

2018 Water Quality Monitoring Plan

Lakes

Big Floyd	North Floyd	Little Floyd	Big Detroit
Little Detroit	Sallie	Melissa	St. Clair
Abbey	Brandy	Pearl	Lind

The lakes listed in the table above will be monitored bi-weekly from May through 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). 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)

Results from the analysis will be entered into the District’s database. Mean summer averages will be compared to historical data and the District’s water quality goals to determine trends and target areas for potential nutrient reduction projects.

Routine Lake Monitoring Budget

Big Floyd, North Floyd, Little Floyd, Big Detroit, Little Detroit, Sallie, Melissa, St. Clair, Abbey, Brandy, Pearl, Lind

Lake Site Analysis	Sites	Samples	\$/sample	Total
Total Phosphorous	12	9	14	1512
Orthophosphate	12	9	12	1296
Chlorophyll-a	12	9	20	2160
			Total	4968

Lake Ecology - AIS Impacts Research Study

Zebra Mussels can ecologically negatively impact our waters by re-engineering the lake’s ecosystem. The District will assist MN DNR and MAISRC Phytoplankton (staple food source for fish) distribution studies on Detroit, Sallie and Melissa. The study will help track phytoplankton concentrations in nearshore areas (Near-Shore Shunt Hypothesis). The high ZM filtration rate strips food out of the water column, leaving behind nutrient-rich sediment deposits, and also clarifies the water, allowing more sunlight to reach deeper water into the lake. The additional sunlight and nutrient rich deposits can cause harmful algae bloom (increases in filamentous algae and cyanobacteria-blue/green). Climate change can also add into the mix with higher intensity storms and water surface warming can dramatically increase ZM populations by changing the lake water dynamic. An increase in storm intensities is enough by increase phytoplankton supplies and expand ZM populations. Mussels are stationary and live along the upper edges of a lake, and food supplies are limited to this area. However, storm events act like a cocktail shaker and mix up the water layers bringing fresh supplies of phytoplankton to the mussels and encouraging ZM multiplication. Stable, stratified lake water layers reduce mixing and helps to restrict mussel populations. The MN DNR is studying how ZM influence lake ecosystems and how they influence viability of certain fish and sport species

Phytoplankton Population Shifts. District staff will begin monitoring plankton population shifts on Zebra Mussel invested lakes - Detroit, Sallie and Melissa

Nuisance Algae Blooms. First, lakes infested with zebra mussels will be visually monitored in near shore areas in mid-late summer for nuisance filamentous algae and cyanobacteria blooms. If observed, these blooms will be documented and mapped.

Dr. Mike McCartney (University of MN) recommended following the MN DNR zooplankton monitoring studies and adding phytoplankton monitoring.

MN DNR is currently conducting zooplankton monitoring at two locations on Big Detroit Lake and one on Little Detroit. PRWD will collect additional samples at two locations on both Sallie and Melissa. In addition to zooplankton sampling, PRWD will collect phytoplankton samples at routine monitoring locations on Big Detroit, Little Detroit, Sallie, and Melissa Lakes to determine community composition and biomass approximation. Both phytoplankton and zooplankton samples will be obtained monthly from May through September (5 samples). MN DNR will include PRWD samples in shipping and analysis free of charge. Phytoplankton samples will be analyzed at RMB Laboratories, costs will be paid from LMP-01 funds.

Zooplankton Monitoring Budget: No PRWD Cost; MN DNR will cover costs (Shipping and analysis).

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

Shoreline Surveys

The survey and assessment of shoreline development conditions will be done on Long Lake, Pearl Lake, and Detroit Lake. If time allows, Curfman may also be included. During the survey, each parcel will be photographed and the level of shoreline alteration, number of boats, number of docks, and number of 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 Vegetation Survey

A point-intercept survey will be conducted within the littoral area of Long Lake. The species type and abundance of the plants will be mapped and reported. Additionally, the survey will investigate and report any occurrence of invasive plants.

Streams

Routine monitoring will be conducted on 21 stream sites throughout the district on a bi-weekly basis beginning at spring ice break up through October. Stream gages at each location will record water level. The parameters that are sampled/measured vary depending on the location and the specific monitoring goals of each location. Continuous water level loggers will be installed to monitor daily flows. The Flux32 computer model will be used to calculate annual phosphorus and sediment loads at each of the key monitoring locations.

Routine Stream Monitoring

Pelican River and Ditch 14 (St. Clair)

Note: Additional samples obtained for Campbell Creek and Rice Lake Project Effectiveness Monitoring

Stream Site Analysis	Sites	Samples	\$/sample	Total
Total Phosphorous	9	13	14	1638
Orthophosphate	9	13	12	1404
TSS	2	13	9	234
			Total	3276

Campbell Creek Ditch 11/12

Three key monitoring locations will be sampled. The location at the 230th street crossing, and the site approximately ¼ miles downstream, will be sampled for Total Phosphorous (TP), Orthophosphate (OP), and Total Suspended solids (TSS). This information will be utilized to assess the effectiveness of the agricultural best management practices (BMPs) that were installed in 2013 and 2014.

To determine the amount of sediment and phosphorus that is generated through the steep, highly erodible section, the County Road 149 crossing location will be monitored in comparison to the upstream location. The difference between the two locations will give sediment and nutrient loads. This monitoring site is also used to calculate the annual sediment and nutrient load to North Floyd.

Campbell Creek project effectiveness monitoring

CC2, CC2a, CC1

Stream Site Analysis	Sites	Samples	\$/sample	Total
Total Phosphorous	3	13	14	546
Orthophosphate	3	13	12	468
TSS	3	13	9	351
			Total	1365

Pelican River (Ditch 13)

There are 8 monitoring locations between Little Floyd Lake and Detroit Lake along Pelican River (Ditch 13). Key areas that will be monitored are within the Rice Lake Wetland area, and the Industrial Park (Snappy Park).

Locations at the inlet to Rice Lake (Anchor road crossing) and the outlet of Rice Lake (approximately 1.2 miles downstream) will be sampled to determine the amount of nutrients that are released from the wetland complex. These nutrient loads will be compared to loads measured after the completion of the water control structures to monitor the effectiveness of the Rice Lake Project.

The difference in the samples and nutrient loads in the Pelican River between the 8th street crossing and the Randolph Road crossing will be used to quantify the amount of nutrients and sediment that enter the Pelican River from the Industrial Park. This information will be valuable for future grant applications for stormwater improvements for this area, which currently receive little to no stormwater treatment prior to discharge into the river.

Rice Lake Project Effectiveness

PR2, PR2a, PR3

Stream Site Analysis	Sites	Samples	\$/sample	Total
Total Phosphorous	3	13	14	546
Orthophosphate	3	13	12	468
Chlorophyll-a		0	20	0
TSS	3	13	9	351
			Total	1365

Ditch 14 (St. Clair outlet)

Two sampling locations will be monitored at the outlet from Lake St. Clair (Highway 59 crossing) and the outlet of the downstream wetland complex. Nutrient loads will be calculated to determine the total nutrient load from Lake St. Clair and the load to the Pelican River. The difference between those two will show the contributing load from the wetland complex between St. Clair and the Pelican River.

2018 Overall Monitoring Budget

Routine Lake	4968
Phytoplankton	3900
Routine Stream	3276
Storm Event*	1225
Campbell Creek	1365
Rice Lake	1365
Total	16,099

*Storm Event Monitoring Cost are an estimate of annual expense