LAKE WINNIPEG
COMMUNITY-BASED MONITORING NETWORK

2017 REGIONAL REPORTS

EAST-INTERLAKE CONSERVATION DISTRICT

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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.

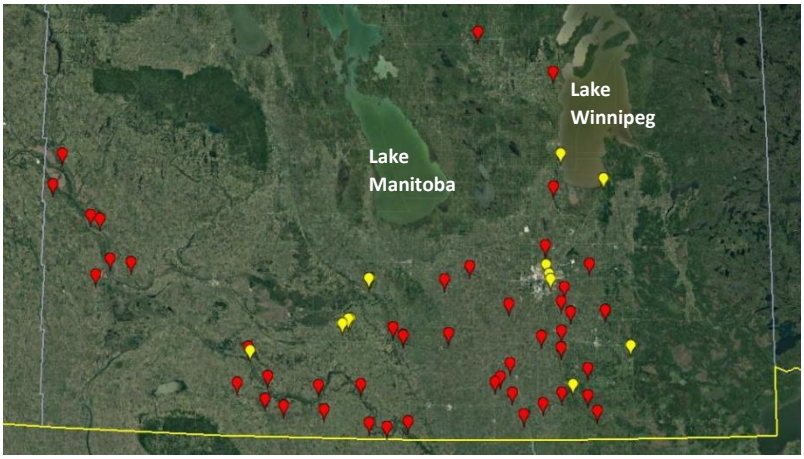

Figure 1. 2017 sample sites. Sites in red are located at Water Survey of Canada flow-metered stations. Sites in yellow are monitored by volunteer samplers where flow is not measured.

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
East Interlake Conservation District	1	4	67	0.33 kg/ha/y (Icelandic River)	Armand Belanger (EICD)
Seine Rat River Conservation District	2	14	151	1.64 kg/ha/y (Manning Canal)	Jodi Goerzen and Chris Randall (SRRCD)
La Salle Redboine Conservation District	2	9	148	0.76 kg/ha/y (La Salle River at Sanford)	Justin Reid (LSRBCD)
Upper Assiniboine River Conservation District	1	6	111	0.62 kg/ha/y (Arrow River)	Ryan Canart (UARCD)
Pembina Valley Conservation District	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. 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).

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.

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

*** 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.**

EAST-INTERLAKE CONSERVATION DISTRICT

The East-Interlake Conservation District (EICD) is located west of Lake Winnipeg. EICD consists of four major sub-watersheds: Fisher River; Icelandic River and Washow Bay creek; Willow Creek; and Netley-Grassmere watersheds. The primary land use in EICD is agriculture, specifically livestock, hay production and annual cropland. In addition to agricultural activities, wastewater treatment plants and lagoons in municipalities throughout EICD contribute phosphorus to local waterways. Major municipalities include Gimli, Riverton, and Dunnottar.

In partnership with LWCBMN, EICD staff sampled Fisher River, Icelandic River, Netley Creek and Grassmere creek in 2017. EICD was able to collect samples frequently at all four sites, specifically during the spring runoff period, resulting in high-quality data that captured all discharge peaks and a late July storm. Discharge at all sites peaked at the end of March, with a second, smaller, late-spring discharge peak that becomes larger as you move northwards from Grassmere Creek to Fisher River.

Table 2. Phosphorus loads and exports for sample sites in the East Interlake Conservation District.

Sampling station	Phosphorus load (tonnes/y)	Phosphorus export (kg/ha/y)
Fisher River	7	0.11
Icelandic River	41	0.33
Netley Creek	15	0.23
Grassmere Creek	12	0.27

For all EICD sample sites, most of the water (92%) and phosphorus (98%) contribution occurred during the spring, from March 1st to May 31st.

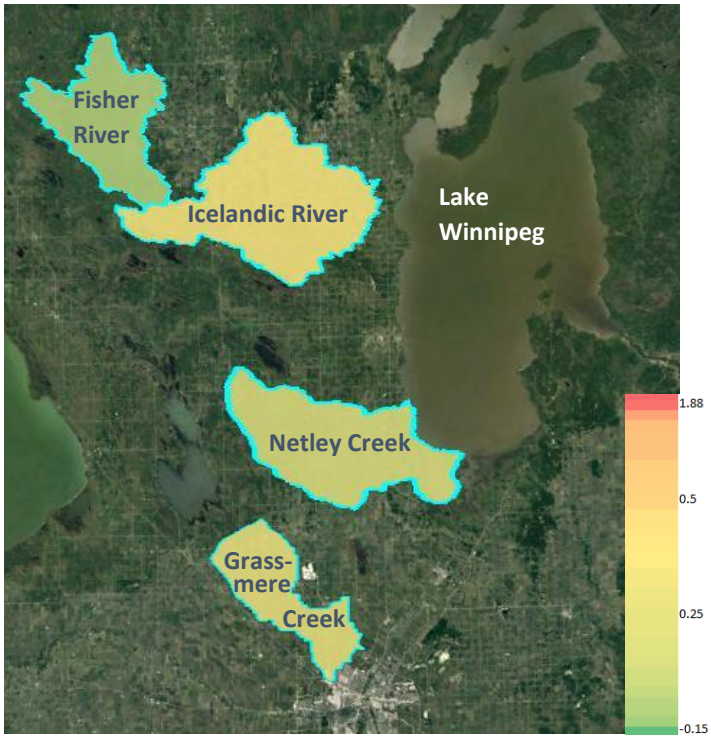

Figure 2. Phosphorus export (kg /ha/y) map for sub-watersheds in the East-Interlake Conservation District.

2017 RESULTS BY SAMPLE SITE

Grassmere Creek near Middlechurch

Grassmere Creek is part of the larger Netley-Grassmere watershed. The Grassmere Creek portion of the watershed is situated north of the city of Winnipeg. The drain begins by flowing southerly but turns to flow easterly once approaching Winnipeg. The drainage area for this sample site is approximately 462 km^2 and drains a portion of the city of Winnipeg, Rural Municipality of Stonewall, and high-quality crop land used for both annual and specialty crop production (Netley-Grassmere Integrated Watershed Management Plan, 2008).

Samples were taken at Water Survey of Canada flow meter 05OJ017 located near Middlechurch. In 2017, 15 samples were collected between March 27th and June 14th.

- **Discharge peaked**: April 1st
- **Secondary peak**: April 18th
- **Greatest phosphorus concentration**: 786 µg/L* measured on March 27th
- **Total phosphorus load:** 12 tonnes
- **Total water load:** 0.02 km^3
- **Phosphorus export:** 0.27 kg/ha/y
- **Percent water load occurred during spring******:** 95%
- **Percent phosphorus load occurred during spring:** 98%

*The "µg" symbol is used to express micrograms

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

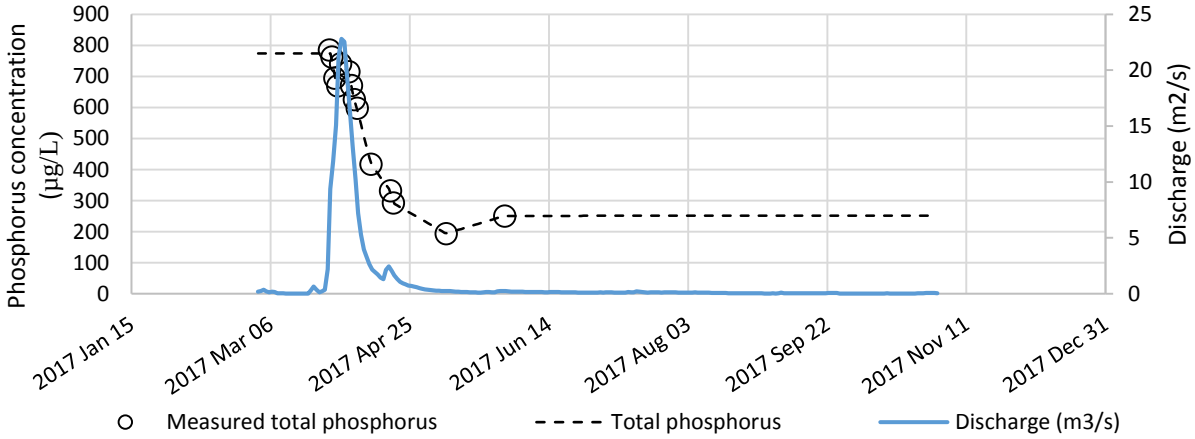

Figure 3. Discharge and total phosphorus concentration over the 2017 sampling season at the Grassmere Creek (Water Survey of Canada Station 05OJ017).

Netley Creek near Petersfield

Netley Creek is part of the larger Netley-Grassmere watershed. Netley Creek portion of the watershed is located on the western side of the Red River just below Lake Winnipeg and drains easterly. The drainage area, is 641 km^2, includes the Rural Municipality of Teulon and Winnipeg Beach, as well as high-quality crop land (Netley-Grassmere Integrated Watershed Management Plan, 2008).

The Netley Creek sample site is located at Water Survey of Canada flow meter 05OJ008, west of Petersfield. In 2017, 16 samples were collected between March 27th and July 13th.

- **Discharge peaked**: March 31st
- **Secondary peak**: April 18th
- **Greatest phosphorus concentration**: 663 µg/L measured on March 30th
- **Total phosphorus load:** 15 tonnes
- **Total water load:** 0.041 km^3
- **Phosphorus export:** 0.23 kg/ha/y
- **Percent water load occurred during spring:** 97%
- **Percent phosphorus load occurred during spring:** 100%

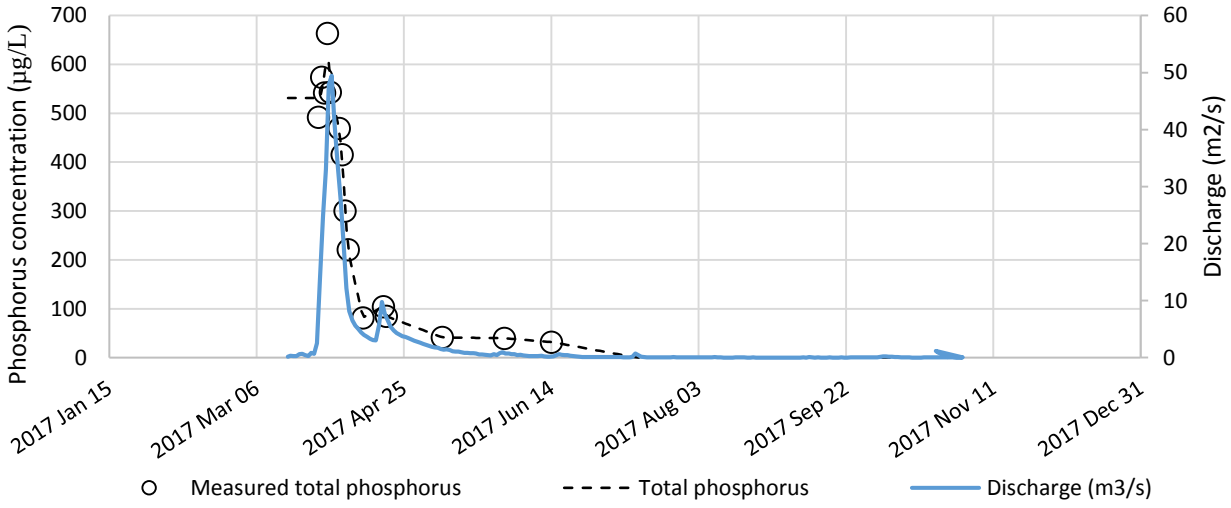

Figure 4. Discharge and total phosphorus concentration over the 2017 sampling season at the Netley Creek (Water Survey of Canada Station 05OJ008).

Icelandic River near Riverton

The Icelandic River watershed, a sub-watershed of the Icelandic River-Washow Bay Creek watershed, is located on the western side of Lake Winnipeg. The Icelandic River sample site drains an area of approximately 1240 km^2 and flows easterly towards Lake Winnipeg. The main land use within the Icelandic River watershed is agriculture, more specifically, pasture, crops and hay (Icelandic River and Washow Bay Creek Integrated Watershed Management Plan, 2008).

This sample site is located at Water Survey of Canada flow meter 05SC002, near Riverton. In 2017, 18 samples were collected between March 27th and July 20th.

- **Discharge peaked**: March 31stst
- **Secondary peak**: April 18th
- **Greatest phosphorus concentration**: 697 µg/L measured on March 29th
- **Total phosphorus load:** 41 tonnes
- **Total water load:** 0.104 km^3
- **Phosphorus export:** 0.33 kg/ha/y
- **Percent water load occurred during spring:** 96%
- **Percent phosphorus load occurred during spring:** 100%

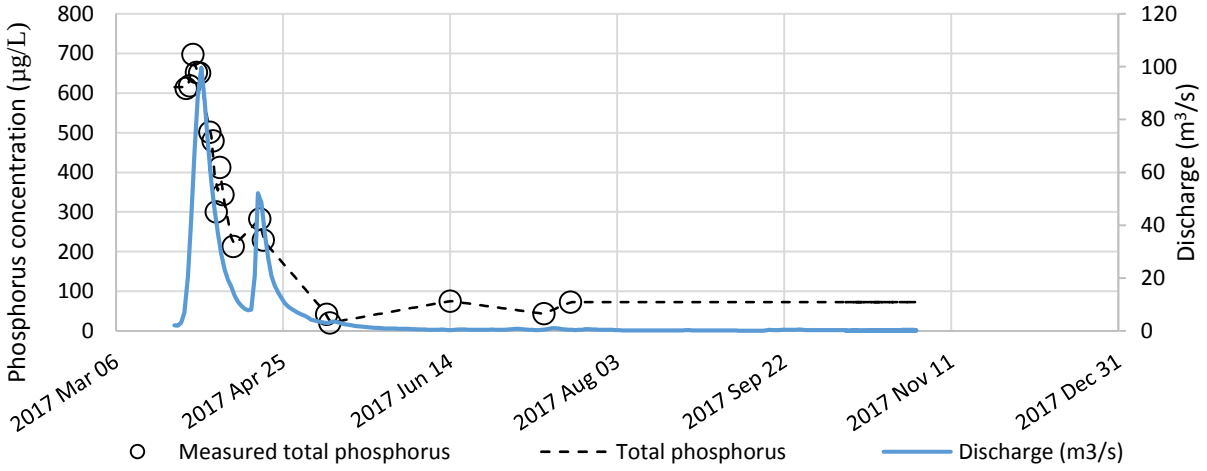

Figure 5. Discharge and total phosphorus concentration over the 2017 sampling season at the Icelandic River (Water Survey of Canada Station 05SC002).

Fisher River near Fisherton

Fisher River is the most northerly river sampled in EICD and flows north-easterly. The 601 km^2 area that drains into this site includes the Rural Municipality of Fisherton and is less densely agricultural compared to the other EICD sites. The Fisher River watershed contains many natural habitats such as forests, wetlands and peat bogs (Fisher River Integrated Watershed Management Plan, 2011).

This sample site is located at Water Survey of Canada flow meter 05SD005, near Fisherton. In 2017, 18 samples were collected between March 27th and October 3rd.

- **Discharge peaked**: March 31st
- **Secondary peak**: April 17th
- **Greatest phosphorus concentration**: 702 µg/L measured on March 29th
- **Total phosphorus load:** 7 tonnes
- **Total water load:** 0.041 km^3
- **Phosphorus export:** 0.11 kg/ha/y
- **Percent water load occurred during spring:** 82%
- **Percent phosphorus load occurred during spring:** 92%

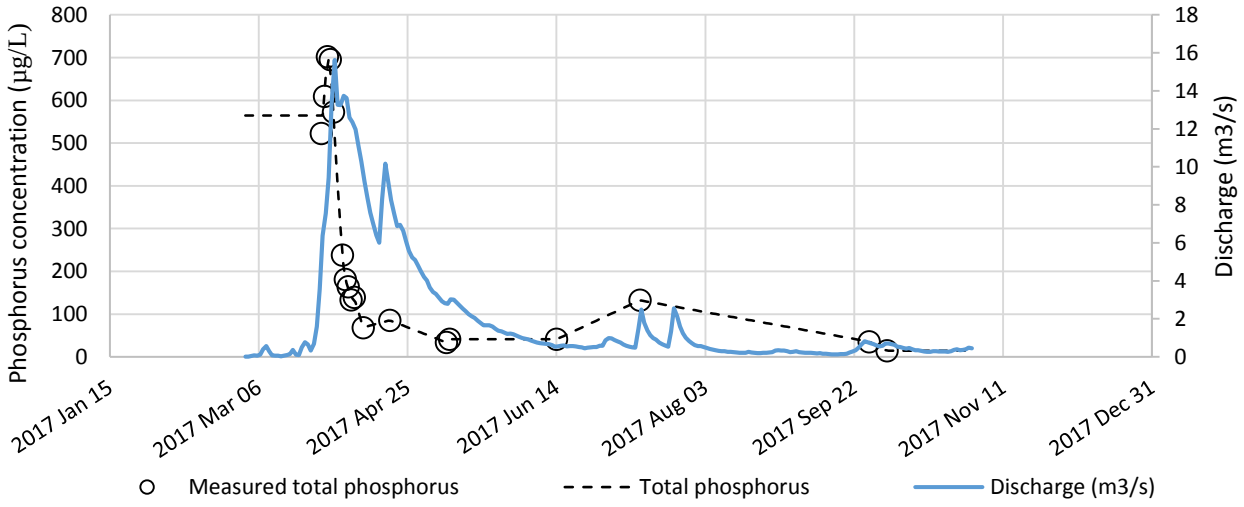

Figure 6. Discharge and total phosphorus concentration over the 2017 sampling season at the Fisher River (Water Survey of Canada Station 05SD005).

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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