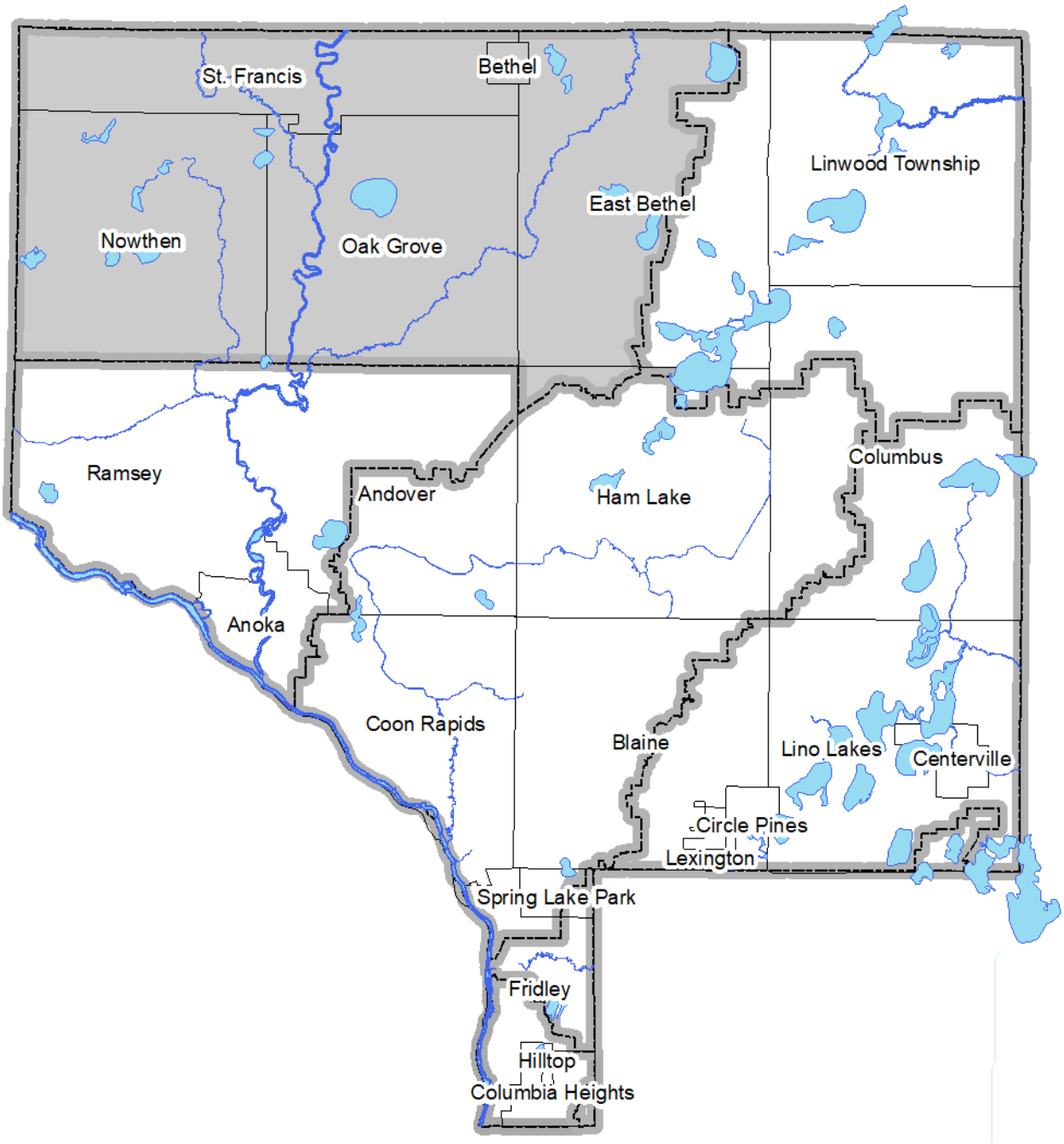
Excerpt from the 2021 Water Almanac

Chapter 3: Upper Rum River Watershed



Prepared by the Anoka Conservation District

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Recommendations

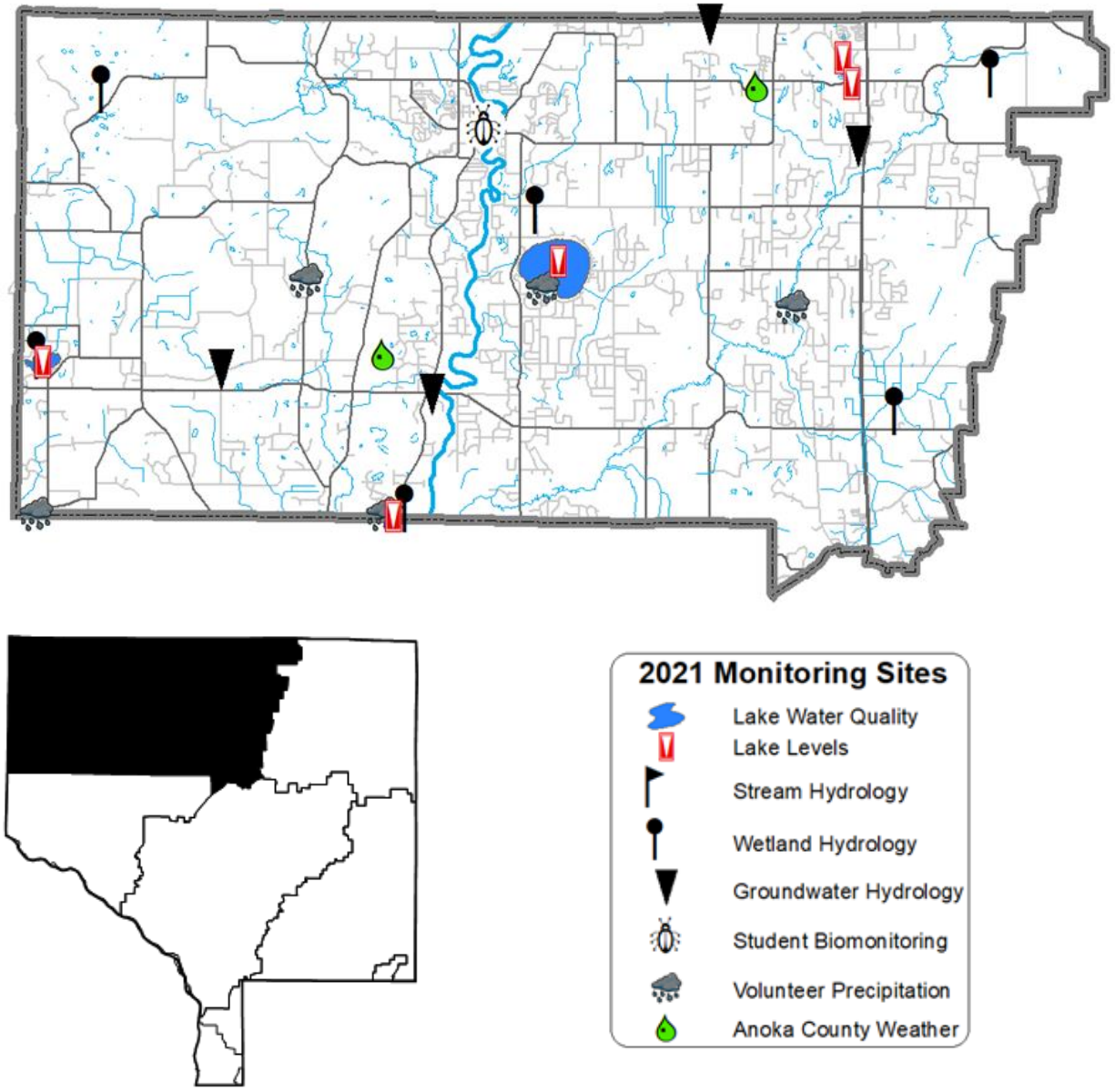
- **Participate in the Rum River One Watershed One Plan** process, resulting in prioritized management across the entire Rum River watershed.
- **Fund and install projects identified in the URRWMO Watershed Management Plan**. This prioritized list was created by the URRWMO Technical Advisory Committee (TAC):
  1. Rum Riverbank stabilizations*
  2. Anoka County Water Resources Outreach Collaborative*
  3. Perform stormwater retrofit analyses for the Rum River and subwatershed assessments*. Prioritized subwatershed assessment areas are: Pickerel Lake, East Twin Lake, Rum River direct drainage, and City of Bethel periphery.
  4. Lake George shoreline stabilizations*
  5. Lake George iron-enhanced sand filter feasibility study.
  6. Ditch 19 connector dredging.

* Indicates projects that have been initiated using State grant funds and URRWMO matching funds.

- **Bring projects to a construction-ready status** so they are positioned for State Watershed Based Implementation Funds. 10% match is needed for these grants.
- **Monitor Lake George water quality at least every other year**. The lake has had a declining clarity trend in recent years. The Lake Improvement District, URRWMO, and Met Council plan to cover most years.
- **Protect Lake George water quality**. Measures include installing projects ranked in a 2018 study and ensuring robust stormwater retention/treatment for any new development in the subwatershed. Wetter years (which have become more frequent) drive poorer water quality in this lake due to stormwater and flushing of nutrient-rich wetland systems, and increases in runoff from new impervious surfaces will exacerbate the situation.
- **Promote practices that limit road deicing salt applications** while keeping roads safe. Streams throughout the URRWMO have increasing specific conductance. Requiring municipal plow drivers to become certified through MN Pollution Control Agency deicing courses is recommended.
- **Periodically monitor chlorides in streams.** Monitoring every 3 years minimum is recommended.
- **Promote groundwater conservation and protection.** Metropolitan Council models predict 3+ ft. drawdown of surface waters in parts of the URRWMO by 2030, and 5+ ft. by 2050. This indicates conservation actions will be required to ensure the groundwater supply stays sufficient. Infiltration practices should be highly prioritized, and unused wells on private and public lands should be sealed to prevent contamination.
- **In the East Twin and Pickerel Lake subwatersheds, protect undeveloped lands or implement rigorous water quality protection measures during development.** These lakes have good water quality. Because they have small drainage areas, land use in those areas is an especially important determinant of water quality.

Map: 2021 Water Monitoring Sites

Upper Rum River WMO Area



Lake Levels Monitoring

Partners: URRWMO, ACD, MN DNR, Volunteers

Description: Weekly water level monitoring using lake gages placed in each lake. The past five and twenty-five years of data (if available) for each lake are illustrated below, and all historical data are available on the Minnesota DNR website using the "LakeFinder" feature (https://www.dnr.state.mn.us/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.

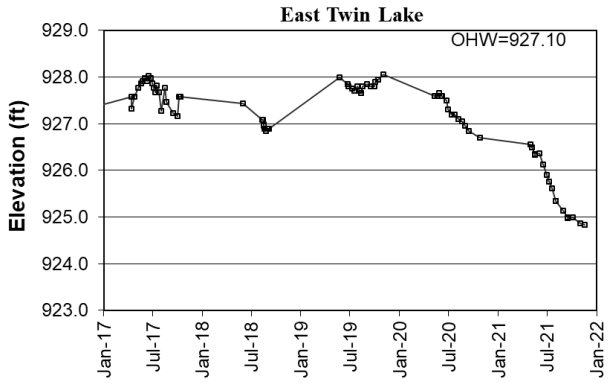
Location: East Twin Lake, Lake George, Rogers Lake, Coopers Lake, and Minard Lake

Results: Volunteers throughout the 2021 open water season measured lake levels. Lake gages were installed by Anoka Conservation District and surveyed by the MN DNR. In 2021, lake levels started near or below average and declined throughout the season. The rebound often seen in the fall was not observed. 2021 was the 11th driest season on record, and Anoka County was in a state of drought beginning in June, with most of the growing season spent in a severe drought condition.

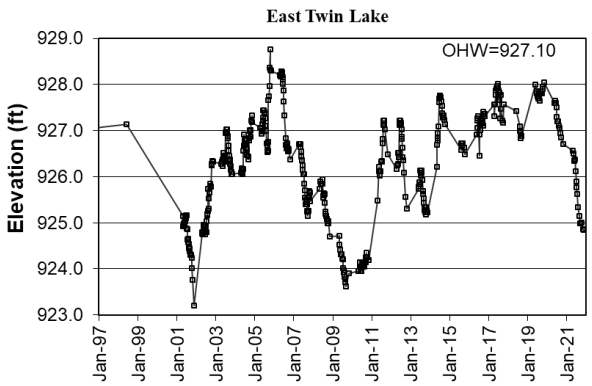
Lower average water levels were recorded on all lakes when compared to 2020. East Twin Lake's average dropped more than 1.5 feet from 2020. Lake George reached its lowest level since 2012 and Rogers Lake since 2010. Minard and Coopers Lakes had their lowest levels ever recorded; however these two lakes have a shorter record.

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.

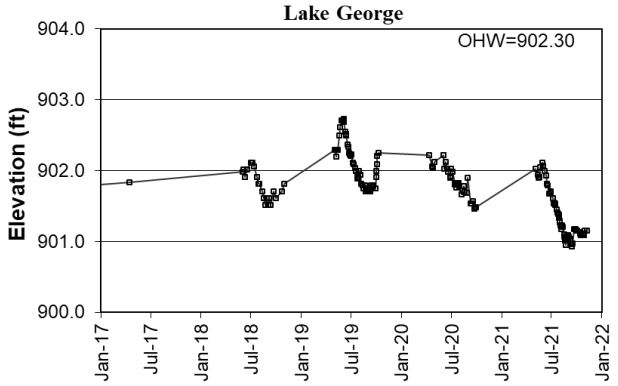
East Twin Lake Levels – last 5 years



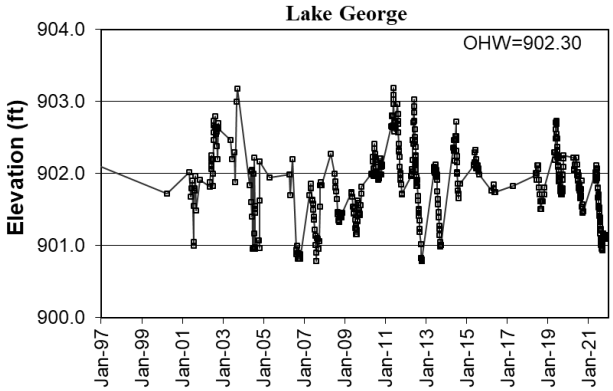
East Twin Lake Levels – Last 25 years



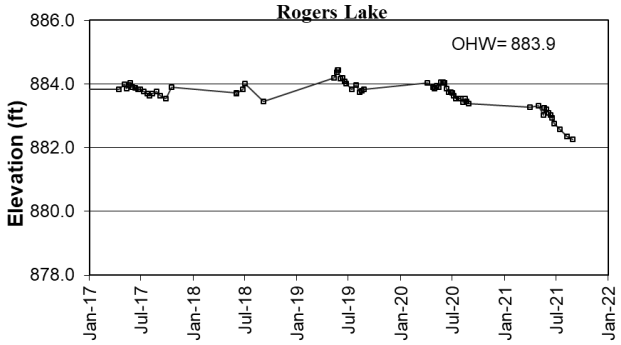
Lake George Levels – last 5 years



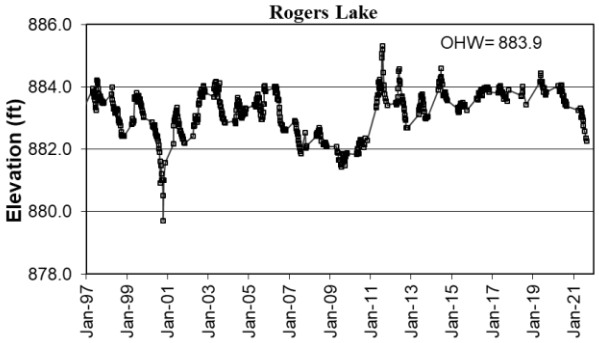
Lake George Levels – last 25 years



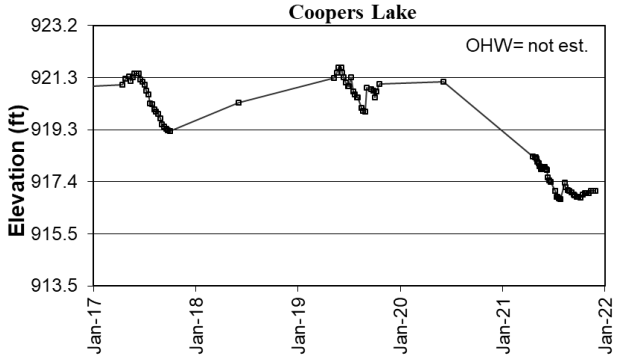
Rogers Lake Levels – last 5 years



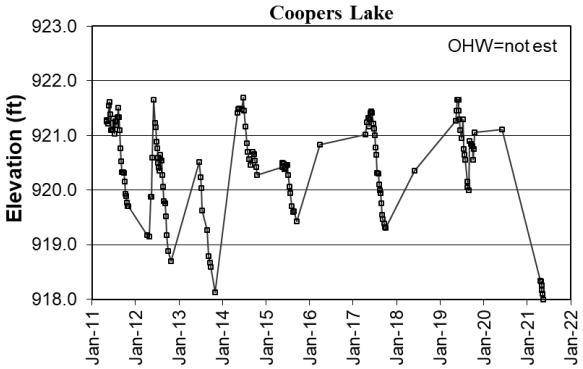
Rogers Lake Levels – last 25 years



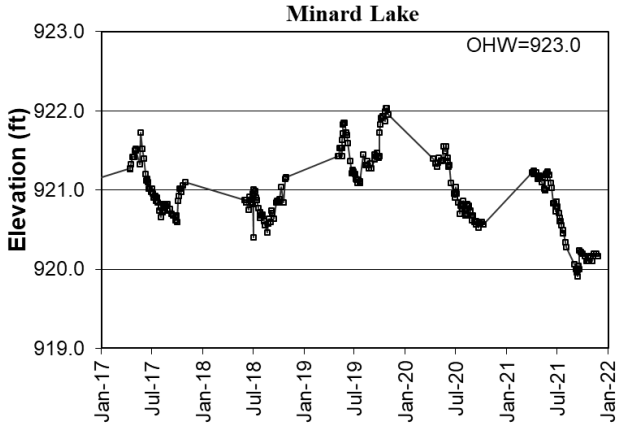
Coopers Lake Levels – last 5 years



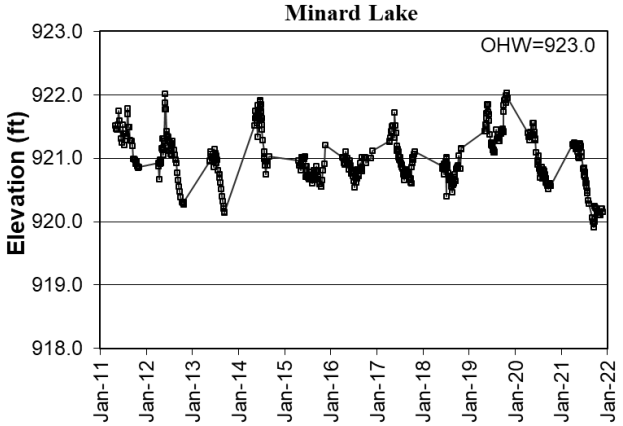
Coopers Lake Levels – last 10 years



Minard Lake Levels – last 5 years



Minard Lake Levels – last 10 years



Lake	Year	Average	Min	Max
East Twin	2017	927.67	927.17	928.02
	2018	927.00	926.84	927.43
	2019	927.83	927.65	928.05
	2020	927.28	926.70	927.65
	2021	925.65	924.84	926.56

Lake	Year	Average	Min	Max
Coopers	2017	920.52	919.30	921.44
	2018	N/A	N/A	N/A
	2019	920.90	920.00	921.65
	2020	N/A	N/A	N/A
	2021	917.40	916.76	918.34

Lake	Year	Average	Min	Max
George	2017	N/A	N/A	N/A
	2018	901.7919	901.51	902.11
	2019	902.12085	901.71	902.73
	2020	901.85844	901.46	902.22
	2021	901.38544	900.93	902.11

Lake	**Year**	**Average**	**Min**	**Max**
Minard	2017	921.00	920.60	921.72
	2018	920.80	920.40	921.16
	2019	921.50	921.09	922.03
	2020	920.94	920.52	921.55
	2021	920.62	919.91	921.24

Lake	Year	Average	Min	Max
Rogers	2017	883.81	883.54	884.04
	2018	883.74	883.44	884.02
	2019	884.08	883.74	884.44
	2020	883.76	883.39	884.05
	2021	882.88	882.26	883.31

Lake Water Quality

Partners: ACD, Lake George LID and Conservation Club, URRWMO

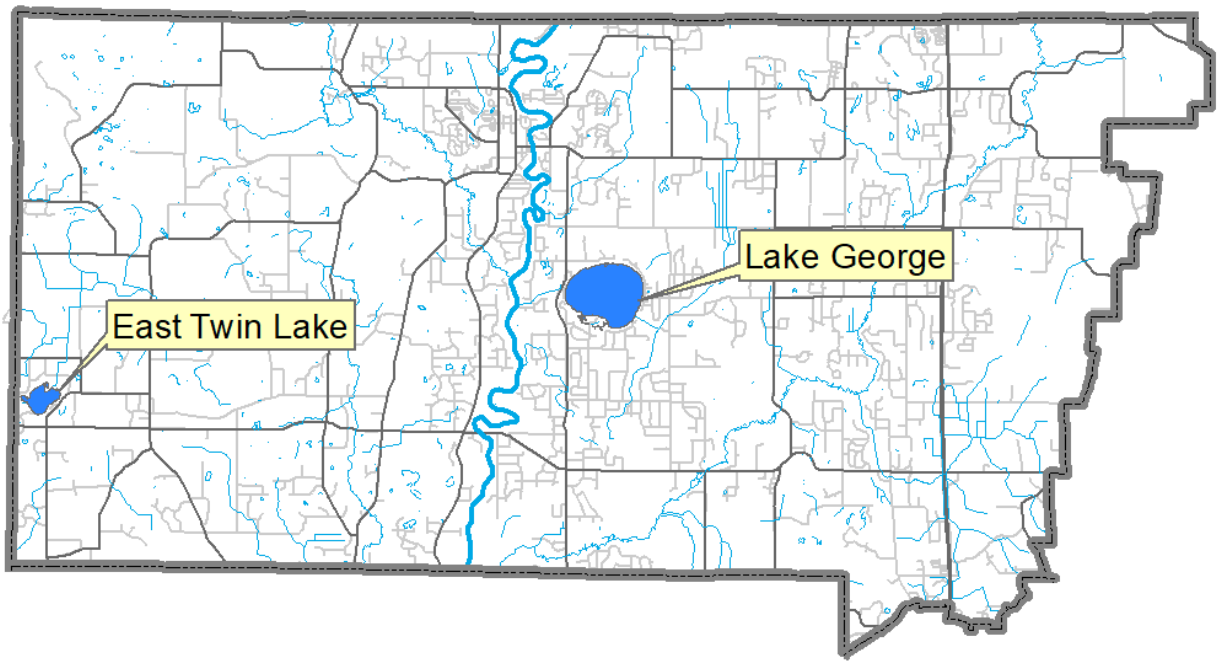
Description: Lake water quality monitoring was conducted ten times between May through September, approximately every two weeks. The monitoring parameters include total phosphorus, chlorophyll-a, Secchi transparency, dissolved oxygen, turbidity, temperature, specific conductance, pH, and salinity.

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

Locations: East Twin Lake and 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 on the Minnesota Pollution Control Agency (MPCA) electronic data access (EDA) website or from ACD. Refer to Chapter 1 for additional information on lake dynamics and interpreting the data.

2021 Upper Rum River Watershed Lake Water Quality Monitoring Sites



EAST TWIN LAKE

CITY OF NOWTHEN, LAKE ID # 02-0133

Background

East Twin Lake is located near Anoka County's western boarder in the City of Nowthen. The lake has a surface area of 91.99 acres with a maximum depth of 68 feet (20.7 m), making it Anoka County's deepest lake. Public access is from East Twin Lake City Park, where there is both a swimming beach and a boat launch. The lakeshore is only moderately developed, with low density housing encompassing about half of the shoreline. The watershed is more than 75% undeveloped, with low-density residential areas. This lake is one of the clearest in the county. The MN DNR last conducted a standard fisheries survey in this lake in 2016. This survey found a healthy Bass-Bluegill-Northern Pike lake. Yellow Perch were found in low numbers and no Walleye were captured during this survey.

2021 Results

In 2021 East Twin Lake had excellent water quality for this region of the state (NCHF ecoregion), receiving an overall A grade, a mark it has received 15 of the 16 years monitored since 1980 (1983 is the exception, with an overall B grade). The lake is mesotrophic, meaning low nutrients drive a moderate to low amount of production. The lake has excellent Secchi transparency, averaging 14.3 feet in 2021. Some historically high Secchi readings in this lake include 19.1 feet on June 12, 2013; 18.7 feet on May of 2011; 22 feet on May 28, 2008 and 20 feet in spring 2002; these are the deepest at any Anoka County lake since at least 1996. East Twin is locally unique, maintaining greater than 10 feet of transparency late into summer.

The lake's poorest water quality parameter on the grading scale is total phosphorus (TP), receiving more B letter grades than A grades, going back to 1980. The majority of the TP B letter grades occurred during the 1980s and 90s. In 2021, the average TP was 19.7 µg/L, which correlates to an A letter grade. Chlorophyll-a (Cl-a) concentrations averaged 4.1 µg/L, also receiving an A letter grade.

Trend Analysis

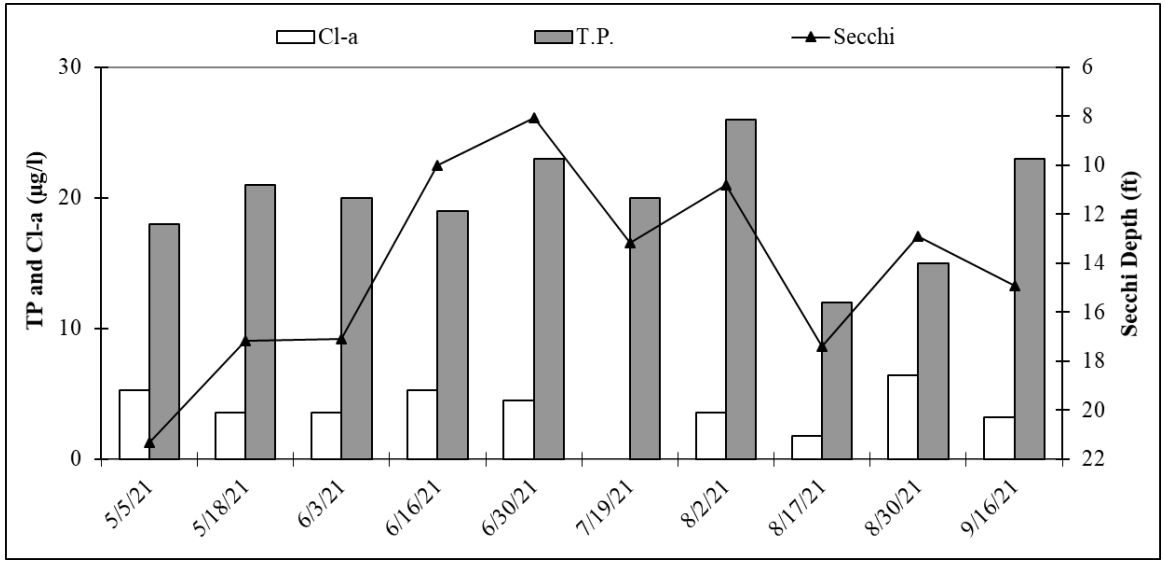
Fifteen years of water quality data have been collected by the Metropolitan Council (1980, '81,'83, '95, and '98), the Minnesota Pollution Control Agency (1989), and the Anoka Conservation District (1997, '99, 2000, 2002, 2005, 2008, 2011, 2013, 2017, and 2021). There has been a statistically significant improvement in overall water quality since 1980 (repeated measures MANOVA with response variables TP, Cl-a, and Secchi depth, $F_{2,13}= 4.50$, $p=<0.05$). Analyzing each parameter individually offers some clues as to the drivers of that water quality improvement. One-way ANOVAs revealed that chlorophyll-a has declined in a significant manner and is the most important factor in the multi-parameter trend. Total phosphorus also leans toward a downward trend, though not statistically significant, and Secchi transparency shows a weak trend towards improvement.

Discussion

East Twin Lake has had good water quality as long as it has been monitored back to 1980, never receiving lower than a B letter grade for any parameter. Statistical analysis shows that the water quality is improving. The ecology of this lake is different from that of other Anoka County lakes because it is deep. Sediment and dead algae can sink to the bottom and are essentially lost from the system because resuspension by wind, rough fish, and other forces is minimal. In shallower lakes, these nutrients circulate within the lake much more readily, and the lake sediments can be a source of nutrients and turbidity that affect water quality. Additionally, East Twin Lake's watershed is small and undeveloped, so there is a limited area from which polluted runoff might enter the lake. Aquatic vegetation is also healthy, but not so prolific as to be a nuisance, further contributing to high water quality.

EAST TWIN LAKE
CITY OF NOWTHEN, LAKE ID # 02-0133

2021 Results



2021 Median Values

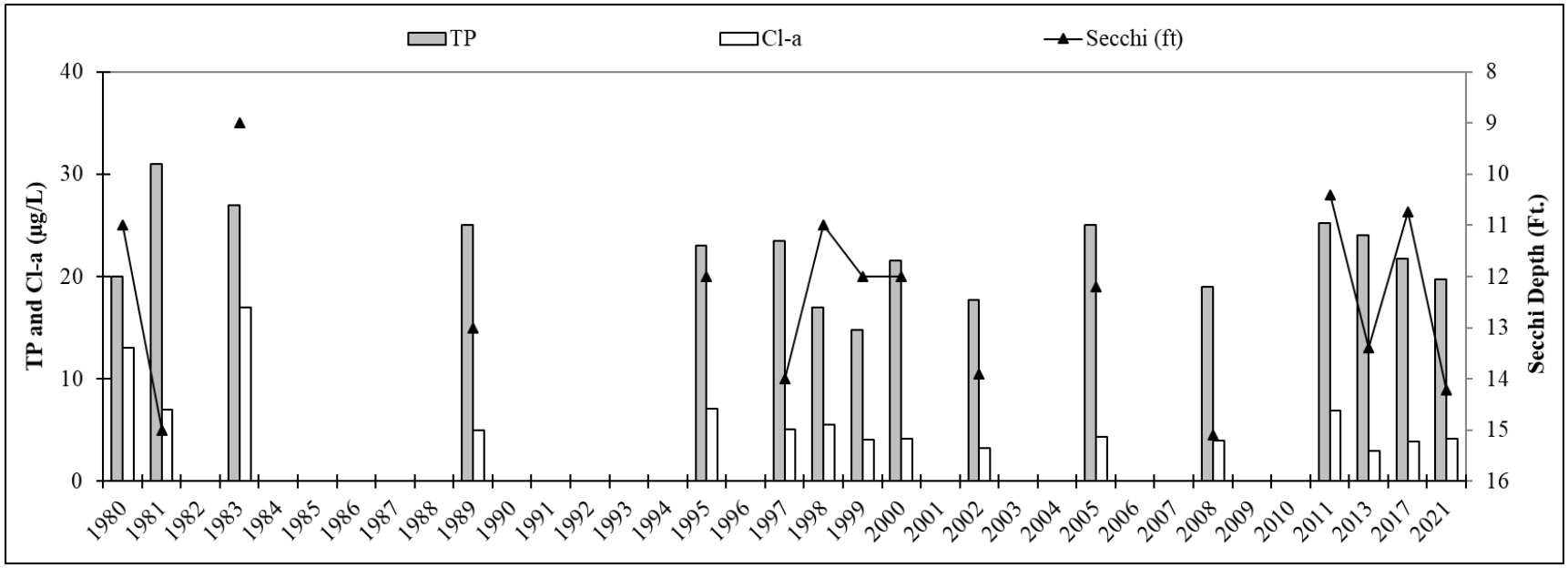
pH		8.29
Specific Conductance	mS/cm	0.22
Turbidity	FNRU	7.35
D.O.	mg/l	9.02
D.O.	%	106.75
Temp.	°F	74.82
Salinity	%	0.10
Cl-a	ug/L	3.60
T.P.	ug/l	20.00
Secchi	ft	14.05

East Twin
2021 Water Quality Data

		Date:	5/5/2021	5/18/2021	6/3/2021	6/16/2021	6/30/2021	7/19/2021	8/2/2021	8/17/2021	8/30/2021	9/16/2021			
		Time:	13:13	12:20	12:06	12:35	11:31	12:22	11:31	12:06	12:24	11:44			
	Units	R.L.*	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Average	Min	Max
pH		0.1	8.25	8.40	8.33	8.60	8.44	8.07	7.58	8.32	8.21	8.18	8.24	7.58	8.60
Specific Conductance	mS/cm	0.01	0.213	0.217	0.215	0.215	0.214	0.222	0.229	0.230	0.231	0.211	0.220	0.211	0.231
Turbidity	FNRU	1	2.50	9.30	0.50	9.40	7.40	14.00	0.20	7.30	1.40	8.60	6	0	9
D.O.	mg/l	0.01	11.63	11.61	11.14	10.12	9.16	8.21	8.42	7.85	8.15	8.88	9.52	7.85	11.63
D.O.	%	1	110.1	125.3	123.7	124.6	113.8	103.4	103.4	97.2	94.2	101.8	109.8	94.2	125.3
Temp.	°C	0.1	13.38	19.82	22.04	26.12	25.26	26.36	24.46	24.12	23.46	20.53	22.6	13.4	26.4
Temp.	°F	0.1	56.1	67.7	71.7	79.0	77.5	79.4	76.0	75.4	74.2	69.0	72.6	56.1	79.4
Salinity	%	0.01	0.10	0.10	0.10	0.10	0.10	0.11	0.11	0.11	0.11	0.10	0.10	0.10	0.11
Cl-a	ug/L	0.5	5.3	3.6	3.6	5.3	4.5	<1	3.6	1.8	6.4	3.2	4.1	1.8	6.4
T.P.	mg/l	0.010	0.018	0.021	0.020	0.019	0.023	0.020	0.026	0.012	0.015	0.023	0.020	0.012	0.026
T.P.	ug/l	10	18	21	20	19	23	20	26	12	15	23	19.7	12	26
Secchi	ft	0.1	21.33	17.17	17.08	10.00	8.08	13.17	10.8	17.4	12.9	14.9	14.3	8.1	21.3
Secchi	m	0.1	6.5	5.2	5.2	3.0	2.5	4.0	3.3	5.3	3.9	4.5	4.4	2.5	6.5
Physical			1	1.0	2.0	2.0	2.0	2.0	2.0	1.0	2.0	2.0	1.7	1.0	2.0
Recreational			1	1.0	2.0	1.0	2.0	2.0	1.0	1.0	3.0	2.0	1.6	1.0	3.0

*reporting limit

Historical Annual Averages



Historical Report Card

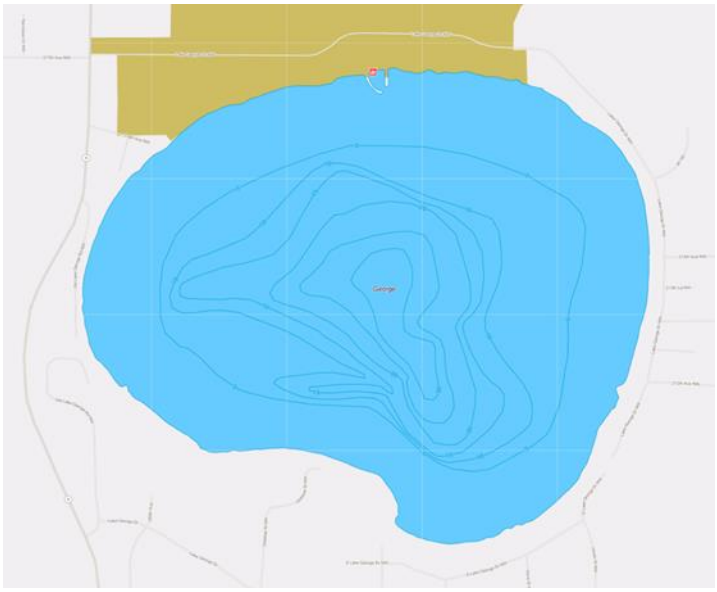
Year	TP	Cl-a	Secchi	Overall
1980	A	B	A	**A**
1981	B	A	A	**A**
1983	B	B	B	**B**
1989	B	A	A	**A**
1995	B	A	A	**A**
1997	B	A	A	**A**
1998	B	A	A	**A**
1999	A	A	A	**A**
State Standards	40 ug/L	14 ug/L	>4.6 ft	

Year	TP	Cl-a	Secchi	Overall
2000	A	A	A	**A**
2002	A	A	A	**A**
2005	B	A	A	**A**
2008	A	A	A	**A**
2011	B	A	A	**A**
2013	B	A	A	**A**
2017	A	A	A	**A**
2021	A	A	A	**A**
State Standards	40 ug/L	14 ug/L	>4.6 ft	

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 a boat launch. About 70% of the lake is surrounded 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.

The MN DNR conducted a standard fisheries survey of this lake in 2014. The lake contains a typical Largemouth Bass-Bluegill-Northern Pike fish community. Fish management efforts have attempted to establish a Walleye population through stocking but this assessment indicates poor recruitment of stocked fingerlings, likely due to the high Northern Pike population. Walleye stocking has not occurred in Lake George since 2014.

2021 Results

In 2021, Lake George had excellent water quality for this region of the state (NCHF Ecoregion), receiving an overall A letter grade for the fourth year in a row. These results are similar to what was recorded before 2009, when the majority of monitoring years scored an A. Between 2009 and 2017 the majority of monitoring years scored a B letter grade, largely due to declining Secchi transparency during that period.

Results for individual water quality parameters varied. Total phosphorus in 2021 averaged 21.40 µg/L, the second lowest since 2005. Secchi transparency, in general, was better in the beginning of the season then gradually became poorer into September. Average Secchi transparency was 9.5 ft (2.9m), which was a 0.25-foot improvement from 2020. Chlorophyll-a (Cl-a) averaged 7.27 µg/L, which was similar to the levels of previous years. Cl-a, TP, and transparency were all poorest in August and September. Throughout the season, all three parameters were better than the State water quality standards for deep lakes in the region.

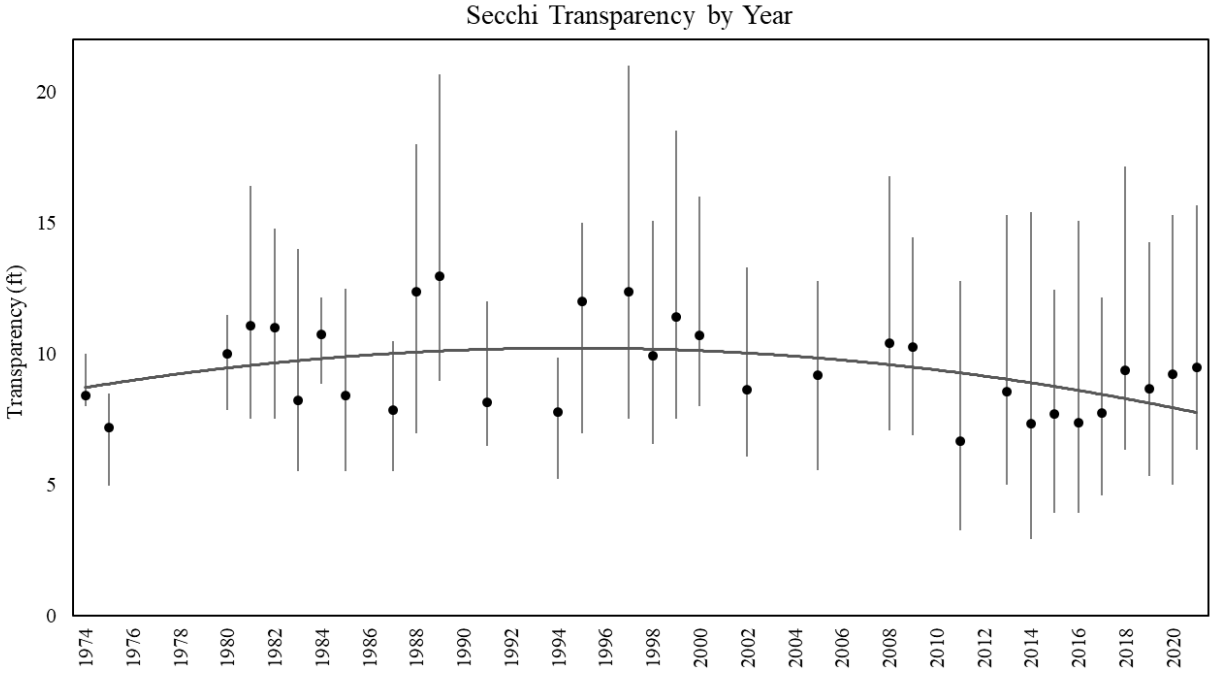
Although Lake George water quality remains better than State standards and is ranked good for a metro-county lake, simply adhering to these standards is not the goal for such an important water body. Decline of Lake George's Secchi transparency has been a cause for concern in recent years with a now twenty-year trend of decline in our statistical analyses. The last four years have shown improving clarity, but these results are most likely linked to the below average precipitation occurring in 2018, 2020, and 2021. 2019 had the highest annual rainfall on record for the state, but Secchi averages remained improved due to higher readings at the beginning of the season.

Trend Analysis

The Metropolitan Council (between 1980 and 2009) and the Anoka Conservation District (1997, 1999, 2000, 2002, 2005, 2008, 2011, and 2013-2021) have collected over thirty years of water quality data. A broad analysis of overall water quality that simultaneously considers TP, Cl-a, and Secchi transparency did not find a statistically significant trend looking at all years of data (repeated measures MANOVA with response variables TP, Cl-a, and Secchi transparency, p=0.57). When parameters are isolated for individual analysis, there is no significant change in Cl-a or TP. However, during this same period there is a statistically significant trend of declining Secchi transparency (p=<0.01).

When the years 2011-2021 were isolated, a statistically significant trend of improving water quality for all parameters was present (repeated measures MANOVA with response variables TP, Cl-a, and Secchi transparency, $F_{2,7}=11.49$, $p<0.05$). When parameters are isolated for individual analysis both TP and Secchi transparency have improved on a statistically significant basis ($p<0.05$) over the past decade.

Lake George Secchi Transparency Trend: Includes years with partial datasets not covering all open water months. Those years are excluded from ACD's statistical analysis and graphs later in this document.



Discussion

Lake George remains one of the clearest of the Anoka County lakes, but a trend of declining Secchi transparency from the mid-1990s through around 2016 caused concern. Lake George is a highly valued lake due to its recreational opportunities and ecological quality. The lake has a large park, many lakeshore homes, and a notably diverse plant community (most metro area lakes have 10-12 different aquatic plant species; Lake George is home to 24).

In 2018, an intensive study of the lake and its watershed titled "Lake George Water Quality Improvement Assessment" was completed. Work for the 2016-2018 study included monitoring of tributaries, modeling, and evaluation of projects to correct the transparency decline. The work focused on the watershed, and a "phase 2" study of in-lake processes may occur in the future. The Lake George Improvement District, Lake George Conservation Club, Anoka Conservation District, and a State Clean Water Fund grant funded the study.

The aforementioned study provides some insight into the causes of transparency decline. While a number of factors may play a role, an increase in the average amount of precipitation is the most significant driver identified. Water years (Oct. 1 – Sept. 30) that are wetter than the 100-year 90th percentile result in increased volumes of runoff and nutrients into the lake from surrounding tributaries, and the lake has the poorer clarity in those years, or in immediately subsequent years.

These "wet" years were more frequent during the period when lake transparency declined. Six out of sixteen years from 2001 to 2017 were "wet" with water year precipitation above the historical 90th percentile, with 1999 reaching just under the 90th percentile mark. Additionally, four of these six wet years occurred during the sustained low Secchi transparency period of 2010 through 2017.

Water year precipitation returned to normal levels in 2017 and 2018, causing a temporary rebound in average Secchi transparency during the most recently monitored years. The 2019 calendar year was the wettest on record. Secchi results in 2019 were only slightly poorer than the improved 2018 results, but that average was likely skewed by much higher readings earlier in the season when ambient conditions were drier, with poorer readings later. The correlation between precipitation and Secchi clarity was again observed in 2020 and 2021. Total annual precipitation in 2020 and 2021 were both well below average, with Anoka County being in a state of drought beginning in June 2021, with most of the growing season spent in a severe drought condition. These conditions resulted in improved Secchi clarity throughout both years.

There is concern that climate change and increased runoff from development in the watershed will drive poorer water quality in Lake George into the future. Among the recommendations of the 2018 study was replacing the deteriorating Ditch 19 weir just east of Lake George which is an important hydrological control for the lake. The weir was replaced in early 2020, and this project may have offered some additional clarity benefit right away. The replaced outlet structure should result in reduced nutrient delivery to the lake during wet years, and the broader benefits of restoring lake hydrology and enhancing game fish spawning opportunities. Other actions identified in the watershed study include agricultural best practices, an iron-enhanced sand filter in the County Park, public education, lakeshore restorations, enhanced stormwater standards for new developments in the lakeshed and others. While certain tributary subwatersheds do generate more nutrients than others, and therefore deserve special consideration for projects, it is also noted that some of these subwatersheds drain through large wetlands with some

apparent pollutant removal ability. Projects nearest the lake are favored because they treat a larger upstream area and do not duplicate treatment that might already be provided by certain wetlands.

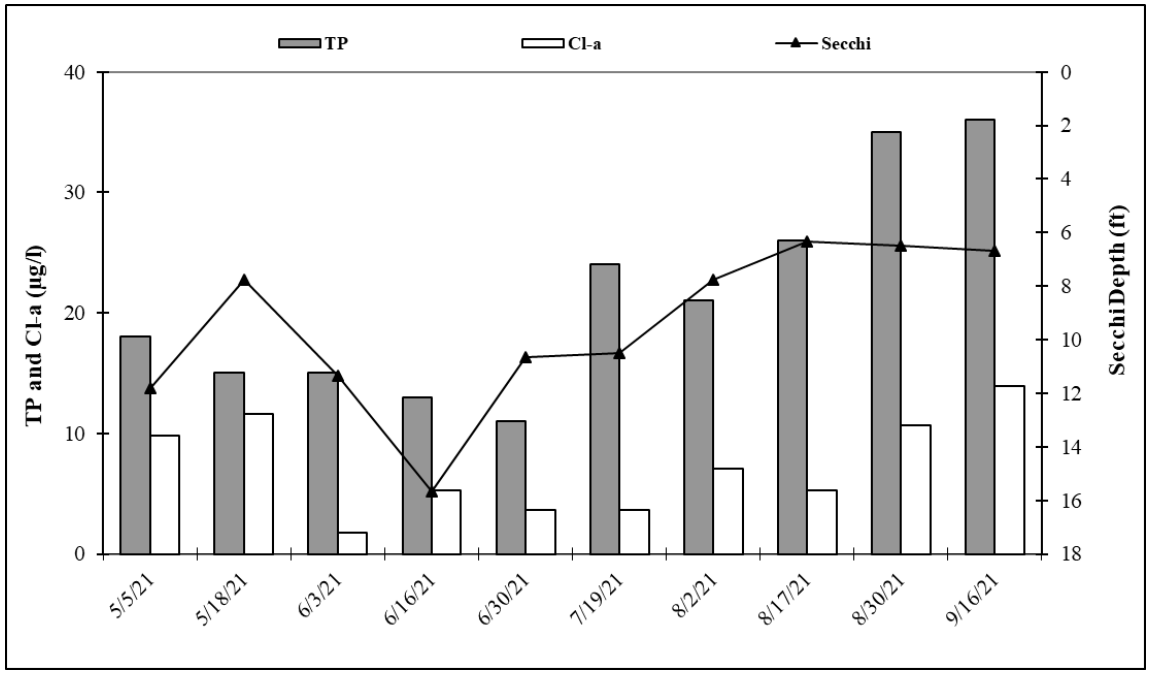
The MN DNR notes an additional concern for Lake George in the 2017 Rum River Watershed Fish-Based Lake IBI Stressor Identification Report. That report found Lake George's fish community was not impaired, but was one of special concern and deemed vulnerable. Lack of aquatic habitat and near-shore development disturbances were indicated as stressors. To help address this concern The Anoka Conservation District received a grant to implement lakeshore restoration projects on the lake in 2021-2022. These types of practices promote native lakeshore habitat while also reducing phosphorus loading into the lake.

Two exotic invasive plants are present in Lake George, curly-leaf pondweed and Eurasian water milfoil. The Lake George Improvement District and Lake George Conservation Club work to control these plants, and multiple years of localized treatments have occurred. In coordination with the MN DNR, the lake groups continually work to achieve control of these invasive plants without harming native plants or water quality. Water quality has been monitored immediately before and after herbicide treatments, and no obvious causal relationship between weed treatment and water quality was found**.**

LAKE GEORGE

CITY OF OAK GROVE, LAKE ID # 02-0091

2021 Results



2021 Median Results

pH		8.50
Specific Conductance	mS/cm	0.21
Turbidity	NTU	4.70
D.O.	mg/l	9.26
D.O.	%	116.15
Temp.	°F	74.96
Salinity	%	0.10
Cl-a	µg/L	6.20
T.P.	µg/l	19.50
Secchi	ft	9.13

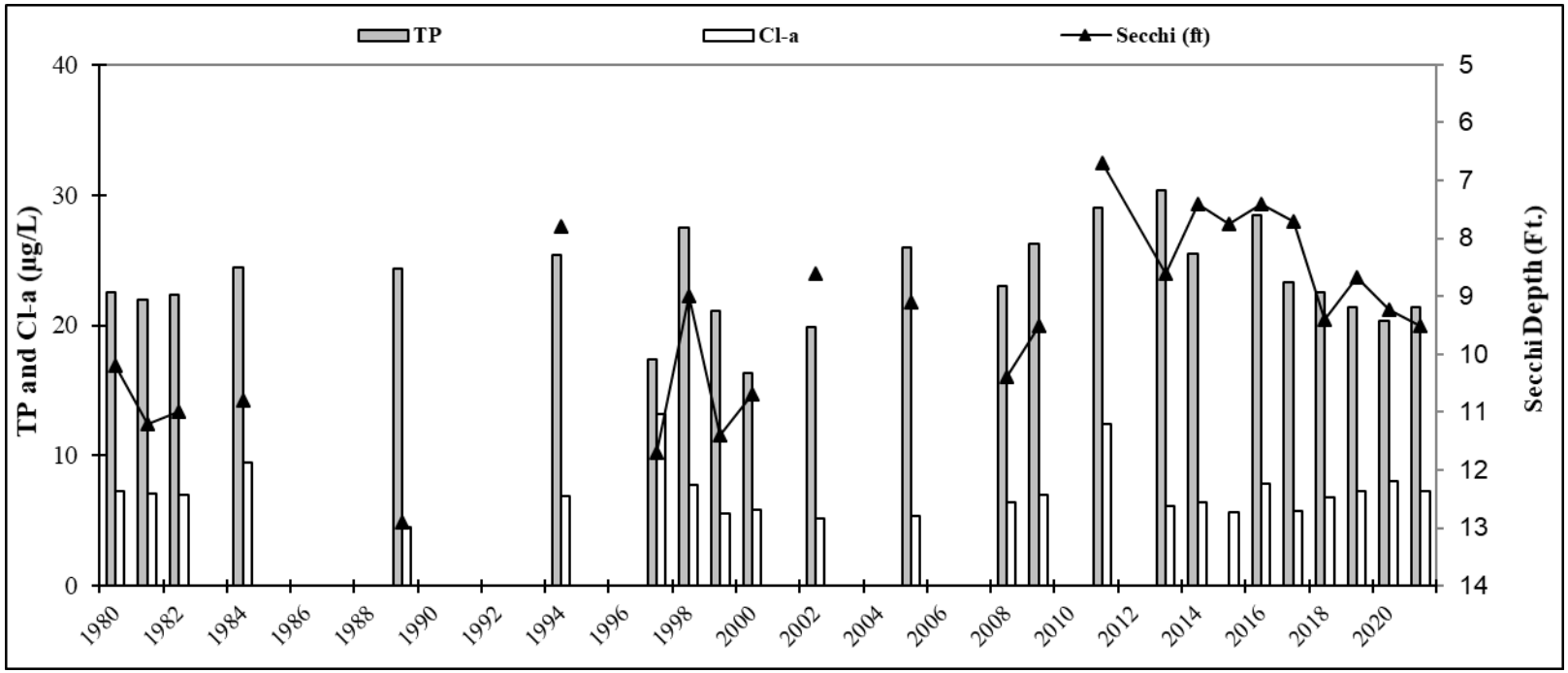
Lake George

2021 Water Quality Data

	Date:		5/5/2021	5/18/2021	6/3/2021	6/16/2021	6/30/2021	7/19/2021	8/2/2021	8/17/2021	8/30/2021	9/16/2021			
	Time:		12:12	11:31	11:26	11:42	10:51	11:41	10:48	11:13	11:34	11:00			
	Units	R.L.*	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Average	Min	Max
pH		0.1	8.48	8.71	8.52	8.48	8.58	8.48	8.56	8.67	8.39	8.46	8.53	8.39	8.71
Specific Conductance	mS/cm	0.01	0.221	0.219	0.214	0.210	0.211	0.212	0.215	0.215	0.217	0.206	0.214	0.206	0.221
Turbidity	NTU	1	4.20	5.20	0.00	15.70	7.10	0.700	10.00	3.30	3.00	5.90	5.79	0	16
D.O.	mg/l	0.01	12.55	12.91	10.43	8.66	9.29	9.22	10.45	8.85	8.26	8.51	9.91	8.26	12.91
D.O.	%	1	116.9	133.1	117.2	106.4	115.4	118.6	126.1	108.5	98.3	98.6	113.9	98.3	133.1
Temp.	°C	0.1	13.00	18.22	20.44	25.40	25.27	27.03	24.89	24.24	23.49	20.43	22.2	13.0	27.0
Temp.	°F	0.1	55.4	64.8	68.8	77.7	77.5	80.7	76.8	75.6	74.3	68.8	72.0	55.4	80.7
Salinity	%	0.01	0.14	0.10	0.10	0.10	0.10	0.10	0.11	0.10	0.11	0.10	0.11	0.10	0.14
Cl-a	µg/L	1	9.80	11.6	1.8	5.3	3.6	3.6	7.1	5.3	10.7	13.9000	7.27	1.8	13.9
T.P.	mg/l	0.005	0.018	0.015	0.015	0.013	0.011	0.024	0.021	0.026	0.035	0.036	0.021	0.011	0.036
T.P.	µg/l	5	18	15	15	13	11	24	21	26	35	36	21.40	11	36
Secchi	ft		11.83	7.75	11.33	15.67	10.67	10.50	7.75	6.33	6.50	6.67	9.50	6.3	15.7
Secchi	m		3.61	2.36	3.45	4.78	3.25	3.20	2.36	1.93	1.98	2.03	2.9	1.9	4.8
Physical			2.0	2.0	2.0	2.0	2.0	2.0	3	2.0	2	1.0	2.0	1.0	3.0
Recreational			2.0	1.0	1.0	2.0	2.0	1.0	2	1.0	2	1.0	1.5	1.0	2.0

*reporting limit

Historical Annual Averages



Historical Report Card

Year	TP	Cl-a	Secchi	Overall
1980	A	A	A	**A**
1981	A	A	A	**A**
1982	A	A	A	**A**
1984	B	A	A	**A**
1989	B	A	A	**A**
1994	B	A	B	**B**
1997	A	B	A	**A**
1998	B	A	B	**B**
1999	A	A	A	**A**
2000	A	A	B	**A**
2002	A	A	B	**A**
2005	B	A	B	**B**
State Standards	40 ug/L	14 ug/L	>4.6 ft	

Year	TP	Cl-a	Secchi	Overall
2008	B+	A	A	**A**
2009	B	A	B	**B**
2011	B	B	C	**B**
2013	B	A	B	**B**
2014	B	A	B	**B**
2015	A	A	B	**A**
2016	B	A	B	**B**
2017	B	A	B	**B**
2018	A	A	B	**A**
2019	A	A	B	**A**
2020	A	A	B	**A**
2021	A	A	B	**A**
State Standards	40 ug/L	14 ug/L	>4.6 ft	

2021 Aquatic Invasive Vegetation Mapping

Partners: Lake George LID, Lake George Conservation Club, MNDNR, ACD

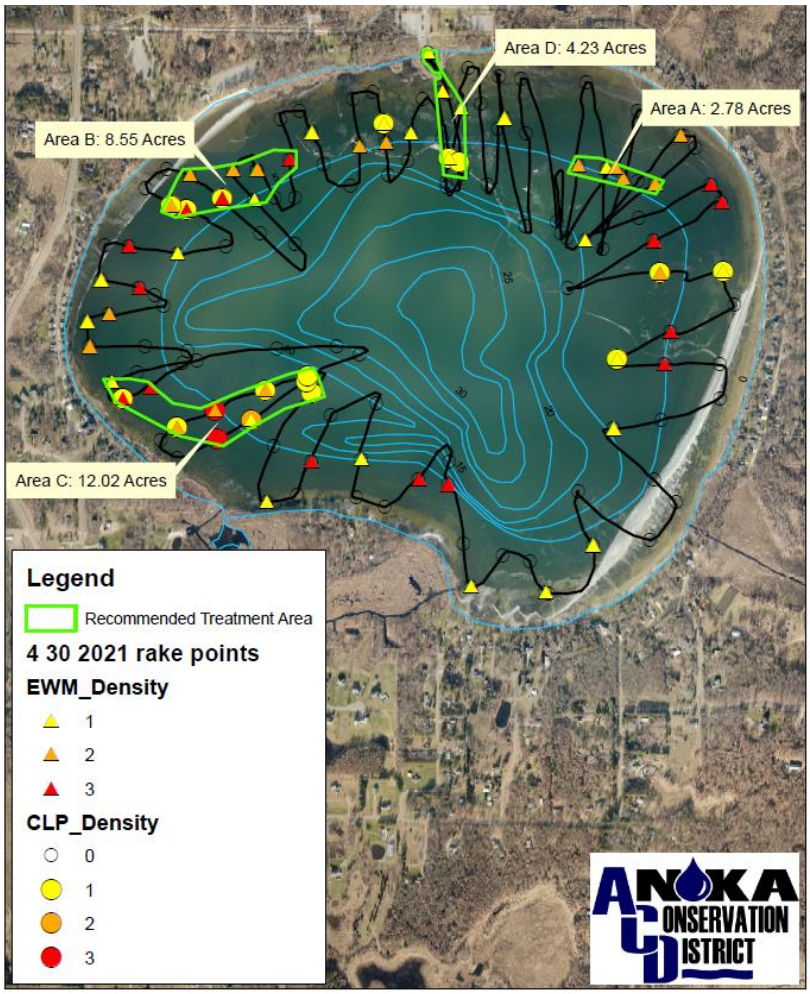
Description: The Anoka Conservation District (ACD) was contracted by the Lake George Lake Improvement District (GLID) to conduct an aquatic invasive vegetation delineation.

Purpose: To map out the presence of Curly Leaf Pondweed (CPL) and Eurasian Water Milfoil (EWM) as required for MN DNR herbicide treatment permits. The goal was to map these invasive species early in the growing season to allow for herbicide treatment as early as possible for reduced impacts on native plants and lessened possible impacts on water quality.

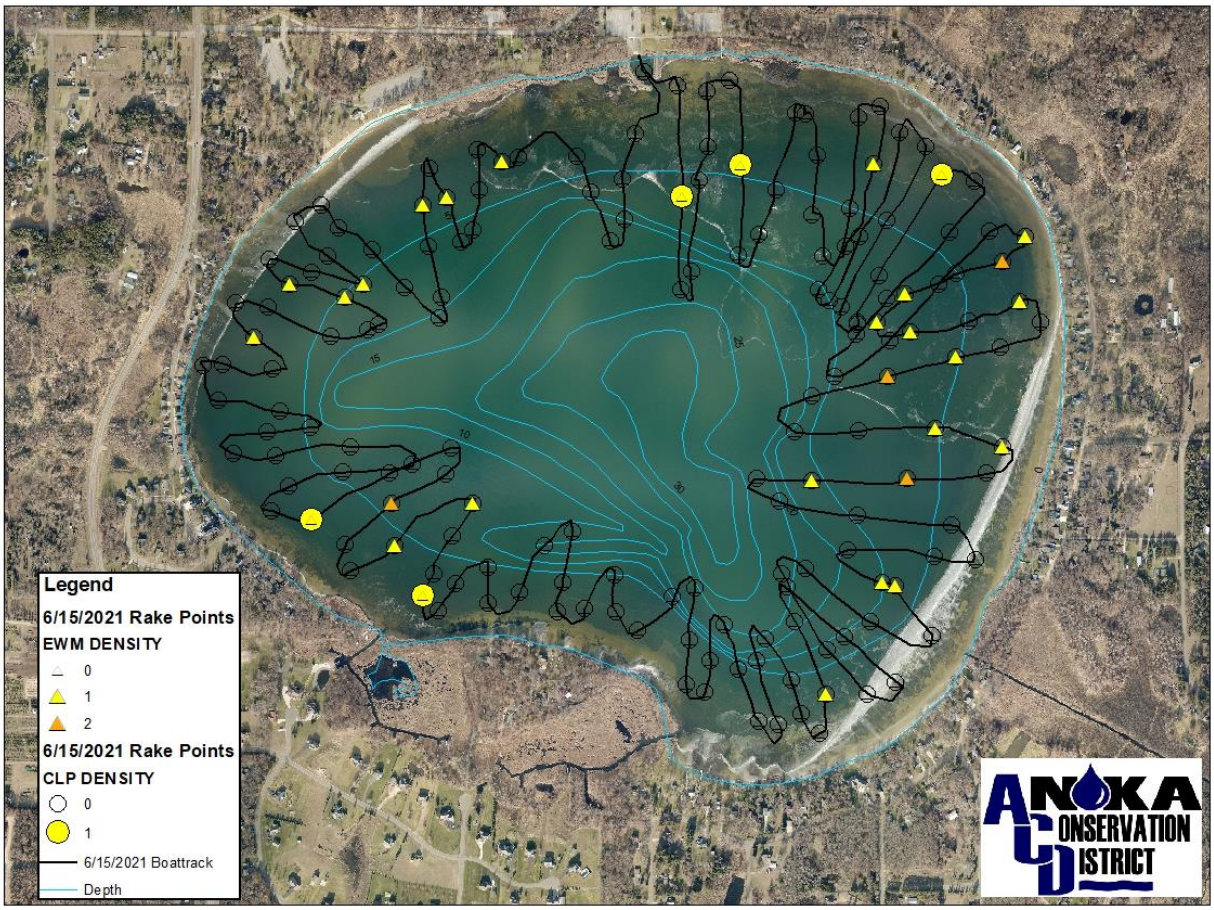
Locations: Lake George, City of Oak Grove, Lake ID # 02-0091

Results: Maps presented below 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 MN DNR and helped direct herbicide treatment efforts.

April 30, 2021 Lake George Curly Leaf Pondweed (CLP) and Eurasian Water Milfoil (EWM) Survey. DNR-selected areas for herbicide treatment are also shown.



June 15, 2021 Lake George Curly Leaf Pondweed (CLP) and Eurasian Water Milfoil (EWM) Survey



Stream Water Quality – Biological Monitoring

Partners: St. Francis American Legion Post #622, St. Francis High School, ACD

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

Purpose: To assess stream quality through biological monitoring while providing an environmental service to the community.

Location: Rum River at Rum River North County Park, St. Francis

Results: Results are detailed in the following sections.

Data Interpretation

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

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

EPT — Number of families of the generally pollution-intolerant orders. Ephemeroptera, Plecopter, Trichoptera. Higher numbers indicate better stream quality.

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

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

Population Attributes Metrics — **% EPT** compares the number of organisms in the EPT orders (Ephemeroptera, Plecoptera, Trichoptera) to the total number of organisms in the sample. A high percent of EPT is good.

% Dominant Family measures the percentage of individuals in the sample that are in the sample's most abundant family. A high percentage is usually bad because it indicates low evenness (one of a few families dominate, and all others are rare).

RUM RIVER BIOMONITORING

RUM RIVER NORTH COUNTY PARK, ST. FRANCIS

Last Monitored:

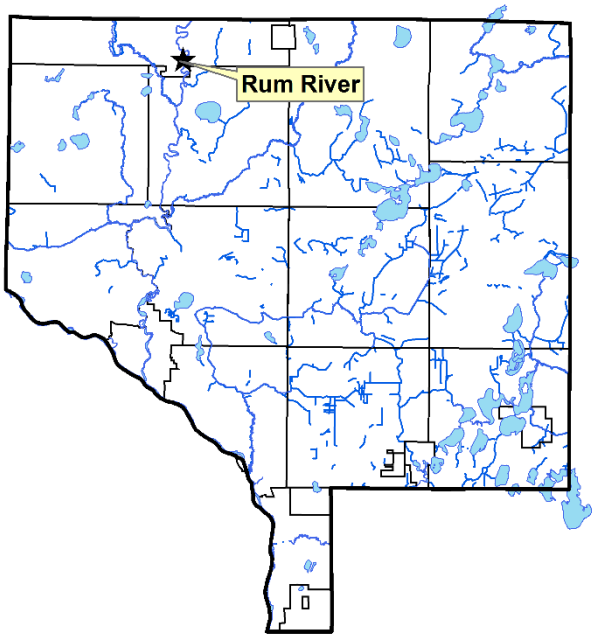
By St. Francis High School in 2021

Monitored Since:

2000

Student Involvement:

150 students in 2021, approximately 1,650 since 2000



Background

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

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

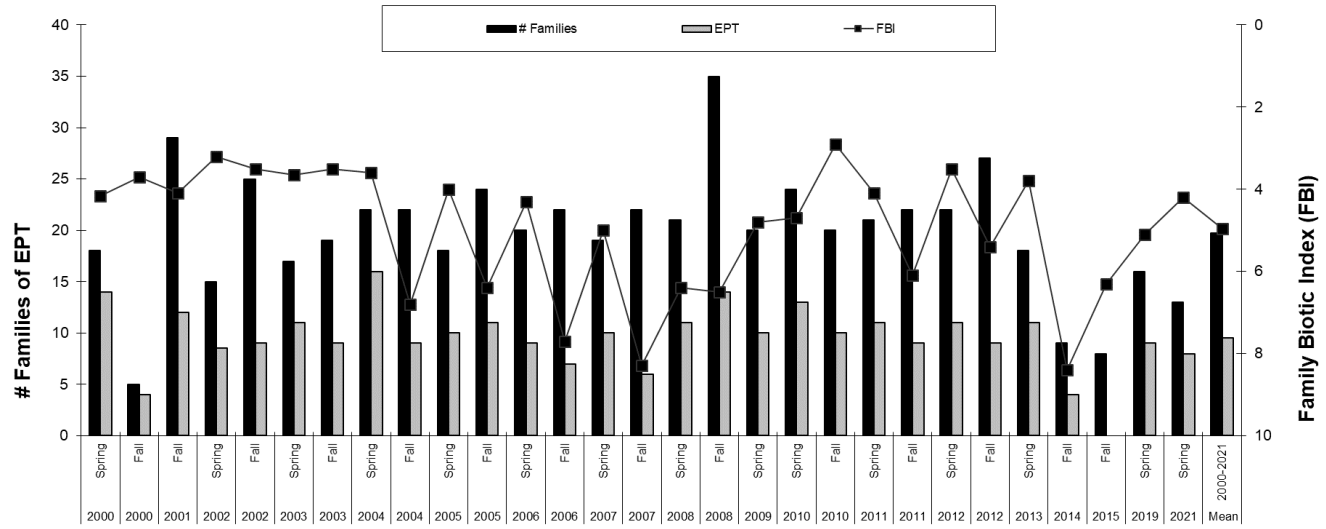
Results

St. Francis High School classes monitored the Rum River in the spring of 2021, with ACD oversight and funding from the St. Francis American Legion. During 2021 fieldwork, general biology classes performed a rapid bio-assessment of the river, where they looked at types of organisms captured and determined a score based on general pollution sensitivity. The college biology class collected macroinvertebrate samples to identify in the lab. Many of the student groups captured numerous EPT taxa, which are indicators of good water quality.

In 2021, monitoring conditions were ideal for high school students, with lower, slower flows and good weather. Multiple years should cumulatively be considered when interpreting biomonitoring data. Water levels, weather, site conditions and differences in class sizes and student capabilities can all contribute to different results in any one year. Based on the multi-year dataset it appears that Rum River ecological health at this site is good.

Summarized Biomonitoring Results for Rum River North County Park, St. Francis

(samplings by St. Francis High School and Crossroads Schools in 2002-2003 are averaged)



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

Data presented are from the most recent five years. Complete data from 2021 is not available, as the number of individuals of each species collected were not recorded. The categories that rely on this information are left blank for 2021.

Table of most recent five years

Year	2013	2014	2015	2019	2021	Mean
Season	Spring	Fall	Fall	Spring	Spring	2000-2021
FBI	3.8	8.4	6.3	5.1	4.2	5.0
# Families	18	9	8	16	13	19.8
EPT	11	4	0	9	8	9.5
Date	20-May	24-Oct	22-Jul	19-May	26-May	
Sampled By	SFHS	SFHS	4-H	SFHS	SFHS	
Sampling Method	MH	MH	MH	MH	MH	
Mean # Individuals/Rep.	247.5	219	23	139		
# Replicates	2	1	1	1		
Dominant Family	Baetiscida	Corixidae	Cambaridae	Siphlonuridae		
% Dominant Family	34.7	86.3	34.8	32.4		
% Ephemeroptera	54.1	3.7	0	46		
% Trichoptera	6.3	0.5	0.0	0		
% Plecoptera	30.3	2.3	0	18		

Discussion

Historically, both chemical and biological monitoring indicate the good water quality of this river. Poorer results in 2014 and 2015 may reflect varying site and sampling conditions rather than a shift in the biological community. Habitat is ideal for a variety of stream life, and includes a variety of substrates, plenty of woody snags, riffles, and pools. Taxa that are extremely sensitive to pollution are still being found. Water chemistry monitoring done at various locations on the Rum River throughout Anoka County indicates that water quality is also good. Continued biological monitoring is recommended both as an education program and for long-term ecological condition monitoring.

Wetland Hydrology

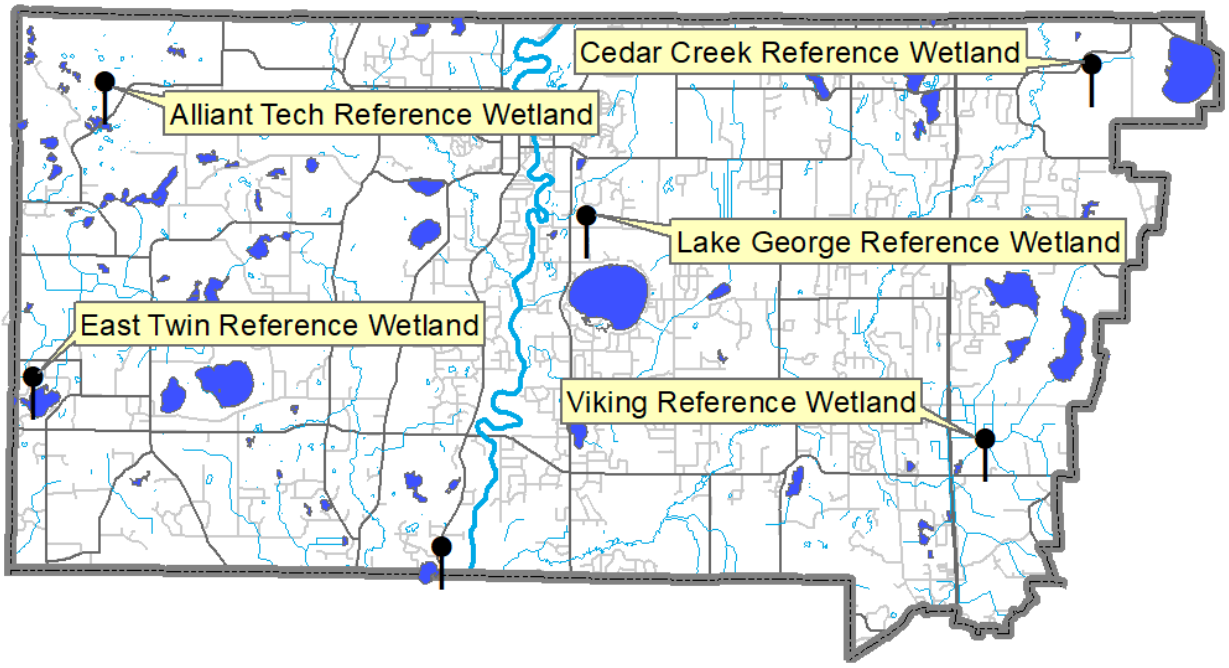
Partners: URRWMO, ACD

Description: Continuous groundwater level monitoring at a wetland boundary to a depth of 40 inches. Countywide, 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 change. These data aid in delineation of nearby wetlands by documenting hydrologic trends including the timing, frequency, and duration of saturation.

Results: See the following pages.

2021 Upper Rum River Watershed Wetland Hydrology Monitoring Site



ALLIANT TECH REFERENCE WETLAND

Alliant Tech Systems Property, St. Francis

Site Information

Monitored Since: 2001

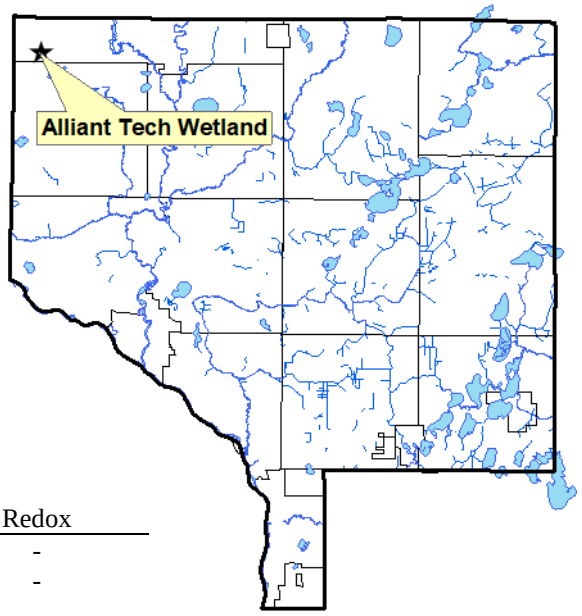
Wetland Type: 5

Wetland Size: ~12 acres

Isolated Basin: Yes

Connected to a Ditch: No

Surrounding Soils: Emmert



Soils at Well Location:

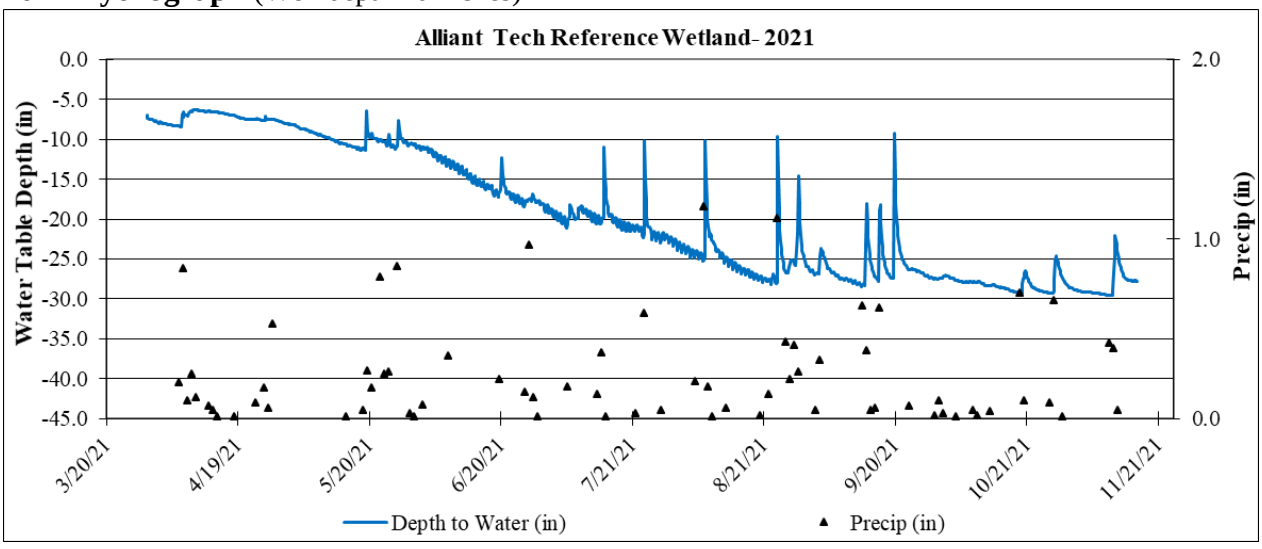
Horizon	Depth	Color	Texture	Redox
A	0-8	N2/0	Murky loam	-
Bg	8-35	5y5/1	Sandy Loam	-

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.

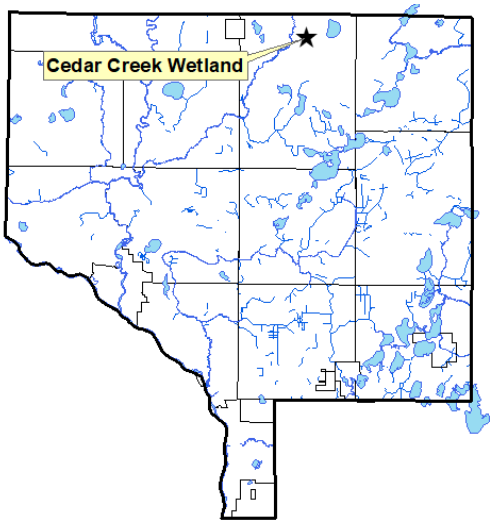
2021 Hydrograph (Well depth 40 inches)



CEDAR CREEK REFERENCE WETLAND

University of Minnesota Cedar Creek Ecosystem Science Reserve, East Bethel

Site Information



Monitored Since: 1996

Wetland Type: 6

Wetland Size: >150 acres

Isolated Basin: No

Connected to a ditch: No

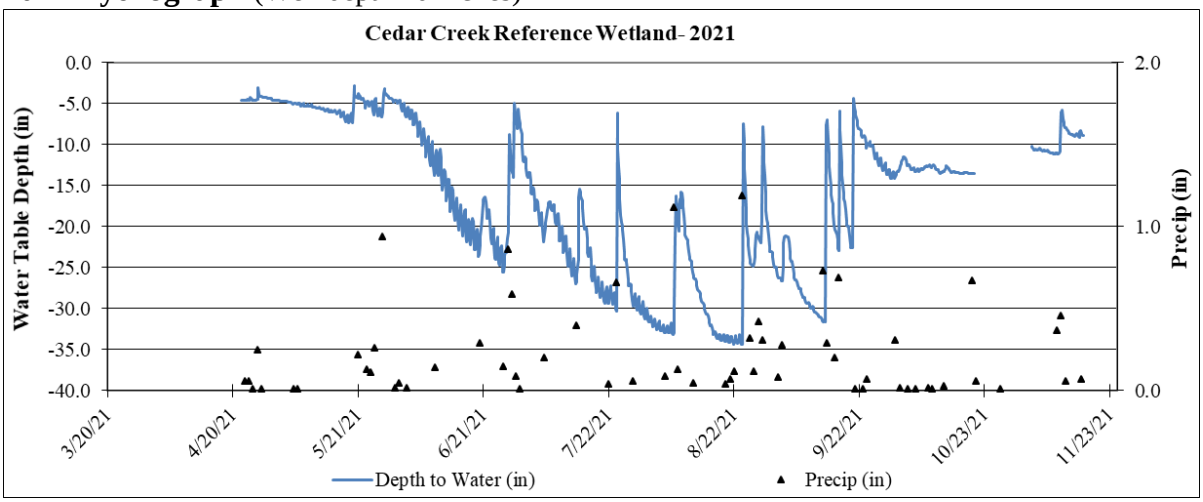
Surrounding Soils: Zimmerman

Soils at Well Location: Not yet available

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. A 2021 issue with the monitoring equipment led to a brief lapse in data collection.

2021 Hydrograph (Well depth 40 inches)



EAST TWIN REFERENCE WETLAND

Twin Lake City Park, Nowthen

Site Information

Monitored Since: 2001

Wetland Type: 5

Wetland Size: ~5.9 acres

Isolated Basin: Yes

Connected to a Ditch: No

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

Soils at Well Location:

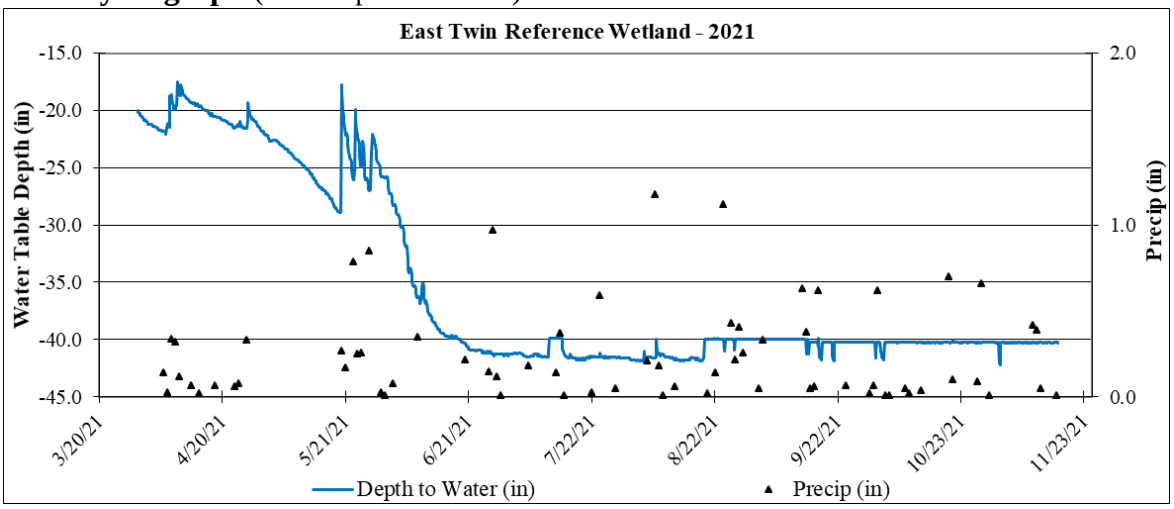
Horizon	Depth	Color	Texture	Redox
A	0-8	10yr 2/1	Mucky Loam	-
Oa	Aug-40	N2/0	Organic	-

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 Twin Lakes City Park, and is only 180 feet from East Twin Lake. The lake levels influence water levels in the wetland, and since Anoka County was in a state of drought beginning in June 2021, with most of the growing season spent in a severe drought condition, the well was dry for most of the year. Dry wells can cause slight miscalculations in equipment readings.

2021 Hydrograph (Well depth 41 inches)



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 road

Connected to a Ditch: No

Surrounding Soils: Lino loamy fine sand and Zimmerman fine sand

Soils at Well Location:

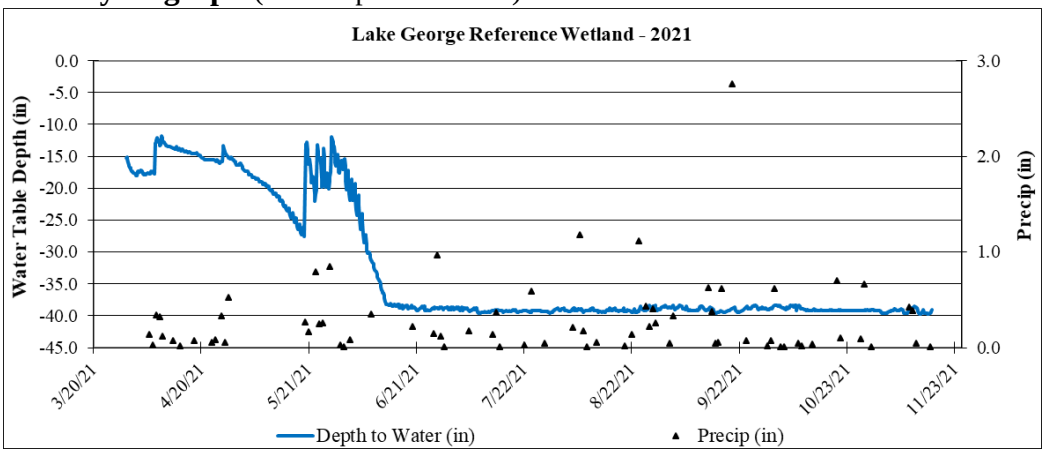
Horizon	Depth	Color	Texture	Redox
A	0-8	10yr2/1	Sandy Loam	-
Bg	8-24	2.5y5/2	Sandy Loam	20% 10yr5/6
2Bg	24-35	10gy 6/1	Silty Clay Loam	10% 10yr 5/6

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

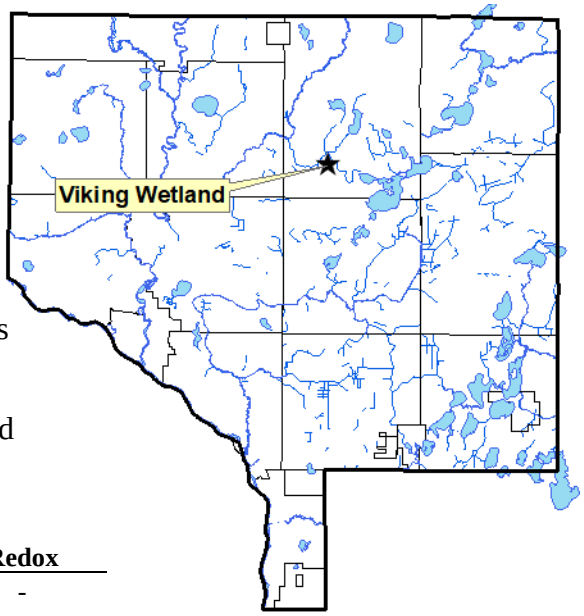
Other Notes: This wetland is located within Lake George County Park, and is only about 600 feet from the lake itself. Much of the vegetation within the wetland is cattails. Anoka County was in a state of drought beginning in June 2021, with most of the growing season spent in a severe drought condition. This well was dry for most of the year.

2021 Hydrograph (Well depth 40 inches)



VIKING MEADOWS REFERENCE WETLAND

Viking Meadows Gold 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 adjacent to wetland

Surrounding Soils: Zimmerman fine sand

Soils at Well Location:

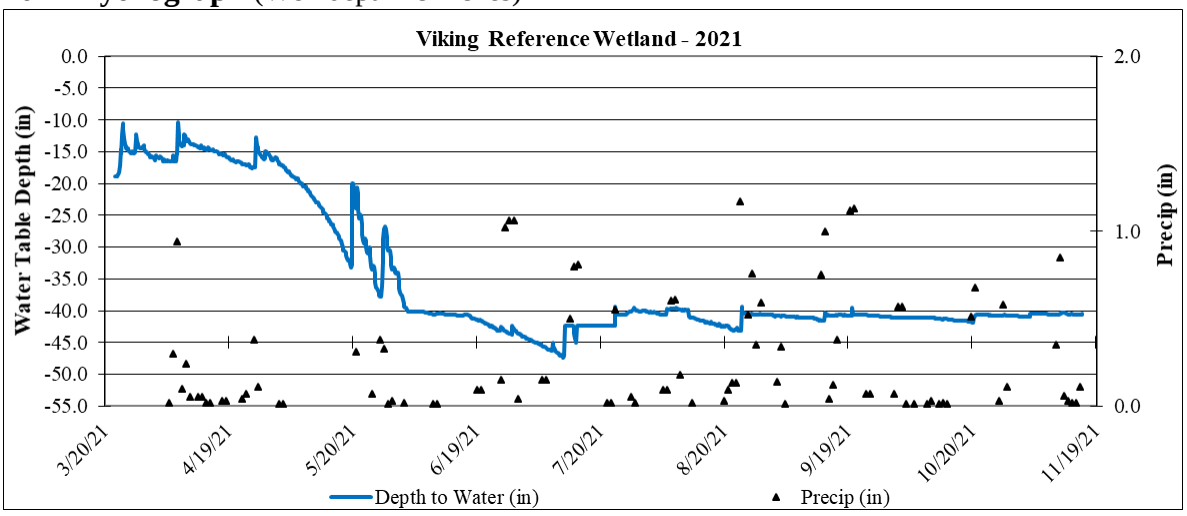
Horizon	Depth	Color	Texture	Redox
A	0-12	10yr2/1	Sandy Loam	-
Ab	12-16	N2/0	Sandy Loam	-
Bg1	16-25	10yr4/1	Sandy Loam	-
Bg2	25-40	10yr4/2	Sandy Loam	5% 10yr5/6

Vegetation at Well Locations:

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).

2021 Hydrograph (Well depth 48 inches)



URRWMO Annual Report to BWSR and State Auditor

Partners: URRWMO, ACD

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), the state agency with oversight authority. 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).

The URRWMO must also submit an annual financial report to the State Auditor. This includes submitting a financial report and filling out a multi-worksheet form.

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

Location: Watershed-wide

Results: Anoka Conservation District prepared the URRWMO annual report to BWSR and reporting to the State Auditor. They are available on the URRWMO website.

Administrative Services

Partners: URRWMO, ACD

Description: The Anoka Conservation District serves as the URRWMO Watershed Coordinator. This includes providing a variety of administrative services. Tasks are limited to those defined in the contractual agreement.

Purpose: To ensure day-to-day operations of the URRWMO and attended to between regular meetings.

Results: In 2021, administrative assistance provided to the URRWMO by the Anoka Conservation District included:

- Prepared meeting packets for and facilitated six URRWMO meetings.
- Developed annual budgets.
- Prepared URRWMO activity summary report for board members to use when meeting with their city councils.
- Requested & received biomonitoring funding for the American Legion.
- Represented URRWMO interested during Rum River One Watershed One Plan (1W1P) staff level meetings. Guided URRWMO in considering joining the Rum 1W1P implementation, including associated resolutions and legal agreements.
- Discussed with the board and county about reassessing jurisdiction over county ditches.
- Advised cities regarding completion of a culvert inventory by the end of 2022.
- Worked with the City of Ham Lake to get their draft local water plan into compliance with the URRWMO Plan. Presented it to the URRWMO board for approval.
- Prepared and presented housekeeping amendments to the URRWMO joint powers agreement (JPA).
- Fielded questions from developers, the county highway department, and others regarding URRWMO stormwater and wetland standards.
- Facilitated the URRWMO technical advisory committee.
- Amended the URRWMO Watershed Management Plan with updated wetland and stormwater standards, landlocked basin standards, culvert inventory protocols, and project prioritization. Steps are in MN Rules 8410 and MN statute 103B.231.
- Grant applications were part of the contracted work. While funding for URRWMO priorities was incorporated into the Rum 1W1P, no specific applications for funding were prepared. Some funding for this task will be returned to the URRWMO. In previous years, grants secured for URRWMO priorities included:
    - Rum Riverbank stabilizations $1.6M ($15K URRWMO match)
    - Lake George shoreline stabilizations $61,000
    - Middle Ford Brook subwatershed assessement study $63,000
    - $15,375 URRWMO match for Ford Brook & Lake George combined

Public Outreach

WEBSITE

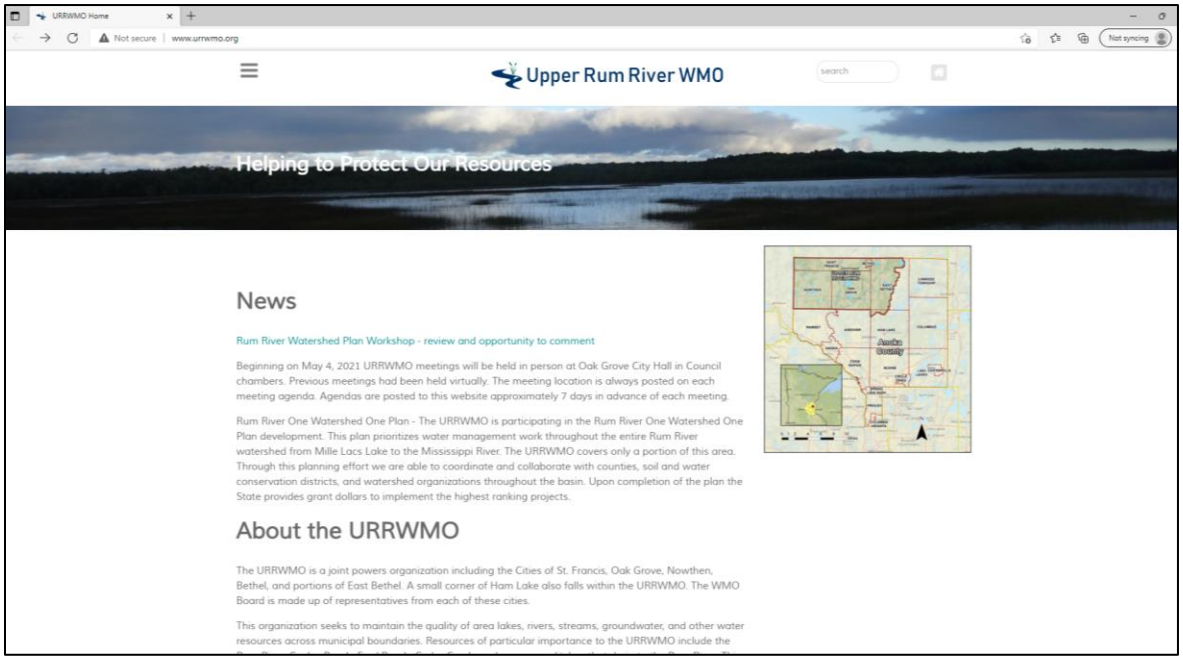
Partners: URRWMO, ACD

Description: The Upper Rum River Watershed Management Organization contracted the Anoka Conservation District to maintain the URRWMO website.

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

Locations: www.URRWMO.org

Results: In 2021, ACD maintained the existing URRWMO website, paid the domain registration and hosting fees, and posted meeting minutes and agendas.



URRWMO NEWSLETTER

Partners: ACD, URRWMO

Description: ACD prepared public education and outreach material based on the URRWMO Watershed Management Plan

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

Location: Watershed wide

Results: 2021 accomplishments included:

- Presented updated Lake George water quality and level data along with lakeshore projects to the Lake George Conservation Club in October.
- Two URRWMO newsletter articles distributed to member communities for publication in city newsletters. One article focused on shoreline stabilization and the other on septic system fix up grants.
- Direct promotion of septic system fix up grants & loans to the few homes on Lake George still using these systems.

ANOKA COUNTY WATER RESOURCE OUTREACH COLLABORATIVE

Partners: ACD, Anoka County, WMO's, watershed districts, cities and townships

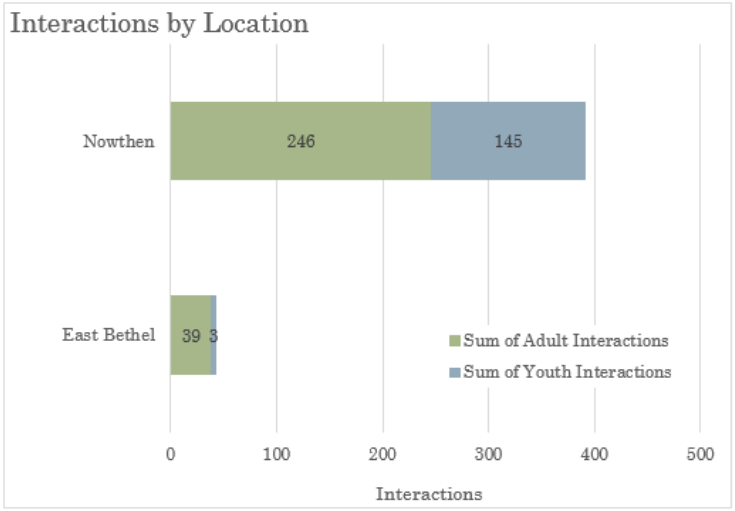
Description: The Anoka County Water Resources Outreach Collaborative (AWROC) is a partnership formed in 2018 to implement a comprehensive water outreach and engagement program. Its purpose is to reduce duplication while improving the cost effectiveness of public outreach about water resources.

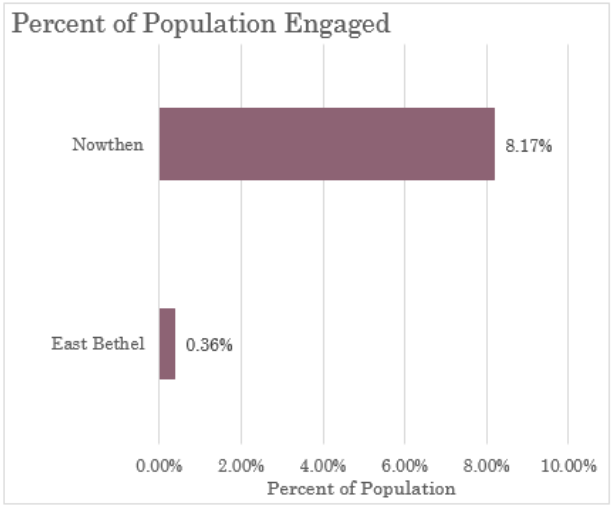
Purpose: To inform community residents, businesses, staff, and decision-makers about issues affecting local waterbodies and groundwater resources. To achieve behavioral changes that improve water quality and recruit people to install water quality projects.

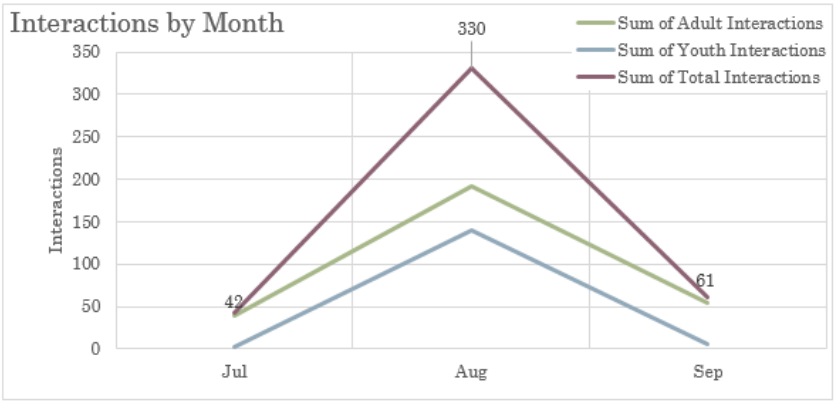
Location: County Wide

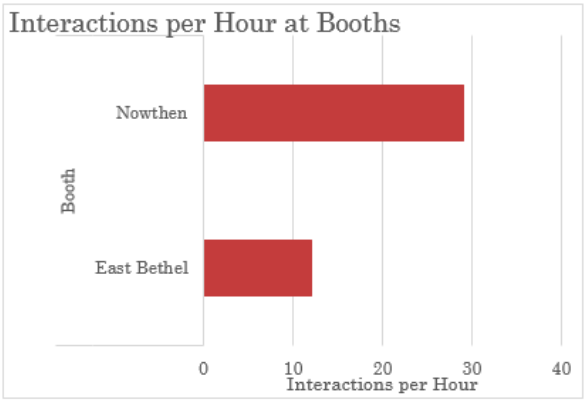
Results: Thirty-four events were attended or facilitated by the Anoka Conservation District's outreach specialist throughout the county in 2021. These events included staffing a booth at community events and facilitating workshops.

2021 Anoka County Water Resources Outreach Collaborative Results for URRWMO









Projects As Detailed in the URRWMO 10-Year Plan

Description: The URRWMO pledges match of approximately $15,375 annually toward priority projects in its Watershed Management Plan. These funds are often match for grants. Priority projects include Rum River and Lake George shoreline stabilizations, a middle Ford Brook subwatershed assessment study, and stormwater retrofits ranked in subwatershed studies.

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

Location: Watershed Wide

Results: Ongoing projects include:

RUM RIVERBANK STABILIZATIONS

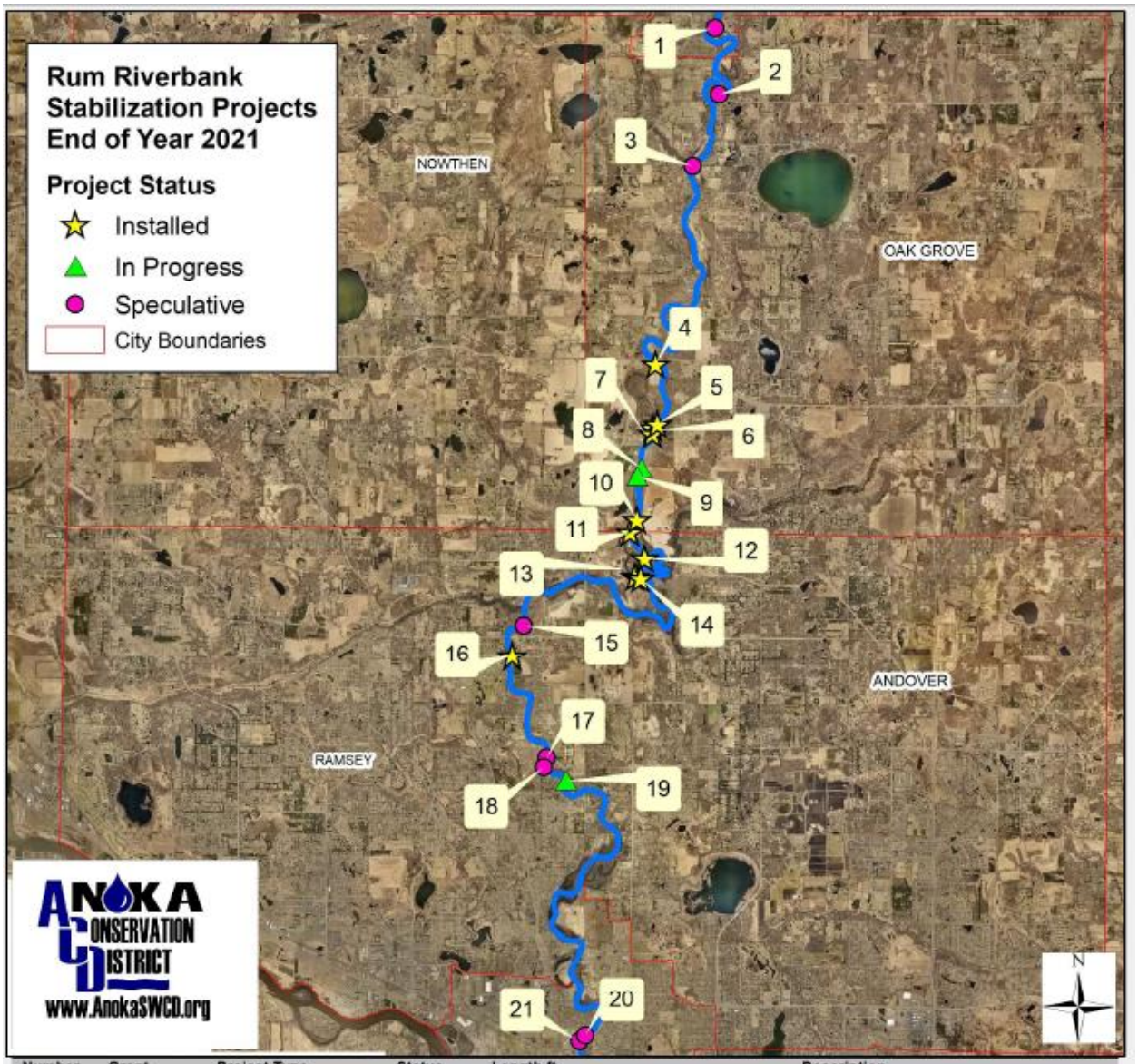
ACD has identified eroding Rum riverbanks throughout Anoka County, ranked them by priority, and reached out to the priority landowners. Project installations began in 2020-21 using over $1.6M in State grant funds, county funds, landowner contributions, and $15K from the URRWMO. Accomplishments so far include:

- 3,845 linear feet of cedar tree revetments installed at minor erosion sites. An additional 1,282 are planned for 2022.

- 400 linear feet of regrading and rock rip rap at a site just south of the Viking Blvd Bridge.

- Planning, surveying, and preliminary design work for other sites including 400 linear feet at two private residences in Oak Grove, 500+ linear feet in the Cedar Creek Conservation Area, 175 linear feet in Andover, 200 linear feet at the Boy Scout camp in Ramsey, and others.

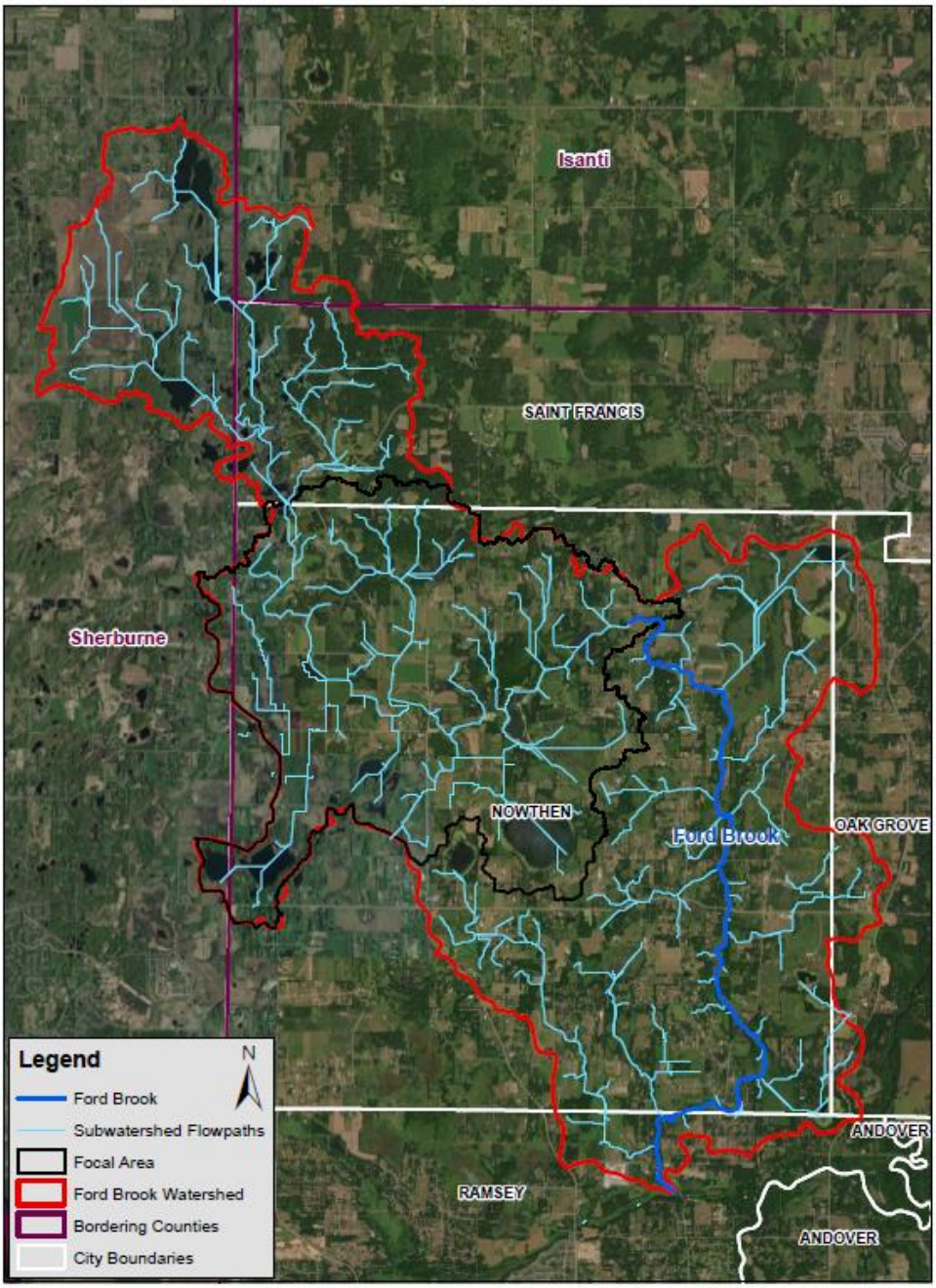
Map of identified Rum Riverbank sites



Number	Grant	Project Type	Status	Length ft.	Description
1	LSOHC	Bioengineering	Speculative	700	Working with St. Francis on bioengineering project.
2	CWF	Hard Armoring	Speculative	500	Working with two landowners on highest priority project on our inventory.
3	CPL	Cedar Tree Revetment	Speculative	600	Working with landowner on potential project.
4	LSOHC	Bioengineering	Installed 2021	400	Bioengineering project installed on private property.
5	CPL	Cedar Tree Revetment	Installed 2021	500	Revetment installed on private property.
6	CPL	Cedar Tree Revetment	Installed 2021	150	Revetment installed on private property.
7	CPL	Cedar Tree Revetment	Installed 2021	320	Revetment installed on private property.
8	LSOHC	Bioengineering	In Progress	525	Bioengineering project at Cedar Creek Cons. Area. Survey complete.
9	CPL	Cedar Tree Revetment	Planned for 2022	200	Revetment planned at Cedar Creek Cons. Area 2022
10	CPL	Cedar Tree Revetment	Installed 2021	1130	Revetment installed at Cedar Creek Cons. Area.
11	CPL	Cedar Tree Revetment	Installed 2021	220	Revetment installed in Rum Central Regional Park
12	CPL	Cedar Tree Revetment	Installed 2021	275	Revetment installed in Rum Central Regional Park
13	CPL	Cedar Tree Revetment	Installed 2020	650	Revetment installed in Rum Central Regional Park
14	CPL	Cedar Tree Revetment	Installed 2021	200	Revetment installed at Rum Central Regional Park.
15	CPL	Revetment	Speculative	200	Possible revetment site on private property. Landowner interested for 2022.
16	CPL	Cedar Tree Revetment	Installed 2021	400	Revetment installed at Timber Rivers Park, Andover.
17	CPL	Revetment	Speculative	100	Possible revetment site on private property. Landowner interested for 2022.
18	LSOHC	Bioengineering	Speculative	125	Bioengineering project at Boyscout Camp. Landowner interested for 2022.
19	LSOHC	Bioengineering	In Progress	500	Bioengineering project on private property. Initial stages.
20	CPL	Cedar Tree Revetment	Speculative	120	Possible revetment site at Rum River South.
21	CPL	Cedar Tree Revetment	Speculative	200	Possible revetment site at Rum River South.

MIDDLE FORD BROOK SUBWATERSHED ASSESSMENT STUDY

ACD began a study to identify and rank water quality improvement projects to benefit Ford Brook and the Rum River downstream. Study components will include water monitoring to identify priority areas, modeling, project identification, cost and pollutant removal estimation for each project, and project ranking. The study is paid for by a State Watershed Based Implementation Fund grant and URRWMO matching funds. Completion is expected in 2022.



LAKE GEORGE SHORELINE STABILIZATION

This project aims to stabilize 500 linear feet of Lake George shoreline in order to improve water quality and enhance near-shore habitat. Candidate sites were identified by ACD from a photo inventory completed by boat. Projects will only be done where the owner is willing and ACD has determined it is a top-scoring project for benefits to the lake. Sites will be prioritized based on erosion rates and the willingness of the owners to both stabilize the shore and include a native plant buffer. At least 6-8 projects are planned. The primary funding is $70,000 in State grant funds. The project is coordinated by the Anoka Conservation District (ACD).

In 2021, the Anoka Conservation District completed the following:

- Sent 40 letters to landowners with moderate erosion in March.
- Visited the Lake George community to door knock at properties that received a letter, unless the owner already responded.
- Facilitated a virtual neighborhood meeting with interested landowners in April to describe the program and answer questions.
- 8 sites were selected. Sites were prioritized based on erosion rates and the willingness of the owners to both stabilize the shore and include a native plant buffer.
- 1 shoreline stabilization project was installed – a small 20-foot biolog.
- 7 sites were surveyed.

In 2022, designs and installations of seven sites will be completed.

Project sites