FEBRUARY 04 | 2020

Cleaning-Up Lake Simcoe

A DISCUSSION PAPER

LAKE SIMCOE WATCH

Introduction

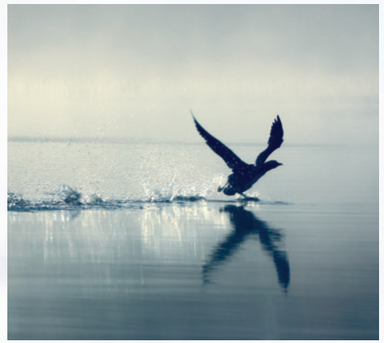
The phosphorus pollution reaching Lake Simcoe must be reduced by

55%

to 44 tonnes per year[1]

According to the Government of Ontario's Lake Simcoe Protection Plan (LSPP), to improve the water quality of Lake Simcoe (e.g., reduction of weeds and algae blooms) and to protect the lake's cold-water fishery (e.g., lake trout and whitefish) the phosphorus pollution reaching Lake Simcoe must be reduced by 55% to 44 tonnes per year.[1]

The Mayors of Aurora, Barrie, Bradford-West Gwillimbury, Brock, Georgina and Oro-Medonte have all called for the development and implementation of a plan to achieve the LSPP's phosphorus reduction target by 2026.[2]



Unfortunately, despite the fact that the LSPP was released more than 10 years ago, the province and our local governments have not developed a plan and a budget to reduce Lake Simcoe's phosphorus pollution by 55%. As a result, Lake Simcoe Watch is releasing this discussion paper to outline steps that can be implemented to achieve the LSPP's phosphorus reduction goal by 2026.

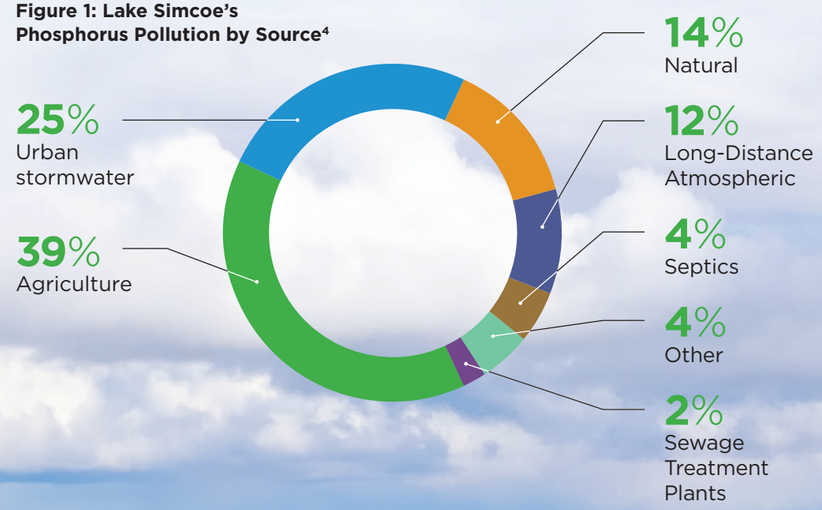
We are looking forward to receiving feedback from the public, local municipalities, the Lake Simcoe Region Conservation Authority, the Province of Ontario and the Government of Canada. Working together we can develop and implement the best possible phosphorus reduction plan for Lake Simcoe.

Despite the fact that the LSPP was released more than 10 years ago, the province and our local governments have not developed a plan to reduce phosphorus pollution to 44 tonnes per year

Lake Simcoe's Phosphorus Pollution by Sources

Lake Simcoe receives 97 tonnes of phosphorus pollution per year.[3] Figure 1 provides a break-out of this pollution by source.

Figure 1: Lake Simcoe's Phosphorus Pollution by Source[4]



Agricultural best management practices can reduce phosphorus pollution by 28-95%

Agriculture

Stormwater runoff from agricultural lands, containing fertilizers (including biosolids), manure and sediments, delivers phosphorus to Lake Simcoe via rivers and streams. In addition, wind blown dust from agricultural fields deposits phosphorus in Lake Simcoe by air.

Agricultural phosphorus pollution can be reduced by implementing the following best management practices (BMPs).

Crop Residue Management is the planned use of crop residue to protect the soil surface. There are many forms of this BMP including no-till planting, mulch tillage, and other tillage techniques that leave crop residue on the soil surface.

Strip Cropping is a method of farming which involves cultivating long narrow strips which are alternated in a crop rotation system. For example, closely sown crops such as hay or wheat or other forages can be alternated with strips of corn or soybeans.

Crop Rotation is the use of different crops in a specified sequence on the same field.

Cover Crops is the use of annual or perennial crops to protect the soil from erosion during the time between the harvesting and the planting of the primary crop.

Nutrient Management is the planned use of organic and inorganic sources of nutrients to sustain optimum crop production while protecting the quality of nearby water resources.

Vegetated Buffer Strips are areas of land maintained by some type of permanent vegetation for the purpose of preventing pollutants contained in the surface runoff from reaching adjacent land areas.

Streambank Fencing prevents cattle from trampling stream banks, destroying protective vegetation and stirring up sediment in the streambed.

Streambank Stabilization involves covering banks with rocks, grass, trees, shrubs and other protective surfaces to reduce erosion.[5]

As Table 1 shows, agricultural BMPs can reduce phosphorus pollution by 28-95%.

Table 1: Phosphorus Reduction Efficiencies of Agricultural BMPs[6]

Agricultural BMP Type	Phosphorus Reduction Efficiency (%)
Crop Residue Management	38
Strip Cropping	40
Cover Crops	36
Crop Rotation	36
Nutrient Management	28
Vegetated Buffer Strips	51
Streambank Fencing	78
Streambank Stabilization	95

In the Lake Erie watershed, where the province wants to reduce phosphorus pollution by 40% by 2025, the Government of Ontario provides farmers with funding to cover 45-65% of the costs of implementing BMPs. In addition, farmers are provided with the assistance of a certified crop advisor or professional agrologist free of charge to develop specific BMPs that are best suited to their farms.[7]

Watercourse Naturalization Zones

As Table 1 indicates, re-naturalizing areas adjacent to streams and rivers (vegetated buffer strips and streambank fencing and stabilization) can be a very effective action to reduce phosphorus pollution to Lake Simcoe.

According to the Lake Simcoe Protection Plan, we should re-naturalize the areas within 30 metres of our streams where practical and feasible.[8] The Lake Simcoe Region Conservation Authority has gone one step further by calling for a 30 metre minimum vegetation protection zone (grasslands, wetlands and woodlands) along watercourses and fish habitat.[9]

Figure 2 shows Lake Simcoe's watercourses. Sixty-two percent of these rivers and streams already have 30 metre vegetation protection zones.[10] By improving and expanding these vegetation protection zones we can reduce phosphorus pollution and flooding and create more fish, pollinator and wildlife habitat.

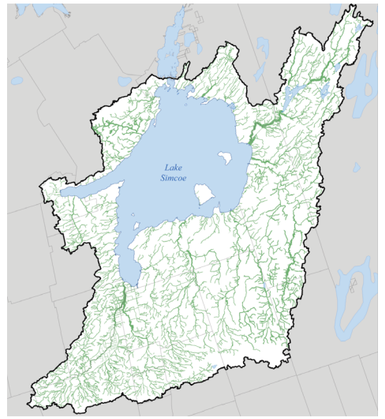
ALUS Canada, a national charitable organization, provides funding to farmers for the creation of grasslands, wetlands and woodlands adjacent to streams and rivers. In addition, ALUS provides farmers with annual ecosystem services payments for their naturalized areas.[11]

Holland Marsh

The Art Janse pumping station in Bradford-West Gwillimbury pumps water out of the Holland Marsh in order to keep the Marsh's water level low enough to permit vegetable growing.

According to an analysis prepared for the Lake Simcoe Region Conservation Authority, a treatment facility located at the Art Janse pumping station could remove 85% of the phosphorus from the Holland Marsh's pumped water for a capital cost of $29 million (2004$).[12] This could reduce the Holland Marsh's phosphorus pollution by 2.4 tonnes per year.[13]

Figure 2: Lake Simcoe's Watercourses



The Art Janse Pumping Station could remove 85% of the phosphorus from the Holland Marsh's pumped water

Urban Stormwater

By installing rain barrels, cisterns and permeable pavement as well as creating rain gardens, soakaway pits, wet ponds or wetlands, we can reduce stormwater pollution by 40-80%

Most of the phosphorus in urban stormwater is due to wash-off from roads, parking lots and roofs. In addition, erosion of exposed soils and fertilizers also contributes to urban stormwater phosphorus pollution.

Urban stormwater is delivered to Lake Simcoe and its tributaries via municipal drainage systems that consist of ditches, culverts and storm sewers located within road right-of-ways.

There are four broad categories of measures that can be implemented to dramatically reduce the amount of stormwater phosphorus pollution that flows into Lake Simcoe: a) stormwater source control measures; b) street sweeping; c) conveyance control measures; and d) municipal stormwater management ponds.

Stormwater Source Control Measures

Homes and businesses can reduce the amount of stormwater and phosphorus pollution that flows into Lake Simcoe by installing rain barrels, cisterns and permeable pavement and by creating rain gardens, soakaway pits, wet ponds or wetlands. According to the Town of Georgina's Stormwater Management Master Plan, these types of source control measures can reduce stormwater pollution by 40% to 80%.[14] Nevertheless, a systematic implementation of stormwater control measures has not yet occurred in Canada.[15]

Most of the municipalities in the Lake Simcoe watershed do not have stormwater user fees. By establishing stormwater user fees, municipalities can give their residents and businesses a financial incentive to reduce their stormwater flows to the municipal drainage systems and offset the cost of maintaining and expanding these systems. The Town of Newmarket recently established stormwater charges that reward their commercial and industrial customers that implement best management practices to reduce the amount of stormwater that flows into the Newmarket's drainage system.[16] On the other hand, the City of Orillia has established fixed monthly stormwater charges (e.g., $22 per commercial property) that do not provide financial incentives for their residents and businesses to invest in stormwater source control measures.[17]

Street Sweeping

Street sweeping, by removing sand, soil and leaves from roads, can reduce the amount of phosphorus that enters municipal drainage systems from our roads.

According to a U.S. study, compared to a baseline of two sweepings per year, the "recovery of phosphorus could be increased by approximately 62% if an additional sweeping is added in the spring and fall, 125% if streets are swept monthly, 250% if streets are swept twice per month, and 350% if streets are swept weekly".[18]

The Town of Georgina currently sweeps its streets only once a year.[19] On the other hand, Newmarket's Stormwater Management Master Plan recommends that street sweeping should occur monthly.[20]

Conveyance Control Measures

Conveyance control measures treat stormwater as it travels overland or through pipes in municipal road right-of-ways. For example, bioswales can be located in ditches to use plants and soil to trap and treat phosphorus runoff from asphalt surfaces.

Bioswales and other conveyance control measures (e.g., perforated pipe surrounded by clean granular stone) can have phosphorus removal efficiencies of 75% to 87%.[21]

Municipal Stormwater Management Ponds

The traditional end-of-pipe method for reducing stormwater phosphorus pollution has been municipal stormwater management ponds. However, most of Lake Simcoe's urban areas do not have any stormwater treatment. Specifically, as of 2007, only 21% of the watershed's existing urban area had some level of stormwater treatment ("quality control"), with an additional 17% having some form of "quantity control" (e.g., dry ponds to prevent flooding).[22]

The Lake Simcoe Region Conservation Authority (LSRCA) has identified 279 opportunities for the creation of wet ponds where no stormwater control presently exists, and for the upgrading of the existing dry ponds to wet ponds. According to a study prepared, in 2010, for the Ontario Ministry of the Environment, these wet ponds could reduce these area's phosphorus pollution by 40-50% for a capital cost of $115 million (2009$).[23]

According to a more recent study prepared for the Town of Georgina, wet ponds and constructed wetlands can reduce phosphorus pollution by 59-74%.[24]

Conclusion

Comprehensive stormwater management plans which incorporate an integrated combination of the above options have the potential to dramatically reduce the amount of stormwater phosphorus pollution flowing into Lake Simcoe. An analysis by AECOM, for example, found that a comprehensive stormwater management plan for the Town of Newmarket could reduce its stormwater phosphorus pollution by more than 78%.[25]

Bioswales and other conveyance control measures can have phosphorus removal efficiencies of 75-87%

Additional Sources of Phosphorous

Phosphorus pollution from the watershed's private septic systems is

2x

greater than the total phosphorus pollution from all of Lake Simcoe's sewage treatment plants

Septics

There are 3,700 private septic systems within 100 metres of Lake Simcoe or rivers or streams that flow into Lake Simcoe.[26] The phosphorus pollution from the watershed's private septic systems is 2 times greater than the total phosphorus pollution from all of Lake Simcoe's sewage treatment plants.

There are a number of options that Lake Simcoe municipalities could implement to reduce phosphorus pollution from private septic systems.

First, they can evaluate the costs and benefits of expanding their sewage pipe distribution systems to permit more homes to be connected to municipal sewage treatment plants. For example, the Town of Georgina could examine the costs and benefits of installing sewage pipes along Hedge Road in Jackson's Point to permit the phase-out of 98 private septic systems on Lake Simcoe's waterfront.[27]

Second, they could require the mandatory hook-up to the municipal sewage treatment systems of all homes that have access to municipal sewage pipes.

Third, in areas that are within 100 metres of Lake Simcoe or streams or rivers that flow into Lake Simcoe, they could make the granting of building permits for the construction of new homes conditional on hook-up to the municipal sewage treatment system or the installation of a septic system that will not discharge any phosphorus to Lake Simcoe.

Long-Distance Atmospheric

Dust from agricultural lands beyond Lake Simcoe's watershed is a major source of long-distance atmospheric phosphorus pollution to Lake Simcoe. Other long-distance sources are roads, pits and quarries and construction sites.[28]

Sewage Treatment Plants

There are 15 sewage treatment plants in the Lake Simcoe watershed. As a result of technological improvements their phosphorus pollution has been reduced by 70% since 2005-2006.[29]

Natural

Natural sources of phosphorus include wetlands, forests, meadows, streambanks and groundwater.[30]

Other

Other local sources of phosphorus pollution include pits and quarries, construction sites and unpaved roads.[31]

Long-distance atmospheric phosphorus pollution from agricultural lands, roads, pits and quarries etc. make up

12% of the phosphorpous found in Lake Simcoe

What the Government of Ontario Can Do to Reduce Lake Simcoe's Phosphorus Pollution by 55% by 2026

We can achieve a 55% reduction in Lake Simcoe's phosphorus pollution by reducing our agricultural and urban storm water phosphorus pollution by 85%.[32] To make this happen the Government of Ontario can take the following actions.

1 Direct the Ontario Ministry Agriculture, Food and Rural Affairs to develop programs and financial incentives to ensure that Lake Simcoe's farmers will adopt agricultural best management practices which will reduce total agricultural phosphorus pollution by 85% by 2026.[33]

2 Direct the Town of Bradford-West Gwillimbury and the Township of King to retrofit the Art Janse pumping station to reduce phosphorus pollution from the Holland Marsh by 85%.

Photo BradfordToday.ca

3 Direct the Lake Simcoe watershed's 17 lower-tier municipalities to develop programs, budgets and policies which will reduce their urban stormwater phosphorus pollution by 85% by 2026.

4 Expand its Conservation Land Tax Incentive Program (CLTIP) to exempt high-quality naturalized areas within 30 metres of Lake Simcoe's streams and rivers from municipal property taxation. Currently, the CLTIP exempts Areas of Natural and Scientific Interest, the Niagara Escarpment Natural Areas and provincially significant wetlands from property taxation. By expanding CLTIP to include high-quality naturalized areas adjacent to Lake Simcoe's watercourses, the Government of Ontario can encourage landowners to take actions that will reduce phosphorus pollution and flooding and create habitat for fish, pollinators and wildlife.

How much will it cost?

Studies have been done and approximate costs have been calculated. It's time to move forward

According to a 2010 report by XCG Consultants and Kieser & Associates for the Ontario Ministry of the Environment, a phosphorus treatment facility at the Art Janse pumping station could reduce phosphorus pollution from the Holland Marsh by 2.4 tonnes per year at a cost of $480,000 per tonne (2009$) assuming a 25-year amortization period.[34] This is equivalent to $552,000 per tonne in 2018$.[35] Therefore the total cost of the treatment facility is $1,325,000 per year (2018$).[36]

According to the XCG Consultants and Kieser & Associates report, the average cost of cropland BMPs is $170,000 per tonne (2009$) assuming the capital costs are amortized over 25 years.[37] This is equivalent to $195,000 per tonne in 2018$. Therefore, we need to spend approximately $5.8 million per year on agricultural BMPs to reduce total agricultural phosphorus pollution by 85% (assuming the Art Janse retrofit proceeds).[38]

According to XCG Consultants and Kieser & Associates, urban stormwater phosphorus pollution can be reduced at a cost of $1,700,000 (2009$) per tonne by building stormwater management ponds, assuming their capital costs are amortized over 25 years.[39] This is equivalent to $1,954,000 per tonne in 2018$. Fortunately, according to the U.S. Environmental Protection Agency (EPA), there are also much lower cost options to reduce phosphorus pollution. Specifically, according to the EPA, low impact development options (e.g., rain barrels, cisterns, permeable pavement, soakaway pits, bioswales) can reduce urban phosphorus pollution at costs that are 15-80% lower than conventional solutions, like stormwater management ponds.[40]

Therefore, we estimate that Lake Simcoe's urban stormwater pollution can be reduced by 85% at an annual cost of approximately $29.9 million.[41]

Table 2: Annual Costs of Reducing Lake Simcoe's Phosphorus Pollution by 55%

Project	Annual Cost
Art Janse Pumping Station Treatment Facility	$1,325,000
Agricultural Best Management Practices	$5,830,500
Urban Stormwater Control Measures	$29,896,200
Total	**$37,051,700**

Who Should Pay?

We need to ensure that growth pays for growth

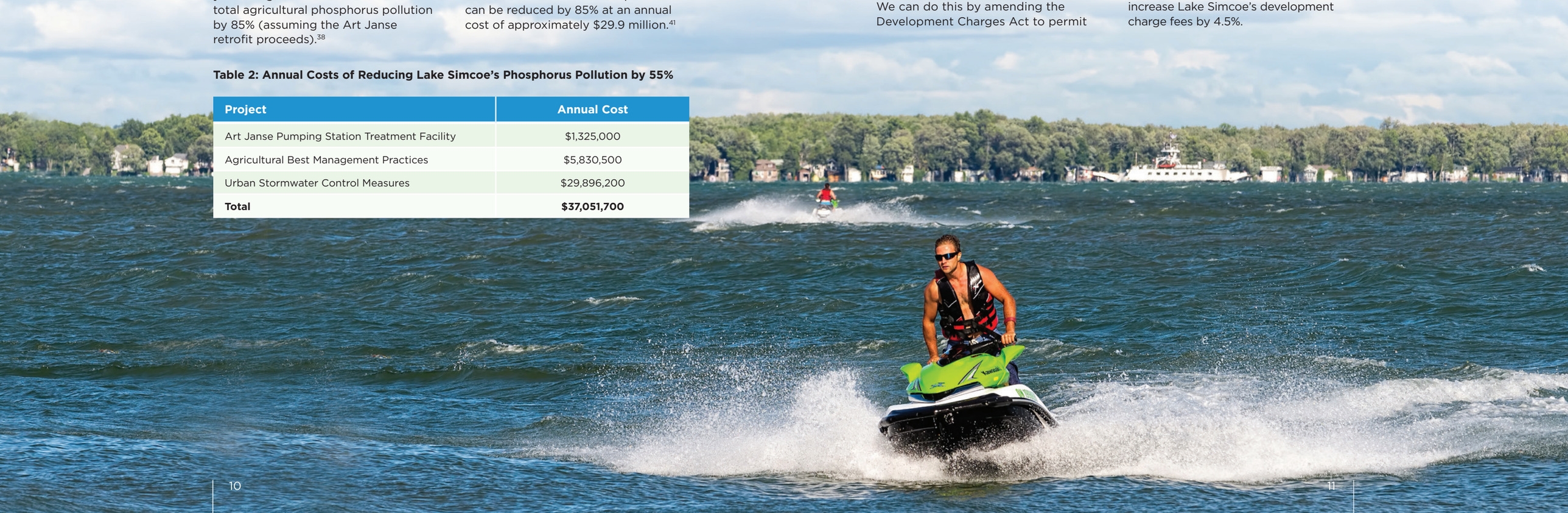
The Lake Simcoe watershed's growing population has been accompanied by higher property taxes and declining water quality. Rising municipal taxes are a result of the fact that developers are not required to pay the full cost of the new municipal infrastructure that is needed to service new residential and commercial developments. Declining water quality is the consequence of the fact that the new development has not been accompanied by the increasingly strict environmental protection measures that are necessary to protect Lake Simcoe and its watershed as the watershed's population grows.

This is not right. We need to ensure that growth pays for growth.

Specifically, we need to ensure that our rising population is accompanied by a 55% reduction in Lake Simcoe's phosphorus pollution. We can do this by amending the Development Charges Act to permit the Government of Ontario and Lake Simcoe's municipalities to levy development charges to recover 100% of their costs of achieving the Lake Simcoe Protection Plan's phosphorus reduction target.

In the past when our municipal governments re-zoned our agricultural lands for residential and commercial development, landowners and speculators have reaped huge windfall profits at the expense of Lake Simcoe and its watershed. It is only fair that going forward some of these huge windfall profits should be clawed-back to clean up Lake Simcoe.

In 2018 the total development charge revenues of the Lake Simcoe watershed's 17 lower-tier and three upper-tier municipal governments were more than $816 million.[42] Making growth pay for the cleanup of Lake Simcoe will increase Lake Simcoe's development charge fees by 4.5%.



Endnotes

1 *Lake Simcoe Protection Plan*, (2009), page 26.

2 http://greenlivingcommunications.createsend.com/t/ViewEmailArchive/y/73255714D336F517/C67FD2F38AC4859 C/

3 Three year average for the hydrological years 2015, 2016 and 2017. David Lembcke, LSRCA, *Phosphorus Loads to Lake Simcoe*, (January 24, 2020).

4 http://lakesimcoewatch.ca/wp-content/uploads/2020/01/Breakout-of-Lake-Simcoes-Phosphorus-Pollution-by-Source-.docx

5 Louis Berger Group Inc., *Estimation of the Phosphorus Loadings to Lake Simcoe: Final Report*, (September 2010), pages 22 and 23.

6 *Estimation of the Phosphorus Loading to Lake Simcoe*, page C-2.

7 http://www.omafra.gov.on.ca/english/cap/watershed.htm

8 *Lake Simcoe Protection Plan*, pages 49 and 51.

9 Lake Simcoe Region Conservation Authority, *Natural Heritage System & Restoration Strategy for the Lake Simcoe watershed 2018*, page vi.

10 Lake Simcoe Region Conservation Authority, *Natural Heritage System & Restoration Strategy for the Lake Simcoe watershed, (2018)*, page vi.

11 Email from Casey Schelock, Hub Manager (East), ALUS Canada to Jack Gibbons (November 25, 2019).

12 XCG Consultants and Kieser & Associates, *Water Quality Trading in the Lake Simcoe Watershed: Feasibility Study, (2010)*, page 81.

13 *Water Quality Trading in the Lake Simcoe Watershed*, page 81.

14 Acquafor Beech Ltd., *Georgina Comprehensive Stormwater Management Master Plan*, (July 2017), page 66.

15 *Georgina Comprehensive Stormwater Management Master Plan*, page 66.

16 https://www.newmarket.ca/LivingHere/Pages/Stormwater%20Charge/Stormwater%20Credit%20and%20Recognition%20Programs/Stormwater-Credit-for-Businesses.aspx

17 https://www.orillia.ca/en/living-here/watersewerrates.aspx

18 *City of Forest Lake Street Sweeping Management Plan 2018*, pages 13 and 14.

19 *Georgina Comprehensive Stormwater Management Master Plan*, page 65.

20 AECOM, *Town of Newmarket Comprehensive Stormwater Management Master Plan*, (June, 2017), page 96.

21 *Georgina Comprehensive Stormwater Management Master Plan*, pages 69, 123 and 125.

22 XCG and Keiser & Associates, *Water Quality Trading in the Lake Simcoe Watershed: Feasibility Study*, (February 2010), page 82.

23 *Water Quality Trading in the Lake Simcoe Watershed*, page 85.

24 Acquafor Beech Ltd., *Georgina Comprehensive Stormwater Management Master Plan*, (July 2017), page 129.

25 *Town of Newmarket Comprehensive Stormwater Management Master Plan*, pages 93 and 94.

26 https://www.ontario.ca/page/ministers-five-year-report-lake-simcoe-protect-and-restore-ecological-health-lake-simcoe-watershed

27 Email from Rod Larmer, Manager of Building & Chief Building Official, Town of Georgina to Jack Gibbons (October 29, 2019).

28 Lee Weiss, Jesse The, Bahram Gharabaghi, Eleanor Stainsby and Jennifer Winter, "A new dust transport approach to quantify anthropogenic sources of atmospheric PM10 deposition on lakes", *Atmospheric Environment*, (August 2014); and Lee Weiss, Jesse The, Jennifer Winter & Bahram Gharabaghi, "Optimizing best management practices to control anthropogenic sources of atmospheric phosphorus deposition to inland lakes", *Journal of the Air & Waste Management Association*, (July 2018).

29 Lake Simcoe Region Conservation Authority, *Report on the Phosphorus Loads to Lake Simcoe 2004-2007*, page 12; David Lembcke, LSRCA, *Phosphorus Loads to Lake Simcoe*, (January 24, 2020).

30 Louis Berger Group, *Estimation of the Phosphorus Loadings to Lake Simcoe, Submitted to Lake Simcoe Region Conservation Authority*, (September 2010), page 15 and Appendix E.

31 Louis Berger Group, *Estimation of the Phosphorus Loadings to Lake Simcoe*, Submitted to Lake Simcoe Region Conservation Authority, (September 2010), page 15.

32 The *Lake Simcoe Protection Plan* calls for Lake Simcoe's annual phosphorus pollution to be reduced to 44 tonnes per year. At the present, Lake Simcoe's total annual average level of phosphorus pollution is 97 tonnes per year. Therefore phosphorus pollution must be reduced by 53 tonnes per year. At the present, the agricultural sector and urban stormwater are responsible for 38 and 24 tonnes of phosphorus pollution per year. Therefore if their total pollution is reduced by 85%, total phosphorus pollution will be reduced to 44 tonnes per year.

33 According to a report by the George Morris Centre for the Crop Nutrient Council, the greatest barriers to the adoption of agricultural BMPs are cost and lack of understanding of the need for the BMPs. George Morris Centre, *An Economic Evaluation of Beneficial Management Practices for Crop Nutrients in Canadian Agriculture: Final Report.* (January 8, 2007).

34 XCG Consultants and Kieser & Associates, *Water Quality Trading in the Lake Simcoe Watershed: Feasibility Study*, (2010), page 81.

35 We have escalated the 2009 cost estimate to 2018 dollars using Statistics Canada's implicit price index for Canada's gross domestic product.

36 2.4 tonnes x $552,000 per tonne.

37 XCG Consultants and Kieser & Associates, *Water Quality Trading in the Lake Simcoe Watershed: Feasibility Study*, (2010), page 82.

38 The annual phosphorus pollution from Lake Simcoe's agricultural sector is 38 tonnes. Therefore this pollution must be reduced by 32.3 tonnes per year to achieve an 85% reduction. Assuming a treatment facility at the Art Janse pumping station reduces phosphorus pollution by 2.4 tonnes per year, an additional 29.9 tonne reduction must be achieved by agricultural BMPs. This will cost $5,830,500 per year (29.9 tonnes x $195,000 per year).

39 XCG Consultants and Kieser & Associates, *Water Quality Trading in the Lake Simcoe Watershed: Feasibility Study*, (2010), page 85.

40 United States Environmental Protection Agency, *Reducing Stormwater Costs through Low Impact Development (LID) Strategies and Practices*, (December 2007), page iv.

41 Lake Simcoe's annual urban stormwater phosphorus pollution is 24 tonnes per year. To achieve an 85% reduction, this pollution must be reduced by 20.4 tonnes per year. We have assumed that 10.2 tonnes per year of reductions are achieved by building stormwater management ponads at a cost of $19,930,800 (10.2 tonnes per year x $1,954,000 per tonne per year); and the remaining 10.2 tonnes per year are obtained at half the cost by low impact development measures, namely, $9,965,400 (10.2 tonnes per year x $977,000 per tonne per year).

42 http://lakesimcoewatch.ca/wp-content/uploads/2020/01/Development-Charge-Revenues-2018.xlsx

For more information
please visit

LakeSimcoeWatch.ca

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