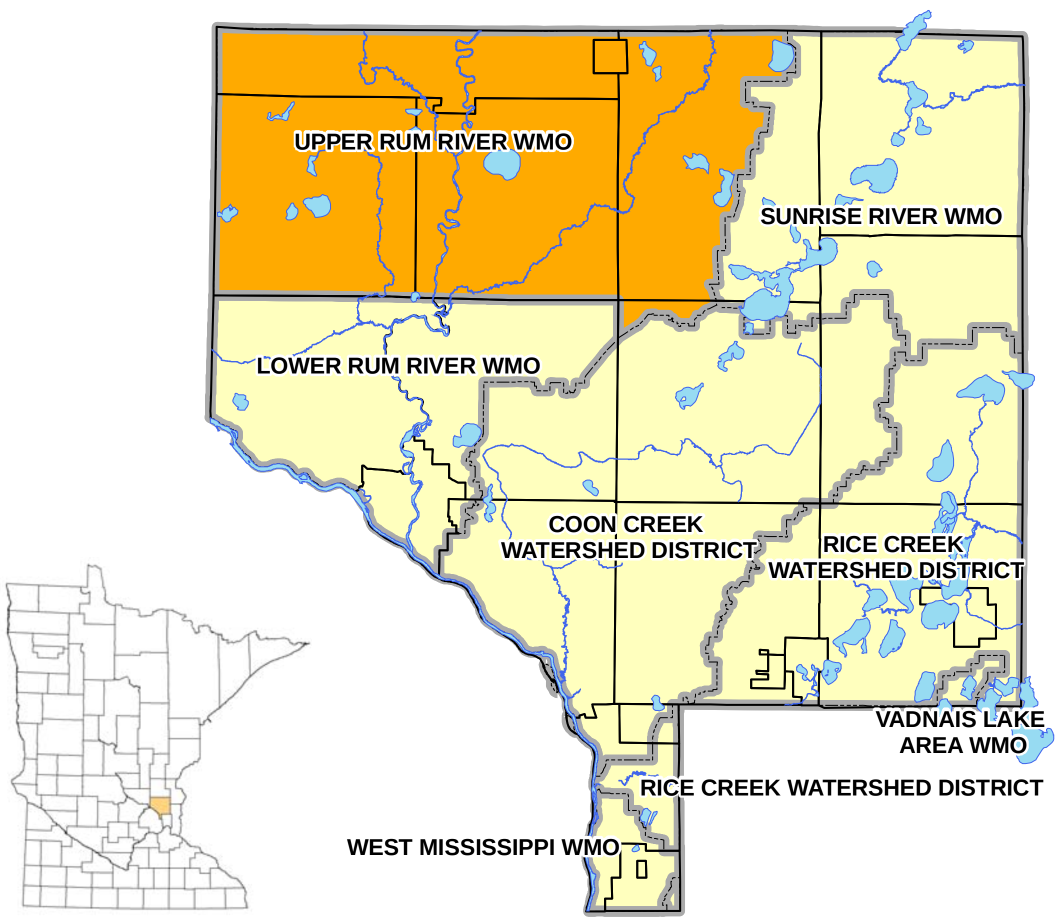
2016 Annual Report

Upper Rum River

Watershed Management Organization

Bethel - East Bethel – Ham Lake
Nowthen - Oak Grove – St. Francis



April 26, 2017

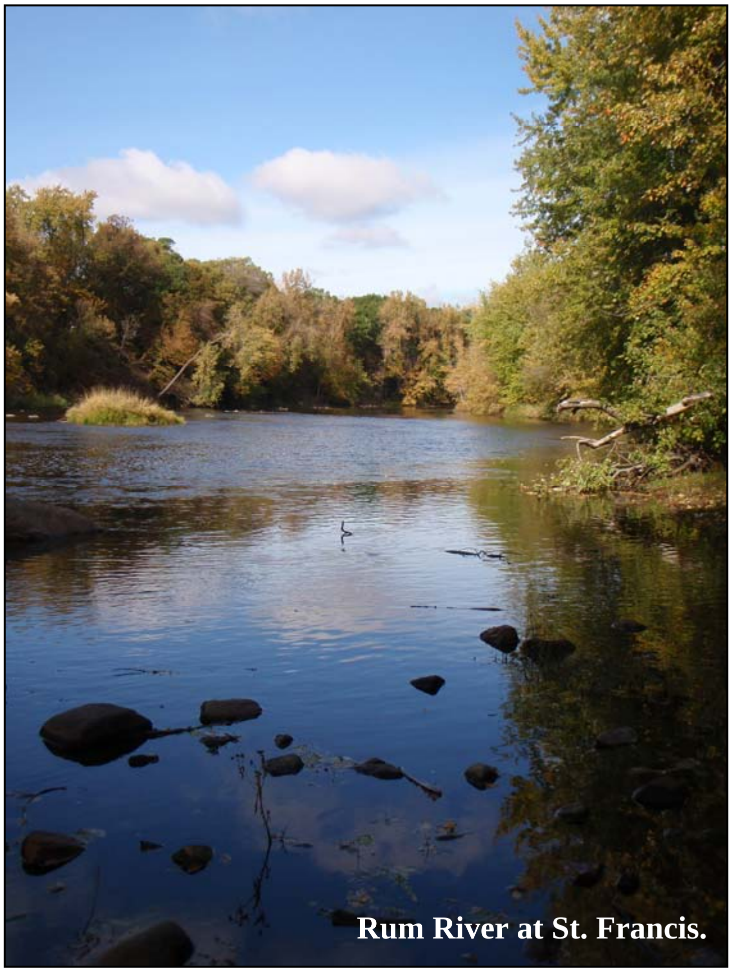
Table of Contents

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

I. Introduction

This report has been prepared to meet the annual watershed management organization reporting requirements of Minnesota Rules 8410.0150. The report is intended to fulfill 2016 reporting requirements.

The Upper Rum River Watershed Management Organization (URRWMO) is a joint powers organization under Minnesota Statutes, Section 471.59. It is comprised of the cities of Bethel, Oak Grove, Nowthen, and St. Francis, and portions of the cities of East Bethel and Ham Lake. Board members are appointed by the member cities. The organization's direction is laid out in its watershed management plan and the member municipalities' local water plans. The URRWMO meets every other month on the first Tuesday at 7pm at Oak Grove City Hall, Minnesota. In 2016-17 the URRWMO is undertaking an update of its 10-year Watershed Management Plan.



Rum River at St. Francis.

II. Activity Report

a. Current Board Members

CITY OF BETHEL

Todd Miller	Ann Arcand
PO Box 15	230 237th Ave NE
Bethel, MN 55005	Bethel, MN 55005
763.434.8331	
mayordude@outlook.com	anabelle1027@hotmail.com

CITY OF EAST BETHEL

Tom Ronning	Vacant
2241 221st Ave NE	
East Bethel, MN 55011	
763.772.4042	
tom.ronning@ci.east-bethel.mn.us	

CITY OF HAM LAKE

Kevin Armstrong	Scott Heaton
14333 Bataan ST NE	2247 147th Lane NE
Ham Lake, MN 55304	Ham Lake, MN 55304
763.757.5121	763.434.5440
kma.ok@me.com	scottmatthewheaton@gmail.com

CITY OF NOWTHEN

Malcolm Vinger II	Randy Bettinger
21070 Cleary Rd NW	5550 210th Ave NW
Nowthen, MN 55303	Nowthen, MN 55303
763.213.8031	763.753.4962
Malcolm.vinger@outlook.com	no email address available

CITY OF OAK GROVE

Dan Denno (Chair)	John West
20530 Sleepy Hollow Dr NW	
Cedar, MN 55011	
763.434.4729	612.414.3513
Dandenno1@gmail.com	john@ipssec.com

CITY OF ST. FRANCIS

Lan Tornes	Jerry Tveit
24244 Hummingbird St NW	23340 Cree St NW
St. Francis, MN 55070	St. Francis, MN 55070
763.213.0621	763.235.2313
lantornes@gmail.com	jtveit@stfrancismn.org

b. Day to Day Contact

The day to day contact persons for the URRWMO who can answer questions about the organization are:

Dan Denno, Chair
20530 Sleepy Hollow Dr NW
Cedar, MN 55011
763.434.4729
Dandenno1@gmail.com

Lan Tornes, Vice Chair
24244 Hummingbird Street NW
St. Francis, MN 55070
763-213-0621
lantornes@gmail.com

c. Employees and Consultants

The URRWMO does not employ staff, but does utilize consulting services and enters into cooperative agreements with other government agencies. A description of contracted services is listed below:

Consultant/Partner	Contact	Work Description
Anoka Conservation District	Jamie Schurbon Water Resource Specialist 1318 McKay Drive NW, #300 Ham Lake, MN 55304 763-434-2030 ext. 12 jamie.schurbon@anokaswcd.org	• Water quality and hydrological monitoring, and special studies. • Website maintenance. • Assistance preparing annual newsletter article. • Assistance preparing annual reports to BWSR. • Assistance reviewing local water plans.
Gail Gessner	Gail Gessner 4621 203rd Lane NW Oak Grove, MN 55303 763-753-2368 recordwmo@gmail.com	• Recording secretary for meetings. • Miscellaneous administrative assistance.
MSA Professional Services	Chuck Schwartz, PE Project Manager 612-548-3141 cschwartz@msa-ps.com	• Watershed plan update.

d. Solicitations for Services

Minnesota Statutes 103B.227 require watershed management organizations to solicit bids for professional services at least once every two years. No solicitation for professional services occurred in 2016. In 2015 the URRWMO solicited proposals for professional services to update the URRWMO Watershed Management Plan. Proposals were requested from each of the six member community’s consulting engineer, plus the Anoka Conservation District (ACD). Proposals were received from WSB and Associates, MSA Professional Services and ACD. Each firm was interviewed. MSA was selected.

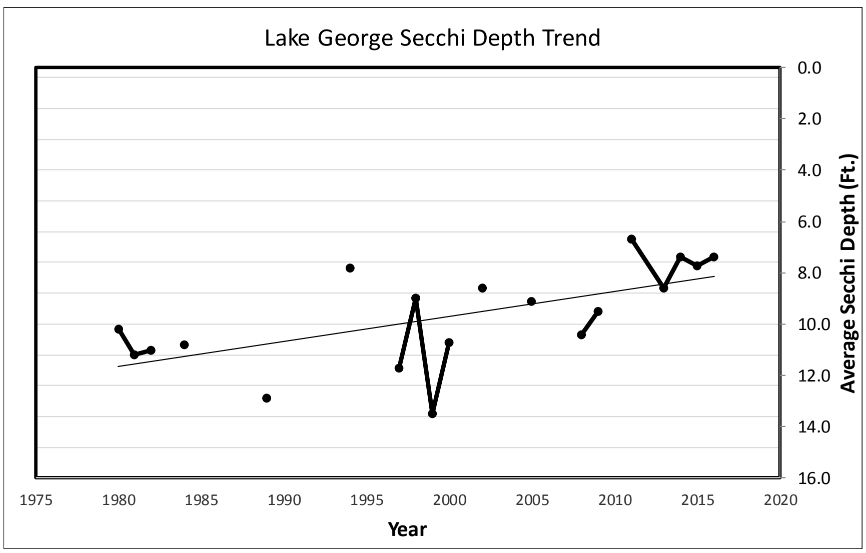
Quotes for financial audit services were also sought in 2015. Michael Pofahl was awarded a contract for performing an audit of 2014 finances.

e. Water Quality Trends

The URRWMO has a long term water quality monitoring program that includes most larger stream and recreational lakes in the watershed. Many waterbodies are monitored every 2-3 years. An important part of evaluating implementation of the watershed management plan is looking at water quality trends. Data for each waterbody monitored, and numerous parameters at each waterbody are provided in **Appendix B**.

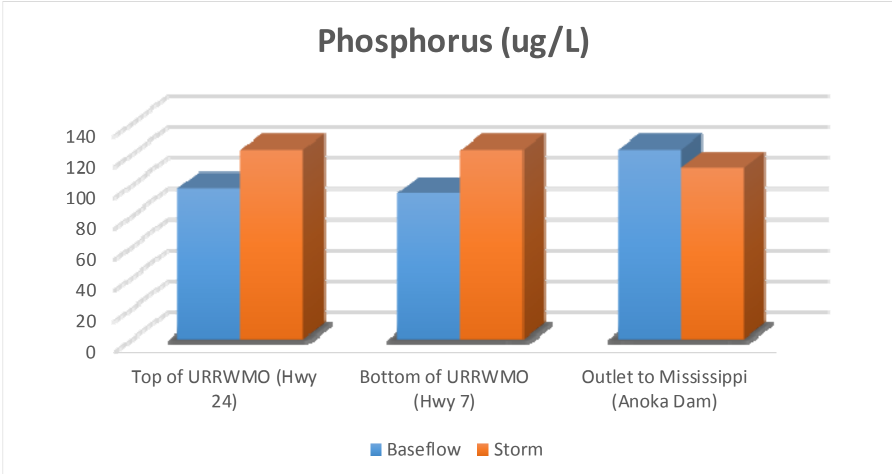
The only waterbody with a statistically significant water quality trend in the watershed is Lake George, which is experiencing a trend of reduced transparency. Detail of this trend analysis is contained in **Appendix B** and the Rum River Watershed Restoration and Protection Strategies Report (see MPCA website). While transparency is declining, trends are not apparent for phosphorus or chlorophyll-a.

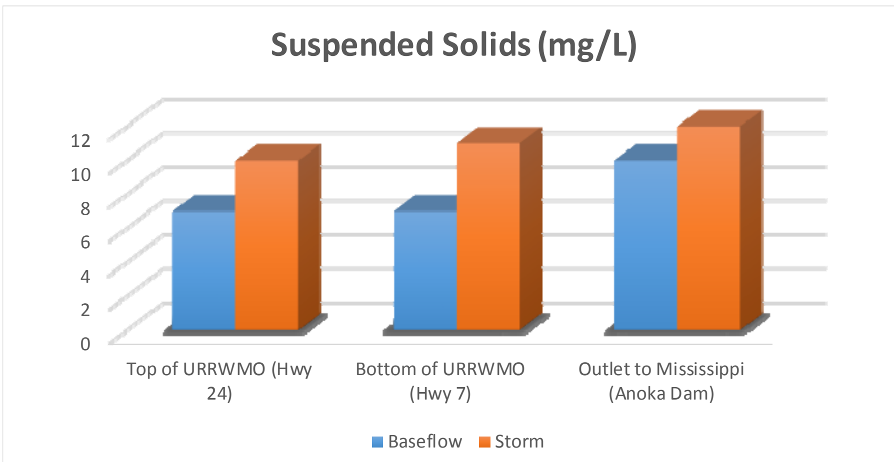
Lake George Secchi Transparency 1980-2016.



The URRWMO also is interested in how the River's water quality changes longitudinally, particularly within its jurisdictional boundary. The Rum River is monitored most years where it enters and exits the URRWMO. The figures below summarizes annual average phosphorus and suspended solids, and Appendix B provides additional detail and data for more parameters. Overall, water quality of the river changes little in the URRWMO.

Average total phosphorus and suspended solids for the Rum River 2004-2016.





Additional water quality data is available online. Annual watershed monitoring reports are available on the URRWMO website (www. URRWMO.org). All water quality data collected by the URRWMO is on the MN Pollution Control Agency's EQuIS database, which is accessible through their website.

f. Evaluation of Watershed Management Plan Implementation

The current URRWMO Watershed Management Plan was approved by the Minnesota Board of Water and Soil Resources (BWSR) in 2007 and expires in spring 2017. The plan contains goals, policies and a detailed water monitoring schedule. The table on the following page compares planned work to accomplished work. The table shows the most recent 3 years. For earlier years, please see previous annual reports, which are posted on www.URRWMO.org.

Comparison of work planned in the URRWMO Watershed Management Plan (including amendments) and work accomplished for the last 3 years. The work plan for 2017 is also shown.

Task	2014		2015		2016		2017	
	Planned	Accomplished	Planned	Accomplished	Planned	Accomplished	In Watershed Plan	Plan to Do
Monitoring								
Lake Levels	George, East Twin, Minard, and Cooper Lakes	George, East Twin, Minard, and Cooper Lakes	George, East Twin, Minard, and Cooper Lakes	George, East Twin, Minard, and Cooper Lakes	George, East Twin, Minard, and Cooper Lakes	George, East Twin, Minard, and Cooper Lakes	George, East Twin, Minard, and Cooper Lakes	George, East Twin, Minard, and Cooper Lakes
Lake Water Quality	Monitor Lake George because it exceeded URRWMO water quality standards.	Pickerel Lake monitored by MPCA WRAP. Lake George monitored by LID.	George, East Twin Lakes		Monitor Lake George because it exceeded URRWMO water quality standards.	Monitored by ACD and lake association	George, East Twin Lakes	George, East Twin Lakes
Stream Water Quality	Seeyle, Ford, Cedar, and 2 Rum R sites monitored by WMO	WMO planned monitoring being done plus Seelye Br, Cedar Cr and Rum R monitored by MPCA WRAP.	Rum R at CR24, Rum R at CR7, Seelye Br at CR7, Cedar Cr at CR9, Ford Br at CR63	Rum R at CR24, Rum R at CR7, Seelye Br at CR7, Cedar Cr at CR9, Ford Br at CR63	Rum R at CR24, Rum R at CR7, Seelye Br at CR7, Cedar Cr at CR9, Ford Br at CR63	Rum R at CR24, Rum R at CR7, Seelye Br at CR7, Cedar Cr at CR9, Ford Br at CR63	Rum R at CR24, Rum R at CR7, Seelye Br at CR7, Cedar Cr at CR9, Ford Br at CR63	Rum R at CR24, Rum R at CR7, Seelye Br at CR7, Cedar Cr at CR9, Ford Br at CR63
River Biomonitoring with St Francis High School classes	Rum River biomonitoring with St. Francis High School classes	Rum River biomonitoring with St. Francis High School classes	Rum River biomonitoring with St. Francis High School classes	Rum River biomonitoring with 4H	Biomonitoring with St. Francis High School classes	Biomonitoring with 4H club	Biomonitoring with St. Francis High School classes	Discontinued. Student groups not available.
Reference Wetland Hydrology	Lake George, E Twin, and Cedar reference wetlands	Lake George, E Twin, and Cedar reference wetlands	Lake George, E Twin, and Cedar reference wetlands	Lake George, E Twin, and Cedar reference wetlands	Lake George, E Twin, and Cedar reference wetlands	Lake George, E Twin, and Cedar reference wetlands	Lake George, E Twin, and Cedar reference wetlands	Lake George, E Twin, and Cedar reference wetlands
Other								
Water Quality Improvement								
Water Quality Improvement Cost Share Fund	$1,000	$0 (discontinued in 2013)	$1,000	$0	$1,000	$0	$1,000	$0
Public Education								
Website or Newsletter	Annual newsletter, Maintain and update website	Annual newsletter, Maintain and update website	Annual newsletter, Maintain and update website	Annual newsletter, Maintain and update website	Annual newsletter, Maintain and update website	Annual newsletter, Maintain and update website	Annual newsletter, Maintain and update website	Annual newsletter, Maintain and update website
Inventories and Studies								
Study groundwater levels, trends, water quality and capacity.						County geologic atlas phase II anticipated complete.		
Other								
Planning and Reporting								
Annual Report to BWSR	Write and submit	Write and submit	Write and submit	Write and submit	Write and submit	Write and submit	Write and submit	Write and submit
Annual Report to State Auditor		Write and submit		Write and submit		Write and submit		Write and submit
Review member cities' annual reports to the URRWMO	Review cities' reports	URRWMO Bd will do.	Review cities' reports	URRWMO Bd will do.	Review cities' reports	URRWMO Bd will do.	Review cities' reports	URRWMO Bd will do.
Review WMO Plan, including past work and upcoming budget	Review WMO Plan, work and budget	Will be done by WMO Board during annual reporting and annual mtg	Review WMO Plan, work and budget	Done by WMO Board during annual reporting and annual mtg	Review WMO Plan, work and budget as part of creating a new 10-year plan.	Done by WMO Board during preparation of the new watershed plan.	Review WMO Plan, work and budget as part of creating a new 10-year plan.	To be done by WMO Board during preparation of the new watershed plan.
Update Joint Powers Agreement								
Set aside matching funds for future grants	$1,000	$0	$1,000	$0	$1,000	$0	$1,000	$0
Rum River WRAP Planning						WMO consultant attended WRAP meetings		
WMO Watershed Plan Update					WMO Plan Update	Plan update ongoing	WMO Plan Update	WMO Plan Update

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g. Status of Local Ordinances, Plan Adoption and Implementation

All URRWMO member cities have local water plans which are consistent with the URRWMO Watershed Management Plan and have been approved by the URRWMO. All were updated in 2008 or 2009 for consistency with the URRWMO Plan, which was approved in 2007. These plans are now being implemented.

To track member cities' progress on local plan implementation, the URRWMO requires a brief annual report from each city and provides a template for this report. In addition to serving as a reporting tool, the template serves as a "to do" list for our cities. These reports are available upon request, and are summarized in the table below.

Status of city local water plans and some recent accomplishments toward plan implementation.

City of Bethel	
Submitted 2016 annual report to URRWMO?	No
Local Water Plan Status	Bethel's local water plan has been approved by the URRWMO and favorably reviewed by Metropolitan Council. The URRWMO approved the plan in February 2009.
Ordinances Status	The City lacks several ordinances or control measures required by the URRWMO including: an erosion and sediment control ordinance, stormwater ordinance, flood ordinance, a permit program for wetland excavations and guidelines for developers. The URRWMO has considered revisiting whether some of these requirements are not applicable to the City of Bethel because it is small and completely built out.
Some Recent Implementation Accomplishments	• In 2015 four storm drains were inspected. • 2015 educational efforts that reached 176 households on the topics of hazardous waste disposal, yard waste management and the activities of the URRWMO.

City of East Bethel	
Submitted 2016 annual report to URRWMO?	Yes
Local Water Plan Status	East Bethel's local water plan was approved by the URRWMO in 2010.
Ordinances Status	The city has all ordinances required by the URRWMO.
Some Recent Implementation Accomplishments	• Mapped all pipes 12" or bigger, outfalls and pollution control devices. • Equational efforts reaching 11,000 residents about water quality monitoring, groundwater protection, controlling invasive species, hazardous waste disposal, yard waste management, pet waste disposal and the URRWMO. • Street sweeping of all curb and gutter streets in spring, and then all neighborhoods adjacent to Coon Lake again in fall. • Ongoing work to complete BMP's in the City's Storm Water Pollution Prevention Plan. • Inventoried and classified 7 wetlands in 2016 as part of the development process, and applied appropriate wetland protection standards.

City of Ham Lake	
Submitted 2016 annual report to URRWMO?	Yes
Local Water Plan Status	Ham Lake's local water plan was approved by the URRWMO in December 2009.
Ordinances Status	The city has all ordinances required by the URRWMO.
Some Recent Implementation Accomplishments	• Routine inspection of land disturbance activities. • Street sweeping. • Ongoing work to complete BMP's in the City's Storm Water Pollution Prevention Plan. • Inspection of 20% of MS4 outfalls, sedimentation basins, and ponds each year on a rotating basis. Any cleaning or maintenance is based on the inspection reports. • Educational efforts through the City's newsletter, which reaches the entire population of 6,700 households and businesses. Educational article topics in 2016 included groundwater protection, water conservation, hazardous waste disposal, yard waste management, ag BMPs, pet waste disposal, and activities of the URRWMO.

City of St. Francis	
Submitted 2016 annual report to URRWMO?	Yes
Local Water Plan Status	The URRWMO approved the St. Francis local water plan on September 1, 2009.
Ordinances Status	The city has all ordinances required by the URRWMO except a shoreland ordinance. However it does have a special Rum River district with scenic river rules. As determined by the DNR, because the city has no lakes, a shoreland ordinance is not applicable.
Some Recent Implementation Accomplishments	• The City recently became subject to MS4 stormwater regulations, and in 2016 submitted part II of their MS4 permit to MPCA and is completing requirements associated with the permit schedule. • Inspecting construction projects weekly or after rain events >0.5 inches. • Swept all streets with improved surfaces (urban and rural) in spring and fall. • Educational efforts that reached 7,500 residents on the topics of groundwater protection, water conservation, yard waste management, pet waste disposal and hazardous waste disposal. • Routine removal of sediment from a Stormceptor treatment device on Rum River Blvd.

City of Nowthen	
Submitted 2016 annual report to URRWMO?	Yes
Local Water Plan Status	The URRWMO approved Nowthen's local water plan in May 2009.
Ordinances Status	The city has all ordinances required by the URRWMO.

Some Recent Implementation Accomplishments	• Swept streets in areas with curb and gutter and other priority areas, including Rogers Lake area, Quiet Meadows, Autumn Acres, East Twin Lakes Parking Lots, and Garnet Street. • Educational efforts to approximately 1,500 residents on topics of groundwater protection.
City of Oak Grove	
Submitted 2016 annual report to URRWMO?	Yes
Local Water Plan Status	Oak Grove's local water plan ahs been approved by the URRWMO. The City first submitted its local water plan to the URRWMO in early 2009. The URRWMO noted several deficiencies in a comment letter dated February 3, 2009. Revisions were made and the URRWMO approved the plan in May 2009. The Metropolitan Council favorably reviewed the plan (letter dated Sept. 9, 2009). The City has all of the ordinances required by the URRWMO Plan.
Ordinances Status	The city has all ordinances required by the URRWMO.
Some Recent Implementation Accomplishments	• Host two annual recycling events to promote recycling and prevent illegal dumping. • In 2016 inspected 26 outfalls and 16 stormwater ponds. • Educational efforts that reached 4,000 residents on the topics of septic system maintenance, groundwater protection, controlling invasive species, hazardous waste disposal, yard waste management and pest waste disposal.

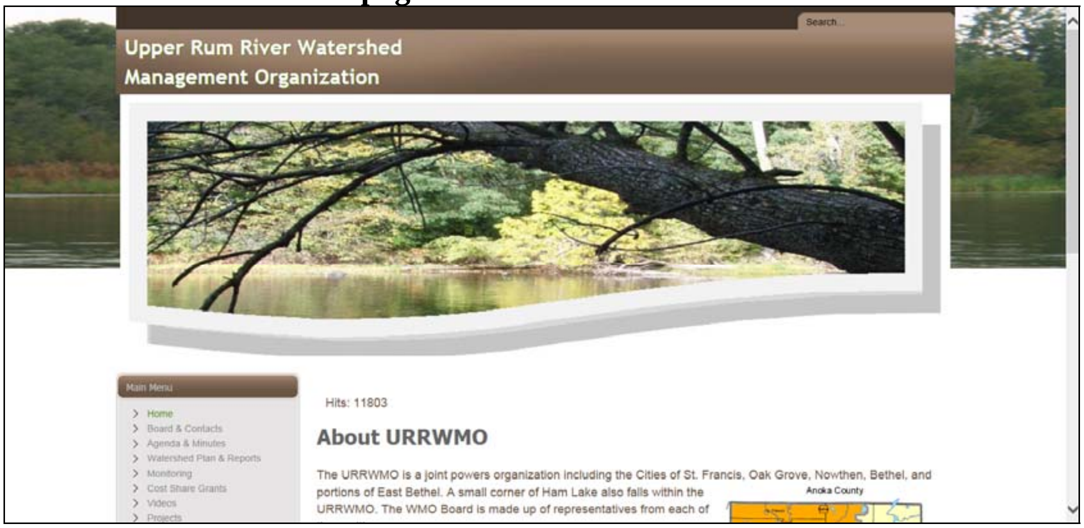
h. Public Outreach

The URRWMO and its member cities do occasional public outreach and education projects, but the URRWMO's website serves as the primary, continuous public outreach tool. Website contents include general information about the organization, the watershed management plan, meeting agendas and minutes, water monitoring results, profiles of WMO projects, access to mapping and data access tools, and others.

The URRWMO ensures visibility of its website by asking member cities and townships to post the URRWMO website address in their newsletters. Links to the URRWMO website are also provided through other websites including the Anoka Conservation District and member municipality websites.

The website address is http://www.urrwmo.org

URRWMO Website homepage



Additional public outreach is accomplished through annual newsletter articles. The articles are distributed to member communities for distribution in their newsletters. In 2016 the URRWMO's newsletter article highlighted the URRWMO's watershed plan update and Rum River WRAP project. It was printed in city newsletters. The text from that article is below.

2016 Newsletter Article

Rum River, Lakes Management Planning Underway

The Rum River, Lake George and Seelye Brook are a few of the waterbodies receiving new management plans in the coming months. Residents interested water quality, aquatic invasive species, flooding and environmental health are invited to contribute to the process. Both local and regional plans are taking shape.

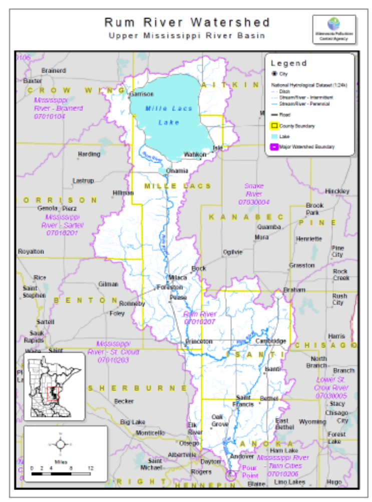
At the local level, the Upper Rum River Watershed Management Organization (URRWMO) is updating its 10-year management plan. The URRWMO was jointly formed by the cities of Bethel, East Bethel, Nowthen, St. Francis, Oak Grove and Ham Lake to manage water issues, including those that tend to flow across city boundaries. It sets consistent minimum regulatory standards across the cities, monitors water quality and may coordinate projects to address problems. The URRWMO will be considering its role relative to cities, as well as its participation in regional management.

At the regional level, the State is funding a Rum River Watershed Restoration and Protection Plan (WRAPP), which encompasses the watershed from Lake Mille Lacs to Anoka. Lakes and streams draining to the river are included. Each county's soil and water conservation district is serving as a key point of contact in this planning effort. The plan will include how to keep good water quality and address problems.

Lake George and the Rum River are likely to get substantial attention locally. Lake George is a regional attraction with good, but declining water quality. Addressing that decline is likely to be a priority. The Rum River has good water quality and is a state scenic and recreational river which many want to protect.

The URRWMO is planning an open house June 29 at 7pm at Oak Grove City Hall. Residents are invited to share their input on priorities for the next ten years. More information is at www.URRWMO.org.

The regional Rum River WRAPP will be holding several opportunities for input between now and the end of the year. Notices of these meetings and draft documents for public review will be posted www.AnokaSWCD.org under the "projects" tab, or contact Jamie Schurbon at 763-434-2030 ext. 12 or jamie.schurbon@anokaswcd.org.



i. Permits, Variances, and Enforcement Actions

The URRWMO does not issue permits, variances, or take enforcement actions. These responsibilities are held by the member municipalities.

j. 2017 Work Plan

Task	Purpose	Description	Locations or Action	Cost
Lake Level Monitoring	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.	Weekly water level monitoring in lakes by volunteers. All are available on the Minnesota DNR website using the “LakeFinder” feature (www.dnr.mn.us.state \lakefind\index.html).	East Twin Lake Lake George Cooper Lake Minard Lake	$1,200
Lake Water Quality Monitoring	To detect water quality trends and diagnose the cause of changes.	Monitoring occurs during the open water season and includes: total phosphorus, chlorophyll-a, secchi transparency, dissolved oxygen, turbidity, temperature, conductivity, and pH. 10 samples will be taken per lake at two week intervals.	East Twin Lake, Lake George	$3,500
Stream Water Quality Monitoring	To detect water quality trends and diagnose the cause of changes.	Monitoring occurs during the open water season and includes: total phosphorus, total suspended solids, transparency tube, dissolved oxygen, turbidity, temperature, conductivity, pH and stage. Four samples will be taken.	Rum R at CR 24 Rum R at CR7 Seelye Br at CR7 Cedar Cr at CR9 Ford Br at CR63	$4,200
Reference Wetland Hydrology Monitoring	The ACD maintains a network of 18 reference wetlands throughout the county. These data aid in understanding of water conditions in wetlands, surficial water table changes, and trends. It is useful for regulatory determinations (for example, is a dry area actually a wetland, or are all wetlands dry right now?) and resolving water level disputes. Each reference wetland has been monitored for more than 10 years, providing a long term record.	Install and maintain an electronic water level monitoring device at the edge of reference wetlands. These devices measure water levels every four hours. Data are made available at any time through the ACD website.	East Twin, Lake George, and Cedar Reference Wetlands	$1,950
URRWMO Website	To increase awareness of the URRWMO and its programs. The website also provides tools and information that helps users better understand water resources issues in the area. The website serves as the URRWMO’s alternative to a state-mandated newsletter.	Maintain and update the URRWMO website with current information about the organization, and meeting minutes and agendas. Web videos developed by the URRWMO are also featured on the website.	http://www.urrwmo.org	$505
URRWMO Annual Newsletter	To increase awareness of the URRWMO and its programs, as well as educate the public on water quality issues.	In order to achieve the greatest distribution at the lowest cost the URRWMO will draft a newsletter article and ask that member cities include it in their newsletters. It is also printed in the school district newspaper, “The Courier.”	Watershed-wide	$500

Task	Purpose	Description	Locations or Action	Cost
Prepare Annual Report to State Auditor	To provide transparency and accountability of organization operations.	Online reporting of WMO finances though the State Auditor's SAFES website.	Watershed-wide	$300
Prepare Annual Report to BWSR	To provide transparency and accountability of organization operations.	Produce an annual report of URRWMO activities and finances that satisfies Minnesota Rules 8410.0150.	Watershed-wide	$700
Watershed Plan Update	To update the URRWMO's required 10-year Watershed Management Plan, which expires in spring 2017.	The Watershed Management Plan is the URRWMO's guiding document. It includes goals, policies and actions the organization will take over a 10-year period.	Watershed-wide	$6,500

III. Financial and Audit Report

a. 2016 Financial Summary

See Appendix A – 2016 Financial Report.

b. Financial Audit

The URRWMO completed an audit of 2014 finances in 2015. No audit of 2016 is required per MN Statutes, section 6.756.

c. 2017 Budget

At its May 3, 2016 meeting the URRWMO Board approved a 2017 budget of $23,300. Details of that budget are below

		Bethel	East Bethel	Ham Lake	Nowthen	Oak Grove	St. Francis
WORK PLAN	**Cost**	**1.08%**	**24.21%**	**0.99%**	**23.66%**	**29.69%**	**20.37%**
Lake Level Monitoring - Lake George, East Twin Lake, Cooper Lake, Minard Lake	$1,000.00	$10.80	$242.10	$9.90	$236.60	$296.90	$203.70
Lake Water Quality Monitoring – Lake George, East Twin Lake	$3,500.00	$37.80	$847.35	$34.65	$828.10	$1,039.15	$712.95
Stream Water Quality Monitoring basic sites - Rum at CR24, Rum at CR7, Seelye Br at CR7, Cedar Cr at CR9, Ford Br at CR63	$4,200.00	$45.36	$1,016.82	$41.58	$993.72	$1,246.98	$855.54
St. Francis High School Rum River Biomonitoring	$825.00	$8.91	$199.73	$8.17	$195.20	$244.94	$168.05
Reference Wetland Hydrology Monitoring - East Twin reference wetland, Lake George reference wetland, Cedar reference wetland	$1,725.00	$18.63	$417.62	$17.08	$408.14	$512.15	$351.38
Website - Annual Operations (hosting $110, domain name $10, maintenance $250, post minutes x 6 $60, post agendas x 6 $60)	$508.00	$5.49	$122.99	$5.03	$120.19	$150.83	$103.48
URRWMO Annual Education Publication/Newsletter Article	$500.00	$5.40	$121.05	$4.95	$118.30	$148.45	$101.85
Matching Fund for Future Grants	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Water Quality Cost Share Grant Fund	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Annual Financial Report to State Auditor prepared by ACD	$300.00	$50.00	$50.00	$50.00	$50.00	$50.00	$50.00
Annual Report to BWSR prepared by ACD	$700.00	$116.67	$116.67	$116.67	$116.67	$116.67	$116.67
10-year Watershed Management Plan	$6,500	$70.20	$1,573.65	$64.35	$1,537.90	$1,929.85	$1,324.05
	$19,758.00	$369.25	$4,707.98	$352.37	$4,604.81	$5,735.92	$3,987.67

ADMINISTRATIVE EXPENSES (Split equally six ways)		**Bethel**	**East Bethel**	**Ham Lake**	**Nowthen**	**Oak Grove**	**St. Francis**
Copies & Postage	$25.00	$4.17	$4.17	$4.17	$4.17	$4.17	$4.17
Recording secretary	$1,217.00	$202.83	$202.83	$202.83	$202.83	$202.83	$202.83
Insurance-League of MN Cities insurance trust	$2,300.00	$383.33	$383.33	$383.33	$383.33	$383.33	$383.33
	$3,542.00	$590.33	$590.33	$590.33	$590.33	$590.33	$590.33
Budgeted Amount	**$23,300.00**	**$959.59**	**$5,298.31**	**$942.70**	**$5,195.14**	**$6,326.25**	**$4,578.00**

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Appendix A:

2016 Financial Report

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UPPER RUM RIVER WATERSHED MANAGEMENT ORGANIZATION

FINANCIAL REPORT
FOR YEAR ENDED DECEMBER 31, 2016

To the Chairperson, Dan Denno, of Upper Rum River Water Management Organization

The enclosed statement has been prepared after review of the organization's financial records for 2016. I have not audited the organization's records and do not express an opinion. The enclosed information fairly reflects the Upper Rum River WMO's financial position for the stated year.

March 30, 2017

Prepared by:
Jamie Schurbon, Anoka Conservation District
1318 McKay Drive NE, suite 300
Ham Lake, MN 55304
763-434-2030

UPPER RUM RIVER WATERSHED MANAGEMENT ORGANIZATION
9900 Nightingale Street NW
Oak Grove, MN 55011-9204

STATEMENT OF REVENUES AND EXPENSES

For: year beginning January 1, 2016 and Ending December 31, 2016

Expenditures	Amount
Administrative	
Insurance – League of MN Cities Insurance Trust	$ 2,275.00
Secretarial services - Gail Gessner	$ 1,600.00
Peoples Bank checking account service fee	$ 16.00
Auditor - Michael Pofahl	$ 600.00
Other	
SUBTOTAL	$ 4,491.00
Non-Administrative	
Water Monitoring - Anoka Conservation District (ACD)	$7,750.00
Website – ACD	$508.00
Annual report to BWSR – ACD	$700.00
Annual financial report to State Auditor - ACD	$300.00
URRWMO annual newsletter article – ACD	$500.00
MSA - WMO plan update	$22,530.91
ACD - WMO plan update	$798.00
Other	
SUBTOTAL	$33,086.91
GRAND TOTAL	**$ 37,577.91**
Revenues	**Amount**
City of Bethel	518.87
City of Nowthen	6,966.81
City of East Bethel	4,962.98
City of Ham Lake	1,014.12
City of Oak Grove	4,275.08
City of St. Francis	6,102.92
Other	$962.00
GRAND TOTAL	**24,802.78**
Retained Cash Reserves	**($12,775.13)**
Total Cash Reserves	**$818.56**

UPPER RUM RIVER WATERSHED MANAGEMENT ORGANIZATION

BALANCE SHEET

For the year beginning January 1, 2016 and ending December 31, 2016

Assets	
Cash	$818.56
Accounts Receivable	$0.00
Water quality project grant fund held at the Anoka Conservation District	$0.00
Other	$0.00
Total Assets	$818.56

Liabilities	
Accounts Payable	$0.00
Other	$0.00
Other	$0.00
Other	$0.00
Total Liabilities	$0.00

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Appendix B:

2016 Water Monitoring and Management Work Results

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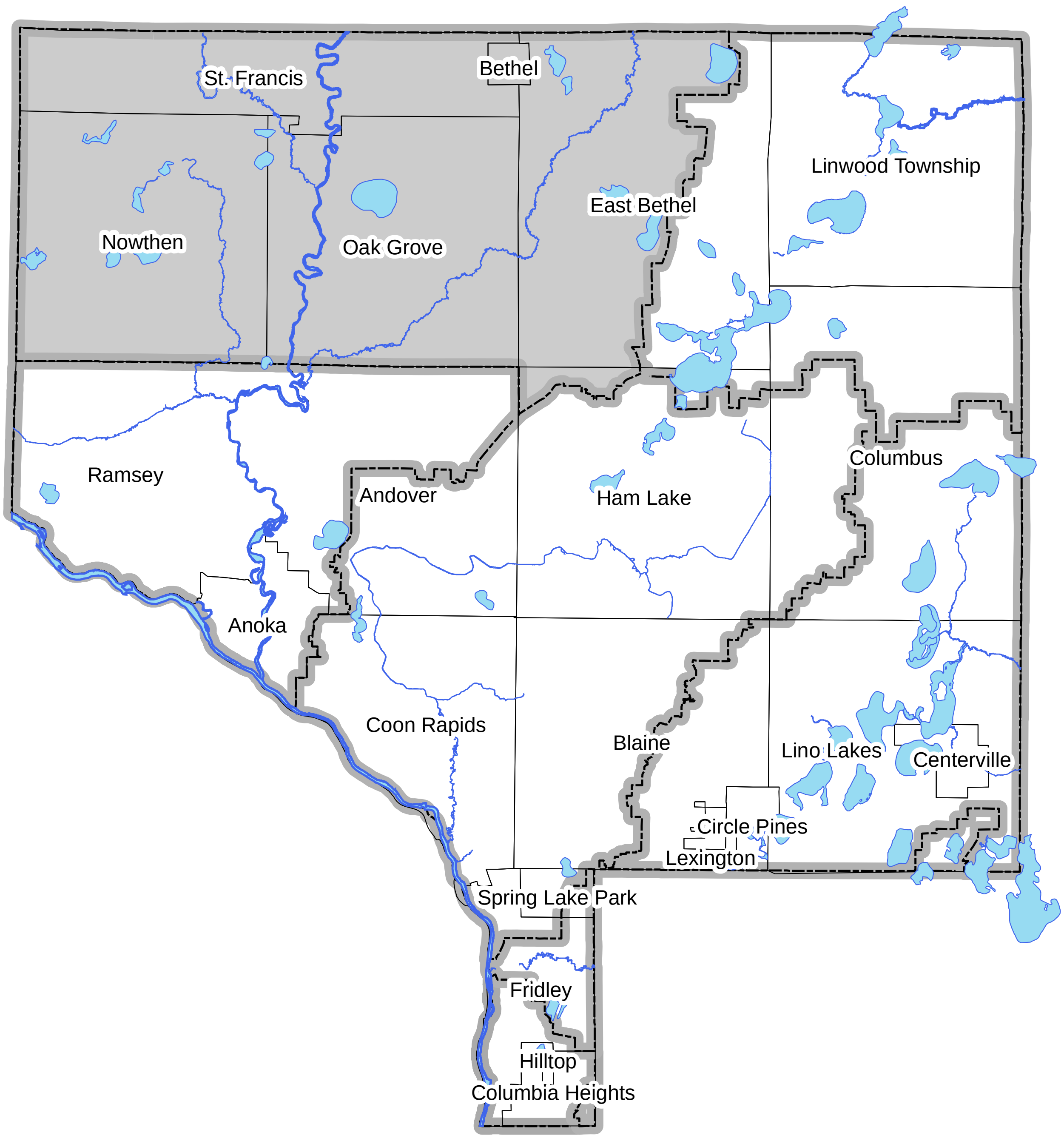
Excerpt from the
2016 Anoka Water Almanac

Chapter 3: Upper Rum River Watershed

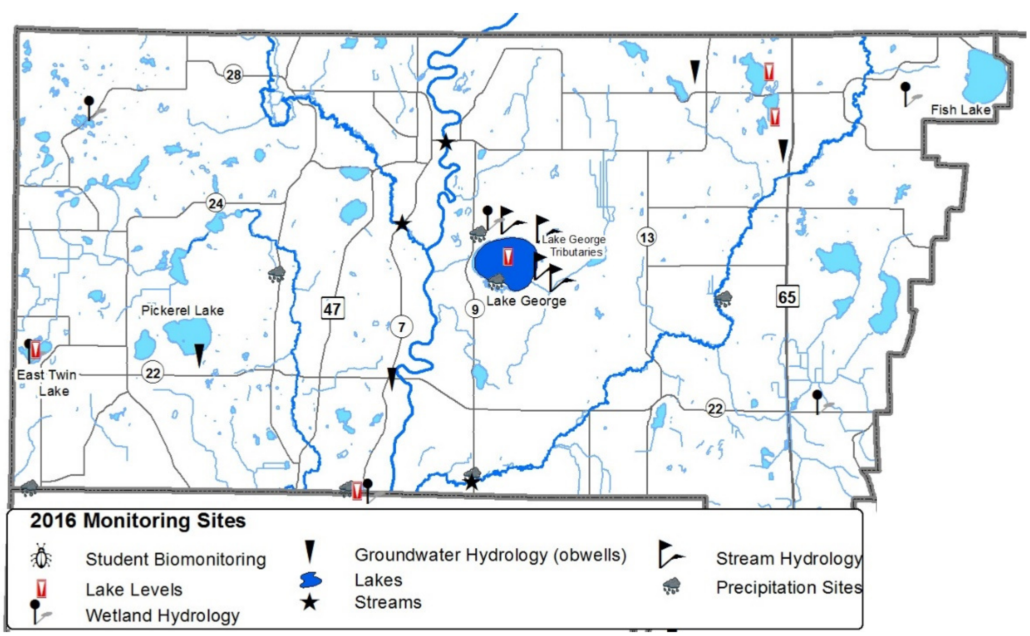


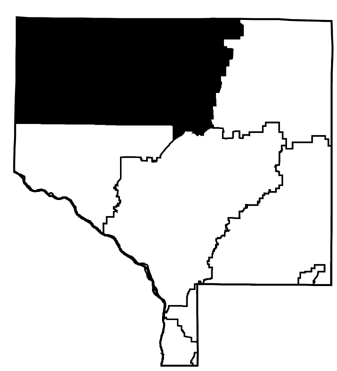
Prepared by the Anoka Conservation District

CHAPTER 3:
UPPER RUM RIVER WATERSHED

Task	Partners	Page
Lake Level Monitoring	URRWMO, ACD, MN DNR, volunteers	3-70
Lake Water Quality Monitoring	ACD, Lake George LID	3-72
Aquatic Invasive Vegetation Mapping	Lake George LID, ACD, DNR	3-76
Stream Water Quality – Chemical Monitoring	MPCA, ACD	3-78
Wetland Hydrology	URRWMO, ACD	3-102
Lake George Stormwater Retrofit Analysis	Lake George LID, ACD	3-108
St. Francis Stormwater Retrofit Analysis	City of St. Francis, MPCA, ACD	3-114
Water Quality Grant Fund	URRWMO, ACD	3-116
URRWMO Website	URRWMO, ACD	3-117
URRWMO Annual Newsletter	URRWMO, ACD	3-118
2014 Annual Reports to the State	URRWMO, ACD	3-119
Financial Summary		3-120
Recommendations		3-121
Groundwater Hydrology (obwells)	ACD, MNDNR	Chapter 1
Precipitation	ACD, volunteers	Chapter 1

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





Lake Levels

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

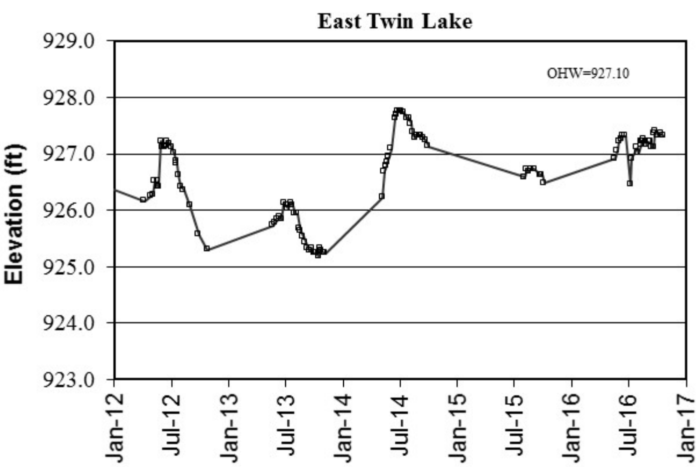
Purpose: To understand lake hydrology, including the impact of climate or other water budget changes. These data are useful for regulatory, building/development, and lake management decisions.

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

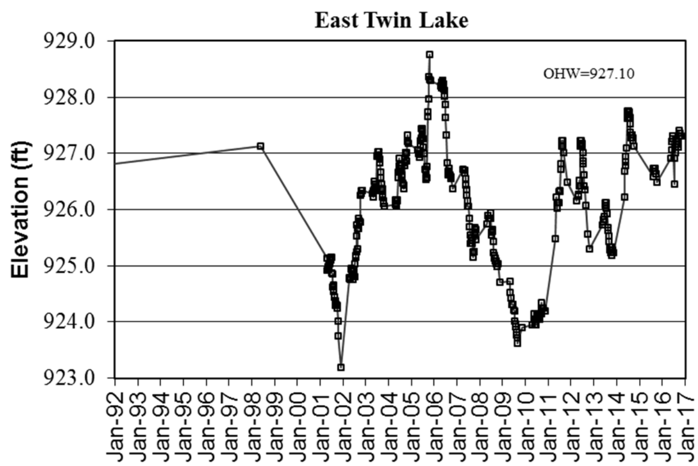
Results: Lake levels were measured by volunteers throughout the 2016 open water season. Lake gauges were installed and surveyed by the Anoka Conservation District and MN DNR. Lakes had increasing water levels in spring and early summer and dropped steadily by mid-summer. A resurgence of rainfall late into fall caused a spike in lake levels at the end of the year. Overall lake levels were lower than in 2014 when very heavy rainfall totals occurred.

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

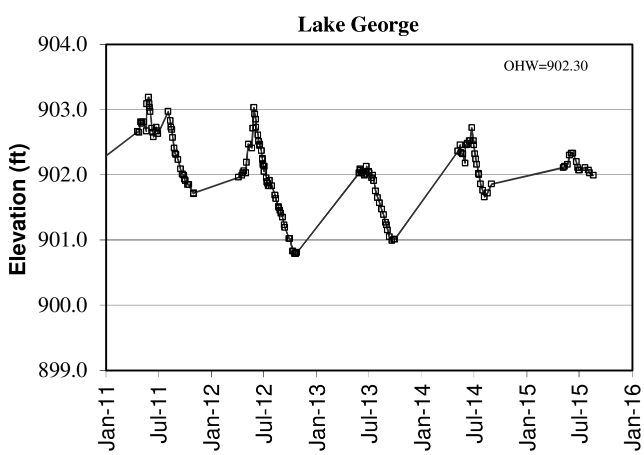
East Twin Lake Levels – last 5 years



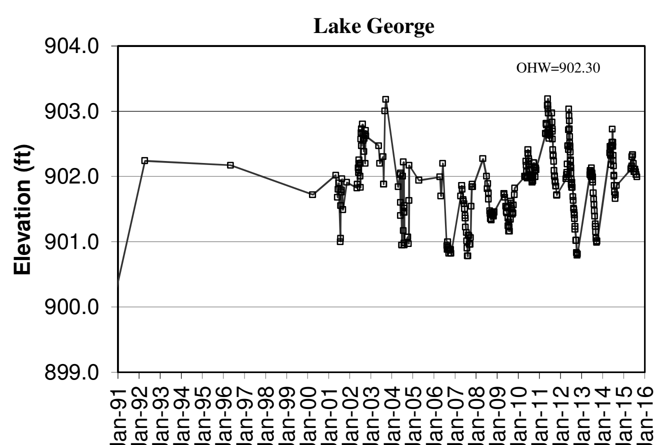
East Twin Lake Levels – last 25 years



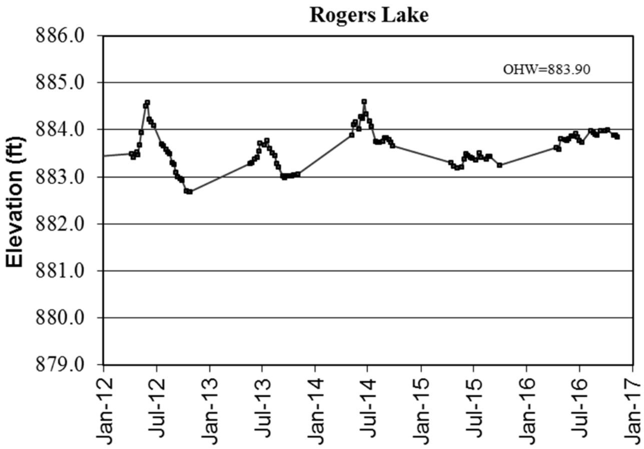
***Lake George Levels – last 5 years**



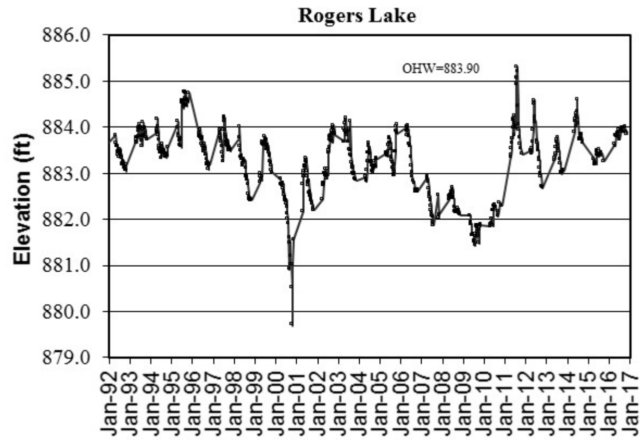
Lake George Levels – last 25 years



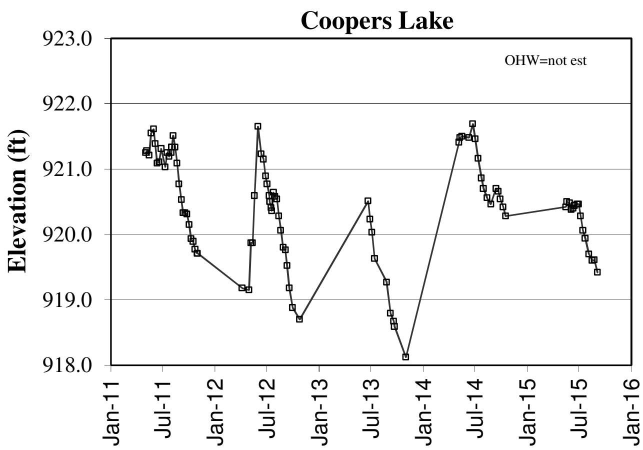
Rogers Lake Levels – last 5 years



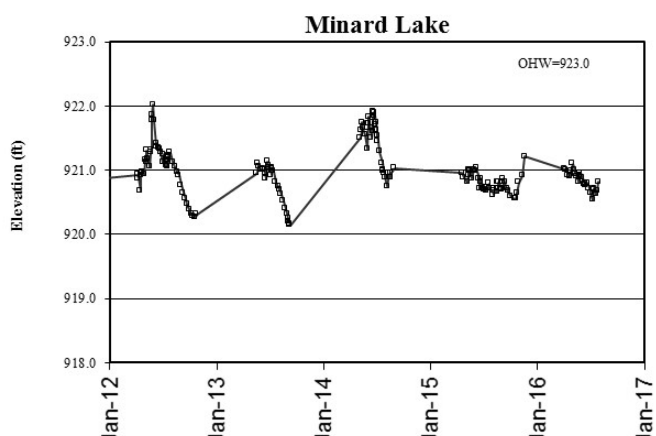
Rogers Lake Levels – last 25 years



***Coopers Lake Levels – last 5 years**



Minard Lake Levels – last 5 years



*2016 lake level readings were not received from Lake George or Coopers Lake volunteers.

Lake Water Quality

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

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

Locations: Lake George

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

Upper Rum River Watershed Lake Water Quality Monitoring Sites

Lake George

CITY OF OAK GROVE, LAKE ID # 02-0091

Background

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

2016 Results

In 2016 Lake George had good water quality for this region of the state (NCHF Ecoregion), receiving an overall A grade. The lake is mesotrophic. Total phosphorus averaged 28.4 ug/L, higher than the previous two years. Secchi transparency was as high as 15 feet in May, but dropped to as low as 3.9 feet in early August. Average Secchi transparency was 7.4 feet, slightly down from 2015. Chlorophyll-a averaged 7.8 mg/L, which is higher than the last three years monitored. Total phosphorous, chlorophyll-a, and transparency were poorest in August. All three parameters conformed to state water quality standards for non-shallow lakes in this region (40 ug/L TP, 14 ug/L Cl-a, and >1.4m Secchi transparency).

Trend Analysis

Nineteen years of water quality data have been collected by the Metropolitan Council (between 1980 and 2009) and the Anoka Conservation District (1997, 1999, 2000, 2002, 2005, 2008, 2011, 2013, 2014, 2015 and 2016). During this period there is a statistically significant trend of declining Secchi transparency (one-way ANOVA $F_{1,17}$= 10.75, p=<0.05). The Rum River Watershed Restoration and Protection Strategy (WRAPS) report, being finalized in 2017, also found "strong evidence" of declining water clarity using a Kendall-Mann statistical analysis. However, an Anoka Conservation District broader analysis of water quality that simultaneously considers TP, Cl-a and Secchi transparency did not find a statistically significant trend (repeated measures MANOVA with response variables TP, Cl-a, and Secchi depth, $F_{2,16}$= 1.54, p=0.24).

Discussion

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

Additional concern for Lake George is noted in the 2017 Rum River Watershed Fish-Based Lake IBI Stressor Identification Report. That report found Lake George's fish community was not impaired, but was of special concern and vulnerable. Lack of aquatic habitat and near-shore development disturbances were concerns.

In 2016 the ACD began monitoring and data collection for an in depth study funded by the Lake George Improvement District and State Clean Water Fund. The study is aiming to identify causes of water quality degradation and projects that can be installed to fix it. The work will take 1-3 years.

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

Two exotic invasive plants are present in Lake George, Curly leaf pondweed and Eurasian Water milfoil. The Lake George Improvement District was formed to control these plants, and multiple years of localized treatments have occurred. Concern has been voiced that plant treatments may have a negative impact on water quality. In 2013, water quality monitoring showed a dramatic rise in phosphorus shortly after curly leaf pondweed treatment, and it was suspected that the herbicide treatment may have caused the phosphorus increase. In the three years since, water quality data was collected immediately before and after herbicide treatment to determine if this was the case. No obvious causal relationship between weed treatment and water quality was observed.

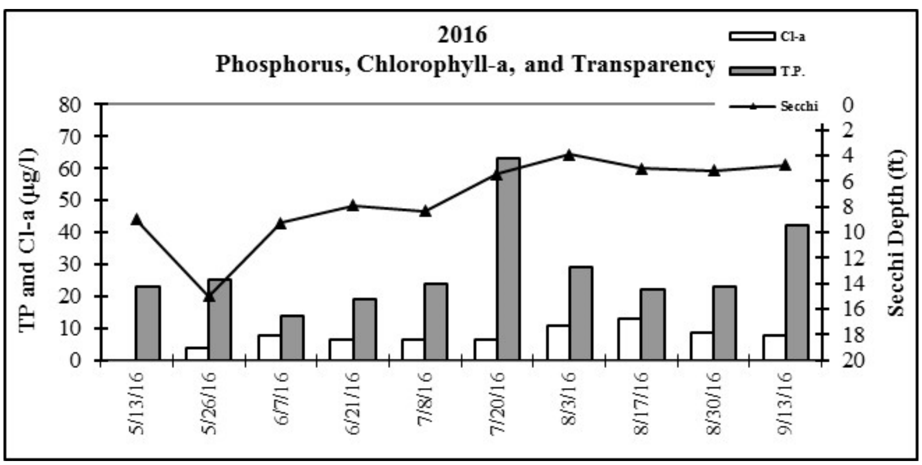
2016 Lake George Water Quality Data

Lake George
2016 Water Quality Data

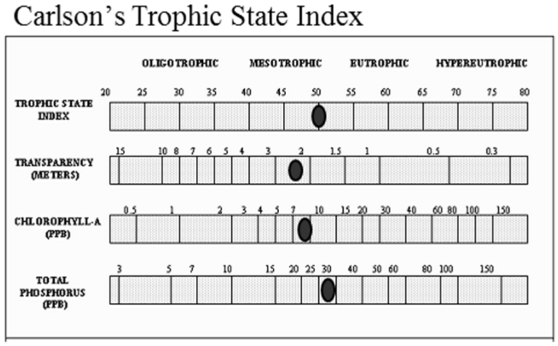
		Date:	5/13/2016	5/26/2016	6/7/2016	6/21/2016	7/8/2016	7/20/2016	8/3/2016	8/17/2016	8/30/2016	9/13/2016			
		Time:	12:20	11:00	13:20	11:30	11:05	10:50	12:20	10:20	11:30	10:30			
	Units	R.L.*	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Average	Min	Max
pH		0.1	8.38	8.69	8.24	8.07	8.33	8.85	9.25	9.03	8.26	7.94	8.50	7.94	9.25
Conductivity	mS/cm	0.01	0.246	0.262	0.271	0.240	0.251	0.250	0.233	0.255	0.246	0.230	0.248	0.230	0.271
Turbidity	FNRU	1	11.30	0.80	1.60	3.40	17.90		6.30	4.80	14.80	16.50	9	1	18
D.O.	mg/l	0.01	10.04	10.15	9.29	8.33	9.26	9.31	9.25	8.54	8.17	8.22	9.06	8.17	10.15
D.O.	%	1	101%	117%	104%	102%	119%	118%	141%	108%	99%	93%	110%	93%	141%
Temp.	°C	0.1	14.6	21.0	19.8	24.1	25.0	25.9	27.3	25.7	23.6	21.1	22.8	14.6	27.3
Temp.	°F	0.1	58.3	69.7	67.6	75.4	77.0	78.7	81.2	78.3	74.4	70.0	73.1	58.3	81.2
Salinity	%	0.01	0.12	0.12	0.13	0.12	0.12	0.12	0.12	0.12	0.12	0.11	0.12	0.11	0.13
Cl-a	ug/L	0.5	<1	3.6	7.8	6.4	6.4	6.4	10.7	12.8	8.5	7.8	7.8	3.6	12.8
T.P.	mg/l	0.010	0.023	0.025	0.014	0.019	0.024	0.063	0.029	0.022	0.023	0.042	0.028	0.014	0.063
T.P.	ug/l	10	23	25	14	19	24	63	29	22	23	42	28.4	14	63
Secchi	ft		9.0	15.0	9.3	7.9	8.3	5.4	3.9	5.0	5.2	4.8	7.4	3.9	15.0
Secchi	m		2.7	4.6	2.8	2.4	2.5	1.7	1.2	1.5	1.6	1.4	2.25	1.2	4.6
Field Observations			Moderately	Clear, light	Clear, light green, algae		Moderately c	Fairly murky	Green	light green, fa	Fairly clear,	Fairly clear, green tinge			
Physical			2.0	2.0	2.0	2.0	2.0	3.0	2.0	2.0	1.0	1.0	1.9	1.0	3.0
Recreational			2.0	2.0	2.0	2.0	2.0	3.0	2.0	1.0	1.0	1.0	1.8	1.0	3.0

*reporting limit

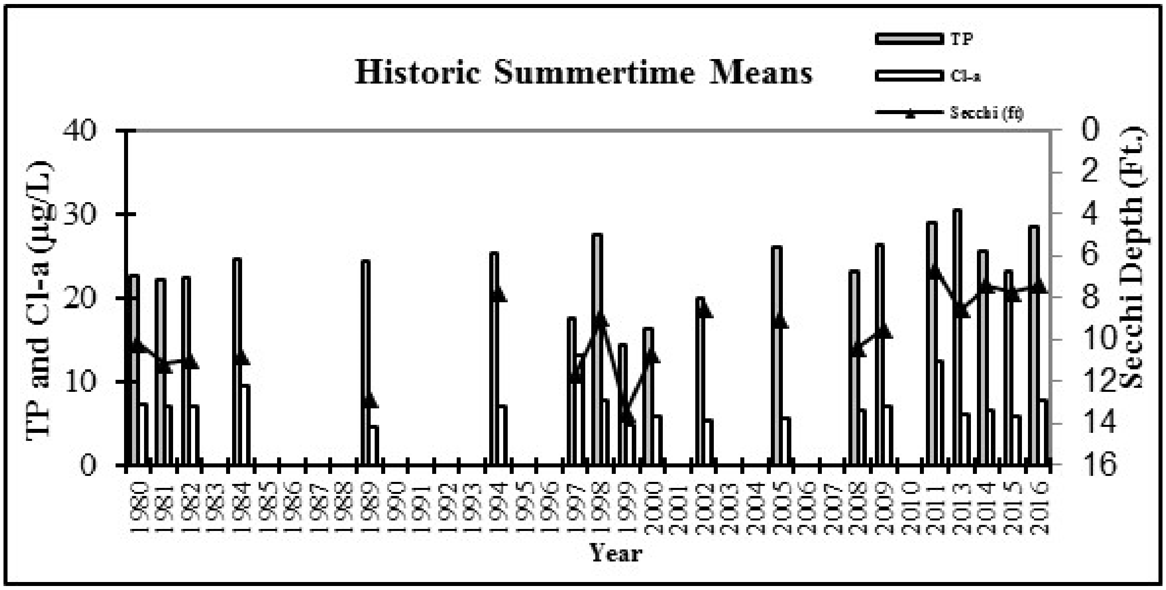
		2016 Median
pH		8.36
Conductivit	mS/cm	0.248
Turbidity	FNRU	4.80
D.O.	mg/l	8.78
D.O.	%	104.00%
Temp.	°C	23.00
Temp.	°F	73.33
Salinity	%	0.11
Cl-a	ug/L	3.60
T.P.	mg/l	0.024
T.P.	ug/l	24.00
Secchi	ft	6.70
Secchi	m	2.03



Carlson's Trophic State Index



Historical Lake George Water Quality Data



Lake George Summertime Annual Means

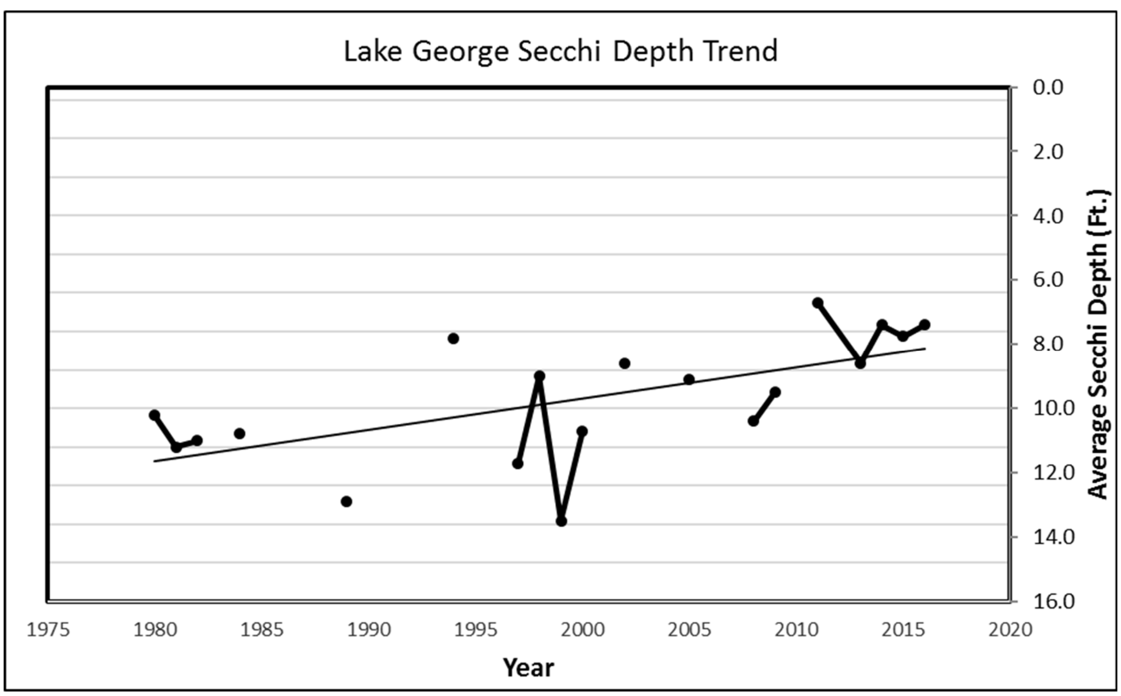
Agency	MC	MC	MC	MC	MC	MC	ACD	MC	ACD	ACD	ACD	ACD	ACD	MC	MC	ACD	ACD	ACD	ACD
Year	1980	1981	1982	1984	1989	1994	1997	1998	1999	2000	2002	2005	2008	2009	2011	2013	2014	2015	2016
TP	22.5	22.0	22.3	24.4	24.3	25.4	17.4	27.5	14.2	16.3	19.9	26.0	23.0	26.2	29.0	30.3	25.5	23.1	28.4
Cl-a	7.3	7.1	7.0	9.5	4.5	6.9	13.2	7.8	4.8	5.8	5.2	5.4	6.4	7.0	12.4	6.1	6.4	5.7	7.8
Secchi (m)	3.1	3.4	3.4	3.3	3.9	2.4	3.6	2.7	4.1	2.8	2.6	2.8	3.2	2.9	1.8	2.6	2.2	2.4	2.3
Secchi (ft)	10.2	11.2	11.0	10.8	12.9	7.8	11.7	9.0	13.5	10.7	8.6	9.1	10.4	9.5	6.7	8.6	7.4	7.7	7.4

Carlson's Trophic State Indices

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

Lake George Water Quality Report Card

Year	80	81	82	84	89	94	97	98	99	2000	2002	2005	2008	2009	2011	2013	2014	2015	2016
TP	A	A	A	B	B	B	A	B	A	A	A	B	B+	B	B	B	B	A	B
Cl-a	A	A	A	A	A	A	B	A	A	A	A	A	A	A	B	A	A	A	A
Secchi	A	A	A	A	A	B	A	B	A	B	B	B	A	B	C	B	B	B	A
Overall	**A**	**A**	**A**	**A**	**A**	**B**	**A**	**B**	**A**	**A**	**A**	**B**	**A**	**B**	**B**	**B**	**B**	**A**	**A**



Aquatic Invasive Vegetation Mapping

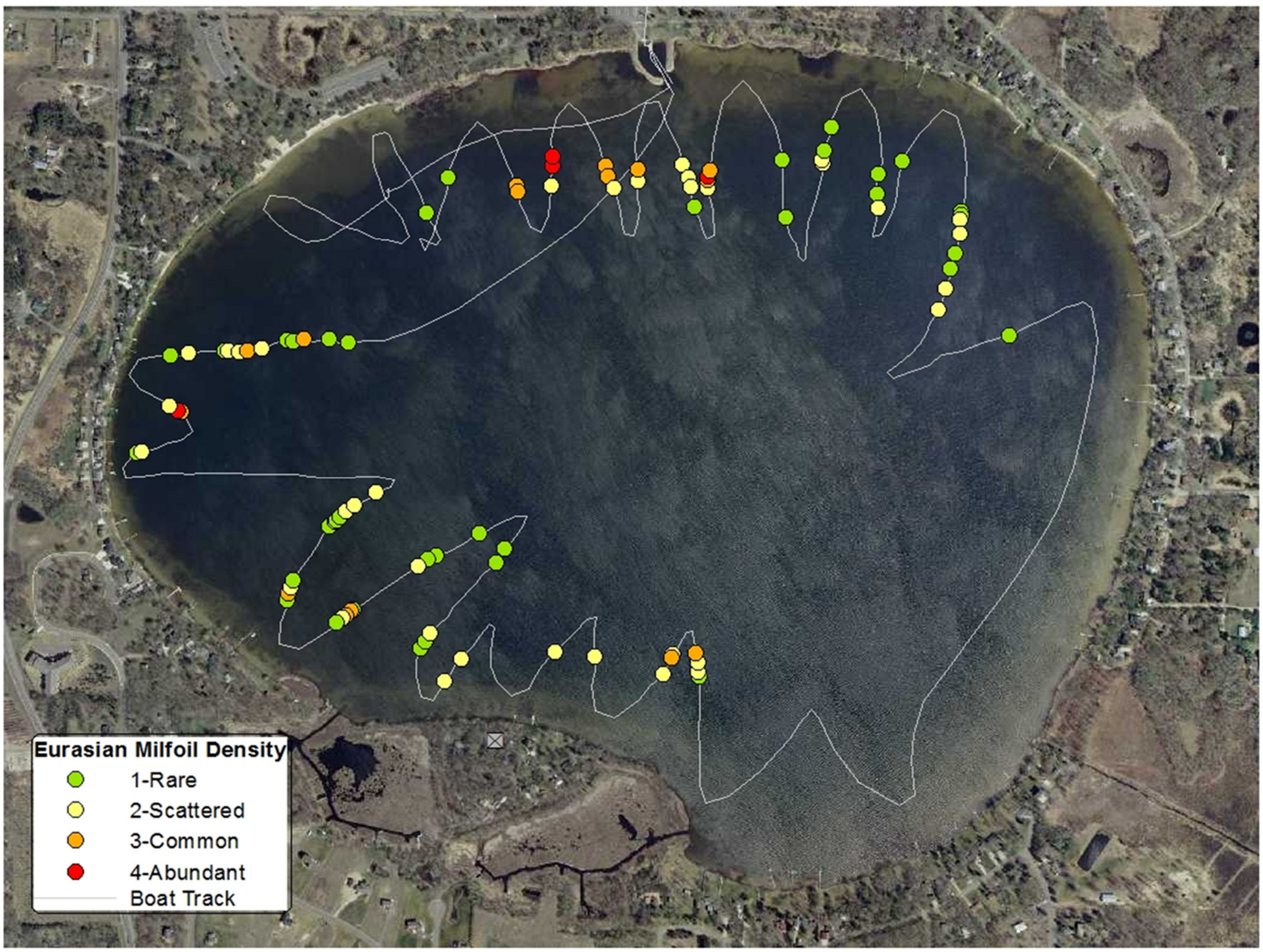
Description: The Anoka Conservation District (ACD) was contracted by the Lake George Lake Improvement District (LID) to conduct an aquatic invasive vegetation delineation.

Purpose: To map out the presence of Curly Leaf Pondweed (CLP) and Eurasian Water Milfoil (EWM) as required for MN DNR herbicide treatment permits. In particular, a goal was to map these invasive species as early as possible in the growing season to allow for herbicide treatment as early as possible. There is concern that plant die-offs associated with later herbicide applications, when plants are larger, may negatively affect water quality.

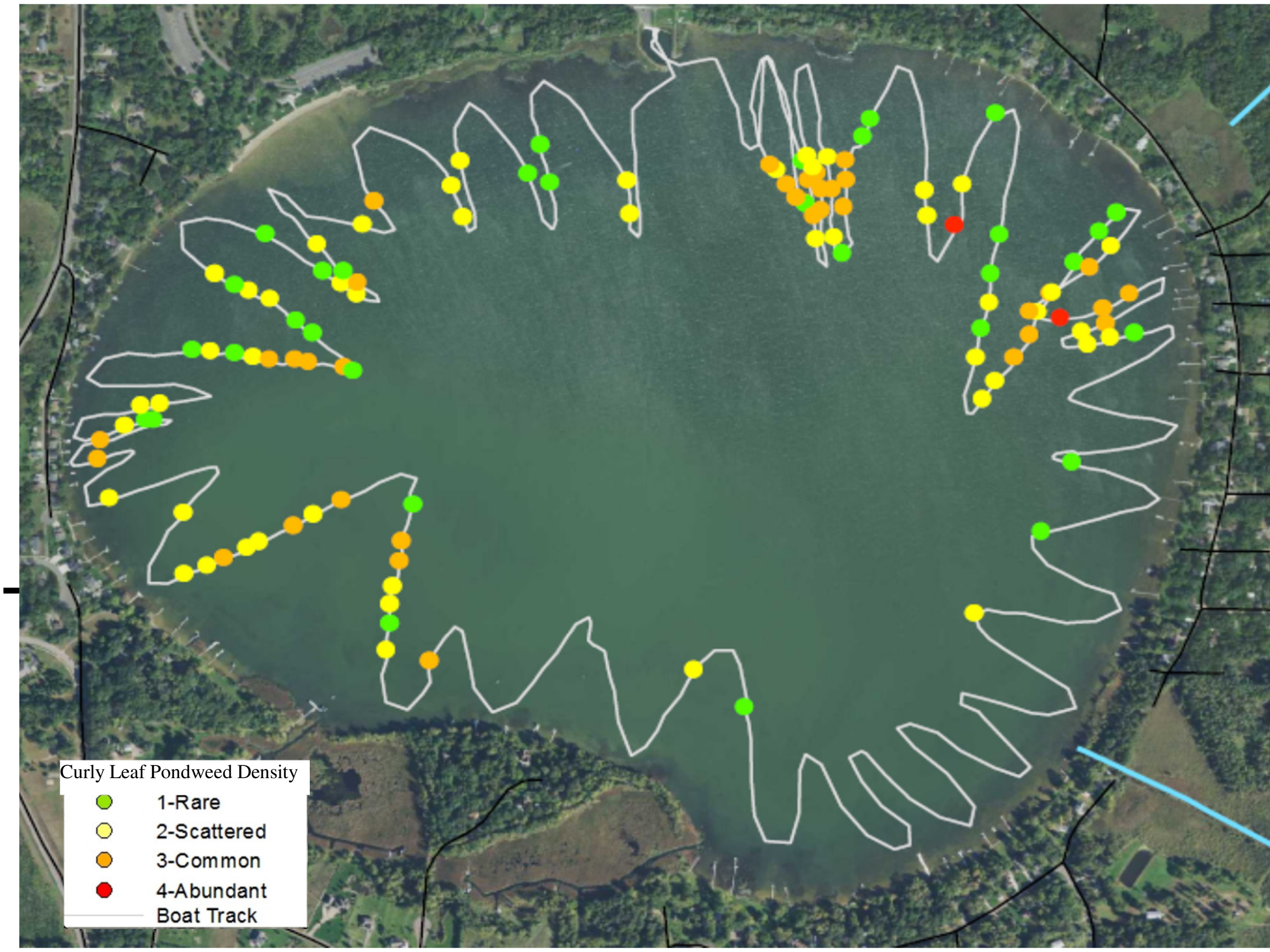
Locations: Lake George

Results: A map is presented below and were delivered to the MN DNR and Lake George Improvement District within 48 hours of the field surveys. These survey points were reviewed by the MNDNR and herbicide treatments occurred in areas with the greatest density of invasive plants.

2016 Lake George Eurasian Water Milfoil (EWM) Survey



2016 Lake George Curly Leaf Pondweed (CLP) survey



Stream Water Quality - Chemical Monitoring

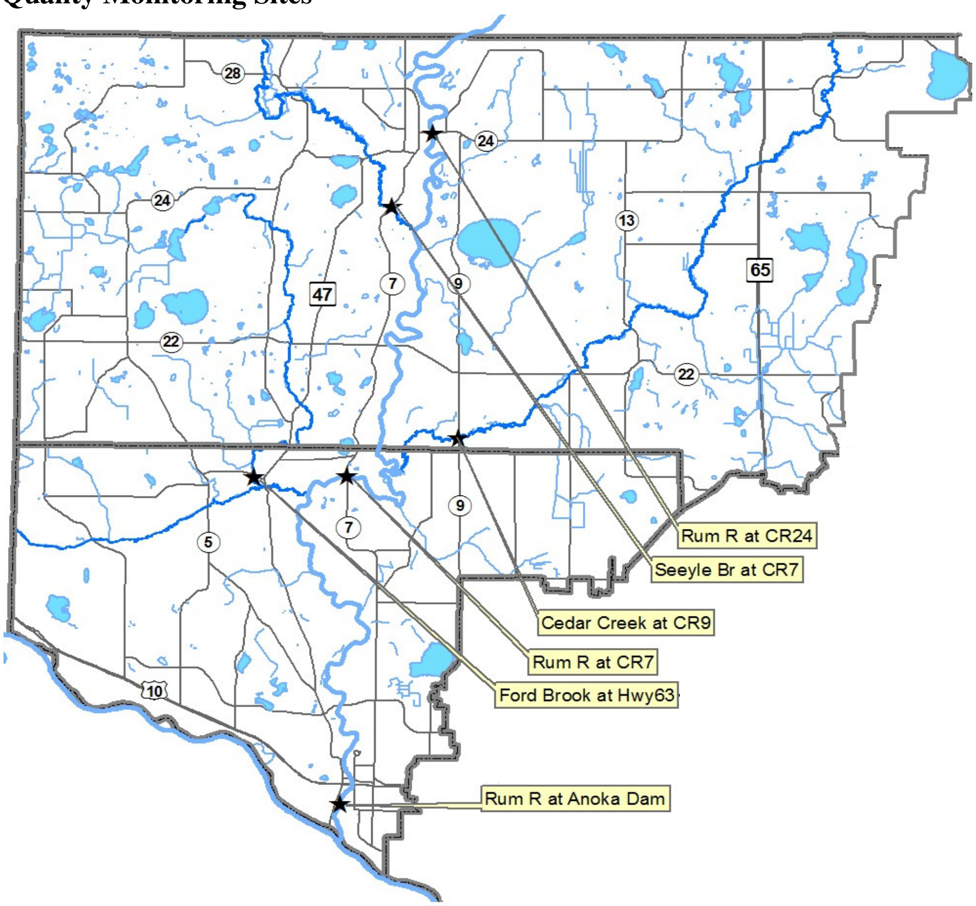
Description: The Rum River and several tributary streams were monitored in 2016. The locations of river monitoring include the approximate top and bottom of the Upper and Lower Rum River Watershed Management Organizations. Tributaries were monitored simultaneously with Rum River monitoring for greatest comparability near their outfalls into the river. Collectively, these data allow for an upstream to downstream water quality comparison within Anoka County, as well as within each watershed organization. It also allows us to examine whether the tributaries degrade Rum River water quality. Monitoring occurred in May through September for each of the following parameters: total suspended solids, total phosphorus, Secchi tube transparency, dissolved oxygen, turbidity, temperature, conductivity, pH, and salinity.

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

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

Results: Results are presented on the following pages.

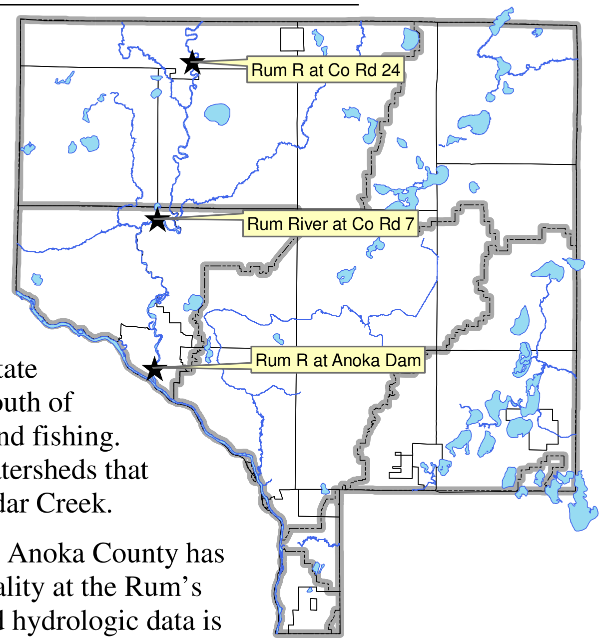
Upper and Lower Rum River Watershed Management Organization
Stream Water Quality Monitoring Sites



RUM RIVER

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

*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 Summary

This report includes data from 2016. The following is a summary of results.

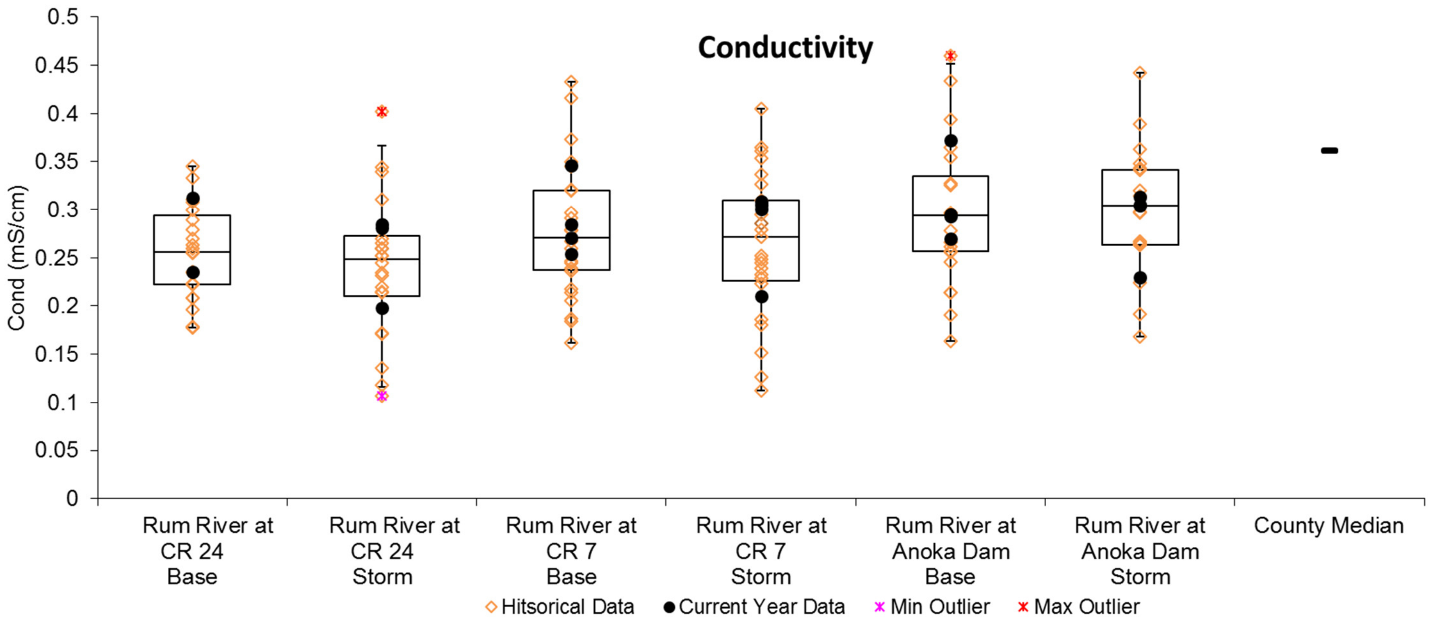
- Dissolved constituents, as measured by conductivity and chlorides. Conductivity results in the Rum River are lower than other Anoka County streams. There is cause for concern however, as conductivity consistently increases moving downstream. Average conductivity for sites tested in 2016 from upstream to downstream was 0.281, 0.293 and 0.300 mS/cm respectively. This increase is likely caused by higher road and development density contributing higher loads of road salts.
- Phosphorous is typically lower than the state water quality standard of 100 ug/L at all sampled sites. Sites exceeded this mark on two single sampling occasions in 2016, once during baseflow, and once after a storm event. Total phosphorus in the Rum River in 2016 averaged 84, 96 and 87 ug/ at sampled sites moving upstream to downstream. Compared to other Anoka County streams, these averages are low. They are however close to the state standard and phosphorus should remain a focus of watershed management.
- Suspended solids and turbidity generally remain at acceptable levels in the Rum River, though turbidity averages were slightly above other Anoka County streams. Average turbidity actually decreased from upstream to downstream in 2016 with averages of 14.8, 10.3 and 8.5 NTU respectively. TSS levels are low in the Rum River compared to other Anoka County streams with 2016 sampling site averages of 7, 9 and 5.5 mg/L upstream to downstream. Turbidity shows a marked increase in the Rum River during storm events, and stormwater runoff mitigation should be a focus of management efforts.
- pH was within the range considered normal and healthy for streams in this area.
- Dissolved oxygen remained well above the state standard of 5 mg/L in 2016.

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.

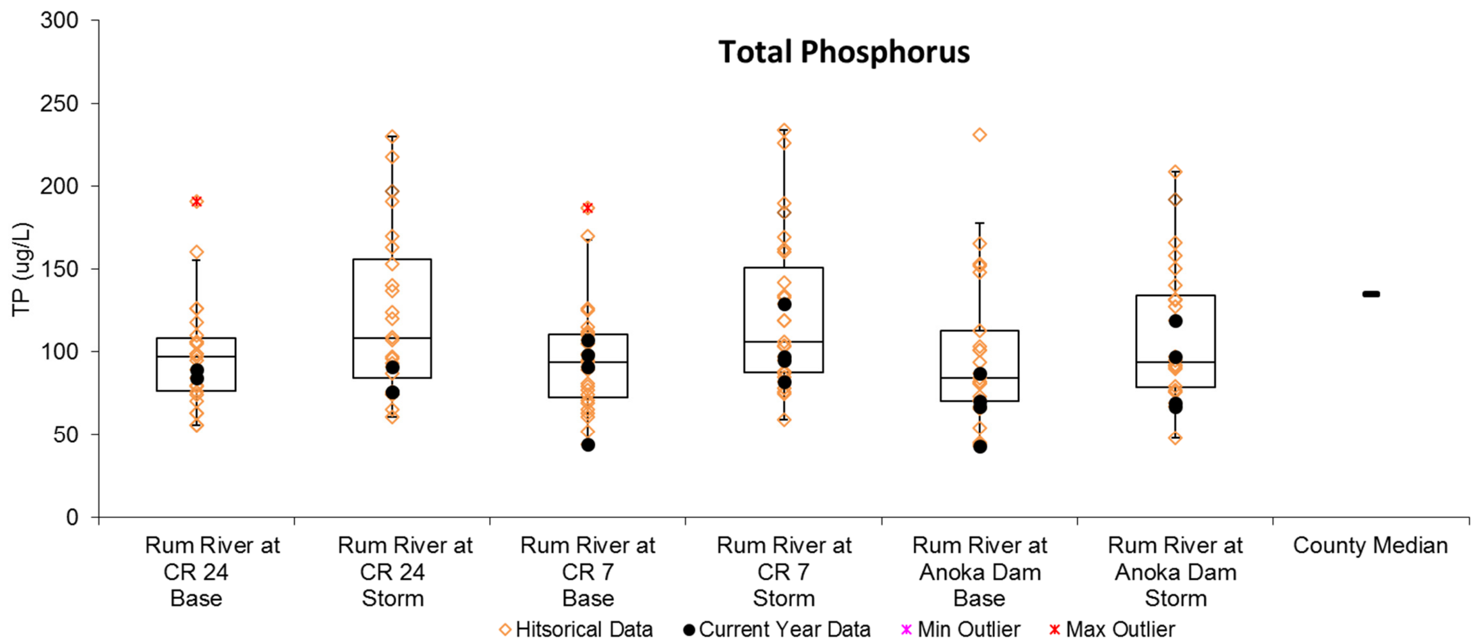
Conductivity was lowest at most sites during storms, suggesting that stormwater runoff contains fewer dissolved pollutants than the surficial water table that feeds the river during baseflow. High baseflow conductivity has been observed in most other nearby streams as well. This occurrence has been studied 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 2016, the highest observed total phosphorus reading was during one particular storm event, with a concentration of 132 ug/L. 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.

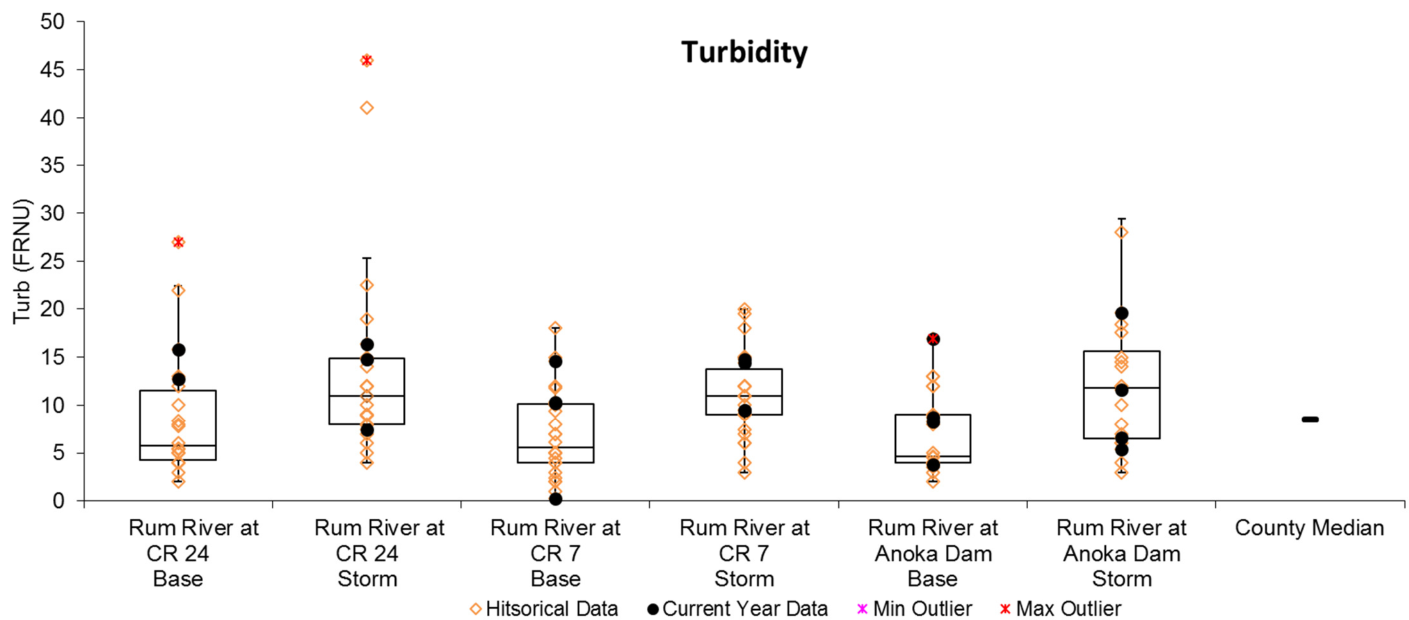
It is important to note the suspended solids can come from sources within and outside of the river channel. Sources on land include soil erosion, road sanding, and others. Riverbank erosion and movement of the river bottom also contributes to suspended solids. A moderate amount of this “bed load” is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

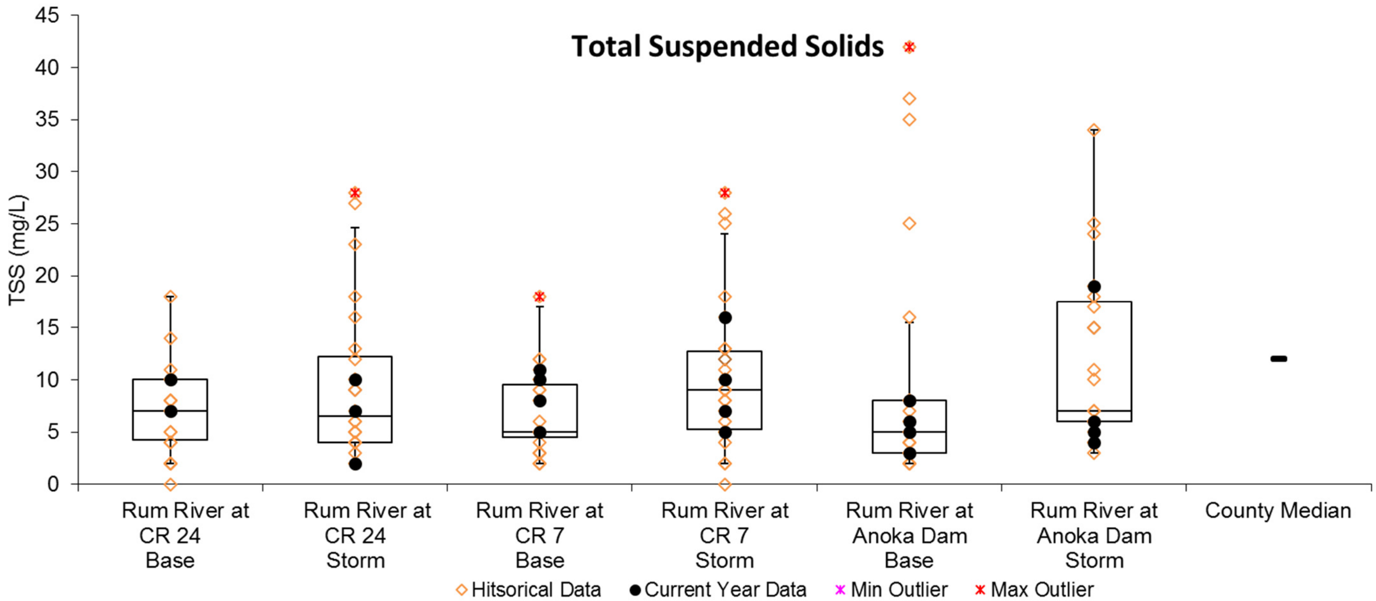
TSS in 2016 was similar to 2015 results. The median TSS, in 2016 (all conditions) was 7, 9 and 5.5 (upstream to downstream). These are all lower than the Anoka County stream median for TSS of 12.

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).



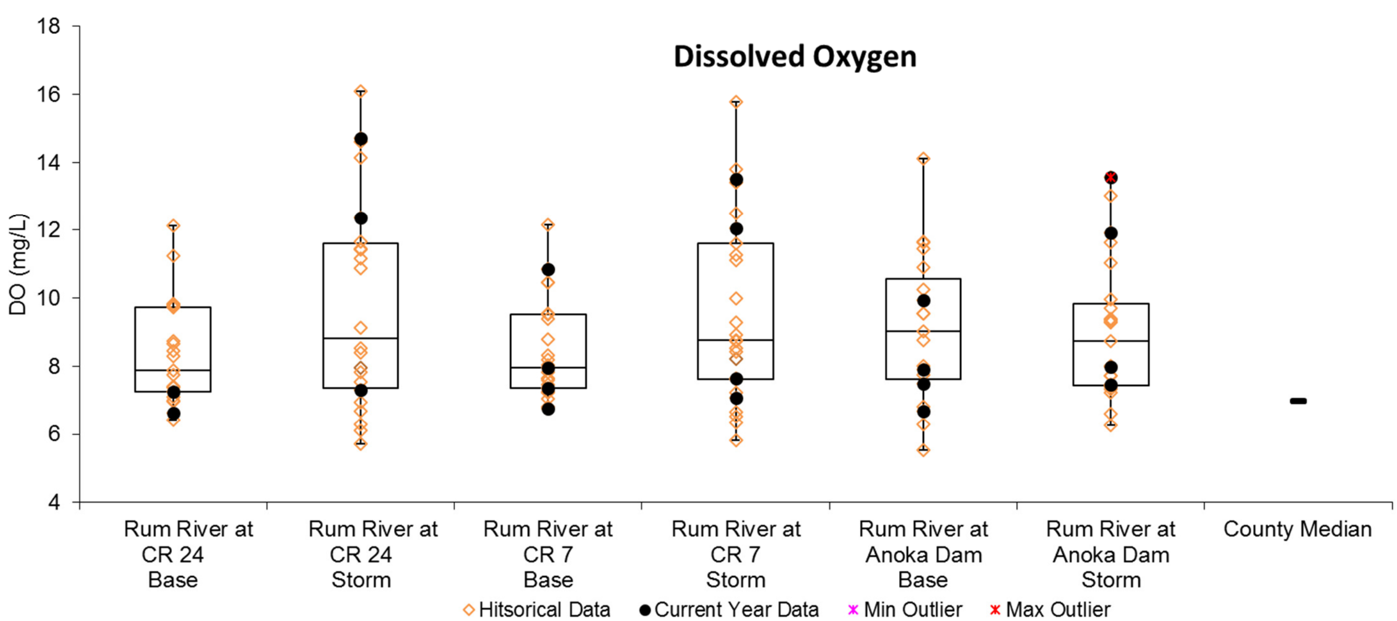
Total suspended solids during baseflow and storm conditions Orange diamonds are historical data from previous years and black circles are 2016 readings Box plots show the median (middle line), 25th and 75th percentile (ends of box), and 10th and 90th percentiles (floating outer lines).



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.

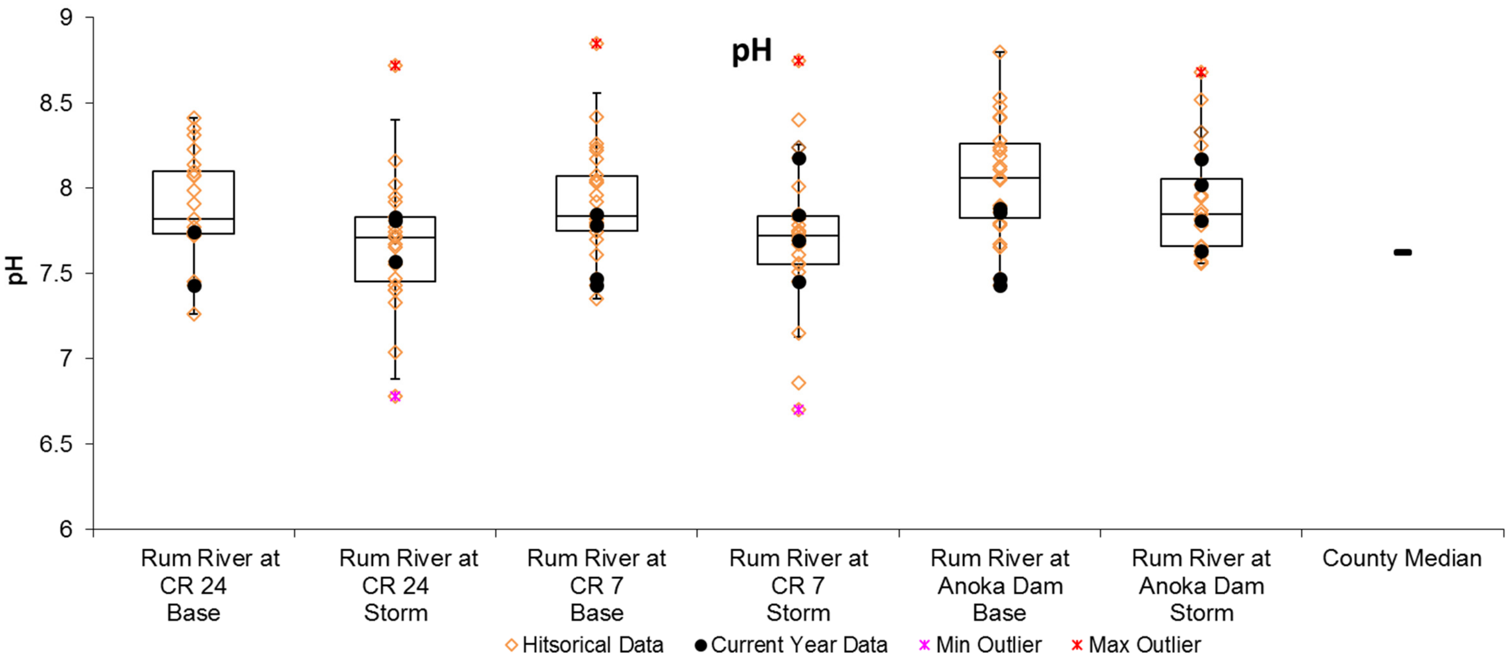
Dissolved oxygen during baseflow and storm conditions Orange diamonds are historical data from previous years and black circles are 2016 readings Box plots show the median (middle line), 25th and 75th percentile (ends of box), and 10th and 90th percentiles (floating outer lines).



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).

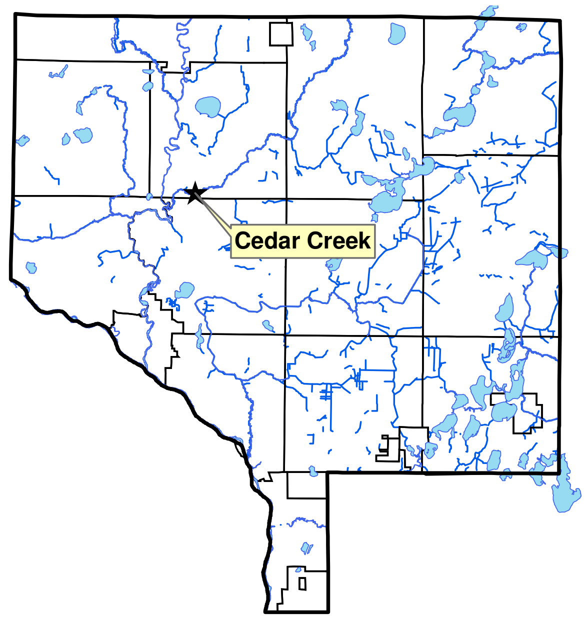


Summary and Recommendations

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.

CEDAR CREEK

at Hwy 9, Oak Grove



Background

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

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

Results Summary

This report includes data from 2016. The following is a summary of results.

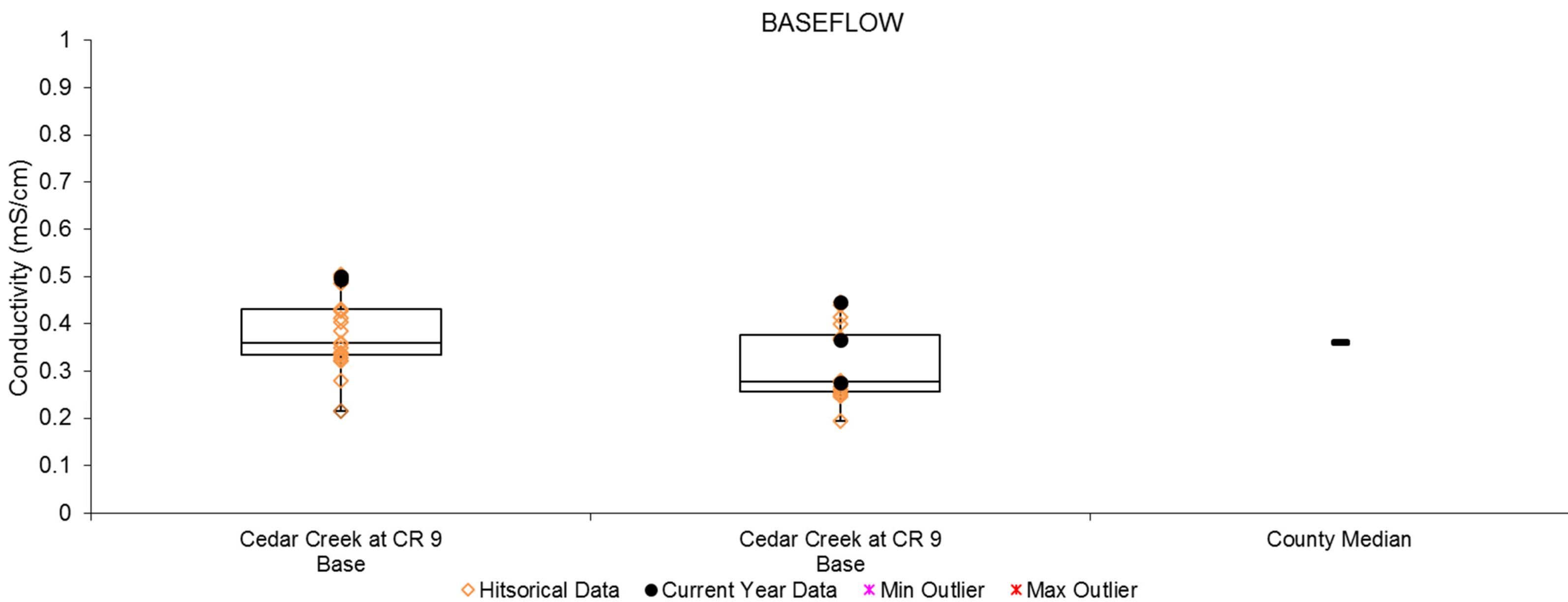
- Dissolved constituents, as measured by conductivity and chlorides, in Cedar Creek were higher than average when compared to similar Anoka County streams. Conductivity averaged 0.422 mS/cm with a maximum of 0.501 mS/cm and a minimum of 0.276 mS/cm). Chlorides were last sampled in 2013 where they averaged 26 mg/l (maximum of 32 mg/l and a minimum of 17 mg/l).
- Phosphorous averaged more than twice the state water quality standard of 100 ug/L. Cedar Creek often exceeds the state standard, even during baseflow periods. Phosphorous results in Cedar Creek averaged 201 ug/l (maximum of 261 ug/l and a minimum of 127 ug/l).
- Suspended solids and turbidity were both fairly high. Total suspended solids averaged 22.6 mg/l (with a maximum of 33.0 mg/l and a minimum of 8 mg/l). Turbidity averaged 20.28 NTU (with a maximum of 38.20 NTU and a minimum of 6.80 NTU).
- pH were within the range considered healthy for streams in this area. pH averaged 7.56 (maximum of 7.98 and a minimum of 6.98).
- Dissolved oxygen was within the range considered healthy for streams in this area. DO averaged 8.87 mg/l (maximum of 11.35 mg/l and a minimum of 7.46 mg/l).

Cedar Creek at CR 9			3/8/2016	3/16/2016	6/1/2016	6/13/2016	8/25/2016				
	Units	R.L.*	Results	Results	Results	Results	Results	Median	Average	Min	Max
pH		0.1	7.76	6.93	7.93	7.57	7.57	7.57	7.56	6.93	7.93
Conductivity	mS/cm	0.01	0.367	0.276	0.501	0.446	0.494	0.45	0.422	0.276	0.501
Turbidity	NTU	1	19.3	18.8	19.3	38	6.8	19.30	20.28	6.80	38.20
D.O.	mg/L	0.01	11.35	10.43	8.25	7.46	7.49	8.25	8.87	7.46	11.35
D.O.	%	1	97.9	85.1	87.6	83.5	83.3	85.10	87.1	83.3	97.9
Temp.	°C	0.1	7.84	4.87	16.56	19.5	19.07	16.56	14.1	4.9	19.5
Salinity	%	0.01	0.17	0.13	0.24	0.21	0.24	0.21	0.20	0.13	0.24
T.P.	ug/L	10	178	251	195	261	127	195.00	201	127	261
TSS	mg/L	2	26		22	33	8	24.00	22.6	8.0	33.0
Secchi-tube	cm		83.00	54.00	67	50	>100	67.00	>90	50	>100

Conductivity

Conductivity and chlorides are measures of dissolved pollutants. Dissolved pollutant sources include urban road runoff, industrial chemicals, and others. Metals, hydrocarbons, road salts, and others are often of concern in a suburban environment. Conductivity was the broadest measure of dissolved pollutants used. It measures electrical conductivity of the water; pure water with no dissolved constituents has zero conductivity. Chlorides were not sampled in 2016 and thus not displayed below. Historical chloride data can be obtained from the Anoka Conservation District and is also available through the Minnesota Pollution Control Agency's EQuIS database, which is available through their website. These pollutants are of greatest concern because of the effect they can have on the stream's biological community.

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

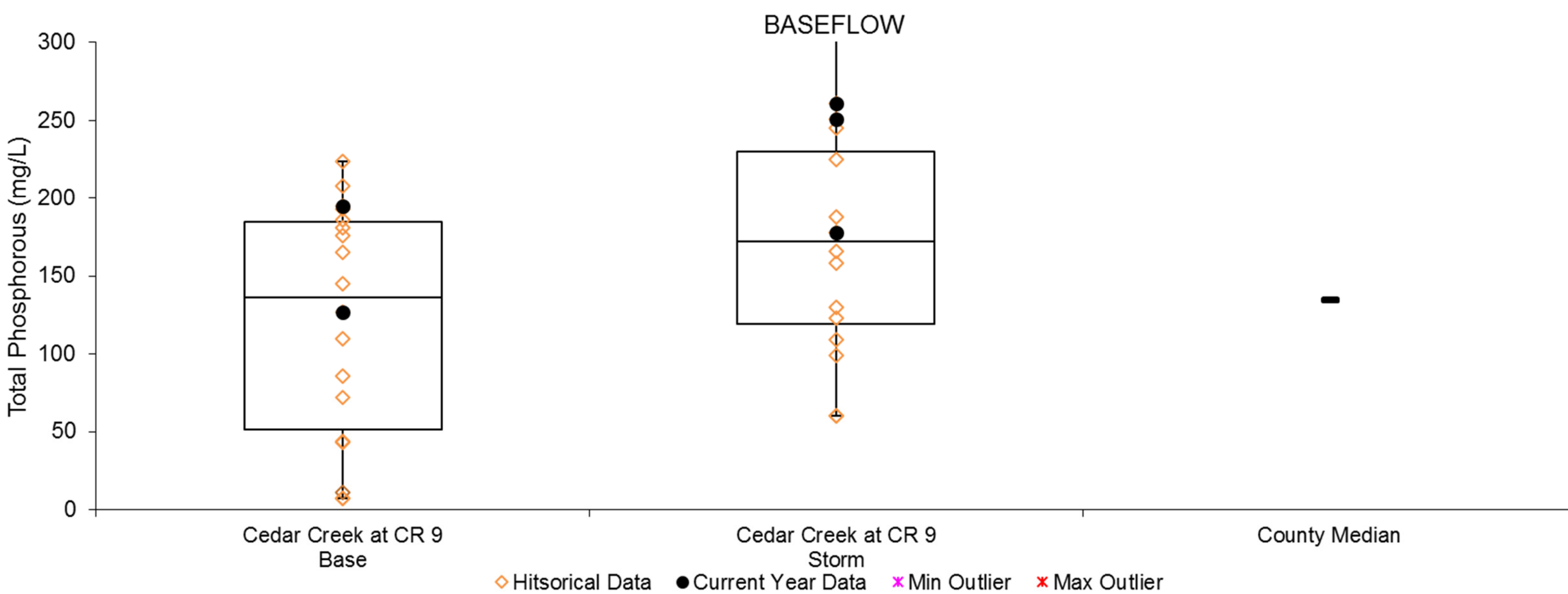


Conductivity is acceptably low in Cedar Creek at CR 9. Median conductivity (all years) is 0.359 mS/cm during baseflow and 0.278 mS/cm during storm events, respectively. Both were lower than the median for Anoka County streams of 0.362 mS/cm. The 2016 maximum observed conductivity in Cedar Creek was 0.501 mS/cm which is the second highest individual reading on record.

Total Phosphorus

Total phosphorus in Cedar Creek remained high in 2016 averaging 201 ug/L, similar to the 2015 average of 204 ug/L for the highest average on record. This nutrient is one of the most common pollutants in our region, and can be associated with urban runoff, agricultural runoff, wastewater, and many other sources. The median phosphorus concentration at Cedar Creek at CR 9 (all years) was 136 ug/L during baseflow and 172 ug/L during storm events. Almost all readings in 2016 had phosphorus concentrations higher than the median for Anoka County streams. In 2016, the highest observed total phosphorus reading was during one particular storm event, with a maximum of 261 ug/L. This is the second highest reading on record. In all, phosphorus in Cedar Creek is at concerning levels, every sample in 2016 exceeding state standards, and should be an area of pollution control efforts.

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

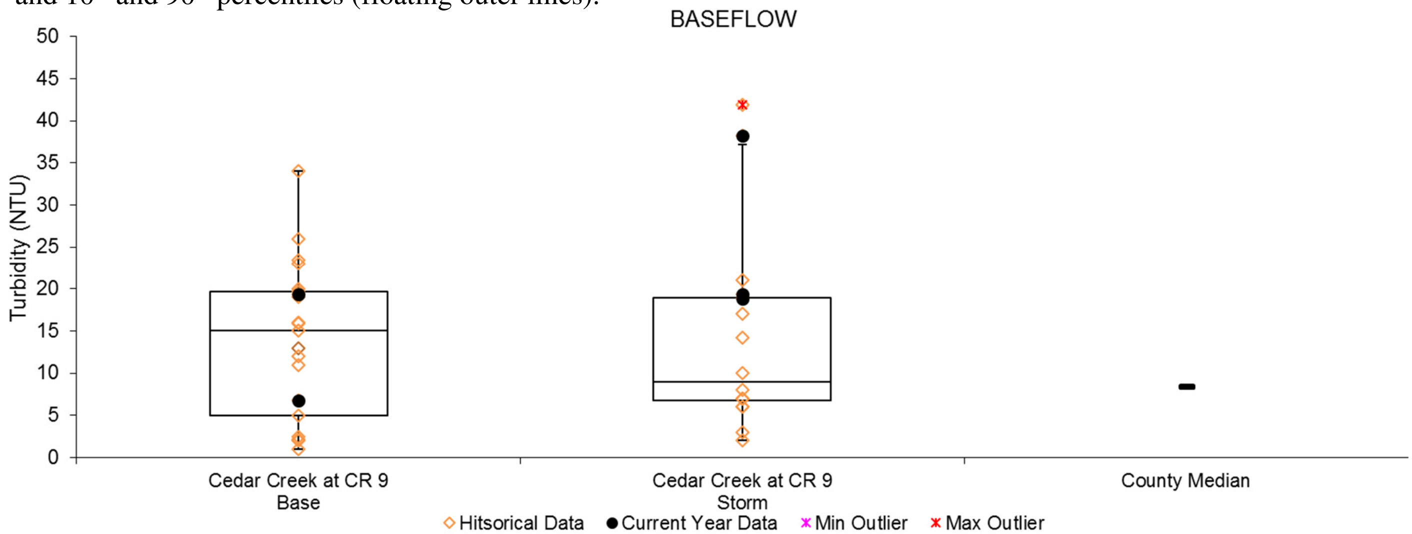


Turbidity and Total Suspended Solids (TSS)

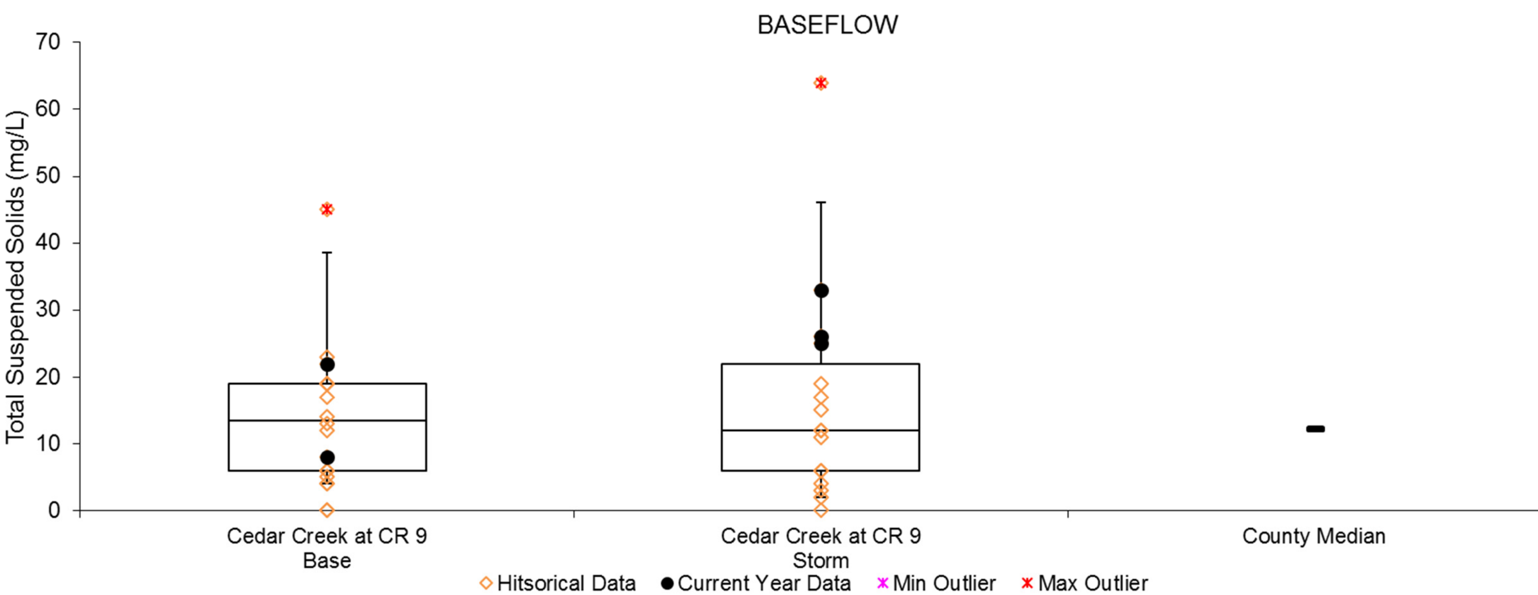
In Cedar Creek, turbidity was slightly elevated in 2016 with all readings except one at or above the long-term median. The median turbidity (all years) is 15 NTU during baseflow and 9 NTU during storm events, which is higher than the median for Anoka County streams of 8.5 FNRU. In 2016 turbidity was elevated on a few occasions, especially during storms. The maximum 2016 observed turbidity was 38 NTU. This is the second highest reading on record for this stream.

TSS was high throughout 2016 with all readings but one being above the median for Anoka County streams of 12 mg/L. In 2016, however, the especially high TSS events measured in 2015 (up to 64 mg/L) did not occur in 2016 when the highest reading was 33 mg/L. Median TSS (all years) is 13.5 mg/L during baseflow and 12 mg/L during storm events.

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).

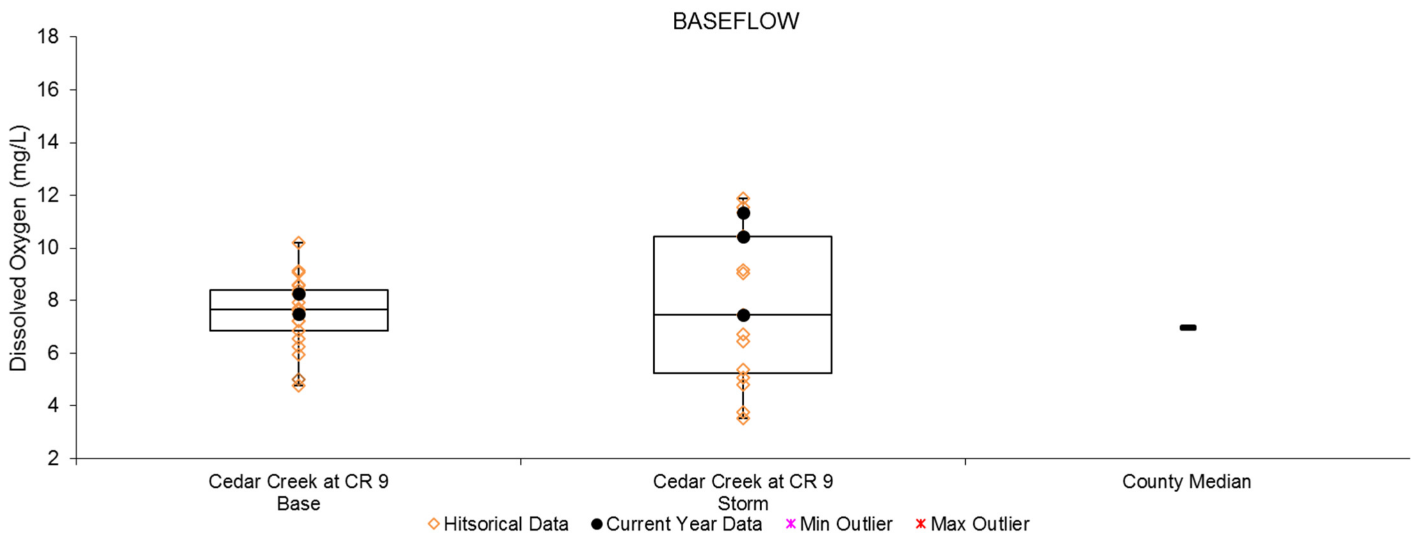


Dissolved Oxygen

Dissolved oxygen is necessary for aquatic life, including fish. Organic pollution consumes oxygen when it decomposes. If oxygen levels fall below the state standard of 5 mg/L aquatic life begins to suffer. In 2016, dissolved oxygen in Cedar Creek was always above 7.0 mg/L. Median dissolved oxygen of all years of data is

7.67mg/L during baseflow and 7.46 mg/L during storm events. Few readings of <5 mg/L, which would be of concern, have been observed at Cedar Creek.

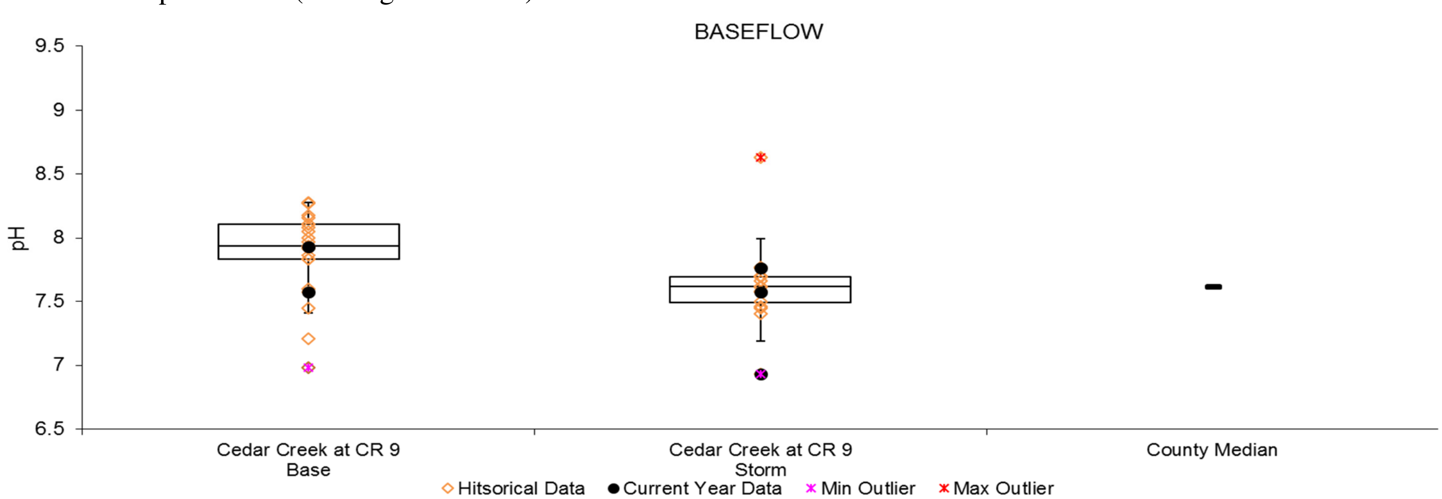
Dissolved oxygen during baseflow and storm conditions Orange diamonds are historical data from previous years and black circles are 2016 readings Box plots show the median (middle line), 25th and 75th percentile (ends of box), and 10th and 90th percentiles (floating outer lines).



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. Cedar Creek has only been recorded outside of this range once historically, and remained well within it in 2016 (see figure below). pH is generally lower during storms than during baseflow. This is because the pH of rain is typically lower (more acidic). While acid rain is a longstanding problem, its effect on this aquatic system is small.

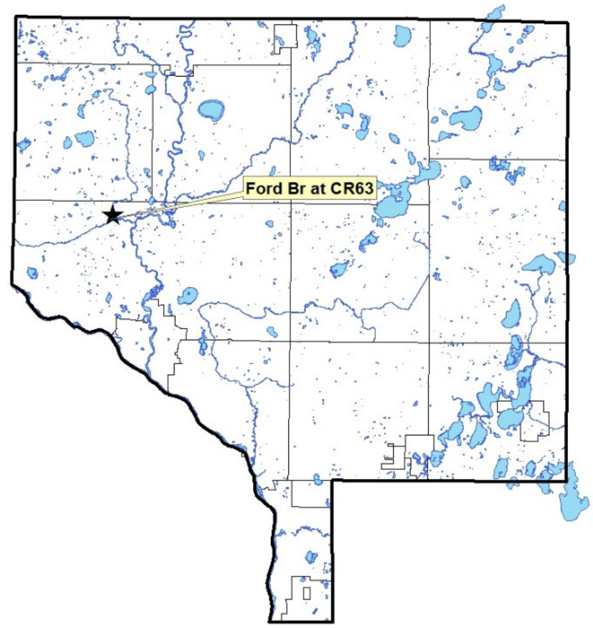
pH during baseflow and storm conditions Orange diamonds are historical data from previous years and black circles are 2016 readings Box plots show the median (middle line), 25th and 75th percentile (ends of box), and 10th and 90th percentiles (floating outer lines).



Stream Water Quality Monitoring

FORD BROOK

At CR 63, Nowthen



Background

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

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

Results Summary

This report includes data from 2016. The following is a summary of results.

- Dissolved constituents, as measured by conductivity, in Ford Brook were above average when compared to similar Anoka County streams. Conductivity averaged 0.442 mS/cm (maximum of 0.488 mS/cm and a minimum of 0.370 mS/cm).
- Phosphorous averaged well below 2015 levels in 2016, but remained in excess of the MPCA water quality standard of 100 ug/L. Ford Brook often exceeds the limit, even during baseflow periods. Phosphorous results in Ford Brook averaged 121 ug/l (maximum of 145ug/l and a minimum of 104 ug/l).
- Suspended solids and turbidity both average below state standards, but turbidity did exceed 25 NTU twice. Total suspended solids averaged 18.6 mg/l (maximum of 24.0 mg/l and a minimum of 7.0 mg/l). Turbidity averaged 17.88 NTU (maximum of 34.6 NTU and a minimum of 5.2 NTU).
- pH was within the range considered healthy for streams in this area. pH averaged 7.52 (maximum of 7.69 and a minimum of 7.35).
- Dissolved oxygen was within the health range for streams. DO averaged 8.62 mg/l (maximum of 11.60 mg/l and a minimum of 6.65 mg/l).

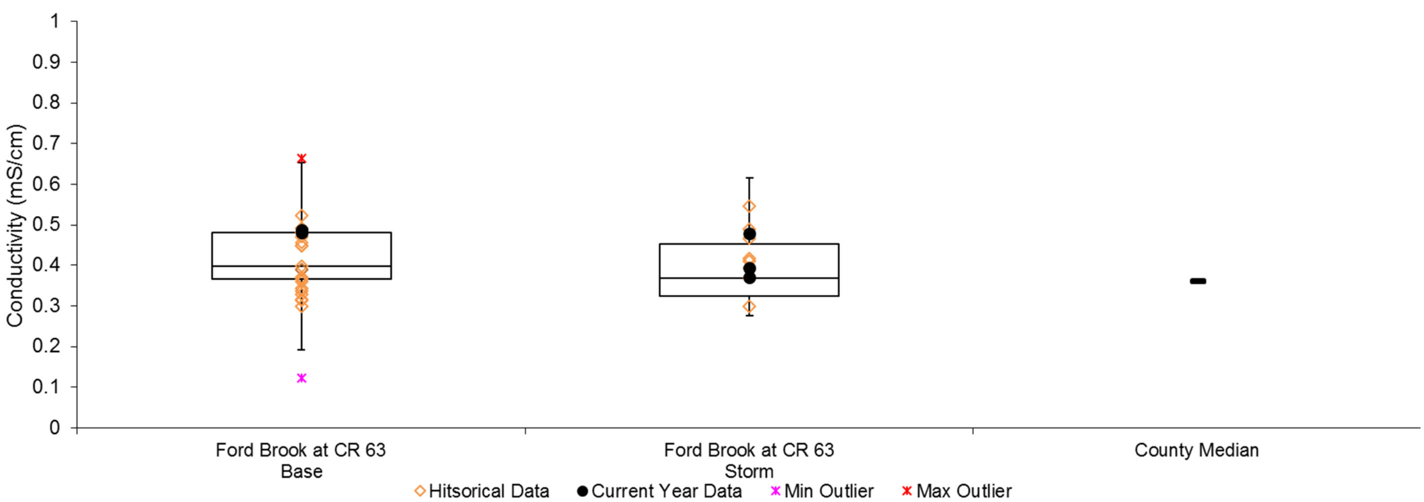
FordBrook at CR63			3/8/2016	3/16/2016	6/1/2016	6/13/2016	8/25/2016				
	Units	R.L.*	Results	Results	Results	Results	Results	Median	Average	Min	Max
pH		0.1	7.69	7.35	7.67	7.48	7.42	7.48	7.52	7.35	7.69
Conductivity	mS/cm	0.01	0.37	0.394	0.481	0.479	0.488	0.479	0.442	0.370	0.488
Turbidity	NTU	1	25.5	11.3	13	34.6	5.2	12.8	17.88	5.20	34.60
D.O.	mg/L	0.01	12.33	11.27	7.41	6.99	6.35	7.41	8.87	6.35	12.33
D.O.	%	1	100.3	91.7	81.2	80.8	72.3	81.2	85.3	72.3	100.3
Temp.	°C	0.1	4.98	4.7	18.2	20.64	20.22	18.16	13.7	4.7	20.6
Salinity	%	0.01	0.17	0.19	0.20	0.23	0.23	0.2	0.20	0.17	0.23
T.P.	ug/L	10	132	121	104	145	104	121	121	104	145
TSS	mg/L	2	22	22	18.0	24	7	22	18.6	7.0	24.0
Secchi-tube	cm		59	66	89	47	>100	62.5	71	47	89

Conductivity

Median conductivity results in Ford Brook were mildly higher than the median for other Anoka County streams (see table and figures below). Median conductivity in Ford Brook was 0.391 mS/cm (all years) during baseflow conditions and 0.368 mS/cm during storms, compared to the countywide median of 0.362 mS/cm.

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

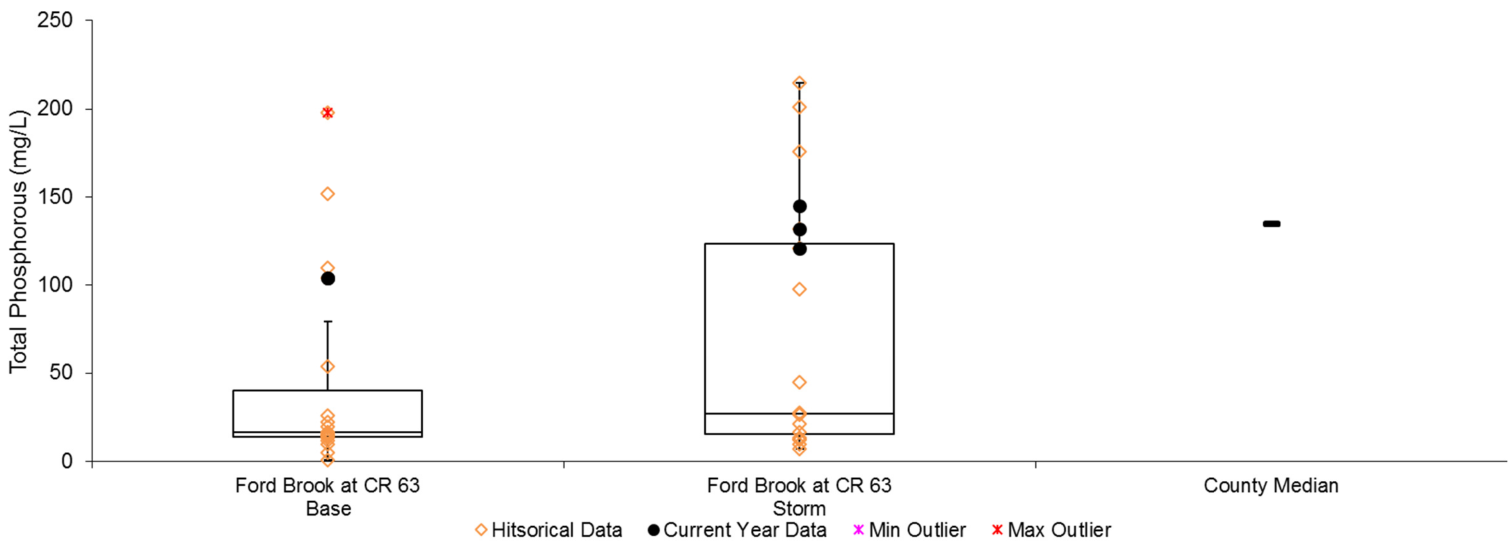
Conductivity at Ford Brook. Orange diamonds are historical data from previous years and black circles are 2016 readings. Box plots show the median (middle line), 25th and 75th percentile (ends of box), and 10th and 90th percentiles (floating outer lines).



Total Phosphorus

Total phosphorus (TP) is a common nutrient pollutant. It is limiting for most algae growth. Total phosphorus in Ford Brook has traditionally been low during baseflow conditions and increased during storms (see figures below). In 2016, TP levels in Ford Brook were generally lower than the county median and were considerably down from 2015, but were still in exceedance of the state standard of 100 ug/L. TP was higher during storm events then baseflow. The last three years of data have shown much higher phosphorus levels than previously measured. The median TP level in 2016 was 121 mg/L and ranged from 104 to 145 mg/L.

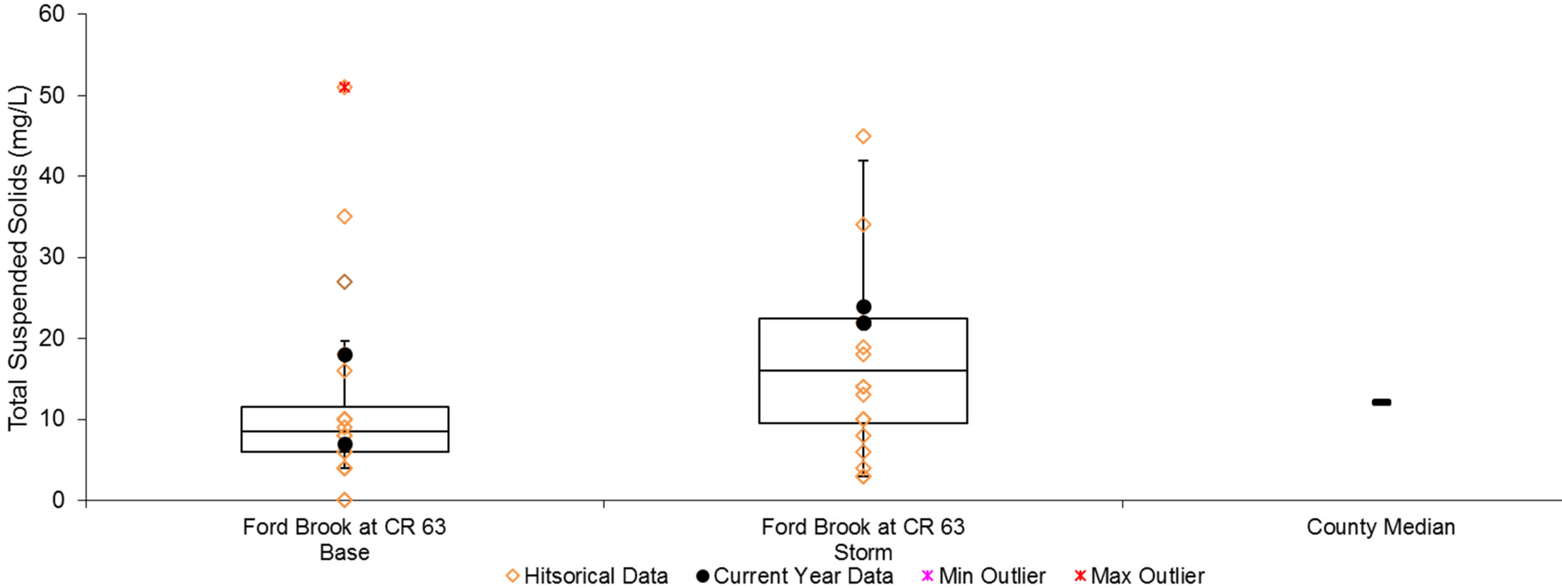
Total Phosphorus at Ford Brook. Orange diamonds are historical data from previous years and black circles are 2016 readings. Box plots show the median (middle line), 25th and 75th percentile (ends of box), and 10th and 90th percentiles (floating outer lines).



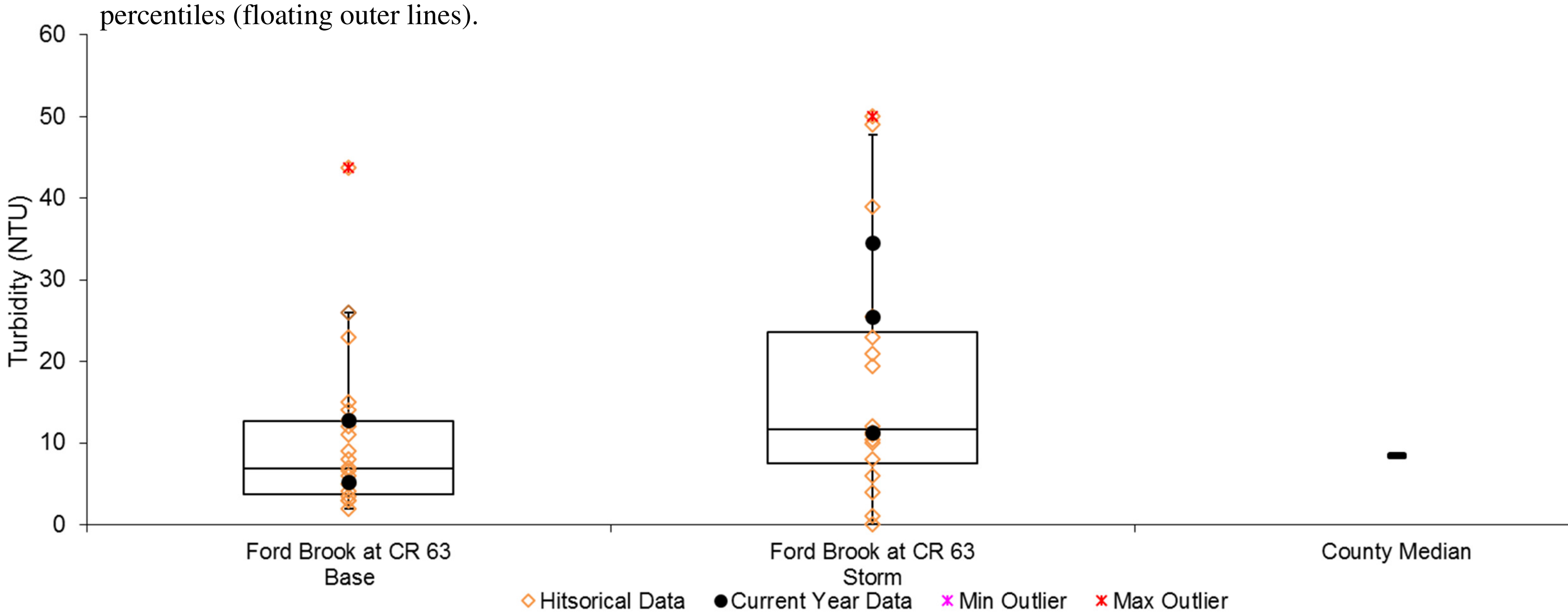
Total Suspended Solids and Turbidity

In Ford Brook both TSS and turbidity are generally low and slightly higher during storm events. Median turbidity for Ford Brook during baseflow (all years) is just 6.8 NTU. Turbidity during storm events is higher with a median (all years) of 11.65 NTU. These medians flank the countywide median of 8.5 NTU for all conditions. In 2016, two of five readings exceeded the MPCA's water quality standard of 25 NTU though only four of thirty-three measurements exceeded it in past years. Median 2016 TSS was 22 mg/L, much higher than last year and higher than the median for streams countywide of 12 mg/L. No individual TSS measurements exceeded the state water quality standard of 30 mg/L in 2016.

Total Suspended Solids at Ford Brook. 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).



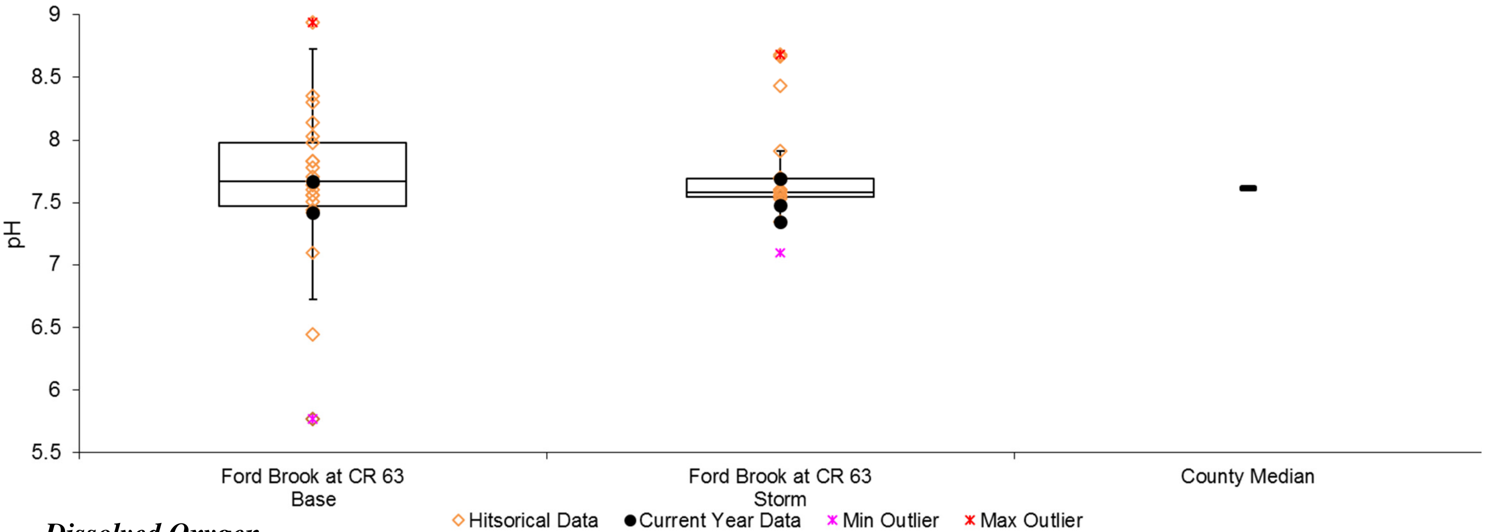
Turbidity at Ford Brook. Orange diamonds are historical data from previous years and black circles are 2016 readings. Box plots show the median (middle line), 25th and 75th percentile (ends of box), and 10th and 90th percentiles (floating outer lines).



pH

pH remained well within the acceptable range in 2016. pH is to be between 6.5 and 8.5 according to MPCA water quality standards. While occasional readings outside of this range have occurred in previous years, they were not large departures that generated concern. In 2016, pH ranged from 7.35 to 7.69, which is well within the acceptable range.

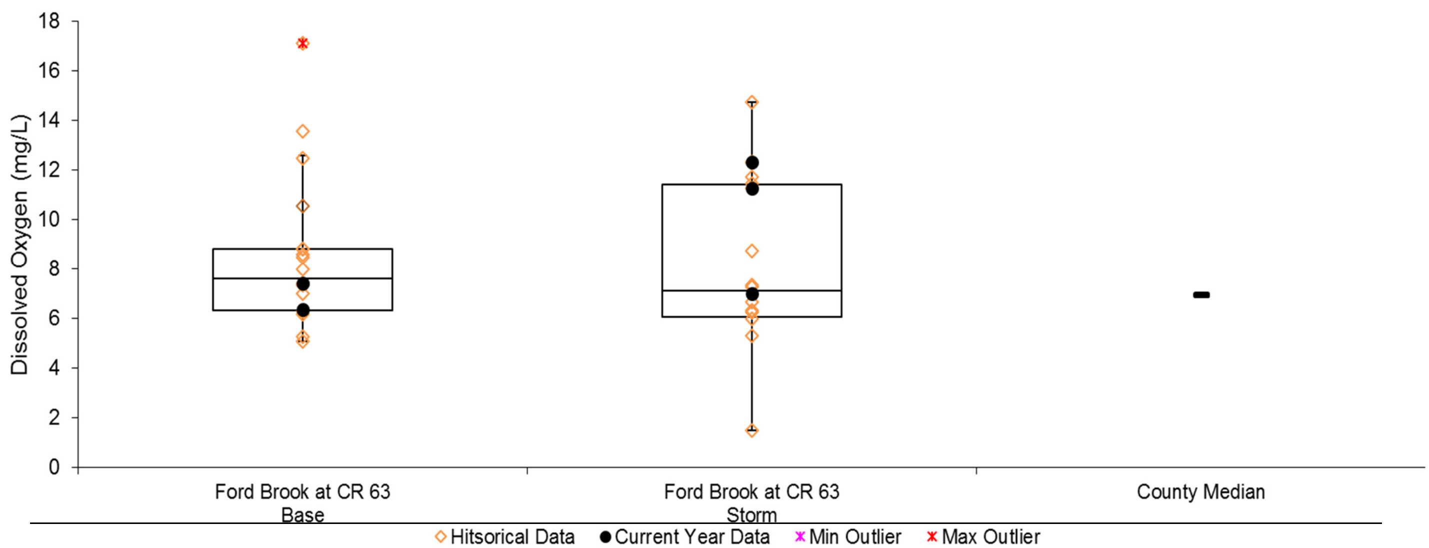
pH at Ford Brook. Orange diamonds are historical data from previous years and black circles are 2016 readings. Box plots show the median (middle line), 25th and 75th percentile (ends of box), and 10th and 90th percentiles (floating outer lines).



Dissolved Oxygen

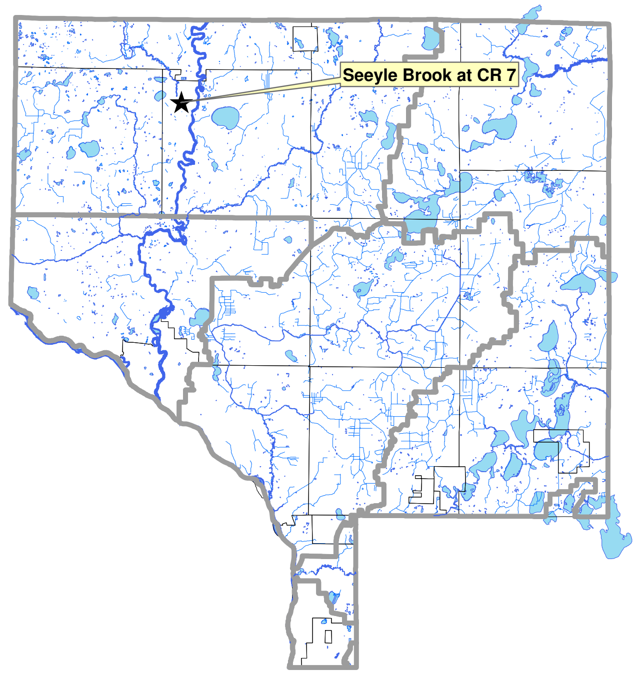
Dissolved oxygen in Ford Brook was within acceptable levels. None of the samples collected have been below the 5 mg/L standard, with the lowest recording in 2016 being 6.35 mg/L

Dissolved Oxygen at Ford Brook. 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).



SEELYE BROOK

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



Background

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

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

Results Summary

This report includes data from 2016. The following is a summary of results.

- Dissolved constituents, as measured by conductivity and chlorides. Conductivity results in Seelye Brook are considered higher than average when compared to similar Anoka County streams. Conductivity averaged 0.430 mS/cm (maximum of 0.522 mS/cm and a minimum of 0.278 mS/cm).
- Phosphorous averaged above the MPCA water quality standard of 100 ug/L. Seelye Brook often exceeds the limit, even during baseflow periods. Phosphorous in Seelye Brook averaged 133 ug/l (maximum of 163 ug/l and a minimum of 104 ug/l) in 2016.
- Suspended solids and turbidity were generally quite low throughout the season following the high readings right away in March. Suspended solids averaged 9.0 mg/l (maximum of 19.0 mg/l and a minimum of 3.0 mg/l). Turbidity averaged 9.30 NTU (maximum of 25.30 NTU and a minimum of 0.0 NTU)
- pH was within the range considered normal and healthy for streams in this area. pH averaged 7.60 (maximum of 7.86 and a minimum of 7.19).
- Dissolved oxygen was within the healthy range for a stream. DO averaged 9.01 mg/l (maximum of 12.79 mg/l and a minimum of 6.01 mg/l).

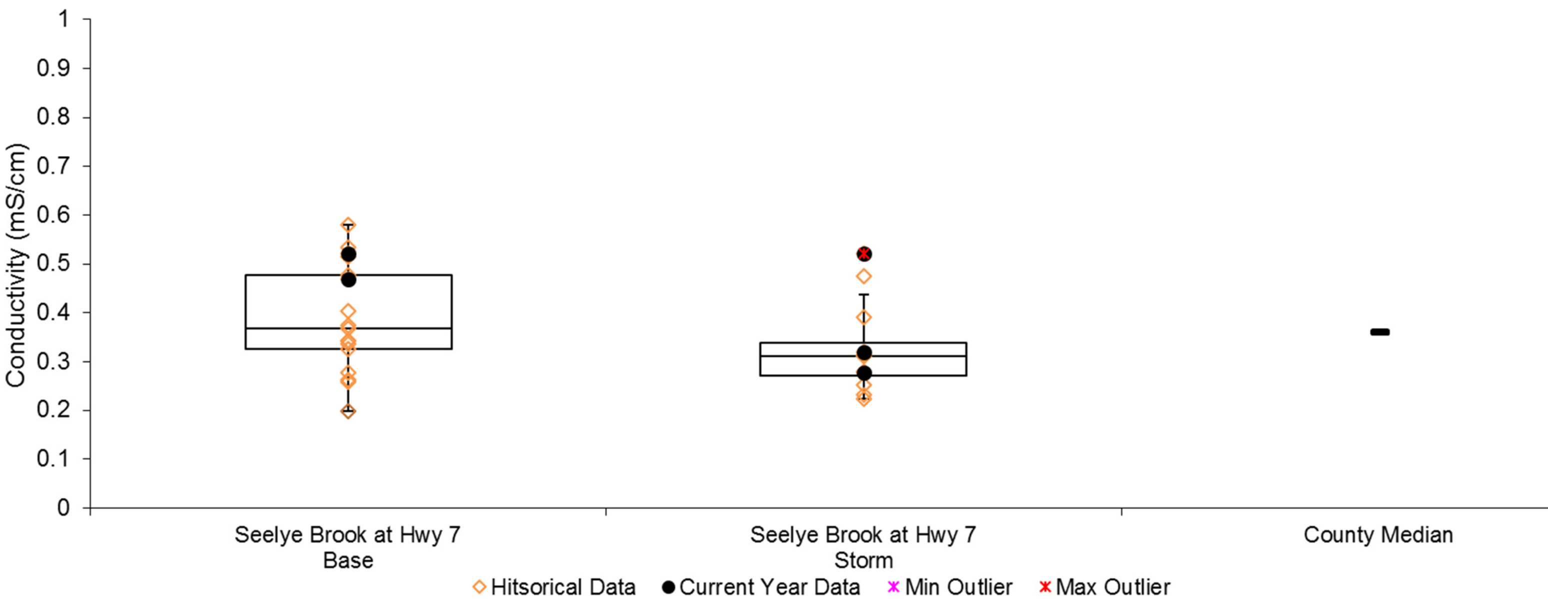
SellyeBrook at Hwy 7			3/8/2016	3/16/2016	6/1/2016	6/13/2016	8/25/2016				
	Units	R.L.*	Results	Results	Results	Results	Results	Median	Average	Min	Max
pH		0.1	7.69	7.19	7.8	7.86	7.34	7.69	7.60	7.19	7.86
Conductivity	mS/cm	0.01	0.32	0.278	0.521	0.522	0.469	0.47	0.430	0.278	0.522
Turbidity	NTU	1	25.3	3.5	8.5	10	0	8.50	9.30	0.00	25.30
D.O.	mg/L	0.01	12.79	10.82	8	8.21	6.01	8.21	9.01	6.01	12.79
D.O.	%	1	101.6	87.5	84.8	92.2	67.1	87.50	86.8	67.1	101.6
Temp.	°C	0.1	3.72	4.54	166.64	19.6	19.49	19.49	38.9	3.7	166.6
Salinity	%	0.01	0.15	0.13	0.25	0.25	0.23	0.23	0.21	0.13	0.25
T.P.	ug/L	10	163	131	139	131	104	131.00	133	104	163
TSS	mg/L	2	19	9	10.0	4	3	9.00	9.0	3.0	19.0
Secchi-tube	cm		74	91	>100	>100	>100	100.00	>100	74	100

CONDUCTIVITY

Conductivity and chlorides are measures of dissolved pollutants. Dissolved pollutant sources include urban road runoff, 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.

Chlorides were not sampled in 2016 and thus not displayed below. Historical chloride data can be obtained from the Anoka Conservation District and is also available through the Minnesota Pollution Control Agency's EQuIS database, which is available through their website.

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).

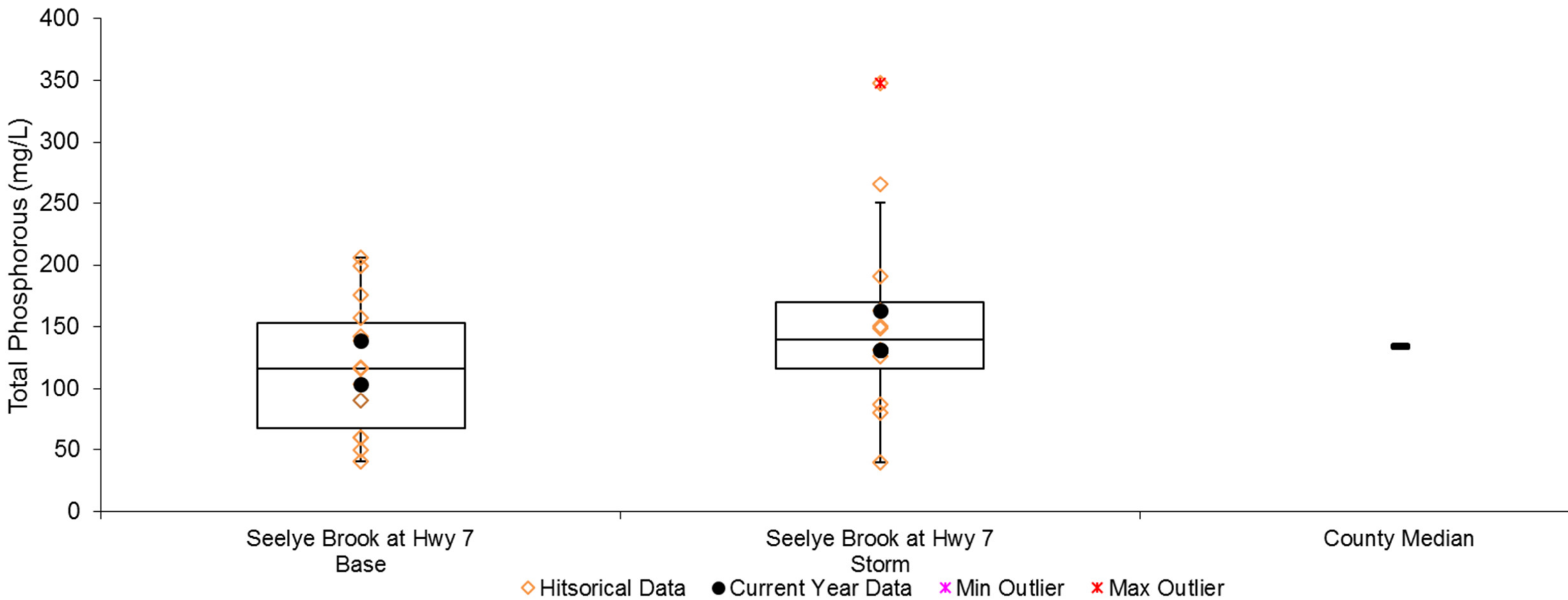


Conductivity has historically been acceptably low in Seelye Brook at Hwy 7. Median conductivity (all years) is 0.368 mS/cm during baseflow and 0.3125 mS/cm during storm events. Both are lower than the median for Anoka County streams of 0.362 mS/cm. From June of 2016 onward, however, the three conductivity readings were all 0.469 mS/cm or higher. These include two of the highest readings ever recorded in Seelye Brook, one during baseflow and one following a storm event.

Total Phosphorus

Total phosphorus in Seelye Brook was high overall in 2016, though slightly down from the previous year. This nutrient is one of the most common pollutants in our region and can be associated with runoff and many other sources. The median phosphorus concentration at Seelye Brook at Hwy 7 (all years) is 116.5 ug/L during baseflow and 140 ug/L during storm events. Each reading in 2016 was over the state standard of 100 ug/L with all but one reading over 130 ug/L. In all, phosphorus in Seelye Brook is at concerning levels and should continue to be an area of pollution control effort as the area urbanizes.

Total phosphorus during baseflow and storm conditions Orange diamonds are historical data from previous years and black circles are 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)

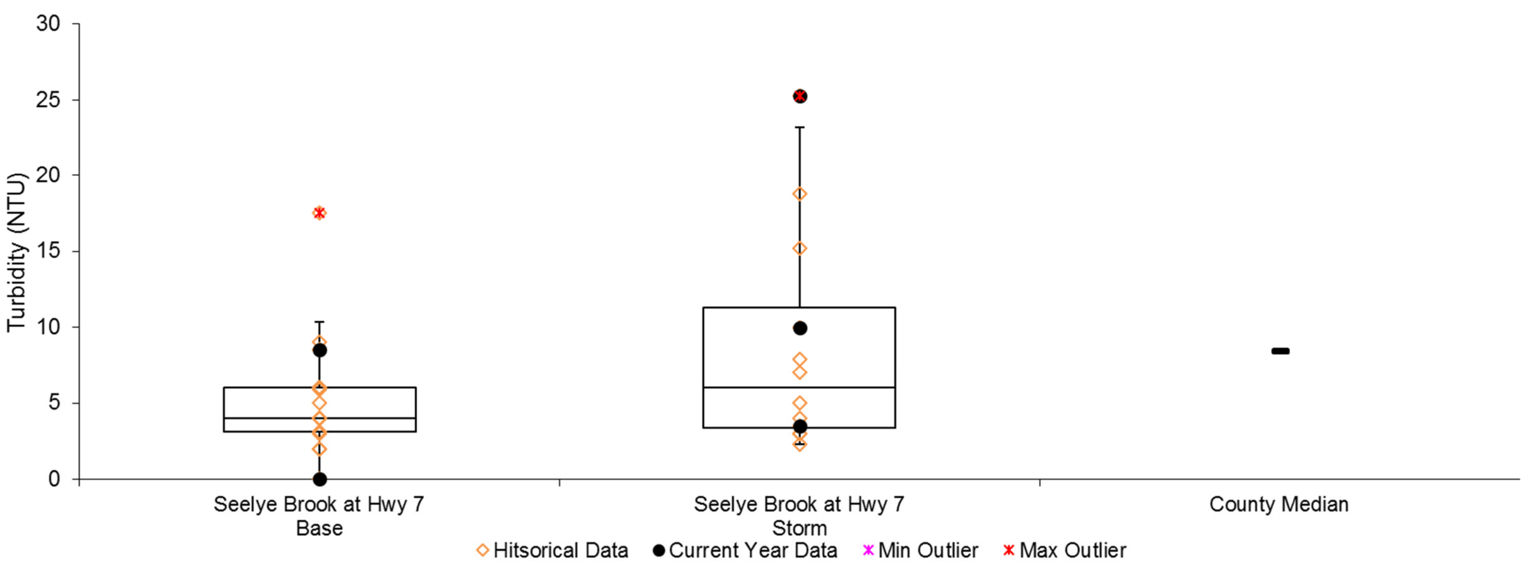
Turbidity and total suspended solids (TSS) are two different measurements of solid material suspended in the water. Turbidity is measured by refraction of a light beam passed through a water sample. It is most sensitive to large particles. Total suspended solids are measured by filtering solids from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

Overall, turbidity in Seelye Brook remains low compared to other streams with its highest reading ever recorded in 2016 of 25.3 NTU. The median turbidity (all years) is 4 NTU during baseflow and 6 NTU during storm events, which is lower than the median for Anoka County streams of 8.5 FNRU. Turbidity was elevated on a few occasions. In 2016 suspended solids and turbidity levels were relatively high (for this site early), but then dipped lower later in the year.

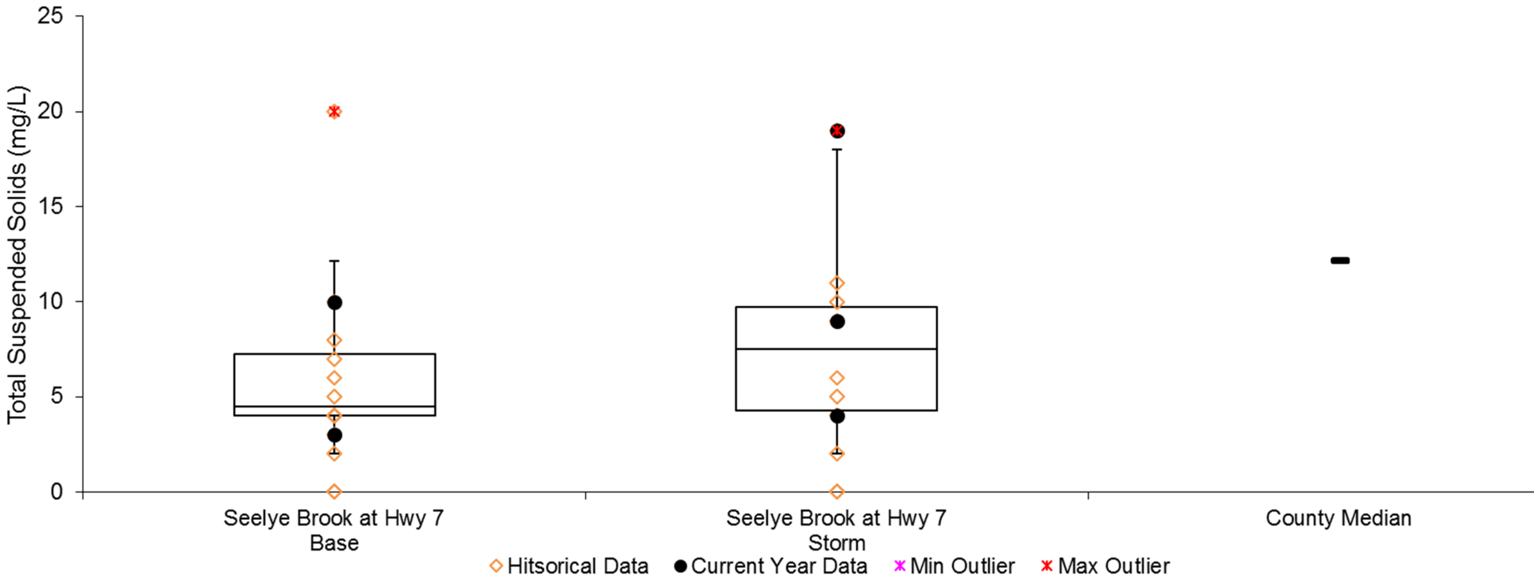
In 2016 suspended solids and turbidity levels were relatively high (for this site early), but then dipped lower later in the year. Both the highest and lowest turbidity readings ever recorded at this site were recorded in 2016, with the highest measured following a storm event.

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. Both turbidity and TSS, while low, should continue to be monitored in this watershed. This monitoring can be especially importing as development of the area continues and can be an indicator of poor erosion management practices.

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).



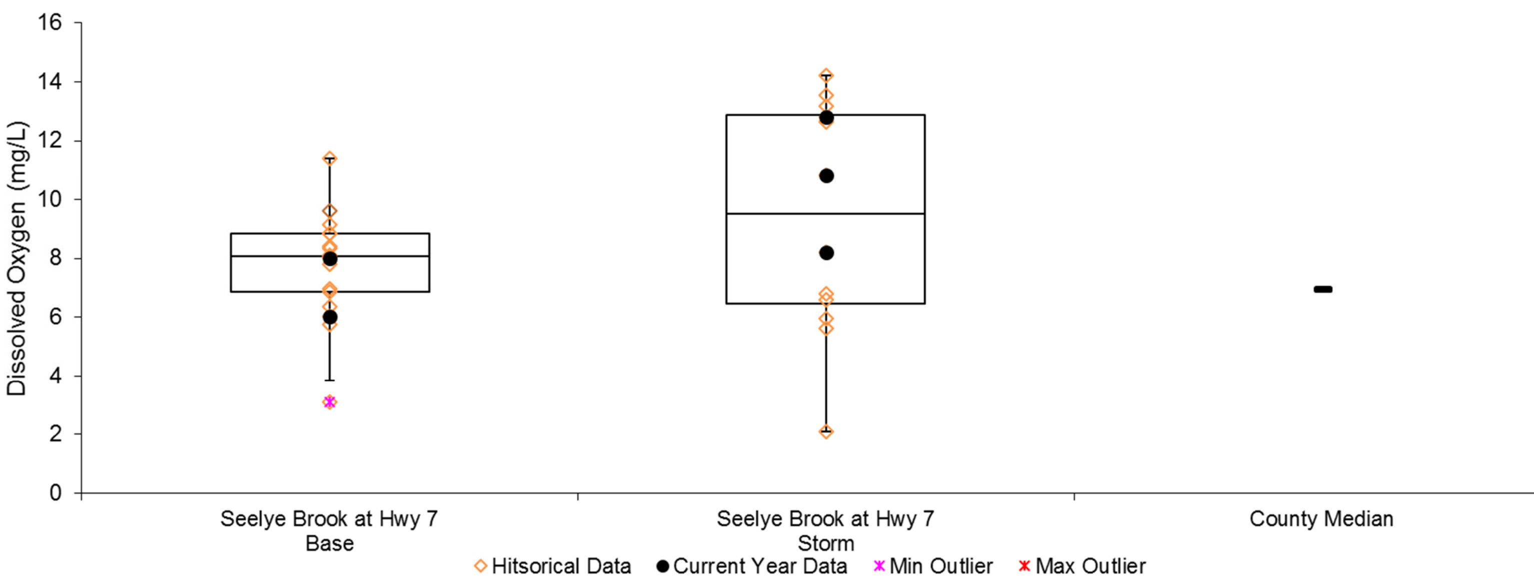
Total Suspended Solids during baseflow and storm conditions Orange diamonds are historical data from previous years and black circles are 2016 readings. Box plots show the median (middle line), 25th and 75th percentile (ends of box), and 10th and 90th percentiles (floating outer lines).



Dissolved Oxygen

Dissolved oxygen is necessary for aquatic life, including fish. Organic pollution consumes oxygen when it decomposes. If oxygen levels fall below the state standard of 5 mg/L, aquatic life begins to suffer. Seelye Brook's dissolved oxygen levels were typically well above this mark in 2016 with the lowest recorded DO being 6.01 mg/L. Median dissolved oxygen (all years) is 8.08 mg/L during baseflow and 9.51 mg/L during storm events.

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).

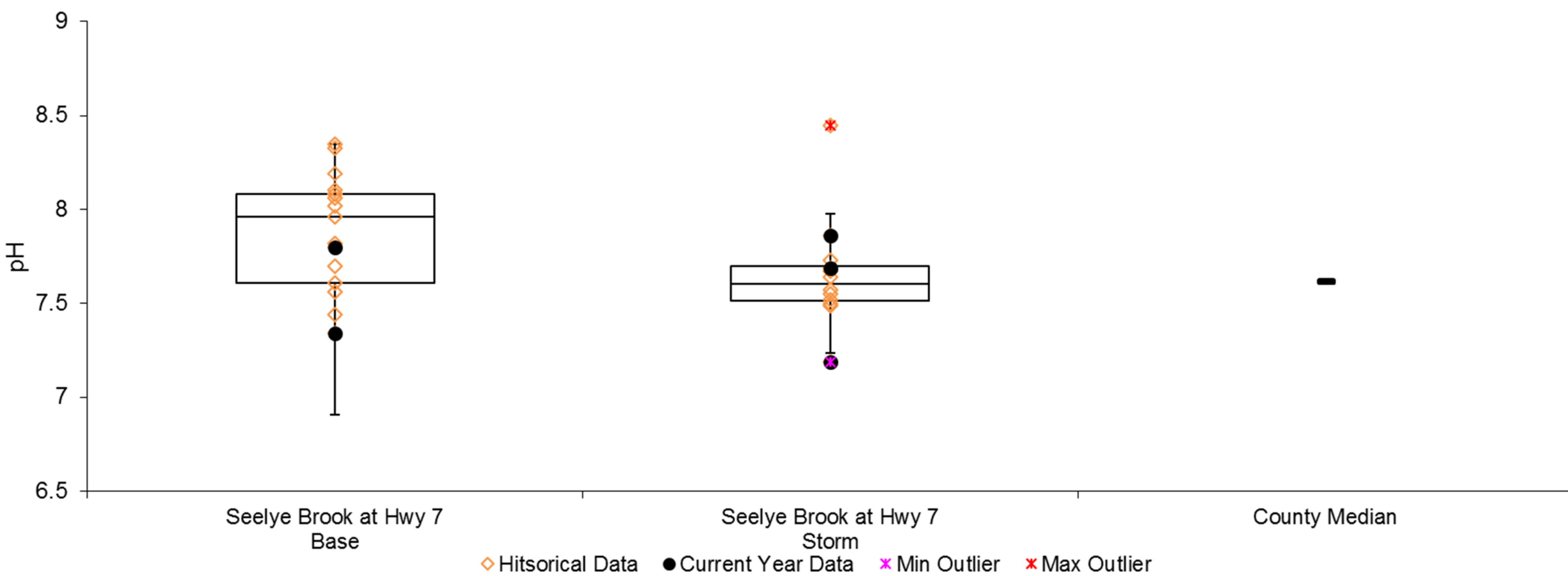


pH

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. Seelye Brook has not exceeded this range during any of the years the ACD has sampled it (see figure below).

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

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



Wetland Hydrology

Description: Continuous groundwater level monitoring at a wetland boundary, to a depth of 40 inches. 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: Alliant Tech Reference Wetland, Alliant Tech Systems property, St. Francis

Cedar Creek, Cedar Creek Natural History Area, East Bethel

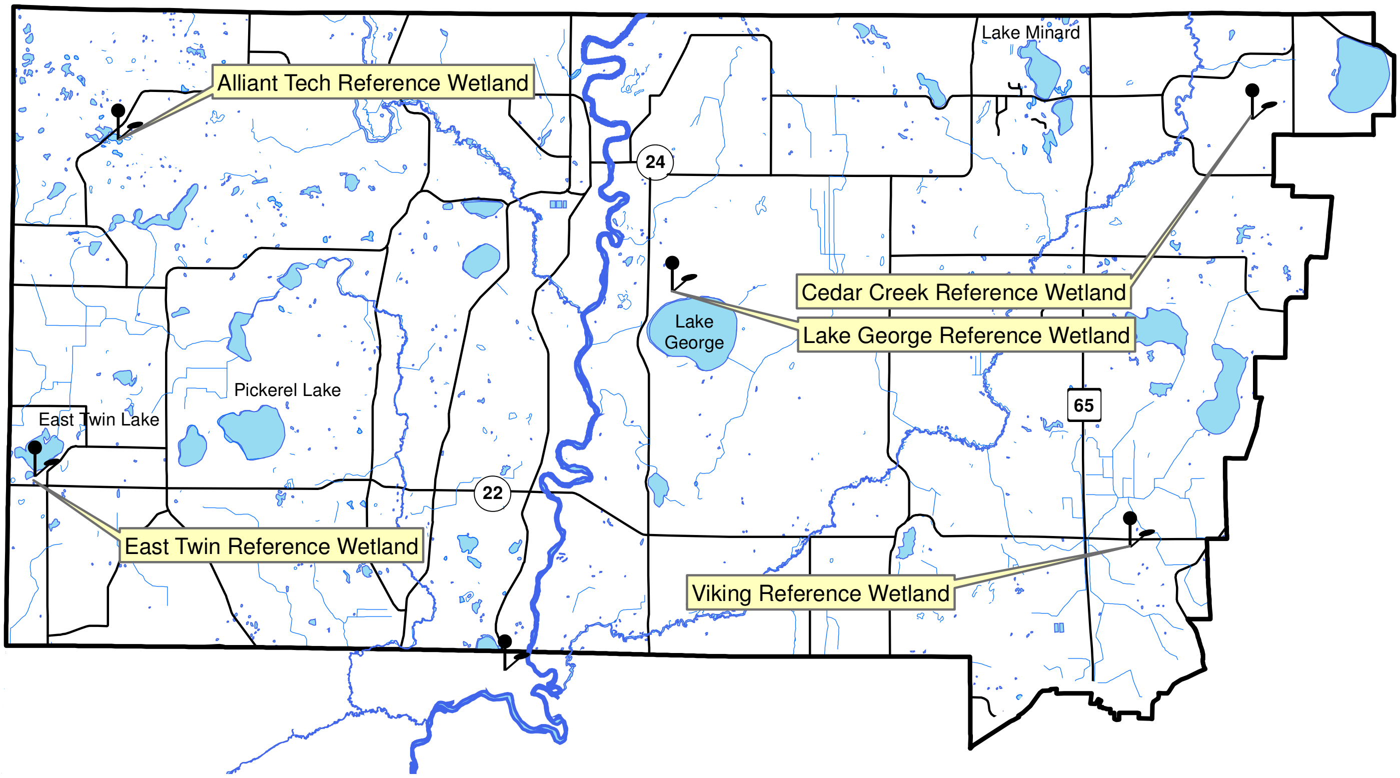
East Twin Reference Wetland, East Twin Township Park, Nowthen

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

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

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

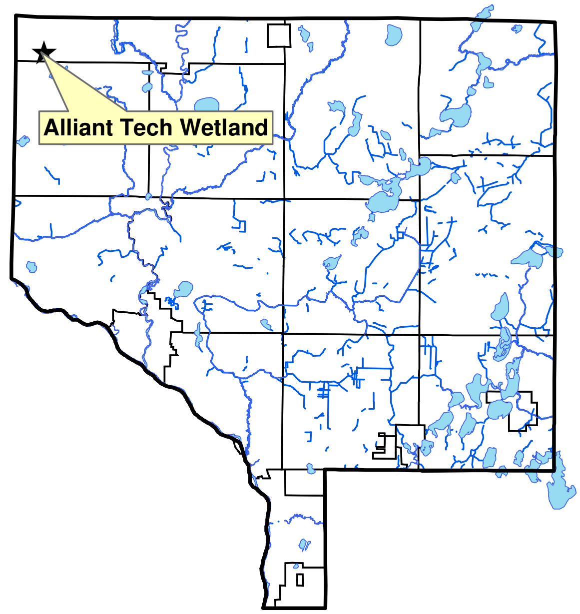
Upper Rum River Watershed Wetland Hydrology Monitoring Sites



ALLIANT TECH REFERENCE WETLAND

Alliant Techsystems Property, St. Francis

Site Information



Monitored Since: 2001

Wetland Type: 5

Wetland Size: ~12 acres

Isolated Basin? Yes

Connected to a Ditch? No

Soils at Well Location:

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

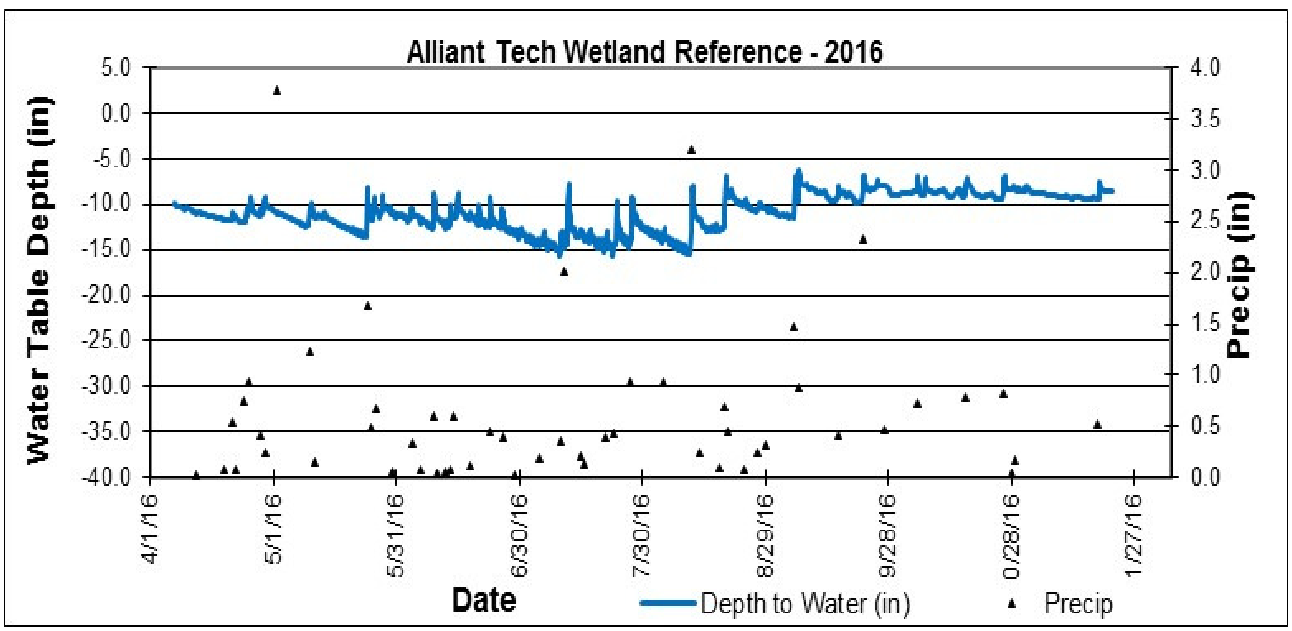
Surrounding Soils: Emmert

Vegetation at Well Location:

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

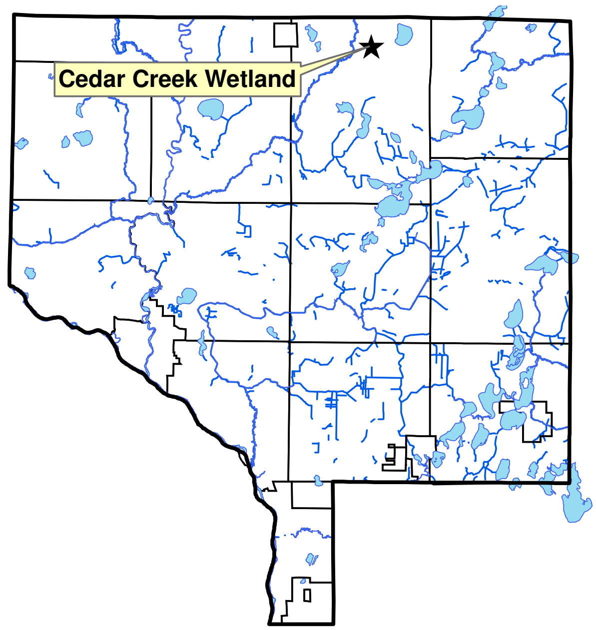
Other Notes: This wetland lies next to the highway, in a low area surrounded by hilly terrain. It holds water throughout the year, and has a beaver den.

2016 Hydrograph



CEDAR CREEK REFERENCE WETLAND

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



Site Information

Monitored Since: 1996

Wetland Type: 6

Wetland Size: unknown, likely >150 acres

Isolated Basin? No

Connected to a Ditch? No

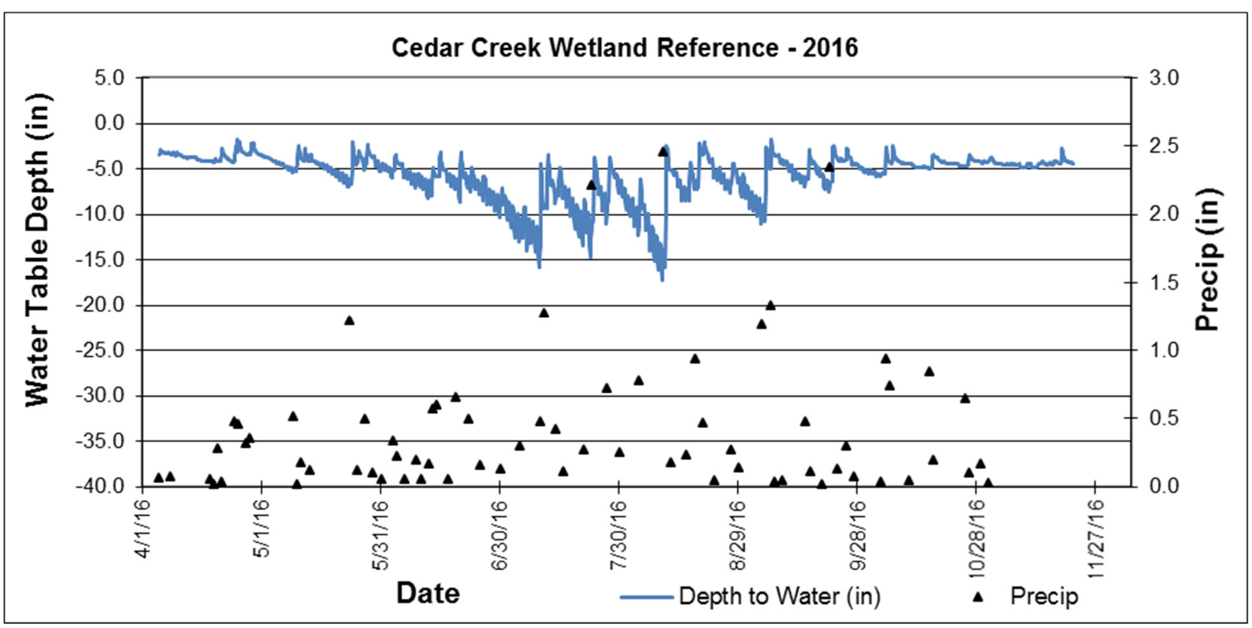
Soils at Well Location: not yet available

Surrounding Soils: Zimmerman

Vegetation at Well Location: not yet available

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

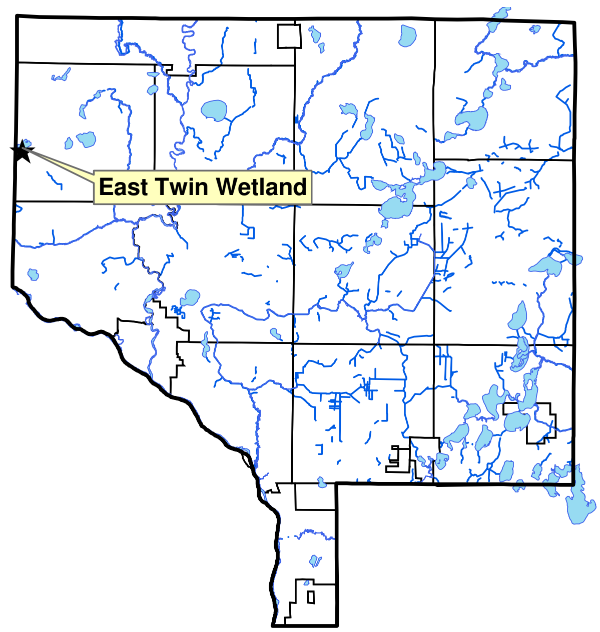
2016 Hydrograph



East Twin Reference Wetland

East Twin Lake Township Park, Nowthen

Site Information



Monitored Since: 2001

Wetland Type: 5

Wetland Size: ~5.9 acres

Isolated Basin? Yes

Connected to a Ditch? No

Soils at Well Location:

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

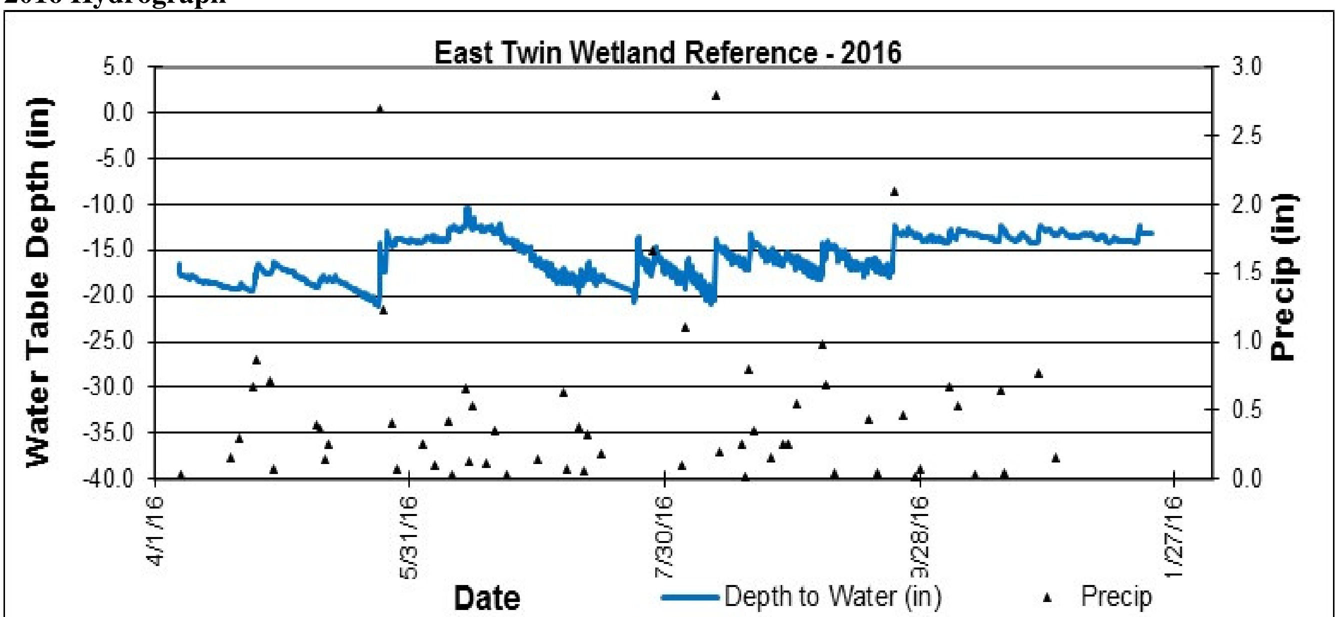
Surrounding Soils: Lake Beach, Growton and Heyder fine sandy loams

Vegetation at Well Location:

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

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

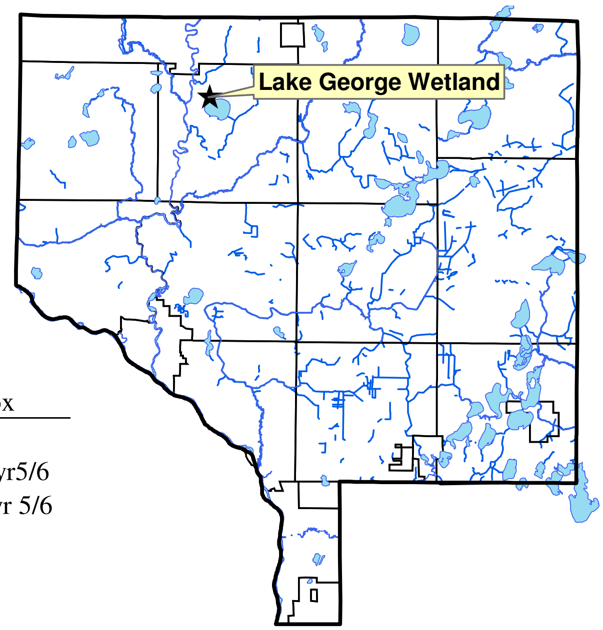
2016 Hydrograph



Wetland Hydrology Monitoring

LAKE GEORGE REFERENCE WETLAND

Lake George County Park, Oak Grove



Site Information

Monitored Since: 1997

Wetland Type: 3/4

Wetland Size: ~9 acres

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

Connected to a Ditch? No

Soils at Well Location:

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

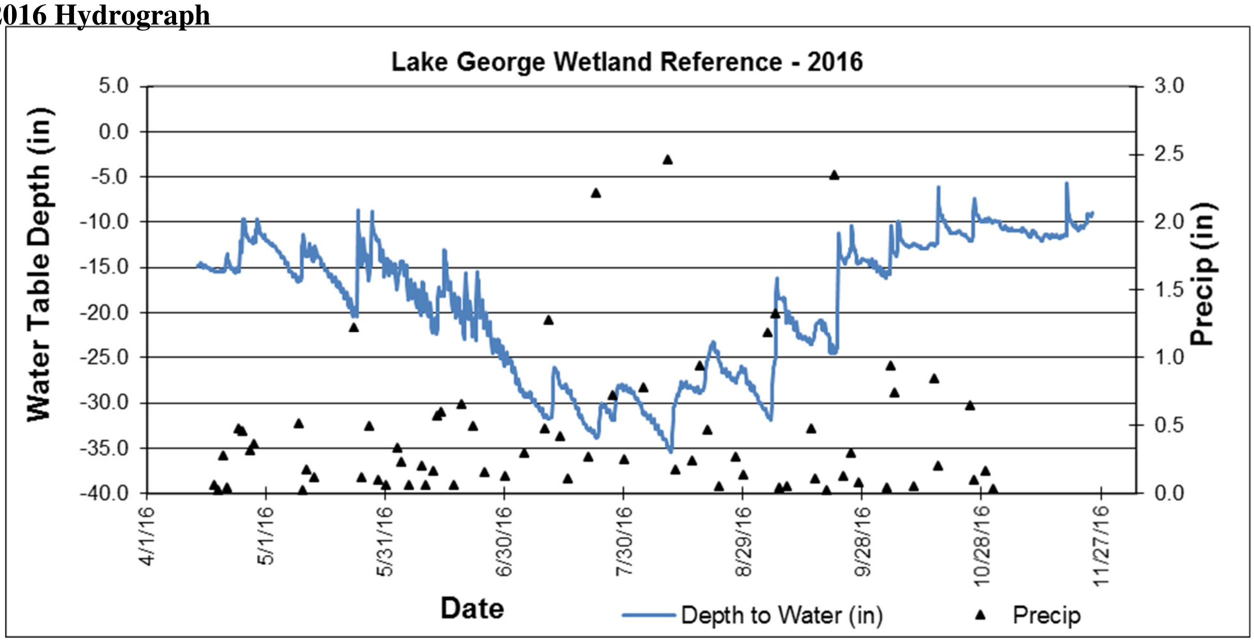
Surrounding Soils: Lino loamy fine sand and Zimmerman fine sand

Vegetation at Well Location:

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

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

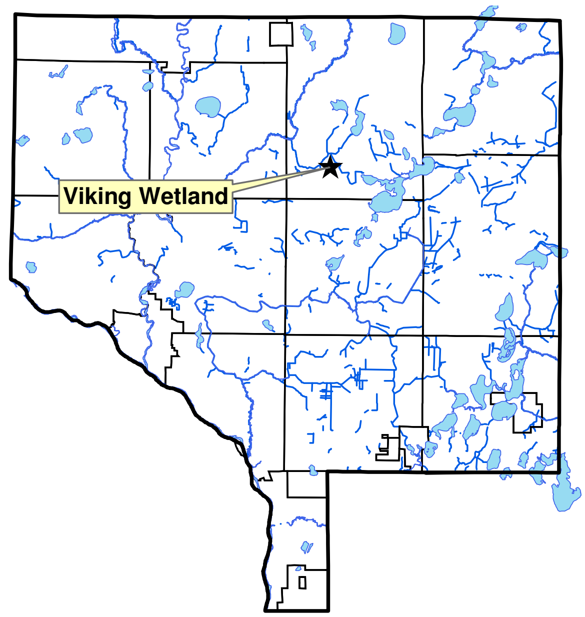
2016 Hydrograph



Wetland Hydrology Monitoring

VIKING MEADOWS REFERENCE WETLAND

Viking Meadows Golf Course, East Bethel



Site Information

Monitored Since: 1999

Wetland Type: 2

Wetland Size: ~0.7 acres

Isolated Basin? No

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

Soils at Well Location:

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

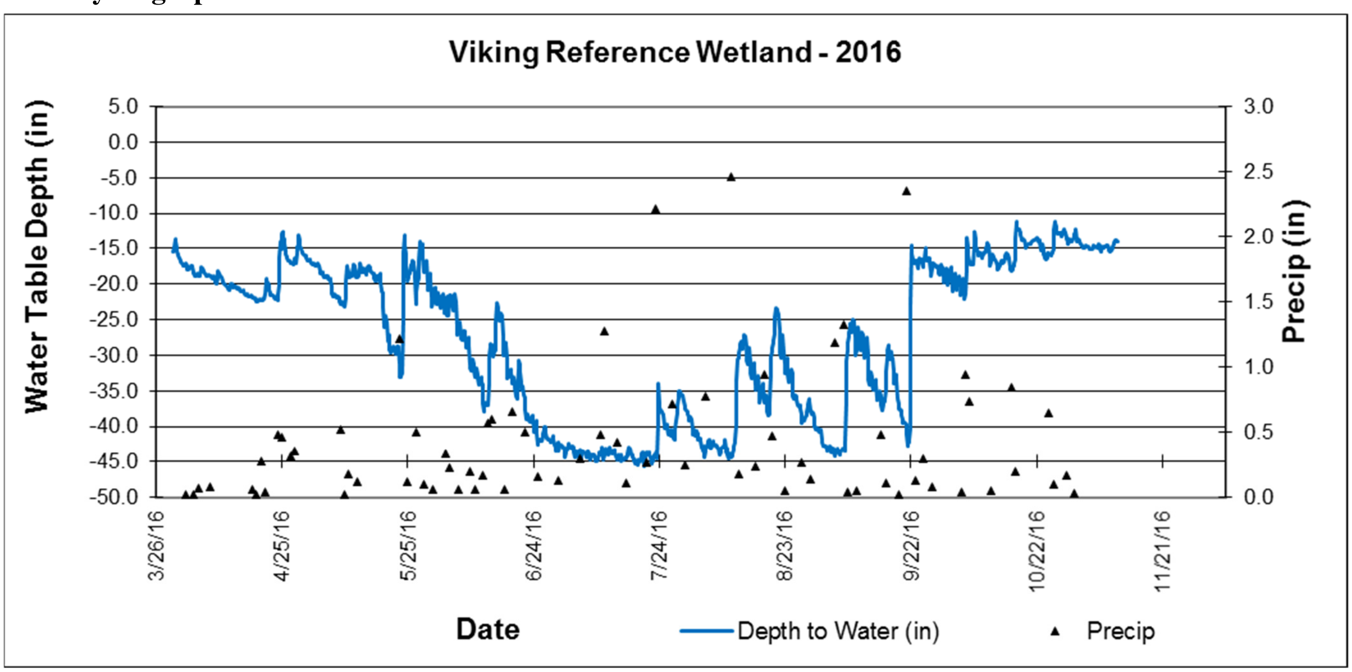
Surrounding Soils: Zimmerman fine sand

Vegetation at Well Location:

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

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

2016 Hydrograph



Lake George Stormwater Retrofit Analysis – Interim Summary Report

Description: Lake George is a premier recreation lake in Anoka County. Water quality, especially Secchi transparency, has been declining in Lake George in the past decade. The Lake George Improvement District and Anoka Conservation District have partnered on a State Clean Water Fund grant to determine the sources of pollution to Lake George and identify specific projects to correct the lake water quality decline. 2016 was the first year of this multi-year grant and was focused on monitoring and intensive data collection from within the Lake George lakeshed. This monitoring will be continued and followed by modelling of the watershed to help identify sources of pollutant loading and target areas for water quality improvement projects.

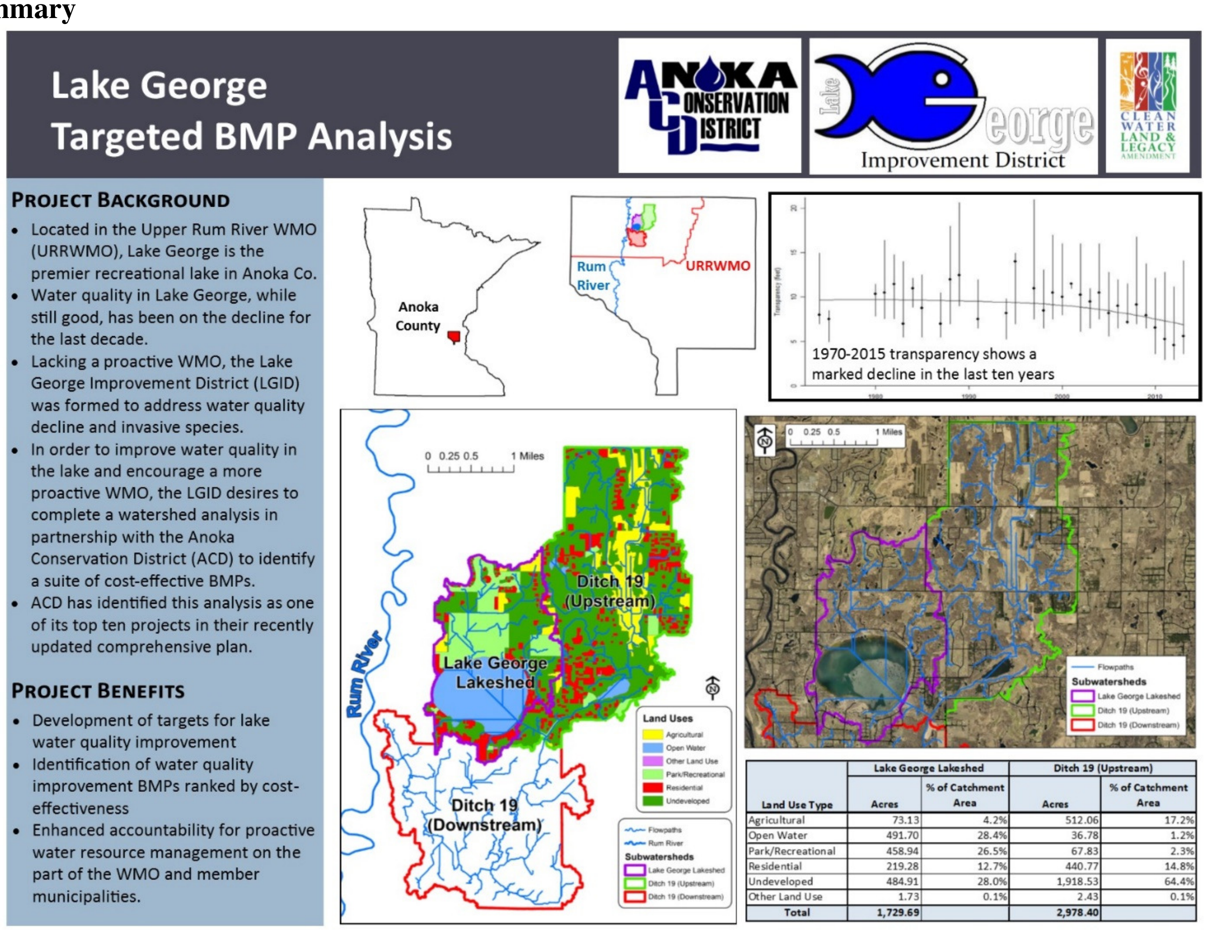
2016 Water Monitoring Locations:

Outfall Lake George at the North side of the Lake
Outfall into Lake George at the NE side of the Lake
Outfall into Lake George at Ditch 19 (alternate site at upstream weir)
Tributary at 221st W of Zion
Tributary at 221st E of Zion
Tributary at 221st E of Nightingale
Ditch 19 at 221st
Ditch 19 at Bluebird and 229th

Purpose: Identify nutrient loading rates from Lake George tributaries to aid in targeting water quality improvement projects. The final work product, due in by December 2018, will be a report detailing specific water quality projects to address the decline in Lake George water quality.

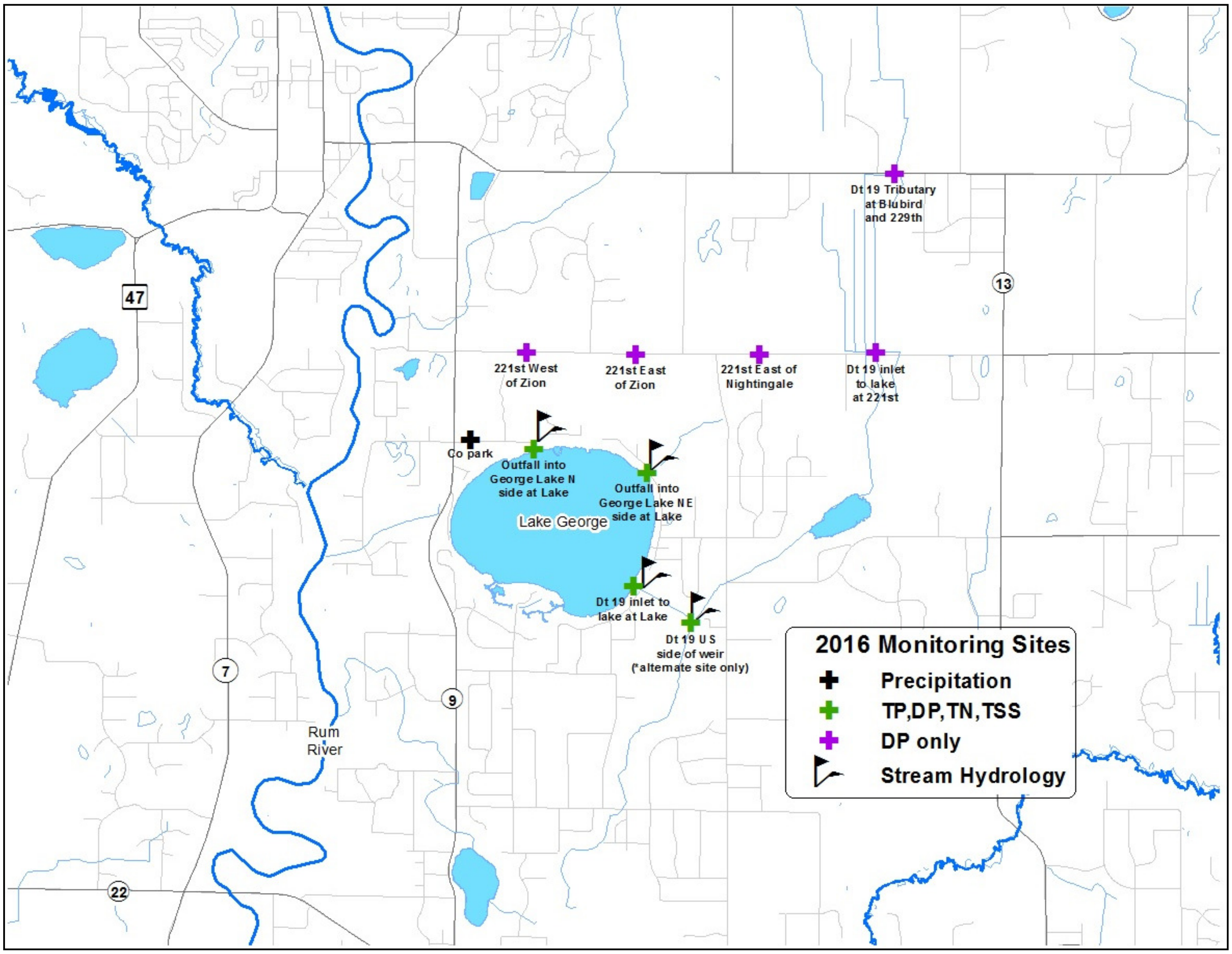
Results: Sampling results and the next steps for this project are provided in detail below

Study Summary



Land Use Type	Lake George Lakeshed Acres	Lake George Lakeshed % of Catchment Area	Ditch 19 (Upstream) Acres	Ditch 19 (Upstream) % of Catchment Area
Agricultural	73.13	4.2%	512.06	17.2%
Open Water	491.70	28.4%	36.78	1.2%
Park/Recreational	458.94	26.5%	67.83	2.3%
Residential	219.28	12.7%	440.77	14.8%
Undeveloped	484.91	28.0%	1,918.53	64.4%
Other Land Use	1.73	0.1%	2.43	0.1%
Total	1,729.69		2,978.40	

Lake George Stormwater Retrofit Analysis Study monitoring sites



TP = total phosphorus, DP = dissolved phosphorus, TN = total nitrogen, TSS = total suspended solids.
*Ditch 19 upstream of the weir was used only as an alternate site when lake levels were high enough to reverse flow at the Ditch 19 outfall.

Stream monitoring data at Lake George outfall sites

Outfall George Lake N Side @ Lake			5/12/2016	5/20/2016	6/2/2016	6/8/2016	6/14/2016	6/20/2016	9/22/2016	11/15/2016			
	Units	R.L.*	Results	Results	Results	Results	Results	Results	Results	Results	Average	Min	Max
pH		0.1	7.07	6.9	6.56	6.56	6.83	6.31	6.25	7.19	6.71	6.25	7.19
Conductivity	mS/cm	0.01	0.279	0.286	0.37	0.411	0.38	0.337	0.266	0.187	0.31	0.19	0.41
Turbidity	NTU	1	9	0.4	5	8.1	4.8	14.5	7.7	6.6	6.96	0.40	14.50
D.O.	mg/L	0.01	5.06	3.82	0.99	0.81	0.65	0.77	2.28	5.73	2.51	0.65	5.73
D.O.	%	1	47.6	36.2	10.1	8	7	8.7	22.6	44	23.03	7.00	47.60
Temp.	°C	0.1	11.18	11.8	14.8	14.15	18.38	20.29	15.62	4.38	13.82	4.38	20.29
Salinity	%	0.01	0.13	0.14	0.18	0.2	0.18	0.16	0.13	0.09	0.15	0.09	0.20
T.P.	ug/L	10	25	11	87	95	186	194	100	0.7	87.34	0.70	194.00
TSS	mg/L	2	8	<2	6.0	10	10	9	4	4	6.63	4.00	10.00
Secchi-tube	cm	n/a	>100	>100	80	76	64	63	63	>100	81.00	63.00	80.00
T.D.P	ug/L	5	16	5	36	54	109	79	49	7	44.38	5.00	109.00
T.K.N	mg/L	0.2	1.2	1.7	1.6	2	2.2		1.5	0.9	1.59	0.90	2.20
Nitrate+Nitrite	mg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
*reporting limit													

Outfall George Lake NE @ Lake			5/12/2016	5/20/2016	6/2/2016	6/8/2016	6/14/2016	6/20/2016	9/22/2016	11/15/2016			
	Units	R.L.*	Results	Results	Results	Results	Results	Results	Results	Results	Average	Min	Max
pH		0.1	7.32	7.37	6.24	6.99	6.96	6.33	6.65	6.84	6.84	6.24	7.37
Conductivity	mS/cm	0.01	0.287	0.271	0.366	0.405	0.375	0.381	0.248	0.212	0.32	0.21	0.41
Turbidity	NTU	1	6.4	19.1	12	20.1	14.1	29.9	8.3	8.7	14.80	6.40	29.90
D.O.	mg/L	0.01	7.83	8.67	4.77	4.91	1.15	1.03	2.76	5.11	4.53	1.03	8.67
D.O.	%	1	80.2	99.8	51.9	54.2	13	12.4	28.5	40.3	47.54	12.40	99.80
Temp.	°C	0.1	15.13	21.03	17.5	18.44	20.19	23.57	16.18	5.32	17.17	5.32	23.57
Salinity	%	0.01	0.14	0.13	0.17	0.2	0.18	0.19	0.12	0.1	0.15	0.10	0.20
T.P.	ug/L	10	94	103	199	161	260	376	214	0.6	175.95	0.60	376.00
TSS	mg/L	2	4	<2	4.0	5	12	9	2	2	5.43	<2	12.00
Secchi-tube	cm		>100	>100	>100	>100	64	38	92	55	81.00	38.00	>100
T.D.P	ug/L	5	42	8	18	17	28	91	22	6	29.00	6.00	91.00
T.K.N	mg/L	0.2	0.9	1.7	1.4	1.4	1.7		0.8	1.1	1.29	0.80	1.70
Nitrate+Nitrite	mg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
*reporting limit													

Ditch 19 Inlet @ Lake			5/12/2016	5/20/2016	6/2/2016	6/8/2016	6/14/2016	6/20/2016	9/22/20116	11/15/2016			
	Units	R.L.*	Results	Results	Results	Results	Results	Results	Results	Results	Average	Min	Max
pH		0.1	7.92	7.02	7.25	6.6	6.99	6.94	7.09	8.1	7.24	6.60	8.10
Conductivity	mS/cm	0.01	0.246	0.241	0.267	0.297	0.234	0.23	0.367	0.192	0.26	0.19	0.37
Turbidity	NTU	1	5.9	12.4	0	2.6	1.9	5.8	3.2	0.4	4.08	0.40	12.40
D.O.	mg/L	0.01	10.63	6.77	4.1	1.96	1.96	4.5	5.83	11.95	5.96	1.96	11.95
D.O.	%	1	109.6	69.3	42.5	19.5	22.3	53.3	61.1	100.2	59.73	19.50	109.60
Temp.	°C	0.1	15.4	14.74	15.5	16.4	20.65	21.95	11.27	7.56	15.43	7.56	21.95
Salinity	%	0.01	0.12	0.11	0.13	0.14	0.11	0.11	0.17	0.09	0.12	0.09	0.17
T.P.	ug/L	10	27	63	81	35	76	75	71	<0.5	61.14	27.00	81.00
TSS	mg/L	2	2	4	3.0	2	4	8	2	3	3.50	2.00	8.00
Secchi-tube	cm		>100	>100	87	>100	79	>100		>100	>100	79.00	>100
T.D.P	ug/L	5	<0.005	0.024	0.015	0.007	0.01	<0.005	0.036	<0.005	0.02	<0.005	0.04
T.K.N	mg/L	0.2	0.8	2.1	1	0.9	1.2		1.2	0.8	1.14	0.80	2.10
Nitrate+Nitrite	mg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.33	<0.05	<0.05	<0.05	0.33
*reporting limit													

Stream monitoring data at watershed tributary sites

Ditch 19 @ Blubird and 229th			5/12/2016	5/20/2016	6/2/2016	6/8/2016	6/14/2016	6/20/2016	9/22/2016	11/15/2016			
	Units	R.L.*	Results	Results	Results	Results	Results	Results	Results	Results	Average	Min	Max
pH		0.1	8.71	8.12	7.94	7.75	7.64	6.67	6.9	7.49	7.65	6.67	8.71
Conductivity	mS/cm	0.01	0.456	0.465	0.52	0.519	0.444	0.348	0.394	0.371	0.44	0.35	0.52
Turbidity	NTU	1	1.2	7.8	2	11.4	0.1	9.4	17	0	6.11	0.00	17.00
D.O.	mg/L	0.01	13.85	11.55	9.73	10.22	7.18	3.52	2.63	6.71	8.17	2.63	13.85
D.O.	%	1	137.1	122.2	97.3	103.4	75.9	39.8	25.7	54.9	82.04	25.70	137.10
Temp.	°C	0.1	13.5	16.86	13.7	14.38	16.76	20.18	14.53	6.46	14.55	6.46	20.18
Salinity	%	0.01	0.22	0.22	0.25	0.25	0.21	0.17	0.19	0.17	0.21	0.17	0.25
T.P.	ug/L	10											
TSS	mg/L	2											
Secchi-tube	cm		>100	>100	>100	>100	>100	>100	39	>100	>100	39	>100
T.D.P	ug/L	5		22	33	36	31	200	428	111	123.00	22.00	428.00
T.K.N	mg/L	0.2											
Nitrate+Nitrite	mg/L	0.05											
*reporting limit													

221st West of Zion			5/20/2016	6/2/2016	6/8/2016	6/14/2016	6/20/2016	9/22/2016	11/15/2016			
	Units	R.L.*	Results	Results	Results	Results	Results	Results	Results	Average	Min	Max
pH		0.1	6.59	6.27	6.27	6.25	5.89	6	6.36	6.23	5.89	6.59
Conductivity	mS/cm	0.01	0.263	0.348	0.365	0.302	0.303	0.269	0.212	0.29	0.21	0.37
Turbidity	NTU	1	20.2	4.5	11	19.6	7.2	2.7	3	9.79	2.70	20.20
D.O.	mg/L	0.01	2.05	0.81	1.29	0.79	1.09	0.75	1.22	1.14	0.75	2.05
D.O.	%	1	18.9	8.2	12.5	8.3	11.7	7.7	10.9	11.17	7.70	18.90
Temp.	°C	0.1	11.02	14.7	13.4	16.87	18.11	15.78	6.65	13.79	6.65	18.11
Salinity	%	0.01	0.13	0.17	0.17	0.14	0.14	0.13	0.1	0.14	0.10	0.17
T.P.	ug/L	10										
TSS	mg/L	2										
Secchi-tube	cm		57	74	75	8	81	>100	>100	71.00	8.00	>100
T.D.P	ug/L	5	9	90	91	73	73	42	22	57.14	9.00	91.00
T.K.N	mg/L	0.2										
Nitrate+Nitrite	mg/L	0.05										
*reporting limit												

221st East of Zion			5/20/2016	6/2/2016	6/8/2016	6/14/2016	6/20/2016	9/22/2016	11/15/2016			
	Units	R.L.*	Results	Results	Results	Results	Results	Results	Results	Average	Min	Max
pH		0.1	6.67	6.24	6.43	6.43	6.33	6.23	6.22	6.36	6.22	6.67
Conductivity	mS/cm	0.01	0.261	0.154	0.271	0.267	0.207	0.143	0.215	0.22	0.14	0.27
Turbidity	NTU	1	1.6	2.9	11	61.5	12.2	n/a	0	14.83	0.00	61.50
D.O.	mg/L	0.01	4.62	1.61	2.29	3.34	3.11	0.9	1.55	2.49	0.90	4.62
D.O.	%	1	45.8	16.6	23.1	36.4	35.6	12.1	12.6	26.03	12.10	45.80
Temp.	°C	0.1	14.06	15.2	15.0	18.9	19.35	15.01	5.36	14.70	5.36	19.35
Salinity	%	0.01	0.12	0.08	0.01	0.12	0.11	0.07	0.1	0.09	0.01	0.12
T.P.	ug/L	10										
TSS	mg/L	2										
Secchi-tube	cm		76	83	67	10	70	60	>100	66.57	10	>100
T.D.P	ug/L	5	18	72	67	200	64	220	11	93.14	11.00	220.00
T.K.N	mg/L	0.2										
Nitrate+Nitrite	mg/L	0.05										
*reporting limit												

221st East of Nightingale			5/20/2016	6/2/2016	6/8/2016	6/14/2016	6/20/2016	9/22/2016	11/15/2016			
	Units	R.L.*	Results	Results	Results	Results	Results	Results	Results	Average	Min	Max
pH		0.1	6.19	5.79	5.76	5.74	5.47	5.7	5.77	5.77	5.47	6.19
Conductivity	mS/cm	0.01	0.237	0.237	0.241	0.2	0.21	0.214	0.171	0.22	0.17	0.24
Turbidity	NTU	1	40.2	3.8	14	17.8	16.5	5.3	31.4	18.40	3.80	40.20
D.O.	mg/L	0.01	2.43	1.22	0.83	0.95	1.17	1.97	4.02	1.80	0.83	4.02
D.O.	%	1	22.1	10.6	7.6	9	11.5	19.5	33.4	16.24	7.60	33.40
Temp.	°C	0.1	10.26	8.47	9.7	11.37	13.64	14.59	6.6	10.66	6.60	14.59
Salinity	%	0.01	0.11	0.11	0.11	0.09	0.1	0.1	0.08	0.10	0.08	0.11
T.P.	ug/L	10										
TSS	mg/L	2										
Secchi-tube	cm		34	>100	>100	>100	77	>100	n/a	>100	34	>100
T.D.P	ug/L	5	52	177	228	291	269	72	112	171.57	52.00	291.00
T.K.N	mg/L	0.2										
Nitrate+Nitrite	mg/L	0.05										
*reporting limit												

Ditch 19 @ 221st			5/12/2016	5/20/2016	6/2/2016	6/8/2016	6/14/2016	6/20/2016	9/22/2016	11/15/2016			
	Units	R.L.*	Results	Results	Results	Results	Results	Results	Results	Results	Average	Min	Max
pH		0.1	7.83	7.53	7.39	7.51	7.72	6.9	6.83	7.1	7.35	6.83	7.83
Conductivity	mS/cm	0.01	0.533	0.523	0.587	0.603	0.496	0.415	0.466	0.416	0.50	0.42	0.60
Turbidity	NTU	1	3.4	6.2	9	6.8	3.3	11.2	9.9	0	6.24	0.00	11.20
D.O.	mg/L	0.01	11.11	11.24	8.51	9.12	8.14	5.51	2.72	7.65	8.00	2.72	11.24
D.O.	%	1	108.6	114.3	83.2	92.2	84.8	60.7	26.3	63.8	79.24	26.30	114.30
Temp.	°C	0.1	12.85	15.03	12.7	13.87	15.94	19.39	14.24	6.5	13.82	6.50	19.39
Salinity	%	0.01	0.25	0.25	0.28	0.29	0.23	0.2	0.22	0.19	0.24	0.19	0.29
T.P.	ug/L	10											
TSS	mg/L	2											
Secchi-tube	cm		>100	>100	>100	>100	>100	98	85	>100	>100	85	>100
T.D.P	ug/L	5		15	18	9	27	92	168	9	48.29	9.00	168.00
T.K.N	mg/L	0.2											
Nitrate+Nitrite	mg/L	0.05											
*reporting limit													

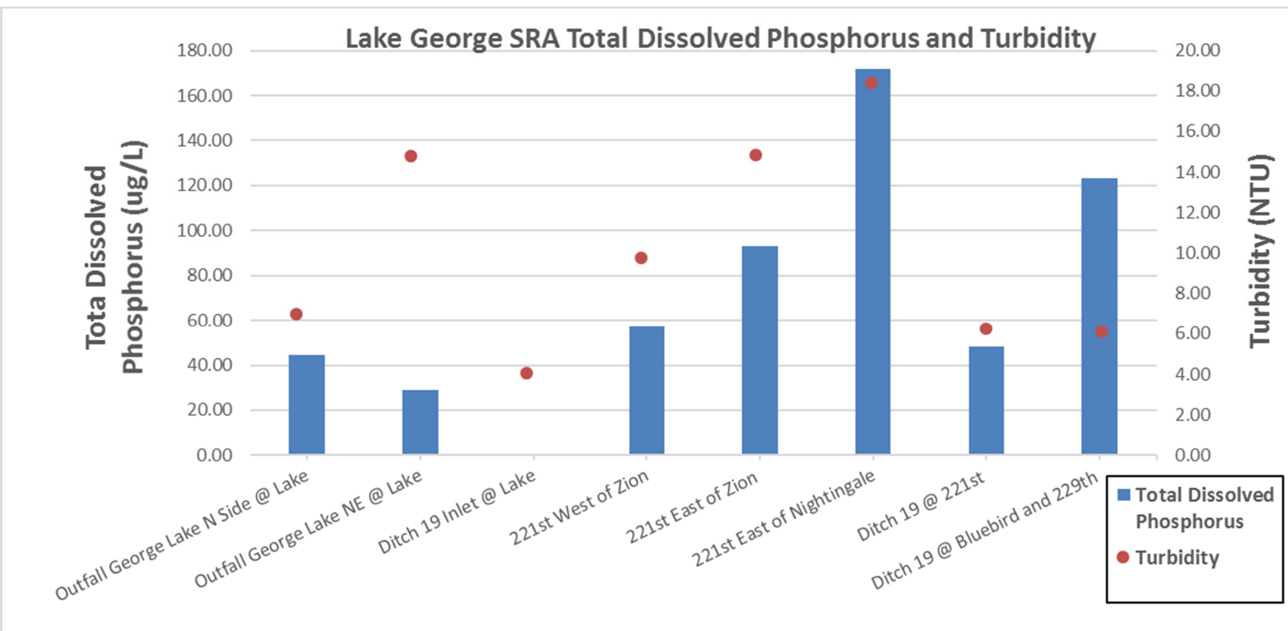
Turbidity and Total Dissolved Phosphorus

For this study, turbidity and total dissolved phosphorus are the two parameters of greatest interest. Therefore, these parameters are explored in depth below and other parameters are reported with less discussion in the tables on the previous pages.

Turbidity is a measurement 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. The amount of suspended material is important because it affects transparency and aquatic life, and because many other pollutants are attached to particles. Phosphorus is one nutrient pollutant that can often be attached to suspended particles, and streams with high turbidity may have high particulate phosphorus. Many stormwater treatment practices such as street sweeping, sumps, and stormwater settling ponds target sediment and attached pollutants.

Total dissolved phosphorus is that portion of phosphorus which is not particulate (attached to particles). It is a good indicator of upstream loading from natural systems like wetland complexes. Since particulate matter is very low in these upstream tributaries, dissolved phosphorus will be a better indicator of the natural loading processes occurring in these systems.

Both turbidity and dissolved phosphorus levels for the monitored lake tributaries are presented in the graph below. The results help indicate which streams may be of greatest interest for water quality improvement projects.



Monitoring Results Discussion

Based on monitoring in 2016, it appears that the largest concentrations of dissolved phosphorus and turbidity exist in the small ditch systems that enter the lake from the north and northeast, especially from the ditch that flows under 221st East of Nightingale and leads directly to the NE outfall at the lake. Although the northern portion of Ditch 19 flows through mostly agricultural land and has extremely high levels of dissolved phosphorus, it appears that the large open-water wetland to the east of Lake George filters out the dissolved phosphorus from Ditch 19 before it reaches the lake. It is also possible that high lake levels caused backflow at the Ditch 19 inlet and dilution of dissolved phosphorus and turbidity occurred in the lowest portions of the ditch.

ACD are collecting flow measurements and developing rating curves at each of these sites, which will be completed in 2017. The purpose of these rating curves is to allow us to analyze how much water is flowing through the tributary and entering the lake (rating curves are the mathematical relationship between water level and flow). These flow volumes, when paired with pollutant concentration measurements, will allow us to quantify the mass of each pollutant entering the lake from each tributary (often called pollutant load). Until this work is done, the pollutant concentration results presented above should be interpreted with the understanding that tributaries with the highest concentrations may not be the biggest contributors of pollutants to the lake because of lower flows.

During the 2017 sampling season ACD will collect additional pollutant concentration measurements while developing rating curves for each tributary. Then we will quantify pollutant loading from each tributary, compare pollutant loads to the overall pollutant budget of the lake to determine the impacts of each tributary on the lake, identify water quality projects that might be installed to improve the lake, evaluate these potential projects by modeling them, and recommend a course of corrective action.

St. Francis Stormwater Retrofit Analysis

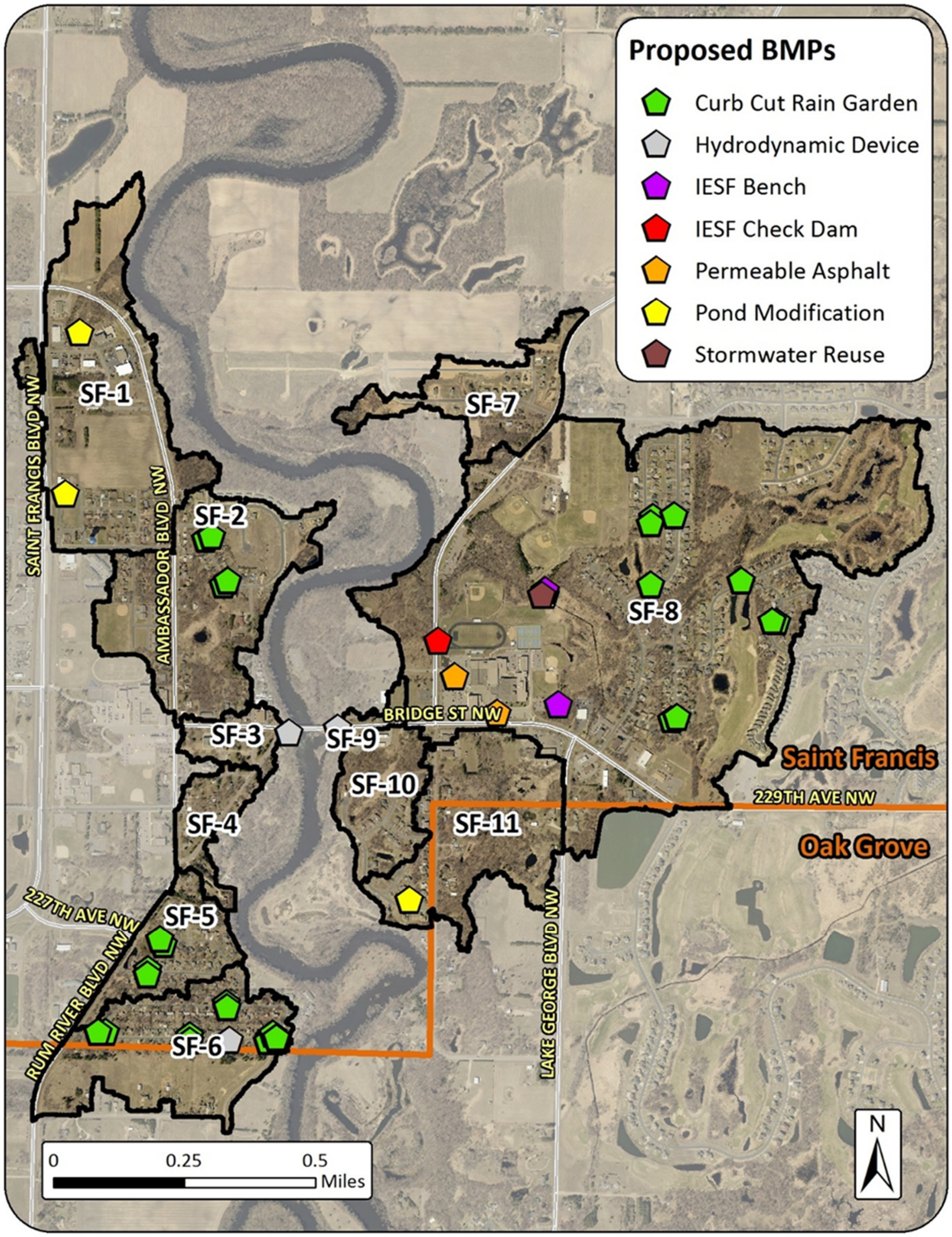
Description: Analysis identified new stormwater treatment opportunities in neighborhoods identified by the city and ranked potential projects by cost effectiveness (amount of pollutant kept out of the Rum River per dollar spent). Water quality benefits associated with the installation of each identified 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. 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. A variety of stormwater retrofit approaches were identified. They include bio-retention, hydrodynamic devices, permeable pavement, iron enhanced sand filter pond benches, iron enhanced sand filter check dams, existing stormwater pond modifications, and water reuse. The analysis provides sufficient detail for pursuit of funds to install the most cost effective projects.

Location: Selected areas in the City of St. Francis.

Purpose: To improve water quality in the Rum River.

Results: Work began in 2015 and was completed in 2016. 17 stormwater retrofit projects were identified and ranked by cost effectiveness. A map showing proposed BMPs is below. A full separate report is available.

City of St. Francis Proposed BMPs



Water Quality Grant Fund

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

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

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

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

Locations: Throughout the watershed.

Results: Projects are reported in the year they are installed.

URRWMO Cost Share Fund Summary

2006 URRWMO Contribution	+	$ 990.00
2006 Expenditures		$ 0.00
2007 URRWMO Contribution	+	$ 1,000.00
2007 Expenditures		$ 0.00
2008 Expenditures		$ 0.00
2009 Expenditures		$ 0.00
2010 URRWMO Contribution	+	$ 500.00
2011 URRWMO Contribution	+	$ 567.00
2010-11 Expenditure Petro streambank stabilization	-	$1,027.52
2011 Expenditure Erickson lakeshore restoration	-	$ 233.63
2012 Expenditure Erickson lakeshore restoration	-	$ 137.97
2012 URRWMO Contribution	+	$1,000.00
2013 URRWMO Contribution	+	$ 0
2014 Expenditure – Stitt lakeshore restoration	-	$1,059.69
2013 Correction	+	$ 0.48
2014 URRWMO Contribution		$ 0.00
2015 URRWMO Contribution		$ 0.00
2016 URRWMO Contribution		$ 0.00
*2017 Expenditure – Rum River revetments	-	$ 1598.67
Fund Balance		**$ 0.00**

* URRWMO directed ACD to transfer remaining funds into ACD's fund for Rum Riverbank stabilizations using cedar tree revetments.

URRWMO Website

Description: The Upper Rum River Watershed Management Organization (URRWMO) contracted the Anoka Conservation District (ACD) to design and maintain a website about the URRWMO and the Upper Rum River watershed.

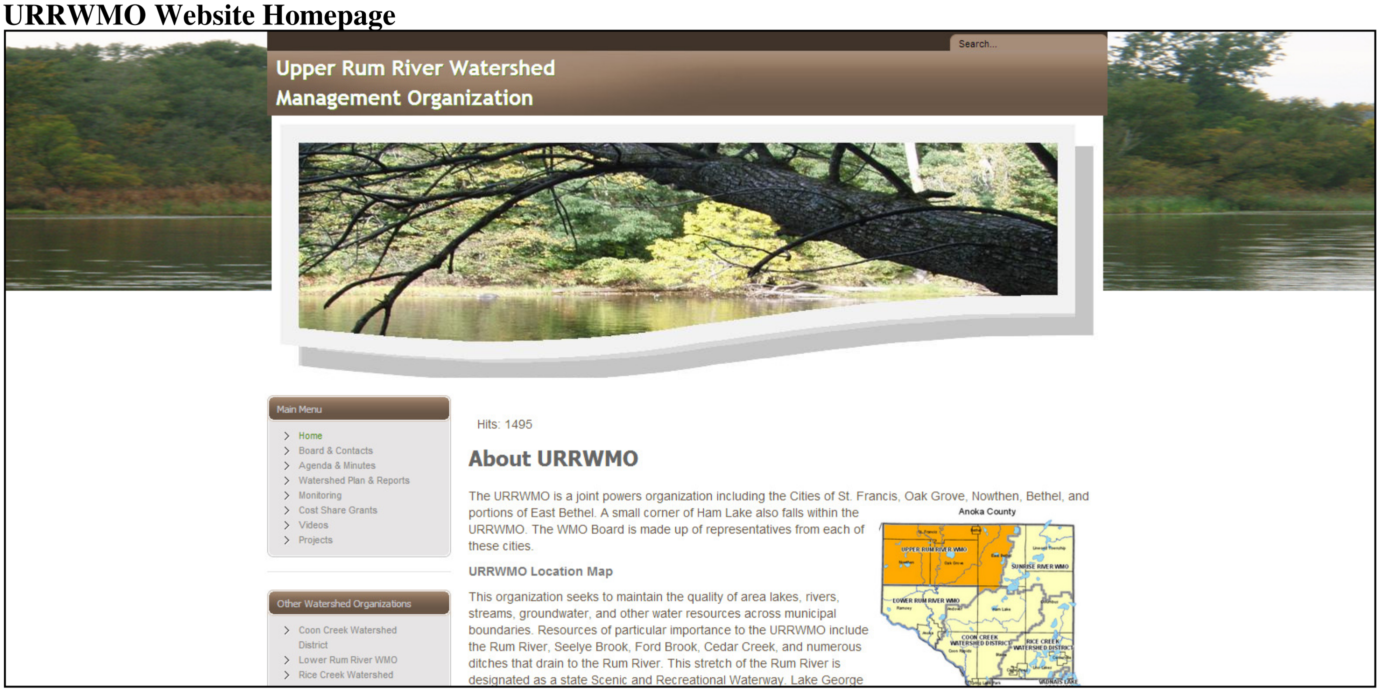
Purpose: To increase awareness of the URRWMO and its programs. The website also provides tools and information that helps users better understand water resources issues in the area.

Location: www.URRWMO.org

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

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

URRWMO Website Homepage



URRWMO Annual Newsletter

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

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

Locations: Watershed-wide.

Results: The Anoka Conservation District (ACD) assisted the URRWMO by drafting the annual newsletter article about the new management plans upcoming for area streams and lakes. The URRWMO Board reviewed and edited the draft article. The finalized article was posted to the URRWMO website, sent to each member community for publication in their newsletters and provided to the Independent School District 15 publication, "The Courier."

2016 URRWMO Newsletter Article

Upper Rum River
Watershed Management Organization

MEDIA RELEASE

Contact person: Jamie Schurbon 763-434-2030 ext. 12
Date: April 29, 2016

Rum River, Lakes Management Planning Underway

The Rum River, Lake George and Seelye Brook are a few of the waterbodies receiving new management plans in the coming months. Residents interested water quality, aquatic invasive species, flooding and environmental health are invited to contribute to the process. Both local and regional plans are taking shape.

At the local level, the Upper Rum River Watershed Management Organization (URRWMO) is updating its 10-year management plan. The URRWMO was jointly formed by the cities of Bethel, East Bethel, Nowthen, St. Francis, Oak Grove and Ham Lake to manage water issues, including those that tend to flow across city boundaries. It sets consistent minimum regulatory standards across the cities, monitors water quality and may coordinate projects to address problems. The URRWMO will be considering its role relative to cities, as well as its participation in regional management.

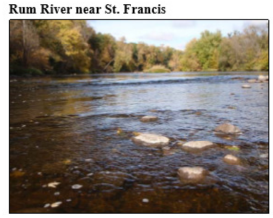
At the regional level, the State is funding a Rum River Watershed Restoration and Protection Plan (WRAPP), which encompasses the watershed from Lake Mille Lacs to Anoka. Lakes and streams draining to the river are included. Each county's soil and water conservation district is serving as a key point of contact in this planning effort. The plan will include how to keep good water quality and address problems.

Lake George and the Rum River are likely to get substantial attention locally. Lake George is a regional attraction with good, but declining water quality. Addressing that decline is likely to be a priority. The Rum River has good water quality and is a state scenic and recreational river which many want to protect.

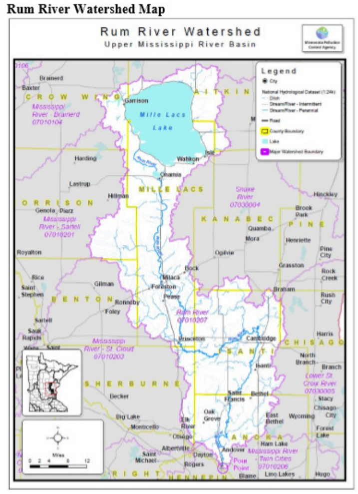
The URRWMO is planning an open house June 29 at 7pm at Oak Grove City Hall. Residents are invited to share their input on priorities for the next ten years. More information is at www.URRWMO.org.

The regional Rum River WRAPP will be holding several opportunities for input between now and the end of the year. Notices of these meetings and draft documents for public review will be posted www.AnokaSWCD.org under the "projects" tab, or contact Jamie Schurbon at 763-434-2030 ext. 12 or jamie.schurbon@anokaswcd.org.

Rum River near St. Francis



Rum River Watershed Map



URRWMO 2015 Annual Reports to the State

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

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

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

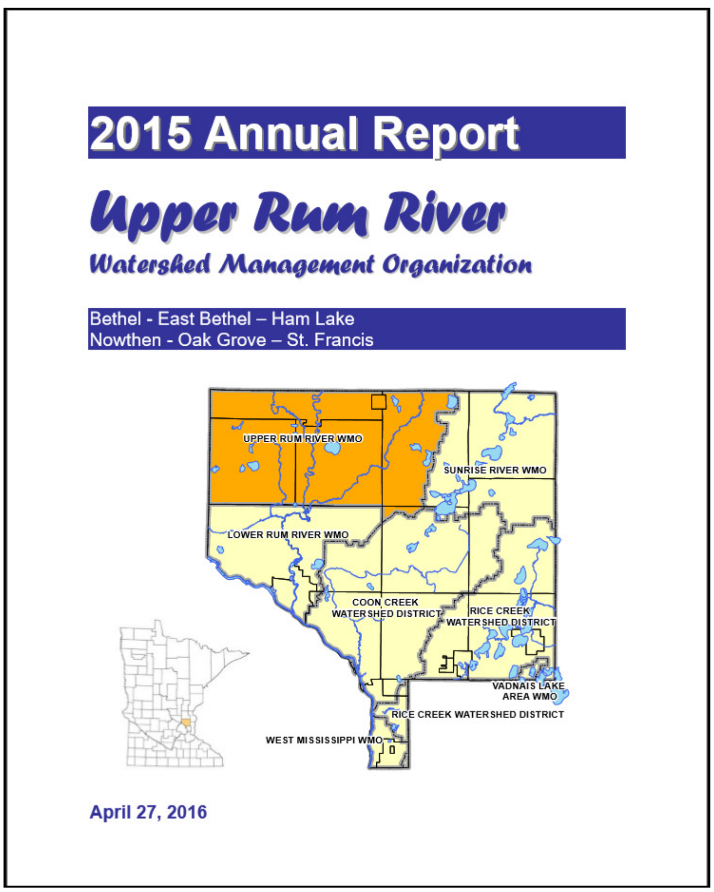
Locations: Watershed-wide

Results: The Anoka Conservation District assisted the URRWMO with preparation of a 2015 Upper Rum River WMO Annual Report to BWSR and reporting to the State Auditor. This included:

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

All were completed by the end of April 2016. The report to BWSR and financial report are available on the URRWMO website.

Report to BWSR Cover


2015 Annual Report

Upper Rum River

Watershed Management Organization

Bethel - East Bethel – Ham Lake
Nowthen - Oak Grove – St. Francis

April 27, 2016

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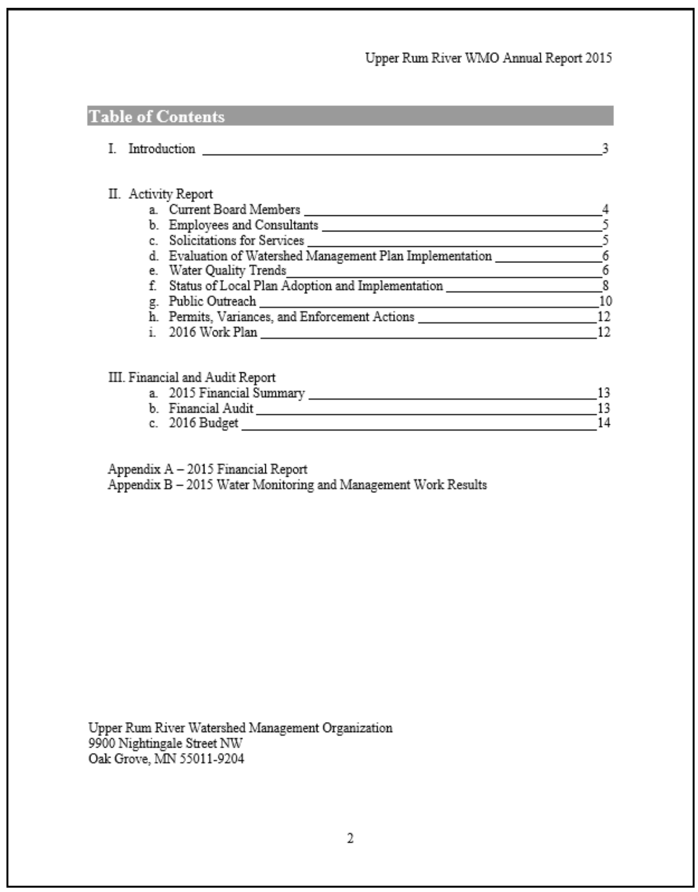
Upper Rum River WMO Annual Report 2015

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

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Financial Summary

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

Upper Rum River Watershed Financial Summary

Upper Rum River Watershed	WMO Asst (no charge)	Volunteer Precip	Reference Wetlands	Ob Well	Lake Level	Lake WQ	Stream Level	Stream WQ	WOMP	Student Biomon	Lake George SRA Monitoring	URRWMO Admin	WMO Annual Rpts to State	URRWMO Outreach/Promo	WMO Website Maint	Kern Property Enhancement	Revetments on the Rum	Rum River 1W1P	Rum River WRAPP	Lake George Phase I SRA	City of St. Francis SRA	Lake George CLP Mapping	URRWMO Plan	Total
Revenues																								
URRWMO	0	0	1725	0	1000	0	0	4200	0	825	0	0	1000	500	508	0	0	0	0	0	0	0	0	9758
State	0	0	0	600	0	0	0	0	0	0	0	0	0	0	0	7724	8316	0	86431	4117	5530	0	0	112719
Anoka Co. General Services	390	0	53	586	601	61	24	0	214	407	2985	581	0	0	50	2099	1325	98	0	0	0	267	330	10071
Anoka Conservation District	0	0	115	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	160	0	275
County Ag Preserves/Projects	0	0	0	0	0	0	0	0	0	475	9375	0	0	0	0	0	0	0	0	2107	0	0	0	11957
Service Fees	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1716	1465	0	0	0	0	0	0	3181
Regional/Local	0	0	80	0	0	139	0	0	800	0	0	0	0	0	0	0	0	0	0	0	6500	1088	0	8608
BWSR Cons Delivery	0	0	0	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	0	3056	0	0	0	0	0	0	0	0	0	0	0	0	0	560	576	0	0	0	0	0	4193
BWSR Cost Share TA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Metro ETA & AWQCP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4667	0	0	0	0	0	0	4667
Local Water Planning	0	1101	1519	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2620
TOTAL	390	1101	6549	1186	1601	200	24	4200	1014	1707	12360	581	1000	500	558	11540	16334	674	86431	6224	12030	1515	330	168049
Expenses-																								
Capital Outlay/Equip	5	14	40	14	19	15	22	20	12	19	3615	21	6	2	5	71	718	8	182	73	126	18	4	5026
Personnel Salaries/Benefits	339	1067	2952	1032	1393	1093	1620	1502	883	1432	4697	1590	431	116	352	5323	11766	586	13535	5415	9409	1318	287	68137
Overhead	25	78	217	76	102	80	119	110	65	105	345	117	32	9	26	392	865	43	996	398	692	97	21	5012
Employee Training	2	6	17	6	8	6	9	8	5	8	26	9	2	1	2	30	66	3	76	30	53	7	2	383
Vehicle/Mileage	7	23	62	22	29	23	34	32	19	30	99	34	9	2	7	113	249	12	286	114	199	28	6	1441
Rent	12	38	105	37	50	39	58	54	32	51	168	57	15	4	13	190	420	21	484	193	336	47	10	2435
Program Participants	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Program Supplies	0	-125	4018	0	0	444	5	794	0	61	1476	0	0	0	191	5421	2824	0	65890	0	0	0	0	80998
TOTAL	390	1101	7411	1186	1601	1700	1867	2520	1014	1707	10427	1827	495	134	596	11540	16909	674	81448	6224	10815	1515	330	163432

Recommendations

- **Integrate the Rum River WRAPP (Watershed Restoration and Protection Plan) into the URRWMO's activity plans.** This WRAPP is an assessment of the entire Rum River watershed, including recommended management strategies, that was produced by the MPCA and local water managers.
- **Collaborate on efforts to diagnose declining water quality in Lake George and fix it.** The Lake George Improvement District and the Anoka Conservation District have begun study of the issue and secured a state grant for partial funding.
- **Install projects identified in the St. Francis stormwater assessment** that is aimed at improving Rum River water quality. The study identified numerous stormwater treatment opportunities and ranking them by cost effectiveness. It lays the groundwork for project installations.
- **Participate with county and DNR efforts to upgrade the water control structure in Ditch 19, the main inlet to Lake George**. Residents have complained that condition of the ditch and water control structures are contributing to low lake water levels in recent years.
- **Update the URRWMO's water monitoring plan**, which expired in 2017.
- **Promote groundwater conservation.** Metropolitan Council models predict 3+ft drawdown of surface waters in parts of the URRWMO by 2030, and 5+ft by 2050.
- **Promote water quality improvement projects** for lakes, streams, and rivers. Cost share grants are available through the URRWMO and the ACD to encourage landowners to do projects that will have public benefits to water quality. Technical assistance for landowners is available through the Anoka Conservation District.