

LAKE WINNIPEG COMMUNITY-BASED MONITORING NETWORK

2017 REGIONAL REPORTS

UPPER ASSINIBOINE RIVER CONSERVATION DISTRICT



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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 sampled.

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 – 2017

In 2017, in its second field season, LWCBMN focused its efforts on the Assiniboine and Red River valleys, collecting samples in the East-Interlake, Seine-Rat River, La Salle Redboine, Upper Assiniboine River and Pembina Valley Conservation Districts. A total of 800 samples were collected from 75 sites.

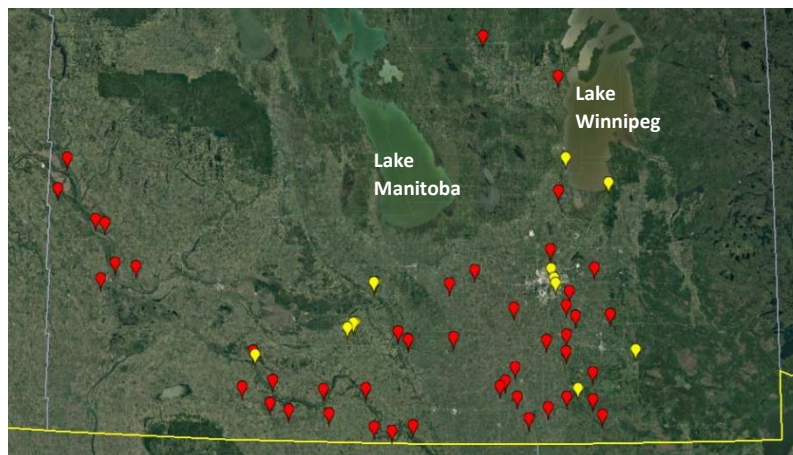


Figure 1. 2017 sample sites. Sites in red are located at Water Survey of Canada flow-metered stations. Sites in yellow are monitored by volunteer samplers where flow is not measured.

2017 RESULTS OVERVIEW

Table 1. Overview of findings from 2017 LWCBMN phosphorus monitoring data.

REGION	# years of LWCBMN data	# sites in 2017	# samples collected in 2017	Highest phosphorus export in region (2017)	Regional lead
<i>East Interlake Conservation District</i>	1	4	67	0.33 kg/ha/y (Icelandic River)	Armand Belanger (EICD)
<i>Seine Rat River Conservation District</i>	2	14	151	1.64 kg/ha/y (Manning Canal)	Jodi Goerzen and Chris Randall (SRRCD)
<i>La Salle Redboine Conservation District</i>	2	9	148	0.76 kg/ha/y (La Salle River at Sanford)	Justin Reid (LSRBCD)
<i>Upper Assiniboine River Conservation District</i>	1	6	111	0.62 kg/ha/y (Arrow River)	Ryan Canart (UARCD)
<i>Pembina Valley Conservation District</i>	1	11	138	1.88 kg/ha/y* (Pembina River near Windygates)	Cliff Greenfield (PVCD) and Jason Vanrobaeys (AAFC)

There was high spatial variation in phosphorus loads between **sub-watersheds**, highlighting the importance of sampling at many stations. For example, the Manning Canal sub-watershed, a phosphorus hotspot in both 2016 and 2017, saw an increase in phosphorus export from 1.10 to 1.64 kg/ha/y. In the Upper Seine River sub-watershed directly north of the Manning Canal, phosphorus export declined from 0.48 to 0.29 kg/ha/y. These watersheds are directly adjacent to one another, yet continue to have very different phosphorus contributions and annual trends.

The high phosphorus exports reported by LWCBMN in both 2016 and 2017 also highlight the importance of sampling more frequently during the spring melt and high water events, when most phosphorus runoff occurs. **In 2017, LWCBMN identified 1,348 tonnes of phosphorus**, of which, 96% occurred during the spring.

A **sub-watershed** is the area of land that drains past a particular LWCBMN sampling location. Multiple sub-watersheds flow together to form larger watersheds, such as the Red River Basin.

The average total phosphorus load to Lake Winnipeg is reported to be 7,655 tonnes annually; the average phosphorus load from the Red River is reported to be 5,380 tonnes annually (State of Lake Winnipeg report, 2011).

LWCBMN data in context

Other phosphorus monitoring projects are also reporting large amounts of spatial variation and high phosphorus exports. In 2017, an Environment and Climate Change Canada research group published a study, “Quantifying seasonal variation in total phosphorus and nitrogen from prairie streams in the Red River Basin, Manitoba Canada”, that looked at 11 sub-watersheds west of the Red River. Like LWCBMN, researchers sampled frequently during the spring melt and after large rain events, and report a wide range of phosphorus exports for sub-watersheds in a relatively small region, from 0.07-1.88 kg/ha/y.

Using the data

CBM provides valuable information for water management in Manitoba. The LWCBMN’s data complements provincial and federal water-quality data sets, and can help guide the development of evidence-based policies and practices.

*** 1.88 kg/ha/y is a relatively high phosphorus export for the PVCD region. We recommend that no conclusions be drawn until we have additional data from this sample 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 5 were at stations where water flow is measured. For the 2 sites where water flow is not measured, useful information can be drawn from the phosphorus concentrations, such as changes in concentrations from upstream to downstream sites. However, we cannot calculate the phosphorus load because we cannot multiply the concentration by the volume of water flowing by the site.

Table 2. Phosphorus loads and exports for samples sites in UARCD.

Sampling station	Phosphorus load (tonnes/y)	Phosphorus export (kg/ha/y)
A. Arrow River	37	0.62
B. Scissor Creek	6	0.27
C. Bailey's Creek	2	0.25
D. Gopher Creek	5	0.15
Assiniboine River southwest of Miniota (not pictured on map)	238	0.03

Together, UARCD and volunteers were able to collect samples frequently at all sites, specifically during the spring runoff period, resulting in high-quality data that captured all discharge peaks. For all UARCD sample sites, most of the water (87%) and phosphorus (93%) contribution occurred during the spring, from March 1st to May 31st.

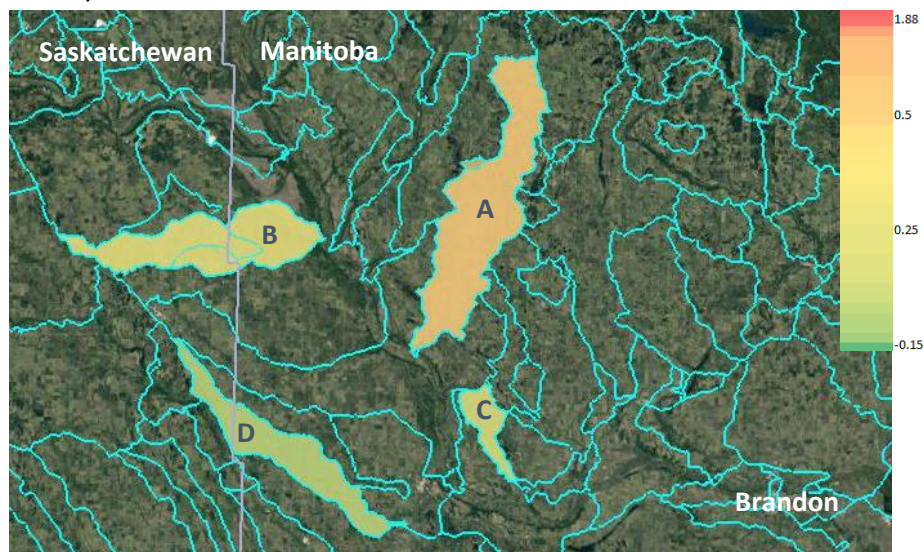


Figure 2. Phosphorus export (kg /ha/y) map for sub-watersheds in the Upper Assiniboine River Conservation District.

2017 RESULTS BY SAMPLE SITE

Assiniboine River tributaries

Arrow River near Miniota

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 km² and drains a largely agricultural area, with mainly annual cropland (Arrow-Oak State of the Watershed Report, 2008).

Samples were taken at Water Survey of Canada flow meter 05MG001 located near Arrow River. In 2017, 14 samples were collected between March 30th and June 16th.



- **Discharge peaked:** April 6th
- **Greatest phosphorus concentration:** 955 µg/L* measured on April 5th
- **Total phosphorus load:** 37 tonnes
- **Total water load:** 0.078 km³
- **Phosphorus export:** 0.62 kg/ha/y
- **Percent water load occurred during spring**:** 74%
- **Percent phosphorus load occurred during spring:** 89%

*The “µg” symbol is used to express micrograms

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

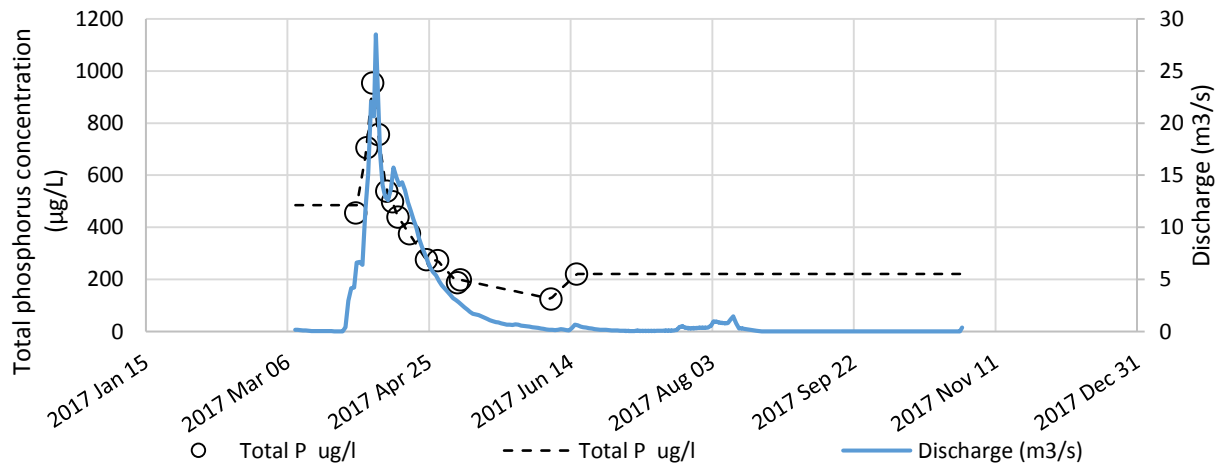


Figure 3. Discharge and total phosphorus concentration over the 2017 sampling season at the Arrow River (Water Survey of Canada Station 05MG001).

Scissor Creek at McAuley

Scissor Creek flows easterly into the Assiniboine River. The drainage area for this sample site is approximately 205 km² and drains a largely agricultural area, with portions of the drainage area in both Manitoba and Saskatchewan.

The Scissor Creek sample site is located at Water Survey of Canada flow meter 05ME009, near McAuley. In 2017, 20 samples were collected between March 29th and September 1st.



- **Discharge peaked:** April 3rd
- **Greatest phosphorus concentration:** 912 µg/L measured on March 31st
- **Total phosphorus load:** 6 tonnes
- **Total water load:** 0.009 km³
- **Phosphorus export:** 0.27 kg/ha/y
- **Percent water load occurred during spring:** 95%
- **Percent phosphorus load occurred during spring:** 98%

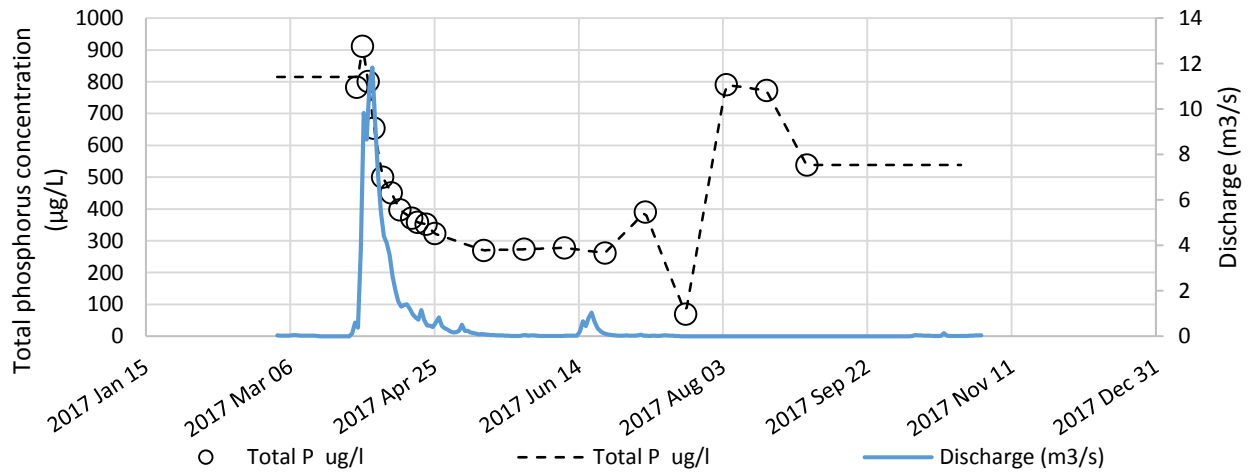


Figure 4. Discharge and total phosphorus concentration over the 2017 sampling season at the Scissor Creek (Water Survey of Canada Station 05ME009).

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 km² 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 2017, 9 samples were collected between April 5th and April 23rd.



- **Discharge peaked:** April 4th
- **Greatest phosphorus concentration:** 630 µg/L measured on April 5th
- **Total phosphorus load:** 2 tonnes
- **Total water load:** 0.005 km³
- **Phosphorus export:** 0.25 kg/ha/y
- **Percent water load occurred during spring:** 93%
- **Percent phosphorus load occurred during spring:** 95%

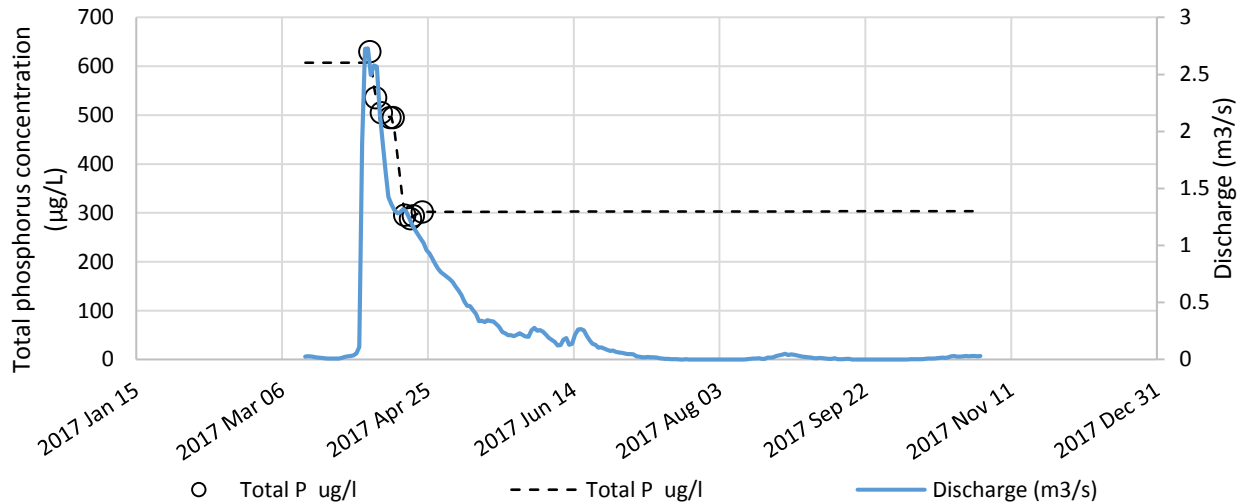


Figure 5. Discharge and total phosphorus concentration over the 2017 sampling season at the Bailey's Creek (Water Survey of Canada Station 05MG015).

Gopher Creek near Virden

Gopher Creek flows easterly into the Assiniboine River. The drainage area for this sample site is approximately 301 km² and drains a largely agricultural area, with 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 2017, 19 samples were collected between March 30th and September 27th.



- **Discharge peaked:** April 4th
- **Greatest contributing phosphorus concentration*:** 479 µg/L measured on April 2nd
- **Total phosphorus load:** 5 tonnes
- **Total water load:** 0.013 km³
- **Phosphorus export:** 0.15 kg/ha/y
- **Percent water load occurred during spring:** 97%
- **Percent phosphorus load occurred during spring:** 99%

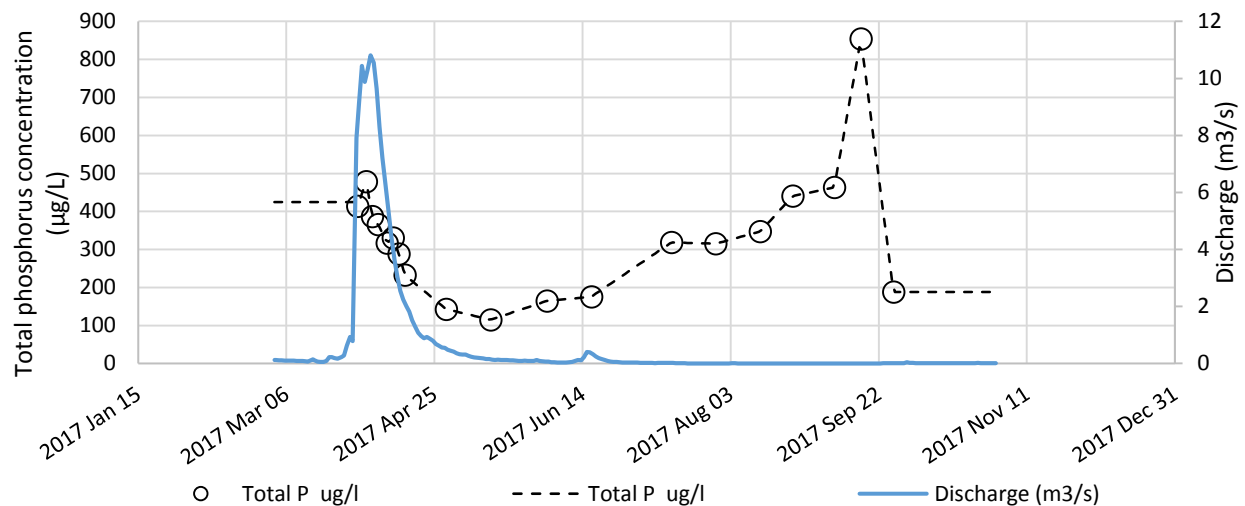


Figure 6. Discharge and total phosphorus concentration over the 2017 sampling season at the Gopher Creek (Water Survey of Canada Station 05MG003).

* The greatest contributing phosphorus concentration is the greatest phosphorus concentration measured during a period when water was flowing. Total phosphorus concentrations at this site increased throughout the dry summer and fall. This is a common occurrence when flow slows down and evaporation causes phosphorus to become more concentrated in the waterway. High phosphorus concentrations during low flow periods do not contribute a significant amount of phosphorus to the annual load.

Assiniboine River 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 84200 km². 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 2017, 15 samples were collected between April 3rd and July 6th.



- **Discharge peaked:** April 6th
- **Greatest phosphorus concentration:** 445 µg/L measured on April 3rd
- **Total phosphorus load:** 238 tonnes
- **Total water load:** 1.151 km³
- **Phosphorus export:** 0.03 kg/ha/y*
- **Percent water load occurred during spring:** 77%
- **Percent phosphorus load occurred during spring:** 88%

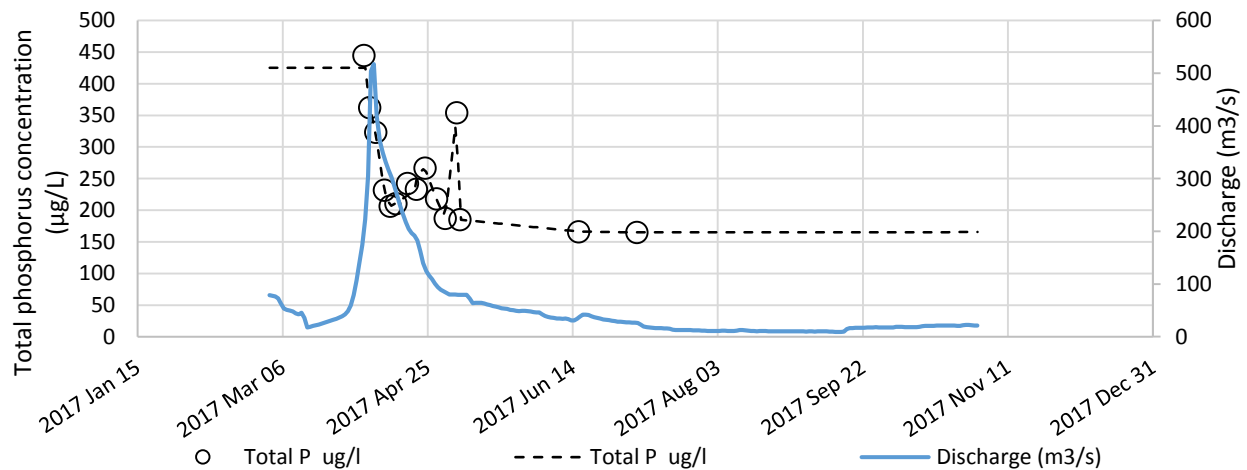


Figure 7. Discharge and total phosphorus concentration over the 2017 sampling season at the Assiniboine River near Miniota (Water Survey of Canada Station 05ME006).

* Larger drainage areas that cannot be broken apart into smaller incremental drainage areas obscure local phosphorus hotspots, resulting in smaller phosphorus exports.

Assiniboine River southwest of St. Lazare

This site is the most upstream site on the Assiniboine River for this region. The drainage area for this site is 80100 km². 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. In 2017, 8 samples were collected between March 27th and July 13th. Because flow is not measured at this site, we cannot calculate phosphorus loads and exports.



- **Water level peaked:** April 4th
- **Greatest phosphorus concentration:** 320 µg/L measured on April 5th

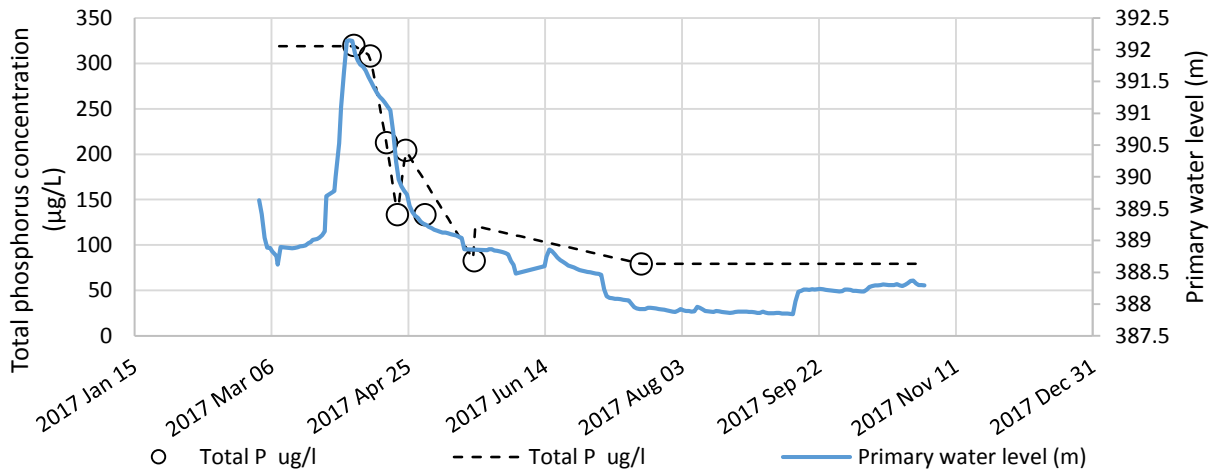


Figure 8. Water level and total phosphorus concentration over the 2017 sampling season at the Assiniboine River southwest of St. Lazare (Water Survey of Canada Station 05ME011).

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 86600 km². 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. In 2017, 20 samples were collected between April 4th and October 30th. Because flow is not measured at this site, we cannot calculate phosphorus loads and exports.



- **Water level peaked:** April 7th
- **Greatest phosphorus concentration:** 544 µg/L measured on April 7th

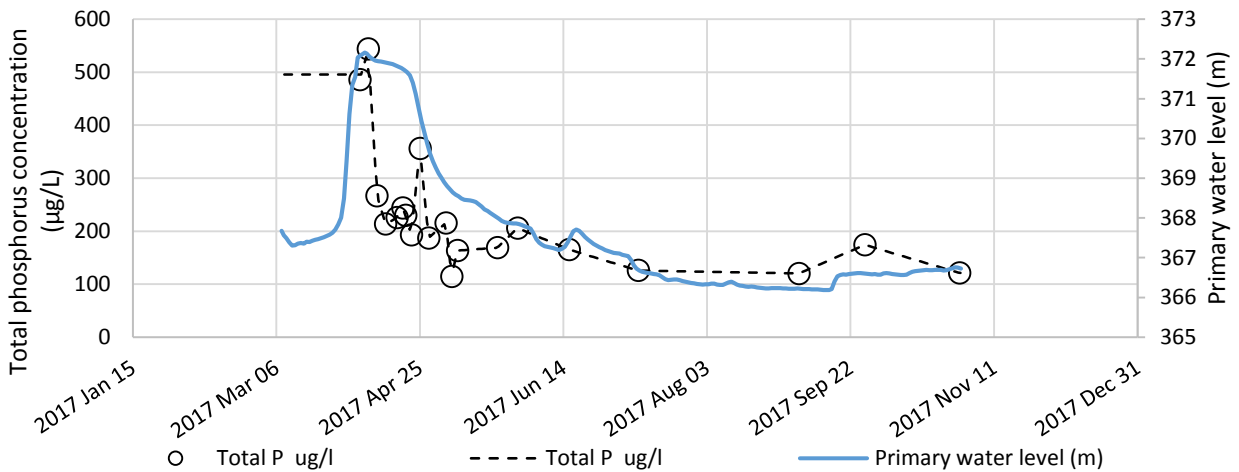


Figure 9. Water level and total phosphorus concentration over the 2017 sampling season at the Assiniboine River east of Virden (Water Survey of Canada Station 05MG014).

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 2018. You can find a map of potential sites [here](#).

If you are interested in sampling, please contact the LWCBMN co-ordinator 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.

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