

# LAKE WINNIPEG COMMUNITY-BASED MONITORING NETWORK

Upper Assiniboine River  
Conservation District

2018 Regional Report

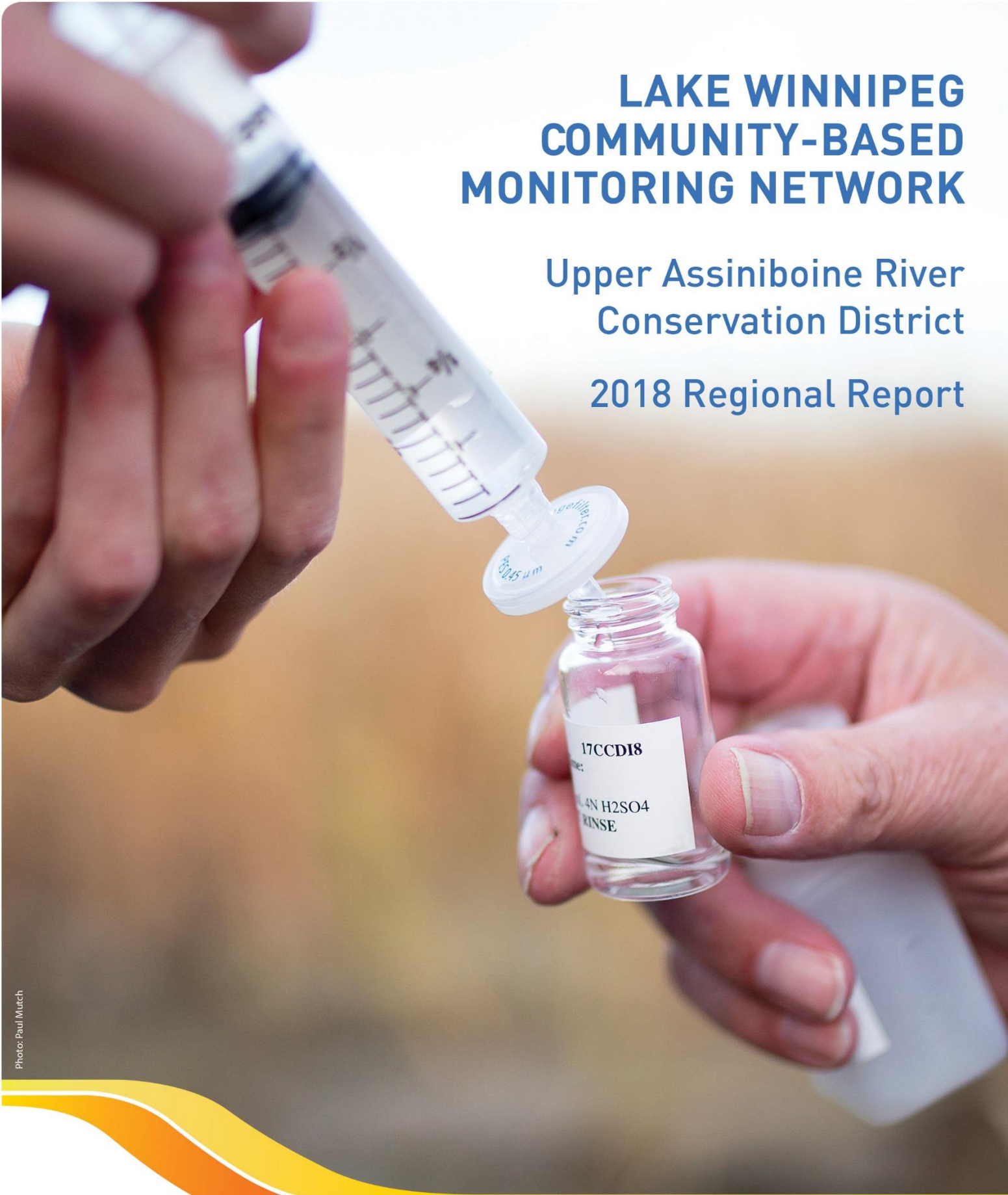


Photo: Paul Mutch



LAKE  
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## LAKE WINNIPEG COMMUNITY-BASED MONITORING NETWORK: OVERVIEW

Lake Winnipeg, the world's 10<sup>th</sup> 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 (SRRCDC)
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.

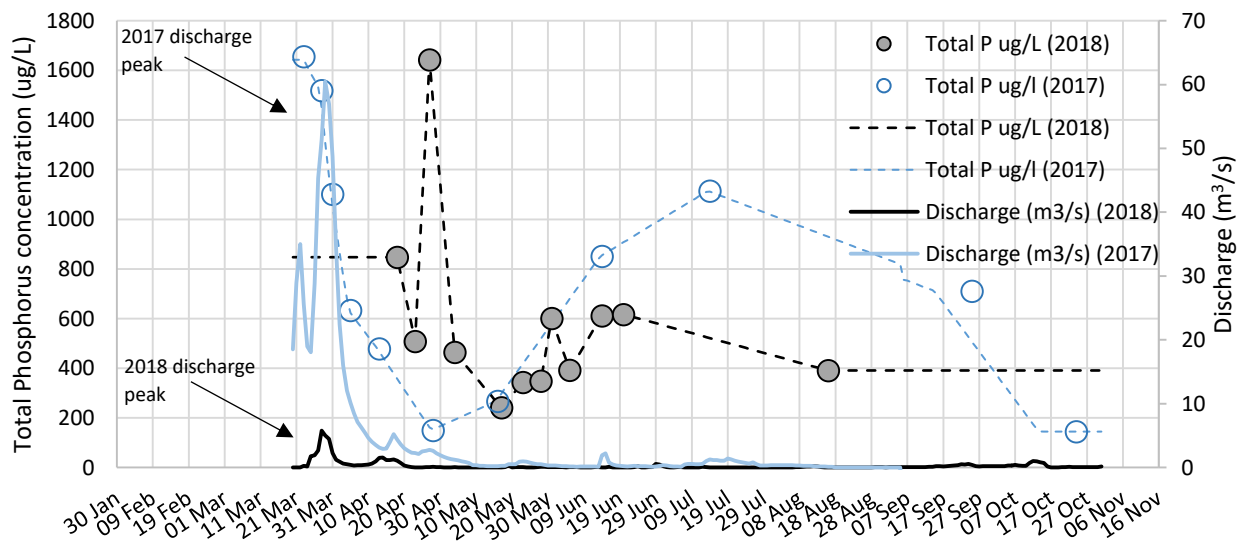


Figure 2. Comparison of phosphorus concentration and discharge in 2017 (blue) and 2018 (black) at the Manning Canal site.

## UPPER ASSINIBOINE RIVER CONSERVATION DISTRICT

The Upper Assiniboine River Conservation District (UARCD) is located in western Manitoba along the Manitoba-Saskatchewan border. The Assiniboine River is the main waterway in this region, with many tributaries flowing into it. The primary land-use in UARCD is agriculture, specifically annual cropland and forage grasslands (Assiniboine-Birdtail State of the Watershed Report, 2008). In addition to agricultural activities, wastewater treatment plants and lagoons in municipalities throughout UARCD contribute phosphorus to local waterways. Major municipalities include Virden, Russel and Miniota.

In partnership with LWCBMN, UARCD staff and volunteers sampled 7 sites in the UARCD region, of which 4 sites were at flow meters. For the sites where flow is not measured, useful information can be drawn from the phosphorus concentration; however, we cannot calculate the phosphorus load because we cannot multiply the concentration by the volume of water flowing by the site.

UARCD and volunteers collected samples frequently at all sites, specifically during the spring runoff period, resulting in high-quality data. For all sample sites, most of the water (78%) and phosphorus (86%) contribution occurred during the spring, from March 1<sup>st</sup> to May 31<sup>st</sup>.

Table 2. Overview of findings from 2018 UARCD sample sites.

Sampling station	Phosphorus load (tonnes/y)	Phosphorus export (kg/ha/y)
B. Scissor Creek near McAuley	1	0.03
C. Bailey's Creek near Oak Lake	1	0.08
D. Gopher Creek near Virden	1	0.04
Assiniboine River near Miniota (not pictured on map)	116	0.01

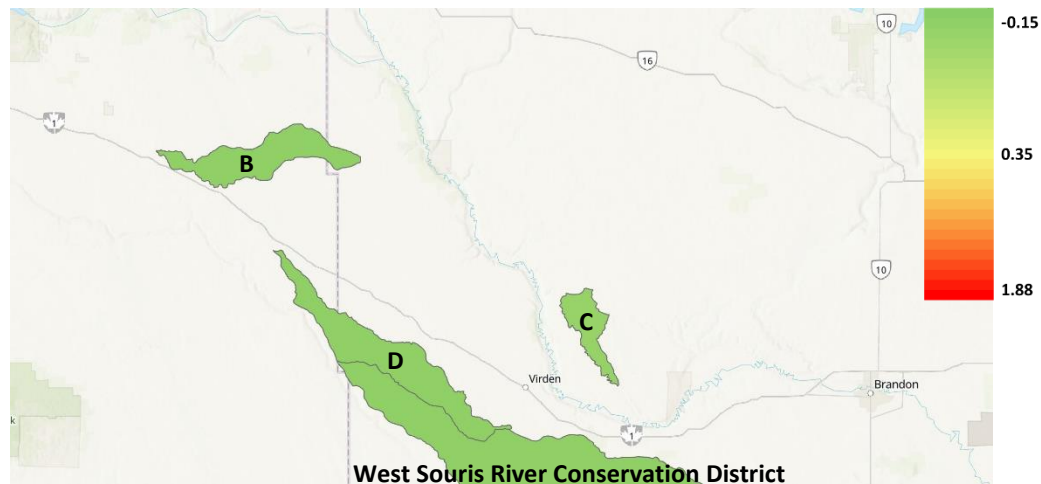


Figure 3. Phosphorus export (kg/ha/y) map for sub-watersheds in the Upper Assiniboine River Conservation District.

## 2018 RESULTS BY SAMPLE SITE

### Assiniboine River tributaries sites

#### Arrow River near Arrow River

Arrow River is part of the larger Arrow-Oak watershed. The Arrow River portion of the watershed flows southerly into the Assiniboine River. The drainage area for this sample site is approximately 606 km<sup>2</sup> and drains a largely agricultural area, with mainly annual cropland (Arrow-Oak State of the Watershed Report, 2008).



This sample site is located at Water Survey of Canada flow meter 05MG001, near Arrow River.

In 2018, only primary water level was measured at this site. Because of this, phosphorus load and export cannot be calculated. In 2018, 21 samples were collected between April 20<sup>th</sup> and September 7<sup>th</sup>.

	2017	2018
Discharge/water level peak:	April 6 <sup>th</sup>	April 20 <sup>th</sup> (water level)
Greatest phosphorus concentration:	955 µg/L* (April 5 <sup>th</sup> )	1494 µg/L (April 20 <sup>th</sup> )
Total phosphorus load:	37 tonnes	-
Total water load:	0.078 km <sup>3</sup>	-
Phosphorus export:	0.62 kg/ha/y	-
Percent water load in spring**:	74%	-
Percent phosphorus load in spring:	89%	-

\*The "µg" symbol is used to express micrograms

\*\* Spring is considered to be March 1st to May 31<sup>st</sup>

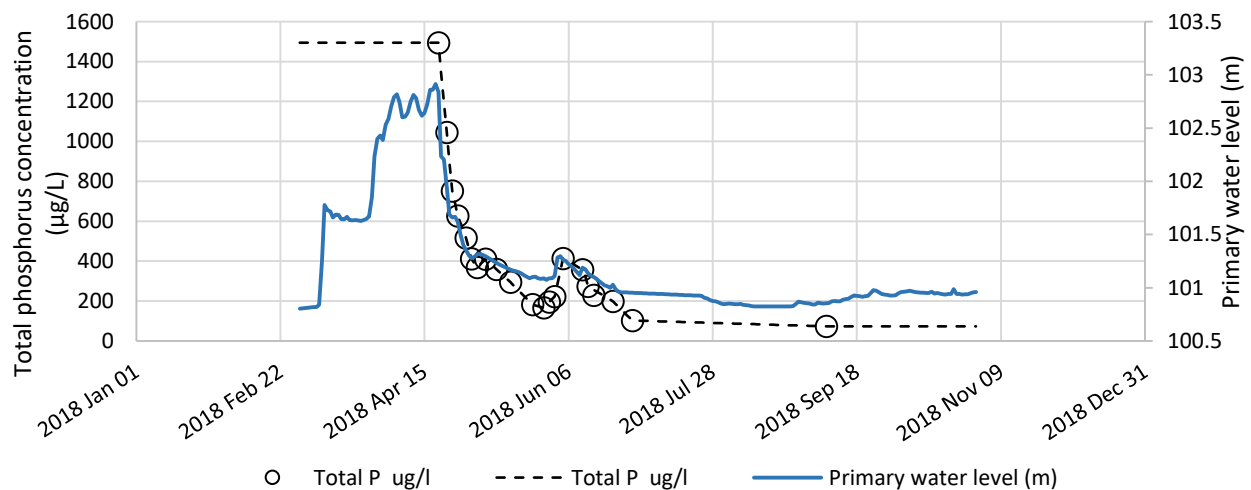


Figure 4. Water level and total phosphorus concentration over the 2018 sampling season at Arrow River near Arrow River (Water Survey of Canada Station 05MG001).

### Scissor Creek at McAuley

Scissor Creek flow easterly into the Assiniboine River. The drainage area for this sample site is approximately 205 km<sup>2</sup> and drains a largely agricultural area, including portions of the drainage area in both Manitoba and Saskatchewan.

This sample site is located at Water Survey of Canada flow meter 05ME009, near Virden. In 2018, 17 samples were collected between April 20<sup>th</sup> and September 4<sup>th</sup>.



	2017	2018
<b>Discharge/water level peak:</b>	April 3 <sup>rd</sup>	April 22 <sup>nd</sup>
<b>Greatest phosphorus concentration:</b>	912 µg/L (March 31 <sup>st</sup> )	992 µg/L (June 29 <sup>th</sup> )
<b>Total phosphorus load:</b>	6 tonnes	1 tonne
<b>Total water load:</b>	0.009 km <sup>3</sup>	0.003 km <sup>3</sup>
<b>Phosphorus export:</b>	0.27 kg/ha/y	0.03 kg/ha/y
<b>Percent water load in spring:</b>	95%	100%
<b>Percent phosphorus load in spring:</b>	98%	100%

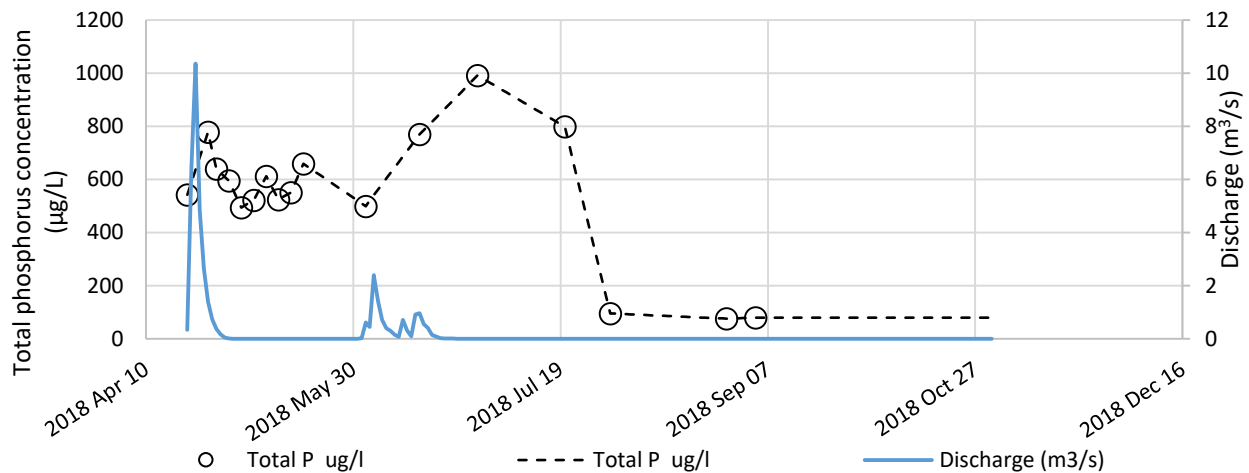


Figure 5. Discharge and total phosphorus concentration over the 2018 sampling season at Scissor Creek at McAuley (Water Survey of Canada Station 05ME009).

### Bailey's Creek near Oak Lake

Bailey's creek flows southerly into the Assiniboine River. The drainage area for this sample site is approximately 86 km<sup>2</sup> and drains a largely agricultural area, and the community of Lenore.

This sample site is located at Water Survey of Canada flow meter 05MG015, near Oak Lake. In 2018, 7 samples were collected between May 23<sup>rd</sup> and August 3<sup>rd</sup>.



	2017	2018
Discharge/water level peak:	April 4 <sup>th</sup>	April 21 <sup>st</sup>
Greatest phosphorus concentration:	630 µg/L (April 5 <sup>th</sup> )	674 µg/L (June 2 <sup>nd</sup> )
Total phosphorus load:	2 tonnes	1 tonne
Total water load:	0.005 km <sup>3</sup>	0.002 km <sup>2</sup>
Phosphorus export:	0.25 kg/ha/y	0.08 kg/ha/y
Percent water load in spring:	93%	100%
Percent phosphorus load in spring:	95%	100%

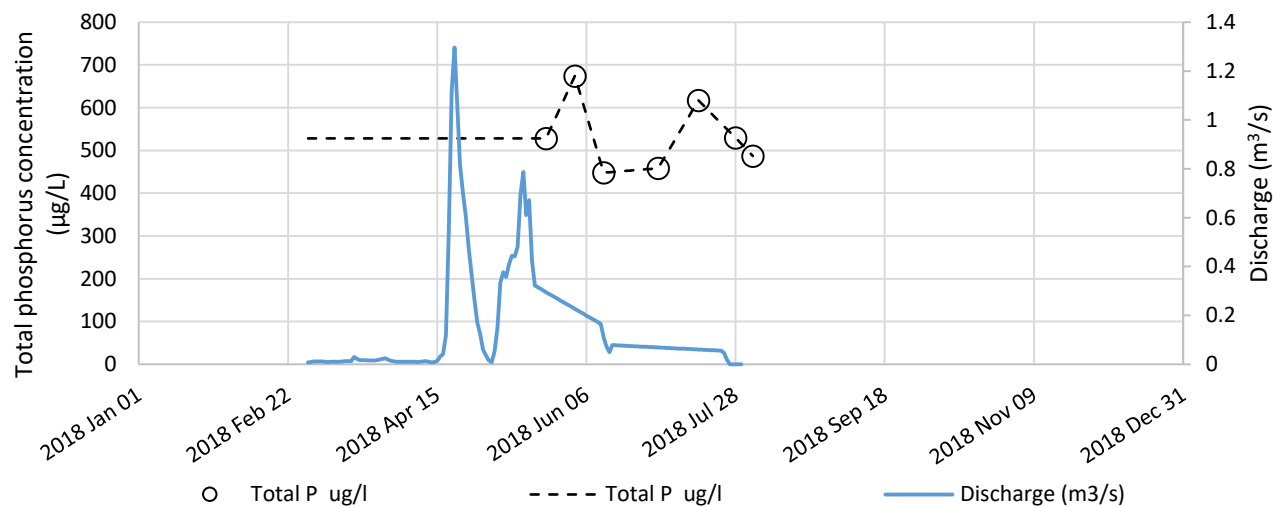


Figure 6. Discharge and total phosphorus concentration over the 2018 sampling season at Bailey's Creek near Oak Lake (Water Survey of Canada Station 05MG015).

**\*In 2018 Bailey's Creek discharge peaked while the river was covered by ice and therefore we were unable to collect samples during this time. This may have resulted in a portion of the phosphorus load being missed.**

## Gopher Creek near Virden

Gopher creek flows easterly into the Assiniboine River. The drainage area for this sample site is approximately 301 km<sup>2</sup> and drains a largely agricultural area, including portions of the drainage area in both Manitoba and Saskatchewan.

This sample site is located at Water Survey of Canada flow meter 05MG003, near Virden. In 2018, 17 samples were collected between April 7<sup>th</sup> and July 20<sup>th</sup>.



	2017	2018
Discharge/water level peak:	April 4 <sup>th</sup>	April 22 <sup>nd</sup>
Greatest phosphorus concentration:	479 µg/L (April 2 <sup>nd</sup> )	645 µg/L (April 18 <sup>th</sup> )
Total phosphorus load:	5 tonnes	1 tonne
Total water load:	0.013 km <sup>3</sup>	0.003 km <sup>3</sup>
Phosphorus export:	0.15 kg/ha/y	0.04 kg/ha/y
Percent water load in spring:	97%	65%
Percent phosphorus load in spring:	99%	74%

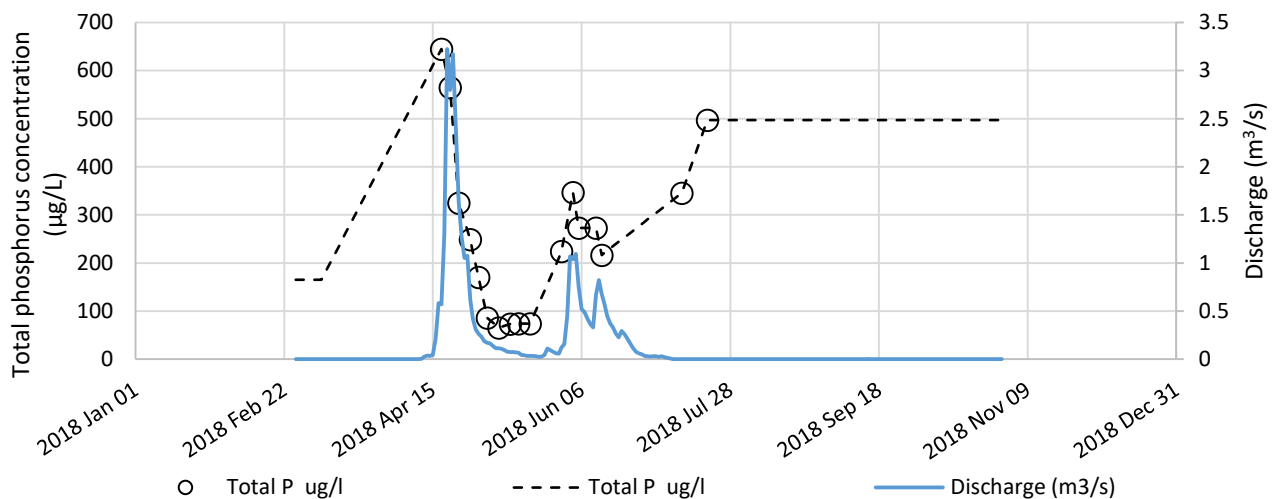


Figure 7. Discharge and total phosphorus concentration over the 2018 sampling season at Gopher Creek near Virden (Water Survey of Canada Station 05MG003).



## Assiniboine River sample sites

### Assiniboine River near Miniota

This is the mid-stream sampling site along the Assiniboine River for this region. The drainage area for this site is 84,200 km<sup>2</sup>. The majority of the drainage area is located in Saskatchewan.

This sample site is located at Water Survey of Canada flow meter 05ME006, near Miniota. In 2018, 23 samples were collected between April 23<sup>rd</sup> and September 25<sup>th</sup>.



	2017	2018
Discharge/water level peak:	April 6 <sup>th</sup>	April 25 <sup>th</sup>
Greatest phosphorus concentration:	445 µg/L (April 3 <sup>rd</sup> )	713 µg/L (April 25 <sup>th</sup> )
Total phosphorus load:	238 tonnes	116 tonnes
Total water load:	1.151 km <sup>3</sup>	0.171 km <sup>3</sup>
Phosphorus export:	0.03 kg/ha/y*	0.01 kg/ha/y*
Percent water load in spring:	77%	45%
Percent phosphorus load in spring:	88%	68%

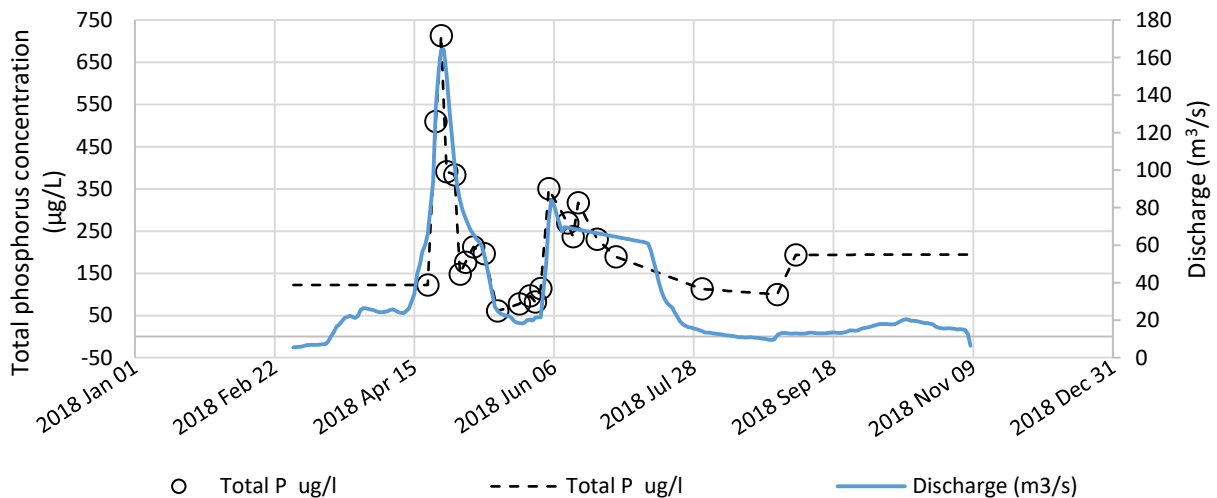


Figure 8. Discharge and total phosphorus concentration over the 2018 sampling season at Assiniboine River near Miniota (Water Survey of Canada Station 05ME006).

\*Assiniboine River near Miniota is the only site along the Assiniboine River in this region that has a flow meter. Because the other sites do not measure flow, we cannot break down the gross drainage areas to calculate phosphorus loads and exports for smaller, incremental drainage areas. Generally, larger drainage area have smaller exports as loading is averaged over a larger area, making it more difficult to pinpoint phosphorus hotspots.

### Assiniboine River at St. Lazare

This site is the most upstream site on the Assiniboine River for this region. The drainage area for this site is 80,100 km<sup>2</sup>. The majority of the drainage area is located in Saskatchewan.

This Assiniboine River sample site is located at Water Survey of Canada water level meter 05ME011, southwest of St. Lazare. Because flow is not measured at this site, we cannot calculate phosphorus loads and exports. In 2018, 9 samples were collected between April 18<sup>th</sup> and June 26<sup>th</sup>.



- **2017 greatest phosphorus concentration:** 320 µg/L measured on April 5<sup>th</sup>
- **2018 greatest phosphorus concentration:** 438 µg/L measured on June 15<sup>th</sup>

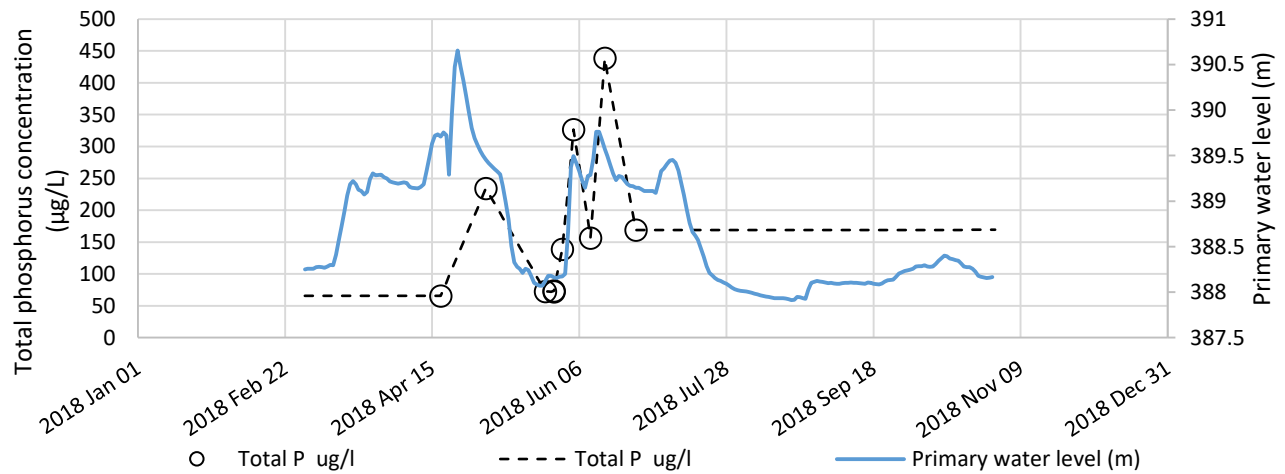


Figure 9. Water level and total phosphorus concentration over the 2018 sampling season at Assiniboine River at St. Lazare (Water Survey of Canada Station 05ME011).

### Assiniboine River east of Virden

This is the most downstream sample site on the Assiniboine River for this region. The drainage area for this site is 86,600 km<sup>2</sup>. The majority of the drainage area is located in Saskatchewan.

This Assiniboine River sample site is located at Water Survey of Canada water level meter 05MG014, east of Virden. Because flow is not measured at this site, we cannot calculate phosphorus loads and exports. In 2018, 18 samples were collected between April 24<sup>th</sup> and November 3<sup>rd</sup>.



- **2017 greatest phosphorus concentration:** 544 µg/L measured on April 7<sup>th</sup>
- **2018 greatest phosphorus concentration:** 335 µg/L measured on June 17<sup>th</sup>

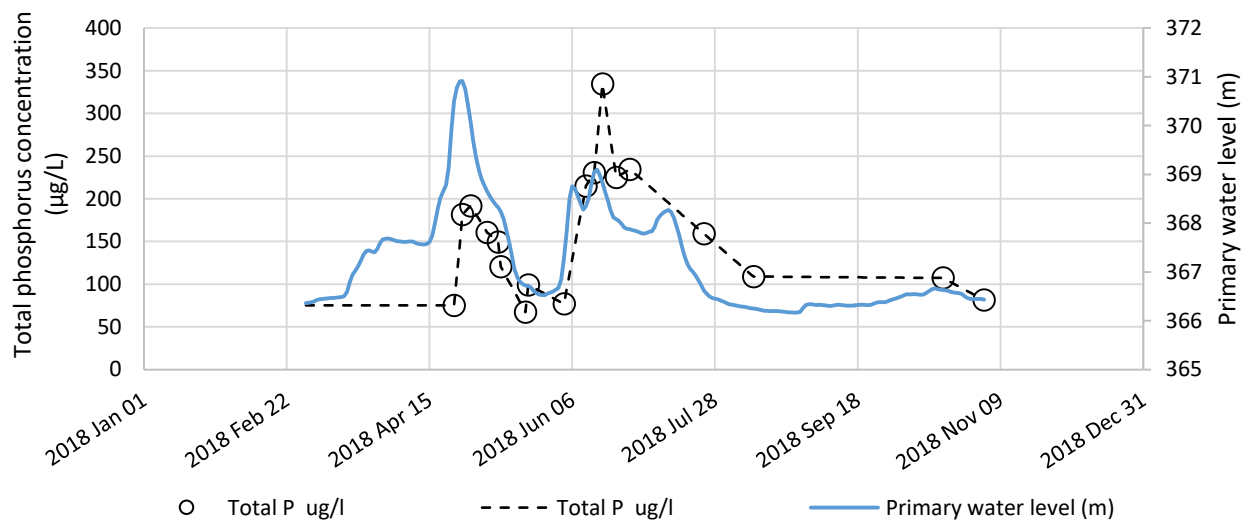


Figure 10. Water level and total phosphorus concentration over the 2018 sampling season at Assiniboine River east of Virden (Water Survey of Canada Station 05MG014).

## 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](mailto: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 

THE  
THOMAS SILL  
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