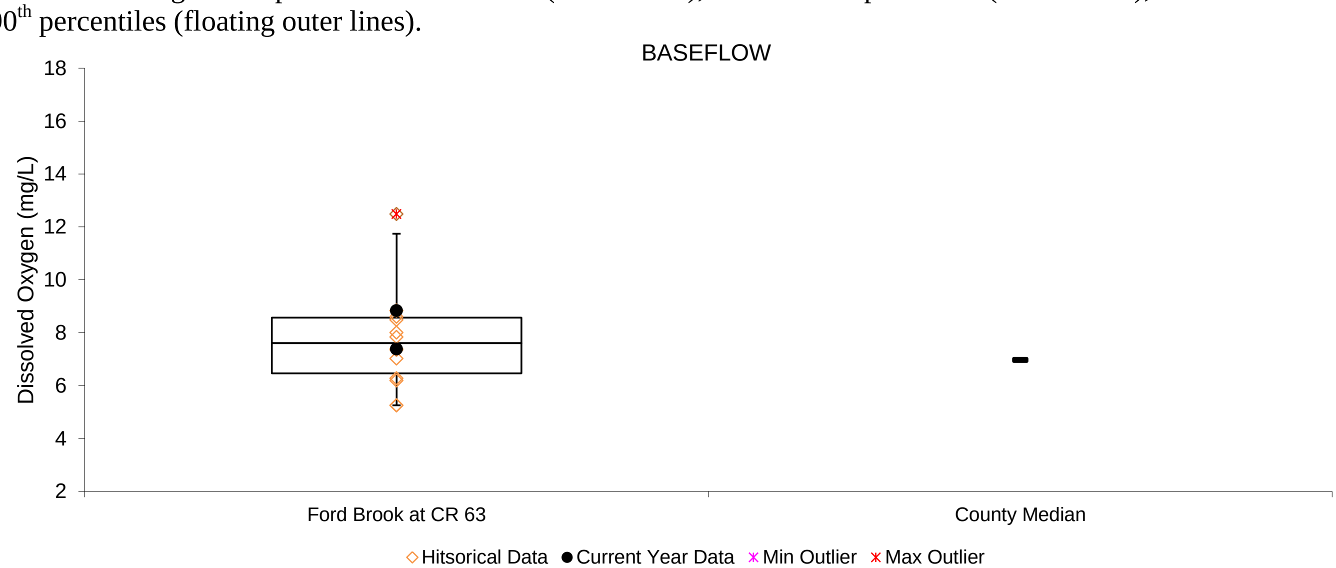
pH at Ford Brook. Orange diamonds are historical data from previous years and black circles are 2015 readings. Box plots show the median (middle line), 25th and 75th percentile (ends of box), and 10th and 90th percentiles (floating outer lines).



Dissolved Oxygen

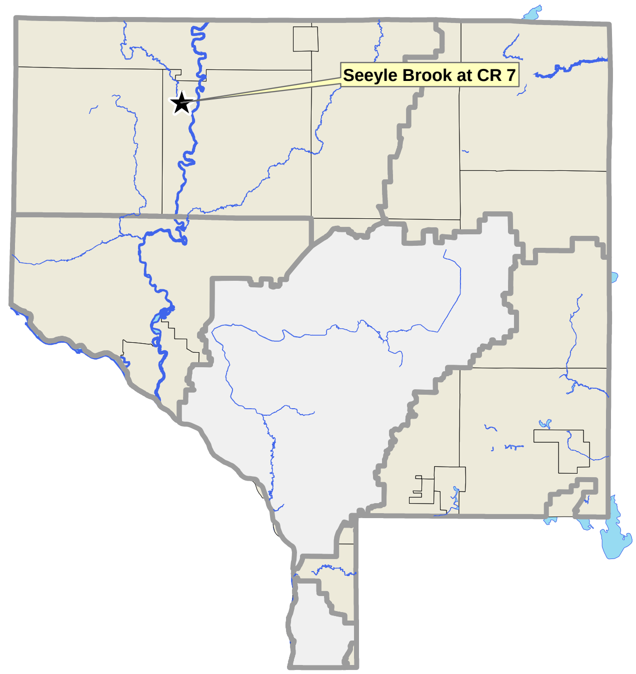
Dissolved oxygen in Ford Brook was within acceptable levels. None of the samples collected have been below the 5 mg/L standard.

Dissolved Oxygen at Ford Brook. Orange diamonds are historical data from previous years and black circles are 2015 readings. Box plots show the median (middle line), 25th and 75th percentile (ends of box), and 10th and 90th percentiles (floating outer lines).



SEELYE BROOK

Seelye 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 2015. The following is a summary of results.

- Dissolved constituents, as measured by conductivity and chlorides. Conductivity results in Seelye Brook are considered higher than average when compared to similar Anoka County streams. Conductivity averaged 0.396 mS/cm (maximum of 0.534 mS/cm and a minimum of 0.264 mS/cm).
- Phosphorous averaged over the MPCA water quality standard of 135 ug/L. Seelye Brook often exceeds the limit, even during baseflow periods. Phosphorous in Seelye Brook averaged 177 ug/l (maximum of 266 ug/l and a minimum of 117 ug/l).
- Suspended solids and turbidity were higher than the state standards throughout the season. Suspended solids averaged 11.8 mg/l (maximum of 20.0 mg/l and a minimum of 5.0 mg/l). Turbidity averaged 13.88 NTU's (maximum of 18.80 NTU's and a minimum of 4.0 NTU's)
- pH and dissolved oxygen averaged within the range considered normal and healthy for streams in this area. pH averaged 7.85 (maximum of 8.45 and a minimum of 7.44). DO averaged 9.32 mg/l (maximum of 13.53 mg/l and a minimum of 6.61 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.

SeelyeBrook at Hwy 7

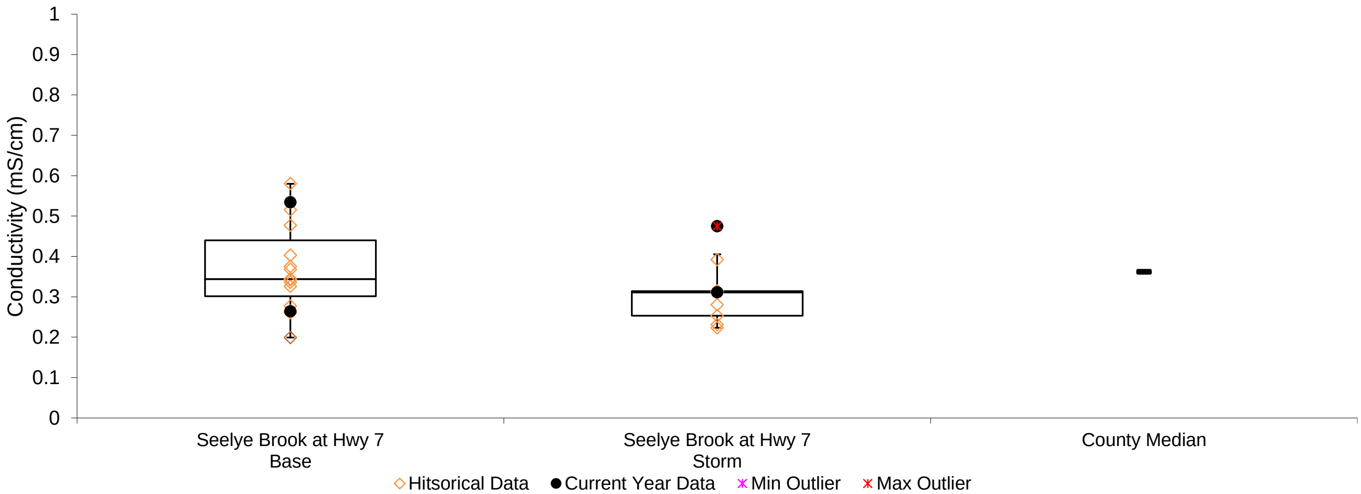
	Units	R.L.*	3/12/2015 Results	4/13/2015 Results	7/6/2015 Results	7/10/2015 Results	Median	Average	Min	Max
pH		0.1	8.45	7.44	7.67	7.82	7.745	7.83	7.44	8.45
Conductivity	mS/cm	0.01	0.311	0.264	0.475	0.534	0.393	0.395	0.264	0.534
Turbidity	NTU	1	18.8	17.5	15.2	4.0	16.35	14.37	4.00	18.80
D.O.	mg/L	0.01	13.53	9.3	6.61	7.82	8.56	9.16	6.61	13.53
D.O.	%	1	93.8	80.6	75.5	90.1	85.35	85.1	75.5	93.8
Temp.	°C	0.1	0.9	9.2	20.1	20.9	14.66	13.2	0.9	20.9
Salinity	%	0.01	0.14	0.13	0.23	0.25	0.185	0.19	0.13	0.25
T.P.	ug/L	10	266	176	149	117	162.5	174	117	266
TSS	mg/L	2	11	20	9.0	7	10	11.4	7.0	20.0
Secchi-tube	cm		64	51	64	>100	64	>100	51	64
E coli	MPN									
Appearance										
Recreational										

*reporting limit

Conductivity

Chlorides were not sampled in 2015 and thus not displayed below. Historical chloride data can be obtained from the Anoka Conservation District and is also available through the Minnesota Pollution Control Agency's EQuIS database, which is available through their website. These pollutants are of greatest concern because of the effect they can have on the stream's biological community.

Conductivity during baseflow and storm conditions Orange diamonds are historical data from previous years and black circles are 2015 readings. Box plots show the median (middle line), 25th and 75th percentile (ends of box), and 10th and 90th percentiles (floating outer lines).

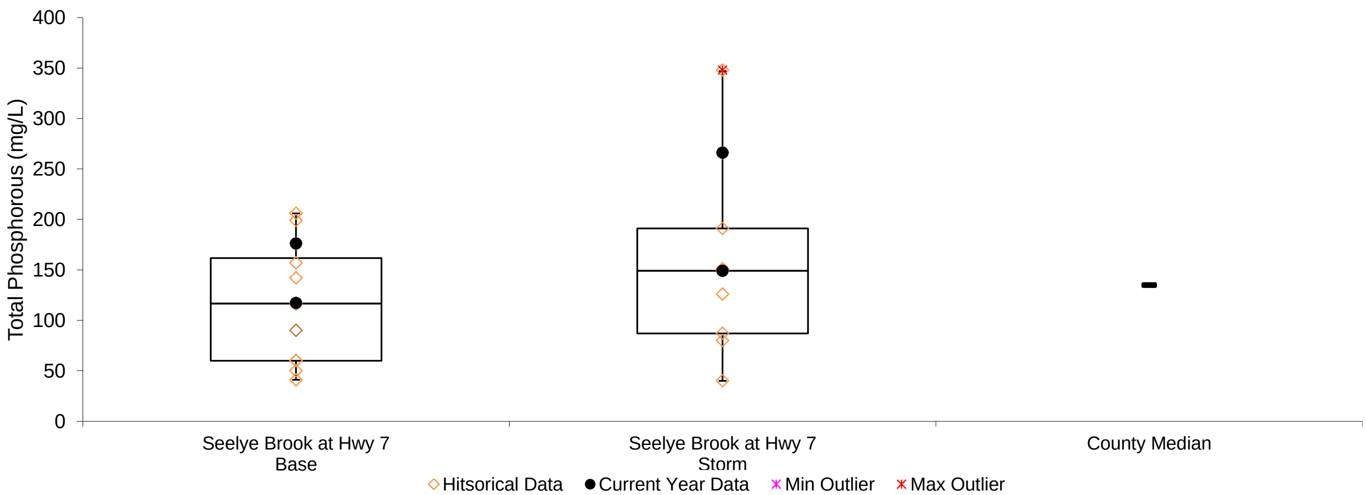


Conductivity is acceptably low in Seelye Brook at Hwy 7. Median conductivity (all years) is 0.301 mS/cm during baseflow and 0.253 mS/cm during storm events, respectively. Both were lower than the median for Anoka County streams of 0.362 mS/cm.

Total Phosphorus

Total phosphorus in Seelye Brook was overall high in 2015 with a slight increase from 2014. This nutrient is one of the most common pollutants in our region, and can be associated with runoff and many other sources. The median phosphorus concentration at Seelye Brook at Hwy 7 (all years) was 116.5 ug/L during baseflow and 149 ug/L during storm events. All but one reading in 2015 had phosphorus concentrations higher than the median for Anoka County streams of 135 ug/L. In all, phosphorus in Seelye Brook is at concerning levels and should continue to be an area of pollution control effort as the area urbanizes.

Total phosphorus during baseflow and storm conditions Orange diamonds are historical data from previous years and black circles are 2015 readings. Box plots show the median (middle line), 25th and 75th percentile (ends of box), and 10th and 90th percentiles (floating outer lines).



Turbidity and Total Suspended Solids (TSS)

Turbidity and total suspended solids (TSS) are two different measurements of solid material suspended in the water. Turbidity is measured by refraction of a light beam passed through a water sample. It is most sensitive to large particles. Total suspended solids are measured by filtering solids from a water sample and weighing the filtered material. The amount of suspended material is important because it affects transparency and aquatic life, and because many other pollutants are attached to particles. Many stormwater treatment practices such as street sweeping, sumps, and stormwater settling ponds target sediment and attached pollutants. In 2015 suspended solids and turbidity increased from 2014.

It is important to note the suspended solids can come from sources within and outside of the river channel. Sources on land include soil erosion, road sanding, and others. Riverbank erosion and movement of the river bottom also contributes to suspended solids. A moderate amount of this "bed load" is natural and expected.

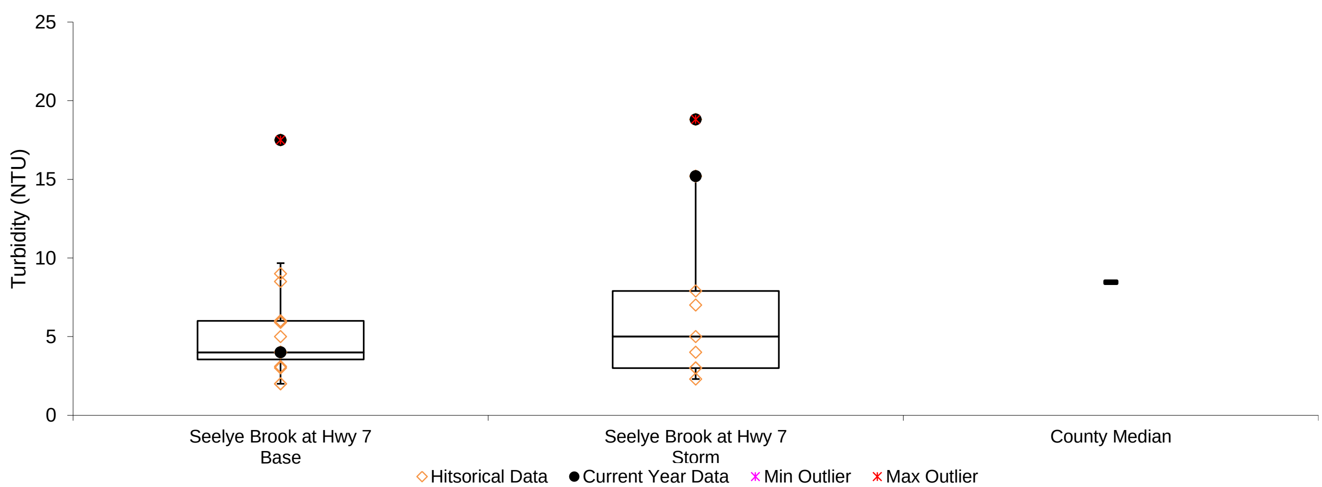
In Seelye Brook, turbidity was much higher in 2015 with slight increases during storms events. The median turbidity (all years) was 4 NTU during baseflow and 5 NTU during storm events, which is lower than the median for Anoka County streams of 8.5 FNRU. Turbidity was elevated on a few occasions. In 2015 the maximum observed was 18.8 NTU during an early-season monitoring event. This was the highest reading ever recorded at this site.

TSS was low throughout 2015 with most readings being below the median for Anoka County streams which is 12.2 mg/L. TSS was much higher than in 2014. During a baseflow sampling an all-time high of 20 mg/L was recorded. Median TSS (all years) was 4.5 mg/L during baseflow and 6.0 mg/L during storm events.

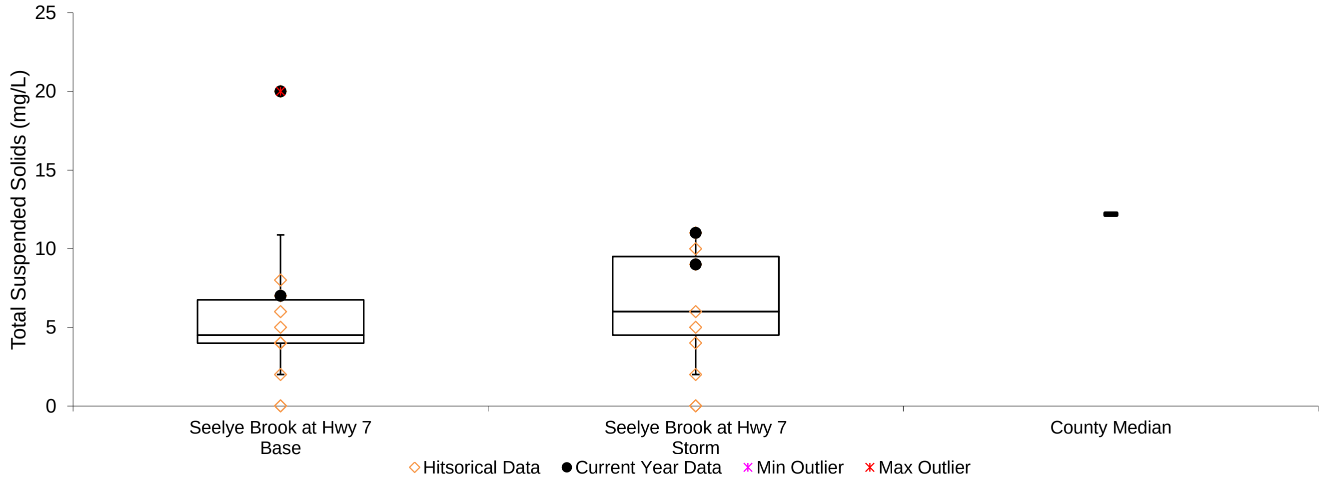
Rigorous stormwater treatment should occur as the Cedar Creek watershed develops, or the collective pollution caused by many small developments will seriously impact the river. Bringing stormwater treatment up to date in older developments is also important.

Differences between TSS and turbidity lend insight into the nature of any problems. TSS showed increases at the downstream monitoring site, while turbidity did not. Turbidity is most sensitive to large particles. Therefore, the downstream increases are likely due to smaller particles. Other pollutants, such as phosphorus and metals, are most highly correlated with smaller particles. These other pollutants can "hitch a ride" on smaller particles because of their greater surface area and, in the case of certain soils, ionic charge. Furthermore, small particles stay suspended in the water column and therefore are more likely to be transported by stream flows and are more difficult to remove with stormwater practices like settling ponds.

Turbidity during baseflow and storm conditions Orange diamonds are historical data from previous years and black circles are 2015 readings. Box plots show the median (middle line), 25th and 75th percentile (ends of box), and 10th and 90th percentiles (floating outer lines).



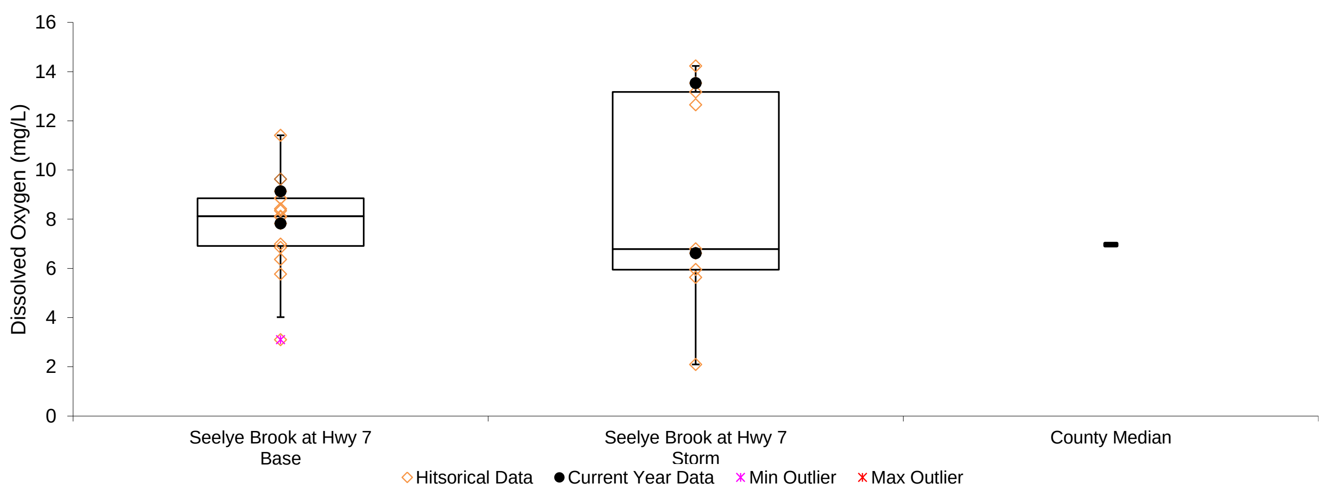
Total Suspended Solids during baseflow and storm conditions Orange diamonds are historical data from previous years and black circles are 2015 readings. Box plots show the median (middle line), 25th and 75th percentile (ends of box), and 10th and 90th percentiles (floating outer lines).



Dissolved Oxygen

Dissolved oxygen is necessary for aquatic life, including fish. Organic pollution consumes oxygen when it decomposes. If oxygen levels fall below 5 mg/L aquatic life begins to suffer. In 2015 Seelye Brooks dissolved oxygen was always above 6.5 mg/L. Median dissolved oxygen (all years) was 6.91mg/L during baseflow and 5.95 mg/L during storm events.

Dissolved oxygen during baseflow and storm conditions Orange diamonds are historical data from previous years and black circles are 2015 readings Box plots show the median (middle line), 25th and 75th percentile (ends of box), and 10th and 90th percentiles (floating outer lines).

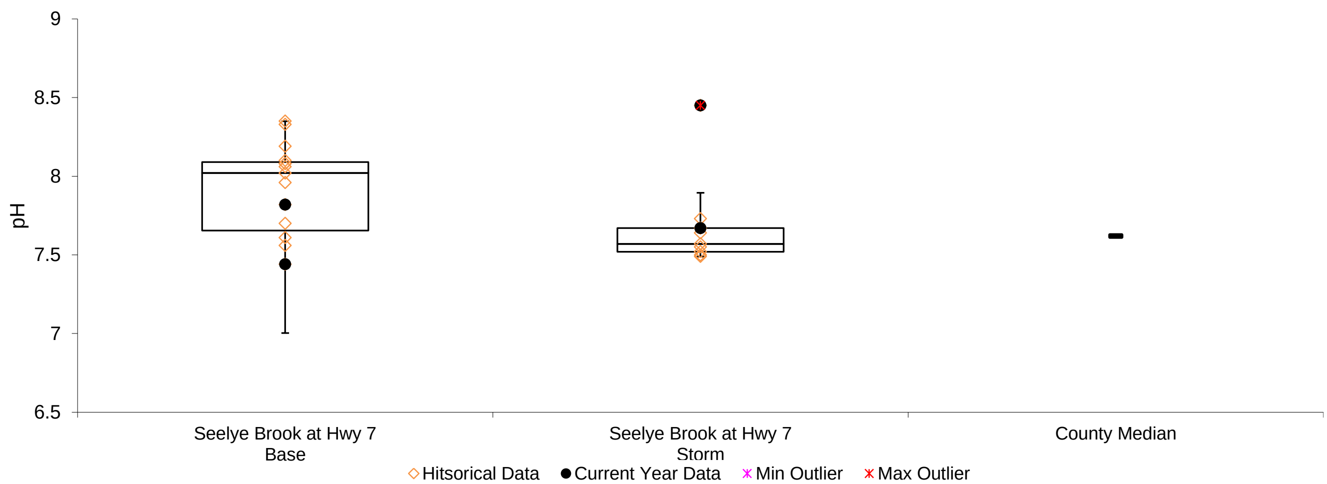


pH

pH refers to the acidity of the water. The Minnesota Pollution Control Agency's water quality standard is for pH to be between 6.5 and 8.5. Seelye Brook is generally within this range (see figure below).

It is interesting to note that pH is lower during storms than during baseflow. This is because the pH of rain is typically lower (more acidic). While acid rain is a longstanding problem, its effect on this aquatic system is small.

pH during baseflow and storm conditions Orange diamonds are historical data from previous years and black circles are 2015 readings Box plots show the median (middle line), 25th and 75th percentile (ends of box), and 10th and 90th percentiles (floating outer lines).



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**

Rum River at CR 7, Rum River **Central County Park, Oak Grove**

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.

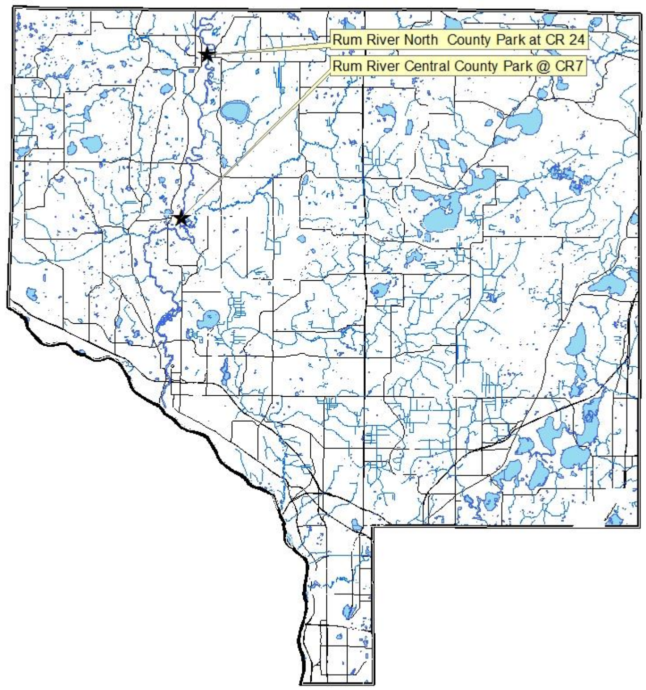
Family Biotic Index (FBI) — An index that utilizes known pollution tolerances for each family. Lower numbers indicate better stream quality.

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 Rum River North County Park, St. Francis



Last Monitored

By St. Francis High School 2014

Monitored Since

2000

Student Involvement

approximately 1,330 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.

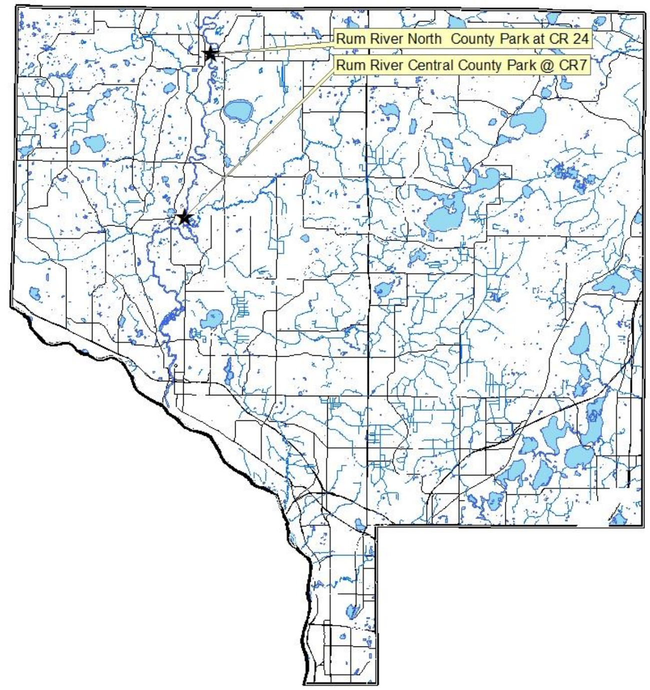
The sampling site is in Rum River North County Park. This site is typical of the Rum in northern Anoka County, having a rocky bottom with numerous pool and riffle areas.

Results

In 2015 teachers at St. Francis High School decided to not participate in the biomonitoring program. Previous year's results can be observed in the analysis of Rum River Central County Park Data below.

RUM RIVER

Moved to Rum Central Park, Ramsey/Oak Grove



Last Monitored

Anoka County 4-H club in 2015

Monitored Since

2015

Student Involvement

8 students in 2015

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.

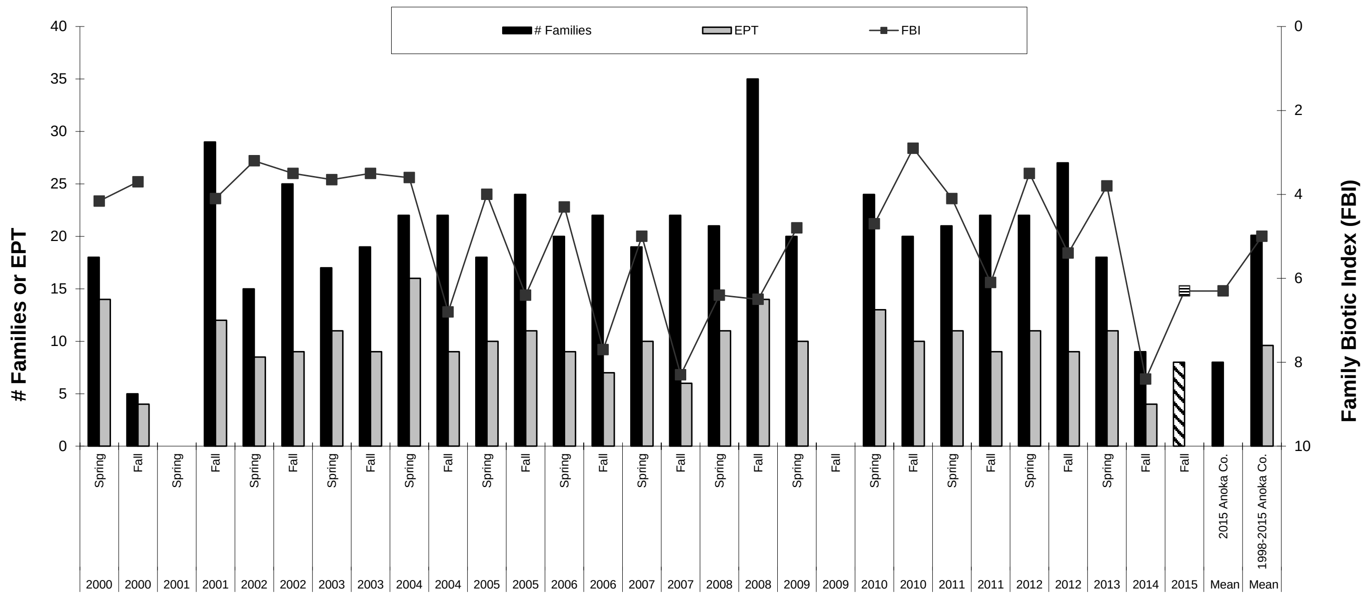
The sampling site is in Rum River Central County Park. This site is typical of the Rum in northern Anoka County, having a rocky bottom with numerous pool and riffle areas.

Results

Due to lack of interest from teachers at St. Francis High School in participating in the biomonitoring program, a 4-H club monitored the Rum River at Rum Central Park with Anoka Conservation District (ACD) oversight. The data collected is displayed side by side with the historical data for Rum River North County Park Biological data purely for comparison. If this site continues to be monitored a multi-year site specific analysis will be done. Data collected at Rum Central is not an indication of stream health at Rum River North. Rum Central data is displayed with dashed points for comparison.

Results were similar to those seen at Rum North in 2014 with the exception of EPT families. None were observed. In July 2015, 8 families were found and 0 of them were EPT. This is among the lowest ever observed throughout the monitored area of the Rum River. While this could be concerning, the lack of sample size, historical data, and the habitat at the monitoring location are all likely contributing factors.

Summarized Biomonitoring Results for Rum River at Hwy 24, St. Francis with Rum River at CR 7, Oak Grove displayed with stripes (samplings by St. Francis High School, Crossroads Schools, and an Anoka County 4-H club)



2015 Data collected at Rum Central County Park, Ramsey/Oak Grove

Biomonitoring Data for Rum River at Rum River North County Park, St. Francis (in White) with Rum River at Rum River Central Park, Oak Grove (in Grey)

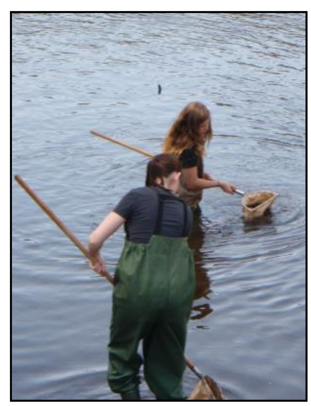
Data presented from the most recent eight years. Contact the ACD to request archived data.

Year	2008	2008	2009	2009	2010	2010	2011	2011	2012	2012	2013	2014	2015	Mean	Mean
Season	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Fall	2015 Anoka Co.	1998-2015 Anoka Co.
FBI	6.40	6.50	4.80	Unusable	4.7	2.9	4.1	6.1	3.5	5.4	3.8	8.4	6.3	6.3	5.0
# Families	21	35	20	Sample	24	20	21	22	22	27	18	9	8	8.0	20.1
EPT	11	14	10		13	10	11	9	11	9	11	4	0	0.0	9.6
Date	27-May	30-Sep	29-Apr	13-Oct	27-Apr	29-Oct	10-Jun	28-Sep	22-May	27-Sep	20-May	24-Oct	22-Jul		
Sampled By	SFHS	SFHS	SFHS	SFHS	SFHS	ACD	ACD	SFHS	SFHS	SFHS	SFHS	SFHS	4-H		
Sampling Method	MH	MH	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	219	23		
# Replicates	2	4	2		3	1	1	2	2	1	2	1	1		
Dominant Family	Corixidae	Corixidae	Corixidae		Nemouridae	Leptophlebiidae	baetidae	hydrophilidae	hydropsy	veliidae	Baetiscida	Corixidae	Cambaridae		
% Dominant Family	57.5	61.4	24.3		28.1	39.4	66.3	21.4	36.6	13.8	34.7	86.3	34.8		
% Ephemeroptera	11.9	17.9	18.7		23.9	51.1	81.3	3.6	43.2	34.2	54.1	3.7	0		
% Trichoptera	5.9	6.9	20.2		10.8	6.2	6.0	4.3	41.1	4.2	6.3	0.5	0.0		
% Plecoptera	17.1	2.1	27.7		32.8	26.6	3.8	9.7	5.2	11.1	30.3	2.3	0		

Discussion

Historically, both chemical and biological monitoring indicate the good quality of the Rum River. 2015 observed some of the worst biomonitoring results in recent history. But varying factors should caution any jump to conclusions. One aspect that should be an area of increased observation is that in both 2014 and 2015 the lack of families found as well as the dominant family making up such a high percentage were the key factors in the poor Family Biotic Index observed. Habitat in the Rum River 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. While there does not appear to be any trend, the upper region of the Rum should continue to be observed closely.

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



- Enforce scenic river law building and clear cutting setbacks.
- Retrofit stormwater conveyance systems to provide better water quality treatment, especially in St. Francis and Anoka where older areas have little or no stormwater treatment.
- Education programs to encourage actions by residents that will benefit the river's health.
- Continue water quality monitoring programs.

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

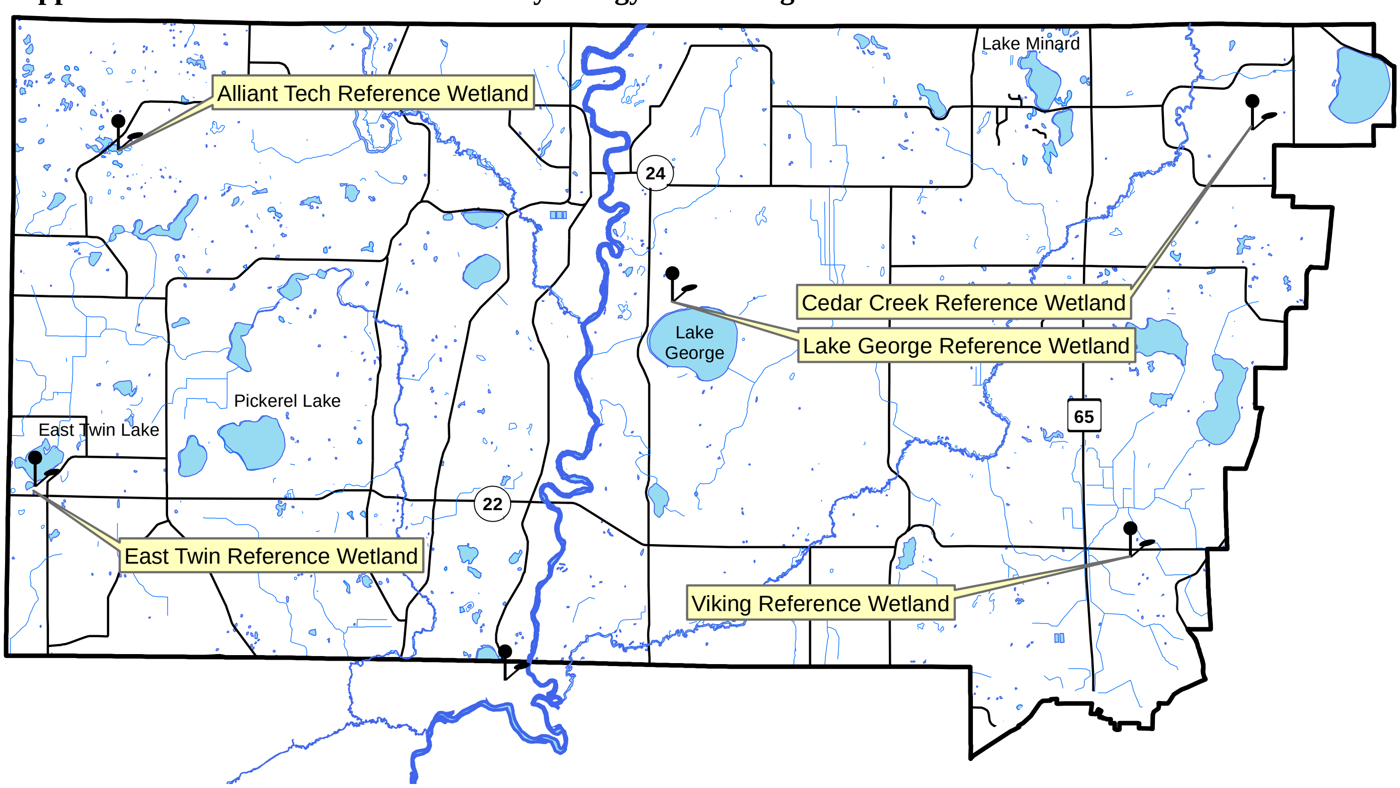
East Twin Reference Wetland, East Twin Township Park, Nowthen

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

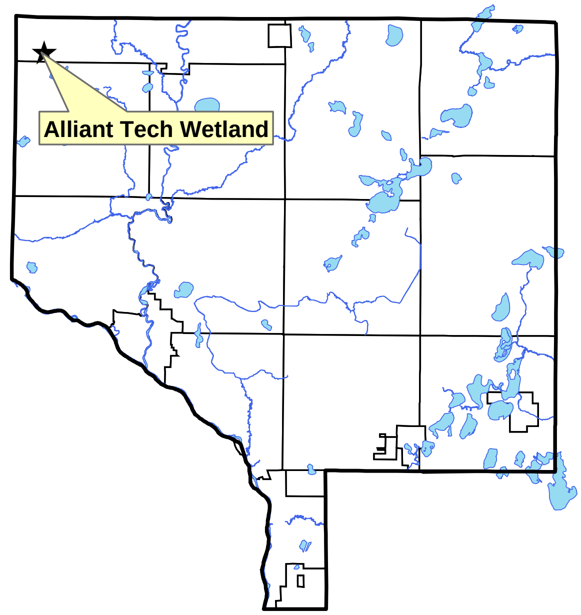
Soils at Well Location:

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

Surrounding Soils: Emmert

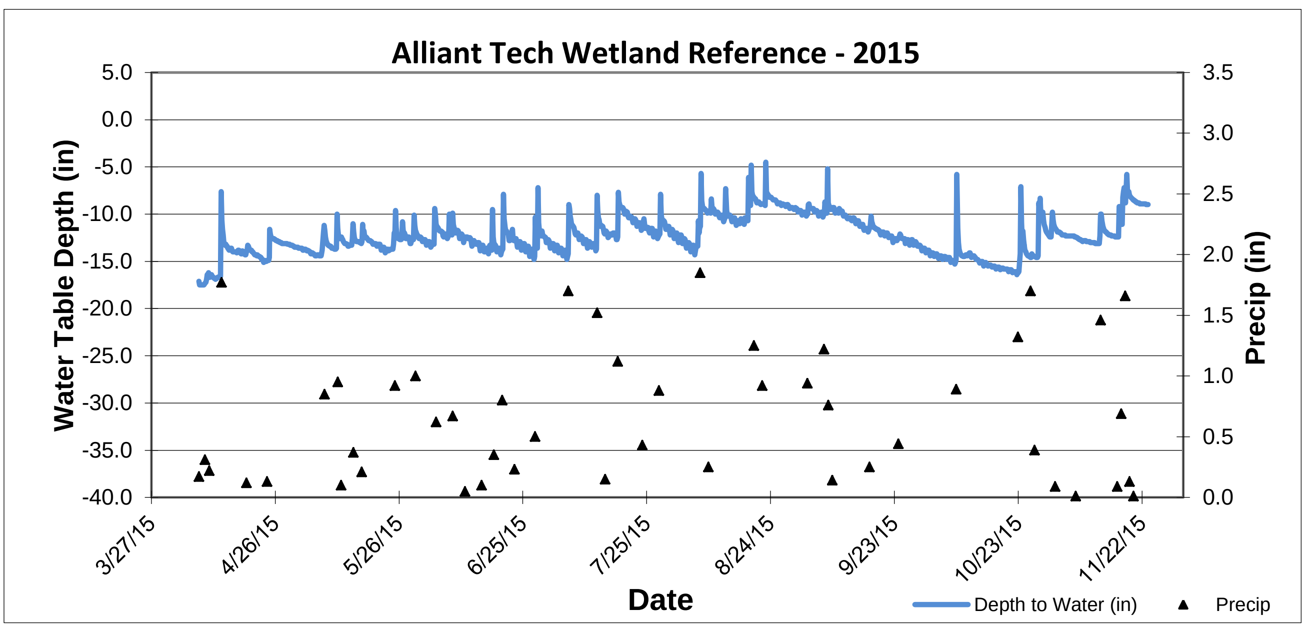
Vegetation at Well Location:

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.

2015 Hydrograph

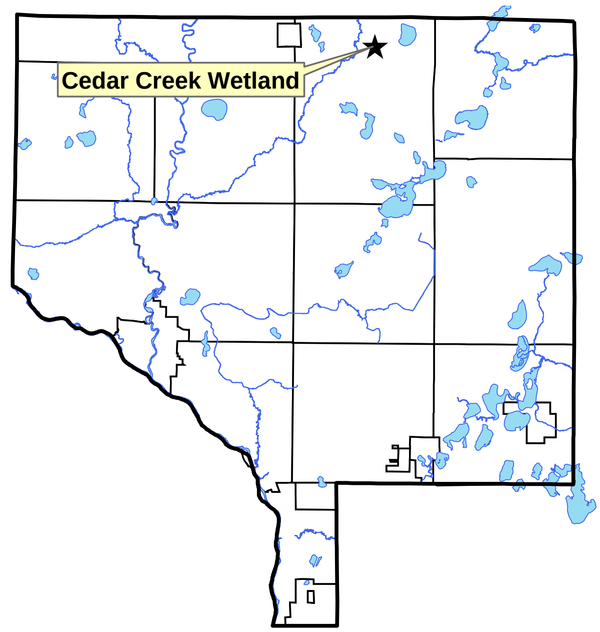


Well depth was 47 inches, so a reading of –47 indicates water levels were at an unknown depth greater than or equal to 47 inches.

Wetland Hydrology Monitoring

CEDAR CREEK REFERENCE WETLAND

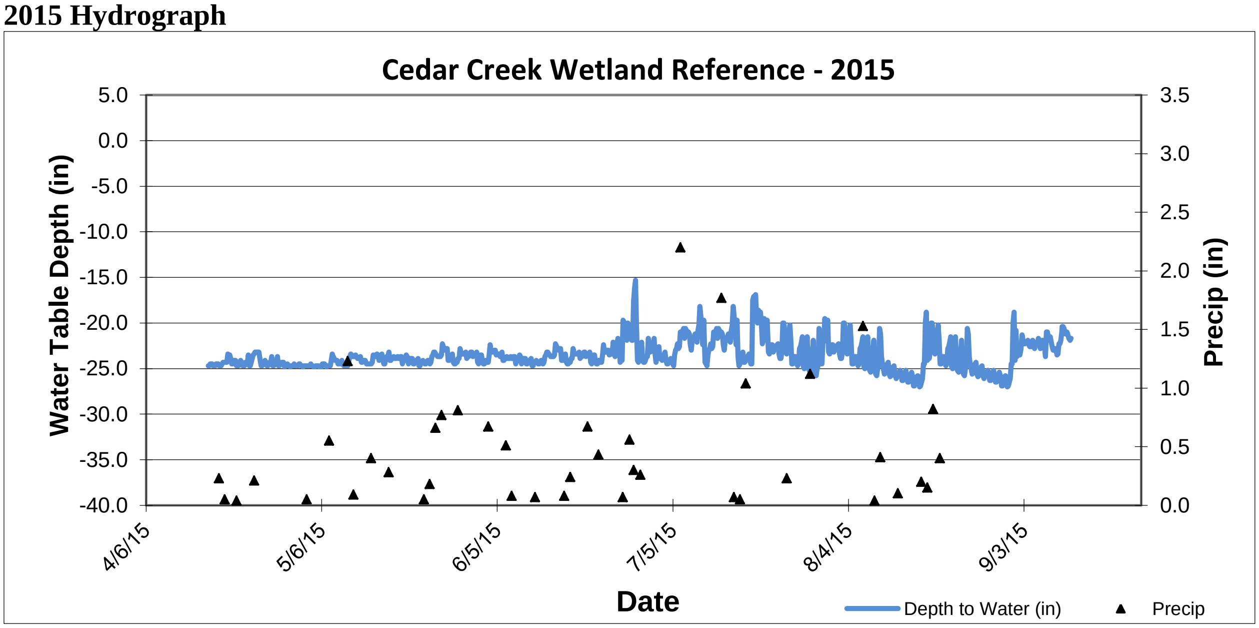
Univ. of Minnesota Cedar Creek Natural History Area, East Bethel



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.

2015 Hydrograph

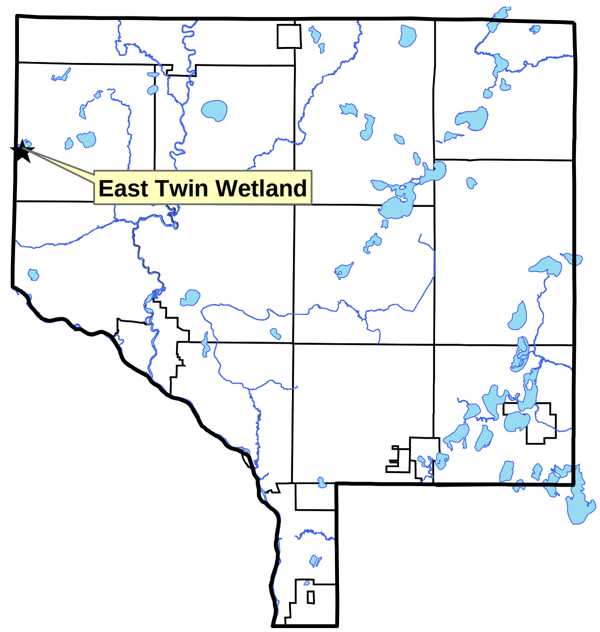


Well depth was 37 inches, so a reading of –37 indicates water levels were at an unknown depth greater than or equal to 37 inches.

Wetland Hydrology Monitoring

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	-

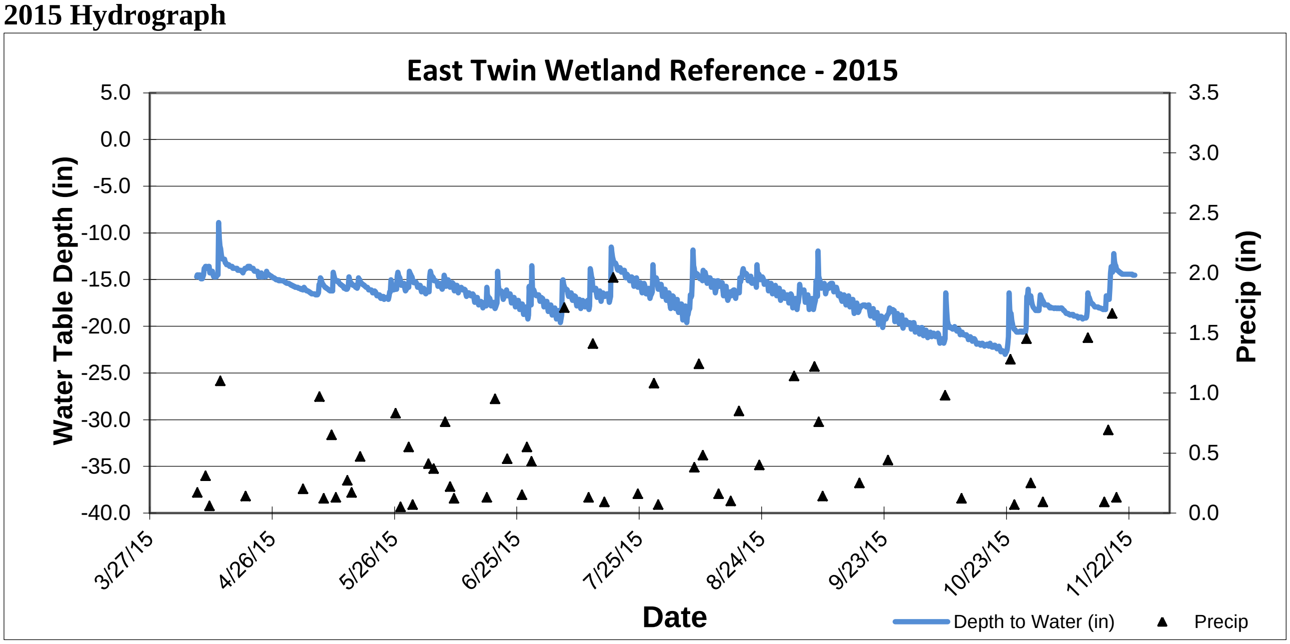
Surrounding Soils: Lake Beach, Growton and Heyder fine sandy loams

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.

2015 Hydrograph

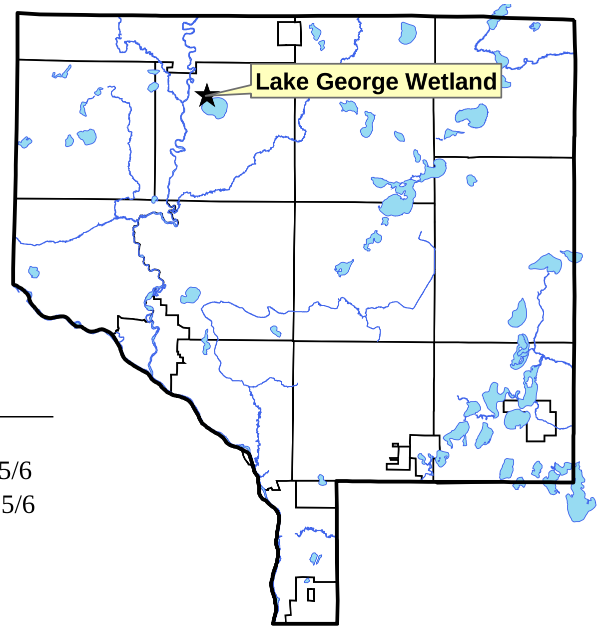


Well depth was 44 inches, so a reading of –44 indicates water levels were at an unknown depth greater than or equal to 44 inches.

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

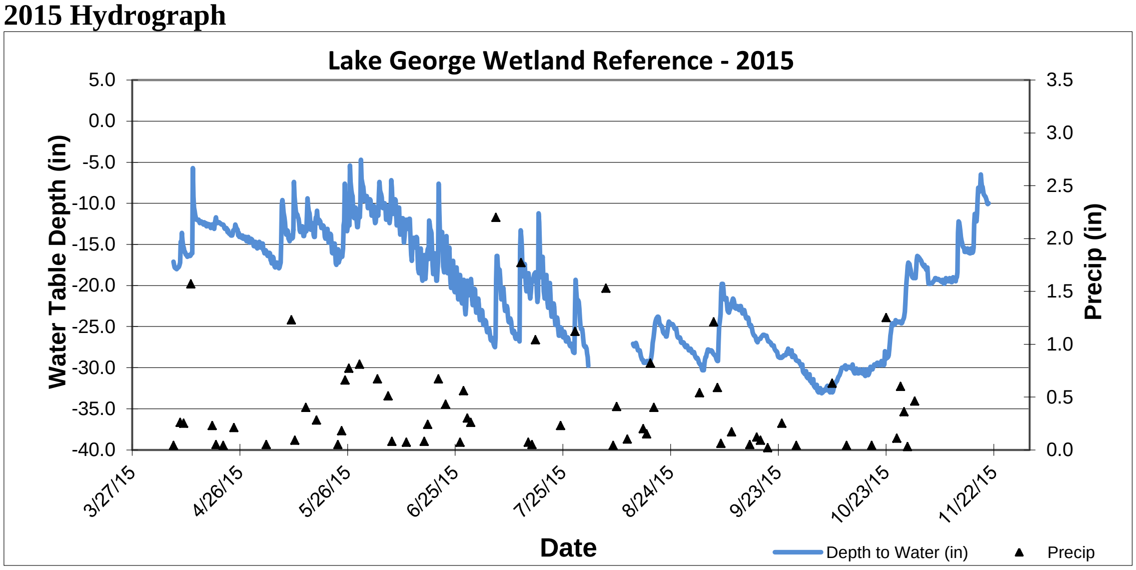
Surrounding Soils: Lino loamy fine sand and Zimmerman fine sand

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.

2015 Hydrograph

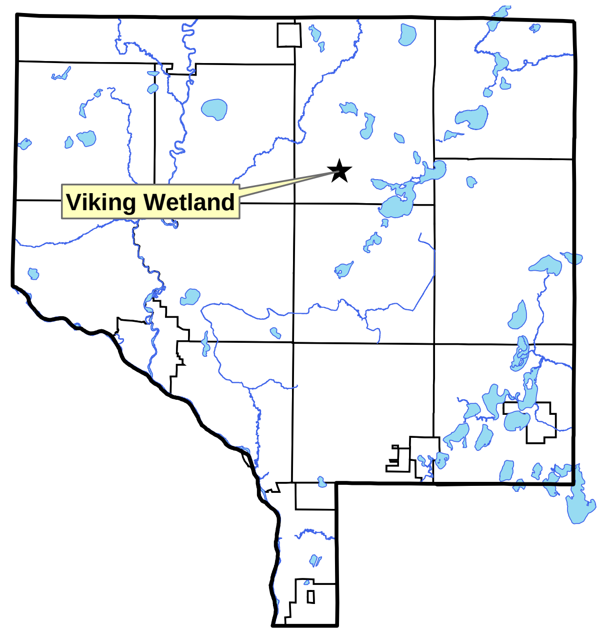


Well depth was 38 inches, so a reading of –38 indicates water levels were at an unknown depth greater than or equal to 38 inches.

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

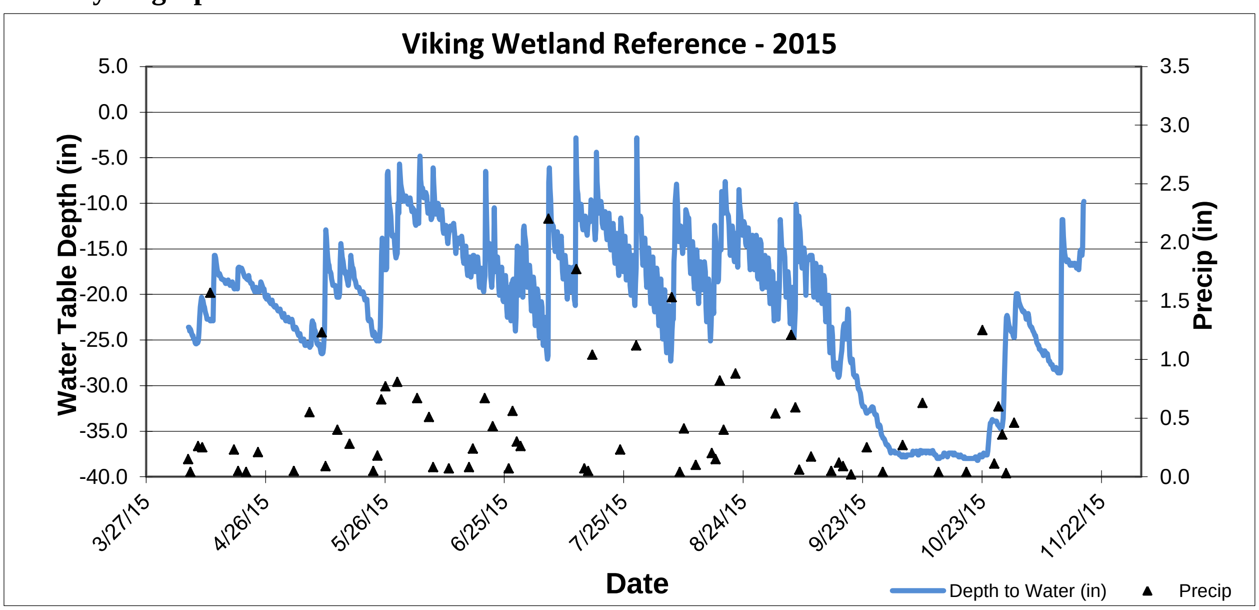
Surrounding Soils: Zimmerman fine sand

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).

2015 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.

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	-	$1,059.69
2013 Correction	+	$ 0.48
2014 URRWMO Contribution		$ 0.00
2015 URRWMO Contribution		$ 0.00
Fund Balance		**$ 1598.67**

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.

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.

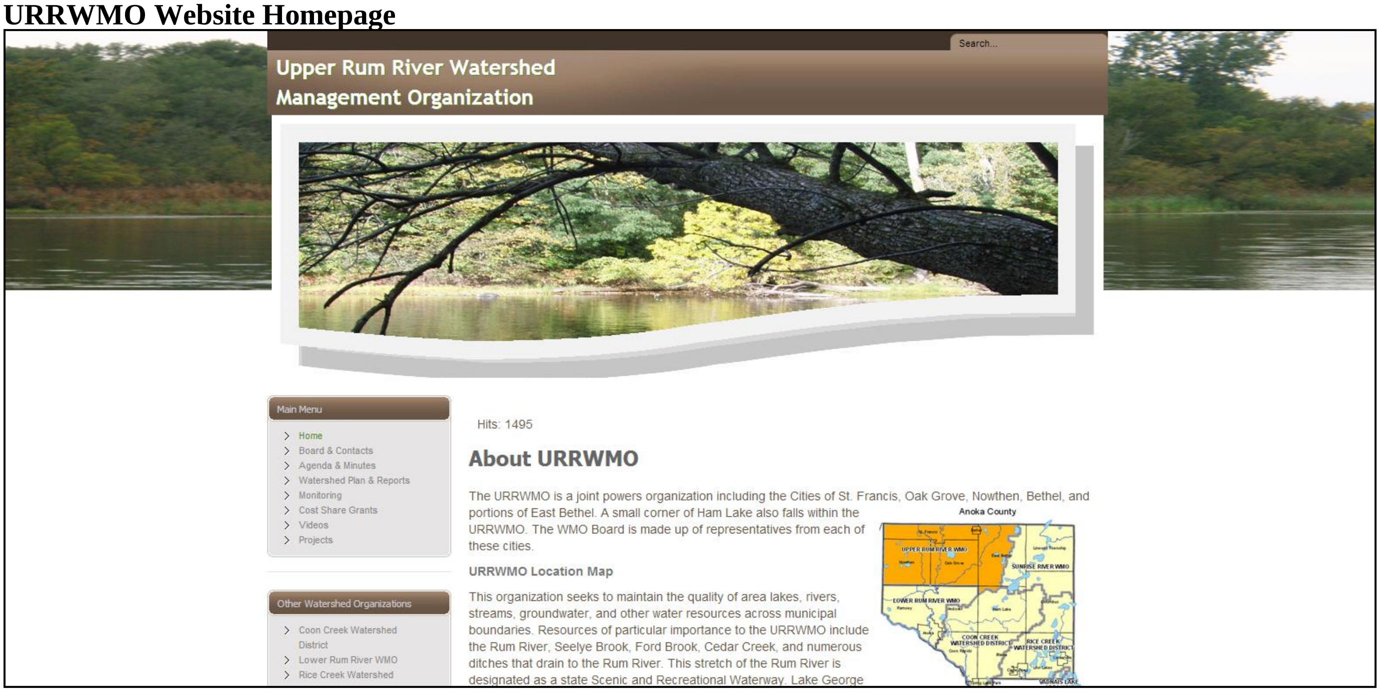
Location: www.URRWMO.org

Results: In 2013 ACD re-launched the URRWMO website.

Regular website updates occurred throughout the year. 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.

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.

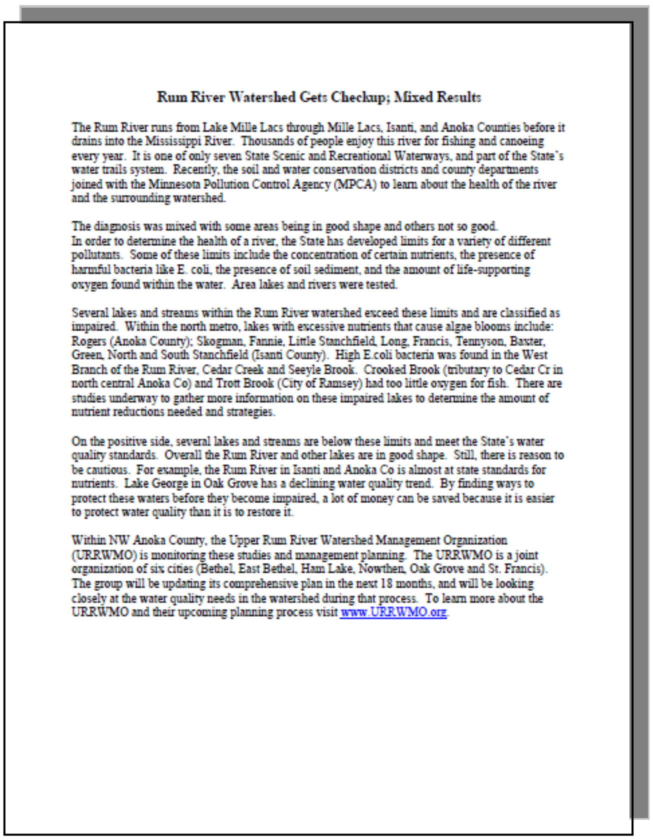
Purpose: To increase public awareness of the URRWMO and its programs as well as receive input.

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 the Rum River Watershed Restoration and Protection Project.

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 posted to the URRWMO Website, sent to each member community, as well as to the Independent School District 15 publication, "The Courier."

2015 URRWMO Newsletter Article



Rum River Watershed Gets Checkup; Mixed Results

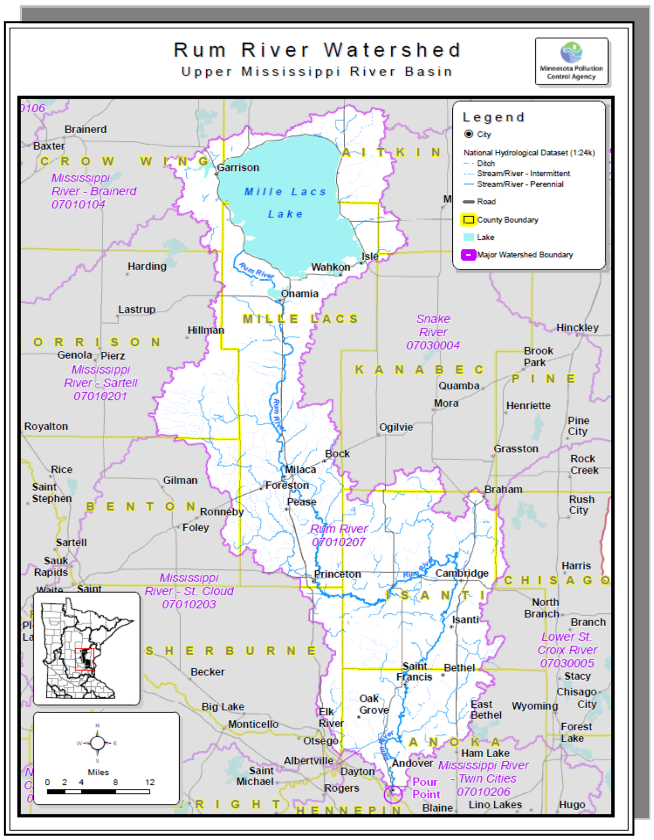
The Rum River runs from Lake Mille Lacs through Mille Lacs, Isanti, and Anoka Counties before it drains into the Mississippi River. Thousands of people enjoy this river for fishing and canoeing every year. It is one of only seven State Scenic and Recreational Waterways, and part of the State's water trails system. Recently, the soil and water conservation districts and county departments joined with the Minnesota Pollution Control Agency (MPCA) to learn about the health of the river and the surrounding watershed.

The diagnosis was mixed with some areas being in good shape and others not so good. In order to determine the health of a river, the State has developed limits for a variety of different pollutants. Some of these limits include the concentration of certain nutrients, the presence of harmful bacteria like E. coli, the presence of soil sediment, and the amount of life-supporting oxygen found within the water. Area lakes and rivers were tested.

Several lakes and streams within the Rum River watershed exceed these limits and are classified as impaired. Within the north metro, lakes with excessive nutrients that cause algae blooms include: Rogers (Anoka County); Skogman, Fannie, Little Stanchfield, Long, Francis, Tennyson, Baxter, Green, North and South Stanchfield (Isanti County). High E.coli bacteria was found in the West Branch of the Rum River, Cedar Creek and Seeyle Brook. Crooked Brook (tributary to Cedar Cr in north central Anoka Co) and Trott Brook (City of Ramsey) had too little oxygen for fish. There are studies underway to gather more information on these impaired lakes to determine the amount of nutrient reductions needed and strategies.

On the positive side, several lakes and streams are below these limits and meet the State's water quality standards. Overall the Rum River and other lakes are in good shape. Still, there is reason to be cautious. For example, the Rum River in Isanti and Anoka Co is almost at state standards for nutrients. Lake George in Oak Grove has a declining water quality trend. By finding ways to protect these waters before they become impaired, a lot of money can be saved because it is easier to protect water quality than it is to restore it.

Within NW Anoka County, the Upper Rum River Watershed Management Organization (URRWMO) is monitoring these studies and management planning. The URRWMO is a joint organization of six cities (Bethel, East Bethel, Ham Lake, Nowthen, Oak Grove and St. Francis). The group will be updating its comprehensive plan in the next 18 months, and will be looking closely at the water quality needs in the watershed during that process. To learn more about the URRWMO and their upcoming planning process visit www.URRWMO.org.



URRWMO 2014 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 2014 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 2015. The report to BWSR and financial report are available on the URRWMO website.

Report to BWR Cover

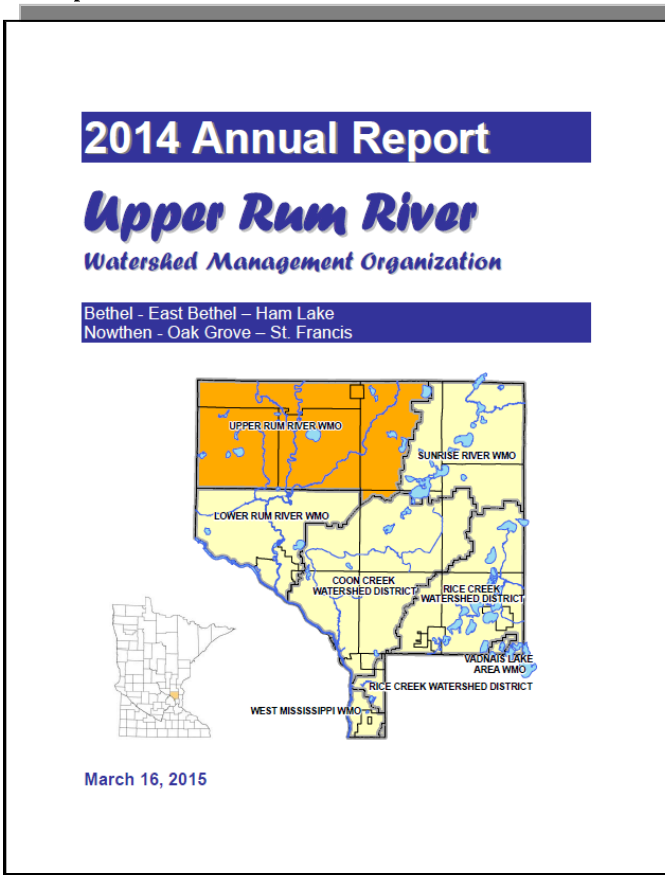


Table of Contents

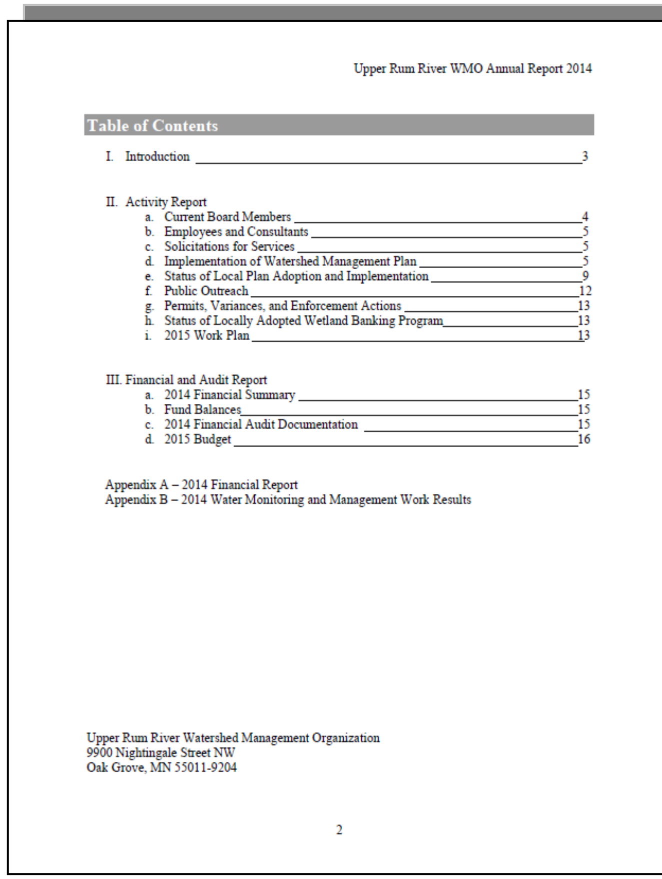

Upper Rum River WMO Annual Report 2014

Table of Contents

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

2

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	WMO Asst (no charge)	Volunteer Precip	CCWD Precip	Reference Wetlands	Ob Well	Lake Level	Lake Water Quality	Stream Level	Stream Water Quality	Student Biomonitoring	URRWMO Admin	WMO Annual Rpts to State	URRWMO Outreach/Promo	WMO Website Maintenance	URRWMO Planning	BMP Maintenance	Rum River WRAPP	Lake George CLP Mapping	St. Francis SRA (Rum River WRAPP)	Total
Revenues																				
URRWMO	0	0	0	1725	0	1000	0	0	4200	825	798	1000	500	490	0	0	0	0	0	10538
State	0	0	0	0	534	0	0	0	0	0	0	0	0	0	0	0	38373	0	5566	44473
Anoka Conservation District	0	0	0	88	0	0	0	0	0	0	112	0	456	0	276	0	0	0	0	932
Anoka Co. General Services	379	0	0	1176	0	0	0	0	0	0	0	0	0	0	0	2481	853	2257	63	7209
County Ag Preserves/Projects	0	0	0	0	0	0	1003	0	0	384	0	0	0	0	0	0	0	0	0	1387
Regional/Local	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Service Fees	0	0	0	46	0	0	1177	138	0	0	0	0	0	0	0	0	0	1079	0	2441
BWSR Cons Delivery	0	0	0	0	0	271	1331	827	0	46	0	0	0	0	0	0	0	0	0	2476
BWSR Cost Share TA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Local Water Planning	0	996	0	852	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1848
TOTAL	379	996	0	3887	534	1271	3512	965	4200	1255	910	1000	956	490	276	2481	39226	3336	5629	71302
Expenses-																				
Capital Outlay/Equip	3	9	0	1110	5	11	25	8	17	11	8	3	8	3	2	21	52	29	49	1373
Personnel Salaries/Benefits	333	877	0	2378	470	1113	2590	846	1726	1105	801	267	842	275	243	2181	5309	2936	4954	29246
Overhead	21	56	0	152	30	71	166	54	111	71	51	17	54	18	16	140	340	188	317	1873
Employee Training	2	6	0	15	3	7	17	5	11	7	5	2	5	2	2	14	34	19	32	186
Vehicle/Mileage	5	13	0	34	7	16	37	12	25	16	12	4	12	4	3	31	76	42	71	421
Rent	14	36	0	99	19	46	107	35	72	46	33	11	35	11	10	90	220	122	205	1212
Program Participants	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Program Supplies	0	0	0	99	0	7	569	4	819	0	0	0	0	0	0	4	33195	0	0	34696
McKay Expenses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	379	996	0	3887	534	1271	3512	965	2779	1255	910	303	956	312	276	2481	39226	3336	5629	69007

Recommendations

- **Actively participate in the MPCA Rum River WRAPP (Watershed Restoration and Protection Plan).** 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.
- **Collaborate on efforts to diagnose declining water quality in Lake George and fix it.** The Lake George Improvement District and Anoka Conservation District have begun study of the issue and secured a State grant for partial funding.
- **Install projects identified in the St. Francis stormwater assessment** that is aimed at improving Rum River water quality. The study is identifying stormwater treatment opportunities and ranking them by cost effectiveness. It lays the groundwork for project installations.
- **Participate with county and DNR efforts to upgrade the water control structure in Ditch 19, the only inlet to Lake George**. Residents have complained that condition of the ditch and water control structures are contributing to low lake water levels in recent years.
- **Correct riverbank erosion issues discovered during the 2010 Rum River survey**. Several locations of severe riverbank erosion were documented, as well as many instances of minor erosion. Offering landowners financial assistance, designs and construction crews is key.
- **Promote groundwater conservation.** Metropolitan Council models predict 3+ft drawdown of surface waters in parts of the URRWMO by 2030, and 5+ft by 2050.
- **Promote water quality improvement projects** for lakes, streams, and rivers. Cost share grants are available through the URRWMO and ACD to encourage landowners to do projects that will have public benefits to water quality. Technical assistance for landowners is available through the Anoka Conservation District.