

BCWMC water monitoring program review

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Technical Advisory Committee Meeting

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BCWMC monitoring history

1972–2019



BCWMC monitoring history

- 1972- Lake water quality monitoring
- 1972 - Lake level monitoring
- 1972 - Stream water quality monitoring
- 1974 - Stream biological monitoring
- Clean Water Act – October 18, 1972



BCWMC monitoring program objectives

- Assess present water quality of water resources in BCWMC watershed
- Identify existing or potential water quality problems for which solution oriented programs could be initiated
- Collect “baseline data” to use with future sampling to detect physical, chemical, and biological changes that may occur and eventually interfere with the intended use of these resources



1972 goals



- Lake monitoring goal:
 - Assess the eutrophication levels of the lakes



- Stream monitoring goals:
 - Monitor present condition of stream
 - Compare water quality to MPCA standards
 - Help pinpoint sources of degrading effluents discharged to the stream
 - Determine short- or long-term trends as the watershed urbanized

1972-1987 monitoring and special studies

- **Monitoring:** 1972, 1977, 1982
- **Medicine Lake special studies**
 - 1974: Phosphorus balance
 - 1982: Diagnostic-feasibility study
 - 1983: Monitoring—further study
 - 1985: Bio-manipulation experiment
 - 1987: Management alternatives study
- **Sweeney Lake special study** (1985)





Lake water quality monitoring

- Data collection for lake and watershed management plans: 1992–1996





Lake water quality monitoring

Monitoring of water quality and assessment of water quality improvement from BMPs: 1997–present



MCES: CAMP program 2000–Present



TRPD: Parkers and Medicine 1994–Present;
BCWMC lakes monitored 2007–2009



MPRB: (Wirth) 1974, 1976, 1977 (contract with U of M) and annually since 1992





Historical lake water quality monitoring

Data collection for total maximum daily load (TMDL) studies



Sweeney Lake: Monitored by BCWMC
2008 & TRPD 2007 and 2009



Medicine Lake: Monitored by TRPD
1994-2009



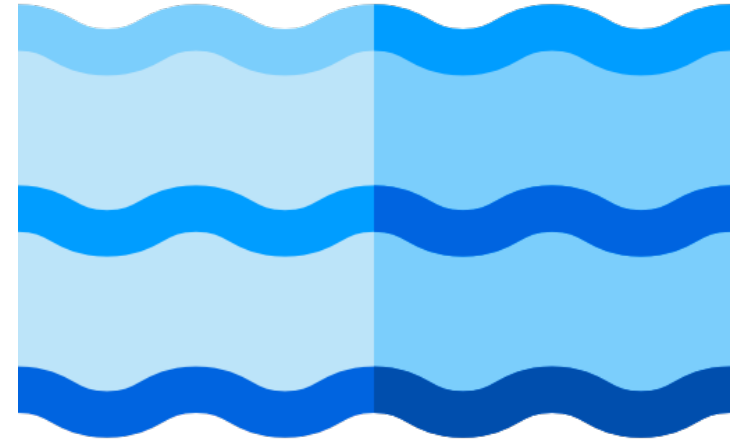
Wirth Lake: Monitored by MPRB
1992-2009





Historical lake level monitoring (1972 to present)

- **1972:** Parkers Lake, Medicine Lake, Sweeney Lake, crest gage near mouth of Bassett Creek
- **1974:** Crane Lake and Westwood Lake
- **1993:** Northwood Lake
- **2006:** Bassett Creek Park Pond and Wirth Park/Hwy 55 structure





Historical precipitation monitoring (1975-present)

- **1975-1981:** Precipitation gage in Plymouth near the city's pumphouse #3
- **1975-1984:** Precipitation gage in Minneapolis near Northern States Power Company's Aldrich station near tunnel entrance
- **2000:** Precipitation gage at Irving Ave. WOMP station





Historical stream water quality monitoring

- Discovery: 1972–1973 and 1975
- Special studies and more monitoring: 1976–1983
- Assess trends: 1984–1985
- Discontinue monthly grab sample stream water quality monitoring program: 1985
- Metropolitan Council Environmental Services (MCES) Watershed Outlet Monitoring Program (WOMP) station on main stem upstream of tunnel: 2000–present
- Automated sampler/flow North Branch: 2018–2019





Historical stream water quality monitoring

- 1976–1982 special studies investigated/monitored:
 - High fecal coliform bacteria
 - High oil concentrations
 - Construction impacts of bridge replacement
 - Stormwater runoff impacts
- 2008–2010 special study: E. coli monitoring (Plymouth Creek, North Branch, and Bassett Creek Main Stem)





Historical stream biological monitoring

- Discovery/program development: 1974–1985
 - Fish and macroinvertebrate monitoring
- Hilsenhoff Biotic Index (HBI) to assess stream water quality: 1980–present
- Discontinued fish monitoring: 1981
- Assess significant changes: 1983–present
- Invertebrate Community Index (ICI) to assess stream water quality: 1995–present
- Trend assessment: 2015–present
- MIBI: 2015–present



Overview of current monitoring in the BCWMC watershed



Overview of current BCWMC water monitoring goals

- Manage the surface water resources of the watershed to meet or exceed state standards and BCWMC water quality goals for wetlands, lakes, and streams.
- Track changes in water quality and analyze trends
- Maintain watershed models including P8 and XP-SWMM
- Minimize the spread and manage the adverse impacts of harmful aquatic invasive species.



Overview of current BCWMC water monitoring goals

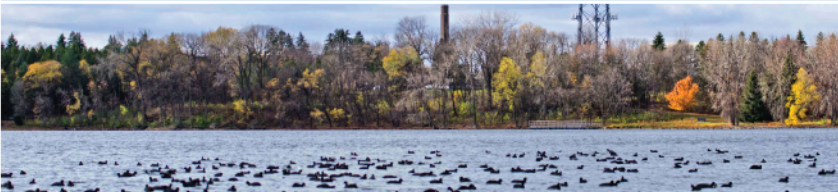
- Prioritize water quality improvement projects that are most effective at achieving water quality goals, including non-structural BMPs and education.
- Cooperate with member cities, the MPCA and other stakeholders in the preparation of total maximum daily load (TMDL) studies.
- Identify opportunities to achieve and maintain excellent water quality in priority waterbodies.




Overview of current BCWMC water monitoring goals

- Compile the available monitoring data, include the data in an annual report available on the BCWMC website, and submit the data to the MPCA.
- Coordinate monitoring efforts with other entities

Parkers Lake 2018 water quality monitoring





About Parkers Lake

BCWMC classification	Priority-1 deep lake
Watershed area	1,065 acres
Lake size	97 acres
Average depth	12 feet
Maximum depth	37 feet
Ordinary high water level	935.9 feet (NGVD29)
Normal water level	934.2 feet (NAVD88)
Downstream receiving waterbody	Medicine Lake
Location (city)	Plymouth
MPCA impairments	Chloride, mercury in fish tissue
Aquatic invasive species	Eurasian watermilfoil, curly-leaf pondweed
Public access	Yes (boat launch)

Monitoring water quality in Parkers Lake

The Bassett Creek Watershed Management Commission (BCWMC) has monitored water quality conditions in the watershed's 10 priority lakes since 1972. This monitoring is done to detect changes or trends in water quality and evaluate the effectiveness of efforts to preserve or improve water quality. A summary of 2018 monitoring efforts on Parkers Lake is provided below; more comprehensive information can be found on pages 2-7.

At a glance: 2018 monitoring results

In 2018, the BCWMC monitored Parkers Lake for:

- Water chemistry (nutrients, chlorophyll *a*, chloride).
- Water measurements (e.g., clarity, dissolved oxygen).
- Phytoplankton and zooplankton (microscopic plants and animals).
- Macrophytes (aquatic plants).

Results indicate that Parkers Lake meets Minnesota Pollution Control Agency (MPCA) and BCWMC water quality standards for Secchi disc (measure of clarity), total phosphorus, and chlorophyll *a*. The lake failed to meet water quality standards for chloride. According to the Minnesota Department of Natural Resources (MDNR) plant IBI, a measure of aquatic plant health, the lake's plant community did not meet standards in August 2018.

Recommendations

- Identify management measures to reduce chloride runoff from the lake's watershed, particularly on the north side of the lake
- Identify management measures to improve the quality of the lake's plant community and survey vegetation annually to facilitate early detection of aquatic invasive species
- Continue water quality and biological monitoring at a 3-year frequency

The Bassett Creek Watershed Management Commission
Stewardship of water resources to protect and enhance our communities

Overview of current monitoring in the watershed



- BCWMC will coordinate monitoring efforts with other programs:
 - Member city monitoring
 - MCES CAMP and WOMP 
 - TRPD monitoring 
 - MPRB monitoring 
 - MPCA Citizen Lake Monitoring Program and other monitoring 
 - Hennepin County River Watch Program 



Overview of current monitoring in the watershed



- Lake water quality
- Lake level monitoring
- Stream water quality
 - BCWMC: Auto sampler/flow—North Branch, Sweeney Lake Branch, and Plymouth Creek
 - MCES: WOMP—Main stem
- Stream biological monitoring (macroinvertebrates)



Overview of current monitoring in the watershed



Lake water quality monitoring

- **Intervals:** 3 years for Priority 1 waterbodies, 5 years for Priority 2
- **Timing:** Shortly after ice-out through September (6 events)
- **Water quality parameters:** Secchi disc, temperature, dissolved oxygen, specific conductance, pH, nutrients, chlorophyll *a*, and chlorides
- **Biological parameters:** phytoplankton (0-2 m composite sample) and zooplankton (including AIS) (bottom to surface tow with a zooplankton net)



Overview of current monitoring in the watershed



- Aquatic plant surveys (including AIS):
 - Point intercept surveys June and August
 - Measure distribution and growth density
 - Calculate DNR's Lake Plant Eutrophication Index of Biological Integrity (IBI)
- No fish surveys-except for special studies



Overview of current monitoring in the watershed



- Early detection AIS monitoring
 - Hennepin County grants
 - Partner with park districts
 - Involve volunteers and lake groups
- AIS suitability analysis



Overview of current monitoring in the watershed



- Lake level monitoring
 - Assesses long-term lake level fluctuation
 - Medicine, Parkers, Sweeney, Crane, Westwood, Northwood, Bassett Creek Park Pond, and Wirth Park/Hwy 55 structure



Overview of current monitoring in the watershed



2018–present: stream flow and water quality monitoring—
North Branch, Sweeney Branch, and Plymouth Creek

- Continuous flow, temperature, and specific conductance
- Storm sampling (automatic samplers)
- Baseflow sampling (grabs) all year
 - Winter: monitor deicing impacts on stream chloride levels



Overview of current monitoring in the watershed



Continued

- Monitor nutrients, chlorides, suspended solids, metals, E. coli, pH, hardness, alkalinity, total organic carbon, sulfate, and chemical oxygen demand
- Same parameters as MCES WOMP at Irving Avenue with exception of chemical oxygen demand
- Estimate 30 samples per 2-year period, split between storm and grab samples



Overview of current monitoring in the watershed



- Biological stream monitoring
 - Plymouth Creek
 - North Branch of Bassett Creek
 - Sweeney Lake Branch of Bassett Creek
 - Main Stem of Bassett Creek
 - 3 sites including WOMP



Overview of current monitoring in the watershed



Continued

- Monitor every 6 years during early October
- Sampled using D-net sampler
- MPCA multi habitat method
- Habitat assessments
- Calculate M-IBI, HBI and ICI



Overview of current monitoring in the watershed



- WOMP station at Irving Ave.
 - In operation since March 2000
 - Measures same parameters as BCWMC stream water quality/flow monitoring with two exceptions
 - Measures precipitation
 - COD recently dropped from WOMP



Overview of current monitoring in the watershed



- Citizen Assisted Monitoring Program (CAMP)
 - Coordinated by Met Council
 - Volunteers collect lake samples and data
 - Total phosphorus, chlorophyll-a, Secchi depth, temp
 - Mid-April thru mid-October
 - Typically every 2 weeks
 - Met Council submits data to MPCA
 - BCWMC uses data in assessments, trends analyses, online graphs
- Parkers, Lost, Medicine (2 sites), Northwood, Sweeney (2 sites), Twin, Westwood



Overview of current monitoring in the watershed

- Medicine Lake, lake inlets (Plymouth Creek, Wood Creek, other inlets) and lake outlet
- Parkers Lake and inflows
- North Branch, upstream of Northwood Lake



Overview of current monitoring in the watershed



- Wirth Lake—annual monitoring
 - **Winter:** 1 time
 - **March or April:** 1 time
 - **May through September:** 2 times per month
 - **October or November:** 1 time
 - Aquatic plant surveys as needed



What are others doing?

- Shingle Creek WMC



- 14 lakes
 - WQ every 2 years (every 5 years by WMC; intervening years thru CAMP)
 - Vegetation every 5 years
 - Sediment cores once in past 10 years
- 4 stream sites
 - Flow and WQ every year
 - DO profiles along whole creek 3x/year
 - Fish and bugs every few years



What are others doing?

- Elm Creek WMC
 - 4 Sentinel Lakes
 - WQ every year by TRPD
 - Vegetation every 5 years
 - CAMP data on other lakes
 - Rotating Stream Sites + cooperate w/ USGS on Elm Creek
 - 2 Streams sites/year = flow and water quality
 - Fish and bugs every 5 years
 - DO profiles along whole creek on occasion
 - Periodic field assessments of stream conditions (erosion, buffers, etc.)



What are others doing?



- Nine Mile Creek WD
 - Lakes – rotating among major lakes
 - Water quality (nutrients, clarity, chlorophyll-a, chlorides, pH, DO)
 - Vegetation, phytoplankton, zooplankton
 - Conduct Use Attainability Analyses
 - Determine effectiveness of capital projects
 - Streams
 - 1 WOMP site + 3 WOMP-like sites
 - 7 stream bioassessment sites – monitored annually for habitat, bugs, fish for long term assessment of stream health

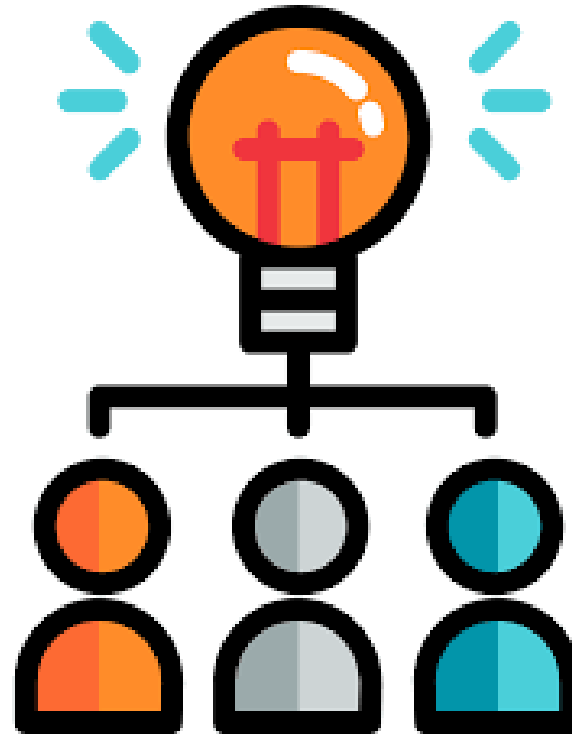


Time to Brainstorm!

Goals

Priority
Locations

Objectives



What – Where – Why - How

Related Questions:

If there are no significant changes in WQ over X number of years, does it make sense to monitor that waterbody less frequently?

Are there standard monitoring frequency/parameters protocols recommended by the MPCA or other organizations?

How much data are needed for robust statistical analyses?

Are there emerging concerns or contaminants we should consider adding?

Are we gathering the right data to help understand impacts of climate change? (Goal from Plan: Develop a greater understanding of climate change and its impact on water resources, including stormwater infrastructure capacity and flooding, and develop strategies to appropriately manage future impacts.)

Impairments

Waterbody	Impaired Use	Pollutant or Stressor	Year Listed	TMDL Study Target Start	TMDL Study Target Completion	TMDL Study Approved
Parkers Lake ²	Aquatic Consumption	Mercury in Fish Tissue	1998	1998	2025	--
	Aquatic Life	Chloride	2014	2009	2015	--
Medicine Lake ³	Aquatic Consumption	Mercury in Fish Tissue	2004	--	--	2008 ⁴
	Aquatic Recreation	Nutrients/Eutrophication	2004	--	--	2010
Sweeney Lake	Aquatic Recreation	Nutrients/Eutrophication	2004	--	--	2011
	Aquatic Life	Chloride	2014	2009	2015	--
Wirth Lake	Aquatic Consumption	Mercury in Fish Tissue;	1998	--	--	2008 ⁴
	Aquatic Life	Chloride	2014	2009	2015	--
	Aquatic Recreation ¹	Nutrients/Eutrophication	2002	--	--	2010
Northwood Lake	Aquatic Recreation	Nutrients/Eutrophication	2004	2020	2024	--
Bassett Creek (Main Stem)	Aquatic Life	Chloride	2010	2009	2015	--
	Aquatic Life	Fish Bioassessments	2004	2012	2016	--
	Aquatic Recreation	Fecal Coliform	2008	2008	2015	2014 ⁵
Plymouth Creek	Aquatic Life	Chloride	2014	2009	2015	--
	Aquatic Recreation	Escherichia coli	2014	2008	2015	2014 ⁵
North Branch Bassett Creek	Aquatic Recreation	Escherichia coli	2014	2008	2015	2014 ⁵
Spring Lake	Aquatic Life	Chloride	2014	2009	2015	--

Classifications

BCWMC Classification	Waterbodies
Priority Streams	<ul style="list-style-type: none">• Main Stem Bassett Creek• North Branch Bassett Creek*• Plymouth Creek• Sweeney Lake Branch Bassett Creek
Priority 1 Deep Lakes	<ul style="list-style-type: none">• Medicine Lake• Parkers Lake• Sweeney Lake• Twin Lake• Wirth Lake
Priority 1 Shallow Lakes	<ul style="list-style-type: none">• Northwood Lake• Westwood Lake
Priority 2 Shallow Lakes	<ul style="list-style-type: none">• Cavanaugh (Sunset Hill) Pond• Crane Lake• Lost Lake•

* Includes Bassett Creek Park Pond