

**LAKE WINNIPEG
COMMUNITY-BASED MONITORING NETWORK**

2017 REGIONAL REPORTS

LA SALLE REDBOINE CONSERVATION DISTRICT



Agriculture and
Agri-Food Canada



**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 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.

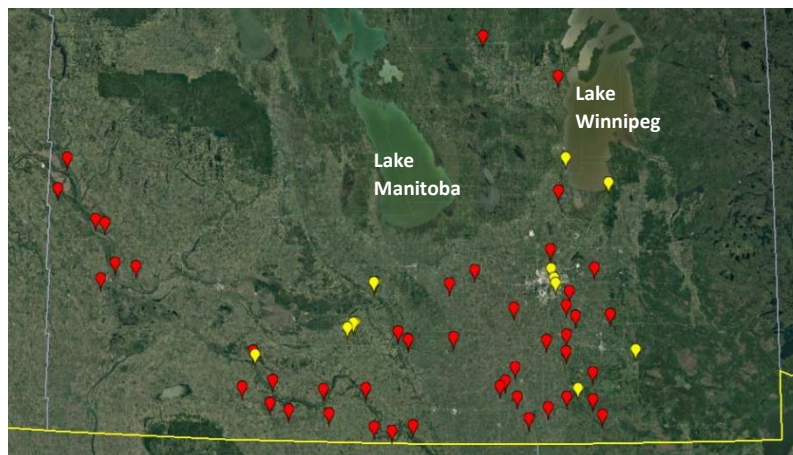


Figure 1. 2017 sample sites. Sites in red are located at Water Survey of Canada flow-metered stations. Sites in yellow are monitored by volunteer samplers where flow is not measured.

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.**

LA SALLE REDBOINE CONSERVATION DISTRICT

The La Salle Redboine Conservation District (LSRBCD) is located west of the city of Winnipeg. LSRBCD consists of two major watersheds: the La Salle and Boyne River watersheds. The primary land use in LSRBCD is agriculture, specifically annual crops and livestock. LSRBCD comprises many large and small municipalities that pose a potential risk for phosphorus contribution through discharge of wastewater lagoons, sewage treatment plants and urban runoff. Major towns include Elie, Carman and Holland.

In partnership with LWCBMN, LSRBCD and partners from the Agriculture and Agri-Food Canada (AAFC) Morden Research and Development Center sampled nine sites in LSRBCD, including three sites along Pelly's Lake, a watershed management project near Holland. For the Pelly's Lake sites, samples were collected upstream, at the site, and downstream of the project. However, flow data was not available for Pelly's Lake sites, so we cannot calculate the phosphorus load because we cannot multiply the concentration by the volume of water flowing by the site.

LSRBCD and AAFC were able to collect samples frequently at all nine sites, specifically during the spring runoff period, resulting in high-quality data that included all discharge peaks. For all LSRBCD sample sites, most of the water (92.5%) and phosphorus (96%) contribution occurred during the spring, from March 1st to May 31st.

Table 2. Phosphorus loads and exports for sample sites in LSRBCD

Sampling station	Phosphorus load (tonnes/y)	Phosphorus export (kg/ha/y)
A. La Salle River at Sanford	78	0.76
B. La Salle River at Elie	11	0.60
C. Elm Creek	11	0.19
D. Boyne River near Carman	8	0.25
E. Boyne River near Roseisle	19	0.32
F. Roseisle Creek	14	0.63

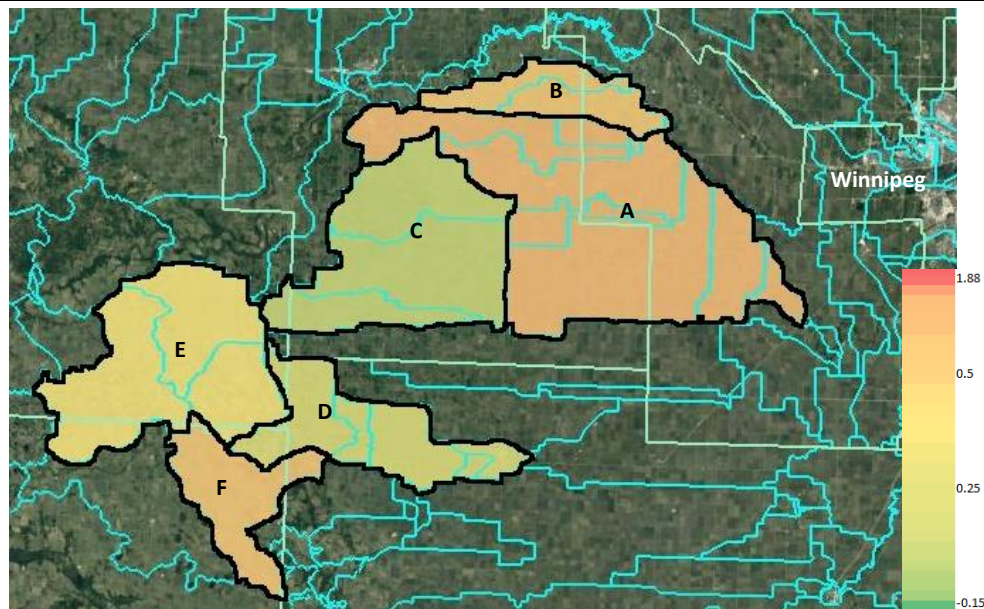


Figure 2. Phosphorus export (kg/ha/y) map for sub-watersheds in the La Salle Redboine Conservation District.

RESULTS BY SAMPLE SITE

La Salle River sample sites

La Salle River at Sanford

This downstream reach of the La Salle River is located west of the Red River and flows easterly. The drainage area for this reach of the river is approximately 1022 km² and drains a largely agricultural area including both cropland and livestock (La Salle River Watershed Management Plan, 2007).



Samples were taken at Water Survey of Canada flow meter 05OG001 located at Sanford. In 2017, 11 samples were collected between March 28th and May 25th.

	2016	2017
• Discharge peaked:	April 18 th	April 6 th
• Greatest phosphorus concentration:	611 µg/L* measured on March 14 th	797 µg/L measured on April 12 th
• Total phosphorus load:	45 tonnes	78 tonnes
• Total water load:	0.074 km ³	0.082 km ³
• Phosphorus export:	0.44 kg/ha/y	0.76 kg/ha/y
• Percent water load occurred during spring**:	82%	98%
• Percent phosphorus load occurred during spring:	83%	99%

*The “µg” symbol is used to express micrograms

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

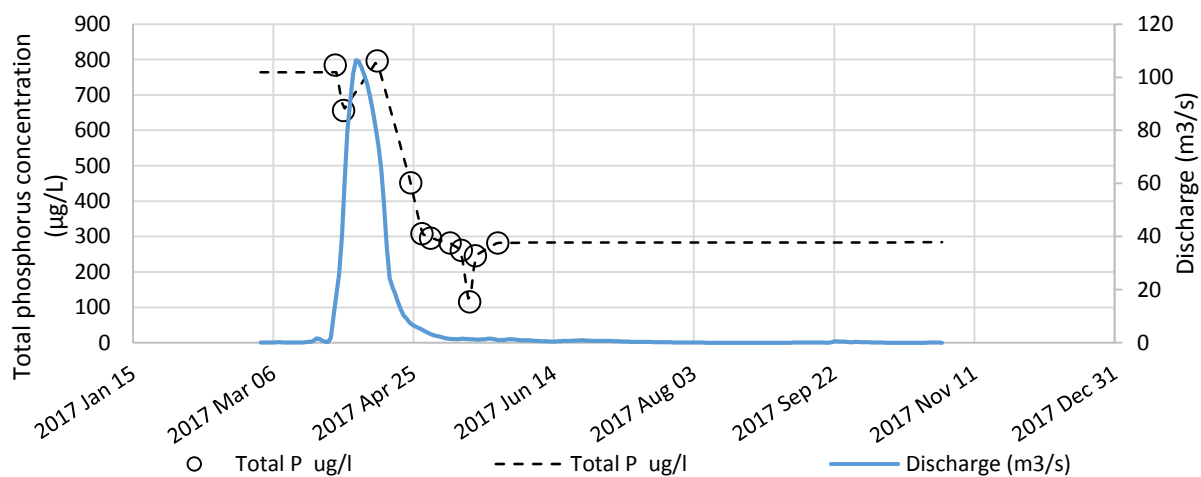


Figure 3. Discharge and total phosphorus concentration over the 2017 sampling season at downstream La Salle River (Water Survey of Canada Station 05OG001).

La Salle River at Elie

The upstream reach of the La Salle River is located east of Portage La Prairie and runs easterly. The drainage area for this sample site is approximately 189 km² and drains a largely agricultural area, including both cropland and livestock (La Salle River Watershed Management Plan, 2007).

Samples were taken at Water Survey of Canada flow meter 05OG008 located near Elie. In 2017, 14 samples were collected between March 28th and August 5th.



	2016	2017
• Discharge peaked:	April 18 th	April 5 th
• Greatest contributing phosphorus concentration*:	865 µg/L measured on March 14 th	795 µg/L measured on March 28 th *
• Total phosphorus load:	8 tonnes	11 tonnes
• Total water load:	0.014 km ³	0.020 km ³
• Phosphorus export:	0.44 kg/ha/y	0.60 kg/ha/y
• Percent water load occurred during spring:	69%	86%
• Percent phosphorus load occurred during spring:	69%	93%

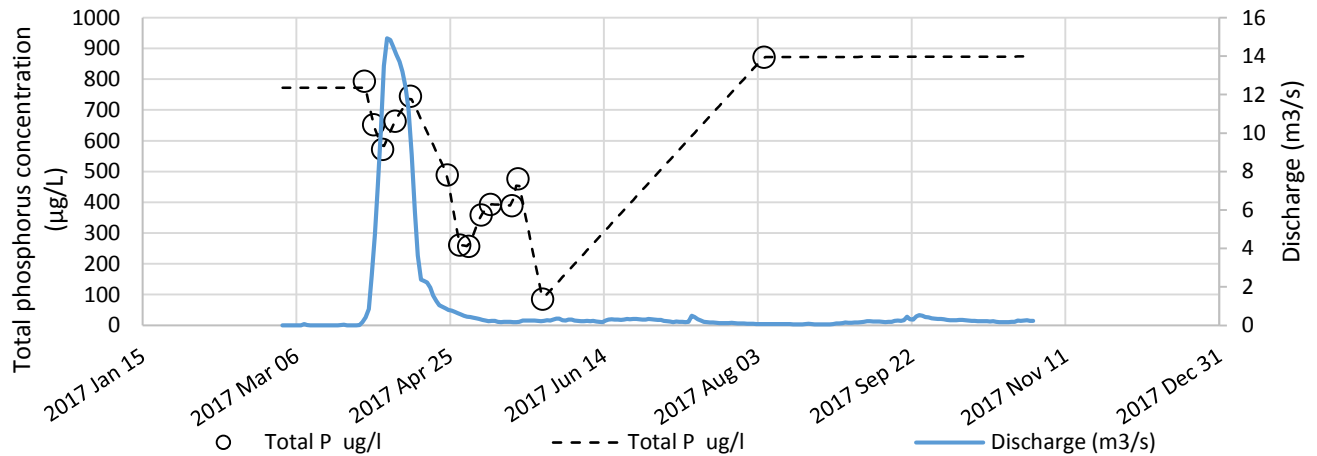


Figure 5. Discharge and total phosphorus concentration over the 2017 sampling season at upstream La Salle River (Water Survey of Canada Station 05OG008)

* 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.

Elm Creek Channel near Elm Creek

Elm Creek Channel is situated south-east of Portage La Prairie and flows easterly towards the La Salle River. The drainage area for this sample site is approximately 589 km² and drains a largely agricultural area and the community of St. Claude. Cropland is limited in this drainage area relative to others in the La Salle watershed. However, there are slightly more livestock (La Salle River Watershed Management Plan, 2007).



Samples were taken at Water Survey of Canada flow meter 05OG005 located near Elm Creek. In 2017, 11 samples were collected between March 31st and June 15th.

	2016	2017
• Discharge peaked:	April 17 th	March 31 st
• Greatest phosphorus concentration:	602 µg/L measured on March 17 th	452 µg/L measured on April 3 rd
• Total phosphorus load:	4 tonnes	11 tonnes
• Total water load:	0.014 km ³	0.043 km ³
• Phosphorus export:	0.07 kg/ha/y	0.19 kg/ha/y
• Percent water load occurred during spring:	74%	99%
• Percent phosphorus load occurred during spring:	78%	100%

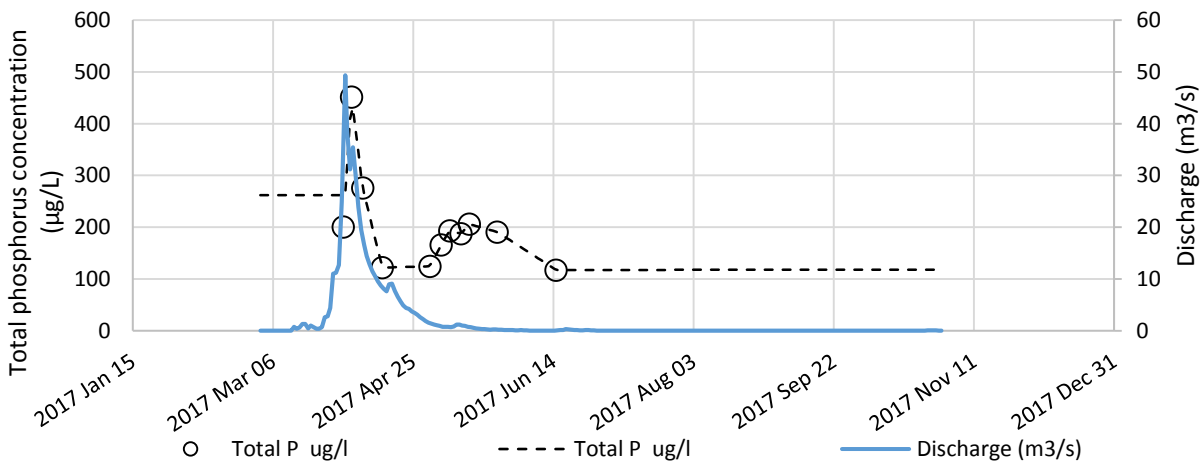


Figure 4. Discharge and total phosphorus concentration over the 2017 sampling season at Elm Creek (Water Survey of Canada Station 05OG005).

Boyne River sample sites

Boyne River near Carman

This downstream reach of the Boyne River begins directly upstream of Stephenfield Lake and flows to Carman. The drainage area for this sample site is approximately 318 km² and drains a largely agricultural area.

Samples were taken at Water Survey of Canada flow meter 05OF003 located near Carman. In 2017, 17 samples were collected between March 24th and September 18th.



- **Discharge peaked:** April 3rd
- **Greatest phosphorus concentration:** 1148 µg/L measured on July 17th
- **Total phosphorus load:** 8 tonnes
- **Total water load:** 0.014 km³
- **Phosphorus export:** 0.25 kg/ha/y
- **Percent water load occurred during spring:** 91%
- **Percent phosphorus load occurred during spring:** 93%

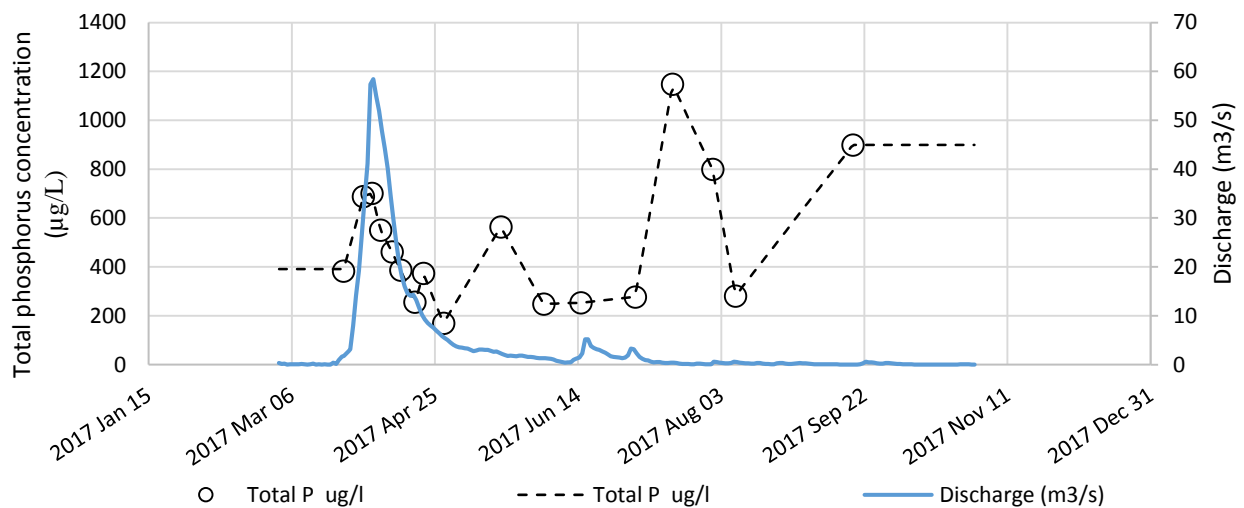


Figure 6. Discharge and total phosphorus concentration over the 2017 sampling season at downstream Boyne River (Water Survey of Canada Station 05OF003).

Boyne River near Roseisle

This upstream reach of the Boyne River begins near Holland and flows into Stephenfield Lake. The drainage area for this sample site is approximately 589 km² and drains the towns of Holland, Treherne and Rathwell as well as a mixture of cropland and forested areas.



Samples were taken at Water Survey of Canada flow meter 05OF011 located near Roseisle. In 2017, 17 samples were collected between March 24th and September 18th.

- **Discharge peaked:** April 4th
- **Greatest phosphorus concentration:** 591 µg/L measured on March 31th
- **Total phosphorus load:** 19 tonnes
- **Total water load:** 0.052 km³
- **Phosphorus export:** 0.32 kg/ha/y
- **Percent water load occurred during spring:** 90%
- **Percent phosphorus load occurred during spring:** 93%

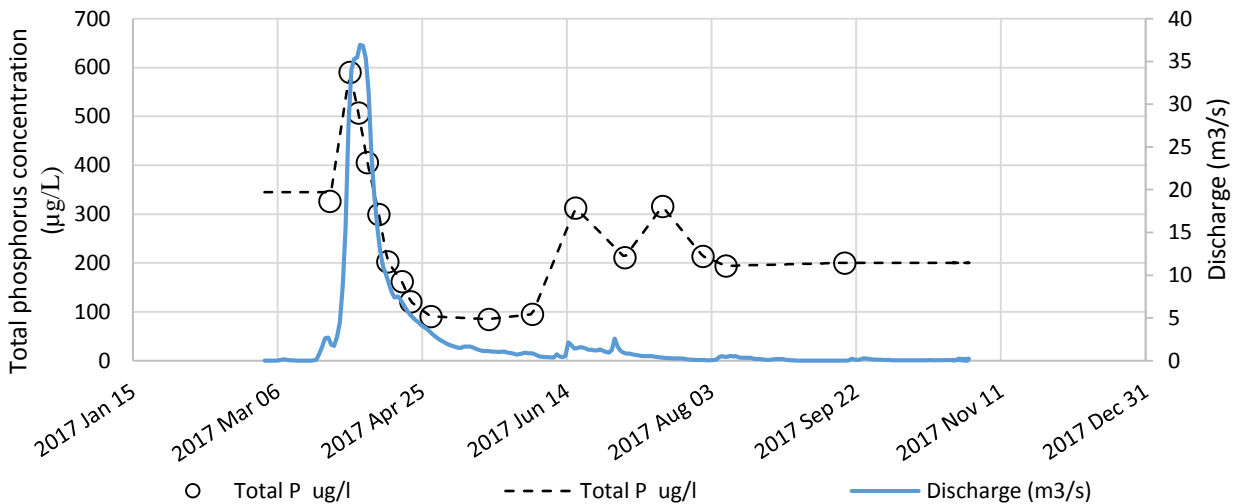


Figure 7. Discharge and total phosphorus concentration over the 2017 sampling season at upstream Boyne River (Water Survey of Canada Station 05OF011).

Roseisle Creek near Roseisle

Roseisle Creek flows easterly towards the Boyne River, where the two waterways join slightly upstream of Stephenfield Lake. The drainage area for this sample site is approximately 223 km² and drains a mixture of agricultural cropland and forest areas, as well as the town of Roseisle (Stephenfield Lake Watershed Management Plan, 2005).



Samples were taken at Water Survey of Canada flow meter 05OF009 located near Roseisle. In 2017, 16 samples were collected between March 31st and September 18th.

- **Discharge peaked:** March 31st
- **Greatest phosphorus concentration:** 1206 µg/L measured on April 3rd
- **Total phosphorus load:** 14 tonnes
- **Total water load:** 0.018 km³
- **Phosphorus export:** 0.63 kg/ha/y
- **Percent water load occurred during spring:** 91%
- **Percent phosphorus load occurred during spring:** 96%

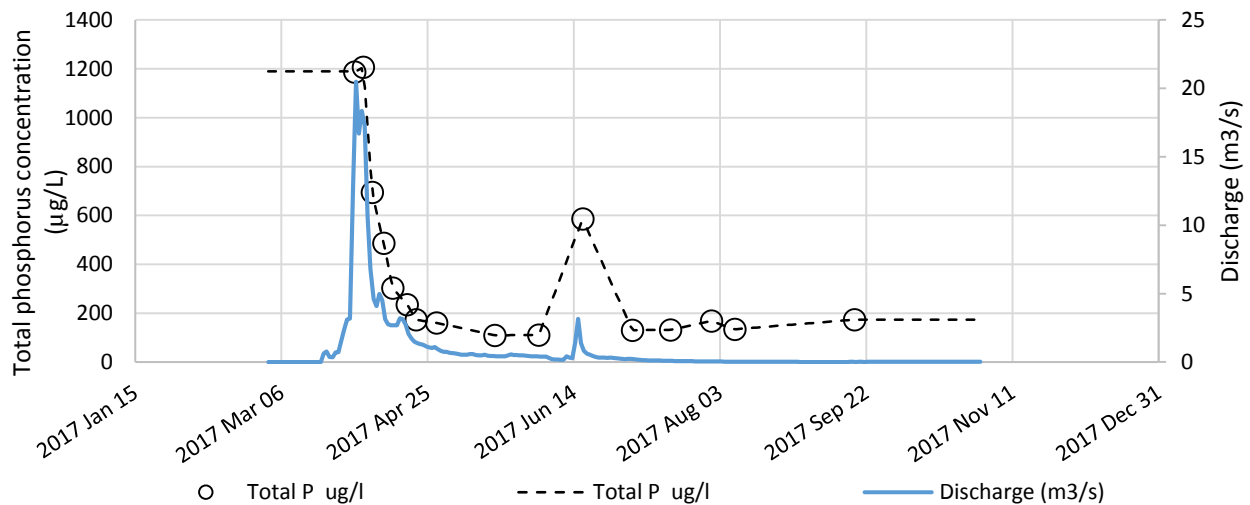


Figure 8. Discharge and total phosphorus concentration over the 2017 sampling season at Roseisle Creek (Water Survey of Canada Station 05OF009).

Pelly's Lake sample sites

Pelly's Lake watershed management project

Pelly's Lake is a watershed management area that is designed to slow the flow of floodwaters. Water is held back by a dam that helps delay the release of spring runoff.

Samples were taken upstream at the inlet, at the dam and at a downstream culvert. In 2016, 18 samples were collected at each site between March 10th and June 14th. In 2017, 22 samples were collected at each site between March 28th and June 15th.



Based on the data currently available, it is not possible to determine if the Pelly's Lake project is effectively sequestering phosphorus, due to the lack of discharge data for these three sites. Because flow is not measured, we cannot calculate phosphorus loads and exports.

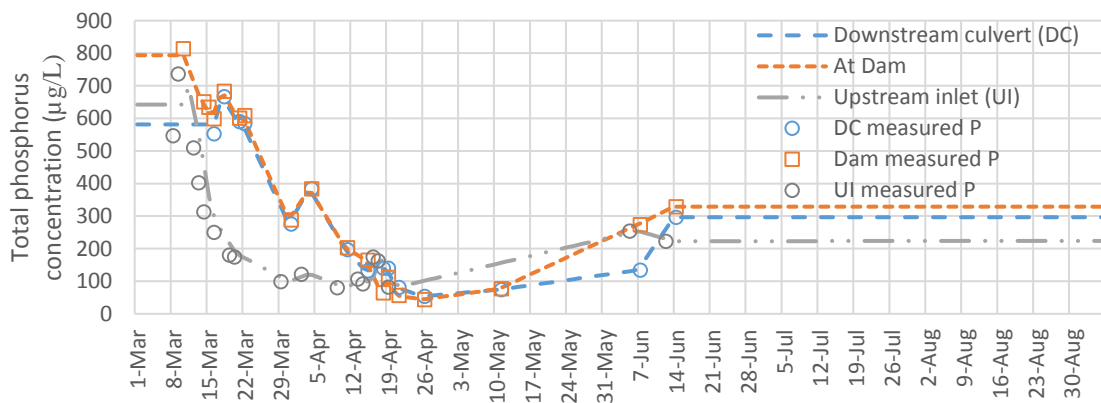


Figure 9. Total phosphorus concentration over the 2016 sampling season at three locations along Pelly's Lake watershed management area.

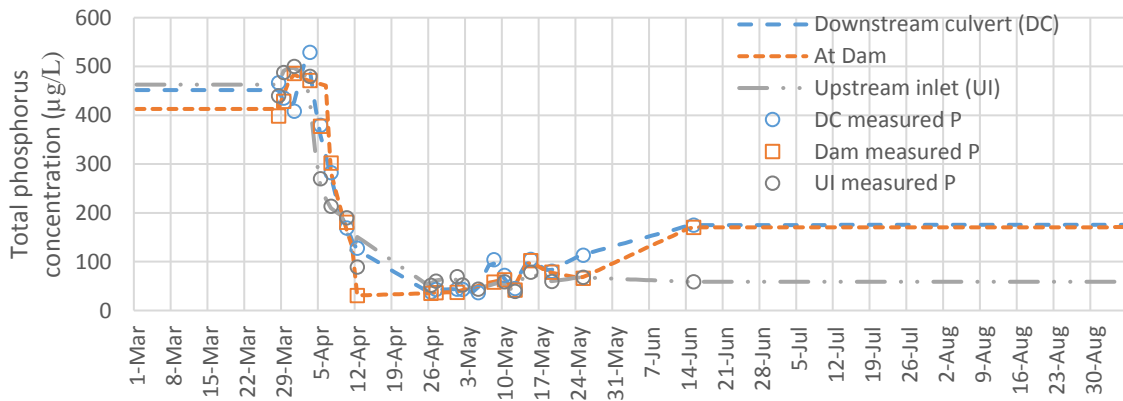


Figure 10. Total phosphorus concentration over the 2017 sampling season at three locations along Pelly's Lake watershed management area.

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.

THANK YOU TO OUR 2017 FUNDERS



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