LWF LAKE WINNIPEG FOUNDATION

Presentation to the International Joint Commission
Re: Proposed Nutrient Concentration Objectives and Loading Targets for the Red River at the US/Canada Boundary

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To address water quality in the Red River watershed and in downstream Lake Winnipeg, we need to focus on phosphorus. The Lake Winnipeg Foundation supports the phosphorus objective proposed for the Red River at Emerson. However, based on the best available science and on the IJC's own recommendations in other jurisdictions, the Lake Winnipeg Foundation does not support the proposed nitrogen objective.

A science-based approach to water-quality management in the Red River watershed must first acknowledge that phosphorus is the cause of algal blooms in freshwater ecosystems, including Lake Winnipeg.

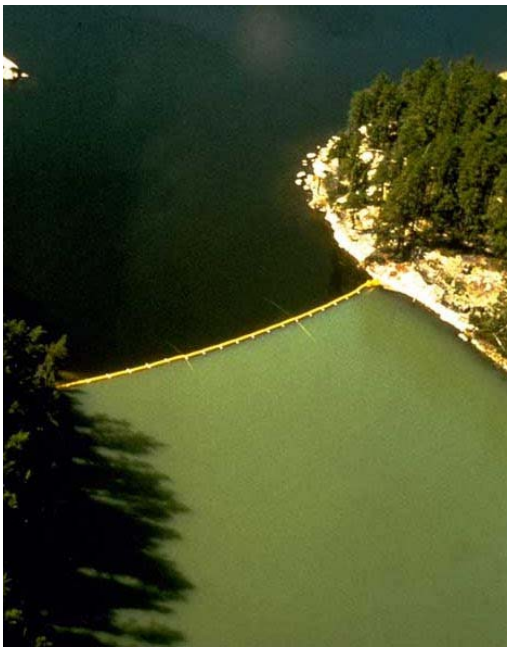

Figure 1. Lake 226 at the Experimental Lakes Area. Nitrogen and carbon are added to the top basin, while nitrogen, carbon and phosphorus are added to the lower basin. The basin with phosphorus added developed blue-green algal blooms – the other basin did not.

The role of phosphorus in promoting algal growth has been demonstrated over five decades of research in freshwater lakes in Northwestern Ontario, at the Experimental Lakes Area. Most recently, a paper by Higgins et al. (2018) demonstrated that total reduction of anthropogenic nitrogen loading had no impact in reducing algal biomass in eutrophic lakes. These studies demonstrate the critical importance of focusing on phosphorus to address algal blooms and make effective use of limited resources.

The solutions we apply to reduce phosphorus will necessarily be site-specific. But the physiology of the algae we are fighting is not. Cyanobacteria – blue-green algae – is present in lakes around North America. It relies on dissolved reactive phosphorus in the water to grow, and it pulls its own nitrogen from the atmosphere – literally out of thin air. This is one of its incredible evolutionary advantages, and it's the reason why reducing nitrogen doesn't reduce blue-green algae – in fact, it plays to the algae's own unique adaptation.

For valuable lessons on reducing algal blooms, we here in the Red River basin can look to Lake Erie. Responding to the whole-ecosystem science produced at ELA, jurisdictions around Lake Erie reduced municipal phosphorus loading in the 1980s and the lake's water quality improved – touted at the time as a global success story.

Unfortunately, severe algal blooms are now recurring in Lake Erie. This is not because of nitrogen – it's because surrounding jurisdictions didn't address all sources of phosphorus the first time around – they ignored diffuse non-point sources in the 1980s. Learning from Lake Erie, we must ensure that here in the Red River watershed, we have the capacity and resources necessary to deal with both municipal and agricultural sources of phosphorus in tandem. Undeniably, this is a significant undertaking.

The nitrogen limits proposed here for the Red River contradict the IJC's own focused and science-based approach to improve water quality in Lake Erie. In its 2014 report "A Balanced Diet for Lake Erie," the IJC states that:

"*the single most important solution for the restoration of Lake Erie water quality is the reduction of phosphorus inputs."* (International Joint Commission, 2014).

The report also acknowledges that "*the recent accelerating decline of this lake, manifested as impaired water quality, massive summer-long algae blooms, hypoxia and fish kills, has focused binational attention on the need for urgent actions to reduce external inputs of phosphorus.*"

And the report acknowledges that all sources of phosphorus must be addressed to successfully improve water quality. While the primary focus in the 1980s was phosphorus from municipal sewage, today phosphorus loads come largely from diffuse non-point sources such as fertilized farm fields and livestock operations. These sources, too, must be addressed.

Learning from the IJC's own work over the last fifty years in Lake Erie, we need to maintain a strict and science-based focus on phosphorus in the Red River watershed; this will ensure we

can commit the attention and resources required to tackle both municipal and agricultural phosphorus sources effectively.

ELA's whole-ecosystem, multi-decade research tells us that setting nitrogen targets for the Red River will – at best – have no beneficial effect on water quality downstream. Our own experience on Lake Winnipeg tell us that setting unnecessary nitrogen targets will – at worst – distract us from focusing on phosphorus and delay action. We can no longer afford this. It's time to get on with the huge and necessary task of reducing phosphorus from all sources, to make real improvements in water quality.

References

Higgins, S.N., Paterson, M.J., Hecky, R.E., Schindler. D.W., Venkitswaran, J.J., & Findlay, D.L. (2018). Biological nitrogen fixation prevents the response of a eutrophic lake to reduced loading of nitrogen: evidence from a 46-year whole-lake experiment. Ecosystems 21: 1088-1100.

International Joint Commission (2014). A Balanced Diet for Lake Erie: Reducing Phosphorus Loadings and Harmful Algal Blooms. Report of the Lake Erie Ecosystem Priority.

The Lake Winnipeg Foundation (LWF) advocates for change and co-ordinates action to improve the health of Lake Winnipeg. Our long-term goal is to ensure policy and practices informed by evidence are implemented and enforced.

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