Natural Wetlands As Additional Wastewater Treatment For Phosphorus Removal In Lake Manitoba First Nation Community

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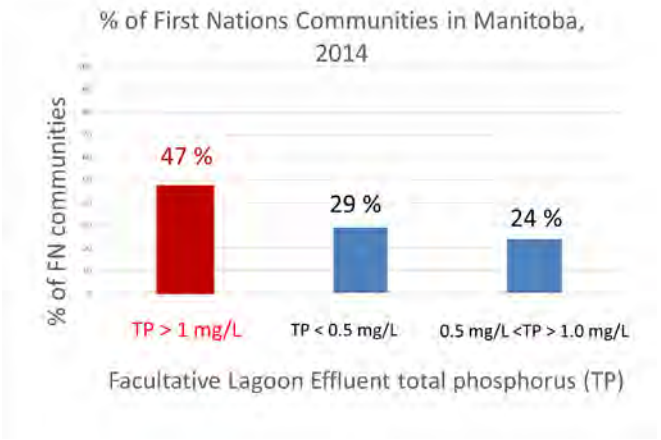
Total Phosphorus (TP)	*The Water Protection Act*	< 1 mg/L

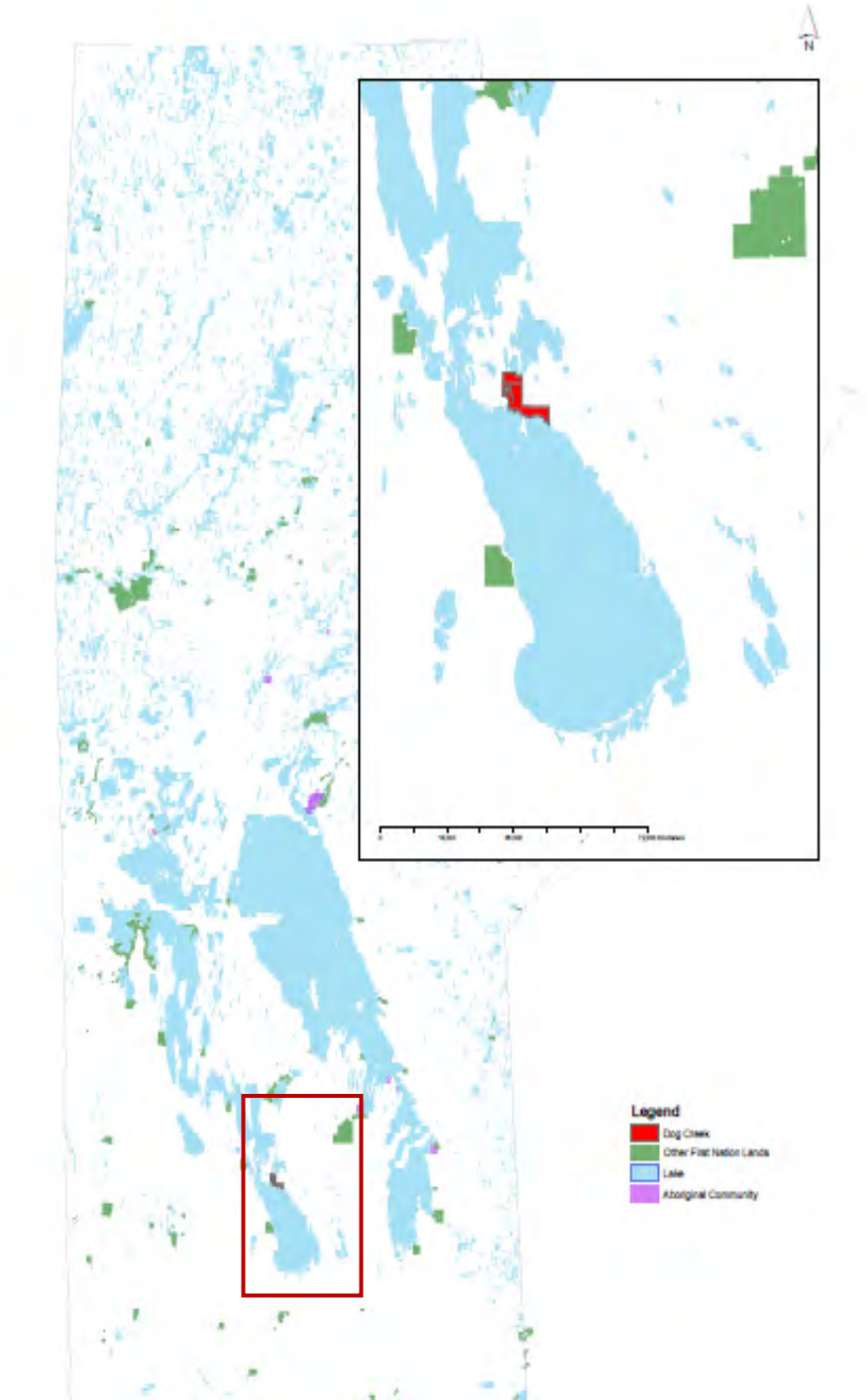


Data courtesy of INAC, 2015

Additional wastewater treatment for phosphorus removal – natural wetlands

Location of natural wetland + lagoons	Discharging period	Phosphorus reduction %
Riding Mountain National Park marsh, Manitoba	Seasonally	61 – 78 %
The River Hebert marsh, NS	Bi -Weekly	90%
Houghton lake, MI	Seasonally	94%
Clermont, FL	Weekly	94%

Phosphorus Retention in wetlands
Sedimentation / peat accretion
Uptake by biomass for growth
Chemical sorption within wetland



Animo-ziibiing (Lake Manitoba) First Nation - Dog Creek 46 / Treaty 2, 1871

- Situated at location in **marshy areas**, sitting on limestone/dolomite bedrock
- Population- 680 residents – wastewater - 2 cells **facultative lagoons** -1 primary cell / 1 secondary cell
- Designed in **1975** to serve school and teacher's residence facilities with **53 m3/day** influent flow
- Estimated today's flow **198 m3/day** due to septic tanks that are overloaded at several homes
- **Discharges lagoon effluent** in adjacent marsh wetland – seasonally, **once or twice per year**
  - 2014. July effluent TP = 2.05 mg/L
  - 2015. July effluent TP = 1.80 mg/L

Research objectives

- Determine TP load from lagoon treated wastewater into wetland
- Determine TP reduction within wetland
- Estimate changes of TP content within soil depth in wetland before and after receiving treated wastewater during vegetation growth season

Wastewater Discharge in June, 2015

Discharge Flow = 2823 ± 197 m^3/day

Volume = 4376 m^3

Area = 1.3 ha

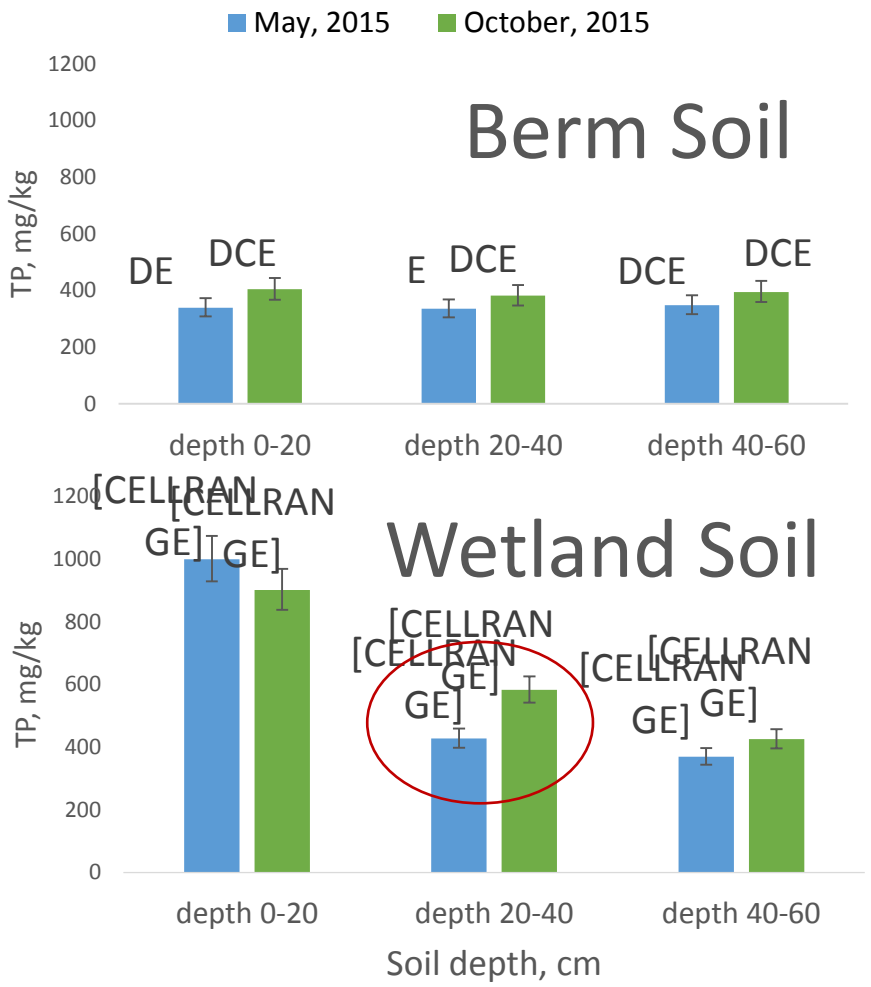
TP Load = 5 kg/day; 0.62 g/m^2/yr

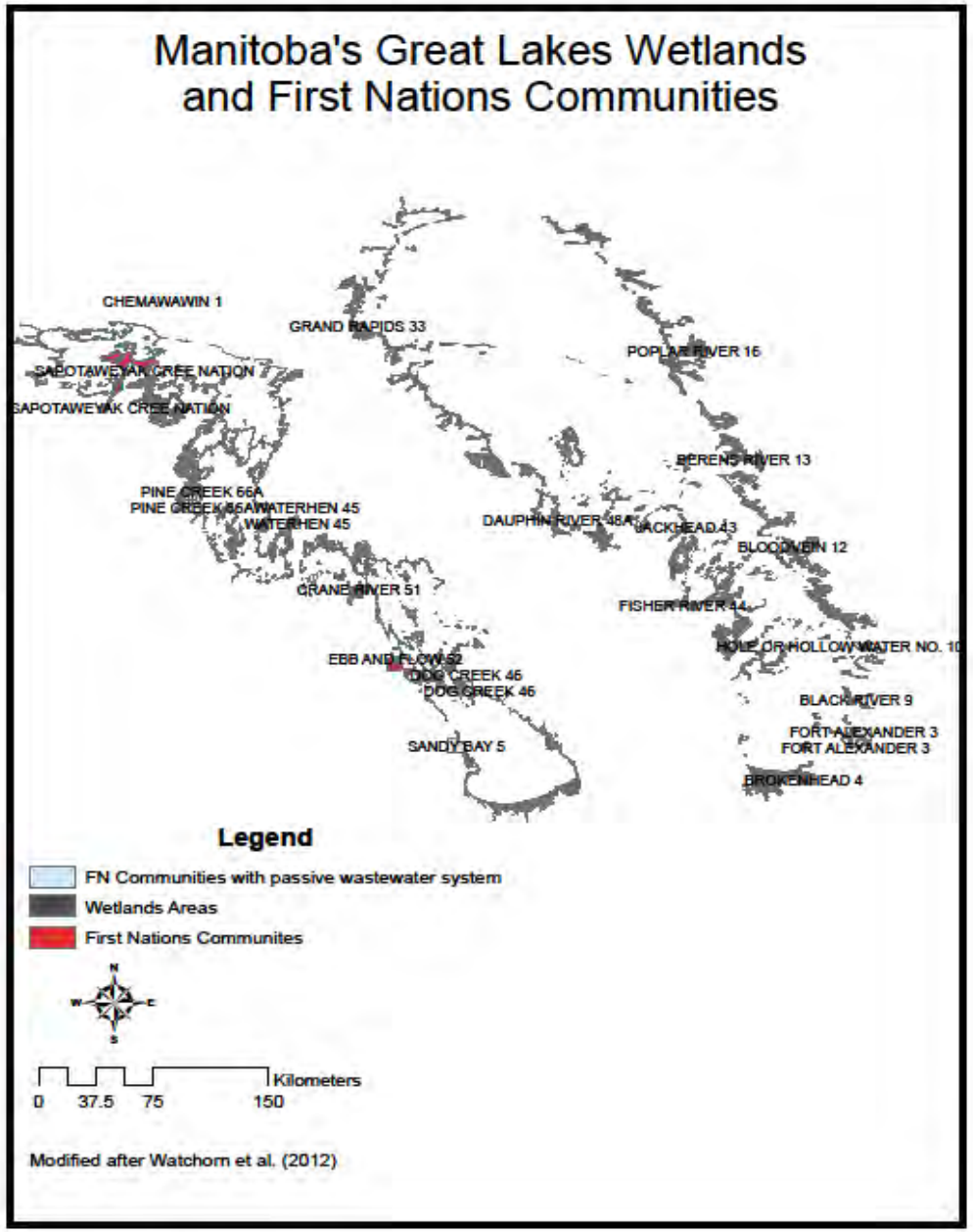
June – October, 2015

TP Reduction Wetland = 78 %

Lake Manitoba First Nation community aerial image, April 2015

Results: May – October TP changes in **SOIL SAMPLES** impacted by discharge of treated wastewater





Conclusions and Recommendation

- TP reduction (78 %) corroborates with other studies
- Accumulation of TP in soil depth of 20- 40 cm
- Wetland delineation in Manitoba's Great Lakes indicates 19 communities that may utilize ability of wetland to polish phosphorus levels from treated wastewaters in which 4 communities have already used passive wastewater treatment
- Harvest the vegetation during vegetation growth
- Continue to monitor wetlands TP inputs and outputs, include monitoring of precipitation, evapotraspiration and groundwater discharge recharge

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