

Qu'Appelle Nutrient Mass Balance Studies

Plain Language Summary

The growth of bloom forming algae can cause poor water quality for recreation. Some types of algae also produce toxins, which can be dangerous for humans, pets, and livestock. Algal blooms form for several reasons but the level of nutrients is important. Higher levels of nutrients can support higher levels of algae. Two important nutrients related to algal growth in lakes are phosphorus and nitrogen and thus, it is important to know where nutrients come from and how levels change under different situations

The soils in the prairie region of Canada naturally have higher levels of nutrients; however, human activities also contribute nutrients to waterways. These studies measuring the nutrients in the Qu'Appelle River provide important information on nutrients entering the river. The studies present data on the large decrease in nutrients from Regina's wastewater treatment plant (WWTP).

The studies also looked at nutrient levels entering the Qu'Appelle River from tributary streams and how nutrient levels changed in the river as it flows downstream.

Study #1

The first study occurred during a very wet period that generated high runoff. During this period the larger Moose Jaw Creek and Wascana Creek tributaries were important sources of nutrients to the Qu'Appelle River. The rest of the tributaries were collectively important but individually were smaller sources of nutrients. Water quality in the Qu'Appelle River changed downstream of Buffalo Pound due to tributary inflows.

Study #2

The second study focused on the mid-reach of the Qu'Appelle River between Buffalo Pound Lake and the outflow from Katepwa Lake.

Most of the flow downstream of the Moose Jaw Creek confluence came from Buffalo Pound Lake and, unlike the first study, water quality did not change as dramatically downstream of Buffalo Pound. The lower runoff and lower water level in some lakes influenced water quality.

Last Mountain Lake

During the first study, Last Mountain Lake water levels were high. This resulted in high outflows at times that diluted nutrient levels in the Qu'Appelle River, especially during the winter. In the second study water levels on Last Mountain Lake were low. Water flowed into the Last Mountain Lake for much of the year to help stabilize water levels.

Last Mountain Lake is a somewhat unique water body because the outflow channel at the south end of the lake can also be an inflow channel. Whether the channel acts as an inflow or outflow depends on water levels in the lake, water levels in the Qu'Appelle River, and operations at the Craven dam.

Lower Qu'Appelle lakes

The lower Qu'Appelle lakes (Pasqua to Katepwa, Crooked, and Round) were found to trap nutrients. This means that more nutrients enter the lakes than leave the lakes. This is common for most lakes. This occurs when organisms that take up these nutrients die and settle to the lake bottom. Nitrogen can also decrease if nitrogen from organic sources is processed by certain bacteria resulting in it being lost to the air. During these studies a third or more of phosphorus and nitrogen was retained in these lakes.

Wastewater Treatment Plant

The total amount of nutrients from Regina's WWTP were significantly lower during this study because of the WWTP upgrades in 2017. Phosphorus decreased by 41 per cent and nitrogen by 75 per cent. As expected during periods of low flows, the transport of nutrients was much lower.

Summary

These studies and ongoing water quality monitoring by the WSA contribute to our knowledge of how the system operates, where nutrients come from and how the amounts of nutrients have decreased, notably in response to Regina's recent WWTP upgrades.

WSA also monitors water quality in Qu'Appelle River lakes to better understand their nutrient dynamics.