DUFFIN CREEK WPCP ADVISORY COMMITTEE

Meeting #3

Presented by: Krista Chomicki, Great Lakes Scientist

February 4, 2021

Toronto and Region Conservation Authority

Presentation Outline

Follow up…

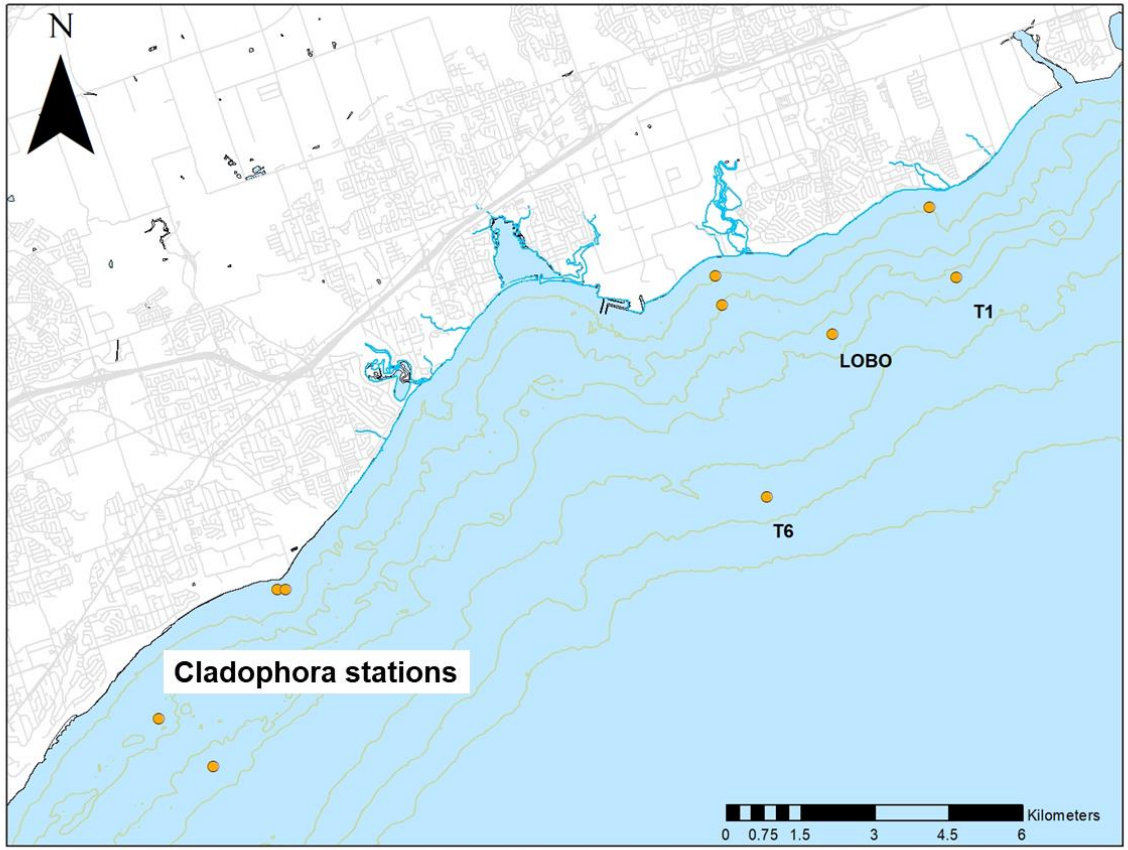
- 2020 sampling
- Golf courses
- Dams
- What can we do?

…and updates

- Tributary monitoring
- Stormwater monitoring
- Postdoctoral research

2020 Sampling

- Maintenance design sampling completed (July, Aug, Sept, Oct)
- Will continue into 2021
- data has not been analyzed



Golf courses

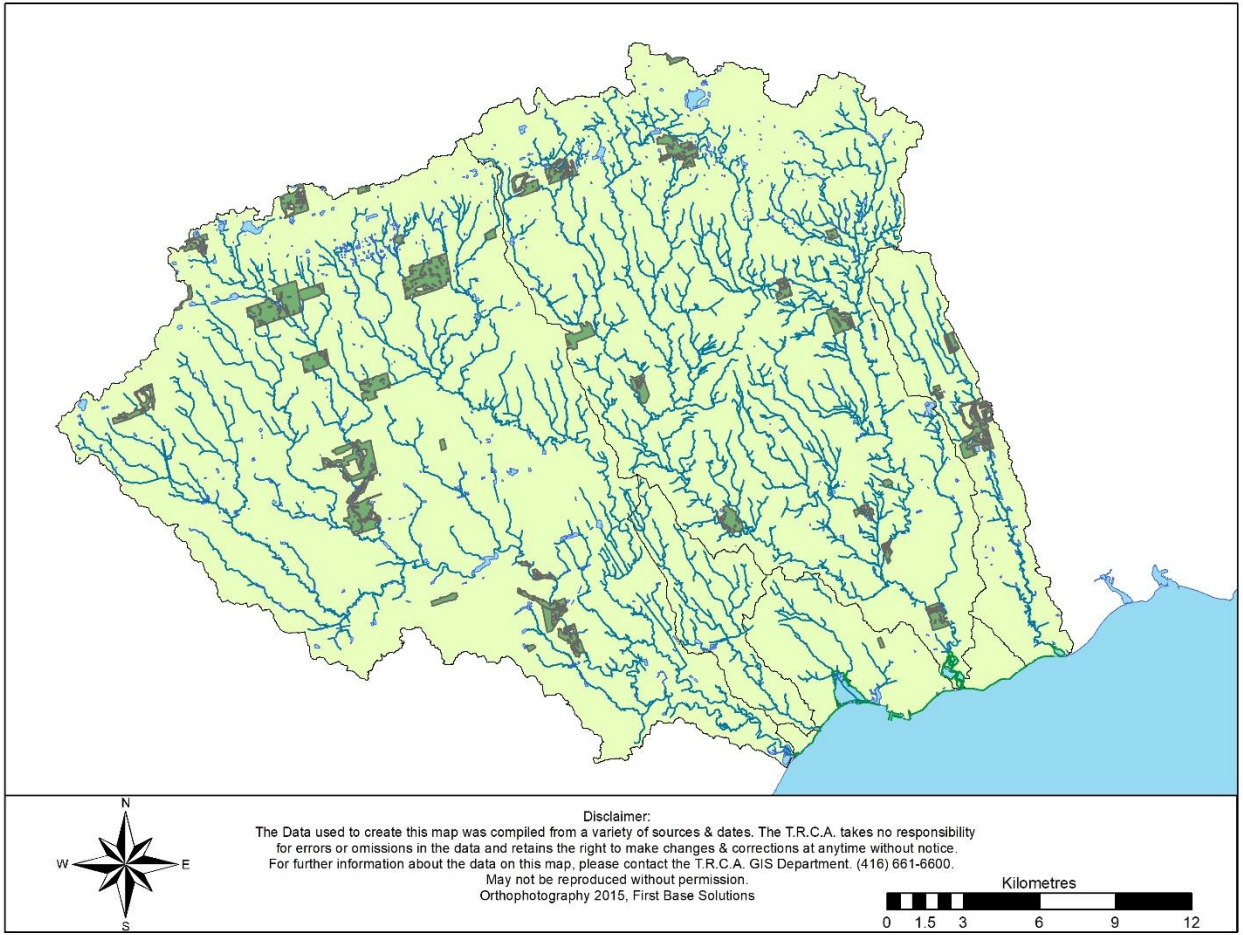
The effects of golf courses on water quality has NOT been examined directly within our watersheds.

Potential effects:

- Volume (water consumption)
- Thermal impacts
- Soil and water pollution (pesticide and fertilizers)
- Nutrient loads, eutrophication
- Urbanization close to fields
- Clearing natural vegetation, deforestation, destruction of natural landscape/habitats
- Changes in topography and local hydrography

Worldwide: pesticides, heavy metals, nutrients in water and soil often exceed current health and environmental regulations

Soluble P loads can be similar to loads from agricultural lands

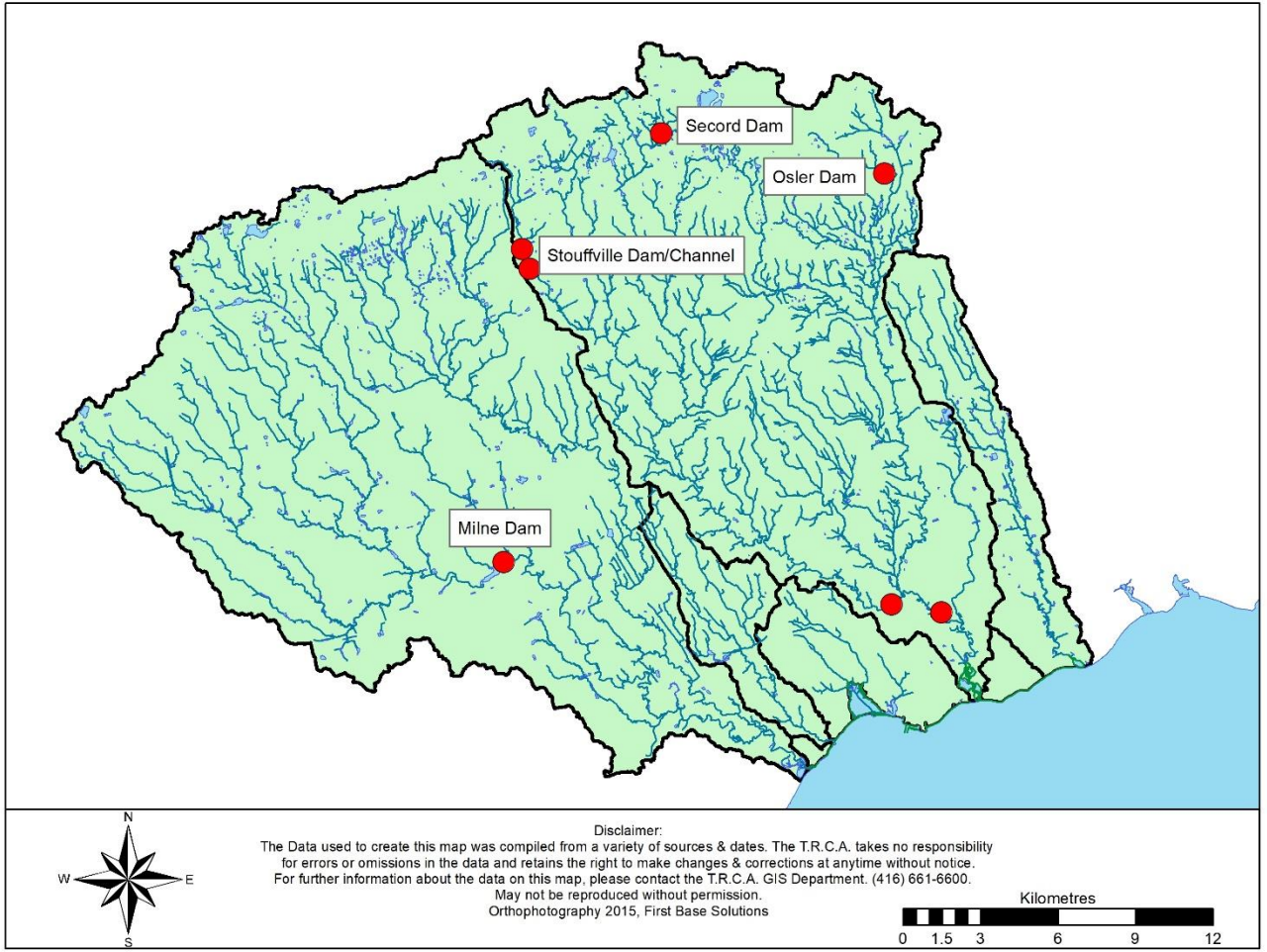


Dams

TRCA maintains a number of small dams and flood control structures in Rouge and Duffins watersheds

Temperature and how they affect the local biology has been examined in some cases, but water quality has not been examined

There are other private dams that are not maintained by TRCA (not shown) with unknown operation procedures



In general (with dams):

Often there are increased nutrient transformations such as:

- dissolved to particulate forms through primary production or adsorption
- sedimentation and retention
- gaseous escape

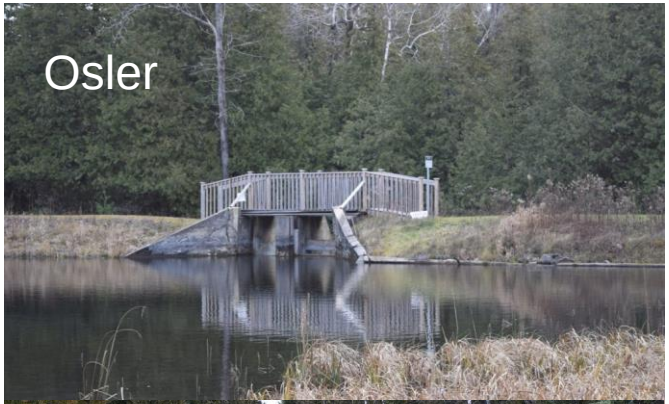
Temperature regime/oxygen dynamics can be affected which can cause:

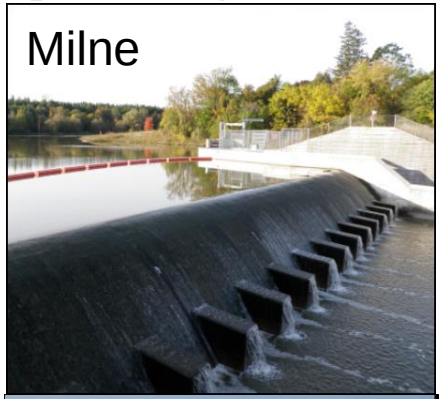
- release of nutrients from sediments
- algal blooms

Biological impacts also exist

How water moves through the dam becomes important (e.g. active/passive, surface or bottom water release, etc.) and the retention time

Possible effects of TRCA maintained dams on water quality





Passive (i.e. not operated):

- Surface water flows through openings at the top of the dam
- Water always flows through
- Slows delivery of water downstream

Suspended solids and particulate phosphorus can potentially settle if retention time is longer…

Oxygen levels and temperature structure is unknown

What can we do in the watersheds to improve water quality?

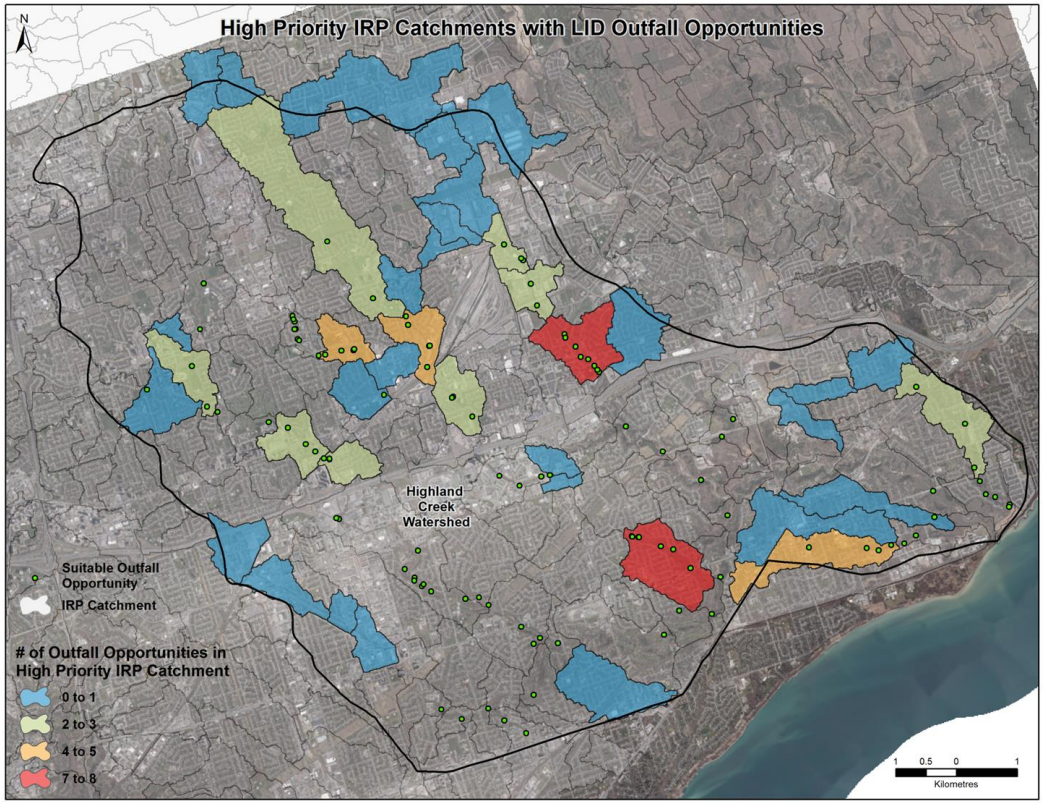
Can include, but is not limited to:	
Reforestation	Reforestation (e.g. Rouge Urban National Park)
Stormwater	TRCA is trying to develop a method to identify SW outfalls that have distance to the creek that would be suitable locations for treatment wetlands (Peel)
Marshes	Tile treatment wetlands

Reforestation in Rouge watershed

- wetland and meadow plantings
- upland forest planting
- riparian plantings

With Parks Canada and other partners, TRCA has participated in planting:
>113,000 native trees, perennials, shrubs and aquatic plants throughout the park.
>108,000 trees in Rouge National Urban Park since 2015

Stormwater outfalls



TRCA is working on a method to identify opportunities to mitigate outfalls and catch basins in Peel.

Accurate mapping of outfalls is important

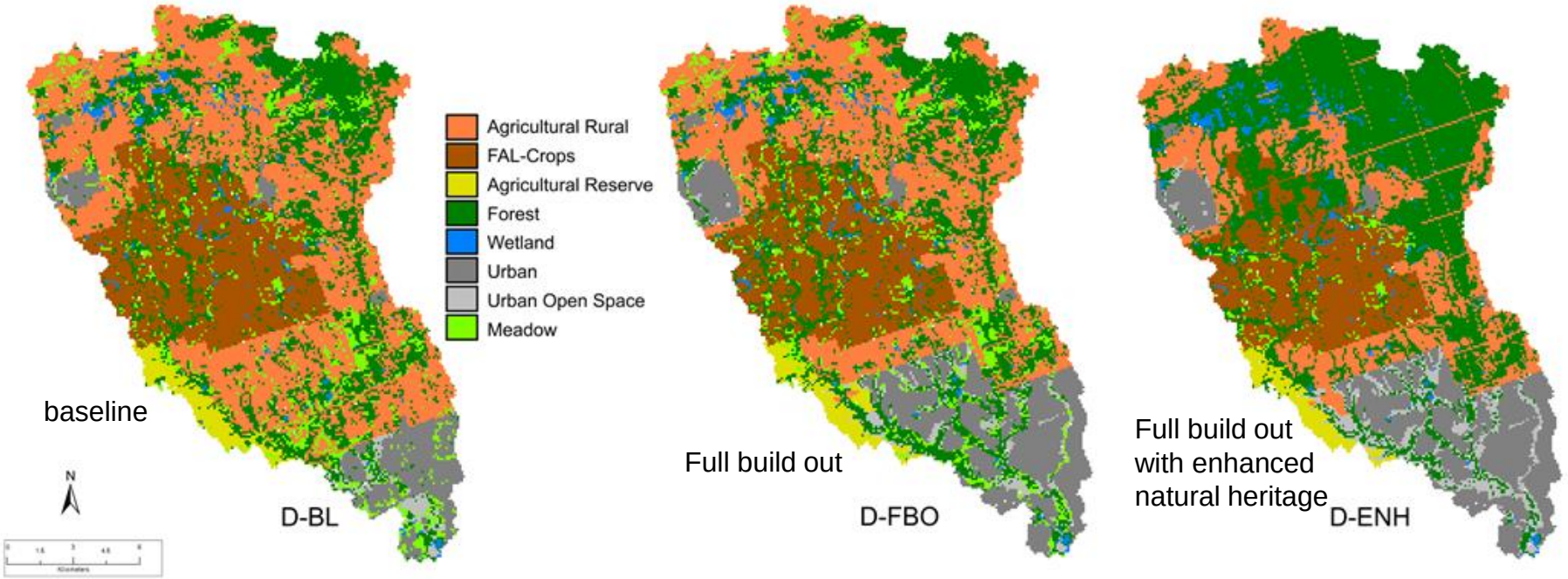
Sites are <5m to water course

Can also do for catch basins

Tile treatment wetlands

Allows settling and processing prior to drainage to creek 50-100m away

SWAT modeling in Duffins watershed



Land use scenarios

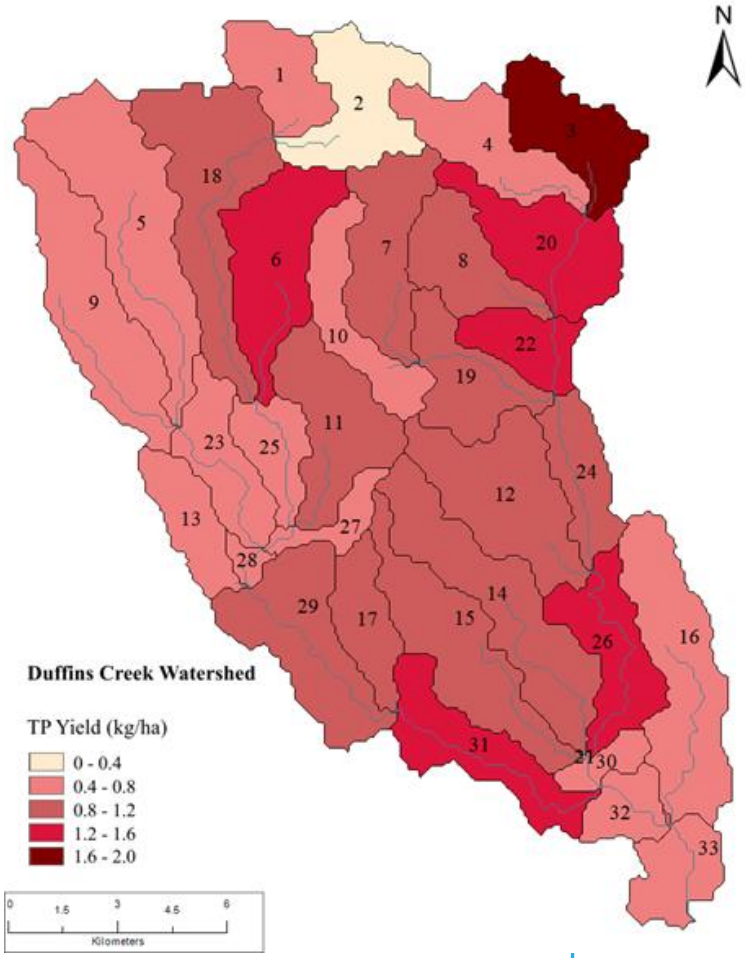
SWAT: TP source tracing

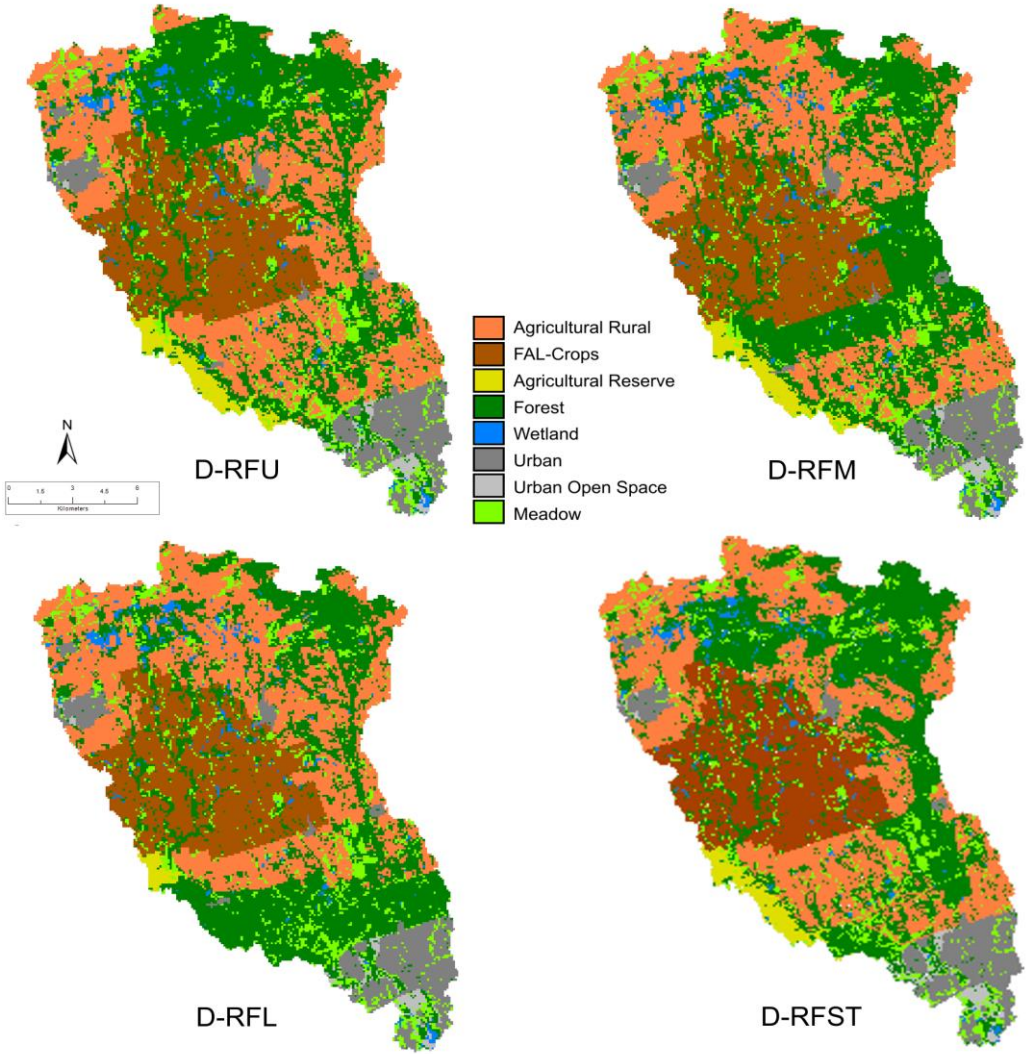
Identify hotspots

Target areas with high TP yields

Reforestation scenarios: convert agricultural lands in high TP yield areas to forest to make up 1/3 of watershed area

Change 8% agricultural lands to forest could have a TP reduction of 23% (modelled)





Reforestation-Upper (RFU),
Reforestation-Middle (RFM),
Reforestation-Lower (RFL) and
Reforestation-Source Tracing (RFST)

TP reductions: 8-36%

TSS reductions: 7-35%

TN reductions: 8-28%

-with vegetative filter strips ranging from 1-30m in the different scenarios

TP reductions: 31-86%

TSS reductions: 30-79%

TN reductions: 24-76%

**Does not include future climate scenarios, although that has also been modelled

Lake Ontario Tributary Monitoring

- Covid-19 delays
- Storm event monitoring from Western Durham to Ganaraska currently running with an extension to program
- Credit to Rouge storm sampling also running again (Fall restart)
- Toronto wet weather program set to begin in 2021

An inter-agency group comprised of: Toronto and Region Conservation Authority (TRCA), Ontario Ministry of the Environment, Conservation and Parks, Ontario Ministry of Agriculture, Food and Rural Affairs, and Environment and Climate Change Canada will be monitoring major tributaries on the Canadian shores of Lake Ontario to understand the amount and timing of nutrient delivery to Lake Ontario from our watersheds throughout all seasons.

Sampling stations have been established to allow for collection of continuous water quantity and water quality monitoring during storm and baseflow events during 2018–2019. The results of the tributary monitoring will contribute to modelling work being conducted by US and Canadian scientists to better understand nutrients and mixing throughout Lake Ontario.

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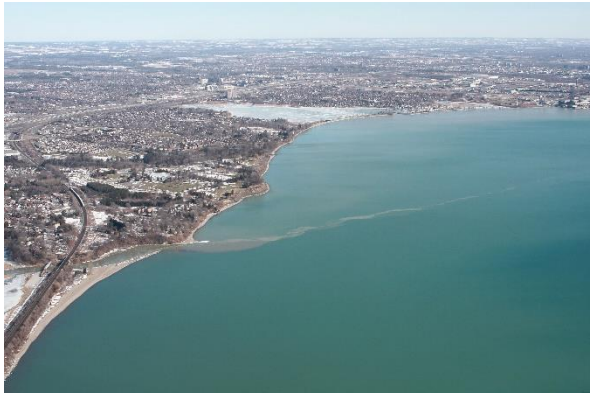
Storm event sampling



Stormwater monitoring

Lower Carruthers watershed

- real time flow monitoring
- storm sampling of twin storm sewers
- Phosphorus speciation
- Samples are being collected for 1 year

Cladophora Postdoctoral Fellow

Delays in data acquisition due to Covid-19

Water quality observed by the shoreline is related to multiple drivers including distance to storm drains, and loading sources

There are a lot of unknowns regarding the timing, the magnitude, and the quality of stormwater inputs to Lake Ontario

Additional work is required to assess stormwater relevance to Lake Ontario

Marsh Postdoctoral Fellow

Marshes are like bioreactors and can process stormwater and river water and transform nutrients

Water quality patterns are different in marshes with different structure

Anoxia/release of SRP in summer

A better understanding of water flow through cells to the lake would be beneficial

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