

2019 PRWD Surface Water Monitoring Plan

Stream/Drainage Ditch Monitoring

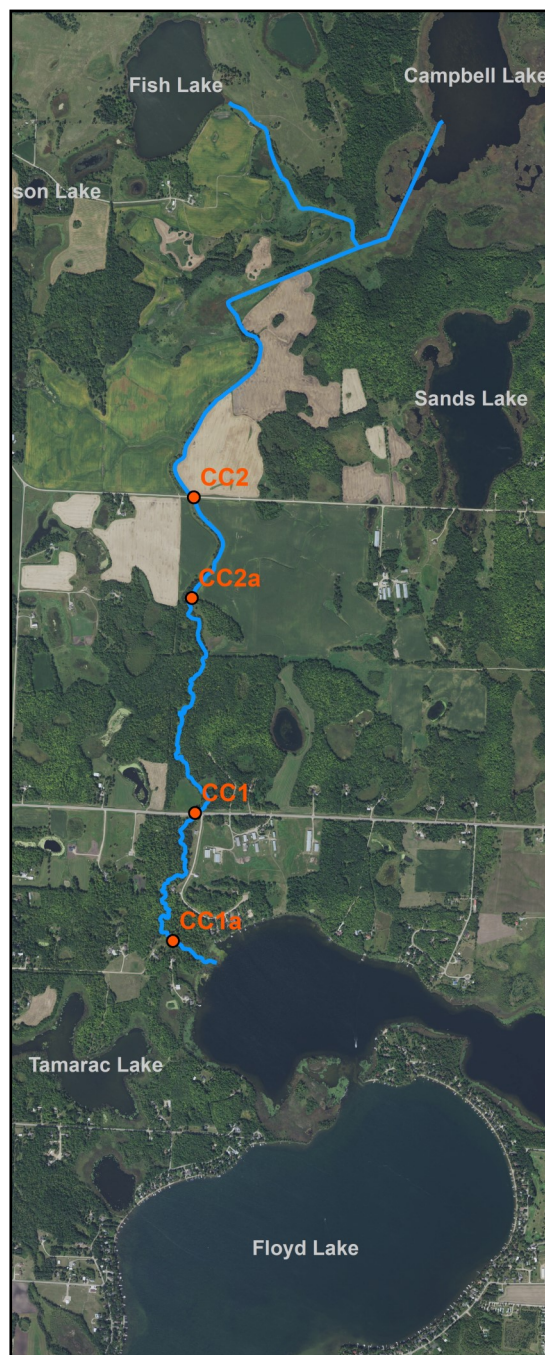
Routine water chemistry samples are taken bi-weekly throughout the District, from spring melt through September. Specific analytes vary depending on the source of the water and the project goals, but typically include Total Phosphorous, Orthophosphate, and Total Suspended Solids (sediment). In addition to chemistry analysis, water level and stream flow measurements are collected. Continuous water level logging equipment is deployed and rain gauges are set at strategic locations to assess stream response to rain events and to record high water conditions. PRWD also samples following storm events (rainfall greater than 1") to observe potential nutrient and sediment increases during high flows.

Campbell Creek (Ditch 11/12)

Campbell Creek is a ditched stream which drains to Floyd Lake and is the major contributor of nutrient and sediment load to the Lake. CC2(230th St) and CC1 (CR 149) are the long term stream monitoring sites. During streambank assessments in 2018, significant bank erosion was observed between CC1 and Floyd Lake. Since there is no monitoring station downstream from CC1, sediment loads to Floyd Lake may be underestimated. An additional monitoring location will be added downstream in 2019, CC1a, to more accurately estimate nutrient and sediment loads to Floyd. CC2, CC1 and CC1a will be sampled biweekly and during storm events.

In 2014, CC2a was added to assess project effectiveness of the agricultural Best Management Practices installed in 2012-2013. Monitoring data (2014-2018) indicates that practices are reducing sediment loads except for after large (1" or greater) storm events. CC2a will only be sampled during storm events while CC2 will be sampled both bi-weekly and during storm events.

Daily flows will be measured using water level loggers placed at the CC2 and CC1 locations. Stream ratings will be done at these locations to continue to construct a stream rating curve.



Above: Campbell Creek at CR149

Pelican River (Ditch 13)

The headwaters of the Pelican River flows out of Little Floyd Lake and through the Rice Lake Wetland complex prior to flowing through the City of Detroit Lakes and eventually to Detroit Lake. Three locations will be sampled bi-weekly and during storm events: (1) inlet to Rice Lake, PR2 (Anchor road), (2) outlet of Rice Lake, PR2a (approximately 1.2 miles downstream), and (3) PR3 (Highway 34) to determine the total nutrient load from Rice Lake.



City of Detroit Lakes (Hwy 34 New Projects to Detroit Lake)

Routine samples taken at PR5 (North Shore Drive) will determine total annual nutrient and sediment loads to Detroit Lake. Streamflow is measured at the upstream PR4a location to minimize interference with Detroit Lake back-water effects.

Storm events samples (>1") will be collected at the Industrial Park, IP (Randolph Road) to determine sediment loads from the untreated/undertreated runoff from that area.

New Projects

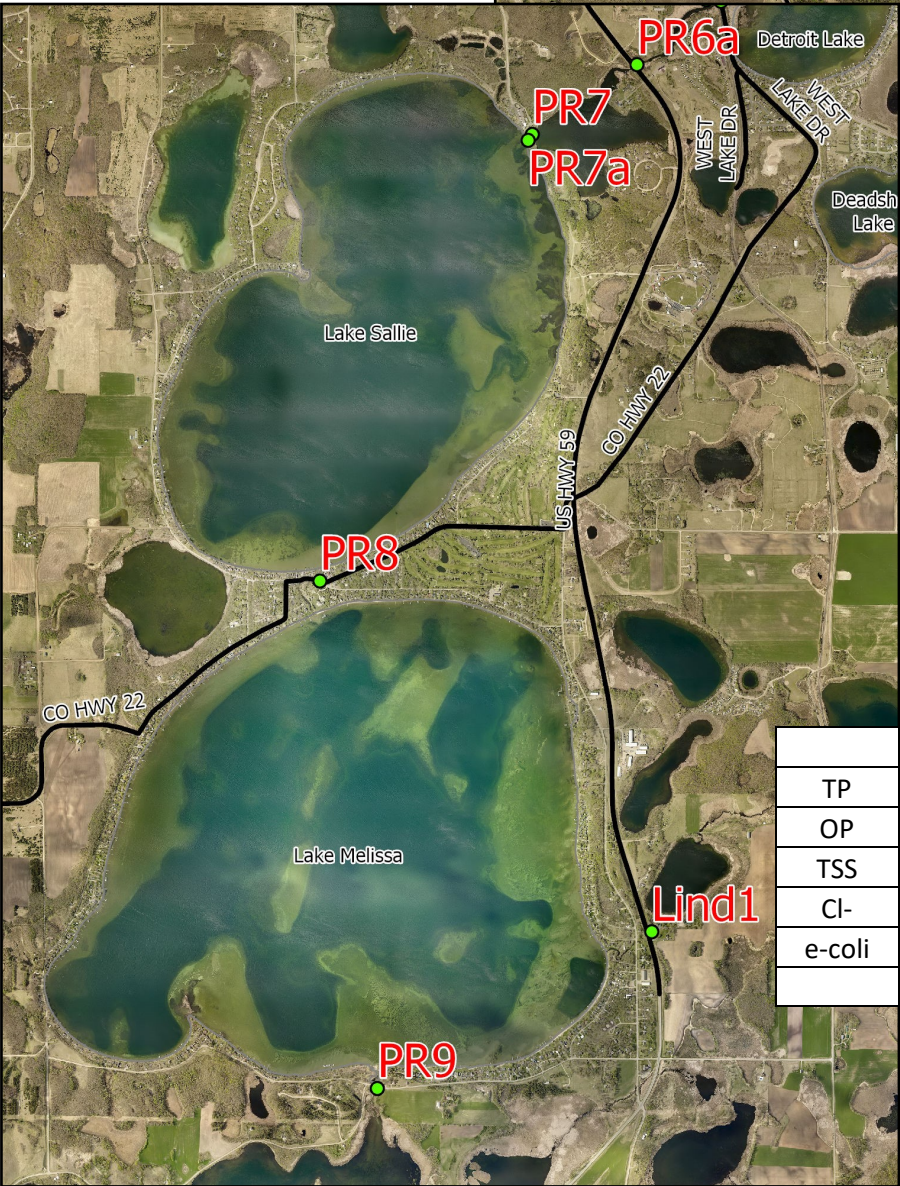
E-coli: As a result of sampling conducted by the MPCA in 2017, high levels of e-Coli were detected in the Pelican



River between Highway 10 and Detroit Lake. Samples will be taken in two locations, PR3 (Highway 34) and PR4a (Boys and Girls Club), to isolate the source. The District will also assist the MPCA by sending samples for DNA source analysis (human, waterfowl, geese, beaver).

Ditch 14 (St. Clair Outlet)

Two sampling locations will be monitored bi-weekly at the outlet from Lake St. Clair SC3 (Highway 59) and the outlet of the downstream wetland complex SC4 (Dunton Bike Trail). The difference between loads at SC3 and SC4 is the contributing load from the wetland complex between St. Clair and the Pelican River. Additional Chloride Samples will be taken at SC4.



The following site will also be monitored bi-weekly.

- PR6: Outlet of Detroit Lake
- PR6a: Inlet to Muskrat Lake
- PR7: Lake Sallie outlet
- PR8: Lake Melissa outlet

Routine Monitoring Budget:

	Number	Cost	# of Samples	Total Cost
TP	15	14	10	2100
OP	15	12	10	1800
TSS	7	9	10	630
Cl-	2	11	10	220
e-coli	4	25	5	500
			Total	5250

Lake Monitoring

Routine Lake Sampling

The lakes listed in the table below will be monitored bi-weekly from June—September as part of the PRWD routine monitoring network. They will all be sampled for Total Phosphorus (TP), Orthophosphate (OP), and Chlorophyll-a (Chl-a). Little Detroit, Big Detroit, and Lake Sallie will also be sampled for chloride monthly. In addition to chemistry sampling, the following parameters will be recorded:

Water Clarity (Secchi)

Environmental Conditions (Air temperature, wind speed, cloud cover)

Water Temperature (surface and at each meter depth)

Dissolved Oxygen (surface and at each meter depth)

pH (surface and at each meter depth)

Specific Conductivity (surface and at each meter depth)

Big Floyd	North Floyd	Little Floyd	Big Detroit
Little Detroit	Sallie	Melissa	St. Clair
Munson	Johnson	Reeves	Fox

Monitoring Budget:

	Total Site	Cost	# samples	Total
TP	12	14	8	1344
Chl-a	12	18	8	1728
OP	12	10.5	8	1008
Cl-	3	10	4	120
			Total	4200

Citizen Lake Monitoring

The District will make contact with lakeshore owners on the following lakes to assist with bi-weekly Secchi disk measurements. This will be done for lakes that are on a rotating monitoring schedule to avoid data gaps (see long term monitoring schedule). Volunteers for Meadow, Munson, Johnson, and Reeves lakes will be recruited for 2019.

Plankton Community Composition Study

The District will continue monitoring plankton population shifts on Zebra Mussel infested lakes in coordination with the MN DNR research efforts. The DNR will conduct zooplankton community composition assessments with samples collected by DNR staff on Big and Little Detroit while PRWD will sample locations on Sallie and Melissa. Additionally, PRWD will collect phytoplankton samples with RMB labs to conduct the community composition assessments.

Zooplankton Monitoring Budget: No PRWD cost as MN DNR will cover shipping and analysis expenses.

Phytoplankton Monitoring Budget:

Lake	Sites	# of Samplings	Cost	Total (LMP-01)
Detroit	2	5	\$195	1950
Sallie	1	5	\$195	975
Melissa	1	5	\$195	975
			Total	3900

Lake Vegetation Survey

Point-intercept surveys will be conducted within the littoral area (>15ft) of Detroit and Curfman Lakes. The species type and relative abundance of the plants at each survey point will be mapped and reported. Additionally, the survey will investigate and report any occurrence of invasive plants.

Shoreline Surveys

The survey and assessment of shoreline development conditions will be done for Long Lake, Pearl, and Munson Lakes. Each parcel will be photographed and the level of shoreline alteration, number of boats, docks, and boat lifts will be quantified. The surveys will be compared to past surveys to analyze trends in shoreline development, land use, and lake use.

Lake	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
"Big" Floyd	1	1	1	1	1	1	1	1	1	1	1
"North" Floyd	1	1	1	1	1	1	1	1	1	1	1
Little Floyd	1	1	1	1	1	1	1	1	1	1	1
"Big" Detroit	1	1	1	1	1	1	1	1	1	1	1
"Little" Detroit	1	1	1	1	1	1	1	1	1	1	1
Curfman		1			1			1			1
Salle	1	1	1	1	1	1	1	1	1	1	1
Melissa	1	1	1	1	1	1	1	1	1	1	1
St. Clair	1	1	1	1	1	1	1	1	1	1	1
Munson	1		1				1		1		1
Johnson	1			1			1			1	
Reeves	1			1			1			1	
Glawe		1			1			1			1
Meadow		1			1			1			1
Abbey			1			1			1		
Brandy			1			1			1		
Fox	1			1			1			1	
Long		1			1						1
Pearl			1			1			1		
Lind			1			1			1		
TBD		1		1		1		1		1	
Number of Lakes	12	13	13	12	13	13	12	13	13	12	13