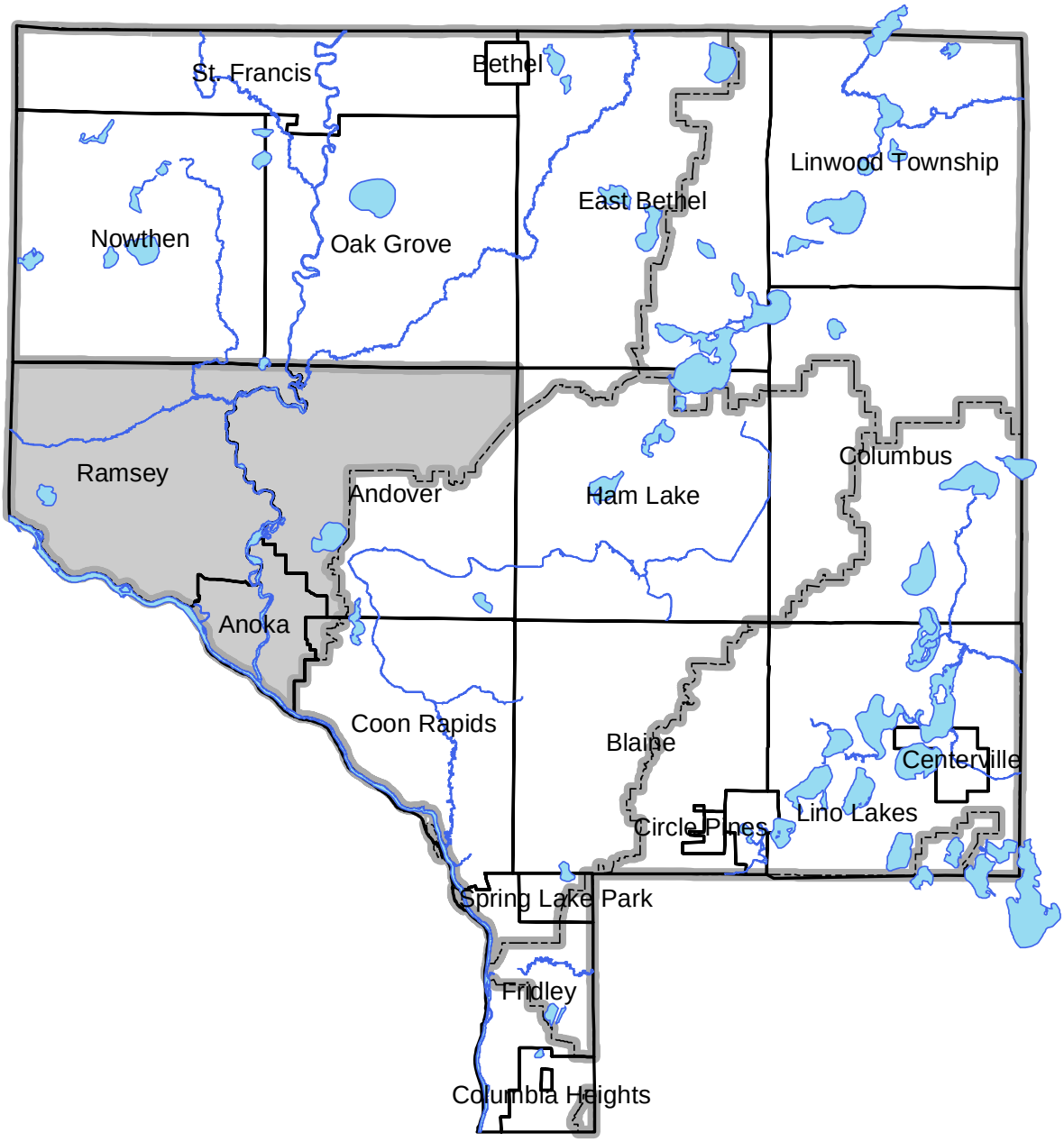
Excerpt from the
2011 Anoka Water Almanac

Chapter 4: Lower Rum River Watershed



Prepared by the Anoka Conservation District

CHAPTER 4
LOWER RUM RIVER WATERSHED

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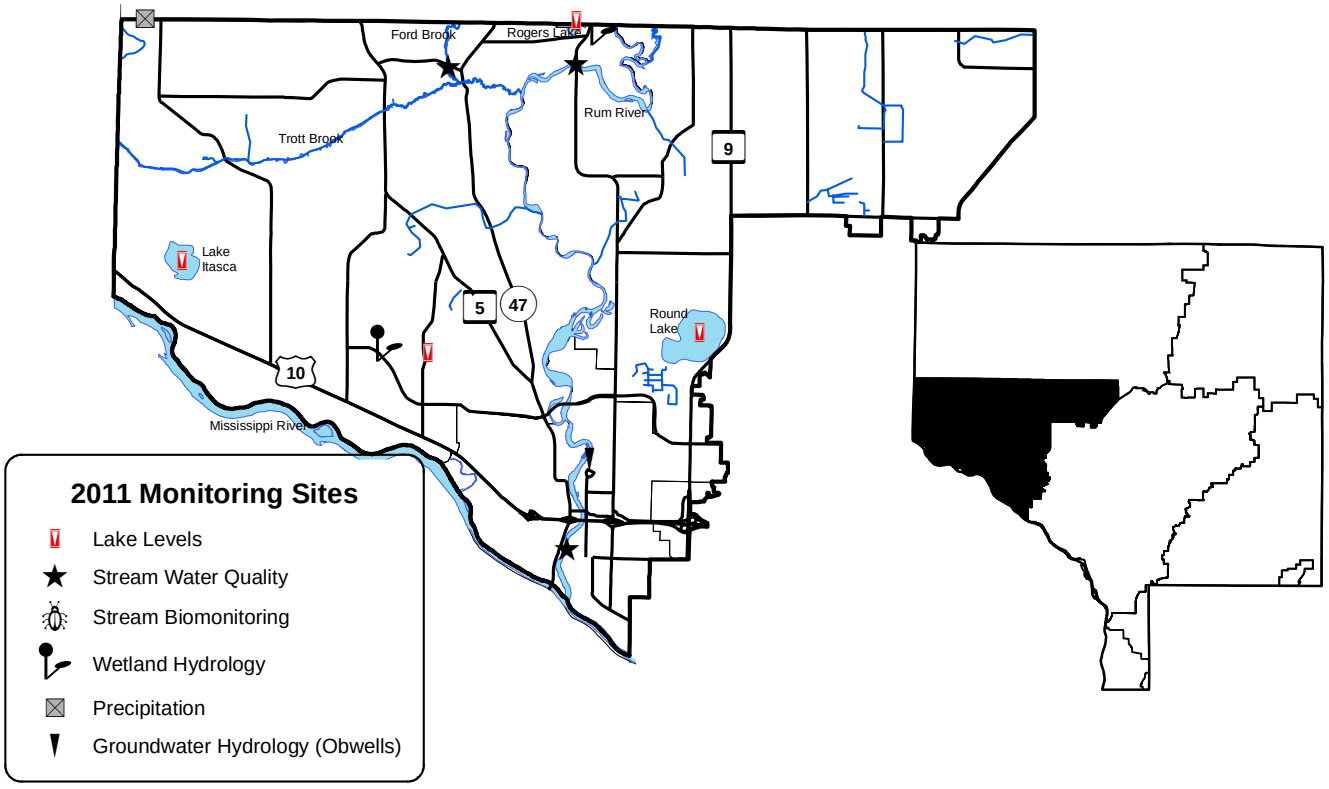
ACAP = Anoka County Ag Preserves, ACD = Anoka Conservation District, LRRWMO = Lower Rum River Watershed Mgmt Org, MC = Metropolitan Council, MNDNR = MN Dept. of Natural Resources



Lake Level Monitoring

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

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

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

Results: Water levels were measured on Rogers, Round, and Sunfish lakes 26, 20, and 10 times respectively. The level in Itasca Lake was measured much more frequently because a WL40 data logger was installed to record daily water levels. Reading a manual gauge was not possible because water was low, forcing placement of the gauge far from shore where volunteers could not read it.

In 2011 all of these lakes had much higher water levels than in other recent years due to high rainfall totals in spring and early summer. In late summer very little rainfall fell and water levels dropped continuously on all lakes. However the magnitude of these changes were very different on each lake (see graphs below).

Round Lake had its highest water levels since 1998. Between 1991 and 1998 water levels were regularly at or higher than the peak seen in 2011. The lake retreated 0.71 feet in late summer.

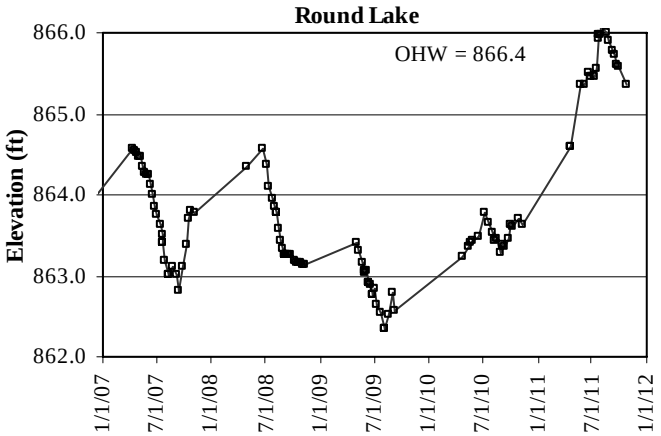
Rogers Lake exceeded the previous highest observed water level by 0.57 feet.

Itasca Lake had less impressive water levels. While it rose about 3 feet from fall 2010 and reached the highest water level since 2009, it was still 2-3 feet lower than the water levels that were historically observed. While all the lakes in the Lower Rum River watershed are mostly groundwater drive, with few or no surface inlets, Itasca may be the most reflective of groundwater because it lies within an undeveloped area. Therefore, it is not surprising that its response to rainfall is dampened. The long term water level decline at this lake and Round Lake are concerning indicators of groundwater depletion.

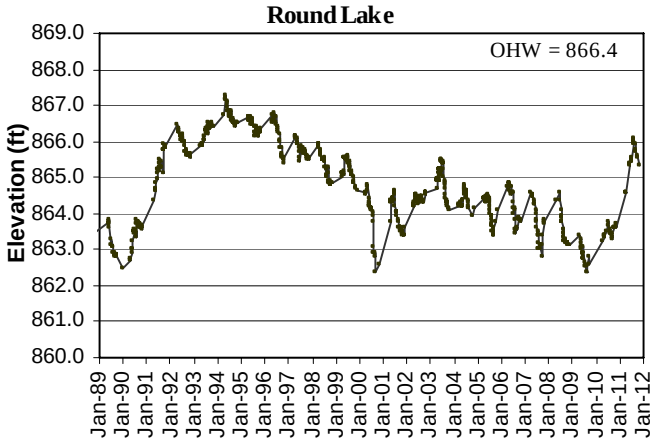
Sunfish Lake reached its highest water level since 1991.

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.

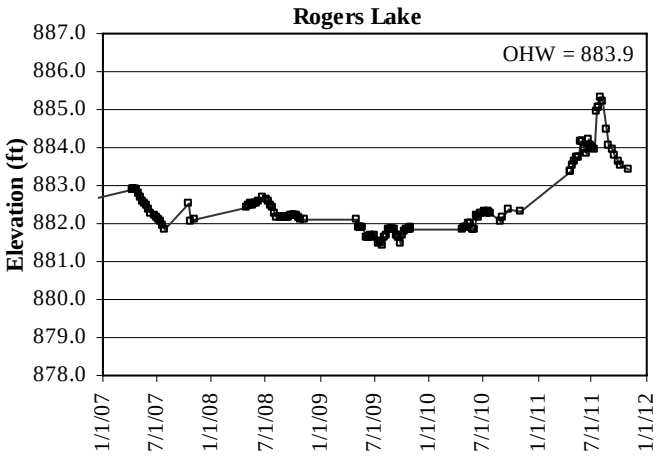
Round Lake Levels 2007-2011



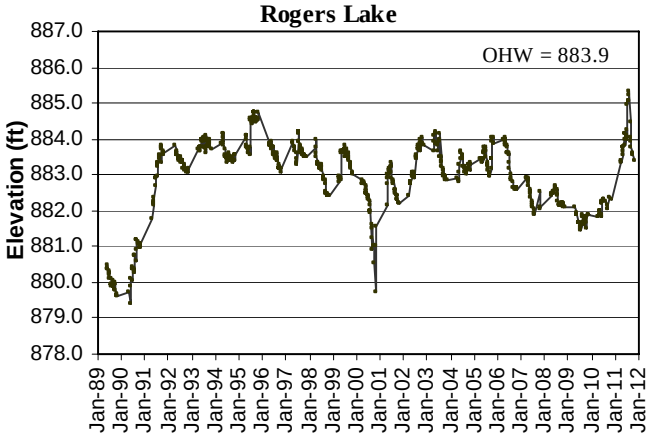
Round Lake Levels 1990-2011



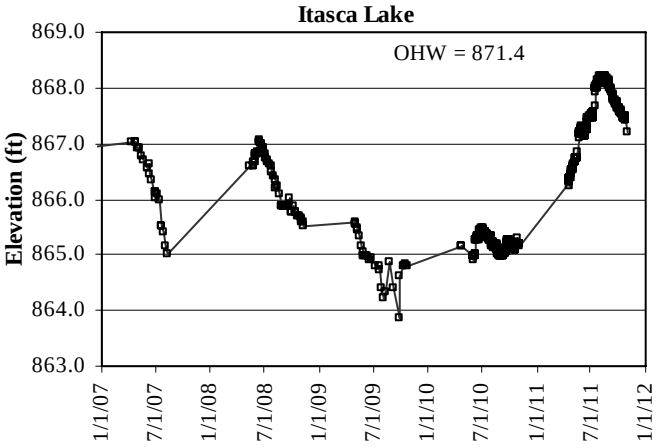
Rogers Lake Levels 2007-2011



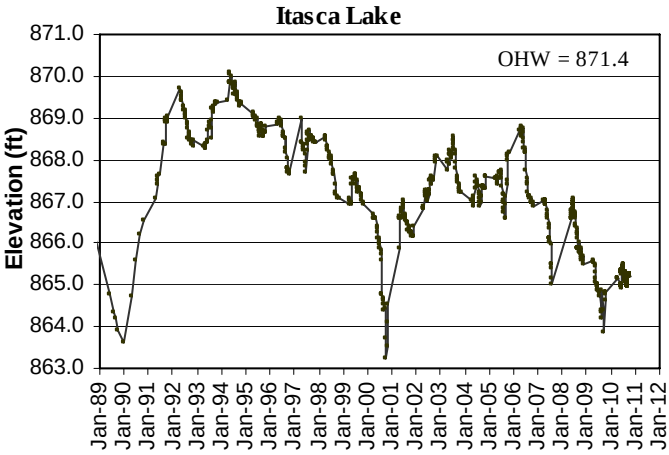
Rogers Lake Levels 1990-2011



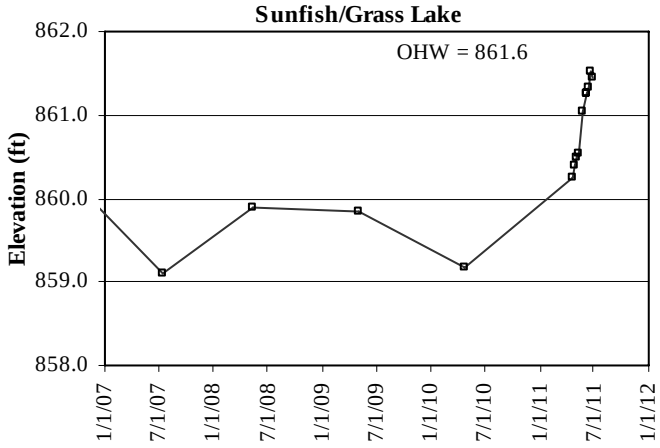
Itasca Lake Levels 2007-2011



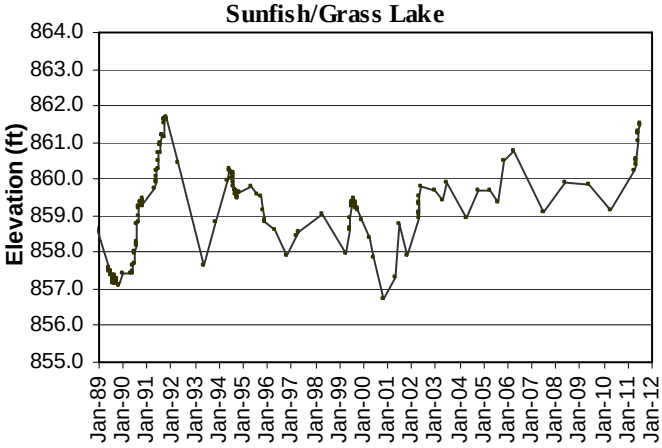
Itasca Lake Levels 1990-2011



Sunfish/Grass Lake Levels 2007-2011



Sunfish/Grass Lake Levels 1990-2011



Stream Water Quality - Chemical Monitoring

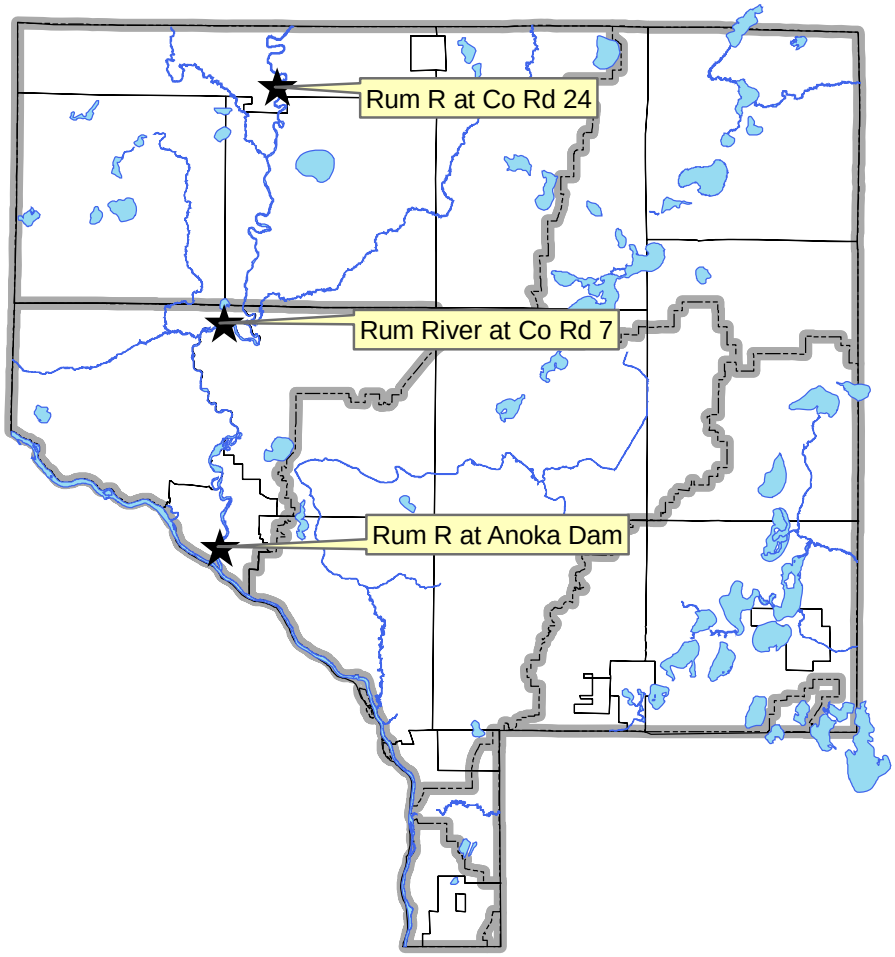
Description: The Rum River has been monitored simultaneously at three strategic locations in 2004, 2009, 2010, and 2011. The locations include the approximate top and bottom of the Upper and Lower Rum River Watershed Management Organizations. The two organizations share the middle location. The Metropolitan Council collects additional data at the farthest downstream location. Collectively, the data collected allow for an upstream to downstream water quality comparison within Anoka County, as well as within each watershed organization. While other Rum River monitoring has occurred, it is excluded from this report in order to include only data that were collected simultaneously for the greatest comparative value.

Purpose: To detect water quality trends and problems, and diagnose the source of problems.

Locations: Rum River at Co Rd 24
Rum River at Co Rd 7
Rum River at the Anoka Dam

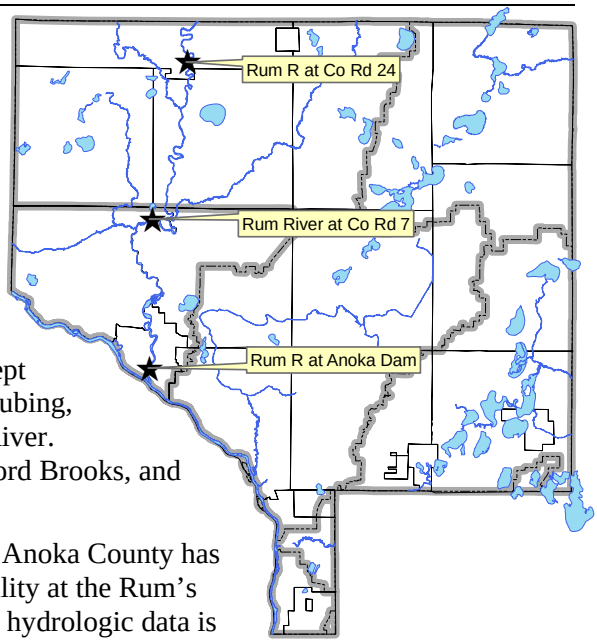
Results: Results are presented on the following page, with a focus on comparing river conditions from upstream to downstream. More detailed reporting for the Metropolitan Council WOMP monitoring station, including additional parameters and analysis are presented elsewhere by the Metropolitan Council (see http://www.metrocouncil.org/Environment/RiversLakes/).

2011 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



Years Monitored

At Co. Rd. 24 – 2004, 2009, 2010, 2011

At Co. Rd. 7 – 2004, 2009, 2010, 2011

At Anoka Dam – 1996-2011 by the Met Council WOMP program

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 and 2011 monitoring was conducted at three locations simultaneously to determine if Rum River water quality changes in Anoka County, and if so, generally where changes occur. The Upper and Lower Rum River Watershed Management Organizations contributed to this work and monitoring sites were strategically located near the upper and lower boundary of each organization's jurisdictional boundary. The Metropolitan Council maintains a permanent monitoring station at the Anoka Dam, the farthest downstream monitoring site. The Metropolitan Council monitoring was coordinated to occur with the watershed organization monitoring so the data and costs could be shared. The Anoka Conservation District did the field work for both Metropolitan Council and the watershed organizations, ensured monitoring for both programs was conducted simultaneously so the data and costs could be shared, and reports the data together for a more comprehensive analysis of the river from upstream to downstream.

The river was monitored during both storm and baseflow conditions by grab samples. Eight water quality samples were taken each year; 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, chlorides, sulfates, and hardness. Ten additional parameters were tested by the Metropolitan Council at their laboratory for the Anoka Dam site only and are not reported here. 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 and dates that were simultaneously tested at all three sites. 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

Overall, Rum River water quality is good throughout Anoka County, however it does decline slightly below the County Road 7 bridge (i.e. in the Cities of Andover, Anoka, and Ramsey) and during storms. The declines in water quality below that point are modest, as are declines in water quality during storms. Dissolved pollutants (as measured by conductivity and chlorides), total phosphorus, turbidity, and total suspended solids were all generally near or below the median of all 34 Anoka County streams that have been monitored, while pH and dissolved oxygen levels were appropriate.

Two areas of concern were noted. First, dissolved pollutants increased at each monitoring site downstream. Dissolved pollutants were highest during baseflow, indicating pollutants have infiltrated into the groundwater which feeds the river and tributaries during baseflow. Road deicing salts are likely the most significant dissolved pollutant. Secondly, total suspended solids increased notably below County Road 7. This was most pronounced during storms.

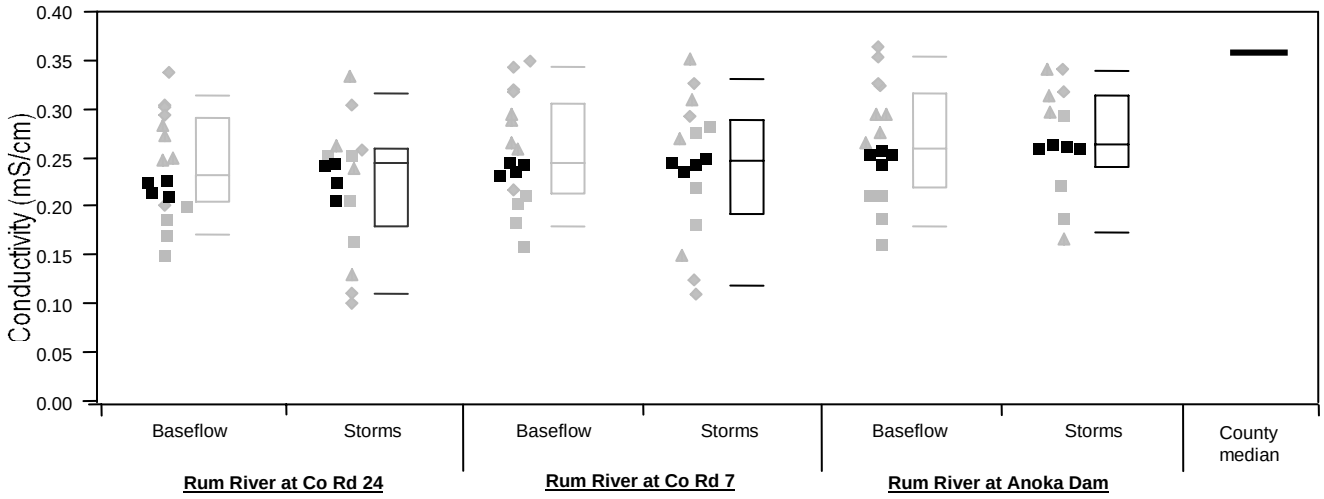
It is important to recognize the limitations of this report. The data is only from 2004, 2009, 2010, and 2011 when all three sites were monitored simultaneously to allow comparisons. It includes drought years (2009), years with slightly above normal precipitation (2010), and years with some excessively wet and some excessively dry months (2004 and 2011). We did not sample any extreme floods when river water quality is likely worst. If a more detailed analysis of river water quality is desired, data from many years and a variety of conditions is available for the Anoka Dam site through the Metropolitan Council. Their work includes composite samples throughout storms.

On the following pages data are presented and discussed for each parameter. The last section outlines management recommendations. The Rum River is an exceptional waterbody, and its protection and improvement should be a high priority.

Conductivity and chlorides

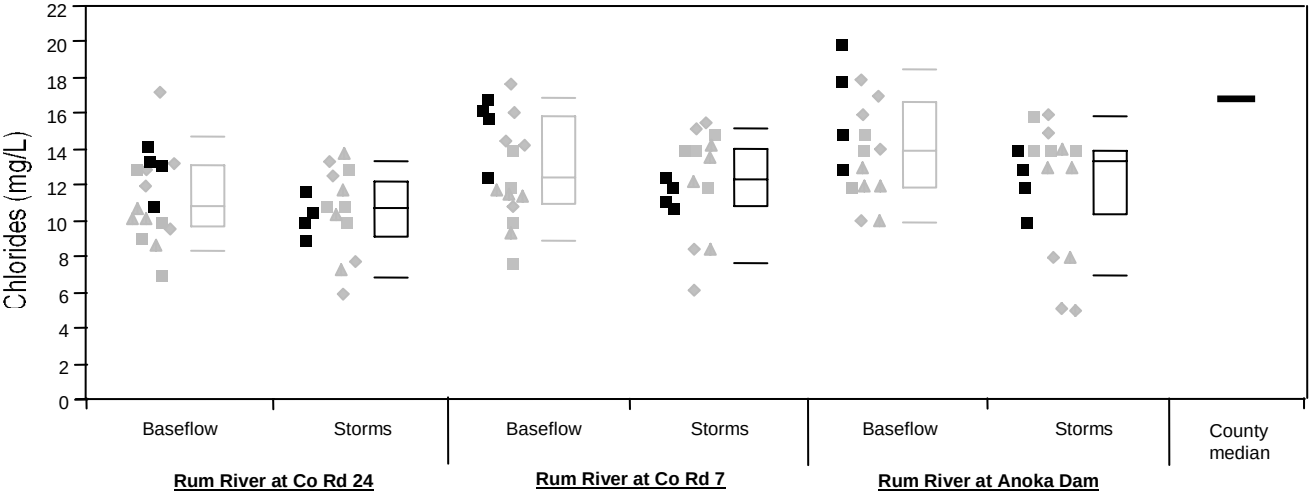
Conductivity and chlorides are measures of dissolved pollutants. Dissolved pollutant sources include urban road runoff, industrial chemicals, and others. Metals, hydrocarbons, road salts, and others are often of concern in a suburban environment. Conductivity is the broadest measure of dissolved pollutants we used. It measures electrical conductivity of the water; pure water with no dissolved constituents has zero conductivity. Chlorides tests for 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 Grey squares are individual readings from 2004, grey diamonds are 2009 readings, grey triangles are 2010 readings, and black squares are 2011 readings. Box plots show the median (middle line), 25th and 75th percentile (ends of box), and 10th and 90th percentiles (floating outer lines).



Upstream → Downstream

Chloride during baseflow and storm conditions Grey squares are individual readings from 2004, grey diamonds are 2009 readings, grey triangles are 2010 readings, and black squares are 2011 readings. Box plots show the median (middle line), 25th and 75th percentile (ends of box), and 10th and 90th percentiles (floating outer lines).



Upstream → Downstream

Conductivity is acceptably low in the Rum River, but increases downstream (see figures above) and during baseflow. Median conductivity from upstream to downstream was 0.245 mS/cm, 0.248 mS/cm, and 0.266

mS/cm, respectively. This is lower than the median for 34 Anoka County streams of 0.362 mS/cm. The maximum observed conductivity in the Rum River was 0.365 mS/cm.

Conductivity was lowest at all 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.

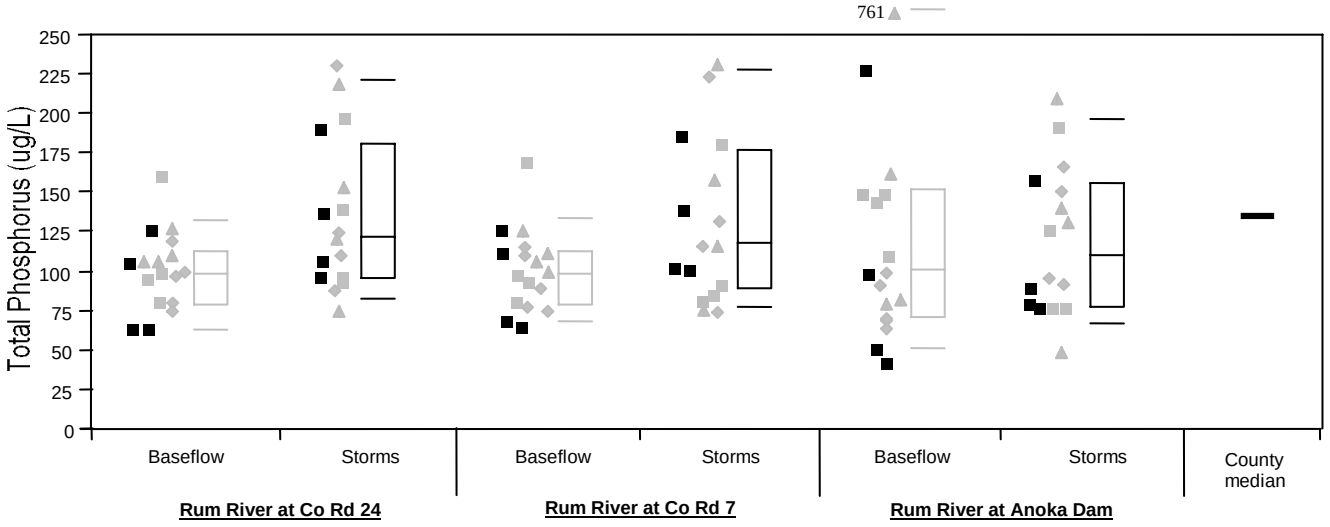
Chloride results parallel those found for conductivity (see figures above), supporting the hypothesis that chloride is an important dissolved pollutant. Chloride levels in the Rum River (median 11, 13, and 14 mg/L from upstream to downstream) are slightly lower than the median for Anoka County streams of 17 mg/L. The highest observed value was 20 mg/L, though higher levels may have occurred during snowmelts which were not monitored. The levels observed are much lower than the Minnesota Pollution Control Agency's (MPCA) chronic standard for aquatic life of 230 mg/L. Like conductivity, chlorides were slightly higher during baseflow than storms at each site and increased from upstream to downstream. Road deicing salt infiltration into the shallow groundwater is likely the primary contributor, as described above.

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). 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 each of the three monitored sites was 106, 106, and 101 ug/L. These upstream-to-downstream differences are negligible and there is no trend of increasing phosphorus downstream. All sites occasionally experience phosphorus concentrations higher than the median for Anoka County streams of 135 ug/L. All of the highest observed total phosphorus readings were during storms, including the maximums at each site of 230, 234, and 761 ug/L (upstream to downstream). 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.

One 2010 total phosphorus reading was excessively high, but we feel this outlier is likely an error. On September 22 a reading of 761 ug/L was recorded at the Anoka Dam. This was recorded as a baseflow sample because no recent rains had occurred, but was during a period of extended high water. River stage was approximately 0.5 feet higher than during the other baseflow samples. During this event dissolved phosphorus was analyzed in addition to total phosphorus. Dissolved phosphorus was only 13% of total phosphorus. Therefore most of the total phosphorus must be particulate phosphorus. Yet, inconsistently, there were few particulates in the water; total suspended solids was only 6 mg/L. Likewise, nothing in the field notes suggest unusually high turbidity. If this reading of 761 ug/L total phosphorus is excluded, as it probably should be, the next highest observed TP at this site is 209 ug/L.

Total phosphorus during baseflow and storm conditions Grey squares are individual readings from 2004, grey diamonds are 2009 readings, grey triangles are 2010 readings, and black squares are 2011 readings. Box plots show the median (middle line), 25th and 75th percentile (ends of box), and 10th and 90th percentiles (floating outer lines).



Upstream → Downstream

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 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. Suspended solids in the Rum River are moderate, and highest during storms and at the farthest downstream site. The results for turbidity and TSS differ, lending insight into the types of particles that are problematic.

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 only slight increases during storms and a very slight decrease at downstream monitoring sites (see figure below). The median turbidity at each site was 9, 8, and 7 FNRU (upstream to downstream), which is similar to the median for Anoka County streams of 8 FNRU. Turbidity was elevated on a few occasions, especially during storms. The maximum observed was 66 FNRU during a snowmelt event in 2011. The Rum River's turbidity exceeded the Minnesota Pollution Control Agency's water quality standard of 25 NTU during only five of 99 events (5%).

Across all years, TSS was similar at the two upstream sites, but higher at the Anoka Dam (see figure below). The countywide TSS median for streams is 12 mg/L. The median at all the Rum River sites was the same - 8 mg/L. However the readings ranged highest at the farthest downstream site, the Anoka Dam.

At all the sites median TSS during storms was higher than during baseflow. At the upstream site the difference between median TSS during storms and baseflow was 3 mg/L, while at County Road 7 it was 4 mg/L and at the Anoka Dam 9 mg/L. TSS during storms was much more variable due to variability in storms sampled.

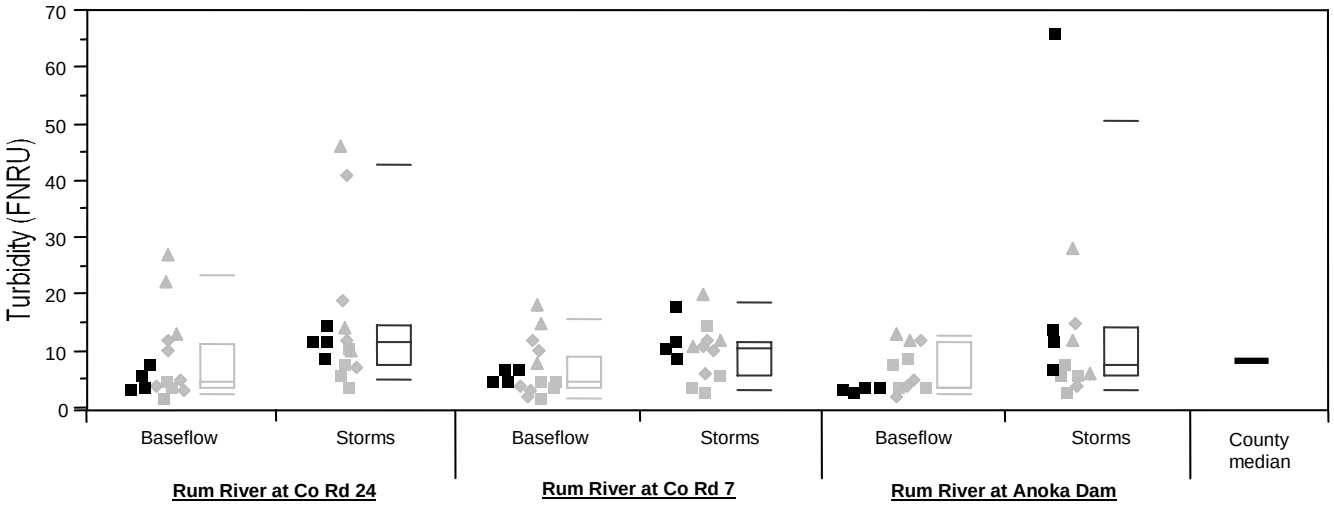
The maximum readings and moderate increases during storms are not unexpectedly high for a large river, and are within the range that should be considered healthy. At the same time, the increase in TSS between County Road 7 and the Anoka Dam during storms is noteworthy. It is not unexpected given the more dense land development between these two sites, but also speaks to the effectiveness of stormwater management practices like settling ponds. The river's water quality is in good condition, likely due in part to these practices, however they do not eliminate all impact. 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.

In 2011 TSS during storms was very low at the two farthest downstream monitoring sites, and this is likely due to hydrologic conditions. The first half of 2011, when our storm samples were taken, was an extremely wet period. River levels were chronically high. While we did sample immediately following storms, the runoff from that storm was a relatively low percentage of overall flow. Because TSS was low during these periods of very high flow, sediment from the stream bed and bank erosion is relatively low in the Rum River. Sediment carried by storm runoff is the larger source of suspended solids.

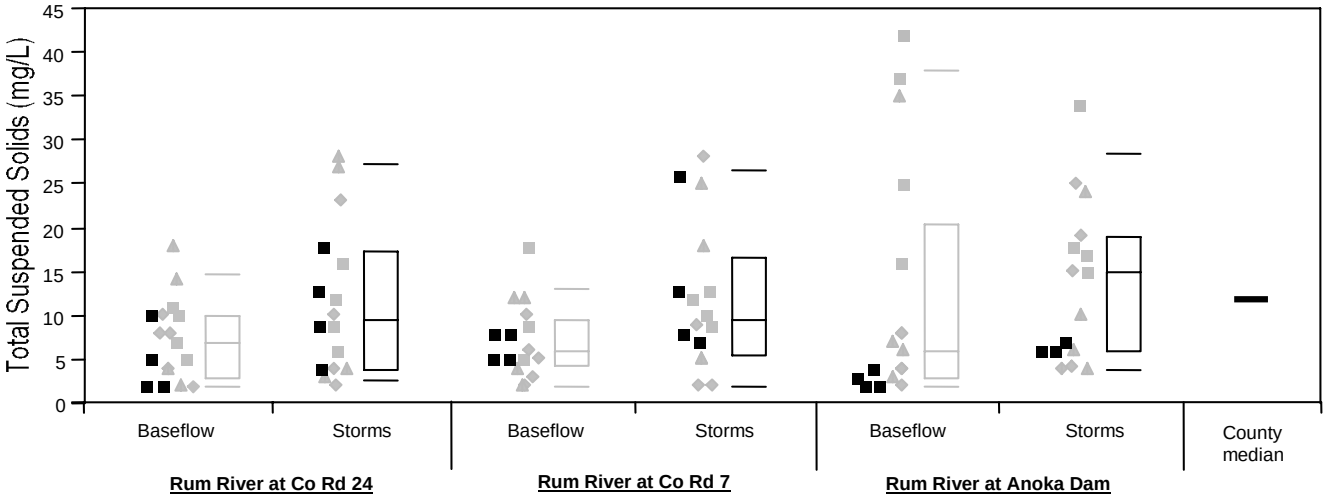
It should be noted that the data presented here do not include monitoring of any large flood events. The water is known to become muddier during such floods.

Turbidity during baseflow and storm conditions Grey squares are individual readings from 2004, grey diamonds are 2009 readings, grey triangles are 2010 readings, and black squares are 2011 readings. Box plots show the median (middle line), 25th and 75th percentile (ends of box), and 10th and 90th percentiles (floating outer lines).



Upstream → Downstream

Total suspended solids during baseflow and storm conditions Grey squares are individual readings from 2004, grey diamonds are 2009 readings, grey triangles are 2010 readings, and black squares are 2011 readings. Box plots show the median (middle line), 25th and 75th percentile (ends of box), and 10th and 90th percentiles (floating outer lines).

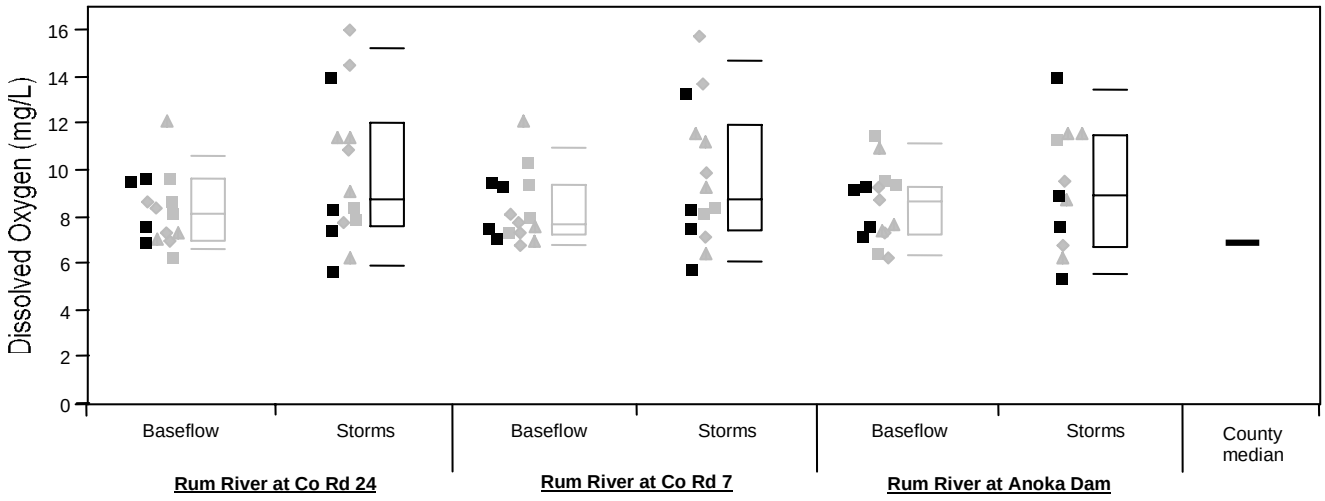


Upstream → Downstream

Dissolved Oxygen

Dissolved oxygen is necessary for aquatic life, including fish. Organic pollution consumes oxygen when it decomposes. If oxygen levels fall below 4 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 Grey squares are individual readings from 2004, grey diamonds are 2009 readings, grey triangles are 2010 readings, and black squares are 2011 readings. Box plots show the median (middle line), 25th and 75th percentile (ends of box), and 10th and 90th percentiles (floating outer lines).



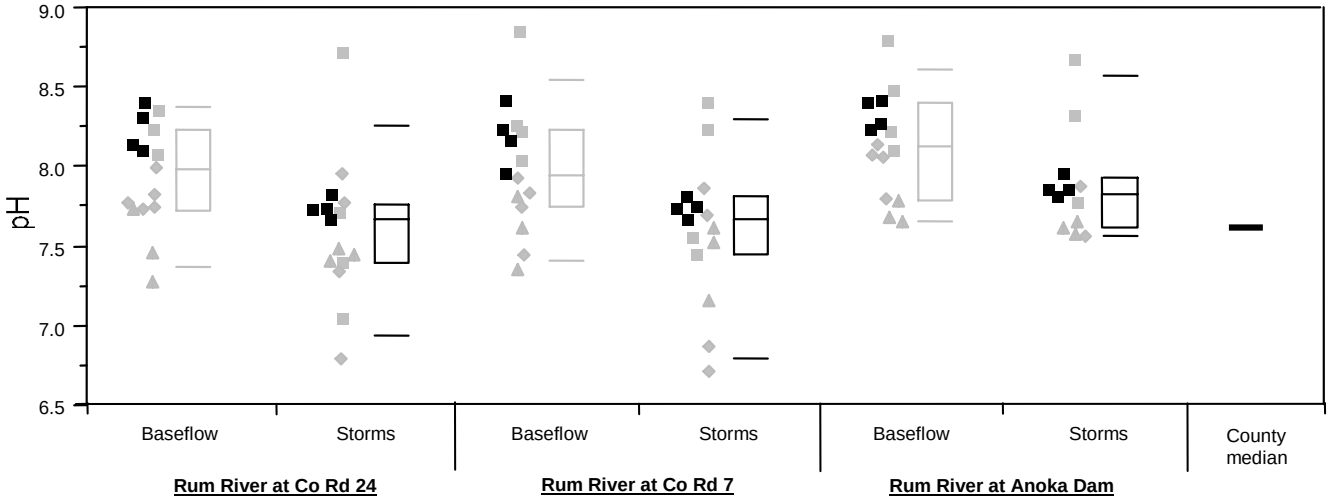
Upstream → Downstream

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 regularly within this range (see figure below). Each of the three sites exceeded 8.5 on one occasion, but the highest was only 8.85. This rare and modest exceedance of the state water quality standard is not concerning.

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 affect on this aquatic system is small.

pH during baseflow and storm conditions Grey squares are individual readings from 2004, grey diamonds are 2009 readings, grey triangles are 2010 readings, and black squares are 2011 readings. Box plots show the median (middle line), 25th and 75th percentile (ends of box), and 10th and 90th percentiles (floating outer lines).



Upstream → Downstream

Summary and Recommendations

The Rum River's water quality is very good. It does show some deterioration in the downstream areas that are most developed. 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. Measures to maintain the Rum River's good water quality should include:

- Enforce the building and clear-cutting setbacks from the river required by state scenic rivers laws to avoid bank erosion problems and protect the river's scenic nature.
- Use the best available technologies to reduce pollutants delivered to the river and its tributaries through the storm sewer system. Any new development should consider low impact development strategies that minimize stormwater runoff production. Aggressive stormwater treatment should be pursued in all areas of the watershed, not just those adjacent to the river. The area's soils are well suited to stormwater treatment by infiltration.
- Seek improvements to the existing stormwater conveyance system below County Road 7. Total suspended solids in the river increase in this portion of the watershed during storms.
- Utilize all practical means to reduce road deicing salt applications. These may include more efficient application methods, application only in priority areas, alternate chemicals, or others. Road salt infiltration into the shallow groundwater has become a regional problem. Deicing salts are apparent year-round in the groundwater that feeds area streams.
- Survey the river by boat for bank erosion problems and initiate projects to correct them. Both the Lower and Upper Rum River Watershed Management Organizations, which serve Anoka County, have completed this work. It should be periodically repeated.
- Continue education programs to inform residents of the direct impact their actions have on the river's health.

- Continue regular water quality monitoring. A reasonable baseline of four years of data that has been collected, so future monitoring every 1-3 years seems reasonable. Frequency of monitoring should be most frequent in the next few years and following any major projects that might positively or negatively impact the river. Additionally, periodic monitoring of the primary tributary streams should also occur every 2-3 years. Coordinating simultaneous monitoring across communities and watershed organizations is highly desirable.
- Investigate E. coli bacteria. In 2011 the MPCA sampled for E. coli at the outlet of the Rum River into the Mississippi River. They found levels that exceeded state standards. It is unknown how much of the Rum River's length might be declared "impaired" based upon this data. It is desirable to do additional bacteria monitoring upstream to define the extent of the problem. Bacteria is a difficult pollutant to reduce.
- Engage the entire watershed. To date, most efforts to monitor the Rum River have occurred in Anoka County by the Upper and Lower Watershed Management Organizations. This is the farthest downstream part of the watershed. A broader scale effort is needed to protect the river. Strong encouragement from already-active partners is needed to engage those who are inactive.

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 behind Anoka High School, south side of Industry Ave, 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

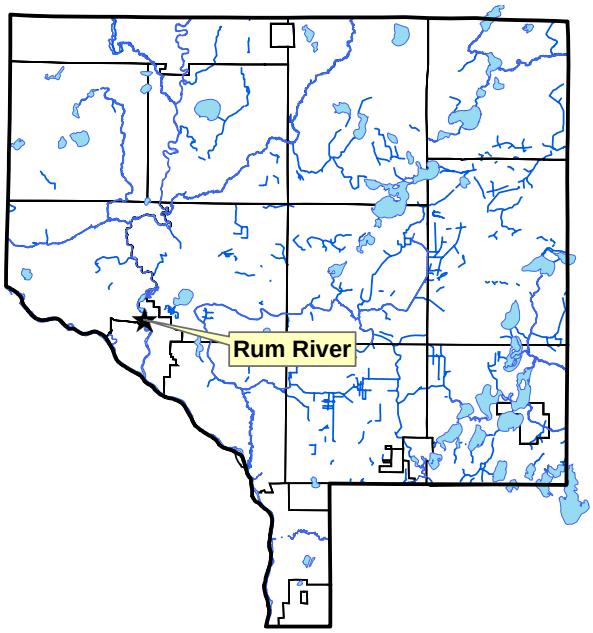
By ACD staff in 2011

Monitored Since

2001

Student Involvement

0 students in 2011, approximately 410 since 2001



Background

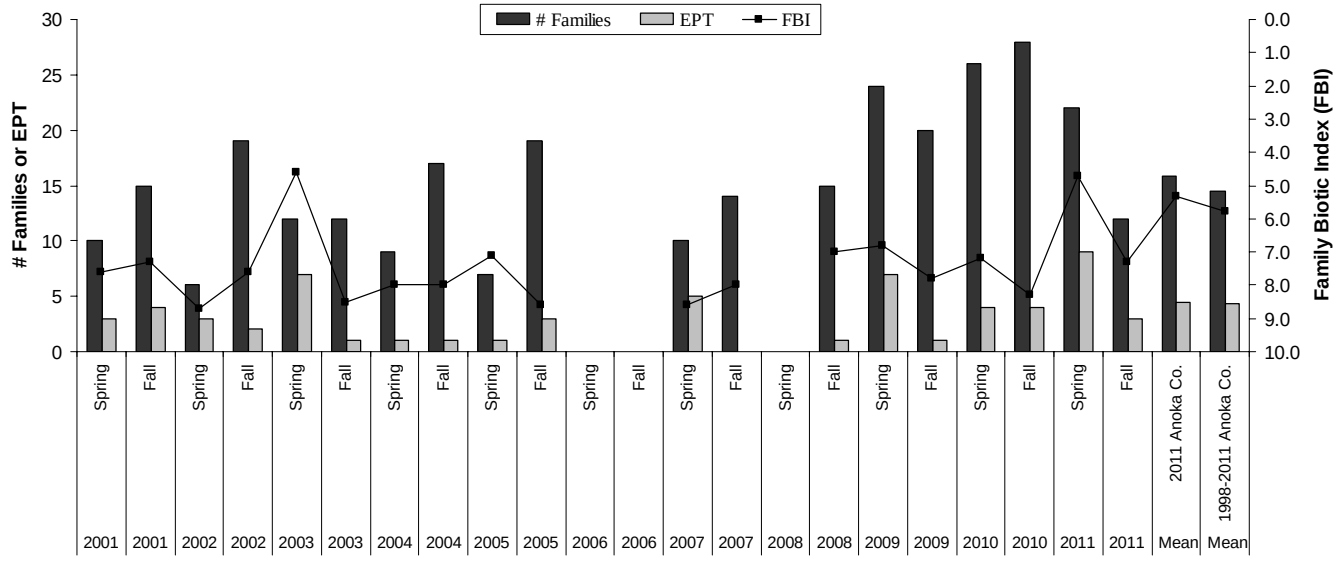
The Rum River originates from Lake Mille Lacs, and flows south through western Anoka County where it joins the Mississippi River in the City of Anoka. In Anoka County the river has both rocky riffles (northern part of county) as well as pools and runs with sandy bottoms. The river's condition is generally 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 is not conducted in a backwater rather than the main channel.

Results

Anoka High School planned to monitor the river in 2011 but was unable so the monitoring was done by Anoka Conservation District staff. The school could not monitor in spring because of chronic high water that did not recede until June. In fall, no ecology class was taught.

The results for spring 2011 were better than most previous years, while fall results were typical of the past. In spring more EPT families were found than ever before at this site and the FBI score was the second best. This was well above the indices typical of Anoka County streams. This sampling was different from most previous efforts in that sampling was done by professionals and a greater percentage of sampling was in the main channel rather than backwaters. However this was also true in fall when indices were typical of past efforts at this site and near or below typical results for the 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	2007	2007	2008	2008	2009	2009	2010	2010	2011	2011	Mean	Mean
Season	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	2011 Anoka Co.	1998-2011 Anoka Co.
FBI	8.60	8.00		7.00	6.80	7.80	7.20	8.30	4.70	7.30	5.3	5.8
# Families	10	14		15	24	20	26	28	22	12	15.8	14.5
EPT	5	0		1	7	1	4	4	9	3	4.4	4.3
Date	7-May	22-Oct		13-Oct	8-May	28-Sep	18-May	7-Oct	10-Jun	5-Oct		
Sampled By	AHS	AHS		AHS	AHS	AHS	AHS	AHS	ACD	ACD		
Sampling Method	MH	MH		MH	MH	MH	MH	MH	MH	MH		
Mean # Individuals/Rep.	208	244		626	880	585	443	816	604	188		
# Replicates	1	1		1	1	2	1	1	1	1		
Dominant Family	Corixidae	Coenagrionidae		Baetidae	Siphlonuridae	Hyalellidae	Gastropoda	Hyalellidae	baetidae	hyalellidae		
% Dominant Family	91.8	37.3		26.5	40.7	39.1	31.8	34.1	57.5	63.3		
% Ephemeroptera	5.3	0		26.5	48.2	0.9	8.1	0.9	59.3	11.2		
% Trichoptera	0	0		0	0.1	0	0	0.2	1	0		
% Plecoptera	0.5	0		0	2.6	0	0.5	0	3.8	0.5		

Supplemental Stream Chemistry Readings

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

Parameter	5/7/2007	10/22/2007	10/10/2008	5/8/2009	9/28/2009	5/18/2010	10/7/2010	6/10/2011	10/5/2011
pH	8.5	7.42	7.75	7.91	7.82	7.24	7.22	7.84	7.98
Conductivity (mS/cm)	0.283	0.243	0.348	0.276	0.421	0.207	0.399	0.296	0.296
Turbidity (NTU)	17	13	3	6	5	7	7	18	10
Dissolved Oxygen (mg/L)	11.41	9.72	8.99	10.82	8.76	6.93	na	6.85	7.91
Salinity (%)	0.01	0	0.01	0.01	0.01	0	0.01	0.01	0.01
Temperature (°C)	15.3	10.6	12.3	17.2	15.5	14.8	12.2	20.7	15.3

Discussion

Biomonitoring results for this site are much different from the monitoring farther upstream in St. Francis. In St. Francis the Rum River harbors the most diverse and pollution-sensitive macroinvertebrate community of all sites monitored in Anoka County. At the City of Anoka location diversity has been high in recent samplings, but the biotic indices indicate a poorer than average river health because most families found were generalists.

The reason for the dramatic difference between St. Francis and Anoka invertebrate communities is probably habitat differences. The river near St. Francis has a steeper gradient, moves faster, and has a variety of pools, riffles, and runs. Downstream, near Anoka, the river is much slower moving, lacking pools, riffles and runs. The bottom is heavily silt laden. The area is more developed, so there are more direct and indirect human impacts to the river.

Water quality is good throughout the Rum River, though slightly poorer in Anoka than St. Francis. Chemical monitoring in 2004, 2009, 2010, and 2011 revealed that total suspended solids, conductivity, and chlorides were all slightly higher near Anoka than upstream. This is probably due to more urbanized land uses and the accompanying storm water inputs. Given that water quality is still very good even in these downstream areas, it is unlikely that water quality is the primary factor limiting macroinvertebrates at the City of Anoka.

One additional factor to consider when comparing the up and downstream monitoring results is the type of sampling location. Sampling near Anoka was conducted mostly in a backwater area that has a mucky bottom and does not receive good flow. This area is unlikely to be occupied by families which are pollution intolerant because those families generally favor rocky habitats and require high dissolved oxygen not found in stagnant

areas.

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 21 wetland hydrology monitoring stations.

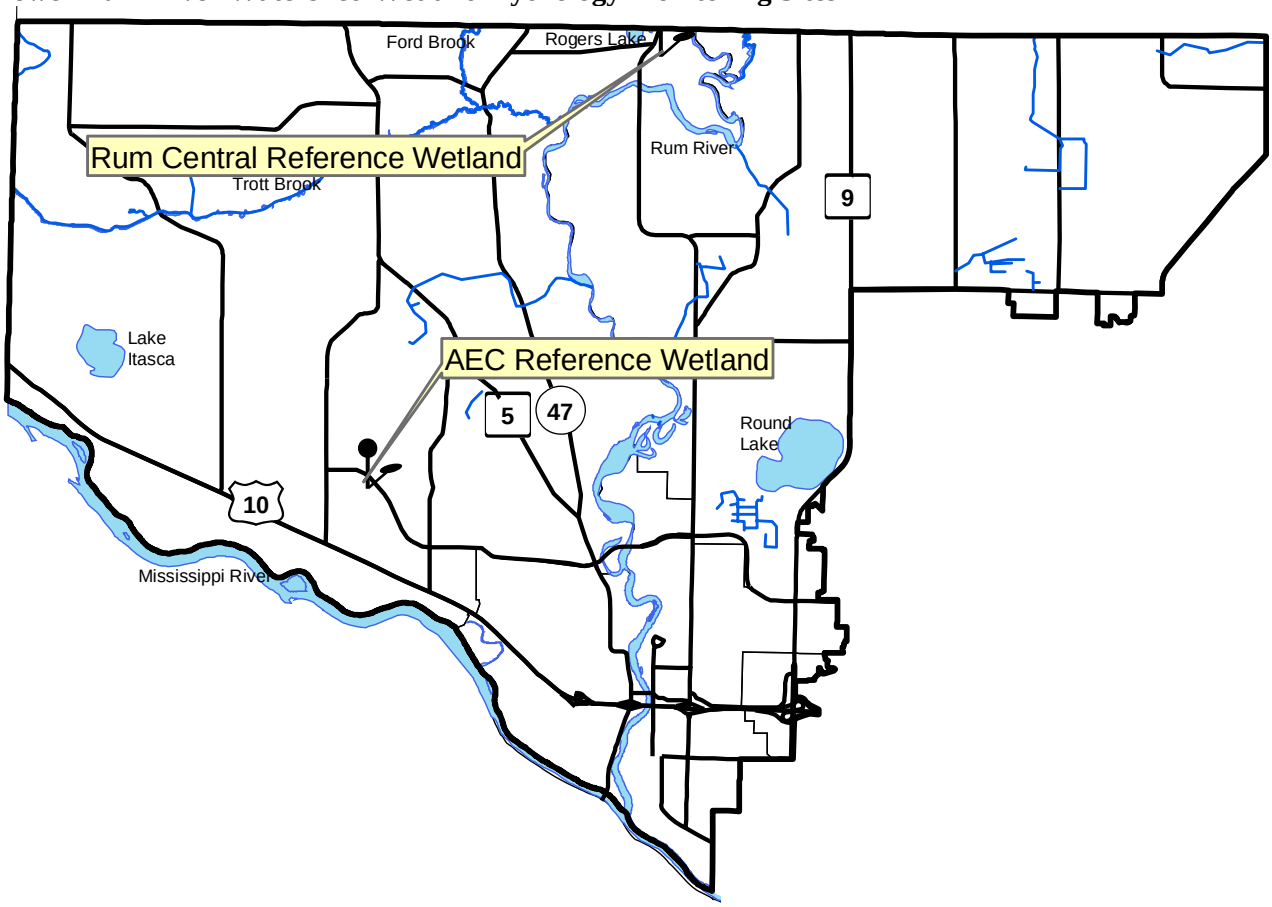
Purpose: To provide understanding of wetland hydrology, including the impact of climate and land use. These data aid in delineation of nearby wetlands by documenting hydrologic trends including the timing, frequency, and duration of saturation.

Locations: AEC Reference Wetland, Connexus Energy Property on Industry Ave, Ramsey

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

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

Lower Rum River Watershed Wetland Hydrology Monitoring Sites

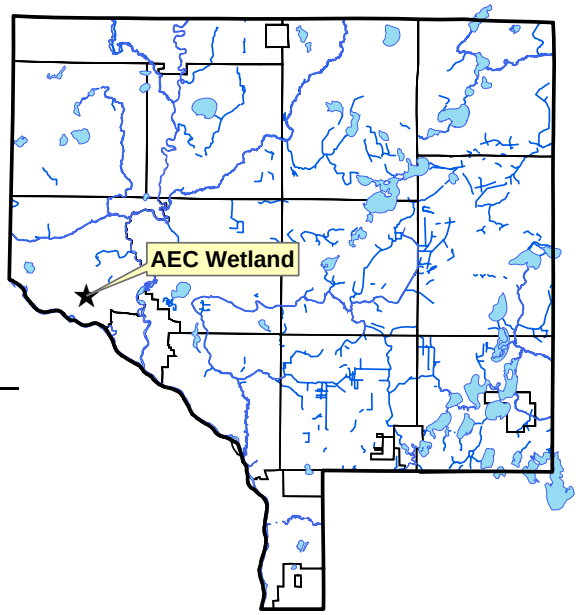


Wetland Hydrology Monitoring

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	-

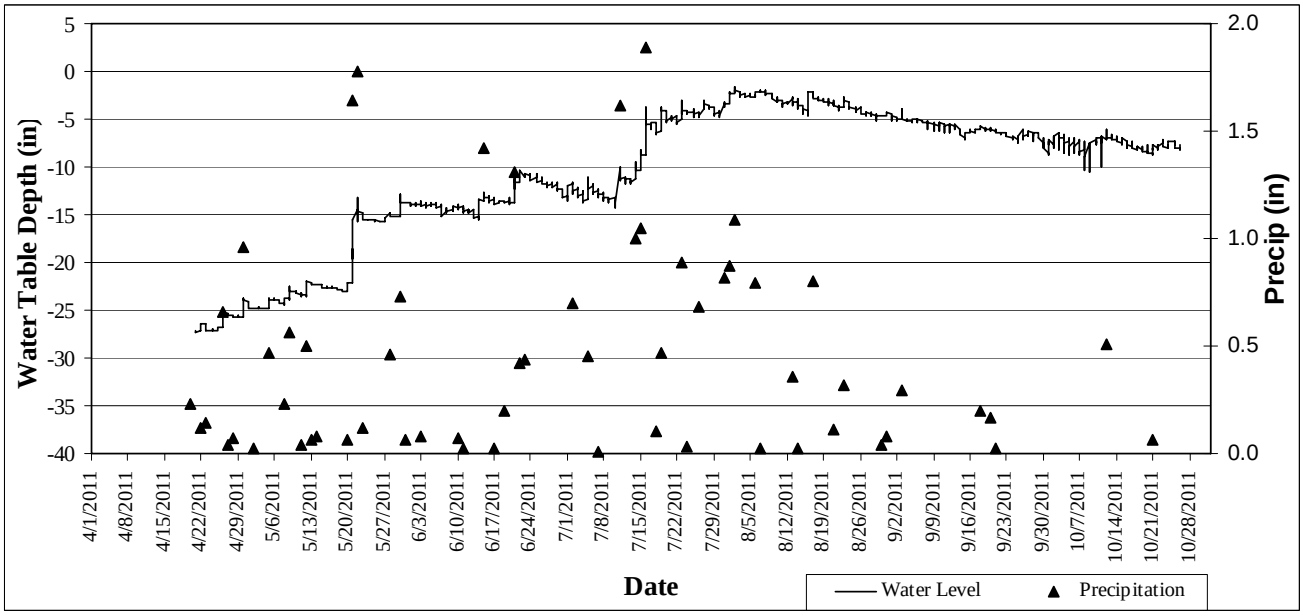
Surrounding Soils: Hubbard coarse sand

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.

2011 Hydrograph



Well depth was 42 inches, so a reading of –42 indicates water levels were at an unknown depth greater than or equal to 42 inches.

Wetland Hydrology Monitoring

RUM RIVER CENTRAL REFERENCE WETLAND

Rum River Central Regional Park, Ramsey

Site Information

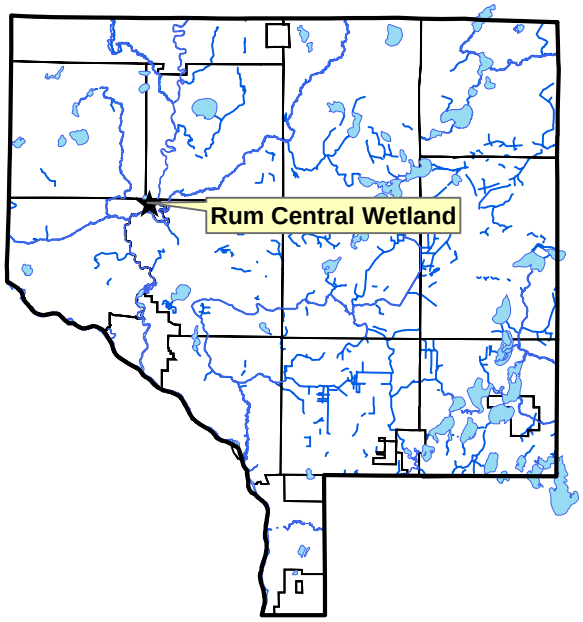
Monitored Since: 1997

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	-

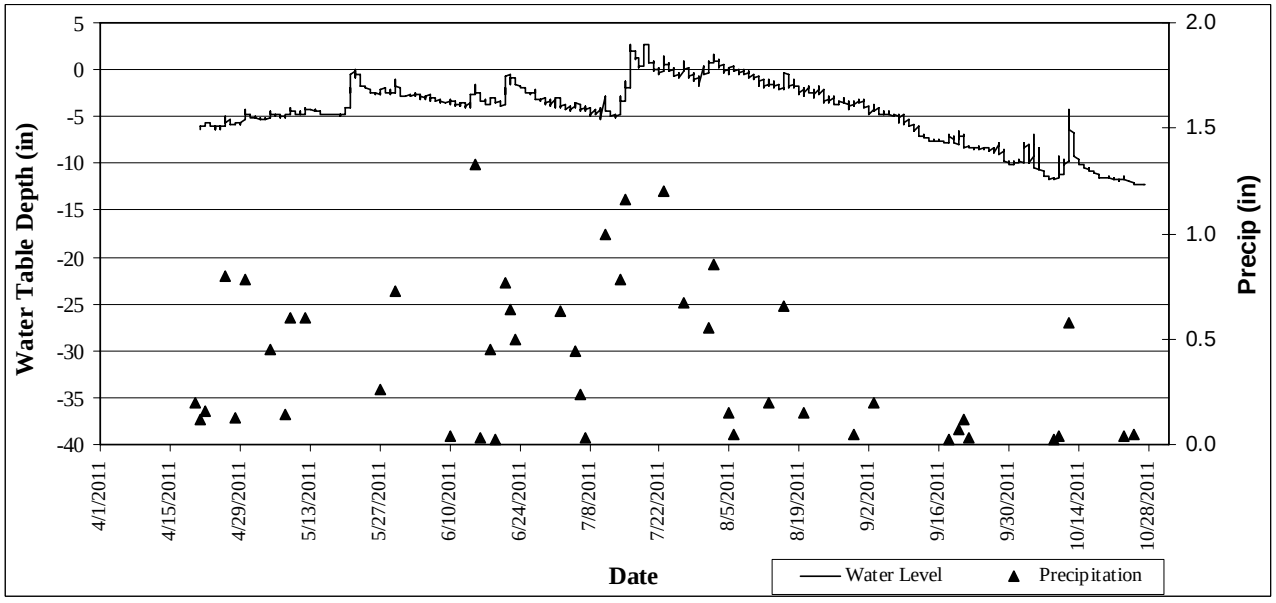
Surrounding Soils: Zimmerman fine sand

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.

2011 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 LRRWMO provided 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 was administered by the Anoka Conservation District, which works with landowners on conservation projects. Projects affecting the Rum River were 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. In 2011 the Blackburn Rum Riverbank Stabilization used $543.46 of LRRWMO cost share dollars.

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 LRRWMO Expenses - Blackburn riverbank	-	$ 543.46
Fund Balance		**$1,028.12**

Blackburn Rum Riverbank Stabilization

Anoka Conservation District (ACD) staff installed a cedar tree revetment on a residential property that borders the Rum River in Ramsey during the fall of 2011. Cedar tree revetments are a cost-effective, bioengineering practice that can be used to stabilize actively eroding streambanks. The Blackburn property had moderate bank undercutting that was in the beginning stages of creating a more serious issue. Installation of the 55 foot cedar tree revetment will slow or stop the erosion and reduce the likelihood of a much larger and more expensive corrective project in the future. It benefits river water quality by reducing sediment delivered to the river, and improves habitat.

Cedar tree revetments are created by anchoring cut cedar trees to the bank. In this case, the trees were harvested at no cost from an Anoka County park where they were undesirable. Each tree was anchored to the toe of the slope using cable, horseshoe clamps, and a duckbill anchor driven 3-4 feet into the bank. The tree's many branches deflect the water's energy from the bank. This low cost treatment is highly effective on mild to moderate problem areas.

Project Funding

LRRWMO Water Quality Cost Share	$543.46
ACD Water Quality Cost Share	$543.45
Landowner	$1,086.91
TOTAL	$2,173.82

Public Education – Web Video

Description: The Lower Rum River Watershed Management Organization (LRRWMO) contracted the Anoka Conservation District (ACD) to create a short web video about the LRRWMO. The video is to be posted on the LRRWMO website.

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

Location: www.AnokaNaturalResources.com/LRRWMO

Results: As of January 27, 2012 the video production is in process. Appropriate video clips have been compiled. Many of these video clips were collected by ACD staff during the LRRWMO's boat tour of the river in September 2011. A script for the video has been completed and sent to the LRRWMO Board for review. The video compilation will be complete before March 31, 2012.

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. The LRRWMO pays the ACD annual fees for maintenance and update of the website.

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. The website serves as the LRRWMO's alternative to a state-mandated newsletter.

Location: www.AnokaNaturalResources.com/LRRWMO

Results: The LRRWMO website contains information about both the LRRWMO and about natural resources in the area.

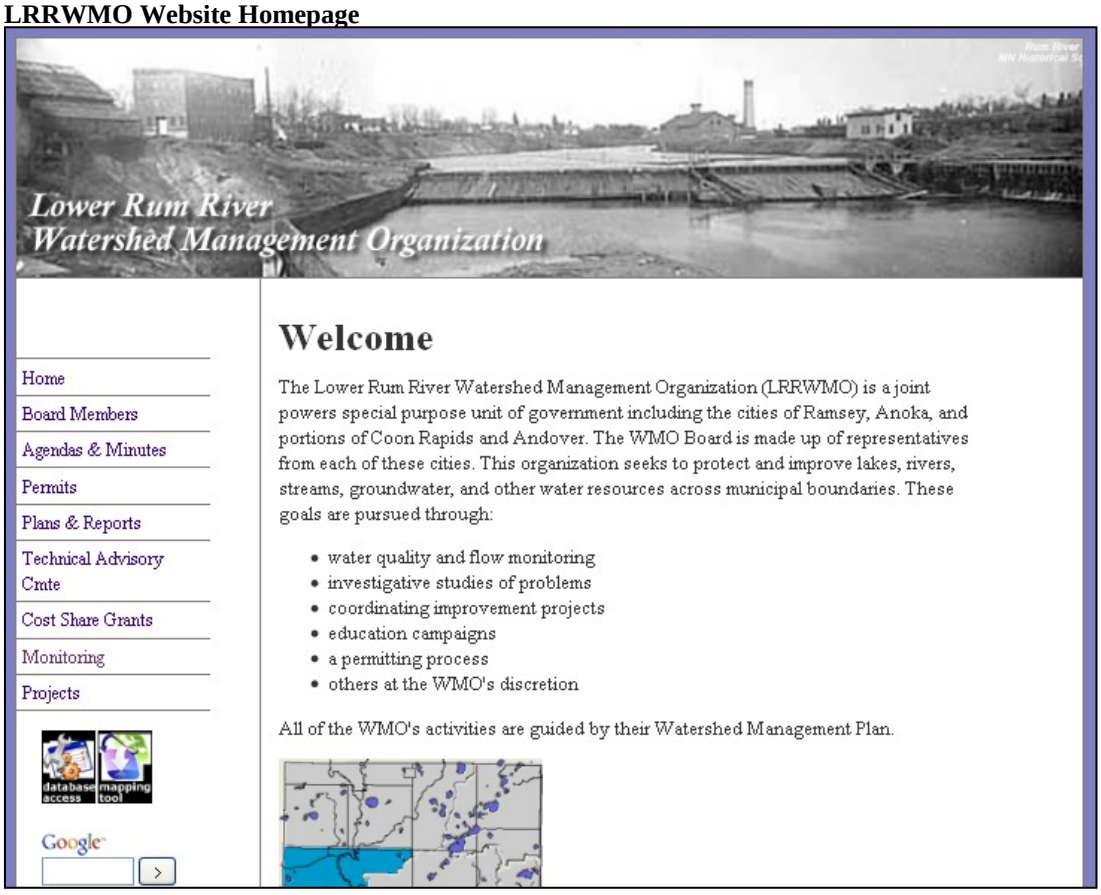
Information about the LRRWMO includes:

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

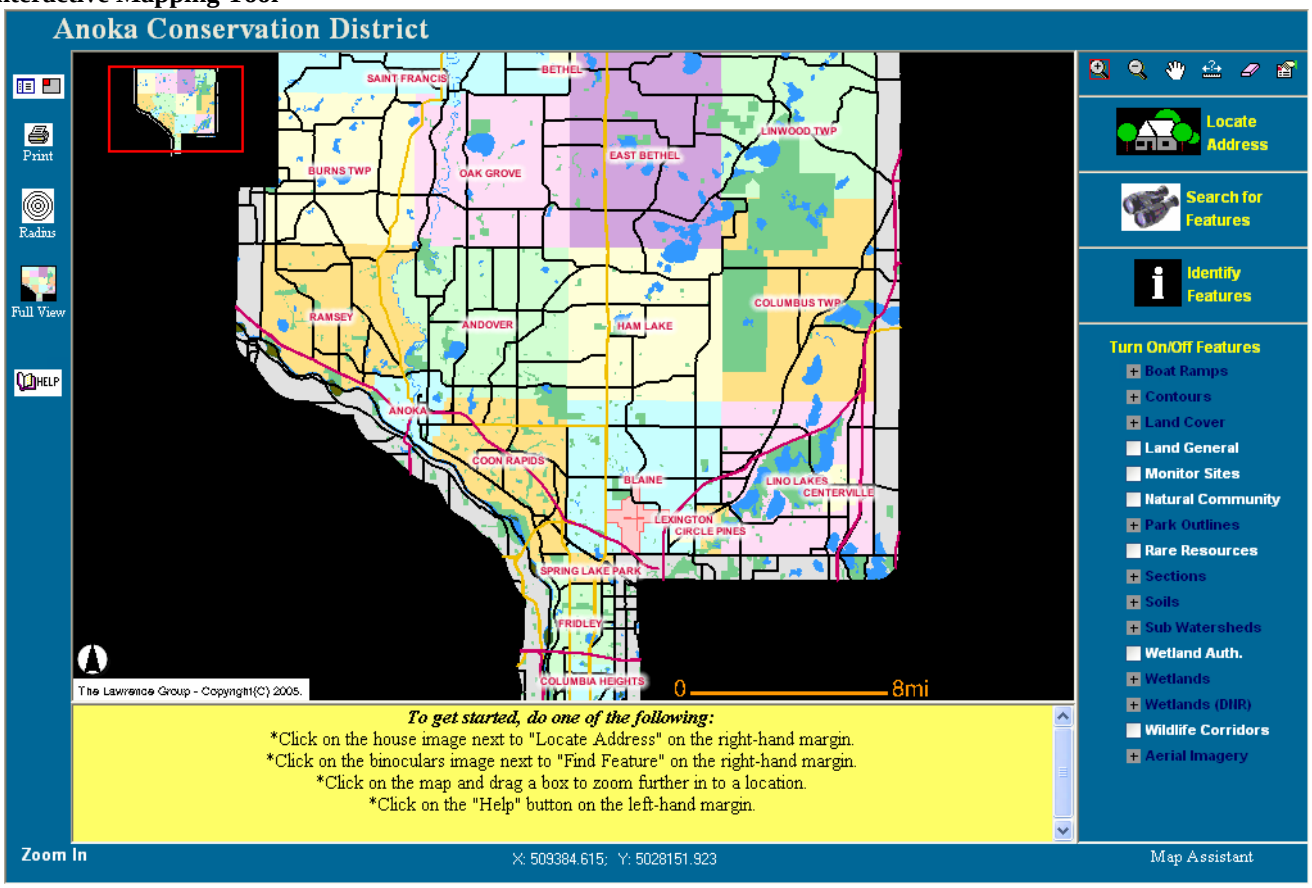
Other tools on the website include:

- an interactive mapping tool that shows natural features and aerial photos
- an interactive data download tool that allows users to access all water monitoring data that has been collected
- narrative discussions of what the monitoring data mean

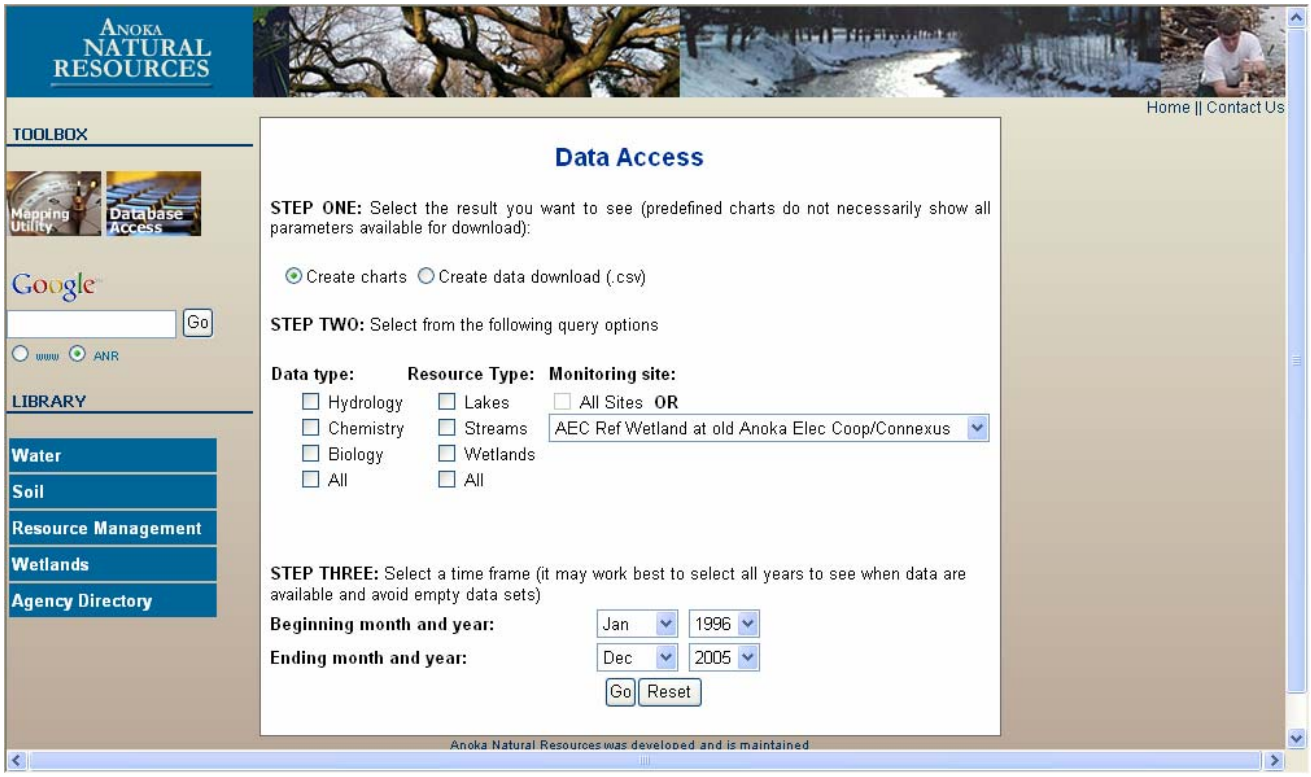
LRRWMO Website Homepage



Interactive Mapping Tool



Interactive Data Access Tool



Member City Annual Reporting Template

Description: The LRRWMO Watershed Management Plan, adopted in January 2012, states:

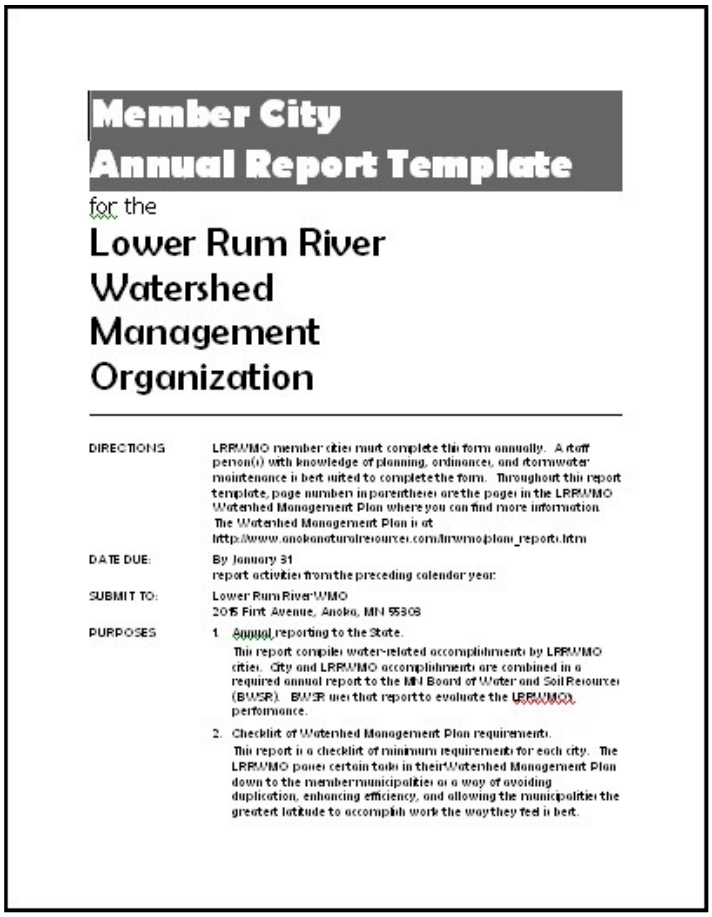
> "Member communities shall prepare and submit an annual status report to the LRRWMO by January 1 of each year reviewing the status of their local plans, the status of the implementation of their plans, and a review of the implementation of policies that are outlined in the LRRWMO plan… The LRRWMO will create a template for this report in 2011 with the assistance of the ACD."

Purpose: To collect information the LRRWMO will need in their annual report to the State Board of Water and Soil Resources (BWSR).
To allow the WMO to defer some responsibilities to the communities, thereby allowing communities more control. BWSR allowed a smaller LRRWMO role on the condition that the LRRWMO have a reporting mechanism that allows them to track city accomplishments.

Location: Watershed wide.

Results: The member city annual reporting template was created by the ACD in January 2012, following adoption of the LRRWMO 3rd Generation Watershed Management Plan on January 19th. It is a three-page, checklist and fill-in-the blank style report that is intended to be brief and quick to fill out. It would be appropriate for cities to complete this report at the end of 2012 (the first year under the new watershed plan), and annually thereafter.

Cover Page of the Member City Reporting Template



Member City
Annual Report Template

for the

Lower Rum River Watershed Management Organization

DIRECTIONS: LRRWMO member cities must complete this form annually. A staff person(s) with knowledge of planning, ordinances, and stormwater maintenance is best suited to complete the form. Throughout this report template, page numbers in parentheses are the pages in the LRRWMO Watershed Management Plan where you can find more information. The Watershed Management Plan is at http://www.anokanaturalresources.com/lrrwmo/plan_report.htm

DATE DUE: By January 31 report activities from the preceding calendar year.

SUBMIT TO: Lower Rum River WMO 2015 First Avenue, Anoka, MN 55303

PURPOSES:

1. Annual reporting to the State.
   This report compiles water-related accomplishments by LRRWMO cities. City and LRRWMO accomplishments are combined in a required annual report to the MN Board of Water and Soil Resources (BWSR). BWSR uses that report to evaluate the LRRWMO's performance.
2. Checklist of Watershed Management Plan requirements.
   This report is a checklist of minimum requirements for each city. The LRRWMO panel certain tasks in their Watershed Management Plan down to the member municipalities as a way of avoiding duplication, enhancing efficiency, and allowing the municipalities the greatest latitude to accomplish work the way they feel is best.

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.

Lower Rum River Watershed Financial Summary

Lower Rum River Watershed	WMO Asst	WMO Websites	Reference Wetland	Lake Level	Stream WQ	WOMP	Student Biomon	LRRWMO TAC	WMO Videos	Total
Revenues										
LRRWMO		420	1080	640	1685		790	8703	910	14228
State										
Anoka Conservation District	1600		2		128	1613	6	7056	593	10998
County Ag Preserves							178			178
Regional/Local						500				500
Other Service Fees					30					30
Local Water Planning			4	112			186			301
TOTAL	1600	420	1086	752	1843	2113	1159	15759	1503	26236
Expenses										
Capital Outlay/Equip	4	1	3	1	5	4	2	90		109
Personnel Salaries/Benefits	1368	223	945	658	763	1825	1000	13291	1356	21430
Overhead	117	20	73	49	977	156	68	1338	75	2872
Employee Training	4	1	6	4	3	5	8	35	13	78
Vehicle/Mileage	26	3	15	11	12	36	14	227	18	362
Rent	64	10	39	25	39	85	36	717	41	1056
Program Participants										
Program Supplies	16		6	5	44	2	32	61		167
Equipment Maintenance										
TOTAL	1600	259	1086	752	1843	2113	1159	15759	1503	26074

Recommendations

- **Consult the newly-completed LRRWMO 3rd Generation Watershed Management Plan** for guidance on priorities and tasks.
- **Repeat periodic tours of the Rum River by the LRRWMO Board.** These boat tours are useful for identifying problems and the overall condition of the resource.
- **Continue coordinating monitoring of the Rum River** with the neighboring Upper Rum River WMO and the Metropolitan Council, who runs a monitoring site at the Anoka Dam.
- **Continue monitoring Round Lake** water quality at least every other year to determine if poorer water quality recently is within this lake's natural variation, due to low water levels, or is indicative of new negative influences on the lake.
- **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.
- **Diagnose the cause of periodically low dissolved oxygen in Trott Brook.** Water quality and hydrology monitoring is planned for 2012.
- **Facilitate resident efforts to control aquatic plant growth on Rogers Lake** as a means to improving low dissolved oxygen problems. Treatments should occur in early spring, occur on no more than 15% of the lake, be coordinated, and proceed under DNR permits. In early 2010 a meeting for residents was held, interest expressed, but coordination and work needed by residents did not materialize.
- **Emphasize protection of Rum River water quality.** The river's water quality declines slightly in the LRRWMO and anticipated future development could cause further deterioration. Continued retrofitting existing stormwater treatment in built-up areas is recommended.
- **Continue the existing cost share grant program for water quality improvement projects** on private properties. This program should be actively promoted by identifying problems and contacting landowners.
- **Encourage public works departments to implement measures to minimize road deicing salt applications**. Monitoring and special investigations in the LRRWMO and elsewhere nearby have shown that road salts are a serious and widespread sources of stream degradation. A metro-wide chlorides TMDL study is underway that will provide additional guidance.
- **Promote groundwater conservation.** Water tables in the LRRWMO appear depressed due to regional over-pumping. Metropolitan Council models predict 3+ft drawdown of surface waters in certain areas by 2030, and 5+ft by 2050.

➢