

LAKE WINNIPEG COMMUNITY-BASED MONITORING NETWORK

Northeast Red
Watershed District
2019 Regional Report



Assiniboine River; Photo: Paul Mutch

LWF

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LAKE WINNIPEG COMMUNITY-BASED MONITORING NETWORK: OVERVIEW

The Lake Winnipeg Community-Based Monitoring Network (LWCBMN), coordinated by the Lake Winnipeg Foundation (LWF), mobilizes citizens to collect water samples across Manitoba in order to measure phosphorus concentration. Phosphorus is the nutrient responsible for blue-green algae blooms on Lake Winnipeg. Phosphorus comes from diverse sources across the watershed, including municipal wastewater and agricultural runoff.

Different sub-watersheds contribute different proportions of Lake Winnipeg's total phosphorus load. With the help of a strong network of watershed partners and citizen scientists, this long-term monitoring program is identifying phosphorus hotspots – localized areas that contribute higher amounts of phosphorus to waterways than other areas. Targeting remedial action in hotspots will reduce the amount of phosphorus entering Manitoba's lakes and rivers, and improve the health of Lake Winnipeg.

Snow melts, floods and heavy rainfall events are responsible for most of the phosphorus that is flushed from the land and carried into our waterways. LWCBMN samples frequently throughout the season, and particularly during the spring melt, to ensure we capture phosphorus runoff during these high-water events.

Most LWCBMN sampling is conducted at stations where water flow is continuously monitored by the [Water Survey of Canada](#). By tracking flow online using the Water Survey of Canada's real-time data, the network can notify partners and citizen scientists across the watershed to ensure frequent sampling during peak flows. Sampling at these stations provides corresponding flow data, allowing LWCBMN data to be used to calculate **phosphorus loads**. We need several samples throughout the season to accurately calculate these loads. Phosphorus loads can subsequently be used to calculate **phosphorus exports**, based on the area of the watershed.

Phosphorus load is the total amount of phosphorus flowing past a sample site over a given period of time, expressed as tonnes per year.

Phosphorus export is the amount of phosphorus exported by each hectare of land in a year, expressed as kg/ha/y.

LWCBMN in action – 2019

In 2019, in its fourth season, LWCBMN expanded to cover more drainage areas across the province, expanding into the Winnipeg River system and the Souris River system. Over 2,000 samples were collected from 161 sites.

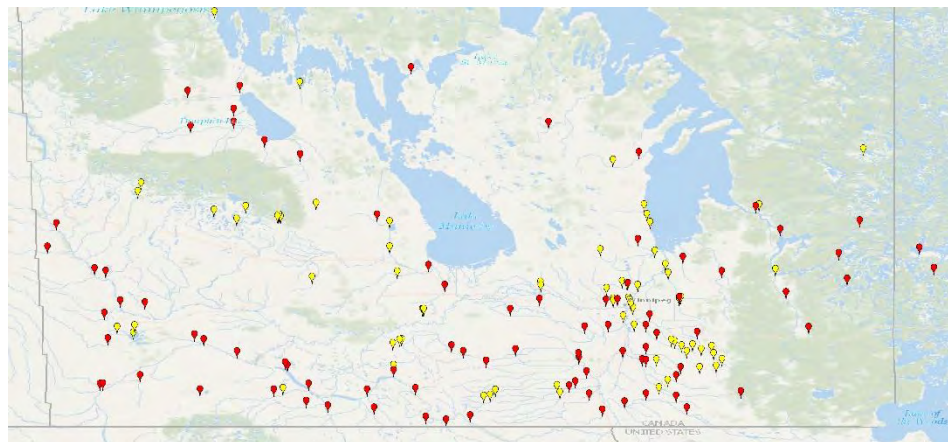


Figure 1. 2019 sampling sites. Sites in red are located at Water Survey of Canada's flow-metered stations. Sites in yellow are located at sampling sites where flow is not measured.

2019 RESULTS: OVERVIEW

Table 1. Overview of findings from 2019 LWCBMN phosphorus monitoring data.

REGION	# years of LWCBMN data	# sampling sites in 2019	# samples collected in 2019	Highest phosphorus export in region (2018)	Highest phosphorus export in region (2019)	Regional lead
East Interlake Watershed District	3	8	112	Icelandic River and Grassmere Creek (0.03 kg/ha/y)	Grassmere Creek Drain near Middlechurch (0.14 kg/ha/y)	Armand Belanger (EIWD)
Seine Rat Roseau Watershed District	4	21	395	Main Drain near Dominion City (0.22 kg/ha/y)	Joubert Creek near St. Pierre-Jolys (2.29 kg/h/y)	Jodi Goerzen and Chris Randall (SRRWD)
Redboine Watershed District	4	14	226	Roseisle Creek near Roseisle (0.12 kg/ha/y)	La Salle River at Elie (0.44 kg/ha/y)	Justin Reid (RWD)
Assiniboine West Watershed District	3	7	148	Bailey's Creek near Oak Lake (0.08 kg/ha/y)	Scissor Creek near McAuley (0.08 kg/ha/y)	Ryan Canart (AWWD)
Pembina Valley Watershed District	3	16	259	Pembina River near Lorne Lake (0.21 kg/ha/y)	Kronsgart Drain near Sewell (1.36 kg/ha/y)	Cliff Greenfield (PWW) and Jason Vanrobaeys (AAFC)
Souris River Watershed District	2	11	117	Pipestone Creek (0.01 kg/ha/y)	Elgin Creek near Souris (0.44 kg/ha/y)	Dean Brooker and Yasemin Keeler (SRWD)
City of Winnipeg	2	7	142	Omand's Creek (0.03 kg/ha/y)	Sturgeon Creek at St. James Bridge (0.27 kg/ha/y)	LWF
Northeast Red Watershed District	2	7	86	Cooks Creek/Cooks Creek Diversion (0.01 kg/ha/y)	Cooks Creek and Cooks Creek Diversion (0.54 kg/ha/y)	Colin Gluting (NRWD)
Whitemud Watershed District	2	7	55	-	Rat Creek near Macdonald (0.02 kg/ha/y)	Chris Reynolds (WWD)
Intermountain Watershed District	1	7	119	-	Vermillion River near Dauphin (0.07 kg/ha/y)	Jeff Theile and Jody Tucker (IWD)
Winnipeg River System	2	9	205	-	Pine Falls Generating Station (0.85 kg/ha/y)	Manitoba Hydro, Ontario Power Generation
West Interlake Watershed District	1	1	20	-	Fairford River near Fairford (0.00 kg/ha/y, only site)	LWF

The 2019 field season was very different than previous years, with the majority of phosphorus loading occurring during the fall rather than the spring. Fall storms and flooding on the eastern side of the Red River valley resulted in a phosphorus export greater than 2 kg/ha/y at the lower Joubert Creek: one of the greatest phosphorus exports ever reported from rural sub watersheds in Manitoba. These unprecedented wet fall conditions in 2019 highlight changing weather patterns on Manitoba's prairies: short-lived but intense precipitation events are expected to become more frequent and intense with climate change (Prairie Climate Centre, 2017). Data collected by LWCBMN in 2019 improves our understanding of how these changes may affect phosphorus loading in the Lake Winnipeg watershed.

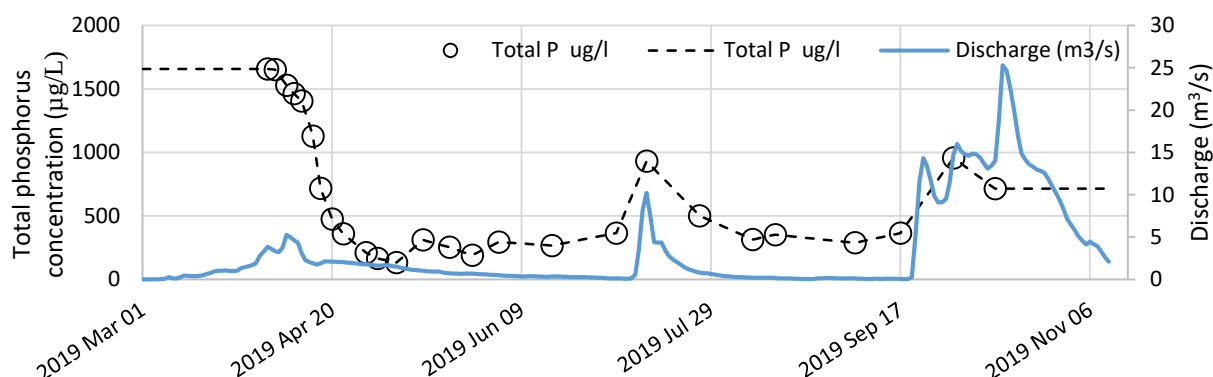


Figure 2. Water discharge and phosphorus concentration for the lower Joubert Creek near St-Pierre-Jolys. In 2019, 70 per cent of the phosphorus load and 73 per cent of the water load occurred during the fall (Sept. 22 to Nov. 11). The high flows in fall 2019 resulted in a phosphorus export of 2.29 kg/ha/y for this sampling site.

NORTHEAST RED CONSERVATION DISTRICT

The Northeast Red Watershed District (NRWD) is located east of Winnipeg and expands all the way to the southeastern shores of Lake Winnipeg. Previously, NRWD consisted of two major sub-watersheds; Cooks Creek watershed and Carr's Creek watershed. In 2020, the watershed district expanded to include the Brokenhead River watershed. The primary land use in NRWD is cropland (Cooks-Devil's Creek Integrated Watershed Management Plan, 2016). In addition to agricultural activities, wastewater treatment plants and lagoons in municipalities throughout NRWD contribute phosphorus to local waterways. Major municipalities include Oakbank and Ste. Anne.

In partnership with LWCBMN, volunteers sampled seven sites in the NRWD region, of which four were located at flow meters. For sampling sites where flow is not measured, useful information can be drawn from the phosphorus concentrations; however, we cannot calculate the phosphorus load because we cannot multiply the phosphorus concentration by the volume of water flowing by the sampling site.

In 2019, volunteers collected samples frequently at all sites, specifically during the spring runoff period, resulting in high-quality data. For the flow-metered sites, most of the water load and phosphorus contribution occurred during the spring, from March 1 to May 31.



Figure 3. Manitoba's Watershed Districts, highlighting Northeast Red Watershed District.

Table 2. Overview of findings from 2019 Northeast Red Watershed District sampling sites.

Sampling site	Phosphorus load (tonnes/y)	Phosphorus export (kg/ha/y)
A. Brokenhead River near Beausejour	9	0.06
B. Cooks Creek and Cooks Creek Diversion	15	0.54
C. Devil's Creek near Libau	4	0.16

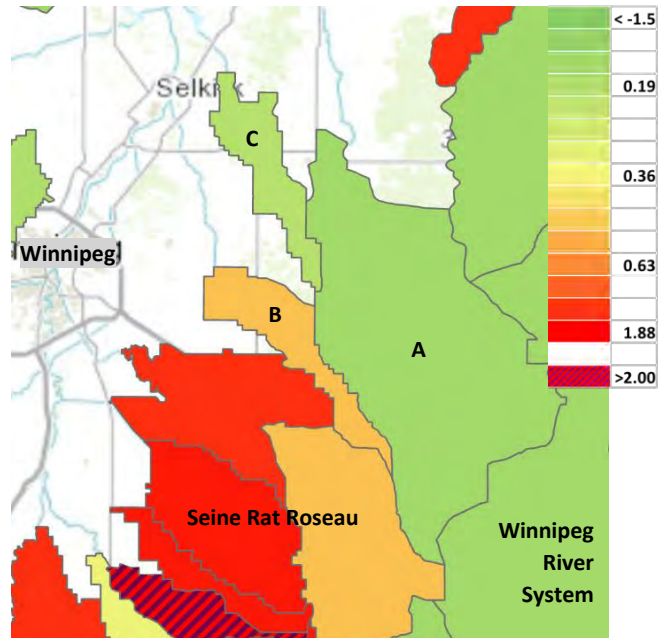


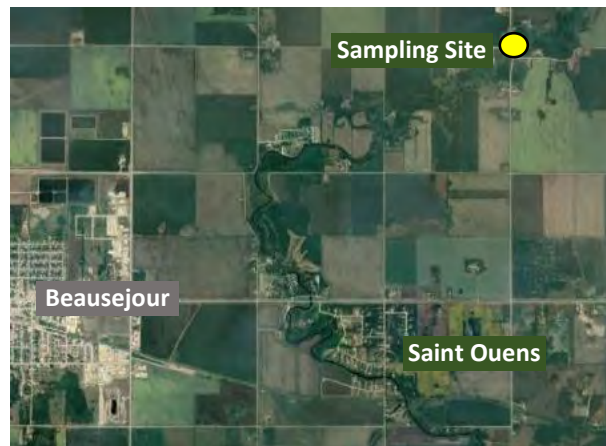
Figure 4. Phosphorus exports (kg /ha/y) for sub-watersheds in the Northeast Red Watershed District.

2019 RESULTS BY SAMPLING SITE

Brokenhead River near Beausejour

The Brokenhead River originates in Brokenhead Swamp which lies within Sandilands Provincial Forest. The river terminates in the south basin of Lake Winnipeg. The river has a total drainage area of 1,580 km², which is primarily agricultural and forested land.

This sampling site is located at Water Survey of Canada flow meter 05SA002, northeast of Beausejour, Man. In 2019, 23 samples were collected between April 2 and Oct. 14.



	2018	2019
Discharge peaked:	July 6	Oct. 15
Greatest phosphorus concentration:	160 µg/L (May 8)	420 µg/L* (April 2)
Total phosphorus load:	2 tonnes	9 tonnes
Total water load:	0.033 km ³	0.143 km ³
Phosphorus export:	0.01 kg/ha/y	0.06 kg/ha/y
Per cent water load in spring:**	16%	19%
Per cent phosphorus load in spring:	33%	26%

*The "µg" symbol is used to express micrograms

** Spring is considered to be March 1 to May 31

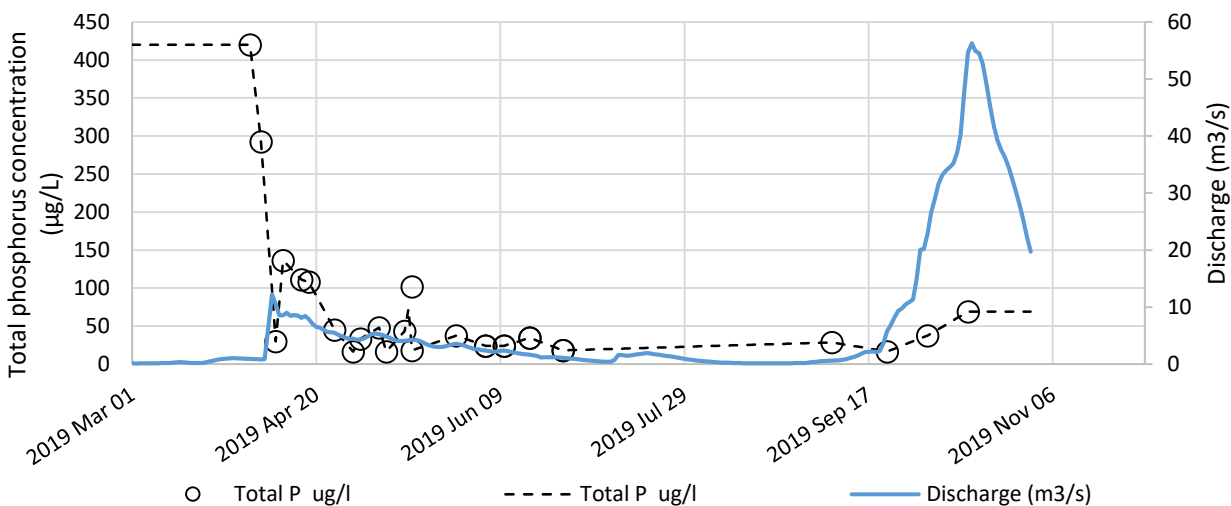


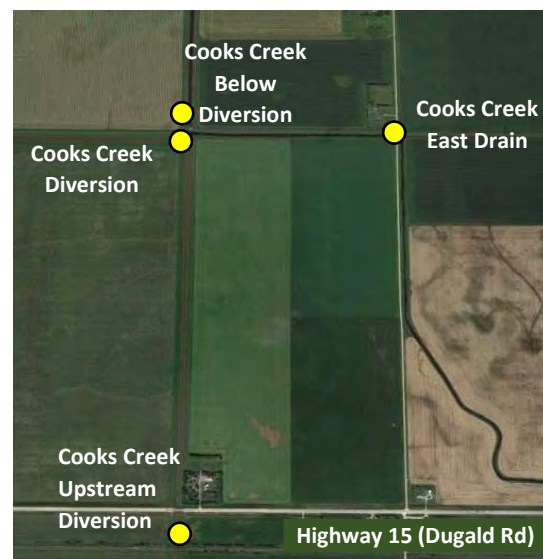
Figure 5. Discharge and total phosphorus concentration over the 2019 sampling season at Brokenhead River (Water Survey of Canada Station 05SA002).

Cooks Creek sampling sites

Cooks Creek Diversion Inlet and Cooks Creek below Diversion

Together, the Cooks Creek Diversion Inlet and Cooks Creek below Diversion sampling site drain a largely agricultural area of 278 km². Water flowing from Cooks Creek is diverted into the Cooks Creek Diversion when water levels and flows are high. Both sites share a drainage area, therefore phosphorus and water loads are added together to accurately calculate the phosphorus export.

In 2019, five samples were collected from Cooks Creek Diversion Inlet and 10 samples were collected from Cooks Creek below Diversion between April 11 and Sept. 25.



	2018	2019
Total phosphorus load:	0.33 tonnes	15 tonnes
Total water load:	0.004 km ³	0.036 km ³
Phosphorus export:	0.01 kg/ha/y	0.54 kg/ha/y

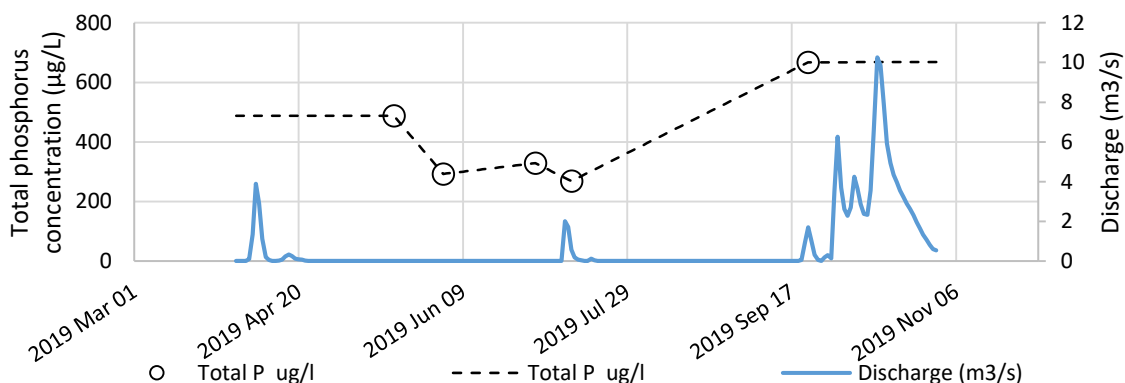


Figure 6. Discharge and total phosphorus concentration over the 2019 sampling season at Cooks Creek Diversion Inlet (Water Survey of Canada Station 050J020).

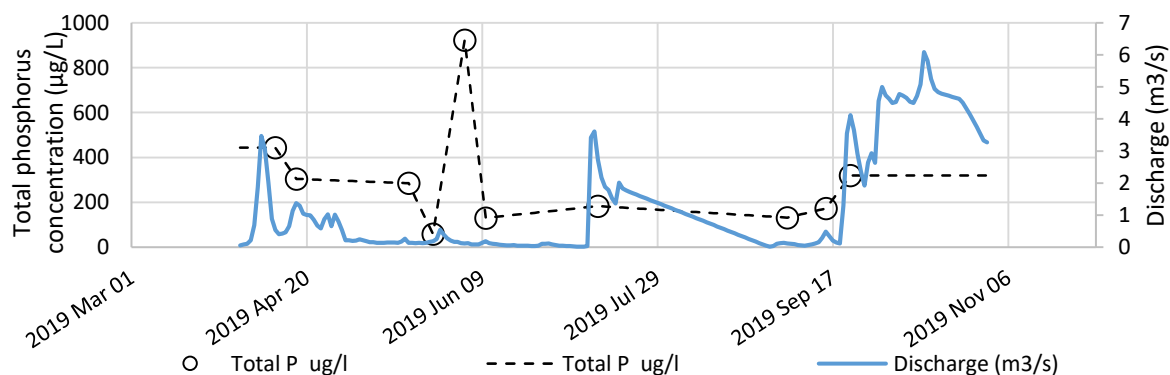


Figure 7. Discharge and total phosphorus concentration over the 2019 sampling season at Cooks Creek below Diversion (Water Survey of Canada Station 050J019).

Cooks Creek Downstream

This sampling site is located near East Selkirk, Man. The area that drains into this sampling site is both residential and agricultural.



In 2019, 15 samples were collected between April 12 and Oct. 16. We cannot calculate phosphorus loads and exports because flow is not measured at this sampling site.

- **2018 greatest phosphorus concentration:** 319 $\mu\text{g/L}$ measured on April 4
- **2019 greatest phosphorus concentration:** 582 $\mu\text{g/L}$ measured on April 12

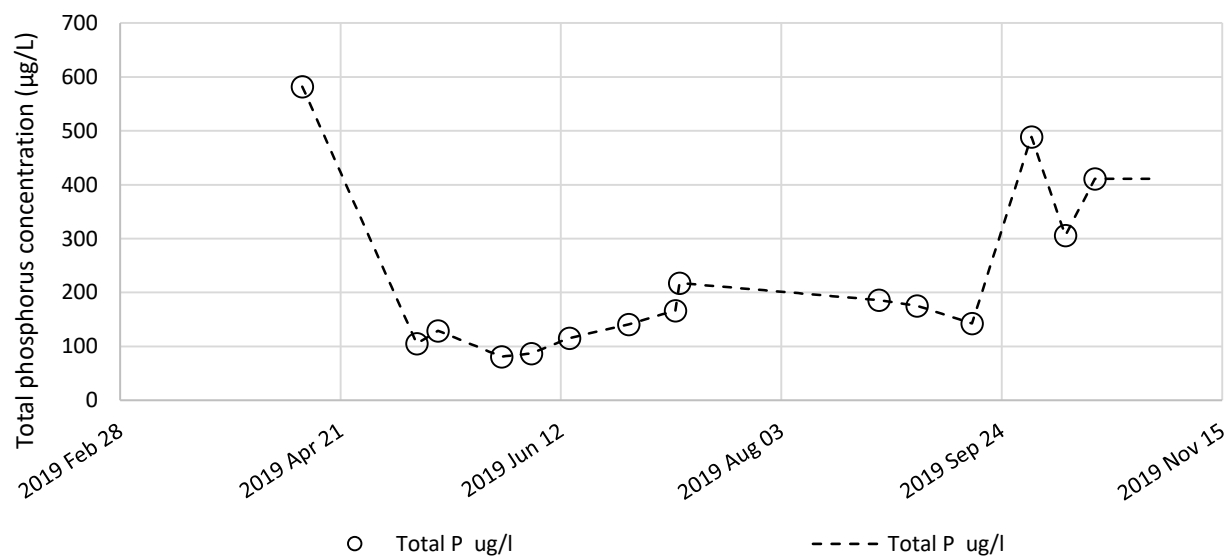
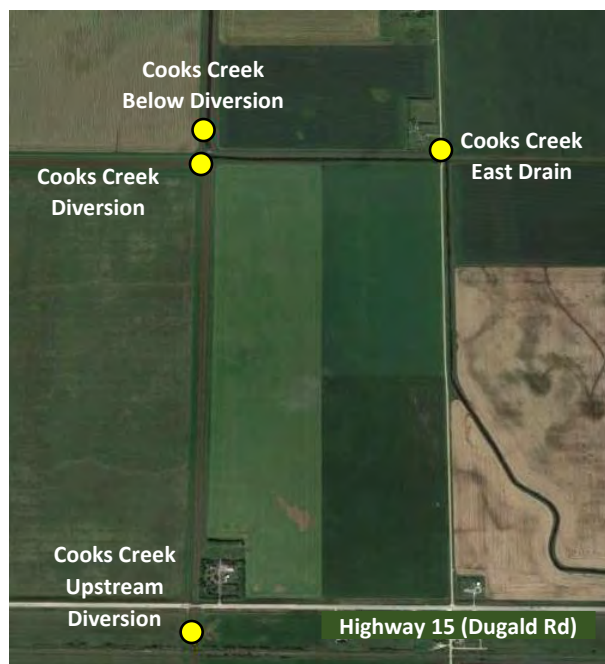


Figure 8. Total phosphorus concentration over the 2019 sampling season at the Cooks Creek Downstream.

Cooks Creek East Drain

This sampling site is located on a drain that enters Cooks Creek from the east, upstream from where the Cooks Creek Diversion begins. The area that drains into this sampling site is agricultural.

Based on the data currently available, it is not possible to determine the contributions from the East Drain or the Cooks Creek Upstream Diversion sites. Because flow is not measured, we cannot calculate phosphorus loads and exports. In 2019, LWCBMN installed water level meters at the East Drain and upstream Diversion site, the first step towards enabling us to calculate phosphorus loads and exports. In 2020, LWCBMN will begin collecting flow data at these sites to establish a discharge curve based on the relationship of flow and water level. Once the curve is established, we can use water level data to retroactively calculate the flow at these sites for 2019.



In 2019, 10 samples were collected between April 11 and Sept. 22. Water level meters were installed on July 19 and removed on Nov. 6.

- **2018 greatest phosphorus concentration:** 271 $\mu\text{g/L}$ measured on April 19
- **2019 greatest phosphorus concentration:** 1,086 $\mu\text{g/L}$ measured on June 4

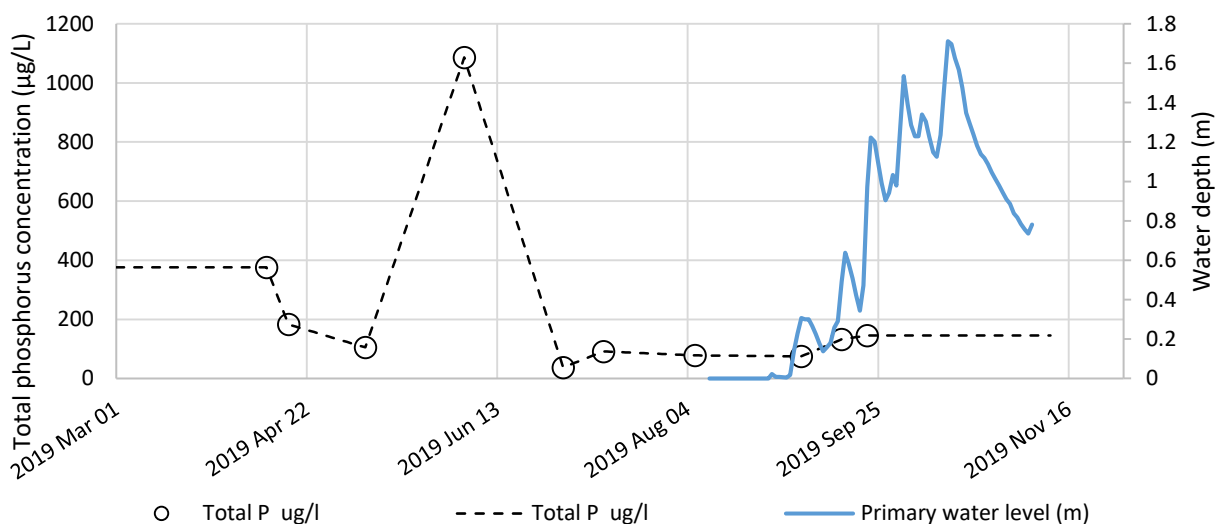


Figure 9. Total phosphorus concentration and water depth over the 2019 sampling season at Cooks Creek East Drain.

Cooks Creek Upstream Diversion

This sampling site is located on Cooks Creek upstream of where the Cooks Creek Diversion begins. The area that drains into this sampling site is agricultural.

In 2019, 10 samples were collected between April 11 and Sept. 23. Water level meters were installed on July 19 and removed on Nov. 6.

- **2018 greatest phosphorus concentration:**
271 $\mu\text{g/L}$ measured on April 19
- **2019 greatest phosphorus concentration:**
618 $\mu\text{g/L}$ measured on June 4

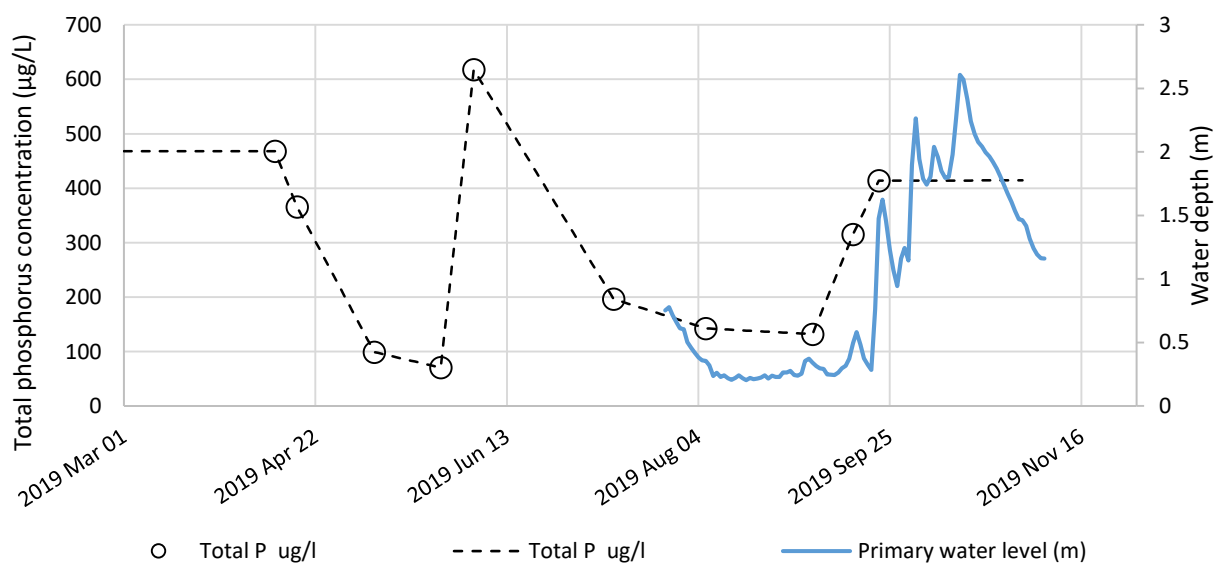
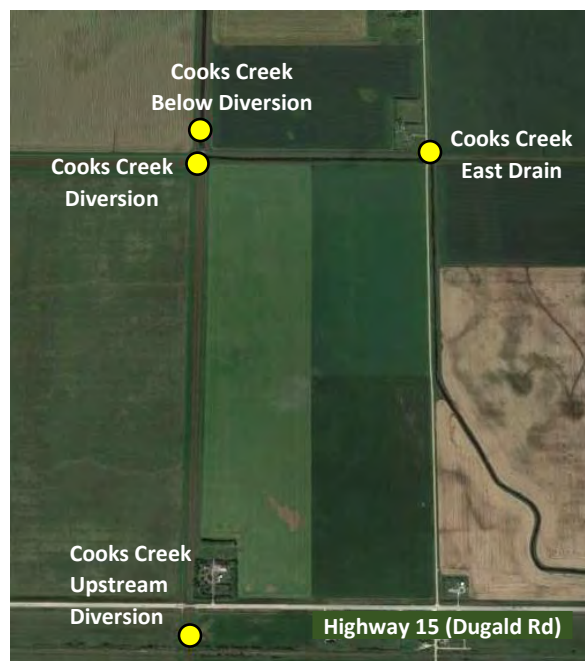


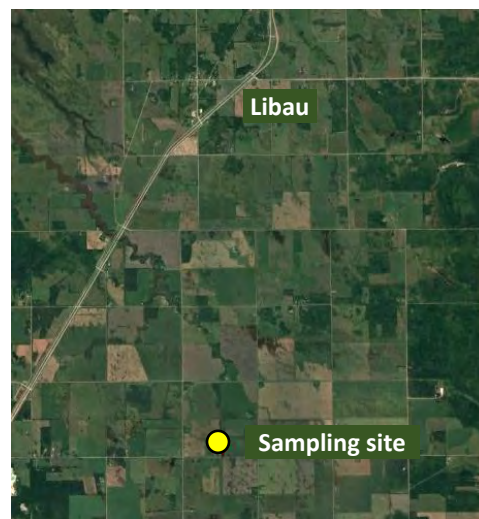
Figure 10. Total phosphorus concentration and water depth over the 2019 sampling season at Cooks Creek Upstream Diversion.

Devil's Creek Sample Sites

Devil's Creek near Libau

Devil's Creek flows northwest and drains into the Red River north of Winnipeg. The Red River then flows through the Netley-Libau Marsh before entering Lake Winnipeg (Cooks-Devil's Creek Integrated Water Management Plan, 2016). Devils Creek has a drainage area of 240 km², which consists primarily of agricultural land and wetlands.

This sampling site is located at Water Survey of Canada flow meter 05OJ016, near Libau, Man. In 2019, 13 samples were collected between April 3 and Oct. 2.



	2019
Discharge peaked:	April 7
Greatest phosphorus concentration:	548 µg/L (April 3)
Total phosphorus load:	4 tonnes
Total water load:	0.013 km ³
Phosphorus export:	0.16 kg/ha/y
Per cent water load in spring:	48%
Per cent phosphorus load in spring:	62%

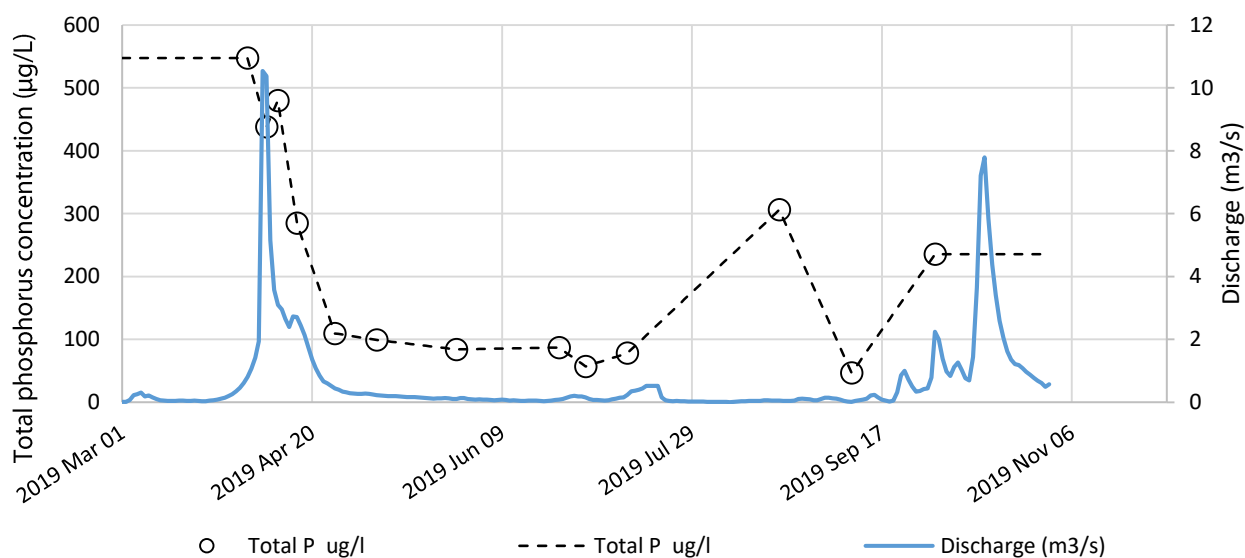


Figure 11. Discharge and total phosphorus concentration over the 2019 sampling season at Devil's Creek near Libau (Water Survey of Canada Station 05OJ016)

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Foundation

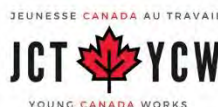
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Red River



LWCBMN is a collaborative initiative delivered in partnership with Manitoba's watershed districts, LWF's science advisors and volunteer citizen scientists.

MONITORING OUR WATERWAYS

To reduce phosphorus loading, we need to know how, when and from where phosphorus is reaching Lake Winnipeg. The Lake Winnipeg Community-Based Monitoring Network (LWCBMN) is a long-term phosphorus monitoring program that engages citizen volunteers to collect water samples across Manitoba using scientific protocols. Because citizen scientists live, work or commute near their sampling sites, they can sample frequently in response to weather events and water conditions, generating critical data to inform research and policy.



The Lake Winnipeg Foundation (LWF) advocates for change and coordinates action to improve the health of Lake Winnipeg. LWF's flagship initiative, the Lake Winnipeg Health Plan, is a set of eight evidence-based actions to reduce phosphorus loading. By addressing the root causes of potentially harmful algae blooms, the plan provides a blueprint for cost-effective decision-making and long-term, adaptive freshwater management.