LWF LAKE WINNIPEG FOUNDATION

SPRING & SUMMER 2024
*special edition

the watershed observer

Cooks Creek; Photo: Paul Mutch

Lake Winnipeg Community-Based Monitoring Network

special edition

Diving into community-based monitoring

In this special issue of the *Watershed Observer*, we're diving into the Lake Winnipeg Community-Based Monitoring Network (LWCBMN), LWF's long-term phosphorus monitoring program.

Addressing the root cause of algal blooms on Lake Winnipeg requires us to focus on phosphorus – but to effectively reduce phosphorus loading, we need to know how, when and from where phosphorus is reaching the lake.

Since 2016, LWCBMN has been generating critical water-quality data to identify phosphorus hotspots: valuable information to focus research, resources and action. Our collective efforts are providing important answers – and raising new questions.

Keep reading to learn more about how the network operates, explore findings from the 2022, 2021 and 2020 field seasons, and discover how LWCBMN is translating citizen science into freshwater solutions.

> I was drawn to support LWF because its strong advocacy is rooted in evidence-based, workable solutions to the problems facing Lake Winnipeg. I remain inspired because I have witnessed the power of LWF's persistence.
>
> - Dr. Greg McCullough, LWCBMN Science Advisor

Thank you to the following LWCBMN funders

This project was undertaken with the financial support of the Government of Canada.
Ce projet a été réalisé avec l'appui financier du gouvernement du Canada.
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lwcbmn online

Find the latest network news and explore all LWCBMN reports online at **lakewinnipegfoundation.org/evidence**.

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message from our chair

Excess phosphorus drives eutrophication in Lake Winnipeg, yet eliminating this excess phosphorus in the watershed is a challenging task. To be successful requires better knowledge about where to focus our efforts. LWF is building this needed knowledge base through community-based monitoring (CBM).

CBM is a broad term for many different activities. It can encompass citizen science initiatives involving large groups of people connecting to solve a specific problem, seen for example in the Canadian documentary, *Flight of the Butterflies*, which shows a network of volunteers assisting in locating the overwintering locations of monarch butterflies. Other CBM programs are designed to understand the regional impacts of industrial development or climate change. Indigenous guardian programs are sometimes synonymous with CBM and are embraced worldwide, designed to protect lands and rights. (On p. 10, you can learn more about how Indigenous guardians in Misipawistik Cree Nation play an important role within their community and traditional territories.)

The Lake Winnipeg Community-Based Monitoring Network (LWCBMN) is CBM with a very specific focus: to solve the very specific problem of eutrophication in Lake Winnipeg. Our volunteers collect water samples which are analyzed to determine phosphorus concentration. Combining this information with other data, we can identity areas contributing more phosphorus to waterways then other areas, known as hotspots. You'll find hotspot maps from 2022, 2021 and 2020 on pages 6, 8 and 9.

With limited funding to address freshwater health, focusing phosphorus-reduction efforts in phosphorus hotspots will show greater returns on investment. As we explain on p. 7, LWF continues to advocate Environment and Climate Change Canada to use LWCBMN data to better target federal funding and deliver results. Our ongoing monitoring can also help evaluate which phosphorus-reduction efforts (whether physical works or regulatory policies) are having the most impact.

CBM is an open door; it is shared knowledge. However, phosphorus pollution is complicated and wrapped up in our collective, multi-generational land-use decisions. Our CBM strategy therefore requires a curiosity that can lead us to new partnerships, new relationships and ultimately, changes in behaviour to protect Lake Winnipeg. Community-based monitoring is one versatile and powerful problem-solving tool!

– Bruce Maclean, Chair, LWF Board of Directors

Photo: Meghan Mills

board of directors

team effort

The ongoing commitment of many people and partners is what makes the Lake Winnipeg Community-Based Monitoring Network (LWCBMN) possible.

The dedicated individuals who head out to their local streams, creeks and culverts to collect samples throughout each field season are the backbone of LWCBMN – we simply couldn't do it without them! Because citizen scientists live, work or commute near their sampling sites, they're able to respond quickly to weather events and water conditions, filling a data gap by identifying where phosphorus is coming from. Fifty-five volunteers will be rolling up their sleeves as part of monitoring efforts in 2024!

Twelve of Manitoba's 14 watershed districts are now part of LWCBMN. In addition to assisting with sample collection, each district brings a wealth of regional expertise and valuable community connections to the network, helping us contextualize and better understand our data.

LWCBMN also works with industries: In 2019 we expanded coverage into new drainage areas thanks to partnerships with Ontario Power Generation and Manitoba Hydro, whose staff collect samples for our network at hydroelectric dams.

The Water Survey of Canada (WSC) is a national agency that collects, interprets and disseminates standardized water-resource data. Most LWCBMN sampling is conducted at locations equipped with WSC hydrometric gauges that continuously monitor water flow. Flow data is then shared online by WSC in real time – sometimes, up to multiple times an hour! By tracking water flow, LWF staff can notify LWCBMN partners and citizen scientists to ensure frequent sampling takes place during peak flows.

Collected water samples are analyzed at Canada Research Chair Dr. Nora Casson's University of Winnipeg laboratory. This ongoing lab partnership provides LWF staff with access to the specialized equipment required to process thousands of LWCBMN samples using standardized methods.

LWCBMN's customized equipment and protocols were developed by LWF science advisors to ensure our program generates high-quality results. The considerable expertise and practical experience of these advisors remain an invaluable part of our success. We greatly appreciate their ongoing guidance on collection methods, data interpretation and trouble-shooting (including adapting protocols in response to a pandemic!).

Thanks to an ongoing collaboration with The Gordon Foundation, our phosphorus concentration data are available on Lake Winnipeg DataStream, an open-access online portal. Our goal is for LWCBMN data to be used by community practitioners, researchers, government policy-makers and anyone else working to advance evidence-based freshwater stewardship.

LWF Programs Director Chelsea Lobson collects a water sample at Cooks Creek. Photo: Paul Mutch

journey of a sample

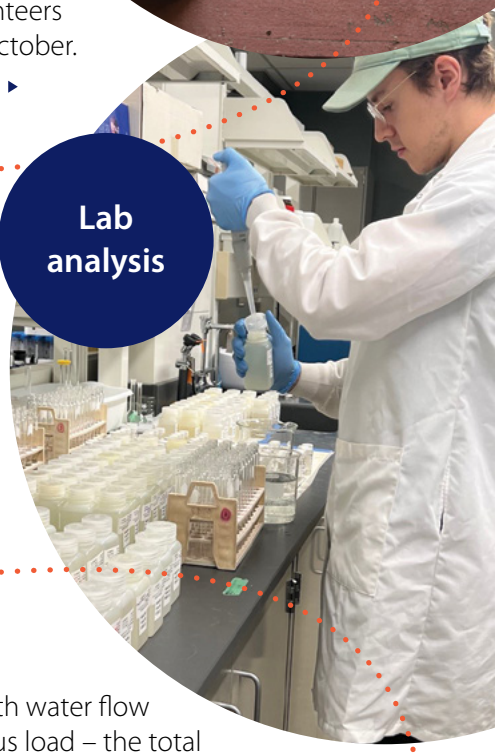
Follow along to learn how the Lake Winnipeg Community-Based Monitoring Network (LWCBMN) generates the data needed to identify phosphorus hotspots!

Sample collection

LWCBMN citizen scientists collect samples frequently throughout the season to ensure we are capturing phosphorus runoff when it matters most. A whole water sample measures total phosphorus (the same measurement used by provincial and federal monitoring programs) while a filtered water sample measures dissolved phosphorus, the portion that's more bioavailable for algal growth.

In preparation for the 2024 season, LWF staff assembled and distributed 2,510 sample packs! These will be used by volunteers and watershed partners at 125 sites from snow melt until October.

LWCBMN volunteer Carla Keast collects a water sample from Truro Creek; Photo: Paul Mutch ▶



Lab analysis

Collected LWCBMN samples are analyzed by LWF Field & Data Technician Karl Friesen-Hughes. Using the same method as other government water-monitoring programs, a chemical which reacts to the presence of phosphorus is added to samples. A device called a spectrophotometer then measures light absorbance, enabling us to quantify phosphorus concentration.

We engage in regular proficiency testing, analyzing standard samples sent to labs across the country to ensure our methods are credible and defensible. In 2023, we received an excellent passing grade of 92/100 from **Proficiency Testing Canada**.

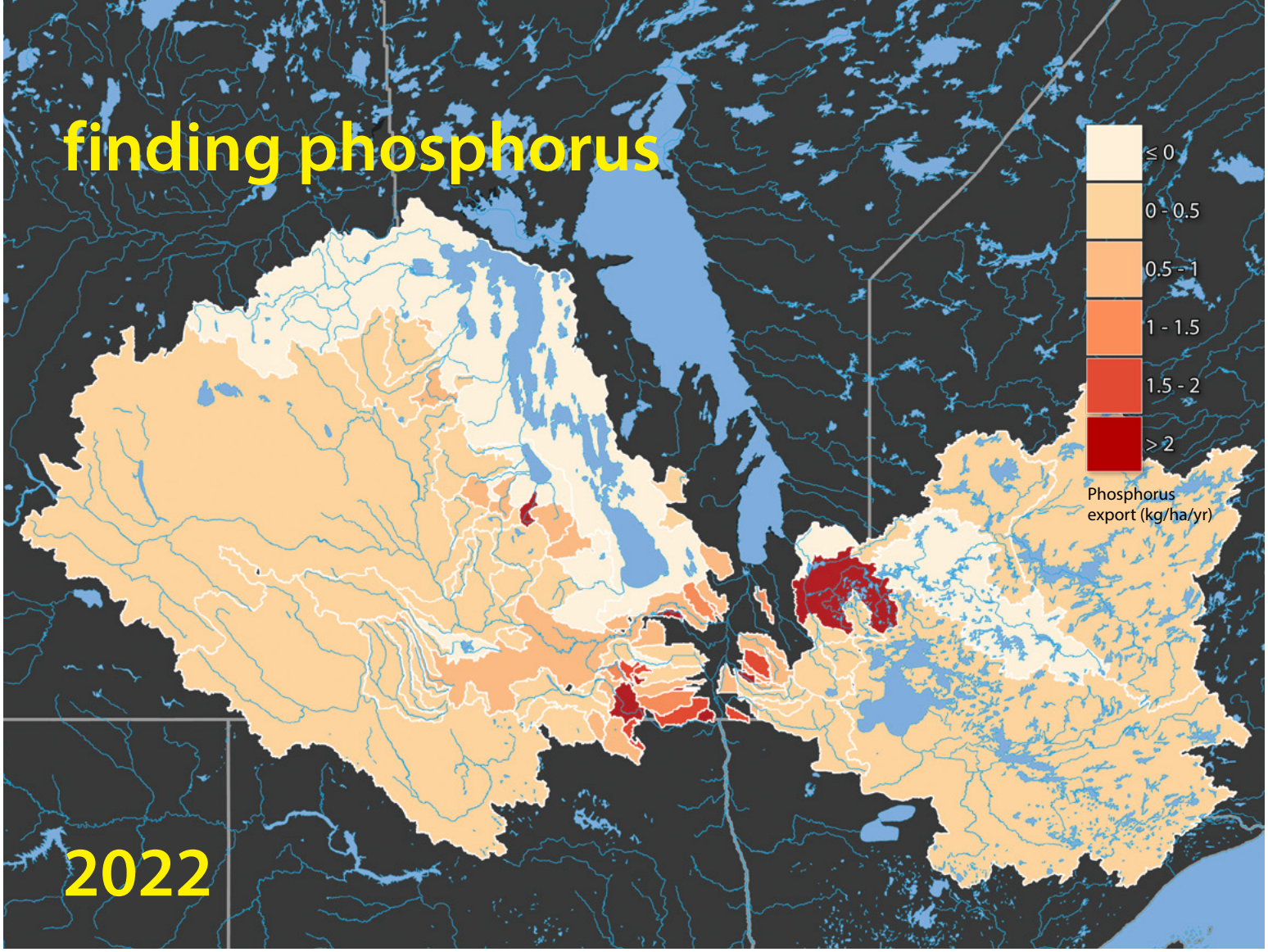
LWF Field & Data Technician Karl Friesen-Hughes analyzes collected LWCBMN samples; Photo: Claire Harvey ▶

Data analysis

Phosphorus concentration from our lab analysis is combined with water flow data from Water Survey of Canada (WSC) to calculate phosphorus load – the total amount of phosphorus flowing past a site in a field season. Using drainage area data from WSC and Agriculture and Agri-Food Canada, we also calculate phosphorus export – the amount of phosphorus exported from each hectare of land in each unique drainage area, expressed as kilograms per hectare per year. Phosphorus exports are then mapped in geographic information systems (GIS) to create colour-coded hotspot maps.

Data sharing

Annual regional reports provide a detailed look at site-specific data collected from each sampling region, useful information for land managers and policy-makers. Larger-scale maps and interannual data trends are generated for LWF members to share key lessons we are learning through our efforts. Phosphorus concentration data are also available online at **lakewinnipegdatastream.ca**.



Phosphorus export (kg/ha/yr) from drainage areas sampled in 2022, LWCBMN's seventh field season.

Persistent hotspots focus our efforts

In 2022, LWCBMN identified recurring phosphorus hotspots in Manitoba's Red River Valley, with high exports occurring in the Seine River watershed in southeastern Manitoba. These hotspots have appeared repeatedly since LWCBMN has been collecting data – in all but the extreme drought years of 2018 and 2021.

Winnipeg River hotspots also re-appeared in 2022; the third time in as many years of sampling this region that we've seen high exports from the western edge of this watershed. While this suggests a trend, these hotspots are not consistently appearing in the same locations each year. This is perplexing and something we will be investigating.

Snow melts, floods and heavy rainfalls are responsible for most of the phosphorus flushed from the land into our waterways – and 2022 was extremely wet. Southern Manitoba received the third highest amount of snow since 1872 in the preceding winter, while record precipitation in April and May fell on mostly frozen soils, leading to flooding across the region.

As LWCBMN's ongoing efforts are demonstrating, phosphorus loading is a function of both water flow and concentration. In wet years, the higher volume of water in Lake Winnipeg's tributaries means more water is available to carry phosphorus to the lake. As well, phosphorus concentrations within these waterways are typically higher during floods since floodwater sits on the surrounding land for extended periods of time. This allows phosphorus within the soil to dissolve into the standing water, a process not unlike steeping tea.

Phosphorus hotspots which persist over multiple years are where we need to direct our efforts. Informed by LWCBMN data, LWF's 2023-2027 strategic plan focuses our attention on persistent Seine River hotspots. By adding more sampling sites, we can break down this hotspot into even smaller drainage areas and generate the higher-resolution data needed to pinpoint phosphorus sources.

from data to impact

How community-based monitoring can inform freshwater policy

The Lake Winnipeg Community-Based Monitoring Network (LWCBMN) has generated a credible and valuable dataset that dates back to 2016. However, to meaningfully address eutrophication and protect Lake Winnipeg, data must not only be collected: it must also be used. Ensuring community-based monitoring initiatives like LWCBMN have the capacity to analyze, interpret and disseminate information will ensure that community-based monitoring data get used to answer the questions that prompted the data collection in the first place.

Decades of research have demonstrated that excess phosphorus drives the growth of harmful algal blooms in freshwater ecosystems. LWCBMN's goal is to support better regional decision-making by providing information about where the phosphorus affecting Lake Winnipeg is coming from. When land managers, researchers, government scientists and policy-makers have accessible, reliable information about phosphorus hotspots, their work can be targeted in these areas, resulting in greater impact.

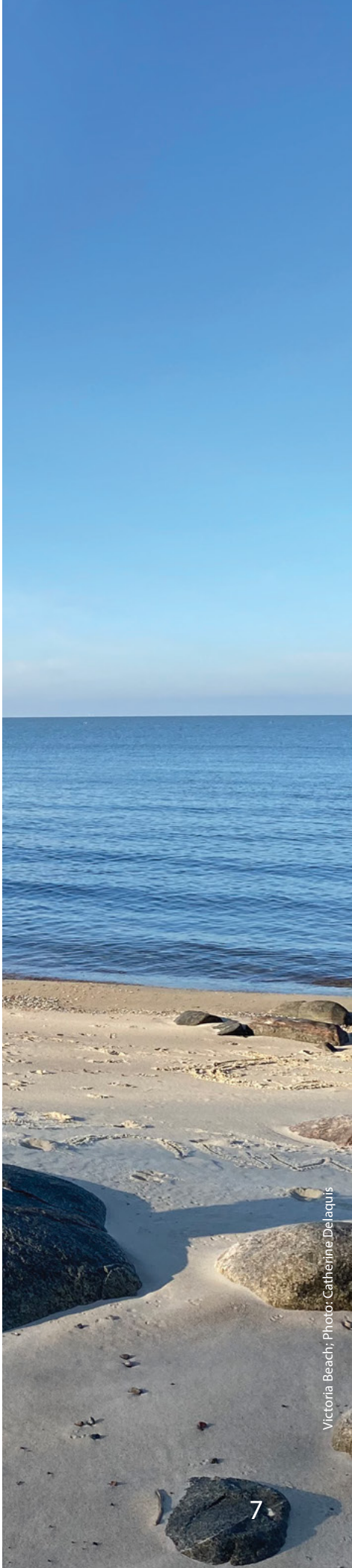
Our network can also play an important role in measurement and evaluation. Because LWCBMN's citizen volunteers and watershed district partners are dispersed across Manitoba, they can sample more frequently over a much larger landscape than a centralized, institutional monitoring program, capturing phosphorus data from many smaller streams throughout the watershed. What's more, having an on-call group of dedicated individuals and organizations means that unlike more rigid programs with pre-set monitoring schedules, LWCBMN can respond quickly to changing weather events and water conditions, critical times for phosphorus exports.

LWCBMN data can also be used to demonstrate whether individual phosphorus-reduction projects are achieving their goals and help evaluate the collective impact of initiatives happening across the larger watershed. This directly aligns with the goals of the Lake Winnipeg Basin Program (LWBP), a federal funding program to reduce phosphorus loading to improve Lake Winnipeg water quality.

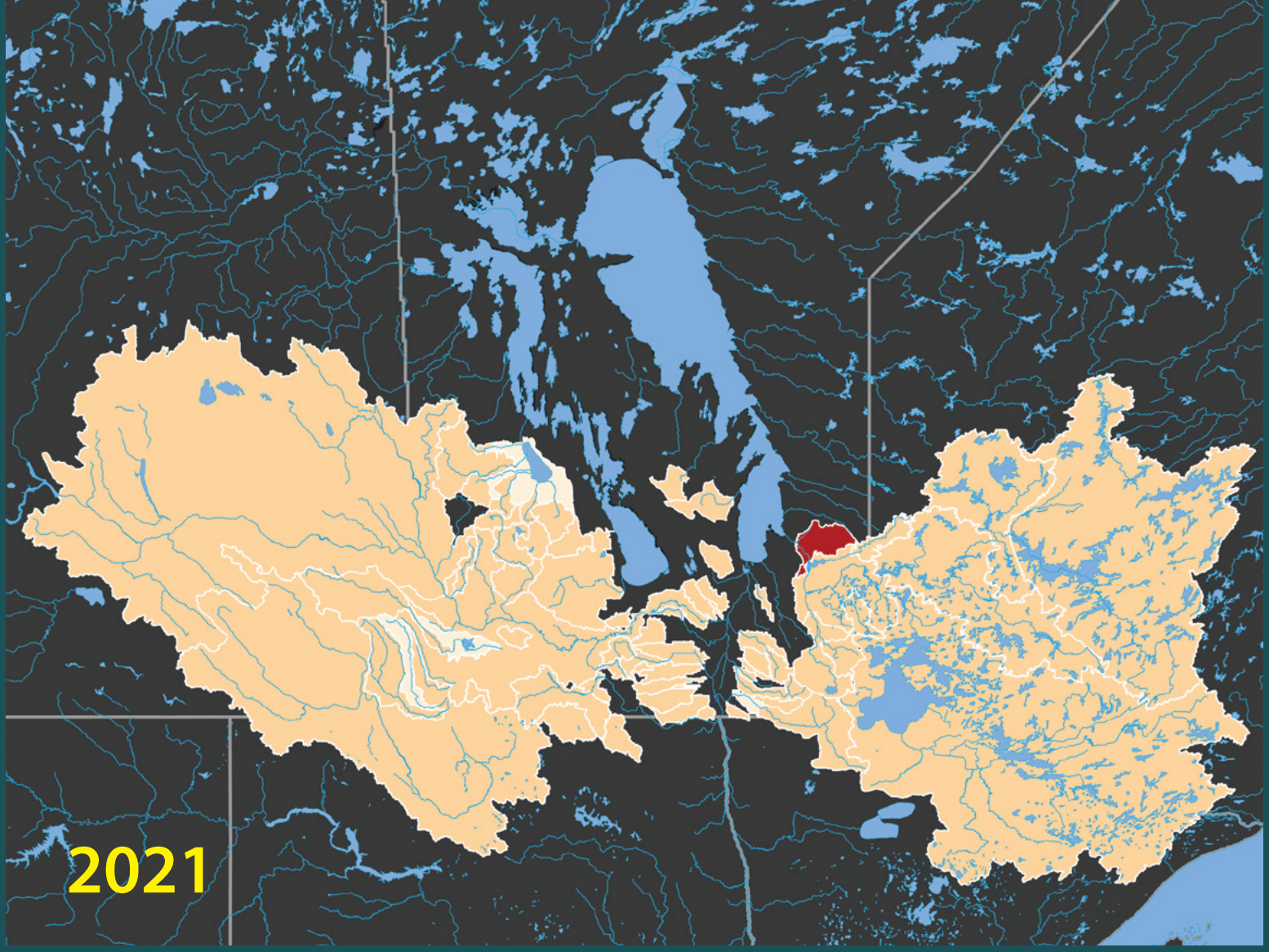
LWBP was renewed as part of the 2023 federal budget, and the program's eligibility requirements now explicitly mention the government's intention to fund phosphorus-reduction projects in known hotspots. However, LWCBMN phosphorus data have not yet been integrated into the program's design. This is a missed opportunity to fully realize the potential of community-based monitoring to guarantee impact from federal investments for Lake Winnipeg.

To date, LWCBMN hotspot data have been used by academic scientists to guide the location of research projects exploring phosphorus runoff from agricultural landscapes and the efficacy of different beneficial management practices, and by watershed districts seeking funding to implement phosphorus-reduction projects in rural areas to improve water quality.

LWCBMN data provides the evidence necessary to effectively address the eutrophication of Lake Winnipeg. We continue to recommend that LWCBMN data be used by Environment and Climate Change Canada to direct funding decisions, improve accountability and achieve measurable results.



Victoria Beach; Photo: Catherine Delaquis



Phosphorus export (kg/ha/yr) from drainage areas sampled in 2021.

Long-term monitoring matters

The small amount of snowmelt in early spring and drought-like conditions throughout the summer resulted in low water flow and low phosphorus exports across all regions. Some LWCBMN sites completely dried up during the 2021 season; as a result, fewer water samples were collected. Yet surprisingly, even with these dry conditions, 2021 saw the return of phosphorus hotspots in the Winnipeg River watershed. These hotspots were first identified in 2019, the first year LWCBMN began sampling in this region.

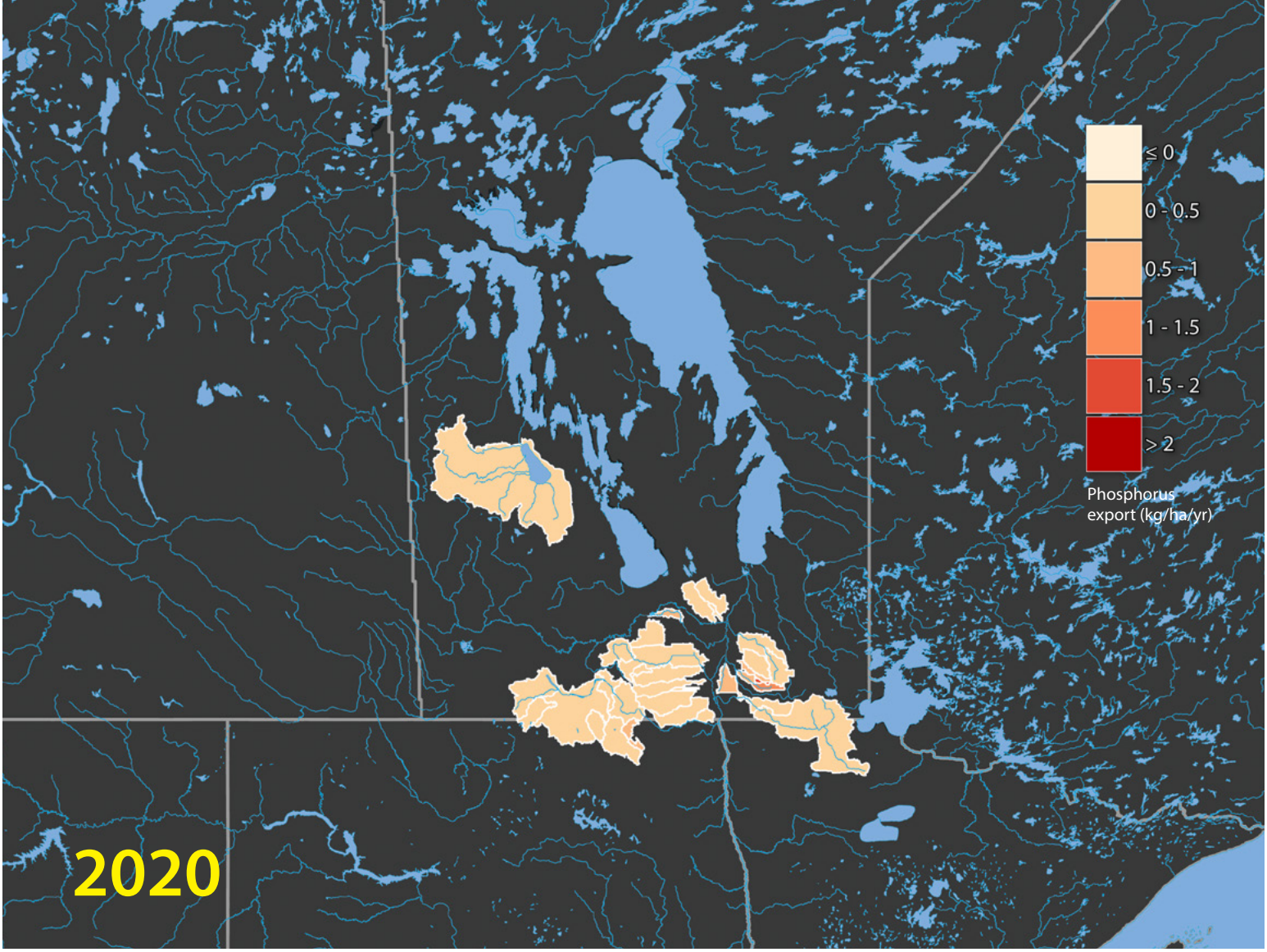
Interannual variation in precipitation and temperature can greatly affect monitoring outcomes. This is why consistent data collection is so important: multiple years of data are needed before we can confidently identify patterns and trends.

Still, the Winnipeg River hotspots have piqued our curiosity.

According to the 2020 State of Lake Winnipeg Report, the Winnipeg River contributes a much smaller proportion of the total phosphorus load to Lake Winnipeg than the Red River (14 per cent verses 69 per cent). But calculating phosphorus load requires both phosphorus concentration and water flow – and water flow from the Winnipeg River to Lake Winnipeg is significantly higher than flow from the Red.

From 2008 to 2016, average discharge from the Winnipeg River was 1,084 cubic metres per second (m^3/s) compared to the Red River's 292 m^3/s. With such a high flow of water, even small changes in phosphorus concentration in the Winnipeg River can result in a significant increase in load.

Many other factors could be contributing to changes in phosphorus concentration in the Winnipeg River. Unexpected results that persist beyond one season merit more research and highlight the critical importance of long-term monitoring.



Phosphorus export (kg/ha/yr) from drainage areas sampled in 2020.

The value of a nimble network

The 2020 spring melt coincided with the arrival of the COVID-19 pandemic to Manitoba. While many monitoring programs across Canada temporarily shut down, the nimble, flexible nature of LWCBMN meant LWF and our science advisors were able to quickly adapt sampling protocols to comply with public health guidelines while also maintaining the scientific integrity of our collection process. Monitoring activities were reduced – which is why the 2020 LWCBMN export map looks so different when compared to other years – but sample collection continued in priority locations. This enabled LWCBMN to maintain data continuity, a vital aspect to any long-term monitoring program.

From March to May 2020, most of southern Manitoba experienced extremely dry conditions. Not surprisingly, low phosphorus exports were reported in almost all LWCBMN-monitored drainage areas.

The hotspots that did appear were located in the Seine River watershed – an area which has consistently shown high phosphorus exports since LWCBMN first began operations in 2016.

Much of the land within the Seine River watershed is used for agriculture, including cereal crops and high-density livestock production. The region, like many sampled by LWCBMN, also includes municipal wastewater treatment plants and sewage lagoons.

LWCBMN phosphorus export data tells us the "where" – not the "why." Further research is required to understand whether exports are being driven by point sources or non-point sources, and whether other factors are also at play. As we generate data, we will continue to work with our on-the-ground watershed district partners who can help us contextualize and interpret results.

eyes and ears on the land

Understanding the role of Indigenous guardians

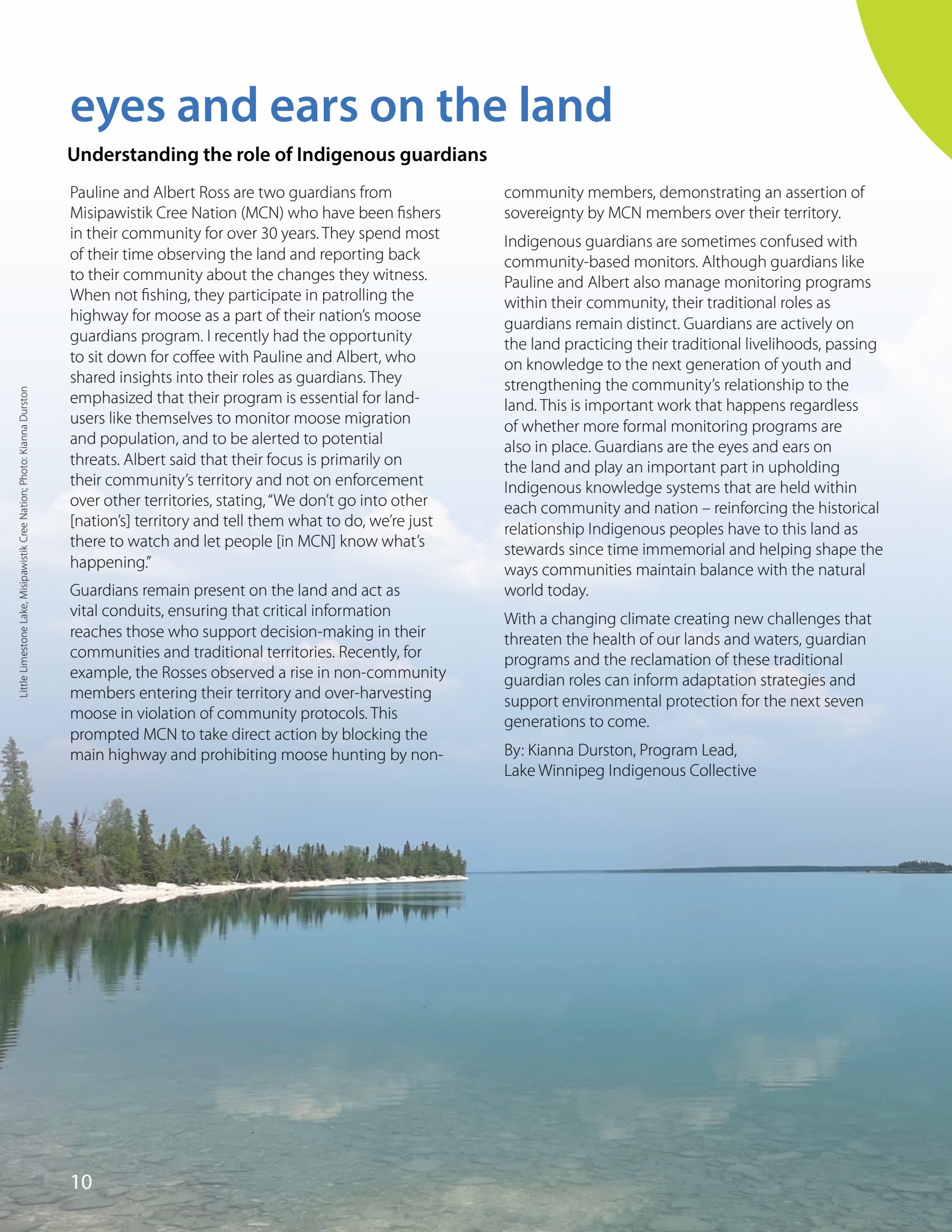
Pauline and Albert Ross are two guardians from Misipawistik Cree Nation (MCN) who have been fishers in their community for over 30 years. They spend most of their time observing the land and reporting back to their community about the changes they witness. When not fishing, they participate in patrolling the highway for moose as a part of their nation's moose guardians program. I recently had the opportunity to sit down for coffee with Pauline and Albert, who shared insights into their roles as guardians. They emphasized that their program is essential for land-users like themselves to monitor moose migration and population, and to be alerted to potential threats. Albert said that their focus is primarily on their community's territory and not on enforcement over other territories, stating, "We don't go into other [nation's] territory and tell them what to do, we're just there to watch and let people [in MCN] know what's happening."

Guardians remain present on the land and act as vital conduits, ensuring that critical information reaches those who support decision-making in their communities and traditional territories. Recently, for example, the Rosses observed a rise in non-community members entering their territory and over-harvesting moose in violation of community protocols. This prompted MCN to take direct action by blocking the main highway and prohibiting moose hunting by non-community members, demonstrating an assertion of sovereignty by MCN members over their territory.

Indigenous guardians are sometimes confused with community-based monitors. Although guardians like Pauline and Albert also manage monitoring programs within their community, their traditional roles as guardians remain distinct. Guardians are actively on the land practicing their traditional livelihoods, passing on knowledge to the next generation of youth and strengthening the community's relationship to the land. This is important work that happens regardless of whether more formal monitoring programs are also in place. Guardians are the eyes and ears on the land and play an important part in upholding Indigenous knowledge systems that are held within each community and nation – reinforcing the historical relationship Indigenous peoples have to this land as stewards since time immemorial and helping shape the ways communities maintain balance with the natural world today.

With a changing climate creating new challenges that threaten the health of our lands and waters, guardian programs and the reclamation of these traditional guardian roles can inform adaptation strategies and support environmental protection for the next seven generations to come.

By: Kianna Durston, Program Lead,
Lake Winnipeg Indigenous Collective



Little Limestone Lake, Misipawistik Cree Nation; Photo: Kianna Durston

your impact

> Lake Winnipeg is a huge lake, its watershed is massive, and the phosphorus comes from a multitude of sources. One person cannot solve this alone. Instead of feeling overwhelmed by the problem, I am contributing to a solution.
>
> - Carla Keast, LWCBMN citizen scientist

Donor-driven advocacy

The Lake Winnipeg Community-Based Monitoring Network is building our understanding of where and when phosphorus loading to Lake Winnipeg occurs.

Thanks to the passionate advocacy of LWF's membership community, we are taking what we're learning to decision-makers. Together, we're pushing for evidence-based policy and the targeted implementation of on-the-ground solutions in known phosphorus hotpots to reduce phosphorus loading and improve water quality.

Your sustained support makes this data-to-impact cycle possible. Thank you.

Stay connected at **lakewinnipegfoundation.org** and through social media for the latest updates on opportunities to get involved this summer – including Bike to the Beach, Walk for Water, education events in Silver Harbour and Victoria Beach, and more! When you join in, you are ensuring our efforts to protect Lake Winnipeg continue, now and for future generations.

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special edition

Volunteer citizen scientists are the backbone of the Lake Winnipeg Community-Based Monitoring Network. In this special-edition newsletter, we're taking a closer look at LWF's long-term phosphorus monitoring program.

LWCBMN volunteer Megan Carrier at a Seine River sampling site; Photo: Paul Mutch

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