LAKE WINNIPEG COMMUNITY-BASED MONITORING NETWORK

City of Winnipeg

2018 Regional Report

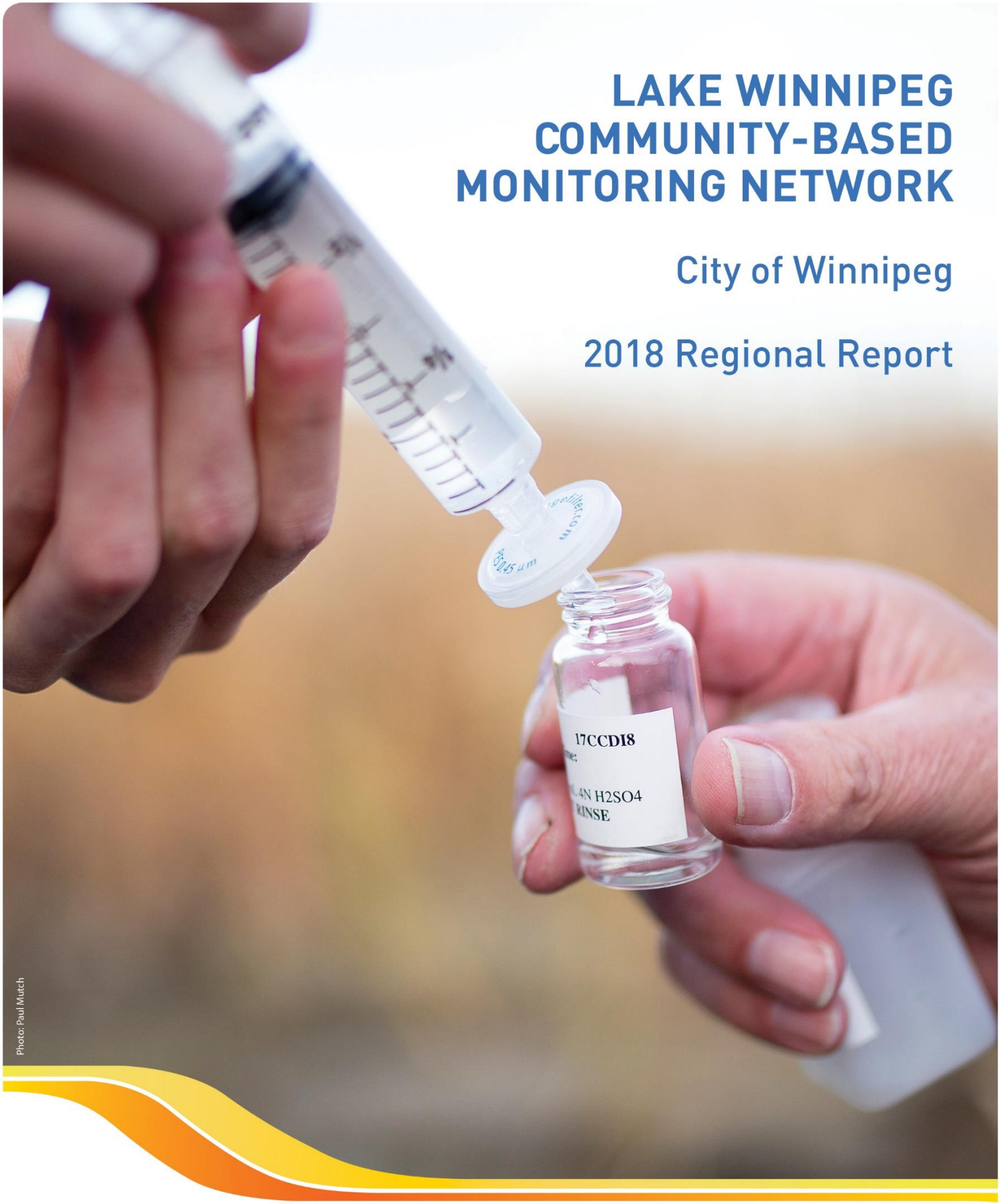

Photo: Paul Mutch

LWF LAKE WINNIPEG FOUNDATION

LAKE WINNIPEG COMMUNITY-BASED MONITORING NETWORK: OVERVIEW

Lake Winnipeg, the world's 10th largest freshwater lake, receives its water from a vast watershed – an area of land 40 times larger than the lake itself which includes many smaller sub-watersheds. All human activities across this huge watershed have the potential to impact our water quality. However, the closer you are to Lake Winnipeg, the bigger your impact will likely be.

Phosphorus is the nutrient responsible for the potentially harmful blue-green algae blooms on Lake Winnipeg and on other lakes within the watershed. Different sub-watersheds contribute different proportions of Lake Winnipeg's total phosphorus load. With the help of a strong network of local organizations and citizen scientists, the Lake Winnipeg Community-Based Monitoring Network (LWCBMN) is identifying phosphorus hotspots on the landscape, creating opportunities to target funding and action to achieve the greatest return on investment.

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 community-based monitoring (CBM) 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 mobilize partners and citizen scientists across the watershed to ensure frequent sampling during peak flows. Sampling at these stations provides corresponding flow data, allowing CBM 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.

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

The network in action – 2018

In 2018, in its third field season, LWCBMN grew to cover more drainage areas across the province, collecting samples at new sites in the western Red River valley, along Winnipeg River tributaries and in the City of Winnipeg. A total of 1000 samples were collected from 101 sites.

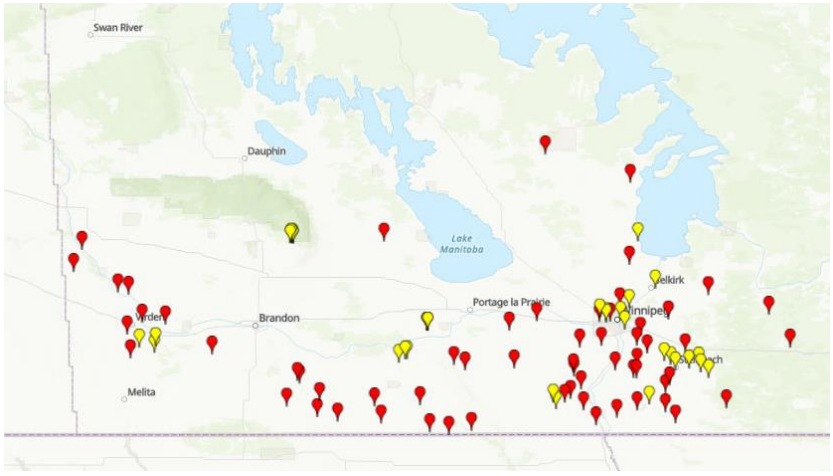

Figure 1. 2018 sample sites. Sites in red are located at Water Survey of Canada flow-metered stations. Sites in yellow are monitored by volunteer samplers where flow is not measured.

2018 RESULTS: OVERVIEW

Table 1. Overview of findings from 2018 LWCBMN phosphorus monitoring data.

REGION	# years of LWCBMN data	# sites in 2018	# samples collected in 2018	Highest phosphorus export in region (2017)	Highest phosphorus export in region (2018)	Regional lead
East Interlake Conservation District	2	4	74	0.33 kg/ha/y (Icelandic River)	0.03 kg/ha/y (Icelandic River and Grassmere Creek)	Armand Belanger (EICD)
Seine Rat River Conservation District	3	20	204	1.64 kg/ha/y (Manning Canal)	0.22 kg/ha/y (Main Drain near Dominion City)	Jodi Goerzen and Chris Randall (SRRCD)
La Salle Redboine Conservation District	3	12	139	0.76 kg/ha/y (La Salle River at Sanford)	0.12 kg/ha/y (Roseisle Creek near Roseisle)	Justin Reid (LSRBCD)
Upper Assiniboine River Conservation District	2	6	102	0.62 kg/ha/y (Arrow River)	0.08 kg/ha/y (Bailey's Creek near Oak Lake)	Ryan Canart (UARCD)
Pembina Valley Conservation District	2	12	102	1.88 kg/ha/y* (Pembina River near Windygates)	0.21 kg/ha/y (Pembina River near Lorne Lake)	Cliff Greenfield (PVCD) and Jason Vanrobaeys (AAFC)
West Souris River Conservation District	1	5	97	-	0.01 kg/ha/y (Pipestone Creek near Pipestone)	Dean Brooker and Scott Hainsworth (WSRCD)
City of Winnipeg	1	6	68	-	0.03 kg/ha/y (Omand's Creek near Empress Street)	Lake Winnipeg Foundation
Western Tributaries of Red River	1	5	27	-	0.11 kg/ha/y (Buffalo Creek near Rosenfeld)	Lake Winnipeg Foundation
Little Saskatchewan River Conservation District	1	6	47	-	No flow metered stations	Colleen Cuvelier (LSRCD)
Cooks Creek Conservation District	2	4	34	-	0.01 kg/ha/y (Cooks Creek below Diversion and at Diversion)	Lake Winnipeg Foundation

In the 2018 field season, southern Manitoba was very dry with low discharge at all sampling sites, resulting in low phosphorus exports and low spatial variation between sub-watersheds. The dry conditions in 2018 highlight the important relationship between water discharge and phosphorus load entering Lake Winnipeg: high water years are high phosphorus loading years and low water years are low phosphorus loading years. For example, the Manning Canal was a phosphorus hotspot in 2016 and 2017 with phosphorus exports of 1.10 kg/ha/y and 1.62 kg/ha/y respectively. In contrast, the Manning Canal had a phosphorus export of 0.07 kg/ha/y in 2018. Though peak phosphorus concentrations were similar in all three years, the water load was ten times lower in 2018 (Figure 2). **Results from the 2018 field season demonstrate that we can reduce the phosphorus entering our lakes by reducing water runoff across the watershed.**

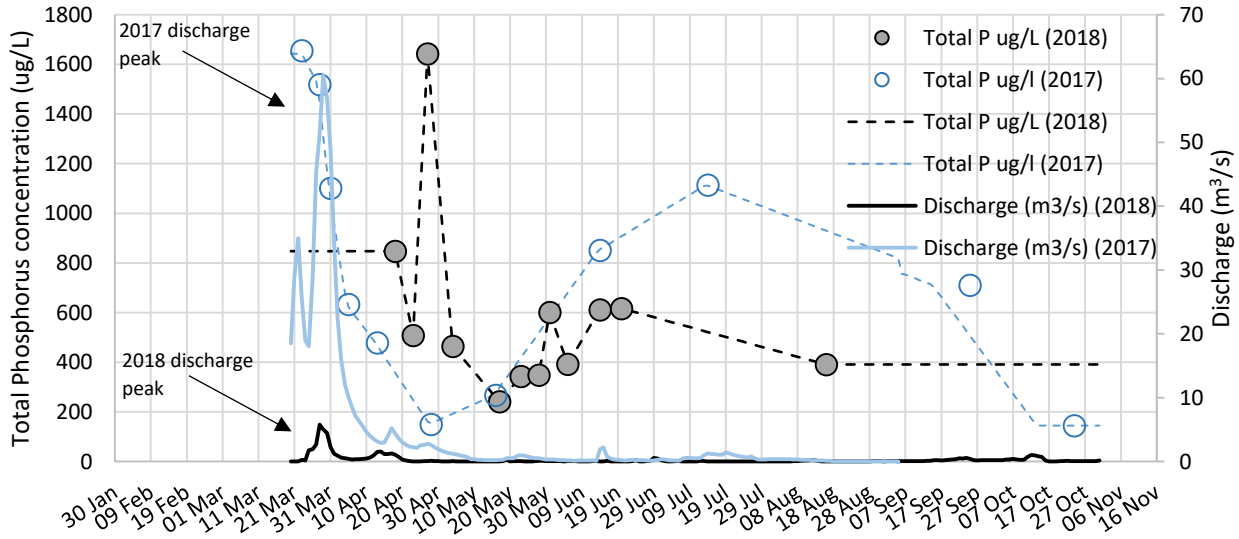

Figure 2. Comparison of phosphorus concentration and discharge in 2017 (blue) and 2018 (black) at the Manning Canal site.

CITY OF WINNIPEG

The City of Winnipeg is located south of Lake Winnipeg where the Assiniboine River flows into the Red River. The primary land use in Winnipeg is residential and industrial (Government of Manitoba, Land Use and Development). Major phosphorus contributors in the City of Winnipeg include wastewater treatment plants, which are estimated to be approximately 5% of the total phosphorus load to Lake Winnipeg (State of Lake Winnipeg Report, 2011), and urban runoff from impervious surfaces such as parking lots and roads.

In partnership with LWCBMN, volunteers sampled six sites in the City of Winnipeg, of which two were located at flow meters. For 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 concentration by the volume of water flowing by the site.

City of Winnipeg volunteers collected samples frequently at all sites, specifically during the spring runoff period, resulting in high-quality data that captured all discharge peaks. For both flow-metered sample sites, most of the water (70%) and phosphorus (81%) contribution occurred during the spring, from March 1st to May 31st.

Table 2. Overview of findings from 2018 City of Winnipeg sample sites.

Sampling station	Phosphorus load (tonnes/y)	Phosphorus export (kg/ha/y)
A. Sturgeon Creek at St. James Bridge	0.8	0.02
B. Omands Creek near Empress Street	0.2	0.03

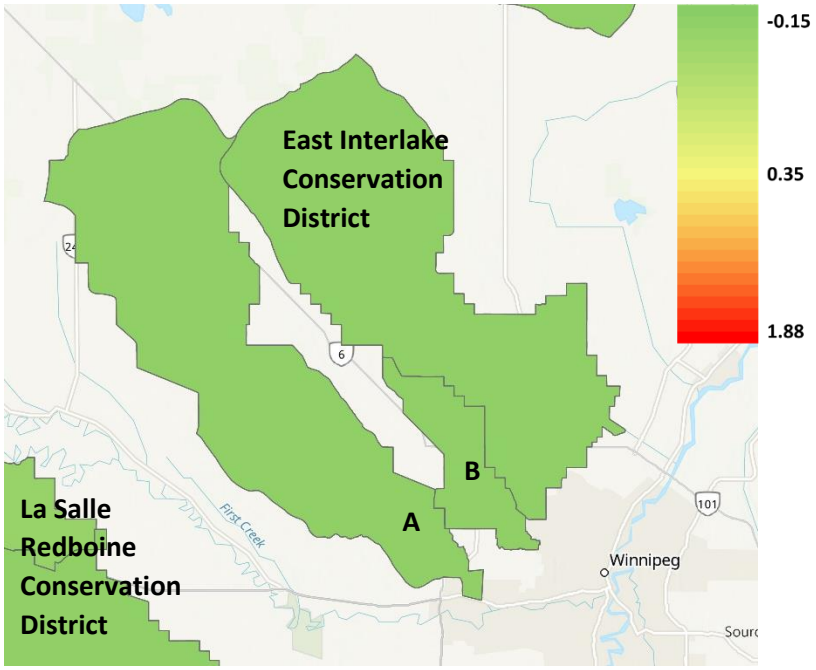

Figure 3. Phosphorus export (kg /ha/y) map for sub-watersheds in the City of Winnipeg.

2018 RESULTS BY SAMPLE SITE

Sturgeon Creek sample sites

Sturgeon Creek at St. James Bridge

This site is located along Sturgeon Creek within Winnipeg. The area that drains into this sample site is 556 km^2 and drains mainly crop land with a portion of residential land in Winnipeg.

This sample site is located at Water Survey of Canada flow meter 05MJ004, at Sturgeon Road. In 2018, 11 samples were collected between April 24th and October 31st.

	2018
Discharge peaked:	April 24th
Greatest phosphorus concentration:	414 µg/L* (April 24th)
Total phosphorus load:	1.1 tonnes
Total water load:	0.004 km^3
Phosphorus export:	0.02 kg/ha/y
Percent water load in spring:**	66%
Percent phosphorus load in spring:	81%

*The "µg" symbol is used to express micrograms

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

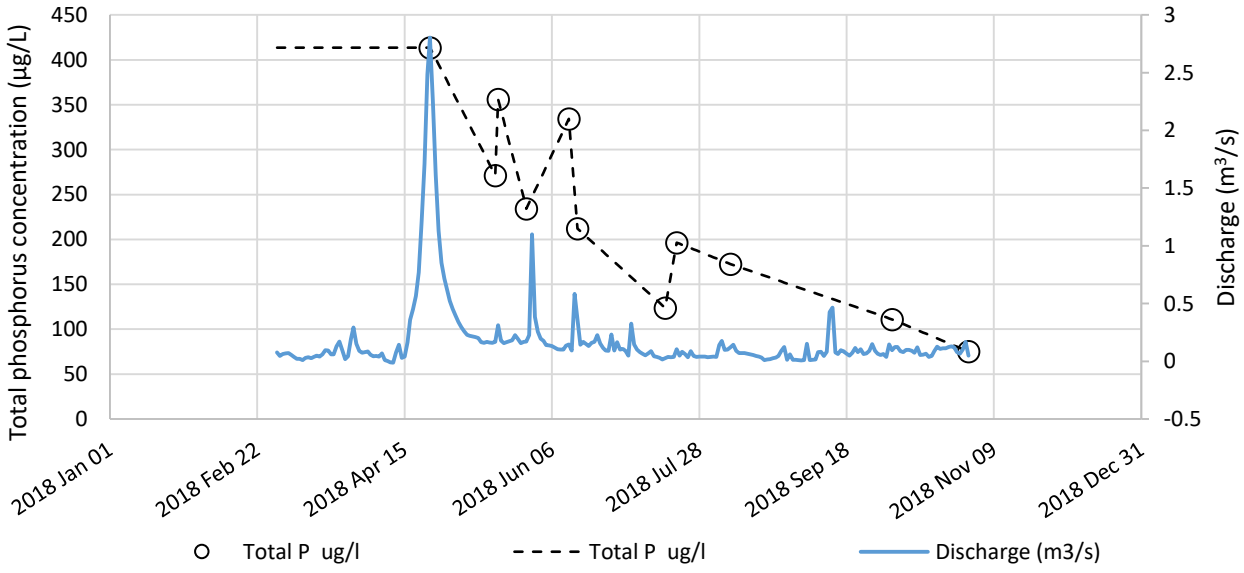

Figure 4. Discharge and total phosphorus concentration over the 2018 sampling season at Sturgeon Creek at Sturgeon Road (Water Survey of Canada Station 05MJ004).

Omands Creek sample sites

Omands Creek near Empress Street

This site is located in Minto, Winnipeg. The area that drains past this sample site is 80 km^2 and drains mainly urban industrial area including CF Polo Park shopping center and the Winnipeg James Armstrong Richardson International Airport.

This sample site is located near Water Survey of Canada flow meter 05MJ013, which is along Empress Street. In 2018, 9 samples were collected between May 19th and September 29th.

	2018
Discharge peaked:	April 5th
Greatest phosphorus concentration:	305 µg/L (July 14th)
Total phosphorus load:	0.2 tonnes
Total water load:	0.001 km^3
Phosphorus export:	0.03 kg/ha/y
Percent water load in spring:	73%
Percent phosphorus load in spring:	81%

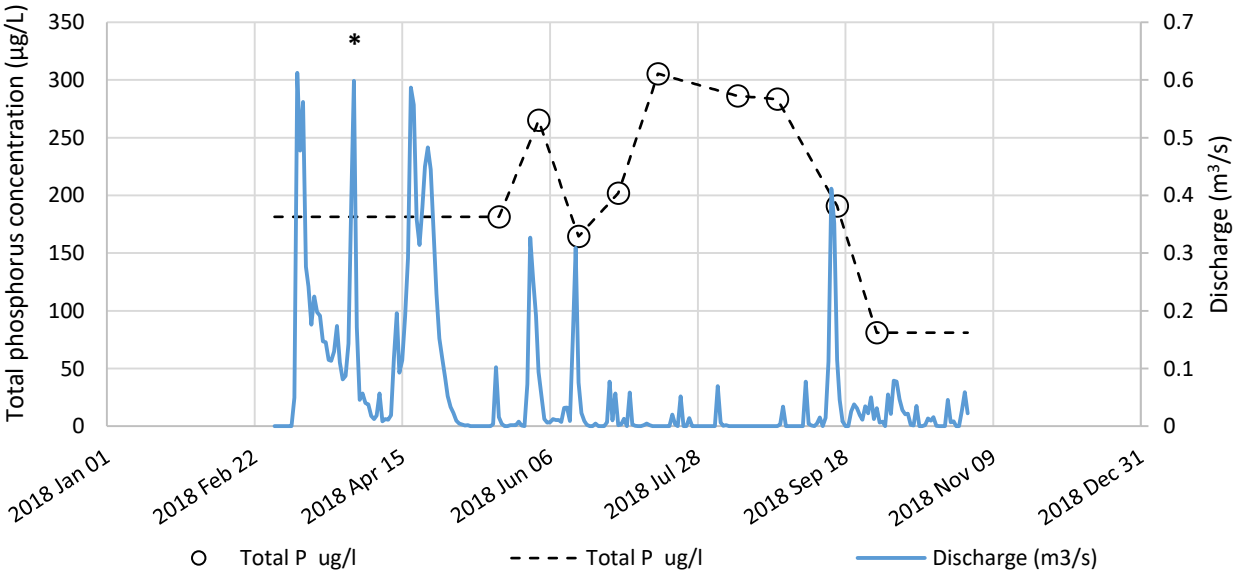

Figure 5. Discharge and total phosphorus concentration over the 2018 sampling season at Omands Creek near Empress Street (Water Survey of Canada Station 05MJ013).

***In 2018 Omands Creek discharge peaked prior to when the volunteer began sampling. This may have resulted in a portion of the phosphorus load being missed.**

Bruce Creek sample sites

There are three sample sites located along Bruce Creek in western Winnipeg. Samples were taken at upstream, midstream and downstream sites near the Perimeter Highway, Winnipeg Airport and Bruce Park, respectively. The Bruce Creek drainage area comprises mainly industrial and urban land with some cropland draining into the upstream site.

In 2018, 44 samples were collected between April 15th and September 23rd.

- **Upstream greatest phosphorus concentration:** 880 µg/L (April 15th)
- **Midstream greatest phosphorus concentration:** 316 µg/L (May 3rd)
- **Downstream greatest phosphorus concentration:** 355 µg/L (August 27th)

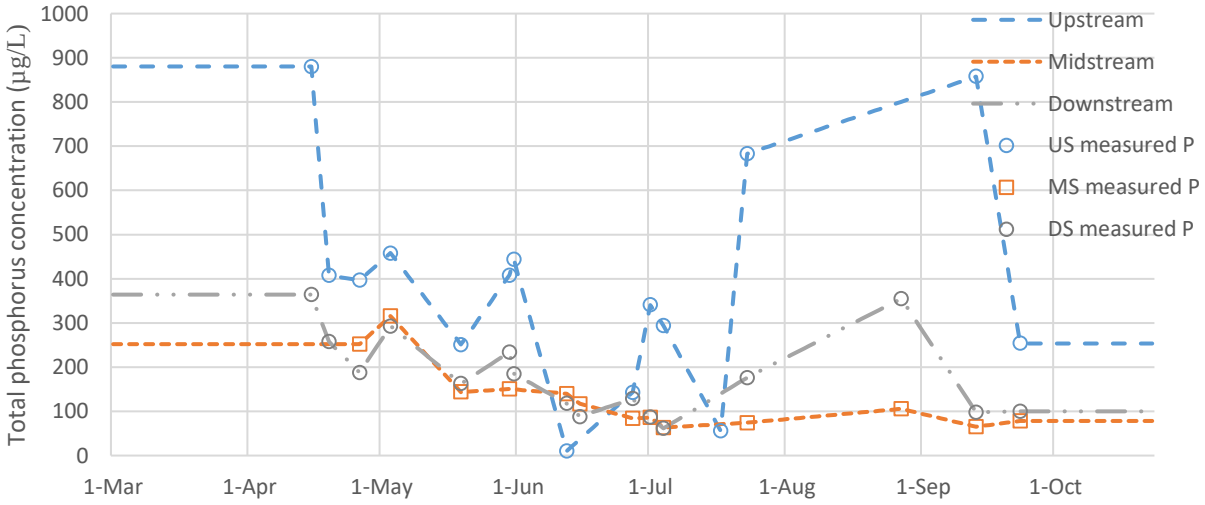

Figure 6. Total phosphorus concentration over the 2018 sampling season at the upstream, midstream, and downstream Bruce Creek sites.

Bottomley Creek sample site

Bottomley Creek near East St. Paul

This sample site is located near East St. Paul, Winnipeg. The area that drains into this site is a residential area along the Red River.

In 2018, 6 samples were collected between April 18th and September 12th.

- **2018 greatest phosphorus concentration**: 346 µg/L (April 18th)

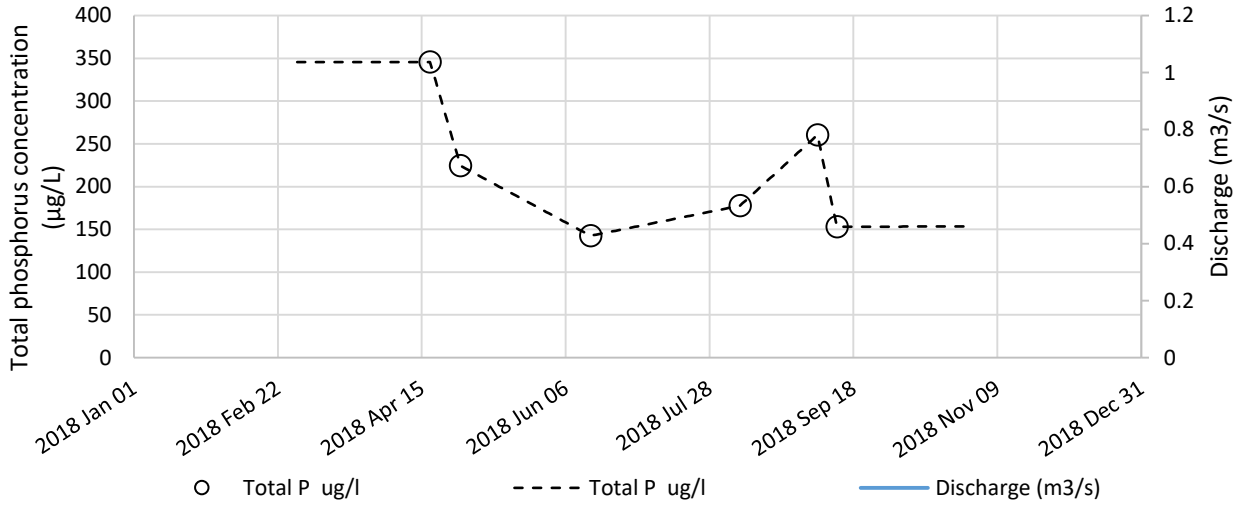

Figure 7. Total phosphorus concentration over the 2018 sampling season at Bottomley Creek near East St. Paul.

INTERESTED IN SAMPLING WITH LWCBMN?

LWCBMN provides hands-on opportunities for citizens to get involved in water sampling activities. We are looking for volunteers to sample at Water Survey of Canada stations in 2019. You can find a map of potential sites **here**.

If you are interested in sampling, please contact the LWCBMN program manager at **cbm@lakewinnipegfoundation.org**. Together, we can choose a sample site near where you live, work or commute and begin collecting valuable information to measure phosphorus loading to local waterways.

THANK YOU TO OUR 2018 FUNDERS

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Canada

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