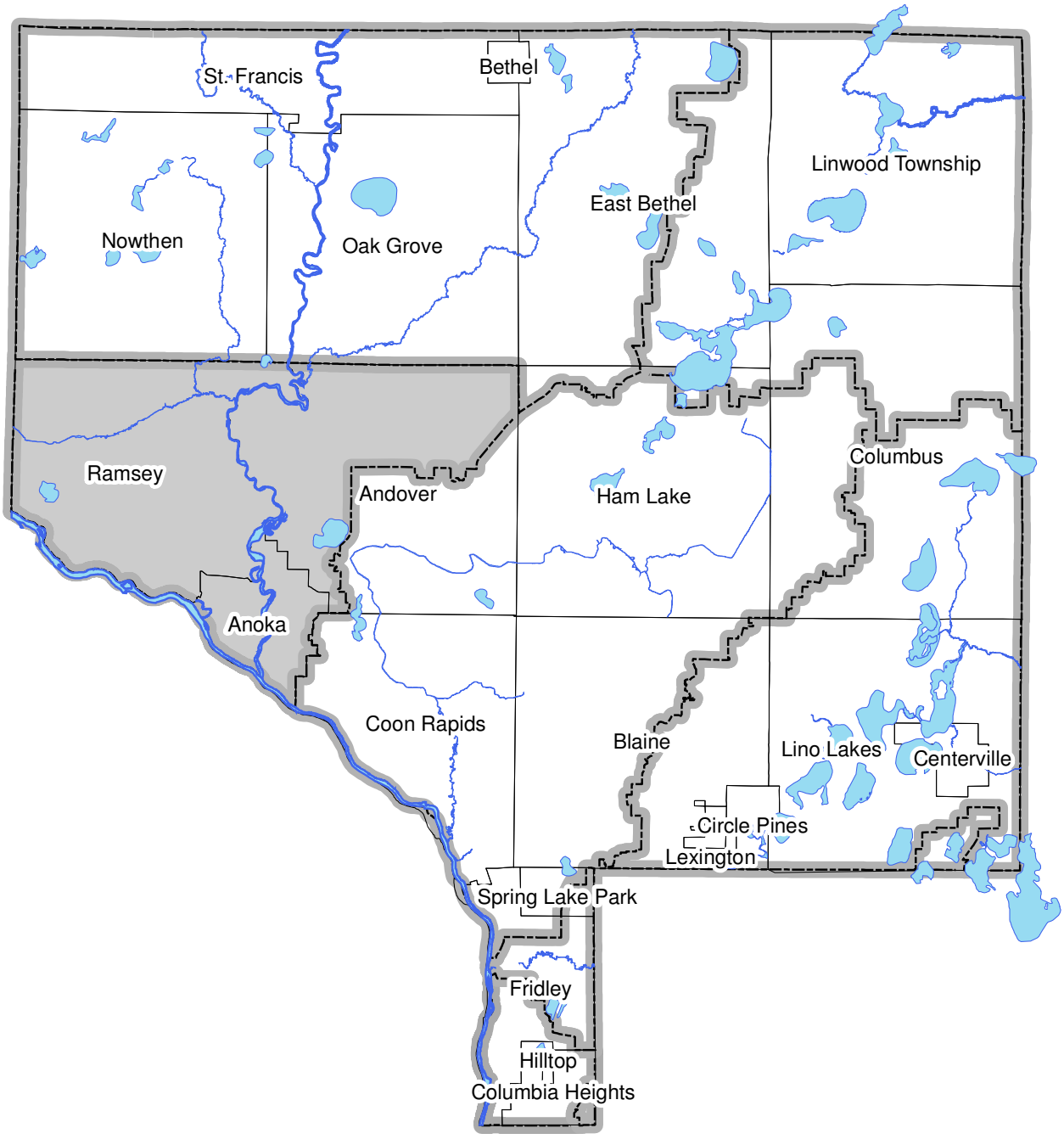
Excerpt from the 2016 Anoka Water Almanac

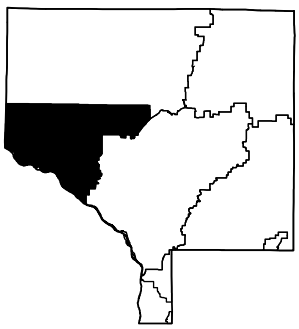
Chapter 4: Lower Rum River Watershed

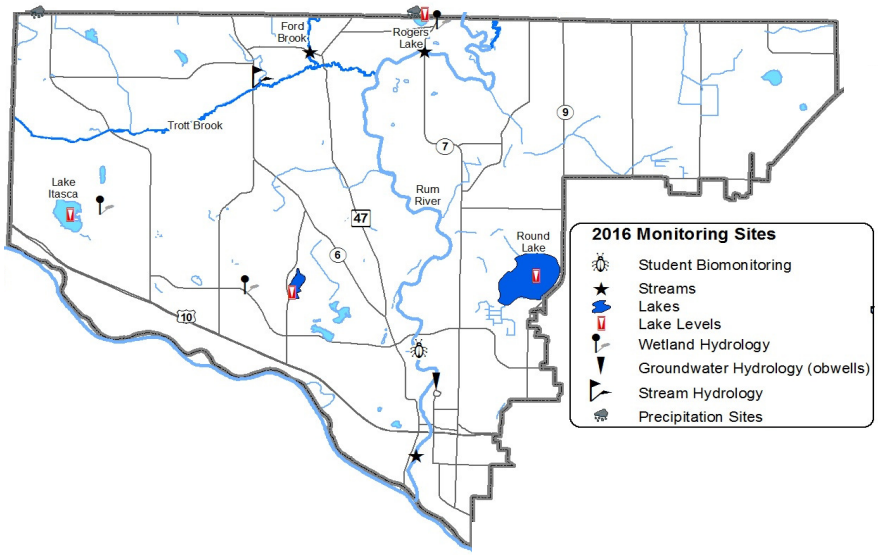


Prepared by the Anoka Conservation District

CHAPTER 4:
LOWER RUM RIVER WATERSHED

ACAP = Anoka County Ag Preserves, ACD = Anoka Conservation District, LRRWMO = Lower Rum River Watershed Mgmt. Org, MC = Metropolitan Council, MNDNR = MN Dept. of Natural Resources, LSOHC = Lessard-Sams Outdoor Heritage Council





Lake Level Monitoring

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

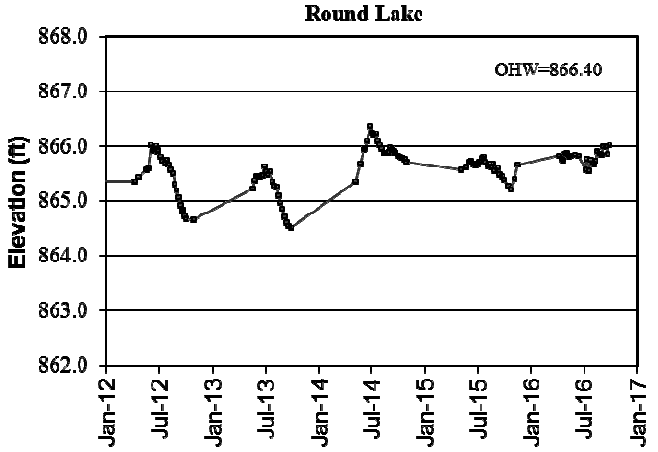
Purpose: To understand lake hydrology, including the impacts of climate or other water budget changes. These data are useful for regulatory, building/development, and lake management decisions.

Locations: Round, Rogers, Itasca, and Sunfish/Grass Lakes

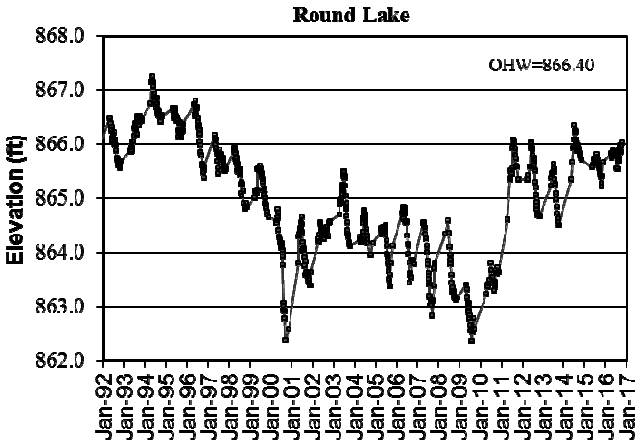
Results: Lake levels were measured by volunteers throughout the 2016 open water season. Lake gauges were installed and surveyed by the Anoka Conservation District and MN DNR. 2016 was an especially wet year, and lake levels increased or were maintained throughout the growing season and into late fall/ Average lake levels were similar or slightly higher than 2015.

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.

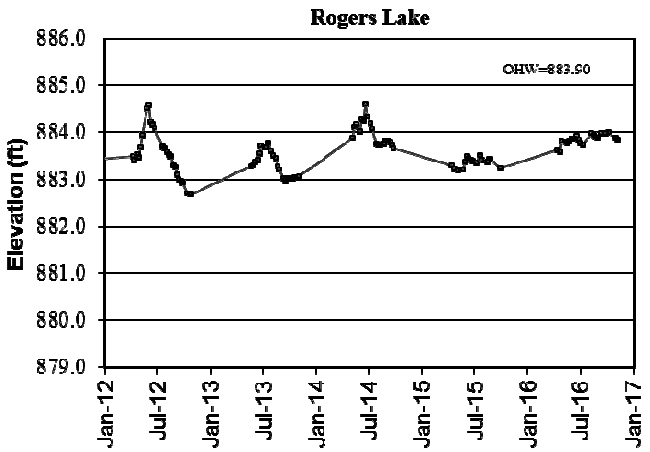
Round Lake Levels – last 5 years



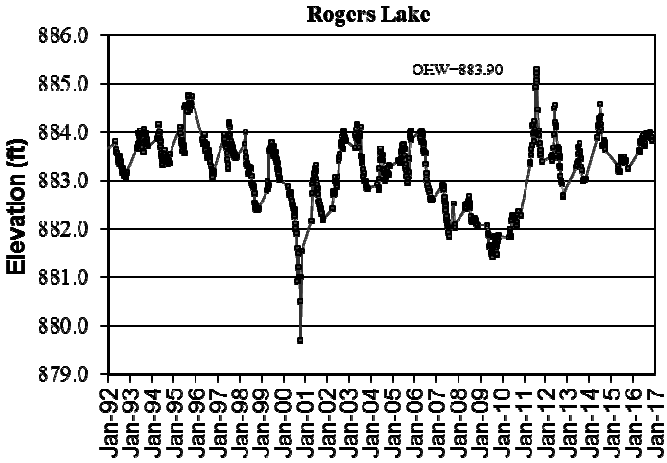
Round Lake Levels – last 25 years



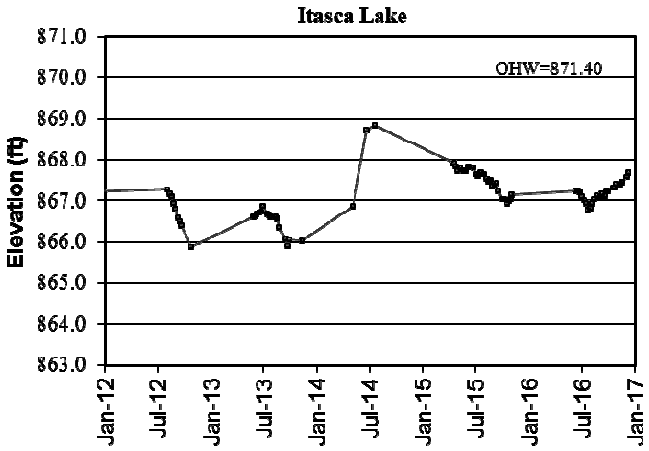
Rogers Lake Levels – last 5 years



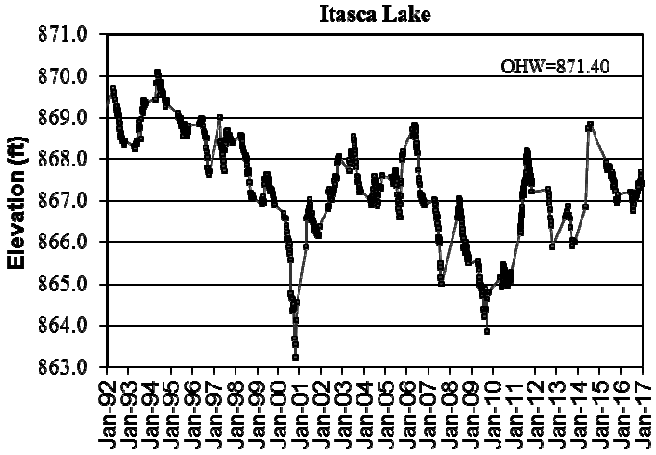
Rogers Lake Levels – last 25 years



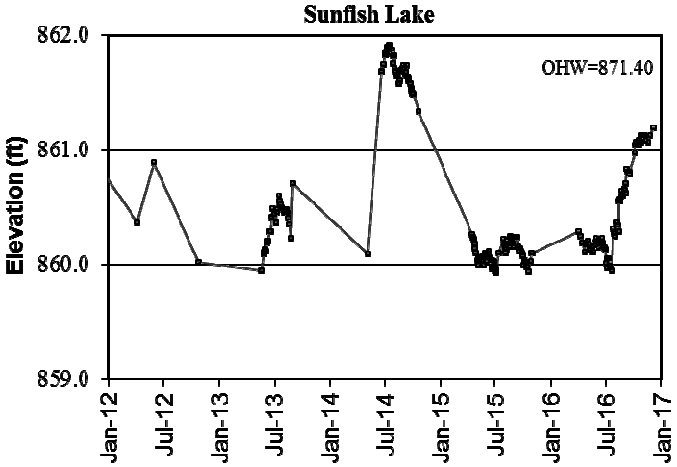
Itasca Lake Levels – last 5 years



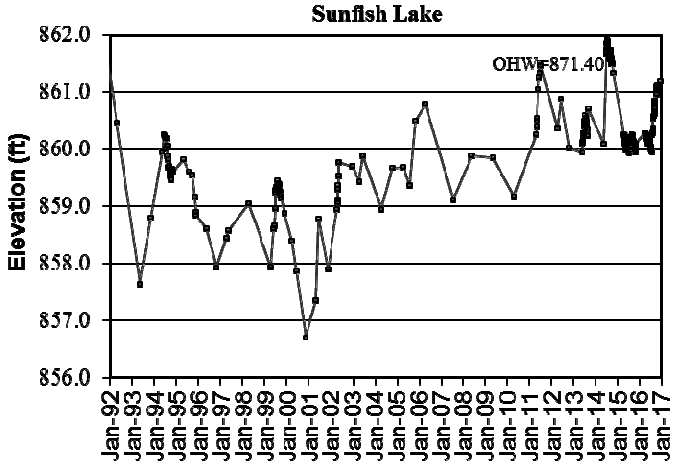
Itasca Lake Levels – last 25 years



Sunfish/Grass Lake Levels – last 5 years



Sunfish/Grass Lake Levels – last 25 years



Lake Water Quality

Description: May through September, every-other-week, monitoring is conducted for the following parameters: total phosphorus, chlorophyll-a, Secchi transparency, dissolved oxygen, turbidity, temperature, conductivity, pH, and salinity.

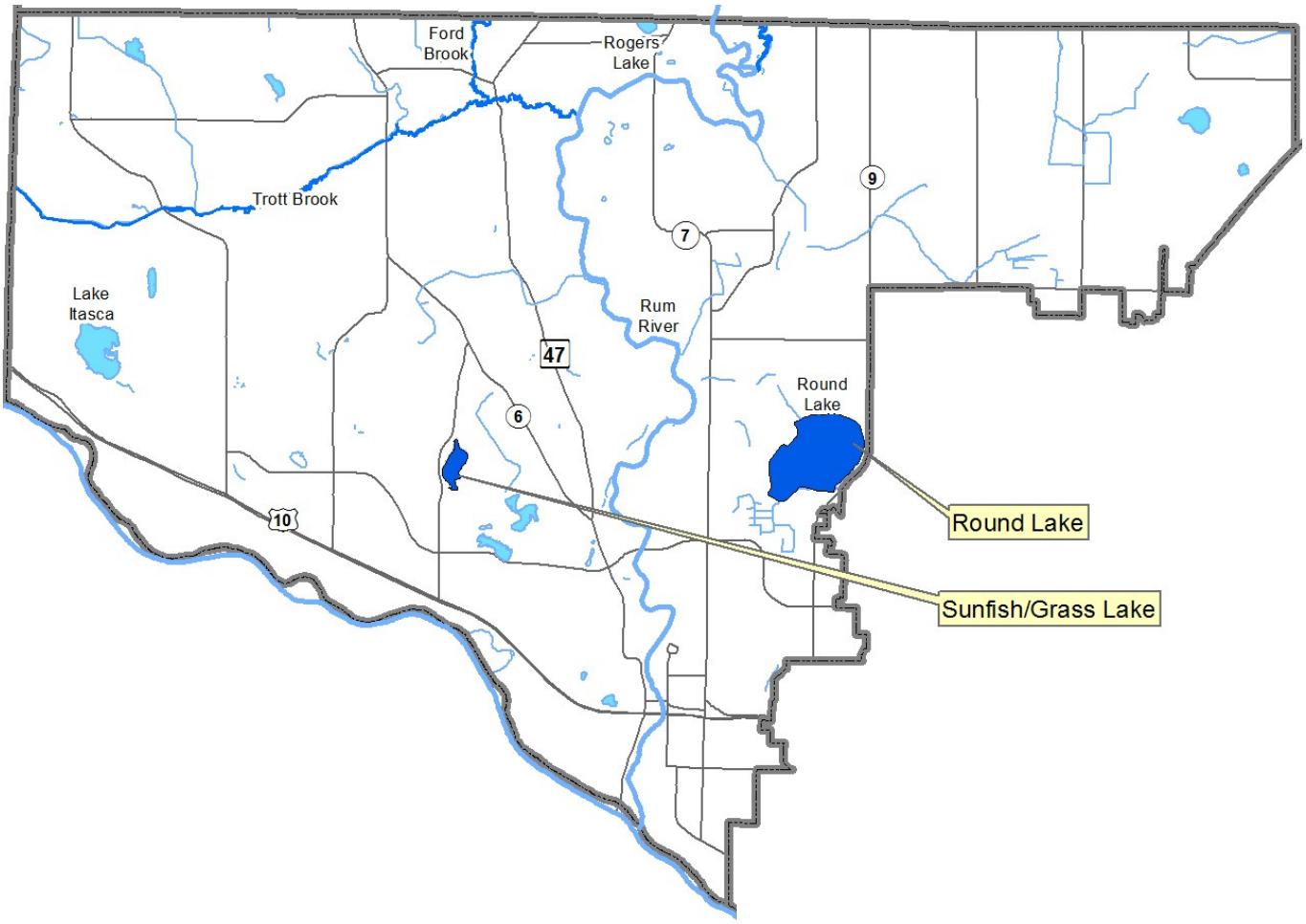
Purpose: To detect water quality trends and diagnose the cause of changes.

Locations: Round Lake

Sunfish/Grass 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 from the ACD. Refer to Chapter 1 for additional information on lake dynamics and interpreting the data.

LRRWMO Lake Water Quality Monitoring Sites



Round Lake

City of Andover, Lake ID # 02-0089

Background

Round Lake is located in southwest Anoka County. It has a surface area of 220 acres and maximum depth of 19 feet, though the majority of the lake is less than 4 feet deep. The lake is surrounded by cattails and has submerged vegetation interspersed throughout the basin. This lake has a small watershed, with a watershed to surface area ratio of less than 10:1. Public access is from a dirt ramp on the lake's southeast side. Almost no boating occurs with mostly wintertime fishing on the lake. Wildlife, especially waterfowl, usage of the lake is relatively high.

2016 Results

In 2016 Round Lake's water quality was very good compared with other lakes in this region (NCHF Ecoregion) receiving an overall A letter grade. The average of both total phosphorus (17.0 ug/L) and chlorophyll-a (2.2 ug/L) were the second lowest on record, beat out only by 2015 results. Secchi transparency was 10.9 feet, the third best ever observed. It is important to note that the true Secchi transparency average was deeper than 10.9 feet because one reading was not used in the average calculatin since clarity exceeded the water depth at the sampling point on that day. Phosphorus and algae were fairly consistent without indication of any seasonal fluctuation.

Trend Analysis

Eleven years of water quality monitoring has been conducted by the Anoka Conservation District (1998-2000, 2003, 2005, 2007, and 2009-2010, 2012, 2014, 2016), which is a marginal number of years for a powerful statistical test of trend analysis. In 2010, the results of the analysis indicated a significant trend of declining water quality across the years studied to that point (repeated measures MANOVA with response variables TP, Cl-a, and Secchi depth, $F_{2,5} = 9.6065$, $p = 0.0194$). When the analysis is run on all data to date, including the exceptional water quality observed since 2012, no significant water quality changes are apparent ($F_{2,8} = 0.41$, $p = 0.49$).

Discussion

2016 was the third consecutive monitoring year in which exceptional water quality was observed in Round Lake, earning an A letter grade each year. There was growing concern about a trend toward poorer water quality before 2010. Phosphorus and chlorophyll-a had increased substantially in each of four monitored years from 2005-2009. These were years of low lake levels. There was speculation that in-lake sources of nutrients, driven by sediment mixing, were a source of phosphorus. During low water conditions, there is more wind mixing due to shallow water depths, and in these years, there was also a conspicuous reduction of chara (a plant-like algae) carpeting the bottom. Since 2012, water levels have recovered substantially and water quality has dramatically improved. It does seem that low water levels in Round Lake lead to poorer water quality. Additional monitoring in the future can help verify this.

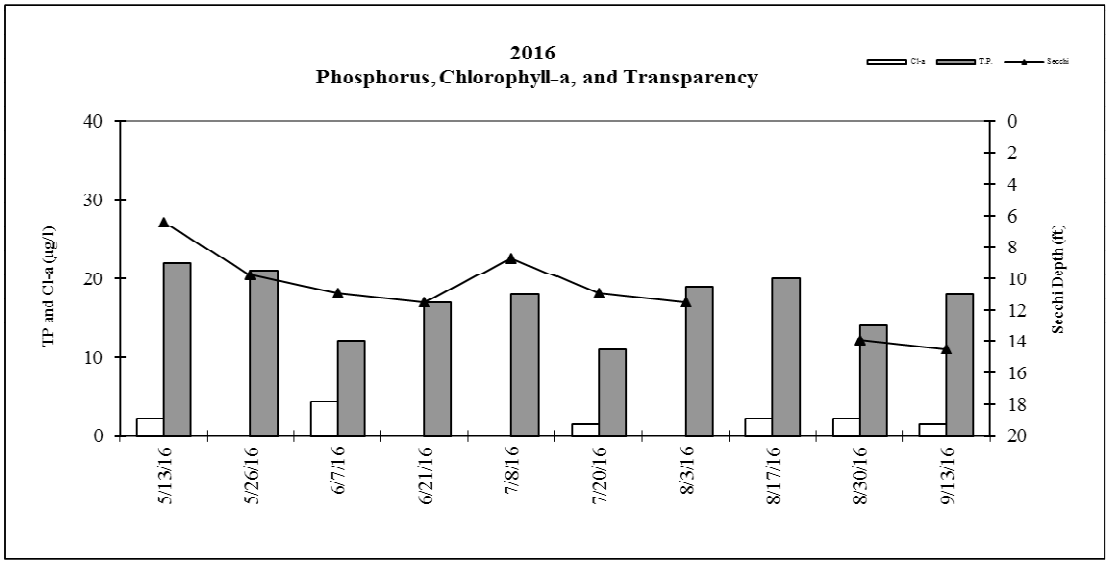
Since at least the 1980s, there have been complaints about low water levels in Round Lake. The lake has few surface water in-flows, so groundwater is important to lake hydrology. There have been concerns that local surficial groundwater levels, and hence the lake, are negatively impacted by a variety of causes including irrigation, residential groundwater use, stormwater management, road embankments, and others. Groups including the MN DNR, the Anoka Conservation District, watershed organizations, and cities have studied each potential cause. None has been found to cause lower-than-expected lake levels. There is evidence that Round Lake levels do behave differently from other nearby lakes. Moreover, studies by the Metropolitan Council and others have found regional surficial water tables are being drawn down by groundwater pumping in some area of the metro metro. Several lakes, including Round and Bunker Lakes, are potentially affected by this groundwater overuse. Conservation of groundwater must become a regional and local priority.

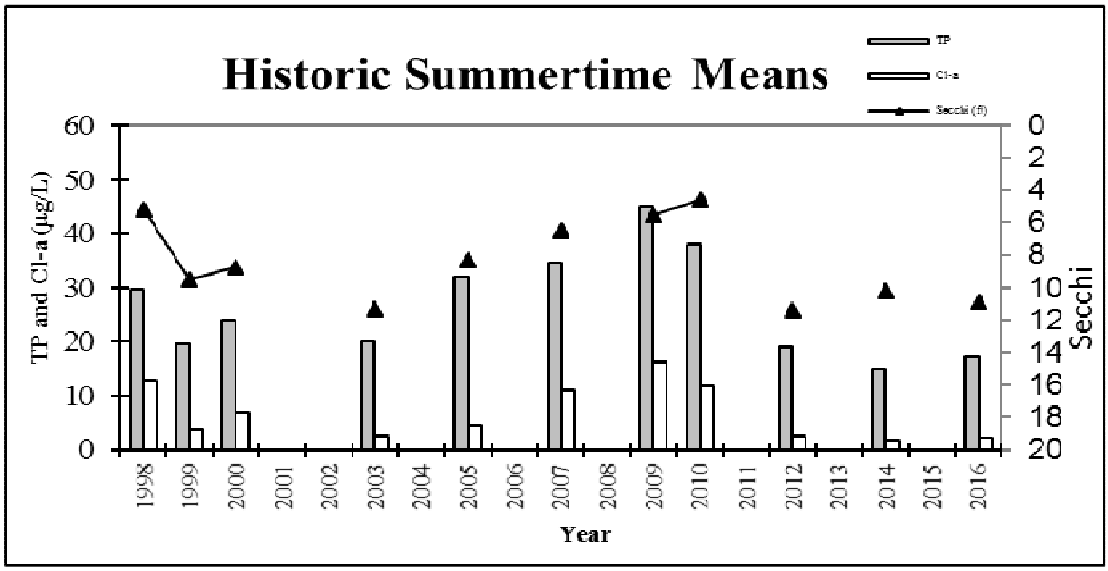
2016 Round Lake Water Quality Data

Round Lake
2016 Water Quality Data

	Units	R.L.*	Date: 5/13/2016 Time: 11:45 Results	5/26/2016 9:45 Results	6/7/2016 12:30 Results	6/21/2016 10:50 Results	7/8/2016 10:25 Results	7/20/2016 10:05 Results	8/3/2016 11:45 Results	8/17/2016 9:45 Results	8/30/2016 11:00 Results	9/13/2016 9:45 Results	Average	Min	Max
pH		0.1	8.55	8.60	8.81	9.04	8.83	9.41	9.32	8.83	8.32	8.20	8.79	8.20	9.41
Conductivity	mS/cm	0.01	0.378	0.369	0.364	0.292	0.299	0.298	0.291	0.321	0.313	0.289	0.321	0.289	0.378
Turbidity	FNRU	1	9.50	2.20	4.80	3.40	13.80		0.00	4.80	2.80	3.30	5	0	14
D.O.	mg/l	0.01	10.18	9.85	10.20	9.26	7.92	10.30	11.01	7.78	8.31	8.41	9.32	7.78	11.01
D.O.	%	1	100%	116%	115%	115%	100%	128%	143%	96%	101%	94%	111%	94%	143%
Temp.	°C	0.1	14.0	21.9	20.2	24.8	24.8	26.6	27.8	24.9	23.6	20.4	22.9	14.0	27.8
Temp.	°F	0.1	57.1	71.3	68.3	76.7	76.7	80.0	82.1	76.8	74.4	68.6	73.2	57.1	82.1
Salinity	%	0.01	0.18	0.18	0.17	0.14	0.14	0.14	0.14	0.15	0.15	0.14	0.15	0.14	0.18
Cl-a	ug/L	0.5	2.1	<1	4.3	<1	<1	1.4	<1	2.1	2.1	1.4	2.2	1.4	4.3
T.P.	mg/l	0.010	0.022	0.021	0.012	0.017	0.018	0.011	0.019	0.020	0.014	0.018	0.017	0.011	0.022
T.P.	ug/l	10	22	21	12	17	18	11	19	20	14	18	17.2	11	22
Secchi	ft		6.4	9.8	10.9	11.5	8.8	10.9	11.5		13.9	14.5	10.9	6.4	14.5
Secchi	m		2.0	3.0	3.3	3.5	2.7	3.3	3.5	0.0	4.2	4.4	3.3	2.0	4.4
Field Observations			Fairly clear,	Light brown	Clear		Fairly clear,	Clear, light c	Very clear	Very clear	Clear				
Physical			2	2.0	1.0	2.0	2.0	2.0	1.0	1.0	1.0	1.0	1.5	1.0	2.0
Recreational			1.5	2.0	1.0	2.0	2.0	2.0	2.0	2.0	1.0	1.0	1.7	1.0	2.0

*reporting limit





Round Lake Historic Summertime Mean Values

Agency	ACD	ACD	ACD	ACD	ACD	ACD	ACD	ACD	ACD	ACD	ACD
Year	1998	1999	2000	2003	2005	2007	2009	2010	2012	2014	2016
TP	29.8	19.6	24.1	20.0	32.0	34.7	45.0	38.0	19.0	15.0	17
Cl-a	12.8	3.7	6.9	2.4	4.6	10.9	16.2	11.8	2.5	1.8	2.2
Secchi (m	1.60	2.90	2.67	3.40	2.50	2.00	1.70	1.40	3.50	3.10	3.3
Secchi (ft	5.2	9.5	8.8	11.3	8.3	6.5	5.5	4.6	11.4	10.2	10.9

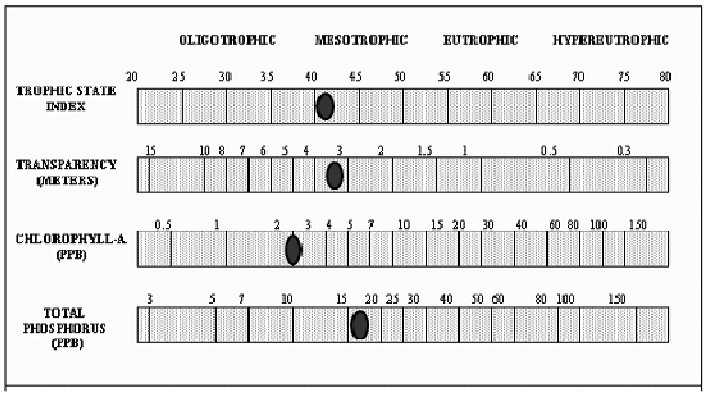
Carlsons Trophic state indices

TSIP	53	47	50	47	54	55	59	57	47	43	45
TSIC	56	44	49	39	46	54	58	55	40	36	38
TSIS	53	45	46	42	47	50	52	55	42	44	43
TSI	54	45	48	43	49	53	56	56	43	41	42

Round Lake Water Quality Report Card

Year	1998	1999	2000	2003	2005	2007	2009	2010	2012	2014	2016
TP	B	A	B	A	B	C	C	C	A	A	A
Cl-a	B	A	A	A	A	B+	B	B	A	A	A
Secchi	C	B	B	A	B	C	C	C	A-	A	A
Overall	**B**	**A**	**B**	**A**	**B**	**C**	**C**	**C**	**A**	**A**	**A**

Carlson's Trophic State Index



Sunfish/Grass Lake

City of Ramsey, Lake ID #02-0113

Background

Grass Lake is located in the City of Ramsey in southwestern Anoka County. It is a rather small lake with a surface area of 35 acres. The lake does not have a public boat landing, but can be accessed through Sunfish Lake Park on the west side of the lake. The park has a fishing pier and kayaks, which can both be used by the public. The lake is quite shallow with floating leaf, emergent and submergent aquatic vegetation throughout. A v portion of the shoreline is developed with most of the lake being surrounded by park or wooded land.

2016 Results

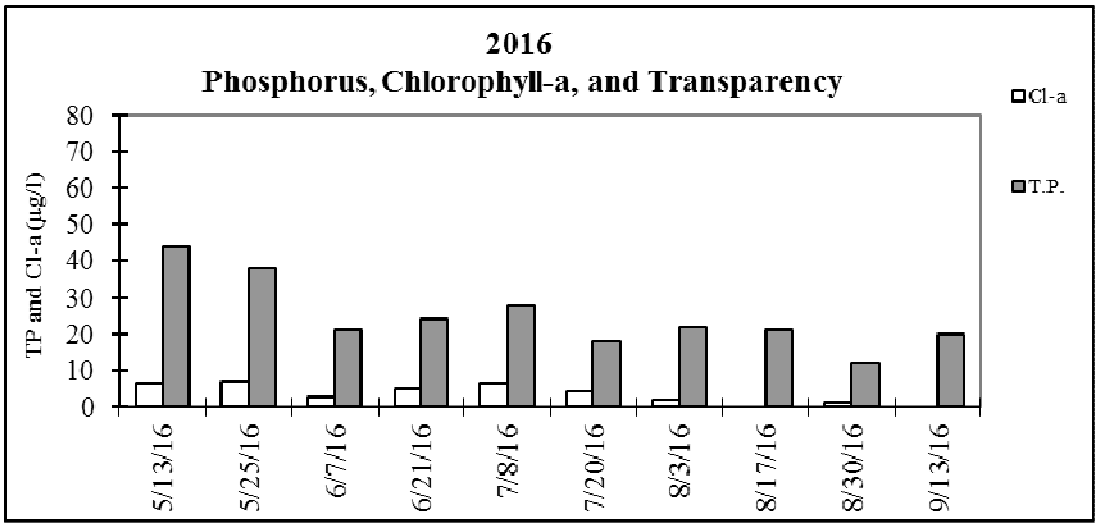
2016 was the first year in which the Anoka Conservation District (ACD) monitored Sunfish/Grass Lake as part of the regular lake sampling efforts. The lake has been monitored two other years through the MPCA Citizen Monitoring Program (CLMP). In 2016 Sunfish Lake's water quality was neither exceptionally good nor especially bad compared with other lakes in this region (NCHF Ecoregion), receiving an overall B letter grade. The average total phosphorus (25 ug/L) was at a typical level for this ecoregion, and was acceptably low compared to the state water quality standard of 60 ug/L for shallow lakes in the NCHF Ecoregion. The average concentration of chlorophyll-a (4.4 ug/L) was the lowest in the three years of data and was acceptably low compared to the state standard of 20 ug/L. On many sampling occasions, the secchi transparency exceeded the lake's depth. .

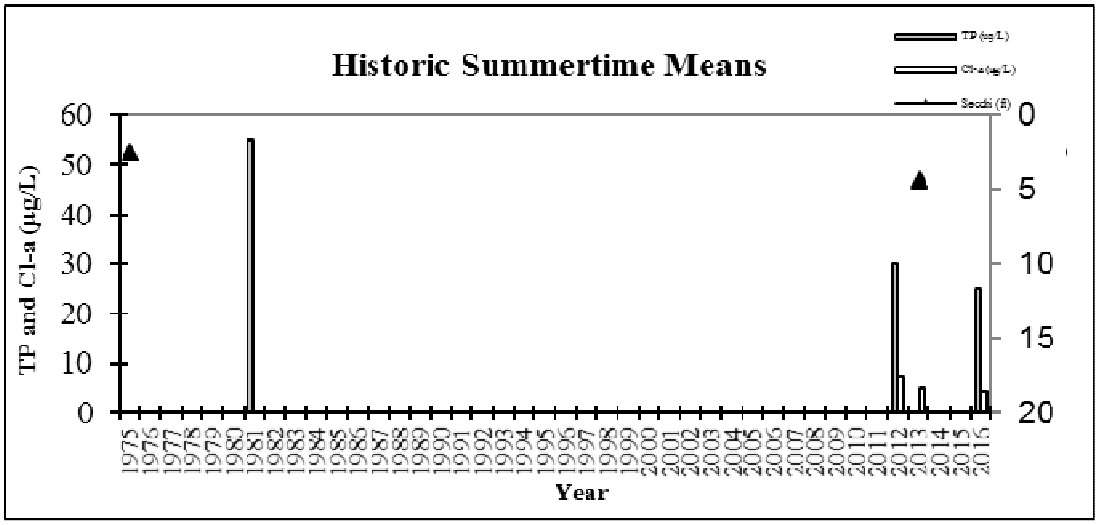
Discussion

Grass Lake looks to be in good health, receiving an overall B letter grade in each of the three years monitored since 2012. This letter grade would likely be even higher in 2016 if Secchi readings were not limited by the depth of the lake. There is not enough data for a trend analysis. Secchi transparency and chlorophyll-a have improved in each year monitored, but no true trend may exist.

Sunfish Lake			5/13/2016	5/25/2016	6/7/2016	6/21/2016	7/8/2016	7/20/2016	8/3/2016	8/17/2016	8/30/2016	9/13/2016			
2016 Water Quality Data			11:00	9:45	11:40	10:05	9:45	9:15	11:00	9:00	10:15	9:10			
	Units	R.L.*	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Average	Min	Max
pH		0.1	8.61	8.75	8.72	8.71	8.44	9.11	9.36	9.04	8.59	8.17	8.75	8.17	9.36
Conductivity	mS/cm	0.01	0.417	0.417	0.401	0.344	0.364	0.357	0.331	0.357	0.350	0.339	0.368	0.331	0.417
Turbidity	NTU	1	25.9	3.9	12	10	22		0	14	2	10	11	0	26
D.O.	mg/L	0.01	10.99	12.10	11.45	9.37	8.37	10.48	12.80	9.61	9.97	8.94	10.41	8.37	12.80
D.O.	%	1	112	141	132	119	106	136	167	121	121	99	125	99	167
Temp.	°C	0.1	14.9	22.1	21.0	25.7	24.6	26.7	28.1	25.4	24.1	20.4	23.3	14.9	28.1
Temp.	°F	0.1	58.7	71.8	69.7	78.3	76.4	80.1	82.7	77.8	75.4	68.7	74.0	58.7	82.7
Salinity	%	0.01	0.20	0.20	0.19	0.17	0.18	0.17	0.16	0.18	0.17	0.16	0.18	0.16	0.20
Cl-a	ug/L	0.5	6.4	7.1	2.8	5.0	6.4	4.3	2.1	<1	1.4	<1	4.4	1.4	7.1
T.P.	mg/L	0.010	0.044	0.038	0.021	0.024	0.028	0.018	0.022	0.021	0.012	0.020	0.025	0.012	0.044
T.P.	ug/L	10	44	38	21	24	28	18	22	21	12	20	25	12	44
Secchi	ft	0.1	3.6	4.0	4.8	>5.0	3.3	>5.08	>4.83	>4.83	>5.5	5.5	4.2	3.3	5.5
Secchi	m	0.1	1.1	1.2	1.4	>1.52	1.0	>1.55	>1.47	>1.47	>1.68	1.7	1.3	1.0	1.7
Physical			3	3	3	3	3	2	1	1	1	1	2.1	1.0	3.0
Recreational			3	3	3	3	3	2	2	3	2	1	2.5	1.0	3.0

*reporting limit

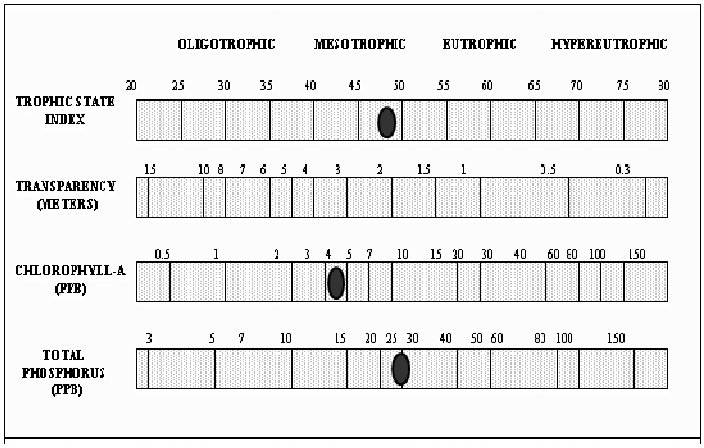




Sunfish Lake Historical Summertime Mean Values

Agency	CLMP	CLMP		ACD
Year	2012	2013	2015	2016
TP (µg/L)	30.0			25.0
Cl-a (µg/L)	7.1	5.0		4.4
Secchi (m)	1.2	1.3		na
Secchi (ft)	3.9	4.4		na
Carlson's Trophic State Index				
TSIP	53			51
TSIC	50	46		45
TSIS	57	56		na
TSI	53	51		48
Sunfish Lake Water Quality Report Card				
Year	2012	2013	2015	2016
TP (µg/L)	B			C
Cl-a (µg/L)	A	A		A
Secchi (m)	C	C		na
Overall	**B**	**B**		**B**

Carlson's Trophic State Index



Stream Water Quality - Chemical Monitoring

Description: In 2016, monitoring events were scheduled May through September for each of the following parameters: total suspended solids, total phosphorus, Secchi tube transparency, dissolved oxygen, turbidity, temperature, conductivity, pH, and salinity.

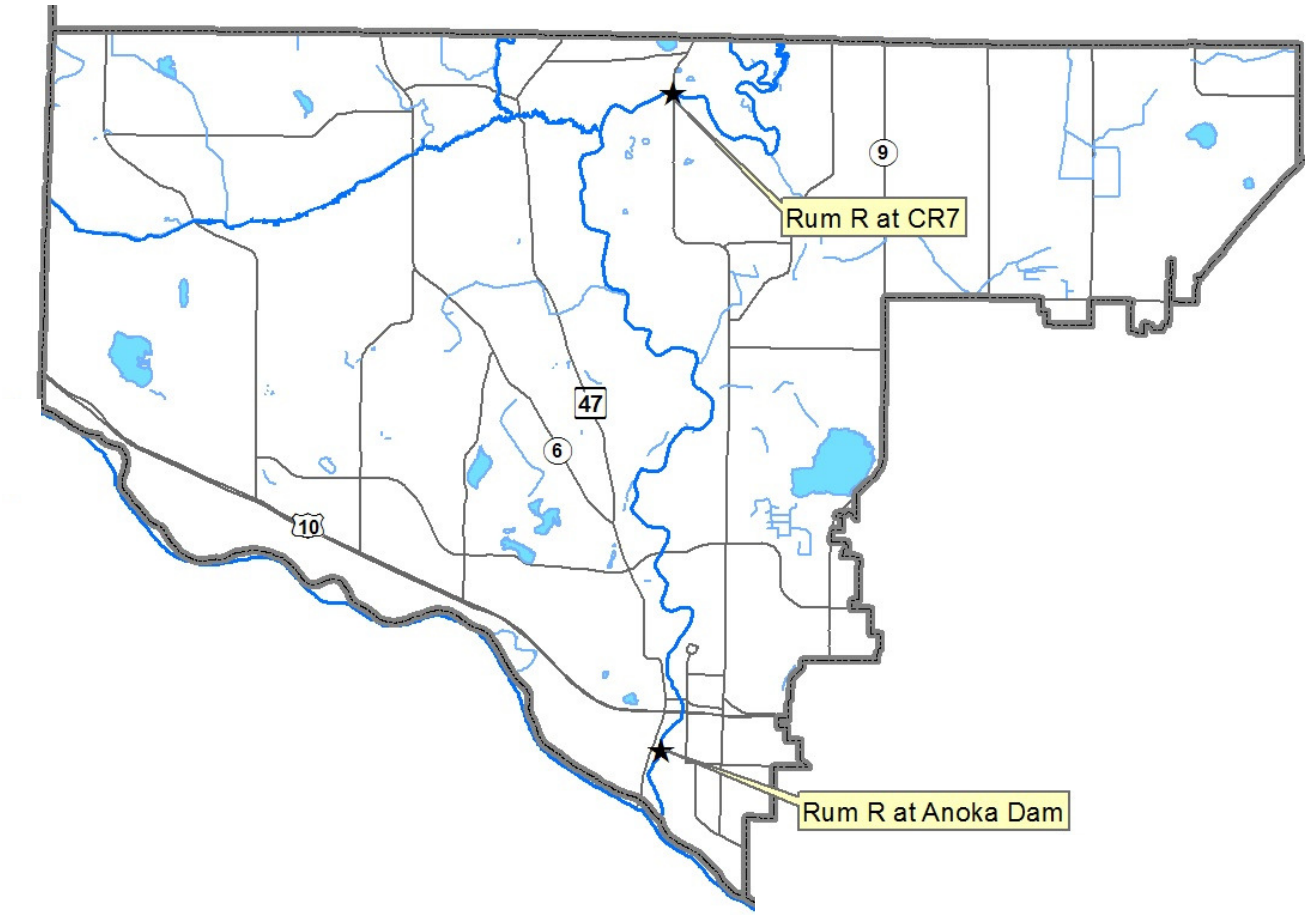
Purpose: To provide an assessment of water quality to be used in the completion of the Rum River Watershed Restoration and Protection Plan (WRAPP).

Locations: Rum River at County Road 7

Rum River at Anoka Dam

Results: Results are presented on the following pages.

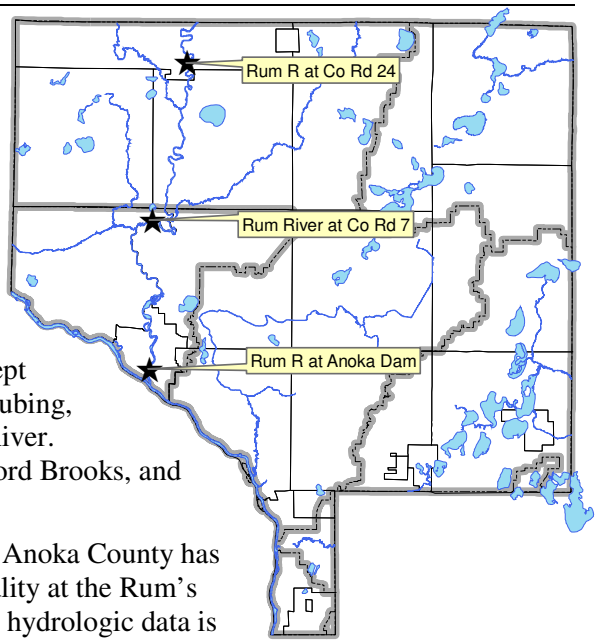
2016 Lower Rum River Monitoring Sites



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

*Located in and contracted by the URRWMO, but reported with all Rum River data for a more complete analysis of the river.



Years Monitored

At Co. Rd. 24 – 2004, 2009, 2010, 2011, 2014, 2015, 2016

At Co. Rd. 7 – 2004, 2009, 2010, 2011, 2014, 2015, 2016

At Anoka Dam – 1996-2011(MC WOMP), 2015, 2016

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 occurred only in more recent years. 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- 2011 and 2014-2016 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 2016 the river was monitored during both storm and baseflow conditions by grab samples. At the two downstream locations, eight water quality samples were taken; half during baseflow and half following storms. At the upstream site, only four samples were taken due to lower funding levels. 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 and total suspended solids. During every sampling event, 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 2016. 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.

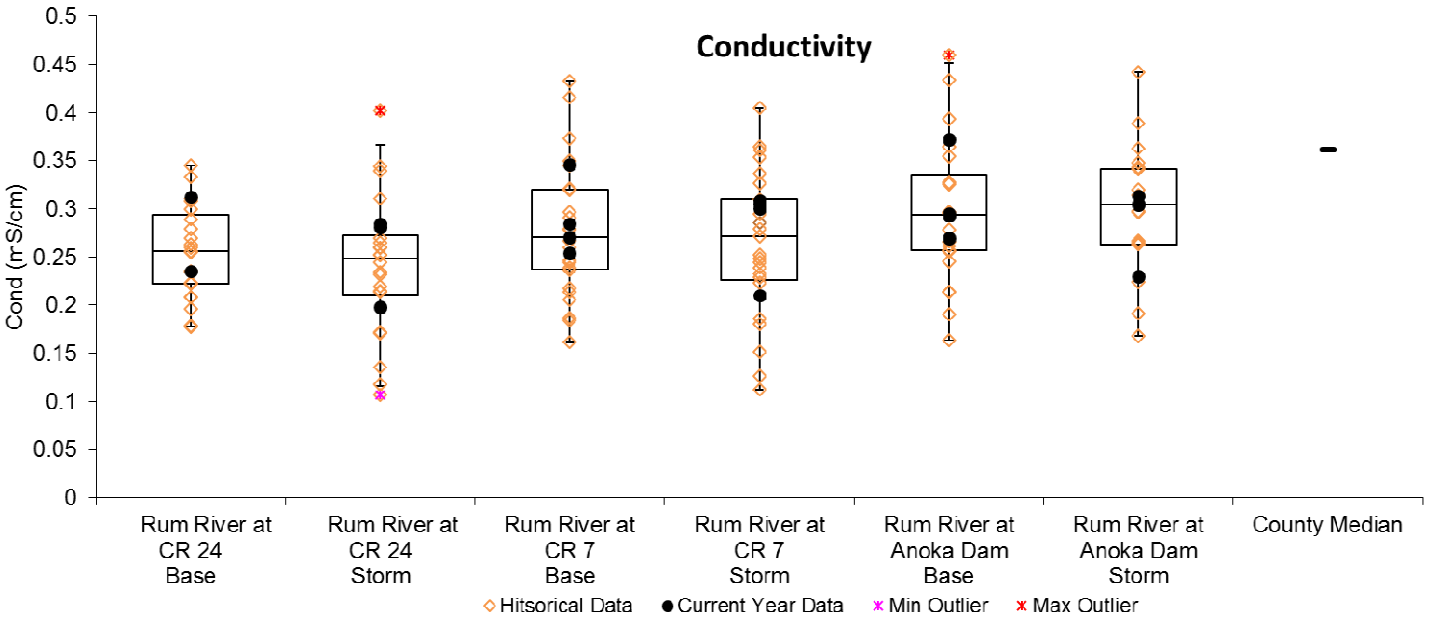
Results and Discussion

On the following pages data are presented and discussed for each parameter. Management recommendations will be included at the conclusion of this report. 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 road runoff and industrial chemicals, among many others. Metals, hydrocarbons, road salts, and others are often of concern in a suburban environment. Conductivity is the broadest measure of dissolved pollutants we used. It measures electrical conductivity of the water; pure water with no dissolved constituents has zero conductivity. Chlorides are the measure of chloride salts, the most common of which are road de-icing chemicals. Chlorides can also be present in other pollutant types, such as wastewater. 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 2016 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 2016 (all conditions) was 0.281 mS/cm, 0.293 and 0.300 mS/cm, respectively. All three sites are lower than the median for 34 Anoka County streams of 0.362 mS/cm. The 2016 maximum observed conductivity in the Rum River was 0.37 mS/cm which is the close to the median for all other Anoka County streams, and levels in general were far lower than in 2015.

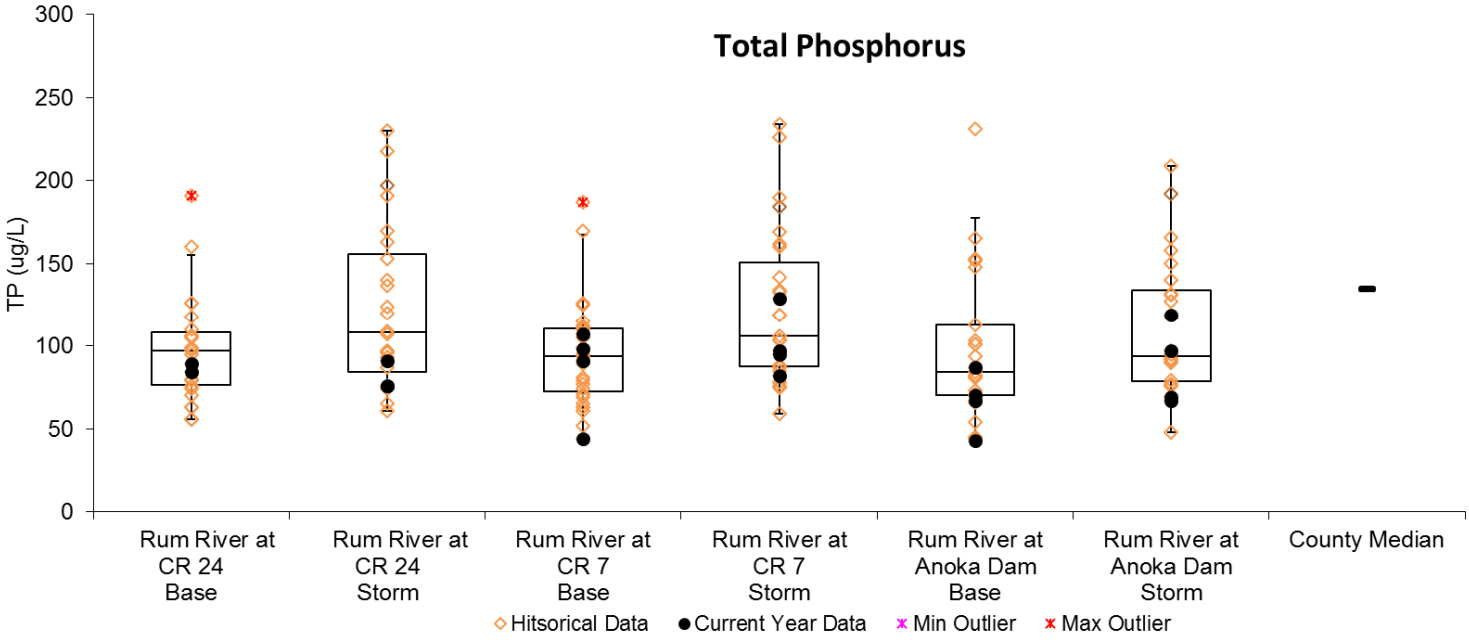
Conductivity was lowest at most sites during storms, suggesting that stormwater runoff contains fewer dissolved pollutants than the surficial water table that feeds the river during baseflow. High baseflow conductivity has been observed in most other nearby streams as well. This occurrence has been studied 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 lower than the median for all other monitored 34 Anoka County streams (see figure below). 2016 readings averaged lower than 2015 results, which had a marked decrease from 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 2016 at the three monitored sites (all conditions) was 84, 96 and 87 ug/L. These upstream-to-downstream differences are negligible and there is no trend of increasing phosphorus downstream. All sites in 2016 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 132. In all, phosphorus in the Rum River is below the state standard of 100 ug/L, but should continue to be an area of pollution control effort as the area continues to be developed.

Total phosphorus during baseflow and storm conditions Orange diamonds are historical data from previous years and black circles are 2016 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 the refraction of a light beam passed through a water sample. It is most sensitive to large particles. Total suspended solids is 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 2016, suspended solids in the Rum River were acceptably low.

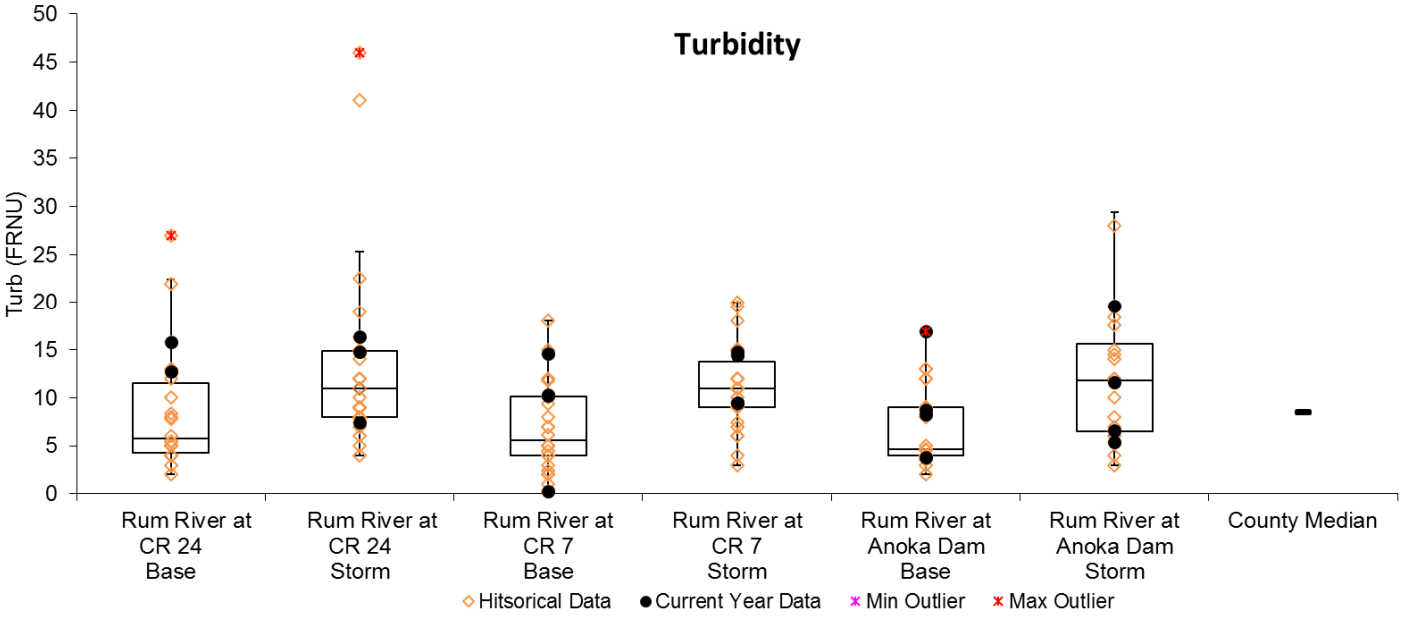
It is important to note the suspended solids can come from sources within and outside of the river channel. Sources on land include soil erosion, road sanding, and others. Riverbank erosion and movement of the river bottom also contributes to suspended solids. A moderate amount of this "bed load" is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

In the Rum River, turbidity was low with increases during storms and a slight decrease at downstream monitoring sites (see figure below). The median turbidity, in 2016 (all conditions) was 14.8, 10.3 and 8.5 NTU (upstream to downstream), which is somewhat higher than the median for Anoka County streams of 8.5 NTU. Turbidity was elevated on a few occasions, especially during storms. In 2016 the maximum observed was 19.6 NTU during a mid-season monitoring event.

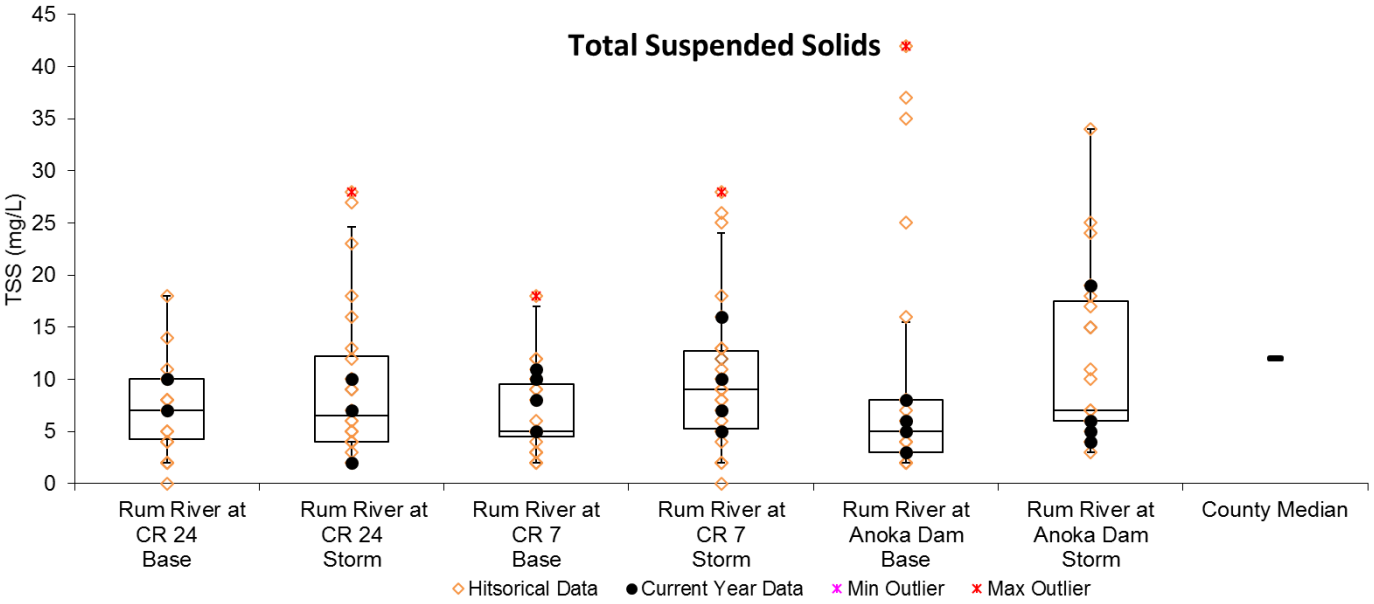
TSS in 2016 was similar to 2015 results. The median TSS, in 2016 (all conditions) was 7, 9 and 5.5 (upstream to downstream). These are all lower than the Anoka County stream median for TSS of 12.

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

Turbidity during baseflow and storm conditions Orange diamonds are historical data from previous years and black circles are 2016 readings Box plots show the median (middle line), 25th and 75th percentile (ends of box), and 10th and 90th percentiles (floating outer lines).



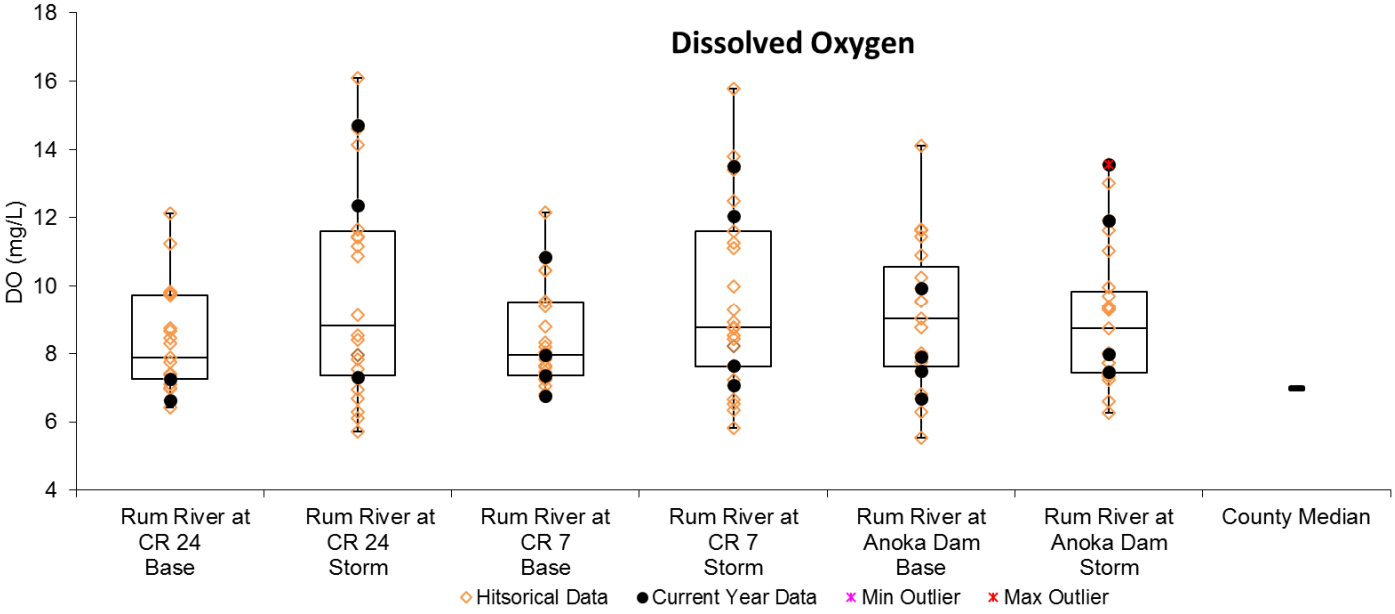
Total suspended solids during baseflow and storm conditions Orange diamonds are historical data from previous years and black circles are 2016 readings Box plots show the median (middle line), 25th and 75th percentile (ends of box), and 10th and 90th percentiles (floating outer lines).



Dissolved Oxygen

Dissolved oxygen is necessary for aquatic life, including fish. Organic pollution causes oxygen to be consumed when it decomposes. If oxygen levels fall below the state water quality standard of 5 mg/L, aquatic life begins to suffer. A stream is considered impaired if 10% of observations are below this level in the last 10 years. Dissolved oxygen levels are typically lowest in the early morning because of decomposition consuming oxygen at night without offsetting oxygen production by photosynthesis. In the Rum River, dissolved oxygen was always above 5 mg/L at all monitoring sites, with 6.62 mg/L being the lowest level recorded in 2016.

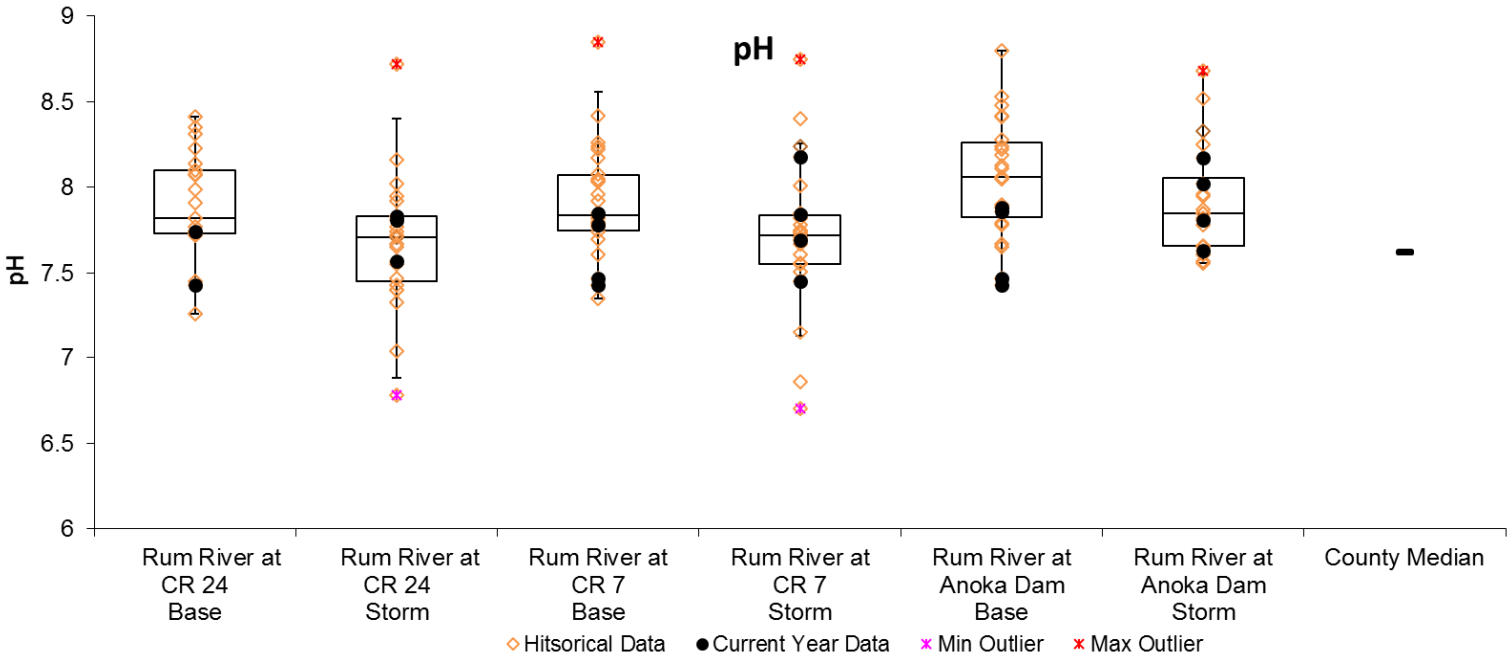
Dissolved oxygen during baseflow and storm conditions Orange diamonds are historical data from previous years and black circles are 2016 readings Box plots show the median (middle line), 25th and 75th percentile (ends of box), and 10th and 90th percentiles (floating outer lines).



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 and easily remained so in 2016 (see figure below).

pH during baseflow and storm conditions Orange diamonds are historical data from previous years and black circles are 2016 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 good. It does show a slight increase in conductivity downstream. Phosphorus levels are near, but slightly below, state water quality standards. 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 this continued development has the potential to degrade water quality unless carefully planned and managed with the river in mind. Development pressure is likely to be especially high near the river because of its scenic and natural qualities.

Stream Water Quality – Biological Monitoring

Description: This program combines environmental education and stream monitoring. Under the supervision of the 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 generally 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.

Location: Rum River behind Anoka High School, south side of Bunker Lake Blvd, Anoka

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, because 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

behind Anoka High School, Anoka
STORET SiteID = S003-189

Last Monitored

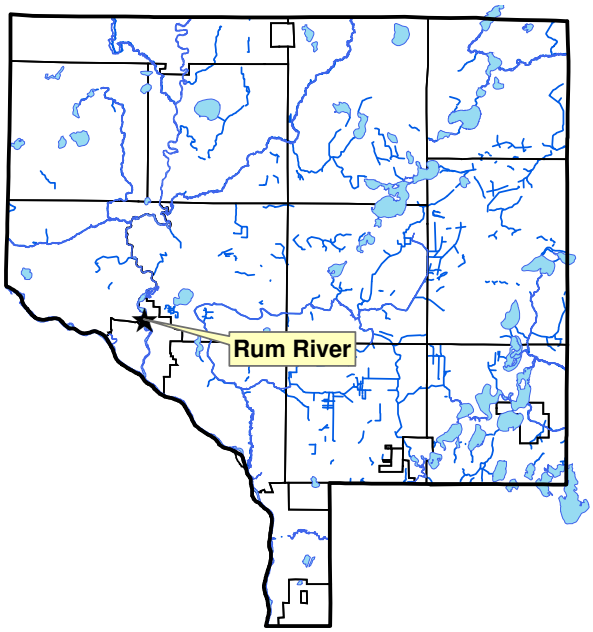
By Anoka High School in 2016

Monitored Since

2001

Student Involvement

About 150 students in 2016, over 1,000 total since 2001



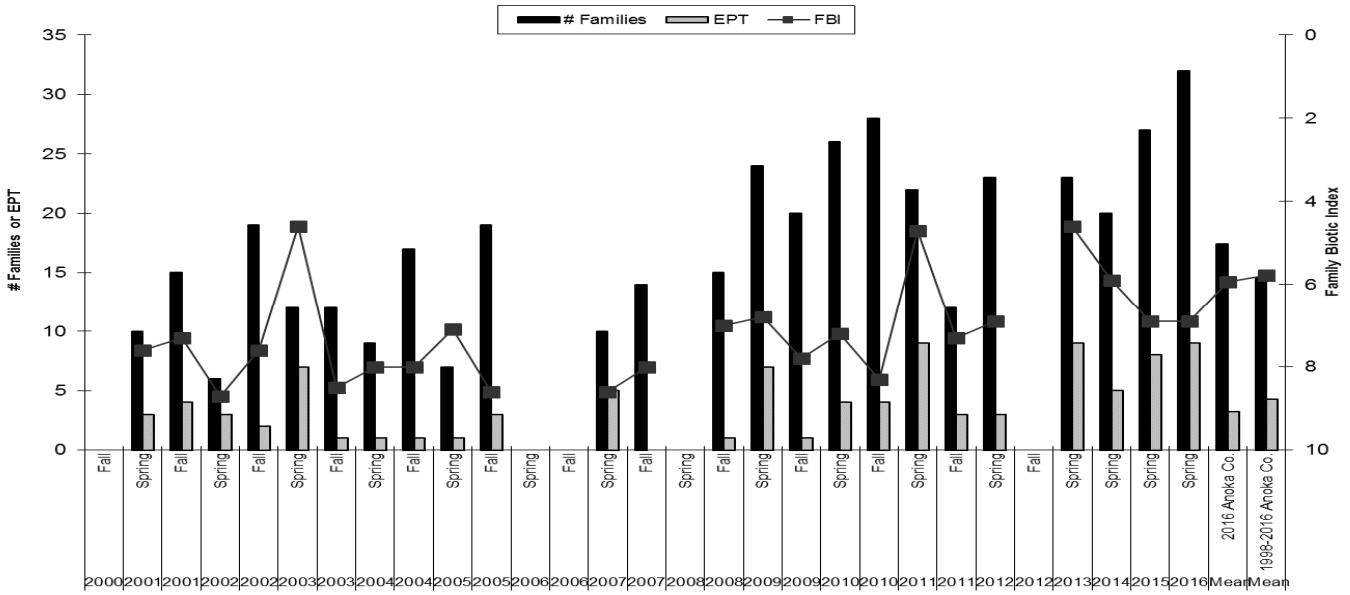
Background

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. In Anoka County the river has both rocky riffles (northern part of county) as well as pools and runs with sandy bottoms. The river's condition is generally regarded as excellent. Most of the Rum River in Anoka County has a state "scenic and recreational" designation. The sampling site is near the Bunker Lake Boulevard bridge behind Anoka High School. Most sampling has been conducted in a backwater rather than the main channel.

Results

Anoka High school classes monitored the Rum River in spring of 2016 with Anoka Conservation District (ACD) oversight. The results for spring 2016 were better than previous years. More families, 32 in total, were found here than in any other Anoka County stream. This was also the highest family total ever collected at this site. The number of sensitive EPT families (9) ties the most ever at this site, and the FBI score (6.9) was the best in Anoka County.

Summarized Biomonitoring Results for Rum River behind Anoka High School



Biomonitoring Data for the Rum River behind Anoka High School

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

Year	2011	2011	2012	2013	2014	2015	2016	Mean	Mean
Season	Spring	Fall	Spring	Spring	Spring	Spring	Spring	2016 Anoka Co.	1998-2016 Anoka Co.
FBI	4.70	7.30	6.90	4.60	5.90	6.90	6.90	5.9	5.8
# Families	22	12	23	23	20	27	32	17.4	14.6
EPT	9	3	3	9	5	8	9	3.2	4.3
Date	10-Jun	5-Oct	8-May	14-May	20-May	11-May	17-May		
sampling by	ACD	ACD	AHS	AHS	AHS	AHS	AHS		
sampling method	MH	MH	MH	MH	MH	MH	MH		
Mean # individuals	604	188	502	357	350	767	3363		
# replicates	1	1	2	4	4	2	1		
Dominant Family	baetidae	hyalellidae	silphonuridae	Perlodidae	Siphlonuridae	Siphlonuridae	Siphlonuridae		
% Dominant Family	57.5	63.3	37.8	42.1	33.4	69.3	74.9		
% Ephemeroptera	59.3	11.2	44.9	19.4	57.8	78.9	78.7		
% Trichoptera	1	0	1.2	0.2	0.1	1.4	0		
% Plecoptera	3.8	0.5	0	42.6	0.5	0	0.4		

Supplemental Stream Chemistry Readings

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

Parameter	5/18/2010	10/7/2010	6/10/2011	10/5/2011	5/8/2012	5/13/2013	5/20/2014
pH	7.24	7.22	7.84	7.98	8.10	7.69	8
Conductivity (mS/cm)	0.207	0.399	0.296	0.296	0.205	0.181	0.237
Turbidity (NTU)	7	7	18	10	7	5	14.2
Dissolved Oxygen (mg/L)	6.93	na	6.85	7.91	7.87	10.00	13.05
Salinity (%)	0	0.01	0.01	0.01	0.00	0.00	0.11
Temperature (°C)	14.8	12.2	20.7	15.3	15.7	13.0	13.5

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.

Historically, biomonitoring near Anoka was conducted mostly in a backwater area that during periods of low water level has a mucky bottom and does not receive good flow. During those conditions the area was unlikely to be occupied by families which are pollution intolerant. Recent monitoring has included sampling the main channel during an extremely low water level condition, followed by multiple years of very high water levels. The main channel and higher water levels offer opportunities for a more diverse habitat. These changes in sampling likely explain the apparent improvement in the invertebrate community in recent years.

Wetland Hydrology

Description: Continuous groundwater level monitoring at a wetland boundary. Countywide, the ACD maintains a network of 23 wetland hydrology monitoring stations.

Purpose: To provide understanding of wetland hydrology, including the impacts 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.

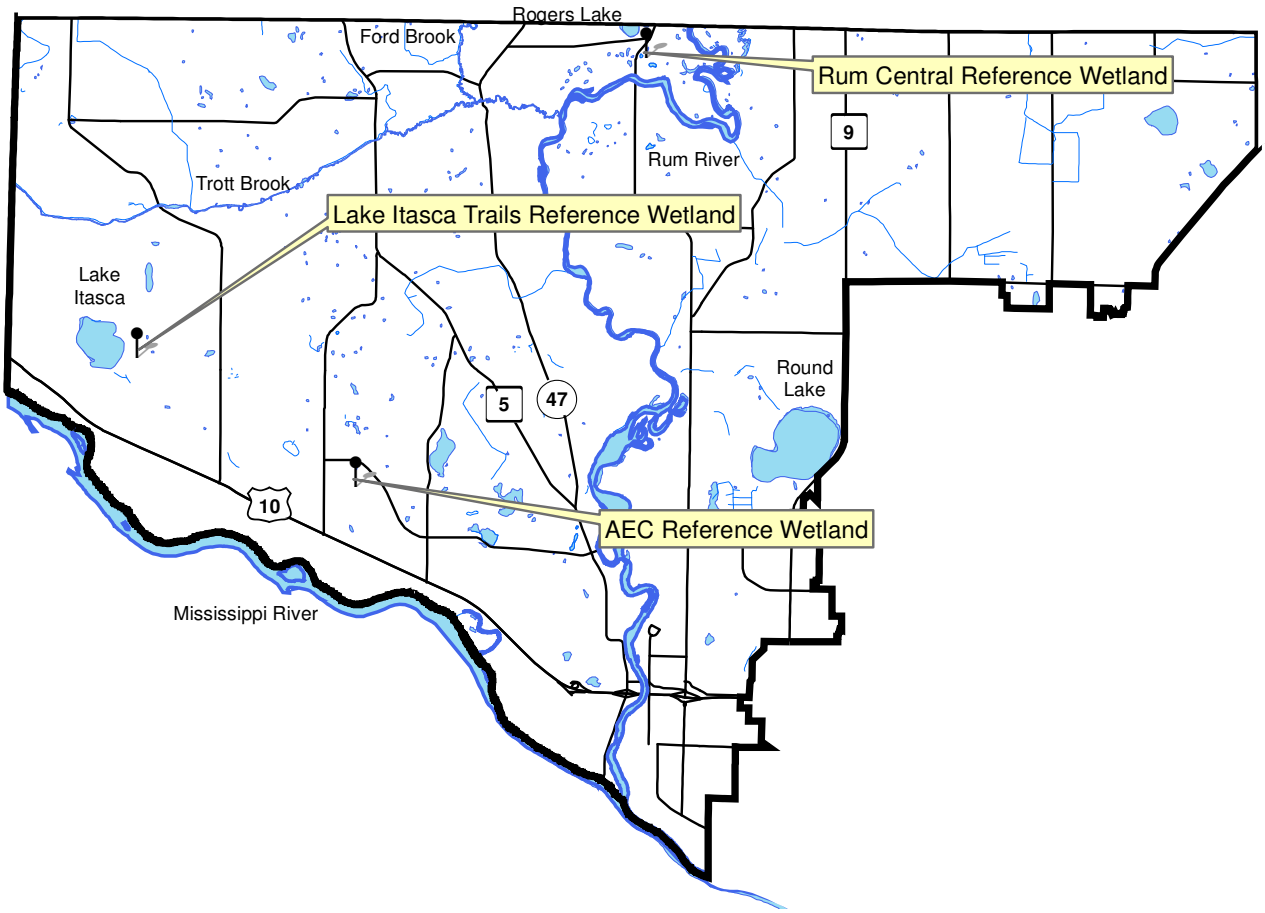
Locations: AEC Reference Wetland, Connexus Energy Property on Bunker Lake Blvd, Ramsey

Rum River Central Reference Wetland, Rum River Central Park, Ramsey

Lake Itasca Trail Reference Wetland, Lake Itasca Park, Ramsey

Results: See the following pages.

Lower Rum River Watershed Wetland Hydrology Monitoring Sites

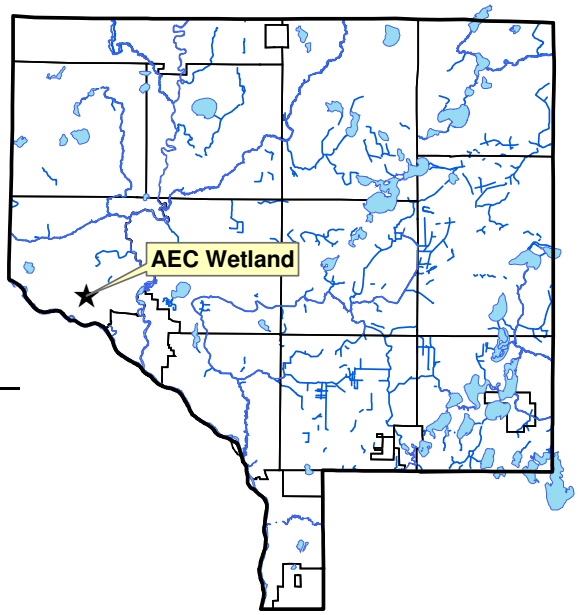


Wetland Hydrology Monitoring

AEC REFERENCE WETLAND

Cottonwood Park, adjacent to Connexus Energy Offices (formerly Anoka Electric Coop), Ramsey

Site Information



Monitored Since: 1999

Wetland Type: 3

Wetland Size: ~18 acres

Isolated Basin? No, probably receives storm water

Connected to a Ditch? No

Soils at Well Location:

Horizon	Depth	Color	Texture	Redox
A	0-15	10yr2/1	Sandy Loam	-
Bw	15-40	10yr3/2	Gravelly Sandy loam	-

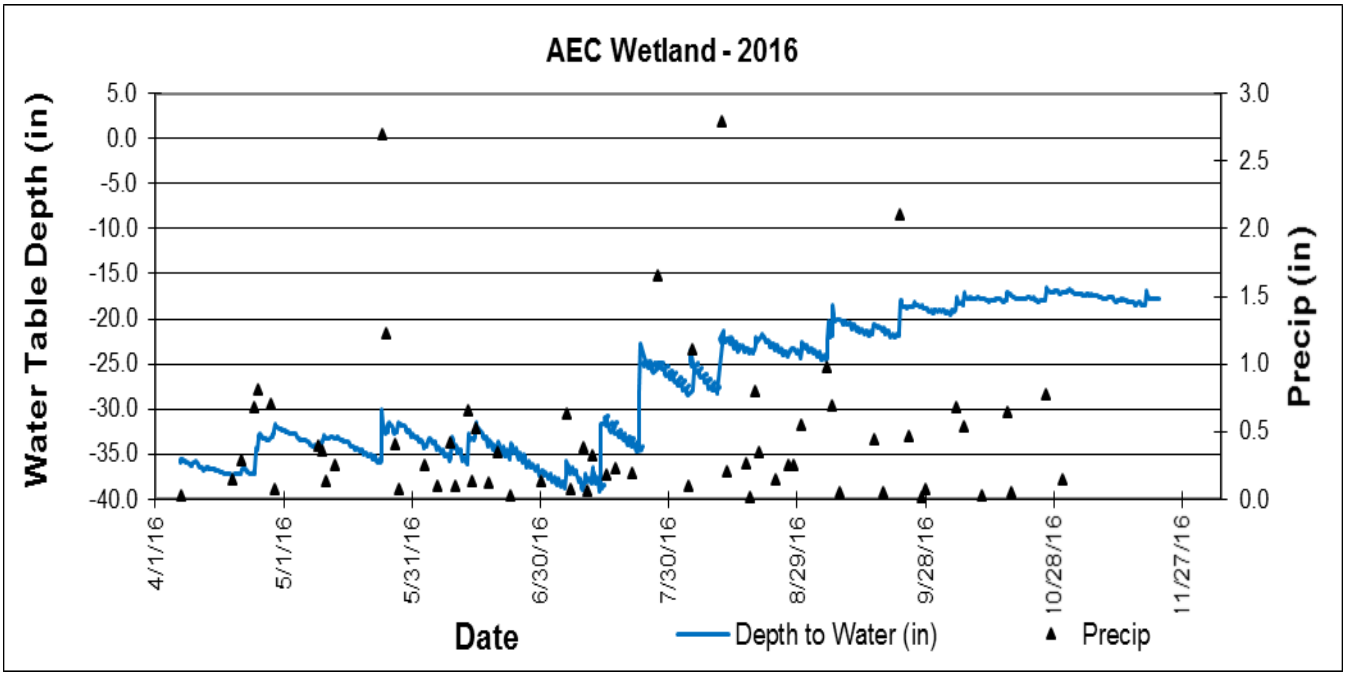
Surrounding Soils: Hubbard coarse sand

Vegetation at Well Location:

Scientific	Common	% Coverage
Populus tremuloides	Quaking Aspen	30
Salix bebbiana	Bebb Willow	30
Carex Spp	Sedge undiff.	30
Solidago canadensis	Canada Goldenrod	20

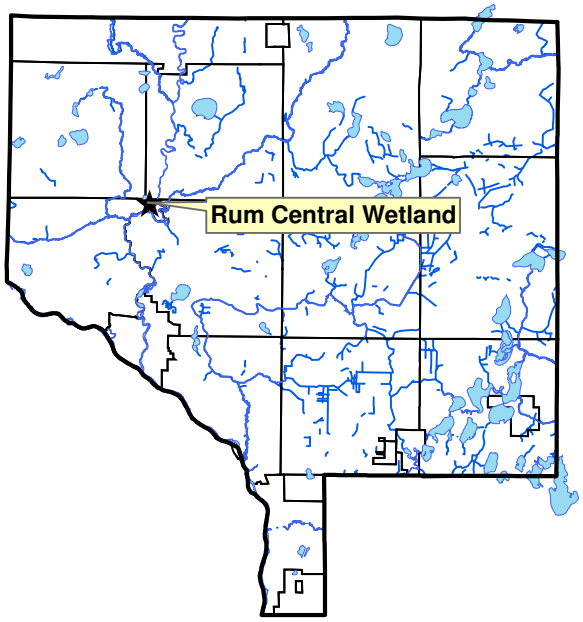
Other Notes: Well is located at the wetland boundary.

2016 Hydrograph



RUM RIVER CENTRAL REFERENCE WETLAND

Rum River Central Regional Park, Ramsey



Site Information

Monitored Since: 1997

Wetland Type: 6

Wetland Size: ~0.8 acres

Isolated Basin? Yes

Connected to a Ditch? No

Soils at Well Location:

Horizon	Depth	Color	Texture	Redox
A	0-12	10yr2/1	Sandy Loam	-
Bg1	12-26	10ry5/6	Sandy Loam	-
Bg2	26-40	10yr5/2	Loamy Sand	-

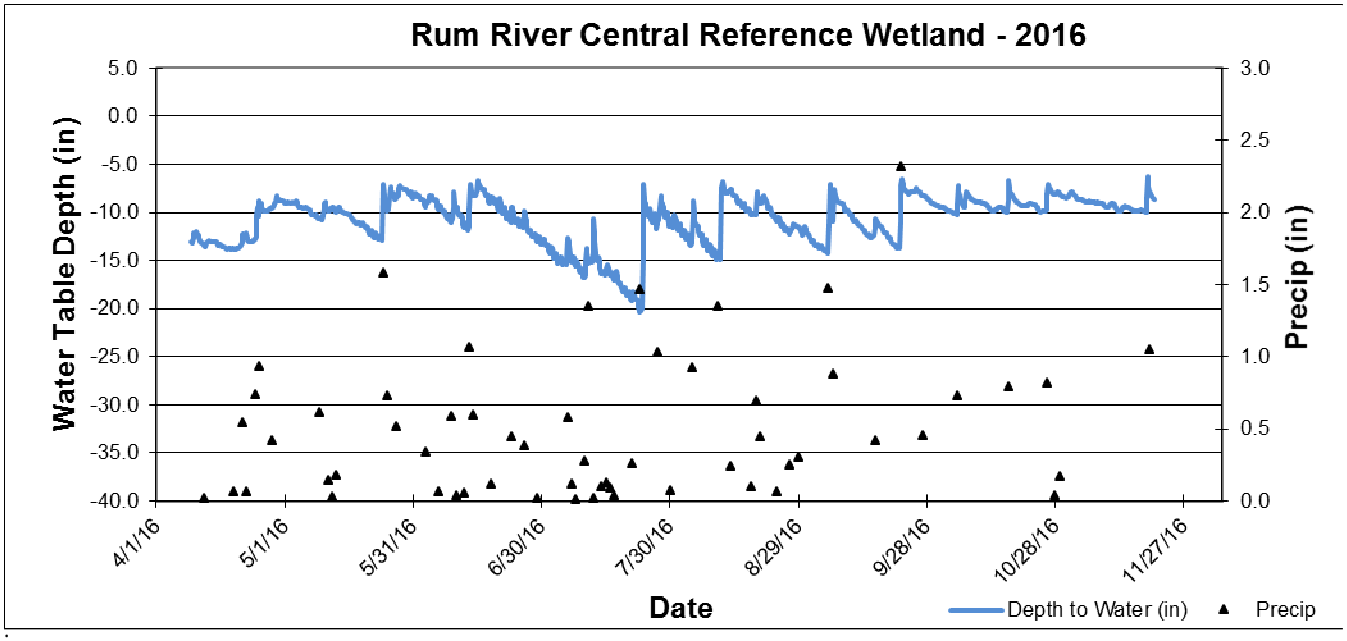
Surrounding Soils: Zimmerman fine sand

Vegetation at Well Location:

Scientific	Common	% Coverage
Phalaris arundinacea	Reed Canary Grass	40
Corylus americanum	American Hazelnut	40
Onoclea sensibilis	Sensitive Fern	30
Rubus strigosus	Raspberry	30
Quercus rubra	Red Oak	20

Other Notes: Well is located at the wetland boundary.

2016 Hydrograph

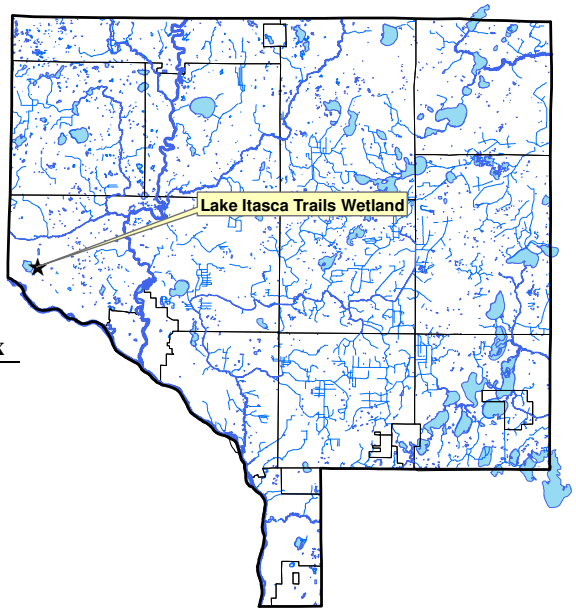


Wetland Hydrology Monitoring

LAKE ITASCA TRAILS REFERENCE WETLAND

Lake Itasca Trails Park, Ramsey

Site Information



Monitored Since: 2013

Wetland Type: 2/6

Wetland Size: ~10 acres

Isolated Basin? Yes

Connected to a Ditch? No

Soils at Well Location:

Horizon	Depth	Color	Texture	Redox
A1	0-12	10yr2/0	Mucky sand	-
A2	12-20	10ry2/1	Sand	-
B1	20-36	10yr4/1	Sand and fine gravel	-
B2	36-48	10yr6/1	Sand and fine gravel	-

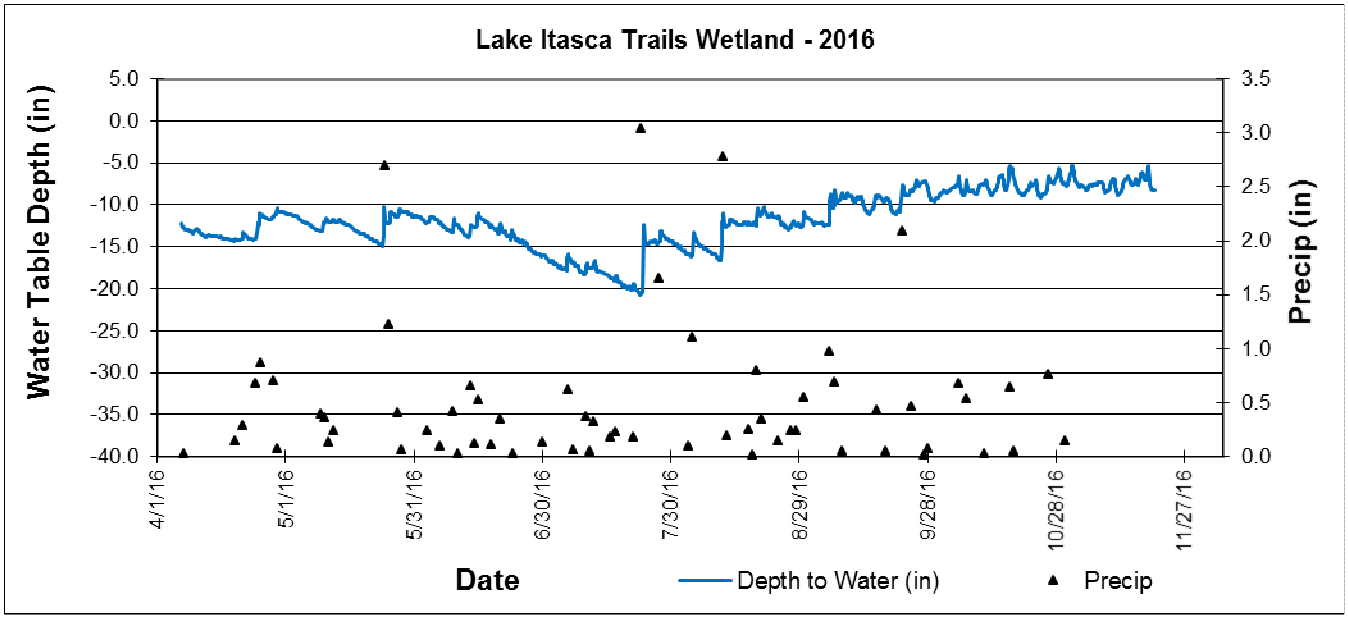
Surrounding Soils: Hubbard coarse sand

Vegetation at Well Location:

Scientific	Common	% Coverage
Carex stricta	Hummock Sedge	80
Phalaris arundinacea	Reed Canary Grass	20
Salix sp.	Willow	20
Rubus sp.	Bristle-berry	5

Other Notes: Well is located about 10 feet east and about 6 inches downslope of the wetland boundary. DNR Public Water Wetland 2-339.

2016 Hydrograph



Water Quality Grant Fund

Description: The LRRWMO provides cost share for projects on either public or private property that will improve water quality, such as repairing streambank erosion, restoring native shoreline vegetation, or rain gardens. This funding is administered by the Anoka Conservation District, which works with landowners on conservation projects. Projects affecting the Rum River are given the highest priority because it is viewed as an especially valuable resource.

Purpose: To improve water quality in lakes, streams and rivers by correcting erosion problems and providing buffers or other structures that filter runoff before it reaches the water bodies.

Results: Projects reported in the year they are installed. One riverbank stabilization project was installed in 2016 with LRRWMO cost share.

LRRWMO Cost Share Fund Summary

2006 LRRWMO Contribution	+	$1,000.00
2008 Expense – Herrala Rum Riverbank stabilization	-	$ 150.91
2008 Expense – Rusin Rum Riverbank stabilization	-	$ 225.46
2009 LRRWMO Contribution	+	$1,000.00
2009 Expense – Rusin Rum Riverbank bluff stabilization	-	$ 52.05
2010 LRRWMO Contribution	+	$ 0
2010 LRRWMO Expenses	-	$ 0
2011 LRRWMO Contribution	+	$ 0
2011 Expense - Blackburn Rum riverbank	-	$ 543.46
2012 LRRWMO Contribution	+	$1,000.00
2012 Expense – Smith Rum Riverbank	-	$1,596.92
2013 LRRWMO Contribution	+	$1,000.00
2013 Expense – Geldacker Mississippi Riverbank	-	$1,431.20
2014 LRRWMO Contribution	+	$2,050.00
2015 LRRWMO Contribution	+	$1,000.00
2015 Expense – Smith Rum Riverbank	-	$ 533.65
2016 Expense – Brauer Rum Riverbank	-	$ 1,150.00
Fund Balance		**$1,366.35**

2016 funded project – Brauer Rum Riverbank, City of Ramsey
Approximately 90 feet of undercut, eroding riverbank was stabilized using a cedar tree revetment.
This project was funded with direct landowner contributions, LRRWMO cost share dollars, as well as a Conservation Corps of MN crew labor grant. Installation was done by the Minnesota Conservation Corps with oversight from the Anoka Conservation District in the fall of 2016.

MISSISSIPPI RIVER BANK STABILIZATION

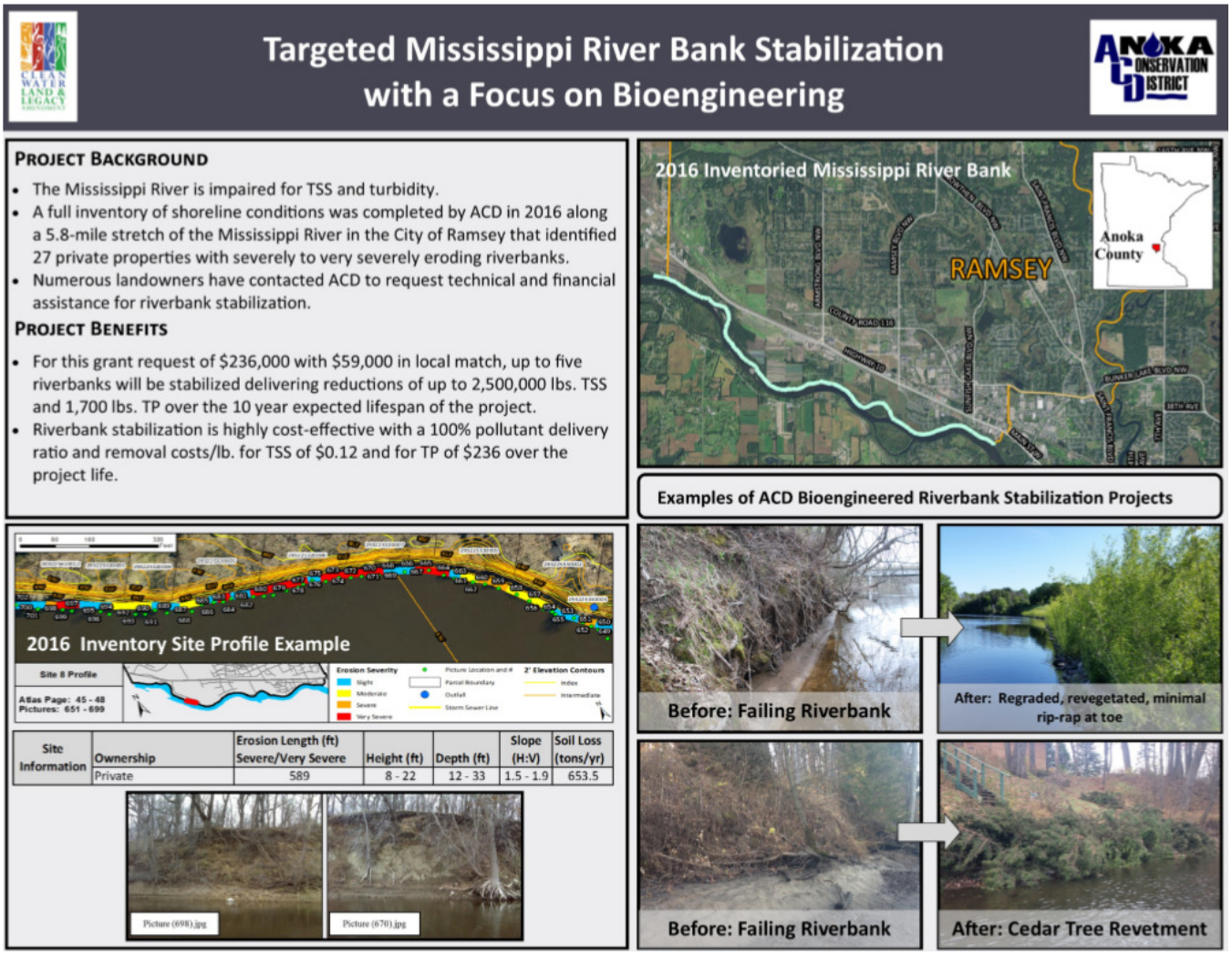
Description: The City of Ramsey contracted the Anoka Conservation District to complete an inventory of riverbank condition along the 5.8 miles of city that border the Mississippi River in 2015. This inventory led to a grant application and acquisition of $236k from BWSR's Clean Water Fund in 2016. This money, along with a 25% match from individual property owners, will be utilized to implement $295k worth of bio-engineered bank stabilization projects along 500 feet of Mississippi River bank.

Location: City of Ramsey

Purpose: To use a bioengineering approach to stabilize previously identified high-priority areas of severe erosion along the Mississippi River within the City of Ramsey

Results: The inventory led to the successful acquisition of $236k in state grant funding for the ACD to complete bio-engineered bank stabilization projects along the Mississippi River bank in Ramsey. The original inventory report is available from the ACD.

Grant Application Image



Rum River Stabilizations

Description: Six riverbank stabilization projects were installed on the Rum River in 2016. At these sites, cedar tree revetments and willow stakes were used to stabilize eroding banks. The projects were installed in partnership with the Conservation Corps Minnesota (CCM). Funding for four of the projects was received from the Lessard-Sams Outdoor Heritage Council, a Clean Water Fund CCM crew labor grant and landowner contribution. Funding for one project was provided by Lower Rum River WMO cost-share, a Clean Water Fund CCM crew labor grant and landowner contribution. Funding for the final project came from the Anoka County Parks Department.

Location: Rum River Central Regional Park, three residential properties in Ramsey and two residential properties in Andover.

Purpose: To stabilize areas of riverbank with mild to moderate erosion, in order to reduce sediment loading in the Rum River, as well as to reduce the likelihood of a much larger and more expensive corrective project in the future.

Results: Stabilized 1,316 linear feet of riverbank on the Rum River.

Anoka and Ramsey Stormwater Retrofit Analyses

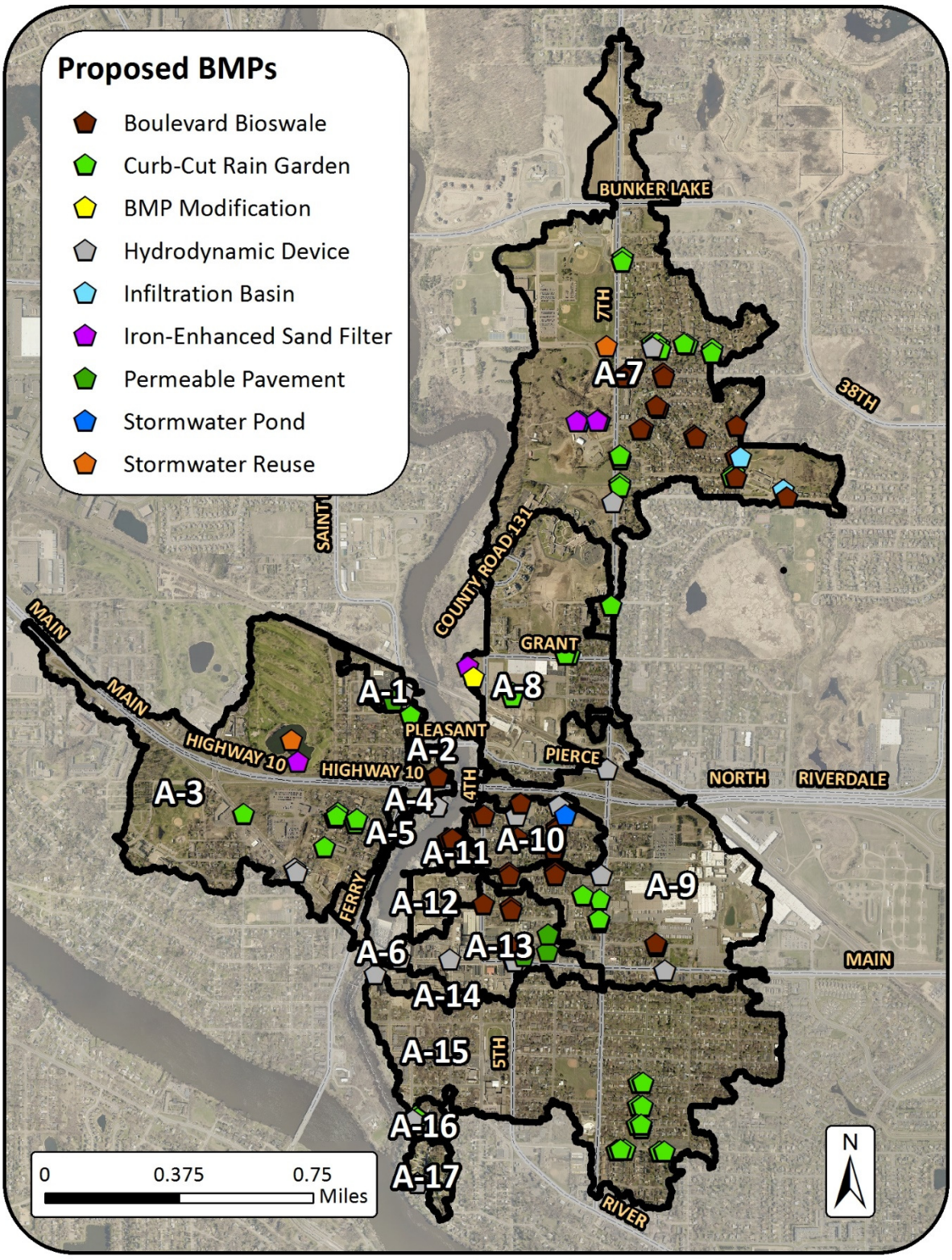
Description: Identified new stormwater treatment opportunities in older, built-out neighborhoods identified by the cities and ranked projects by cost effectiveness (amount of pollutant kept out of area rivers per dollar spent). Water quality benefits associated with the installation of each identified project were individually modeled using the Source Loading and Management Model for Windows (WinSLAMM). WinSLAMM estimates volume and pollutant loading based on acreage, land use, and soils information. The costs associated with project design, administration, promotion, land acquisition, opportunity costs, construction oversight, installation, and maintenance were estimated. The total costs over the assumed effective life of each project were then divided by the modeled benefits over the same time period to enable ranking by cost-effectiveness. It is recommended that projects be installed in order of cost effectiveness (pounds of pollution reduced per dollar spent). Other factors, including a project's educational value/visibility, construction timing, total cost, or non-target pollutant reduction also affect project installation decisions and need to be weighed by resource managers when selecting projects to pursue.

Location: Selected areas in the Cities of Ramsey and Anoka.

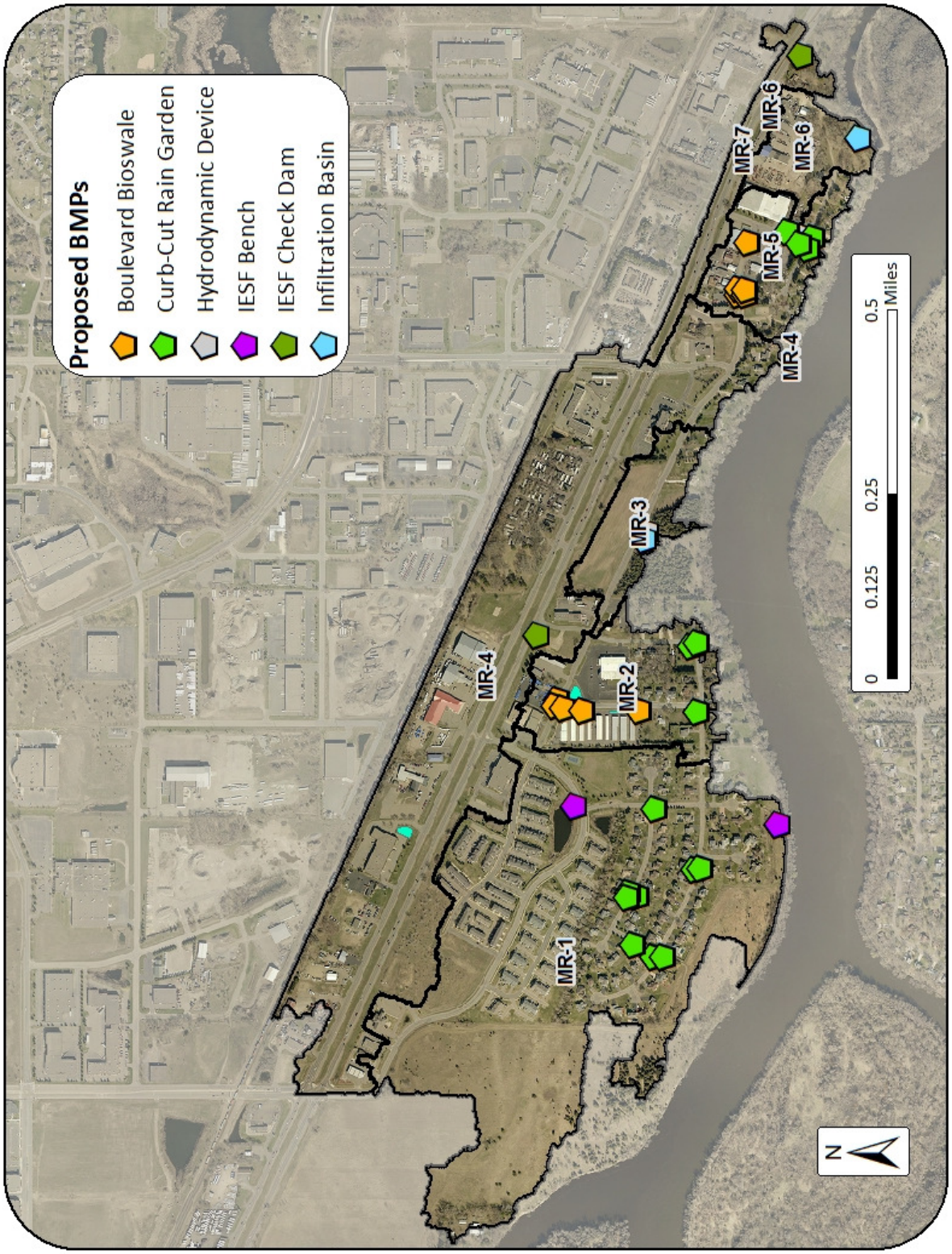
Purpose: To improve water quality in the Rum and Mississippi Rivers.

Results: Work began in 2015 and was completed in 2016. A variety of stormwater retrofit approaches were identified. They include bio-retention, hydrodynamic devices, permeable pavement, iron enhanced sand filter pond benches, existing stormwater pond modifications, new stormwater ponds, and water reuse. The studies provide sufficient detail to pursue installation funds. The LRRWMO and ACD have since partnered to secure a $50,577 Metropolitan Council grant for installations in 2017-18. Maps showing proposed BMPs are on the following pages.

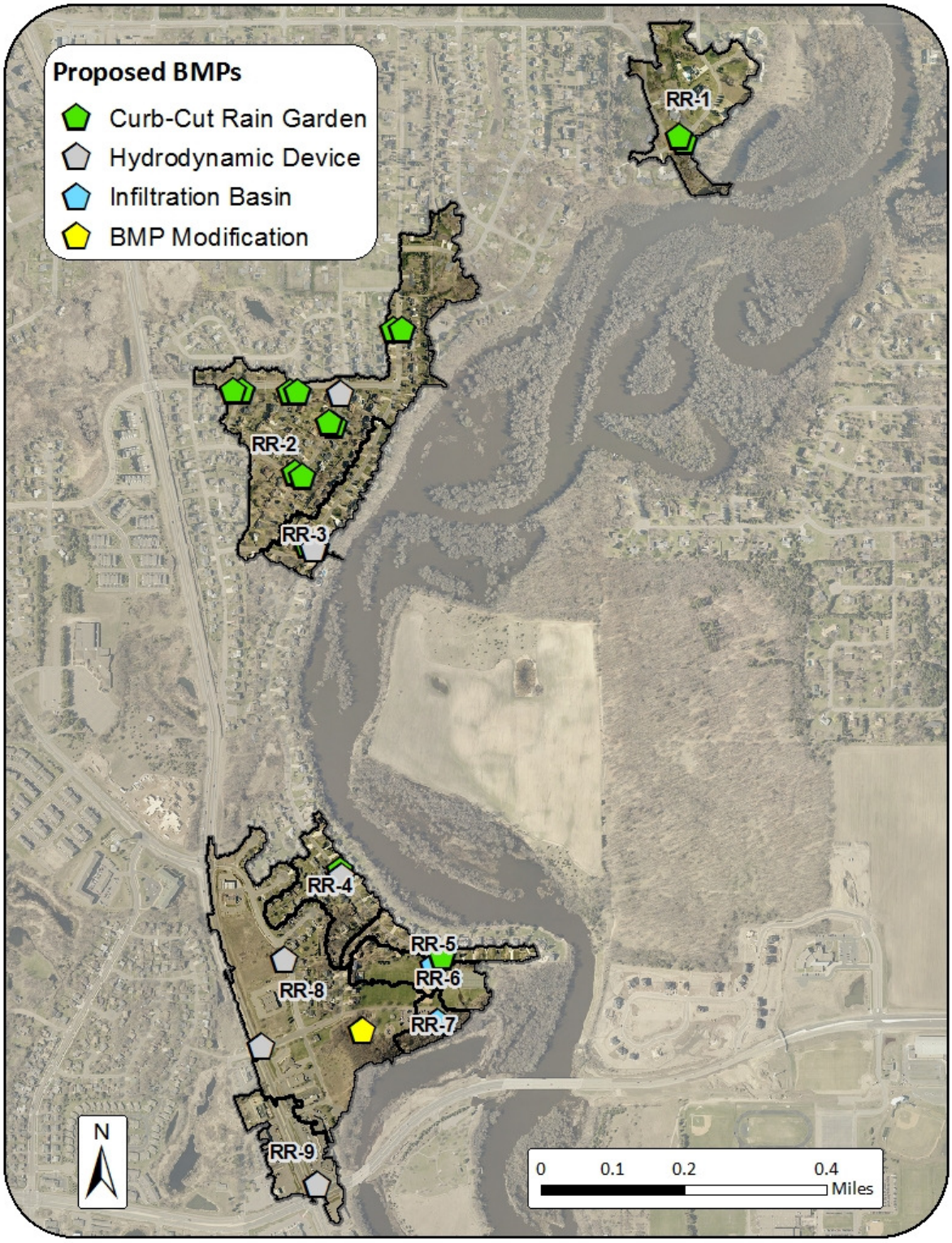
City of Anoka Proposed BMPs



City of Ramsey Proposed BMPs in Mississippi River Network



City of Ramsey Proposed BMPs in Rum River Network



Newsletters

Description: The Lower Rum River Watershed Management Organization (LRRWMO) contracted the Anoka Conservation District (ACD) to create a series of public education newsletter articles. The LRRWMO is required to publish an annual newsletter under State Rules.

Purpose: To improve public understanding of the LRRWMO, its functions, and accomplishments.

Location: Watershed-wide

Results: In 2016, the Anoka Conservation District (ACD) drafted two newsletter articles and sent them to cities for inclusion in their newsletters.

The First newsletter article announced grant funding available to landowners in the LRRWMO interested in having a revetment installed on their riverbank. The other focused on the findings of a watershed-wide study into the health of the Rum River and its watershed.

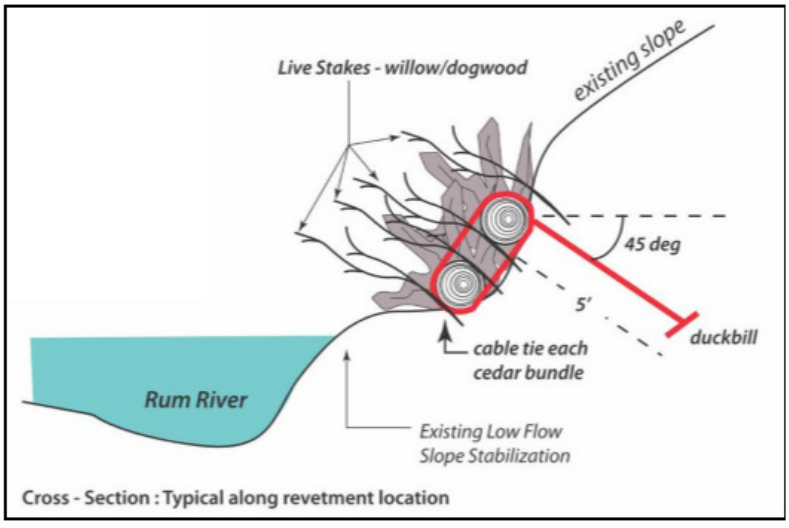
2016 Newsletter Articles

Revetments on the Rum River - Grants Available to Landowners

Landowners on the Rum River will soon have access to funding to address riverbank erosion with a unique method – cedar tree revetments. The Anoka Conservation District, with partners including the Lower Rum River Watershed Management Organization (LRRWMO), has secured a $97,000 grant from the State's Outdoor Heritage Fund which is funded by the Clean Water Land and Legacy Amendment. They plan to install 10-20 projects addressing Rum riverbank erosion, beginning in fall 2016.

CLEAN WATER LAND & LEGACY AMENDMENT

Cedar tree revetments are a low cost, but effective, means to address minor bank erosion before it gets worse. It's not appropriate for major bank erosion, such as on outside bends of the river. The technique involves cable-anchoring cut cedar trees alongside the bank. Their dense branches and naturally rot-resistant wood provide many years of bank armoring. In doing so, they protect property, help improve the river's water quality and provide fish habitat.



Cross - Section : Typical along revetment location

Residents interested in having their riverbank evaluated for a cedar tree revetment should contact Jamie Schurbon at the Anoka Conservation District (763-434-2030 ext. 12; jamie.schurbon@anokaswcd.org). Most projects cost $5,000-$10,000. Landowners must provide 10% of that amount; the remainder is grant-funded.

Rum River Watershed Gets Checkup; New Management Plan

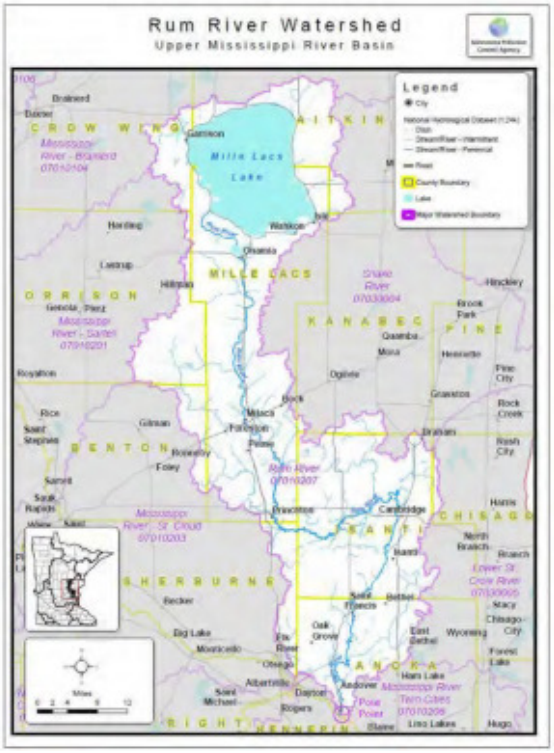
The Rum River runs from Lake Mille Lacs to Anoka. It is one of only seven State Scenic and Recreational Waterways, and part of the State's water trails system. Soil and water conservation districts and watershed organizations recently joined with the Minnesota Pollution Control Agency (MPCA) to test the health of the river and the surrounding watershed. They are developing a new management plan for the river, streams and lakes.

The results of a recent water quality check-up was mixed with some areas being in good shape and others not so good. Within Anoka County, Rogers Lake (partially in Ramsey, Oak Grove and Nowthen) had excessive nutrients that cause algae blooms. Trott Brook (City of Ramsey) and Crooked Brook (City of East Bethel) had too little oxygen for fish. High E.coli bacteria was found in Cedar Creek and Seeyle Brook. Mahoney Brook (City of Oak Grove) had a fish community indicative of poor conditions. There are studies underway to gather more information on these impaired waterbodies to determine the amount of nutrient reductions needed and strategies.

The Rum River and other lakes and streams are in good shape. Still, researchers noted reason for continued vigilance. For example, the Rum River in Isanti and Anoka County is approaching state standards for nutrients and Lake George in Oak Grove has a declining water quality trend, which is being further investigated.

The findings of these studies are being compiled into a new management plan for the watershed, set to be finalized in late 2016. The Lower Rum River Watershed Management Organization (LRRWMO; www.LRRWMO.org), a joint powers board formed by the Cities of Ramsey, Anoka and Andover, is representing local points of view in the development of these plans. They will also be a key player in putting the management plan into action.

The public is invited to participate in the discussion about managing these waterbodies. Throughout summer and fall 2016, draft management plans will be posted to www.AnokaSWCD.org. Residents may also contact Jamie Schurbon, Water Resource Specialist at 763-434-2030 ext. 12 or jamie.schurbon@anokaswcd.org or their representative on the LRRWMO.



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LRRWMO Website

Description: The Lower Rum River Watershed Management Organization (LRRWMO) contracted the Anoka Conservation District (ACD) to design and maintain a website about the LRRWMO and the Lower Rum River watershed. The website has been in operation since 2003.

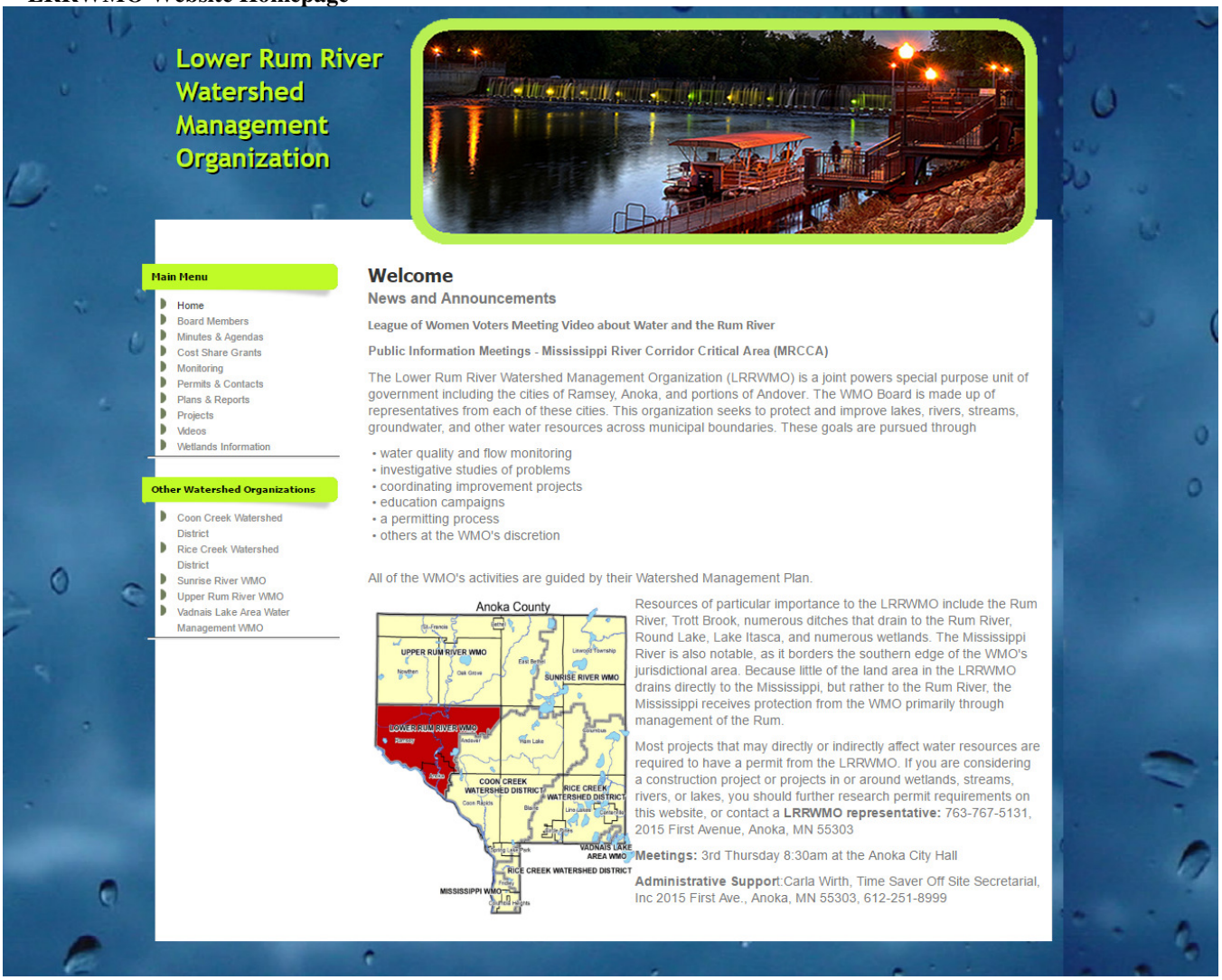
Purpose: To increase awareness of the LRRWMO and its programs. The website also provides tools and information that helps users better understand water resources issues in the area.

Location: LRRWMO.org

Results: Regular website updates occurred throughout the year. The LRRWMO website contains information about both the LRRWMO and about natural resources in the area. Information about the LRRWMO 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.

LRRWMO Website Homepage



Financial Summary

The 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.

Lower Rum River Watershed Financial Summary

Lower Rum River Watershed	WMO Asst (no charge)	Reference Wetlands	Ob Well	Lake Level	Lake WQ	Stream WQ	WOMP	Student Biomon	LRRWMO Admin	WMO Annual Rpts to State	LRRWMO Outreach/Promo	WMO Website Maint	Anoka Nat. Pres. Restoration	Revetments on the Rum	Rum River Stabilization	Rum River 1W1P	Rum River WRAPP	City of Anoka SRA	City of Ramsey SRA	City of Ramsey Riverbank Inventory	Total
Revenues																					
LRRWMO	0	1725	0	1000	3350	2450	0	825	0	850	1120	625	0	1150	0	0	0	1102	898	0	15095
State	0	0	120	0	0	0	0	0	0	0	0	0	0	8316	0	0	86431	6534	6844	0	108245
Anoka Co. General Services	390	32	117	601	121	0	214	407	0	0	518	50	4449	1325	0	98	0	58	0	836	9217
Anoka Conservation District	0	69	0	0	0	0	0	0	0	0	2034	0	0	0	0	0	0	0	0	0	2103
County Ag Preserves/Projects	0	0	0	0	0	0	0	475	0	0	0	0	0	0	7304	0	0	0	0	0	7779
Service Fees	0	0	0	0	0	0	0	0	0	0	0	0	0	1465	0	0	0	0	0	0	1465
Regional/Local	0	48	0	0	278	0	800	0	0	0	0	0	0	0	0	0	0	5656	3441	2005	12229
BWSR Cons Delivery	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BWSR Capacity Funds	0	1834	0	0	0	0	0	0	0	0	2811	0	0	560	243	576	0	0	0	0	6023
BWSR Cost Share TA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1636	0	0	0	0	0	1636
Metro ETA & AWQCP	0	0	0	0	0	0	0	0	0	0	0	0	0	4667	2689	0	0	0	0	0	7356
Local Water Planning	0	911	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	911
TOTAL	390	4619	237	1601	3749	2450	1014	1707	0	850	6483	675	4449	17484	11871	674	86431	13350	11183	2841	172059
Expenses-																					
Capital Outlay/Equip	5	24	3	19	29	11	12	19	3	5	52	5	46	718	117	8	182	164	122	33	1575
Personnel Salaries/Benefits	339	1771	206	1393	2185	801	883	1432	211	366	3865	352	3448	11766	8746	586	13535	12212	9131	2472	75701
Overhead	25	130	15	102	161	59	65	105	16	27	284	26	254	865	643	43	996	898	672	182	5568
Employee Training	2	10	1	8	12	5	5	8	1	2	22	2	19	66	49	3	76	69	51	14	426
Vehicle/Mileage	7	37	4	29	46	17	19	30	4	8	82	7	73	249	185	12	286	258	193	52	1600
Rent	12	63	7	50	78	29	32	51	8	13	138	13	123	420	313	21	484	436	326	88	2705
Program Participants	0	0	0	0	0	0	0	0	0	0	0	0	0	0	441	0	0	0	0	0	441
Program Supplies	0	2411	0	0	889	423	0	61	0	0	2040	191	486	2824	1377	0	65890	0	0	0	76591
TOTAL	390	4447	237	1601	3400	1344	1014	1707	243	421	6483	596	4449	16909	11871	674	81448	14037	10495	2841	164608

Recommendations

- **Install projects identified in the stormwater retrofitting studies for the Cities of Anoka and Ramsey.** This project has identified and ranked projects that would improve stormwater runoff before it is discharged to the Rum or Mississippi Rivers. A Metropolitan Council grant for construction has been secured for 2017-18.
- **Implement the MPCA Rum River WRAPP (Watershed Restoration and Protection Plan).** This WRAPP was an assessment of the entire Rum River watershed. It outlines regional priorities and management strategies, and attempts to coordinate them across jurisdictions.
- **Engage in the Upper Rum River WMO's watershed plan update** process. The draft 10-year Watershed Management Plan was completed in late 2016 and will undergo comment and review stages in early 2017.
- **Implement water conservation measures** throughout the watershed and promote it metro-wide. Depletion of surficial water is a concern.
- **Continue lake level monitoring, especially on Round Lake** where residents have expressed concerns with levels. Other nearby lakes should be monitored for comparison and problems.