

Monitoring Program Overview and Surrounding Water Quality

PRAP Advisory Committee Meeting 2

Presented by: Krista Chomicki, Great Lakes Scientist

Month 09, 2020

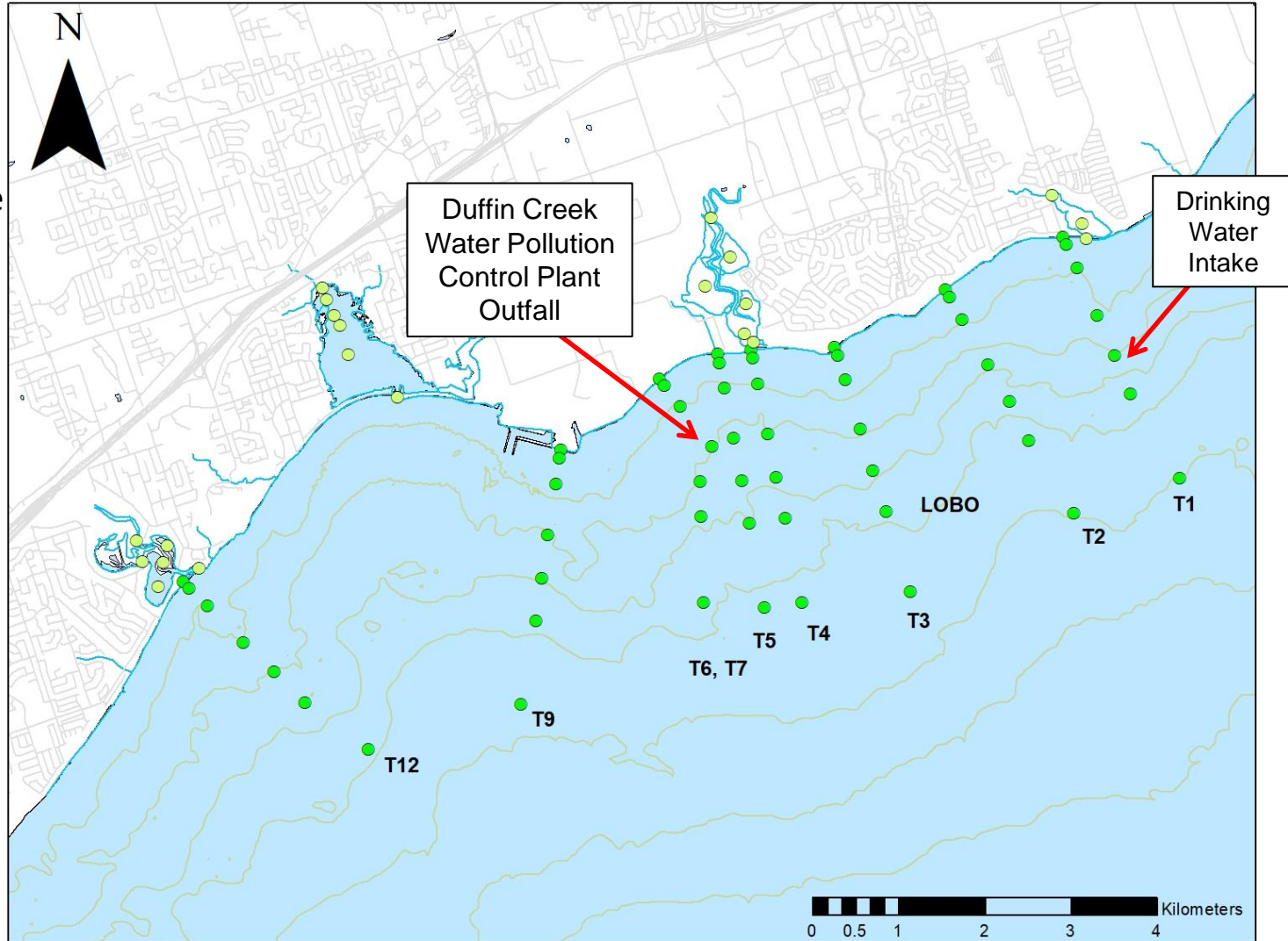
Overview

1. Sampling Program
2. Variability in surrounding environment
3. Algae work in Lake Ontario
4. Other projects



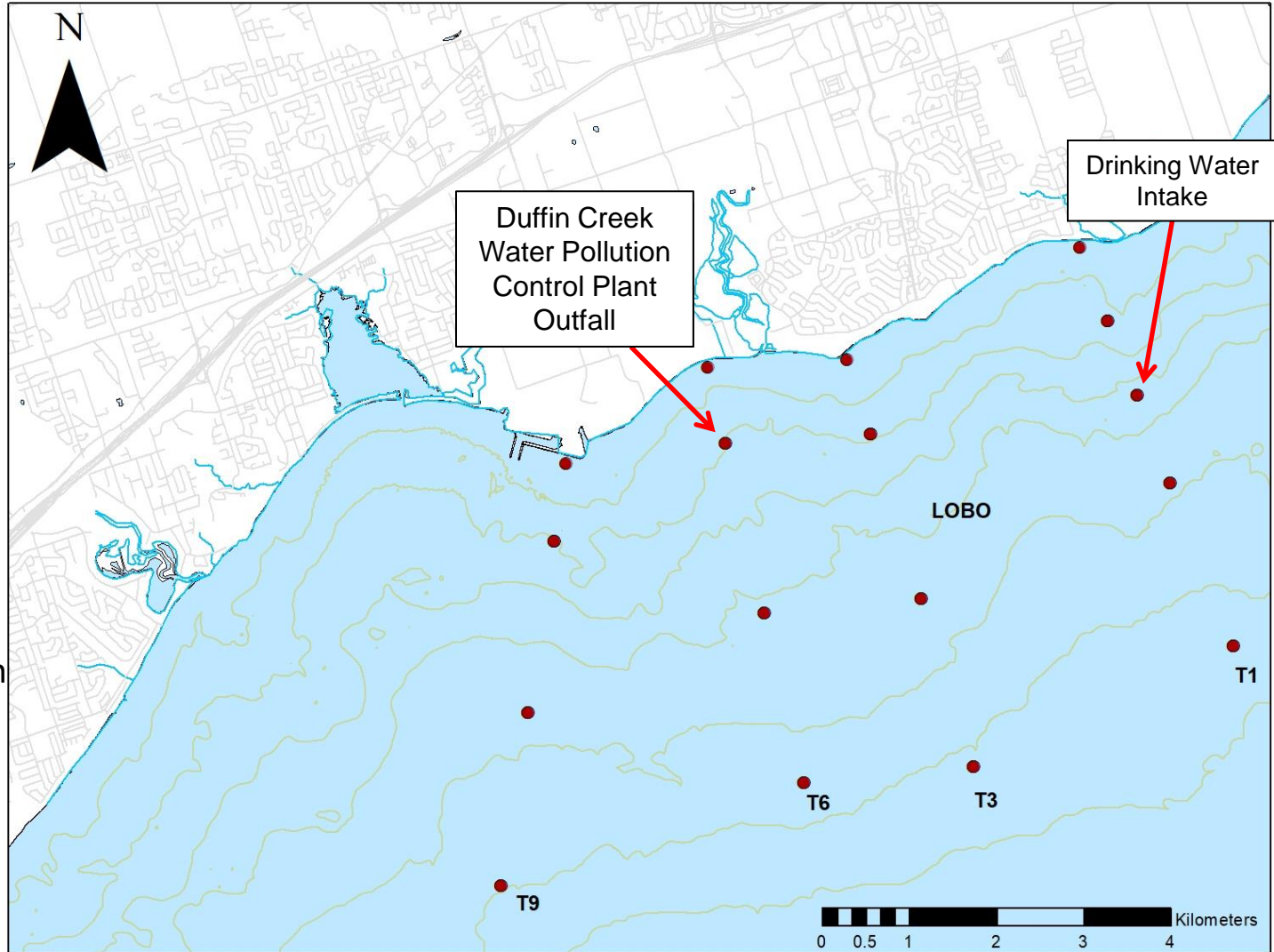
2007 – 2009 Monitoring Program

- Mostly surface samples, with samples at depth along the WPCP outfall transect
- 2 boats required
- One survey in April 2010 straightened outfall transect
- 2010 external program evaluation



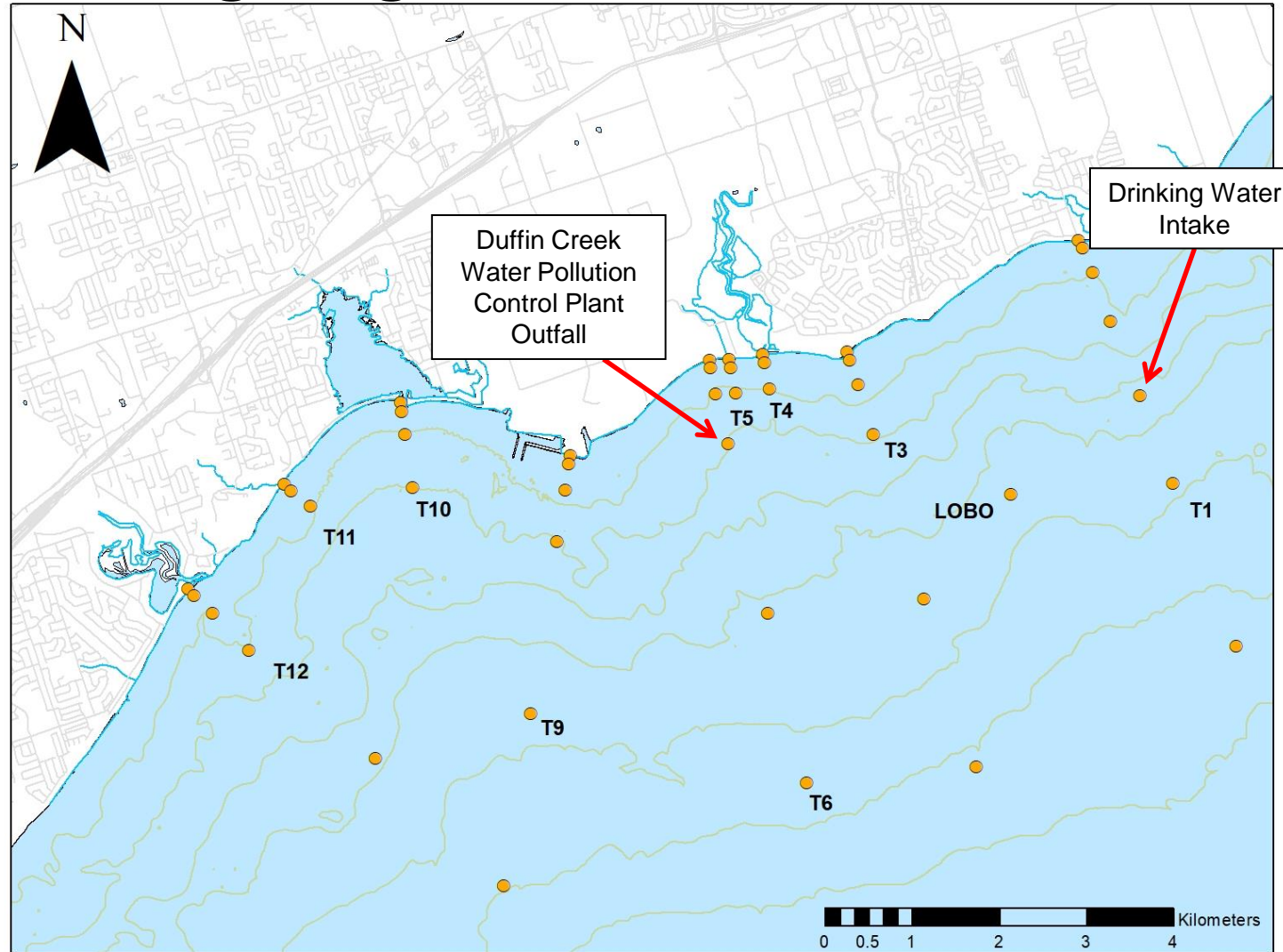
2011 – 2013 Monitoring Program

- External program evaluation
- Still 2 boats
- Reduced number of transects
- Includes samples with depth at distances of 1000 m +



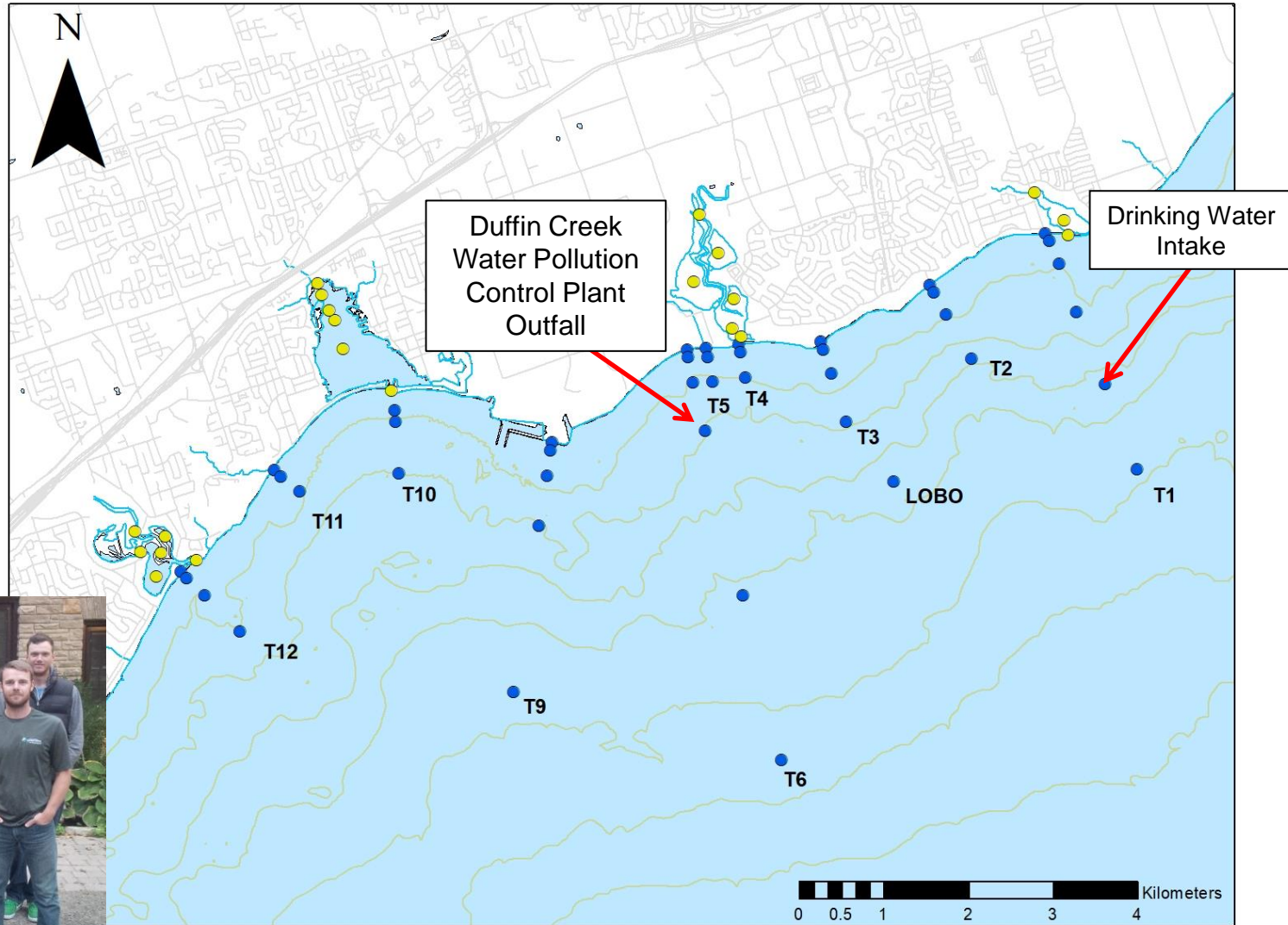
2014 Monitoring Program

- Reintroduced shoreline sites
- Marshes also reintroduced
- 3 boats
- Surface and bottom samples at 1000 m + sites
- Provides regional look at nearshore

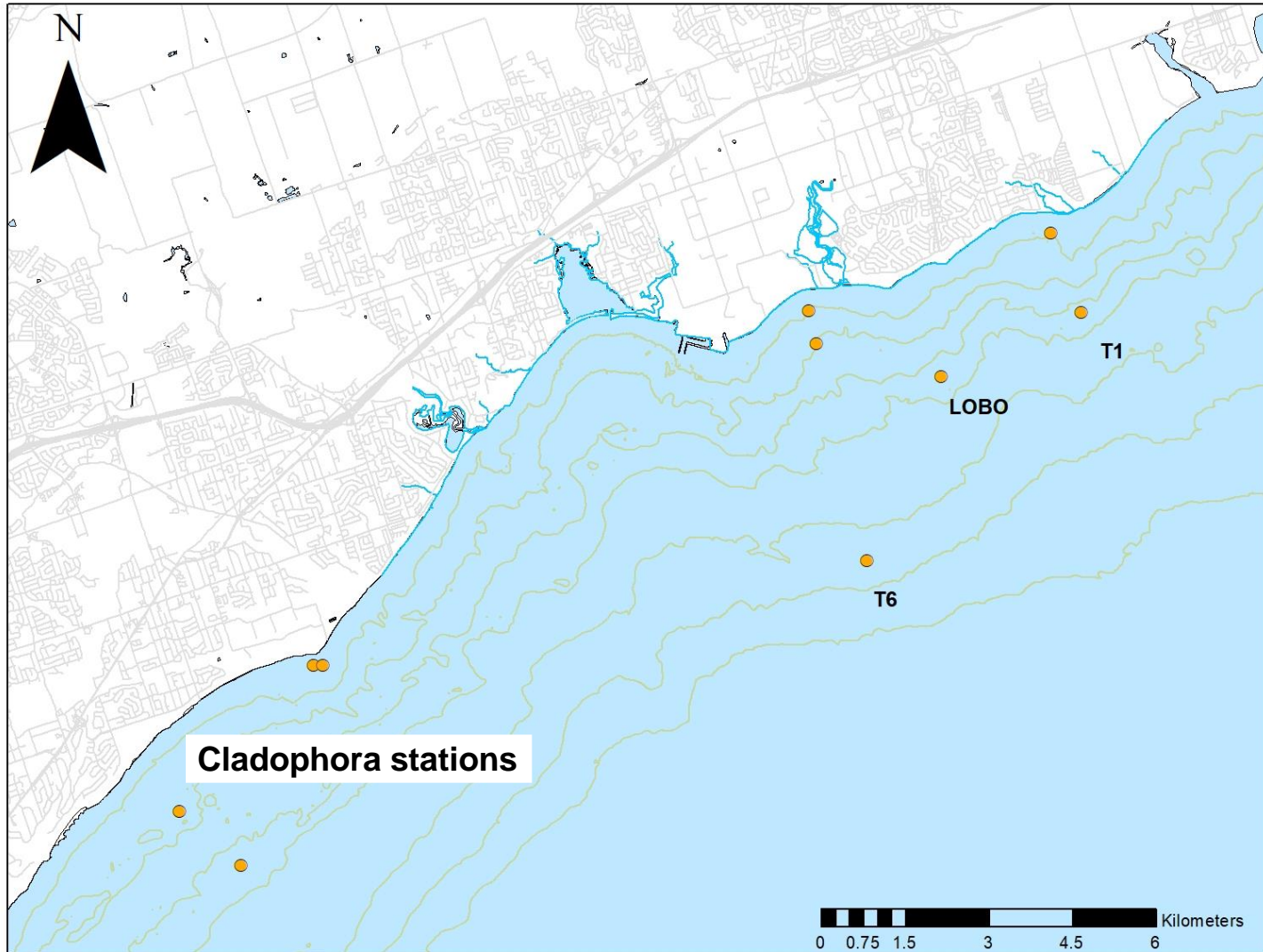


2015 - 2018 Monitoring Program

**A FOCUS ON
THE SHORESIDE**



Maintenance Program 2019-2020



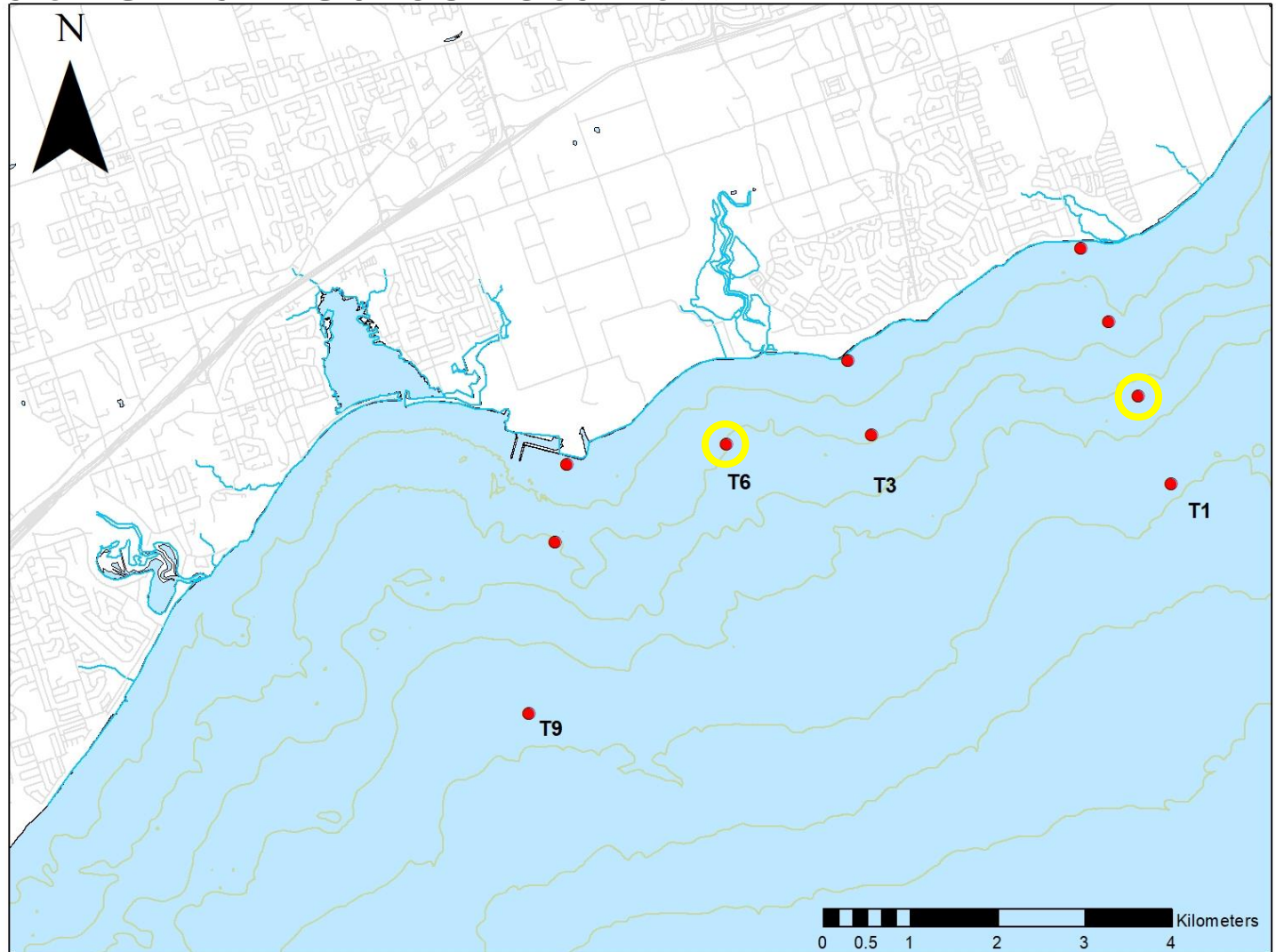
Sites that remained constant...

2007-2018 ●

- Transect 1: 100, 1000, Drinking Water Intake, 3000
- Transect 3: 100, 1000
- WPCP Outfall
- Transect 9: 100, 1000, 3000

2007-2020 ○

- Drinking water intake
- WPCP Outfall



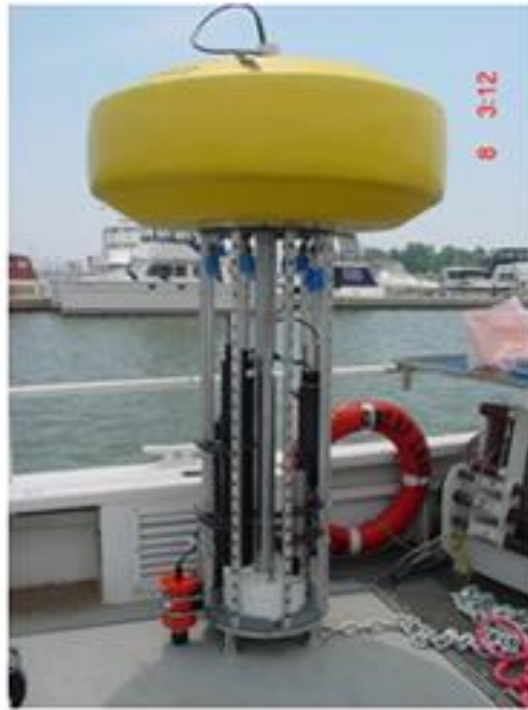
2007	2011	2015	2018
Alkalinity	Alkalinity	Alkalinity	Alkalinity
Conductivity	Conductivity	Conductivity	Conductivity
E. Coli	E. Coli	E. Coli	E. Coli
NH3+NH4	NH3+NH4	NH3+NH4	NH3+NH4
Nitrate + Nitrite	Nitrate + Nitrite	Nitrate + Nitrite	Nitrate + Nitrite
Nitrite	Nitrite	Nitrite	Nitrite
Total Phosphorus	Total Phosphorus	Total Phosphorus	Total Phosphorus
pH	pH	pH	pH
SRP	SRP	SRP	SRP
TKN	TKN	TKN	TKN
Suspended Solids	Suspended Solids	Suspended Solids	Suspended Solids
	Turbidity	Turbidity	Turbidity
		Chloride	Chloride
Parameters measured		DOC	DOC
		DP (TFP)	DP (TFP)
		Low level SRP	Low level SRP
		Sulphate	Sulphate
			Si/SiO/SiO3

Field measurements

- CTD (2015) and PAR sensor (2016)



Deployments: MECP Land-Ocean Biophysical Observatory



MECP deploy this instrument in our area every year

Impressive Effort between 2007 and 2018

	Counts
Surveys	76
Parameters run	11 (in 2007) - 18 (in 2018)
Light profiles (PAR)	366
Depth profiles (CTD)	570
Total Analyses (excl. duplicates, blanks, etc)	67806
Total YD Analyses (excl. duplicates)	66479
Ecoli measurements	3303
TP measurements (all labs)	5440
SRP measurements (all labs)	5415
Conductivity measurements	5142

2. Variability in surrounding environment

- Marshes
- Stormwater
- Nearshore
- Background



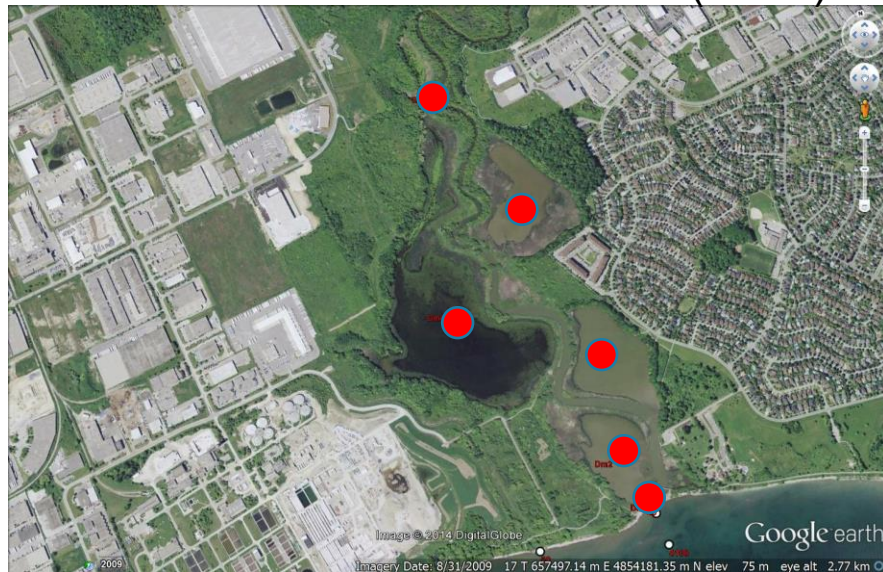
Rouge Marsh (DRM)



Frenchmans Bay Marsh (BBL)



Duffins Marsh (DRM)



Carruthers Marsh (DRM)



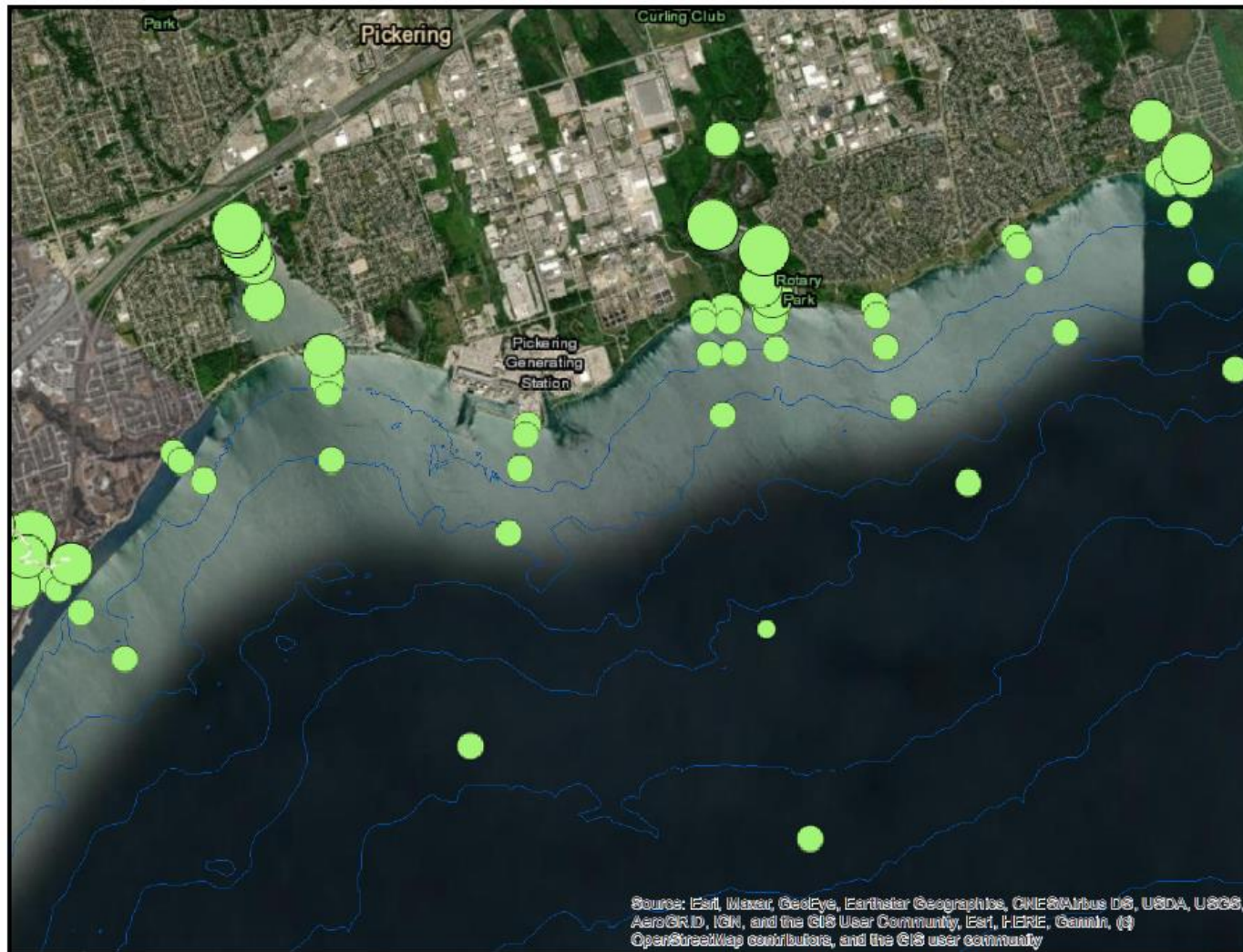
Frisko Storm Drain



Drains directly to the lake



Near Shore Water Quality Monitoring

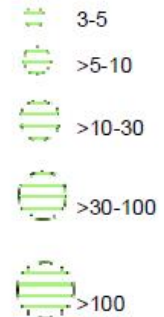


**August 28,
2016**

**Total
Phosphorus**

Legend

Search Results:
**Total
Phosphorus (μg
P/L)**



Disclaimer:
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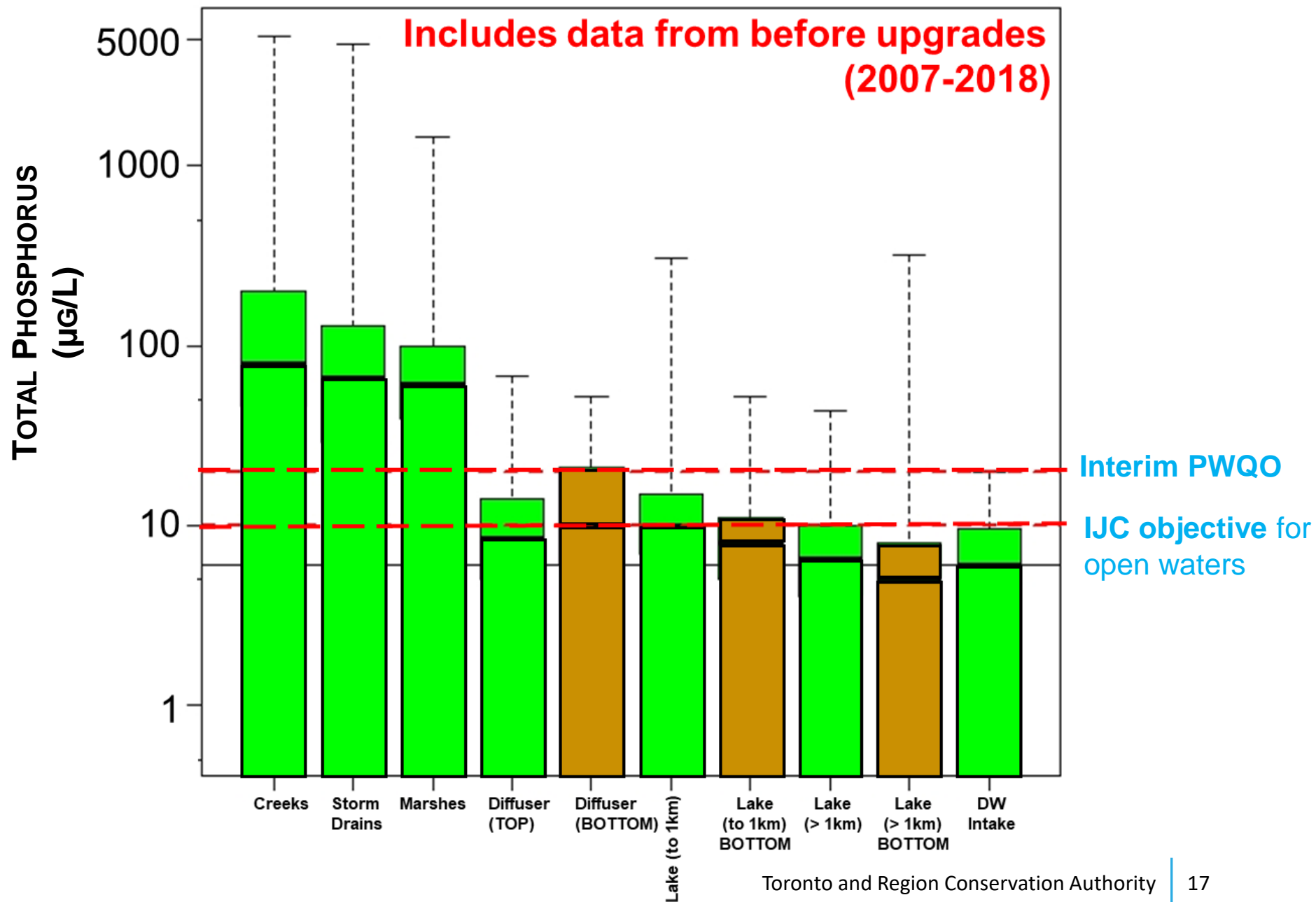
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Author: TRCA



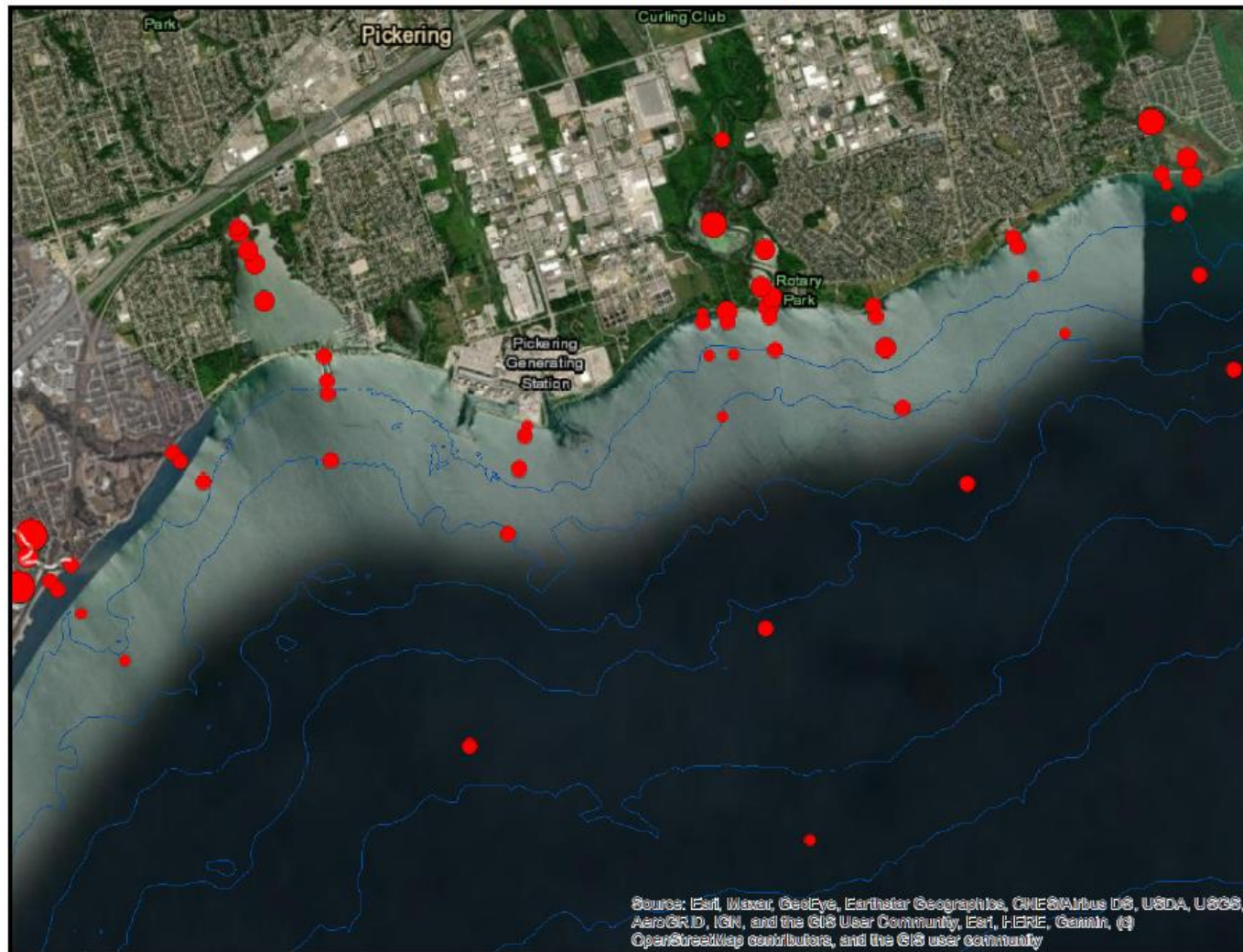
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Near_Shore_...
- NOAA 5m
Contours Lake
Ontario



Near Shore Water Quality Monitoring



**August 28,
2016**

**Soluble
Reactive
Phosphorus**

Legend

Search
Results:
Soluble
Reactive
Phosphorus
($\mu\text{g P/L}$)

0.2-1.9

2-5

>5-10

>10-25

>25-50

Near_Shore_...
- NOAA 5m
Contours Lake
Ontario

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community, Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community

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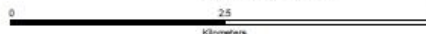


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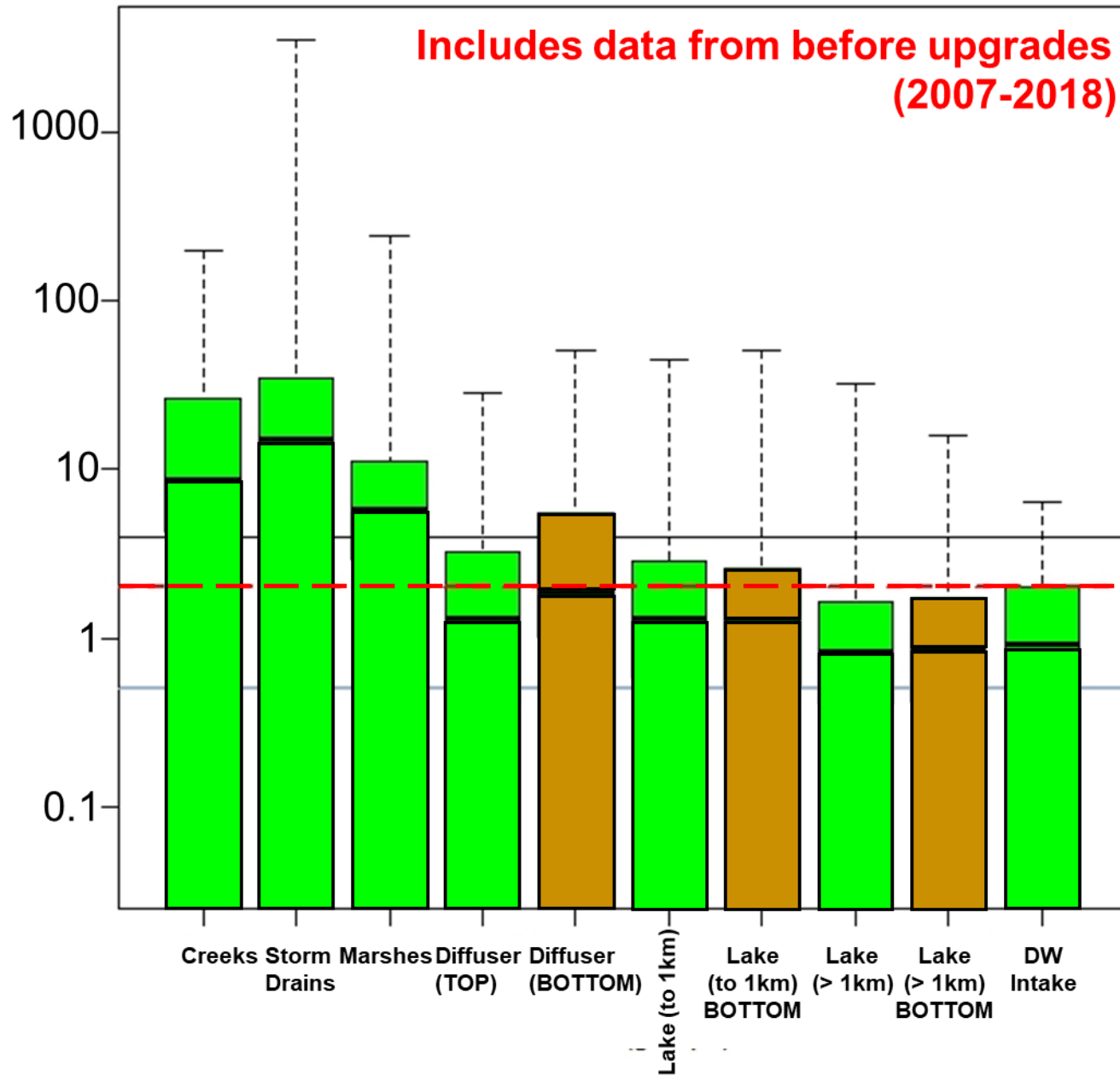
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for The Living City

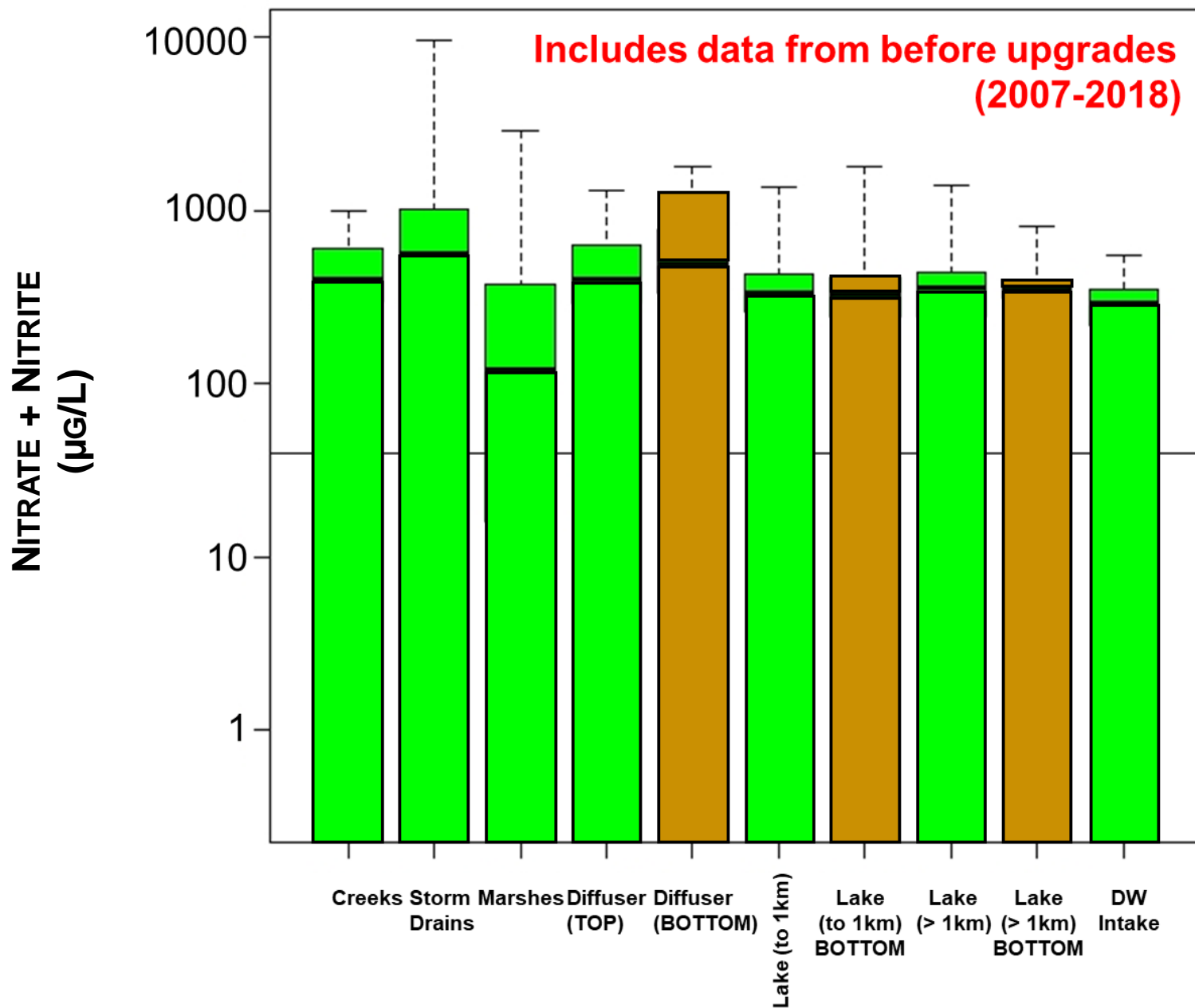


**SOLUBLE REACTIVE
PHOSPHORUS
($\mu\text{g/L}$)**

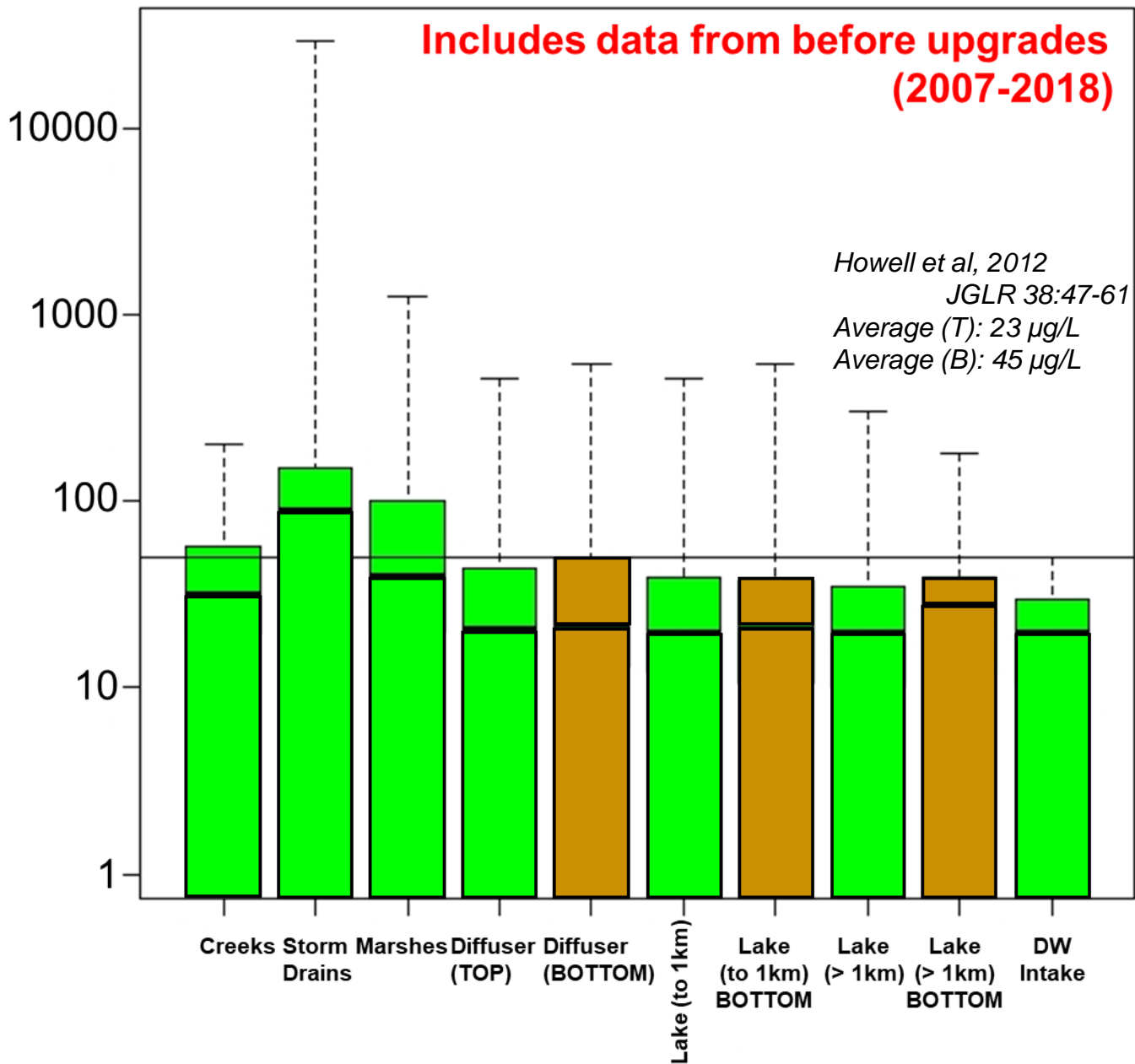


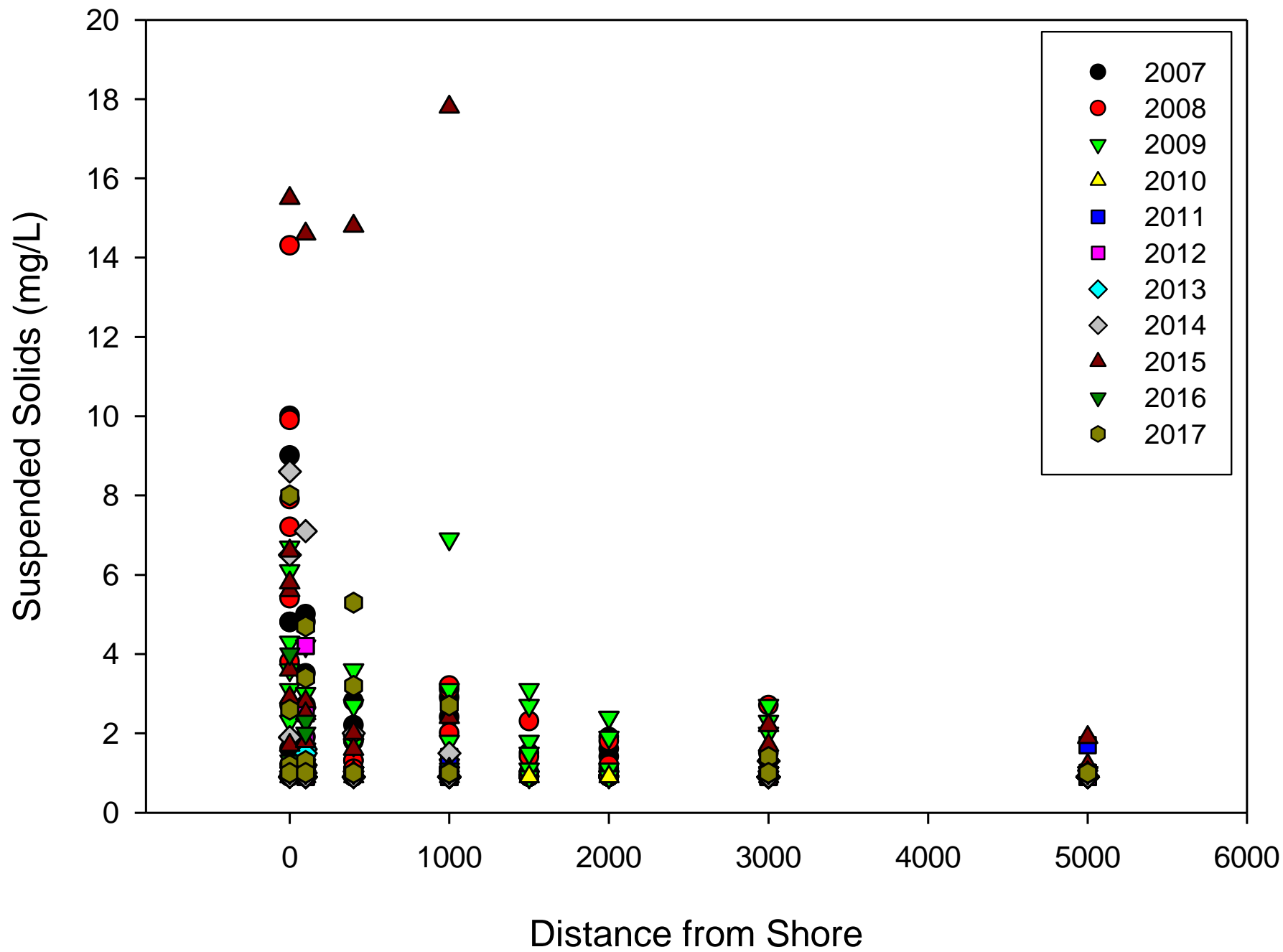
2 $\mu\text{g/L}$

**medians are likely lower due to the nature of the non-detect modeling*



AMMONIA + AMMONIUM (µg/L)





Phosphorus near Duffins and Carruthers

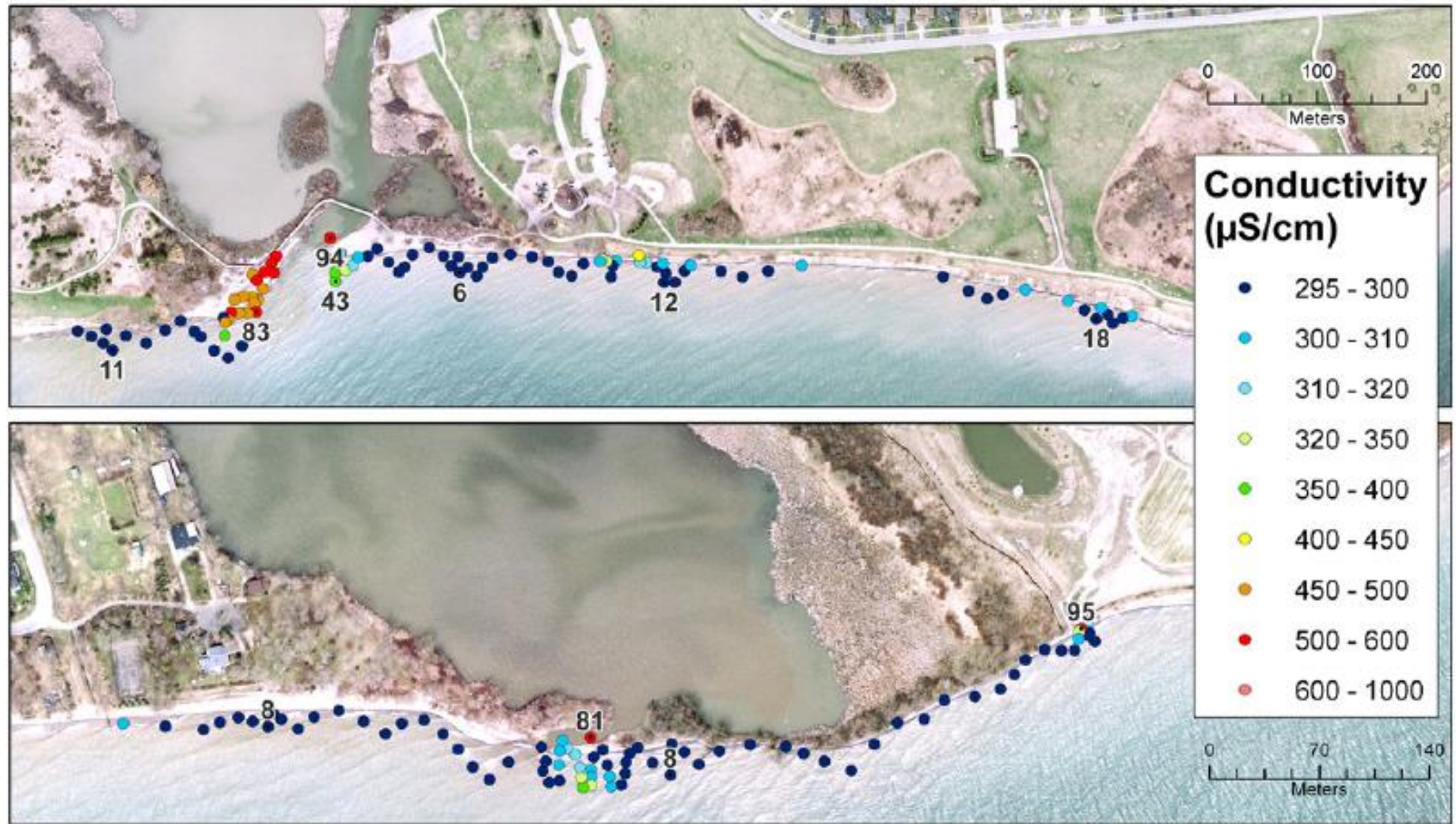
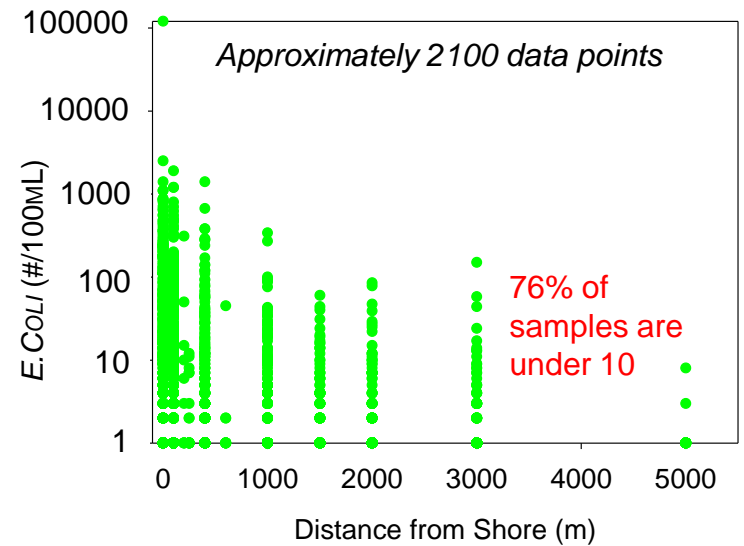
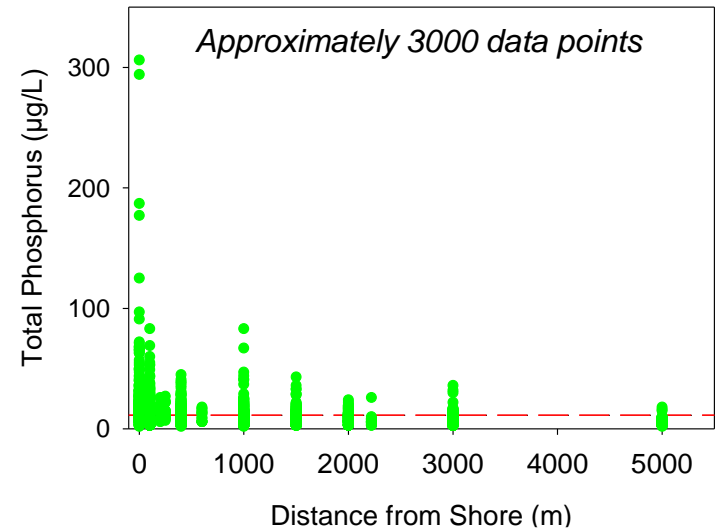
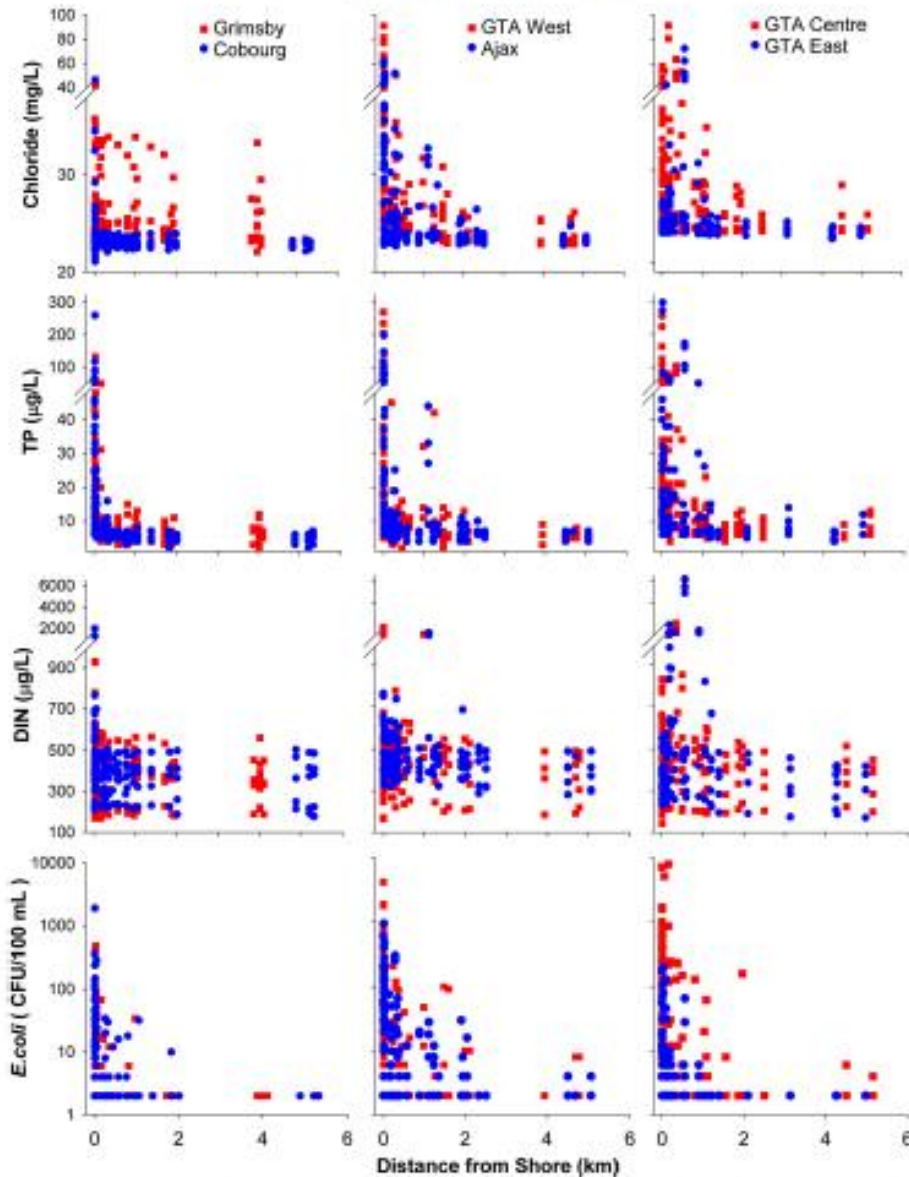


Fig. 3. Shoreside conductivity in the vicinity of Duffins Creek (upper panel) and Carruthers Creek (lower panel) within the Ajax polygon on June 24, 2008. The coloured circles indicate field-measured conductivity and the numeric values are concentrations of TP in $\mu\text{g/L}$.

Patterns align with MECP work

E.T. Howell et al. / Journal of Great Lakes Research 38 (2012) 32–46



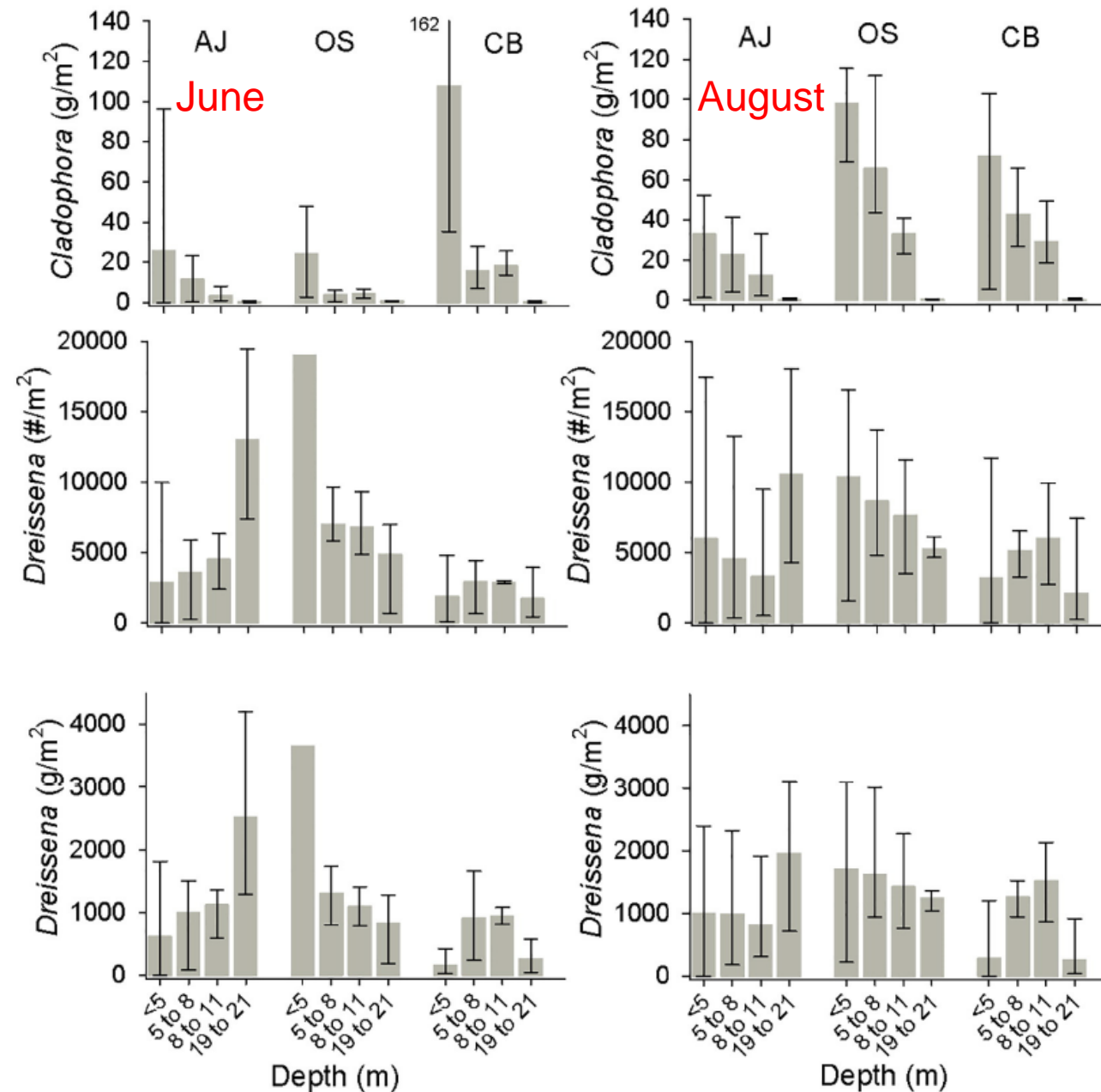
3. Algae work in Lake Ontario



Howell, 2018

JGLR 44(1): 86-104

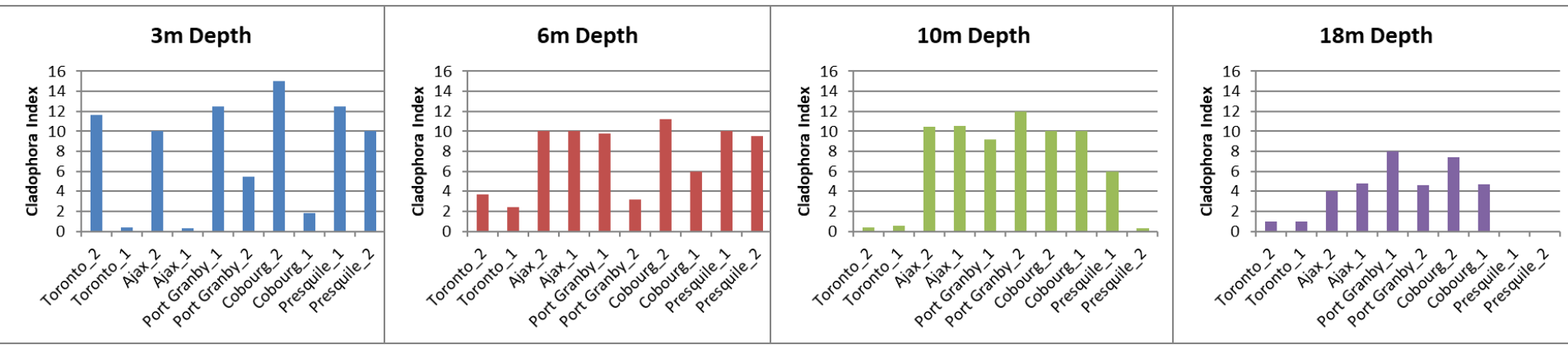
- no direct abundance relationship with Total or Dissolved Phosphorus
- high abundance even where Total Phosphorus was similar to the open lake
- nuisance levels are not only in areas with high external loading (internal lakebed and lake trophic status effects unknown)

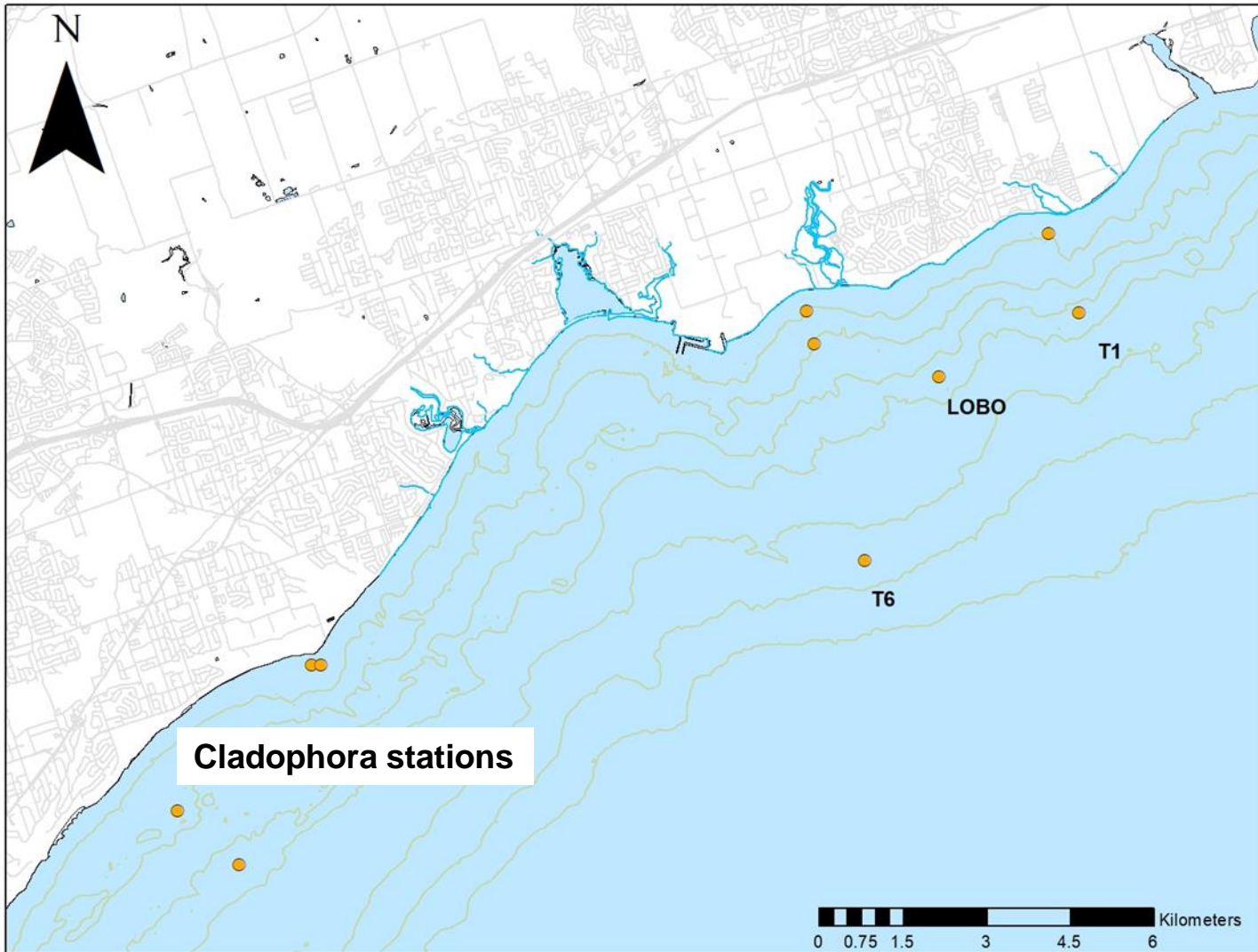


From Toronto to Pres'quile, 2016



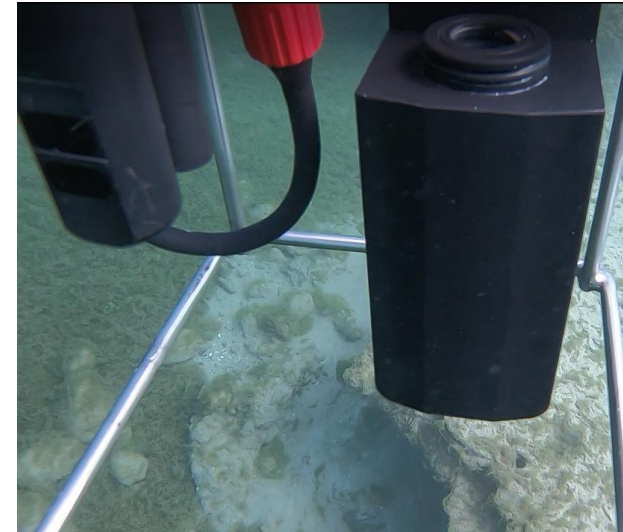
- widespread *Cladophora* coverage and algal biomass despite a very dry spring and summer.
- P inputs to the nearshore still occur in urbanized areas (i.e. Toronto, Ajax), but the presence of significant amounts of algae in areas remote from such inputs is suggestive of a broader whole-lake forcing.





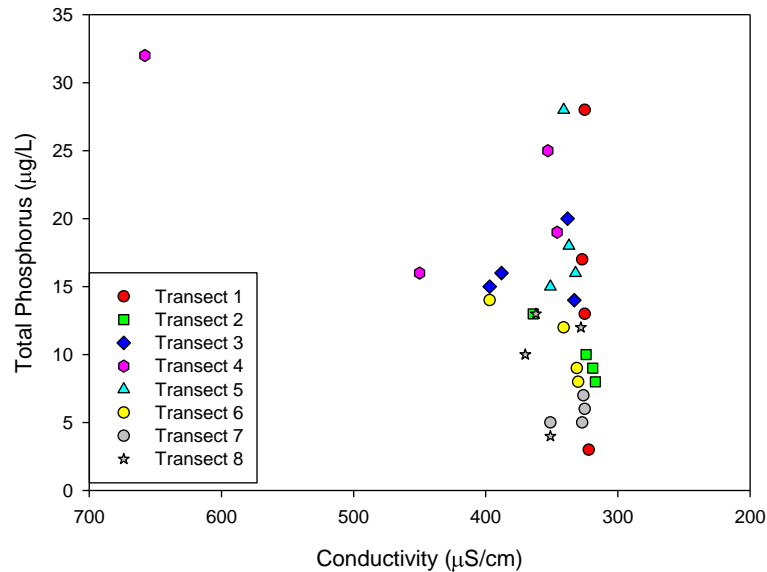
4. Other projects

- Stormwater
- Tributary Loading
- Cladophora stressors
- Marsh-lake connectivity

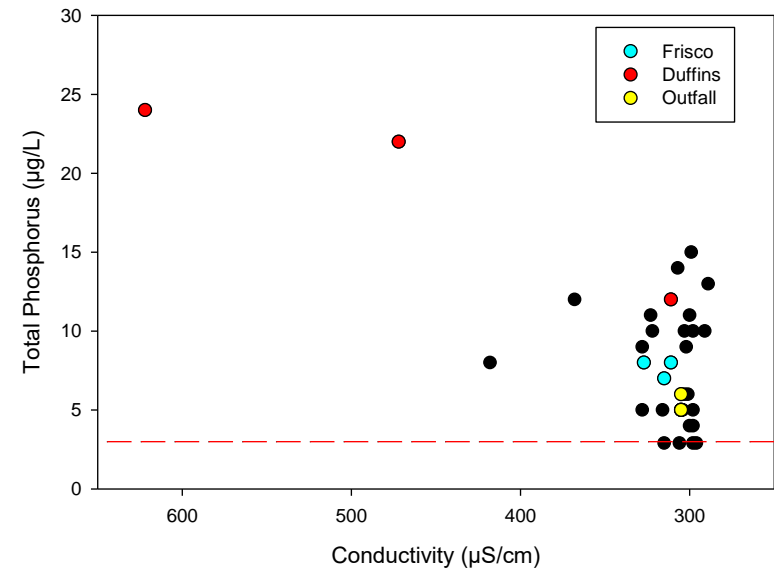


Frisko Storm Drain – Problem Identification and Action

< 1000 m



< 1000 m



U. Waterloo: Ajax Phosphorus Monitoring

- Joint project with University of Waterloo, ECCC, MECP and TRCA
- Real time monitoring of flow and storm sampling of twin storm sewers in the lower Carruthers watershed
- Analyzing Phosphorus speciation and modelling total phosphorus loads from two sewer sheds



Lake Ontario Tributary Loading Project

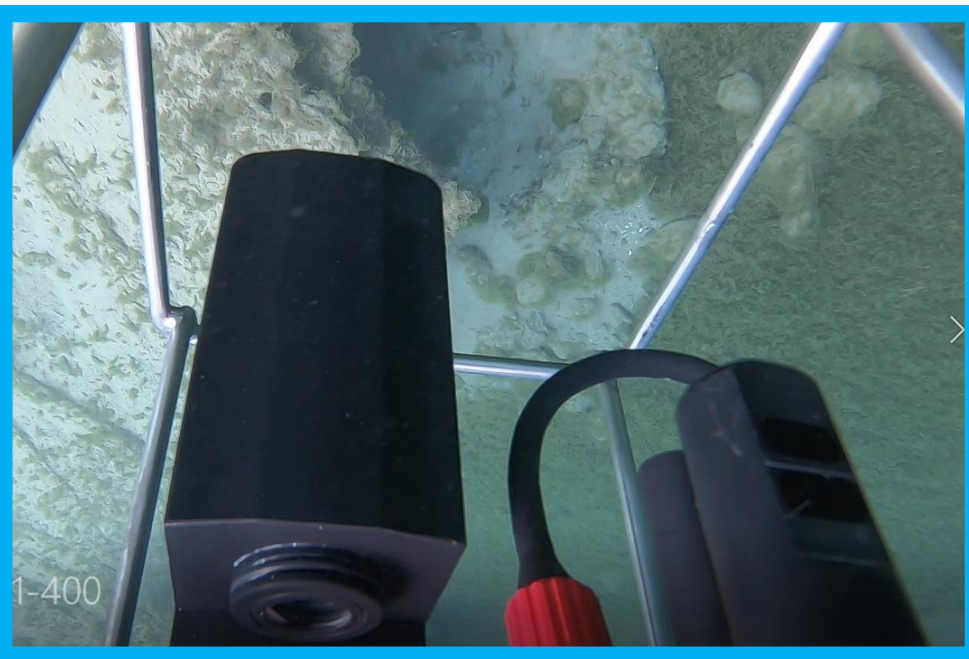


- 12 stations on the north shore of L. Ontario
- ISCO Autosamplers collecting level, discharge, and sampling storm events
- 5 stations equipped with sondes
 - Continuous data collected
- Multi agency project including: TRCA, MECP, ECCC, GRCA, and MOAFRA
- All stations will contribute to nutrient loadings to the lake

Postdoctoral Fellows

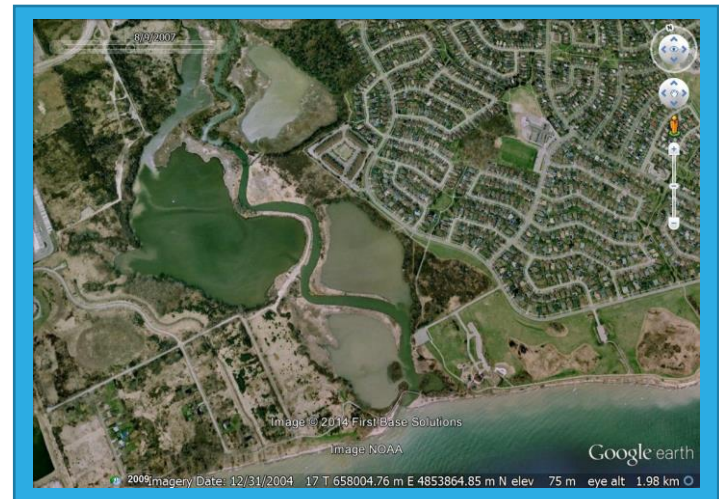
Multiple Stressors

- Disentangling Effects of Multiple Stressors on Nuisance Benthic Algae (Cladophora) in Nearshore Regions of the Great Lakes



Marsh

- Connecting watershed-scale land-use with coastal wetland ecological integrity
- Effects of marshes on tributary loading





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