

The Corporation of the Town of Ajax

GENERAL GOVERNMENT COMMITTEE



Monday May 9, 2016

Open Meeting at 1:30 p.m.

In-Camera to follow immediately after open session

River Plate Room, Town Hall

65 Harwood Avenue South

PRESENTATIONS

*Alternative formats available upon request by contacting:
accessibility@ajax.ca or 905-619-2529 ext. 3347*

Anything in **blue** denotes an attachment/link. By clicking the links on the agenda page, you can jump directly to that section of the agenda. To manoeuvre back to the agenda page use the **Ctrl + Home** keys simultaneously

6. Presentations

- 6.1 **Duffin Creek Water Pollution Control Plant Outfall EA – Status Update**
 - ~ BARB Hodgins, Senior Policy Planner
 - ~ Dr. Martin Auer, Professor of Civil and Environmental Engineering at Michigan Technological University
 - ~ Ms. Jennifer Danahy, Environmental Law Specialist, Gowling WLG

Phosphorus, *Cladophora* and the Ajax Nearshore

What it was like ...

What happened ...

What it is like today

Dr. Martin T. Auer and Anika Kuczynski
Great Lakes Research Center



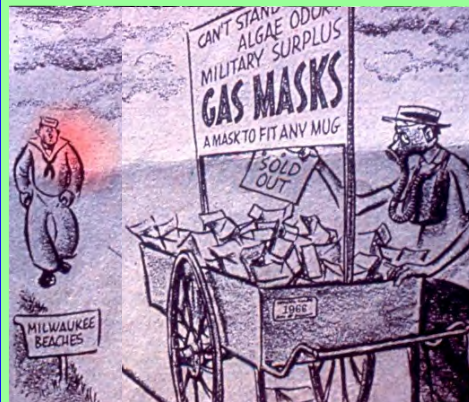
What it was like ...



Lake Erie 1920s



Lake Ontario 1933

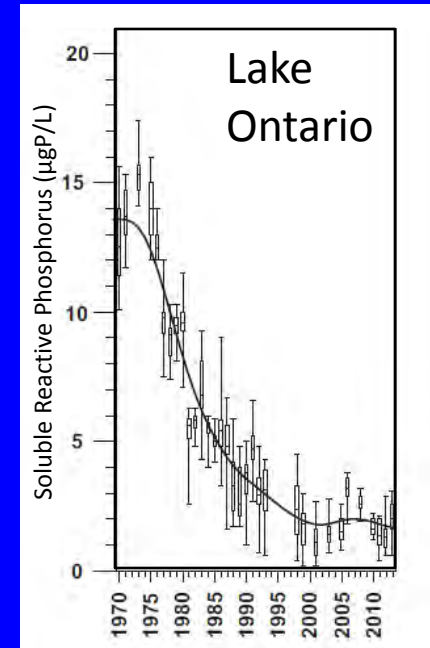
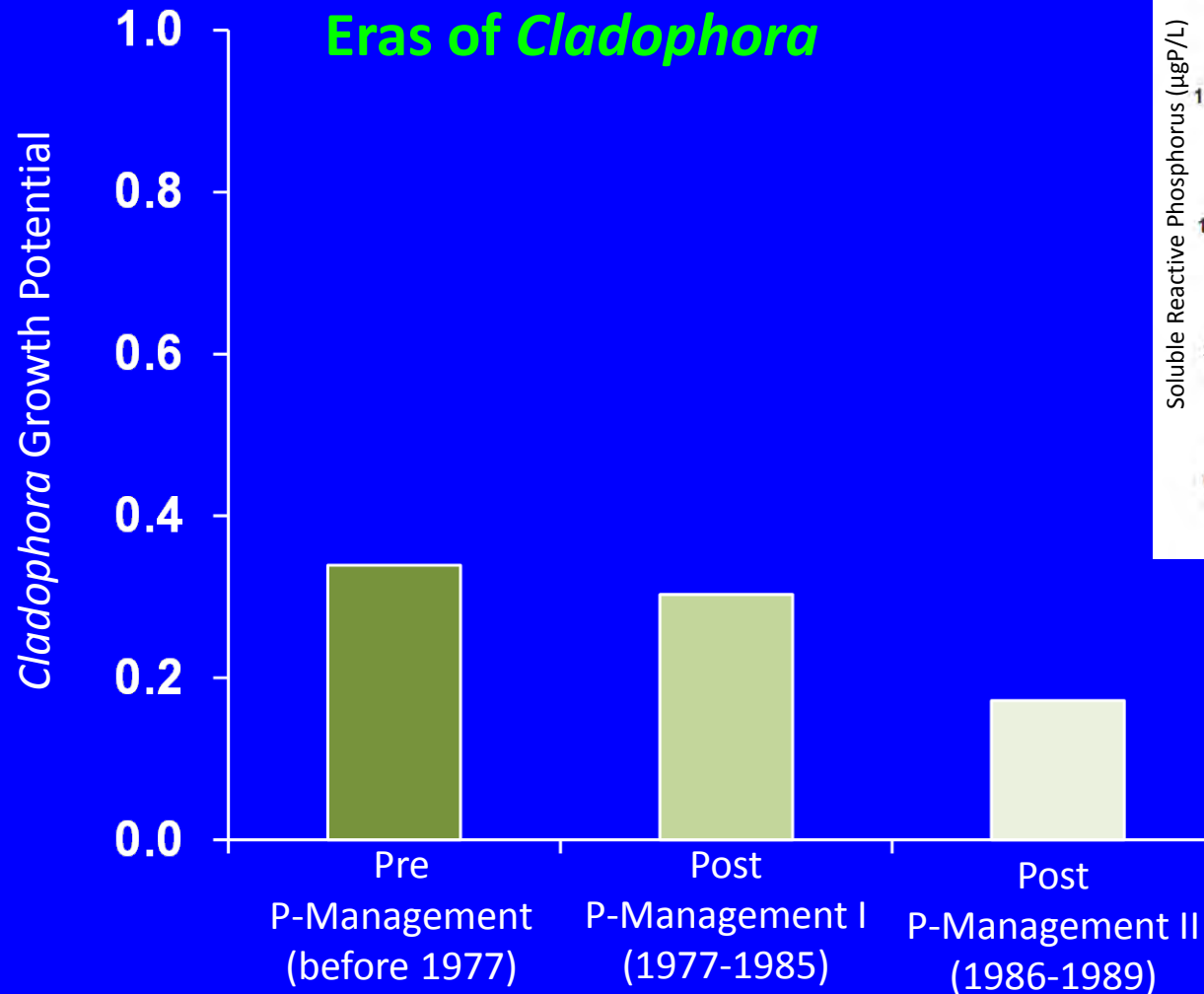


Lake Michigan 1966

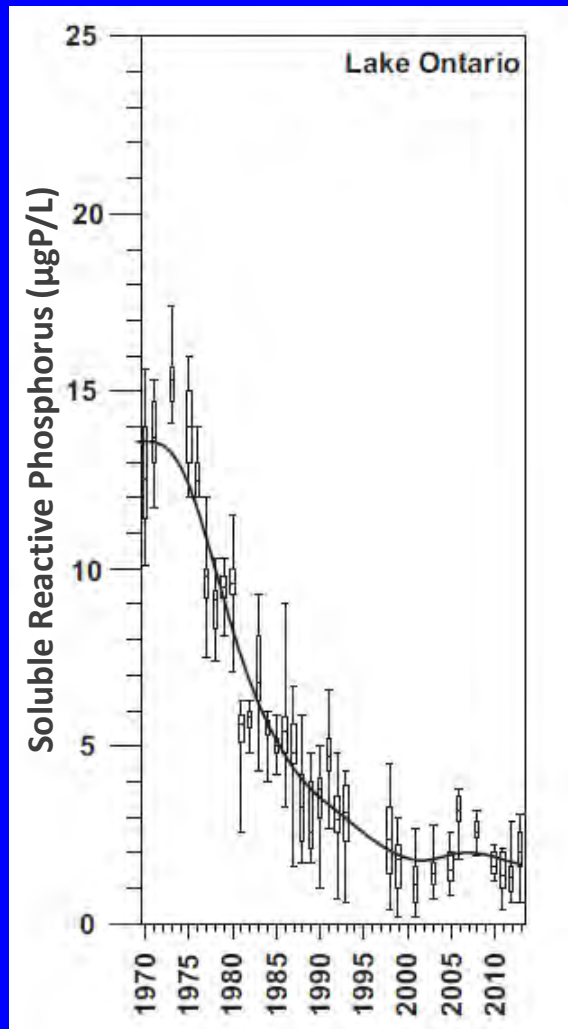


Lake Huron 1980

What it was like ...



What it was like ...



20th Century

eutrophic

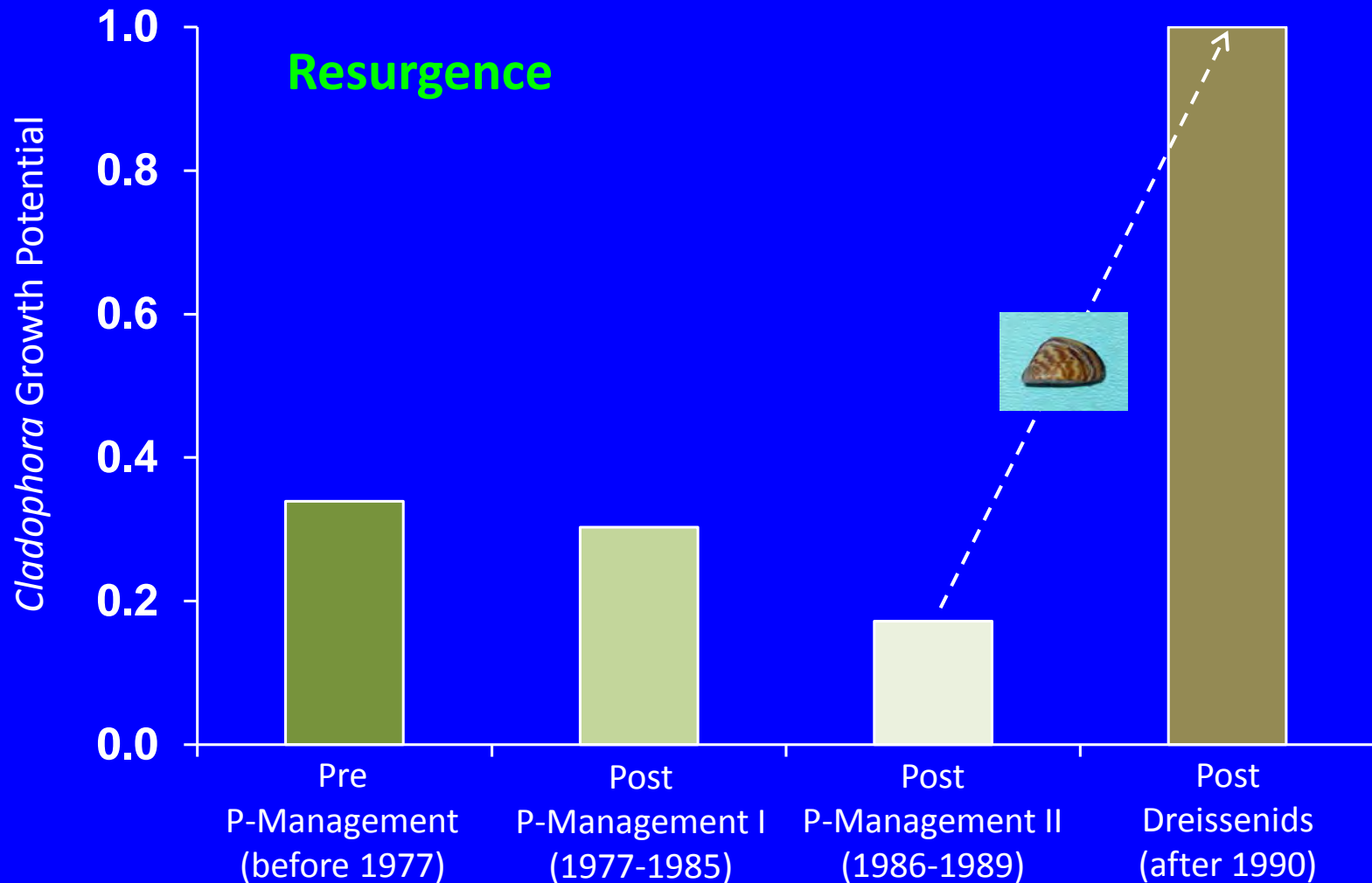
Whole Lake Forced

21st Century

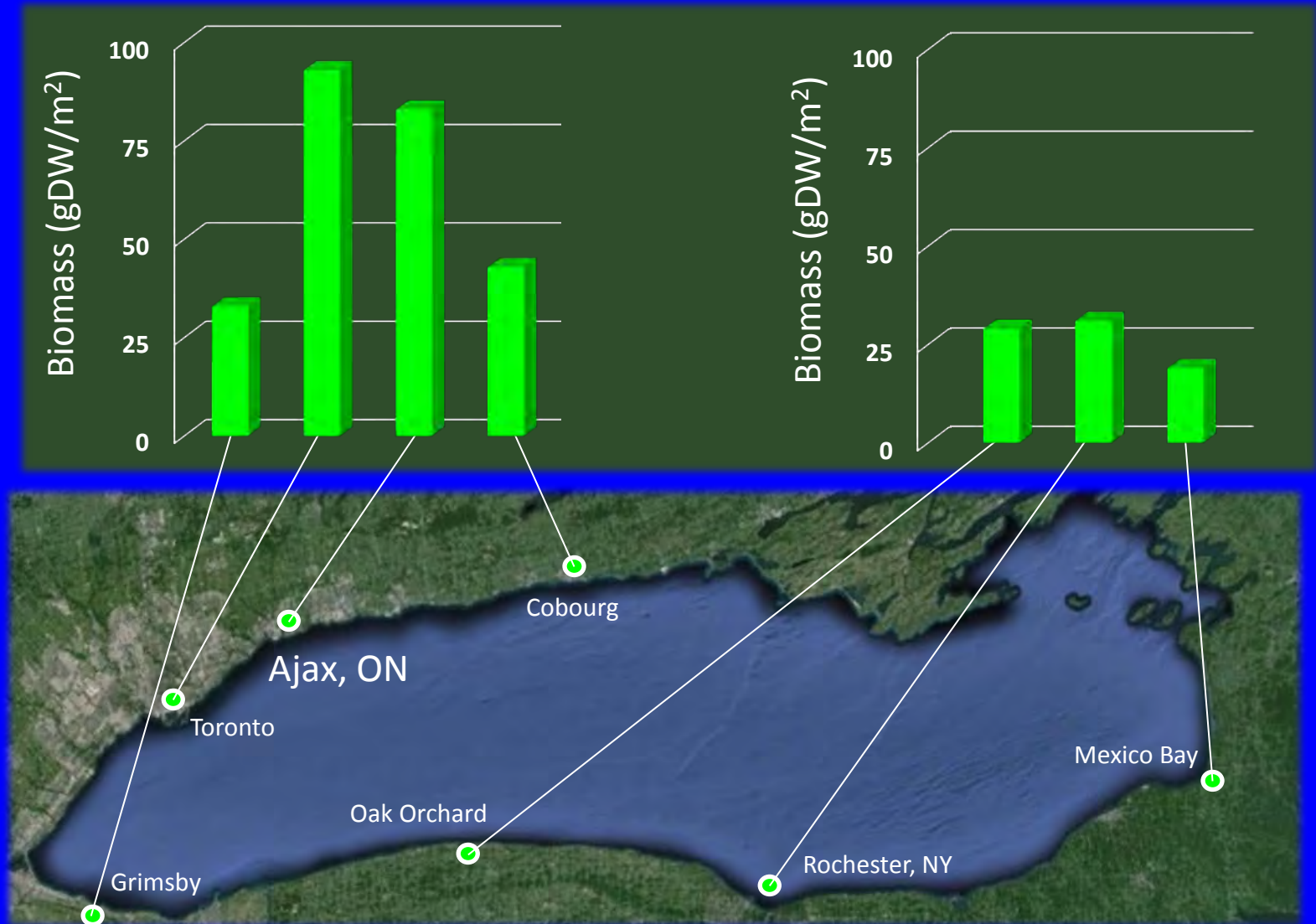
oligotrophic

Local Source Forced

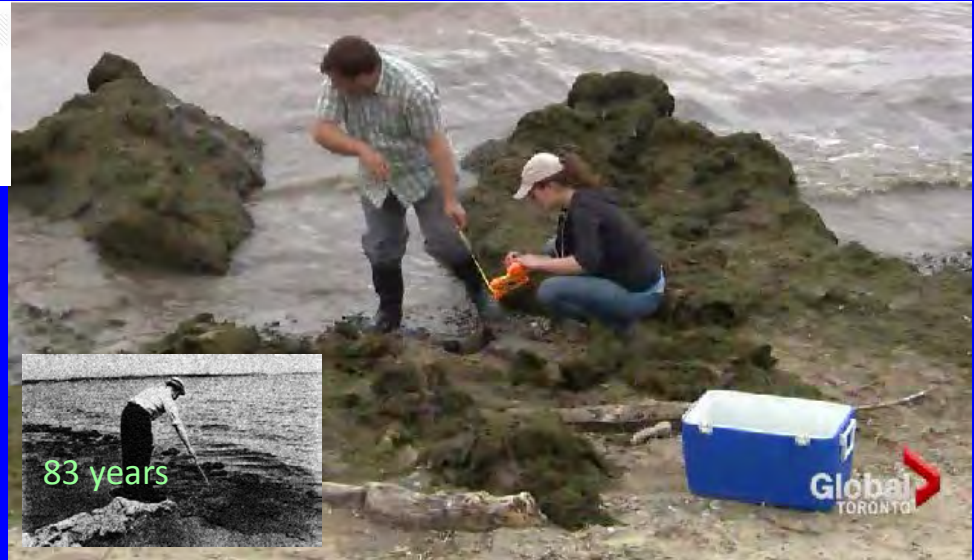
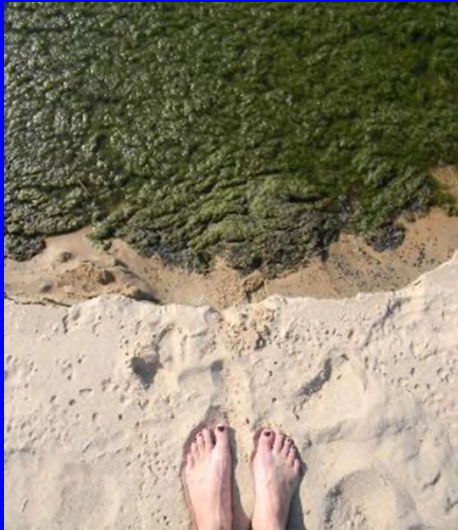
What it was like ...



What it was like ...



What it was like ...



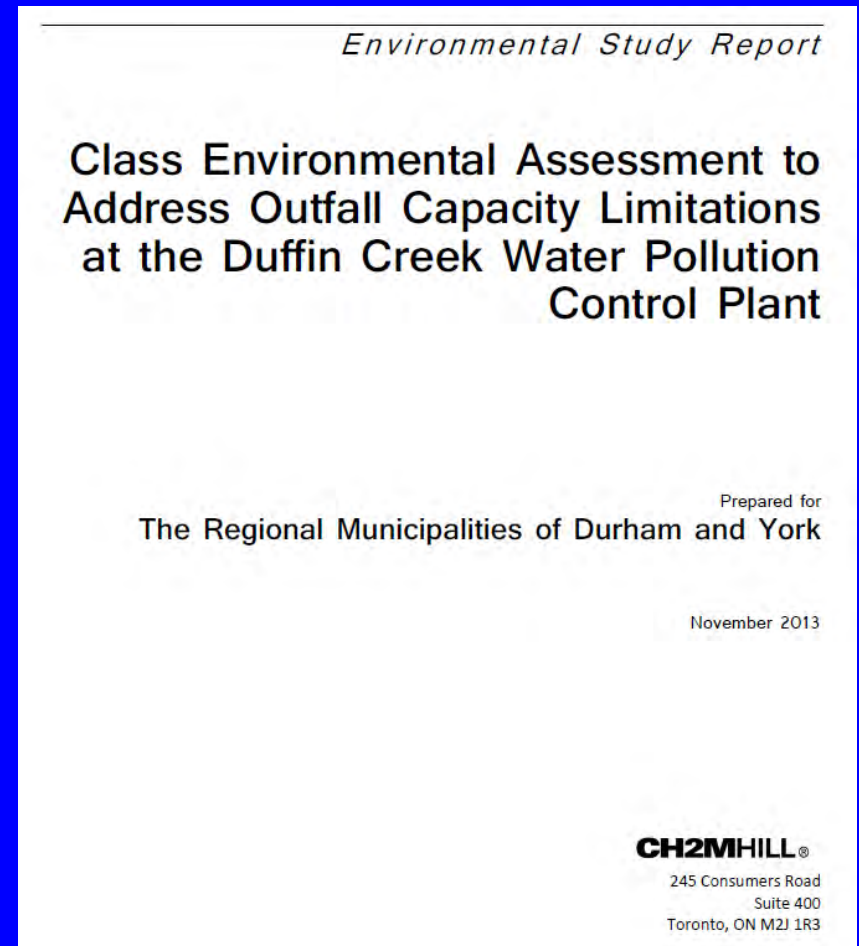
Federal, Provincial and State Authorities have

- no standard for acceptable levels of *Cladophora*
- no phosphorus standard to achieve acceptable levels
- no strategy to eliminate of nuisance conditions

What it was like ...

“Nuisance *Cladophora* growth has been the foremost concern in public and stakeholder meetings during this Class EA.” ESR, p. 5-1

The Regions’ *Environmental Study Report (ESR)* addressed this concern by presenting a suite of processes potentially causing the *Cladophora* problem.



What it was like ...

Potential culprits popped up in the ESR like a family of moles invading a garden.



The list of causes proposed in the ESR was both comprehensive and diverse, and included both true moles and *hybrids* (mole – *red herring* crosses).

One prominent mole was missing.

Causes of nuisance conditions proposed in the ESR were systematically addressed. The Town's attention then turned to the missing mole.

What it was like ...

The Missing Mole

The ESR recognizes that,

Wastewater treatment plants ... have the potential to influence the nearshore environment ... if they discharge at high concentrations with insufficient dilution in the mixing zones. (ESR, p. 5-5, 5-6)



But then fails to accept any responsibility in causing nuisance conditions of *Cladophora* growth along the Ajax waterfront, simply noting that,

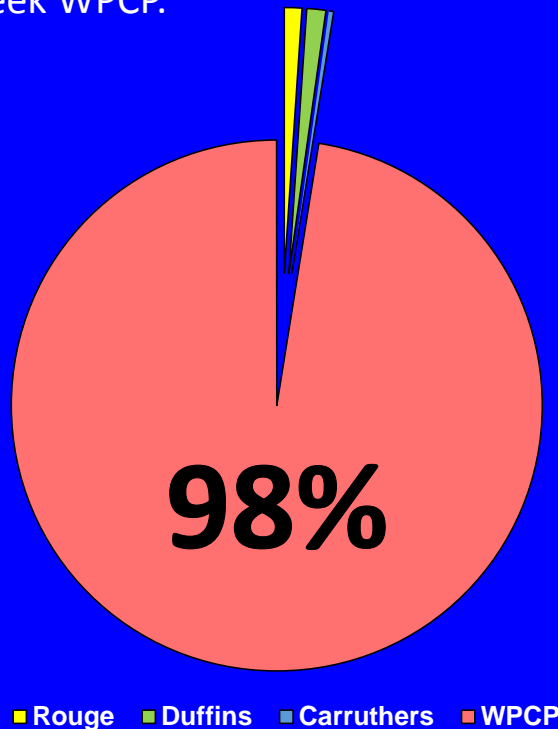
Currently, the Duffin Creek WPCP has one of the most stringent effluent limits discharging to the open water of Lake Ontario. (ESR, p. 5-11)

The Town then initiated a program of scientific study to credibly assess the significance causes of nuisance *Cladophora* growth cited by the Regions in the ESR and to quantify the role of the missing mole. The study focused on three points: “Where Does Phosphorus Come From”, “Where Does Phosphorus Go” and “What Does Phosphorus Do”

What happened ...

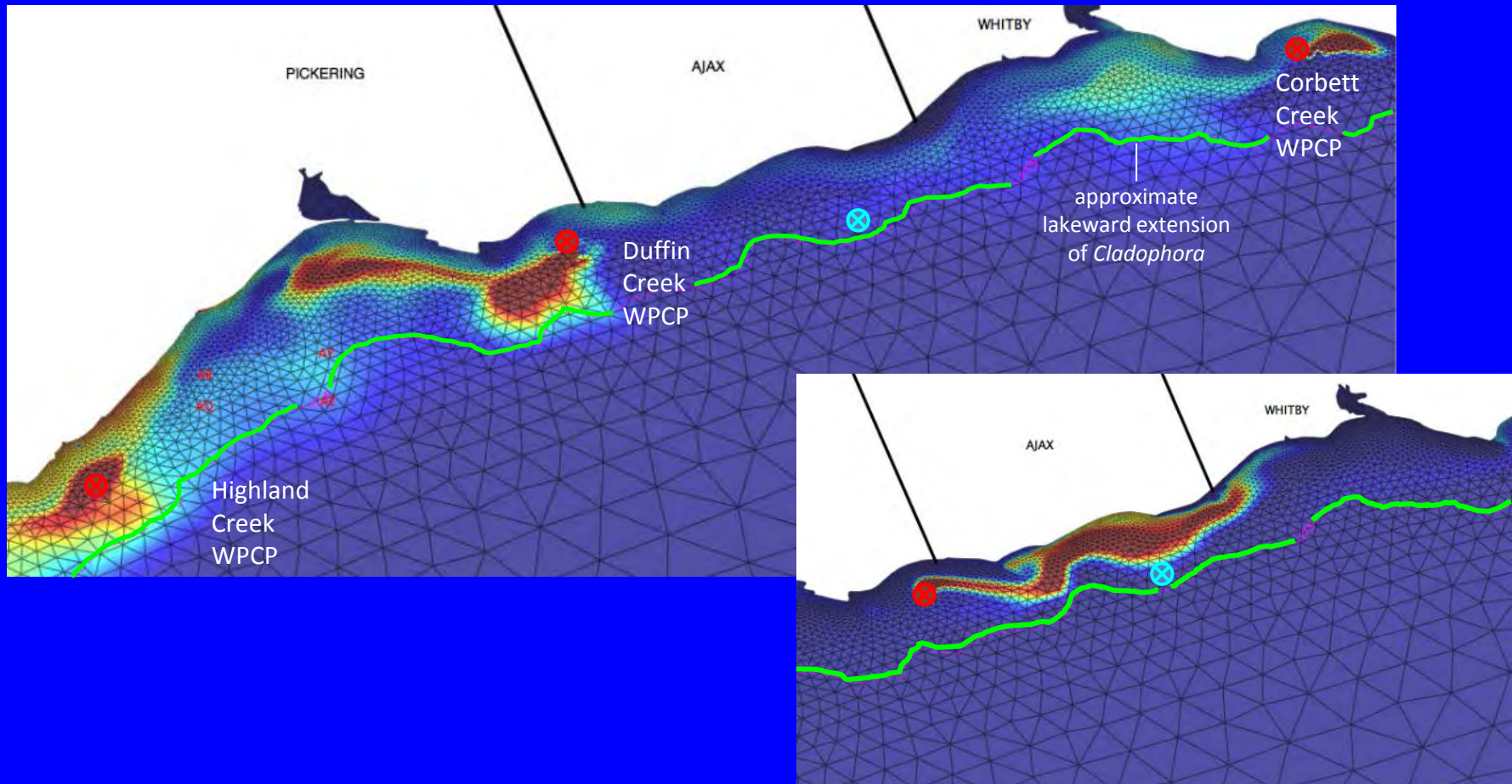
Where Does Phosphorus Comes From?

During the *Cladophora* growing season, 98% of the bioavailable phosphorus (BAP) discharged directly to the Ajax-Pickering nearshore originates from the Duffin Creek WPCP.



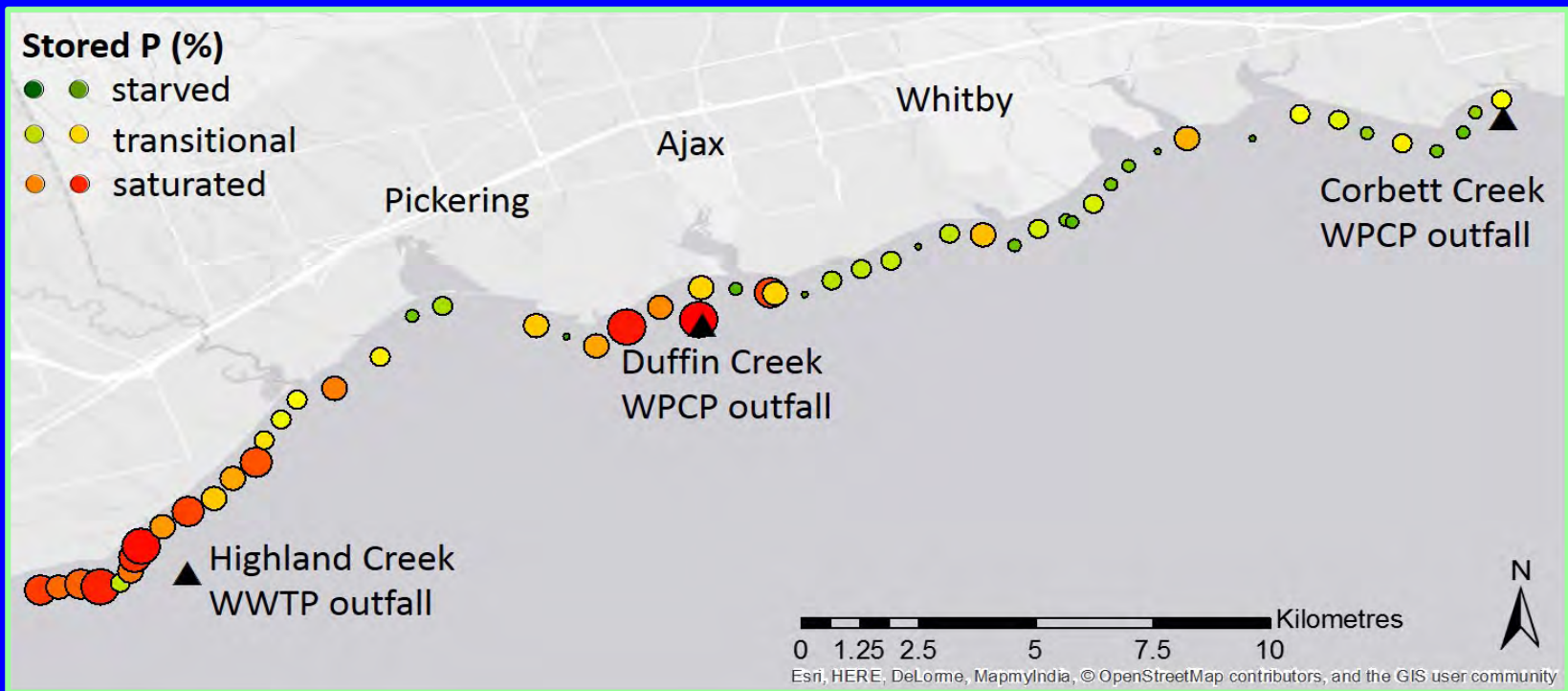
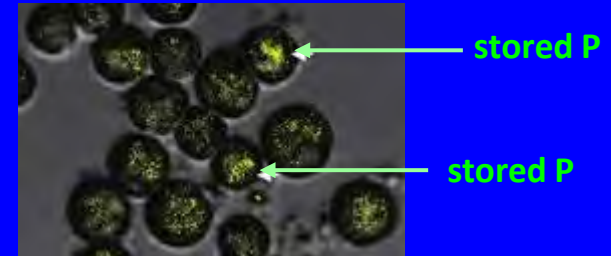
What happened ...

Where Does Phosphorus Go?



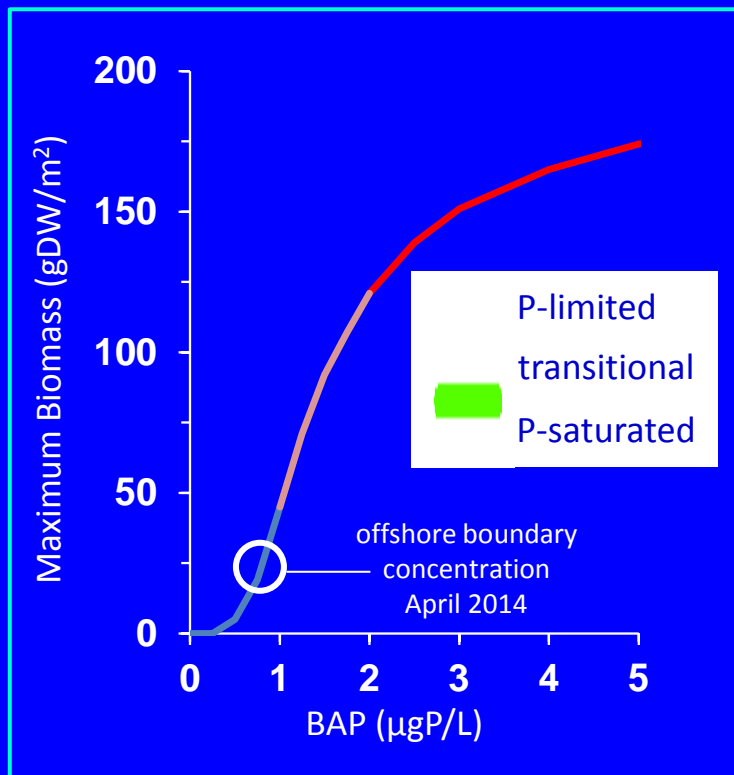
What happened ...

Ask the Algae Where Phosphorus Goes!



What happened ...

What Does Phosphorus Do



Credit: Kevin Wyatt

What happened ...

The Town's study provided a strong scientific foundation for the conclusion that the Duffin Creek WPCP is the primary source of the phosphorus that leads to nuisance growth of *Cladophora* and attendant loss of beneficial uses along the Ajax waterfront.



The Duffin Creek WPCP

- is the largest source of phosphorus to the Ajax nearshore during the *Cladophora* growing season;
- discharge plume distributes effluent across nutrient-sensitive *Cladophora* habitat;
- elevates ambient phosphorus concentrations in the lake water, resulting in
- higher levels of stored phosphorus in *Cladophora*, levels sufficient to support nuisance algal growth.

What it's like today.

The Environmental Assessment (Class EA) Process

The Duffin Creek WPCP is part of the York-Durham Sewage System. Stages 1, 2 and 3 of and incremental expansion plan for the system were completed in 2012. The Environmental Compliance Approval (ECA; discharge permit), granted in 2007, provides for a total treatment capacity of 630 million litres per day (MLD).

The Stage 3 expansion Class EA Receiving Water Impact Assessment Study determined that dilution requirements (20:1 within the mixing zone) would not be met at flows >560 MLD. Thus, the Regions could not access the ECA total treatment capacity until the dilution requirement was met.

The Minister then imposed a condition limiting flows to 520 MLD and requiring that the Regions develop a solution that would address the limitations of the existing outfall. The preferred alternative identified by the Regions was to modify diffuser ports and optimize (phosphorus removal) operations to provide the required dilution (reduction) of phosphorus levels within the mixing zone. The Regions' preferred alternative is presently being considered by the Minister.

What it's like today.

Why the Regions' Preferred Alternative Will Fail to Provide Relief

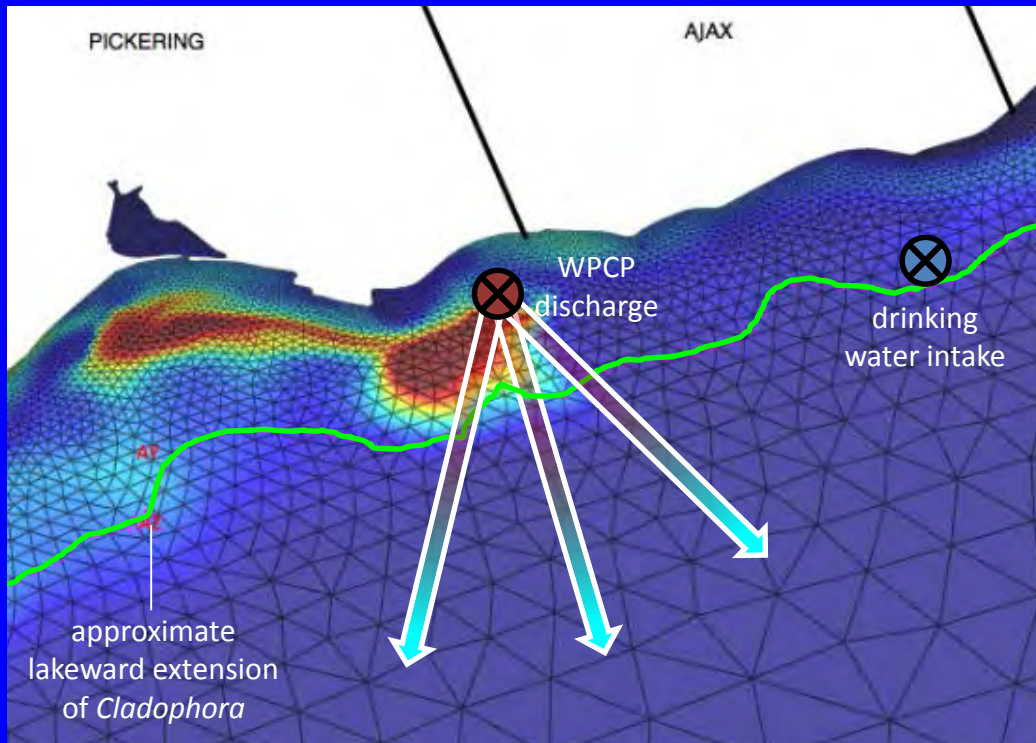
- **WRONG POLLUTANT.** The Provincial Water Quality Objective (PWQO) for total phosphorus, 0.02 mgTP/L, used in the Class EA does not apply to *Cladophora*. Bioavailable phosphorus (BAP), the form freely and fully available to algae, provides the correct management focus for relief from nuisance conditions of *Cladophora* growth.
- **WRONG DILUTION FACTOR.** The dilution factor applied in the Class EA is 20:1. Based on the Minister's Order of an effluent TP of 0.35 mgP/L and a TP bioavailability of 77%, as measured for the DCWPCP effluent, the dilution factor required to eliminate nuisance conditions of *Cladophora* growth is 270:1. The Class EA dilution factor will not reduce levels of SRP sufficiently to provide relief.

TP vs BAP

20:1 vs 270:1

What it's like today.

The Challenge in the Nearshore



Effluents with phosphorus levels meeting standards for discharge to offshore waters have levels that stimulate nuisance algal growth when passing through sensitive *Cladophora* habitat on the way to dilution in the offshore.

The management challenge is to eliminate contact between P-rich effluent and *Cladophora* habitat as the discharge makes its way to and mixes with offshore waters.

What it's like today.

Testing Other Alternatives

The efficacy of two phosphorus management strategies considered in the Duffin Creek WPCP Class EA, but not carried forward as Region preferred alternatives, were examined by the Town.

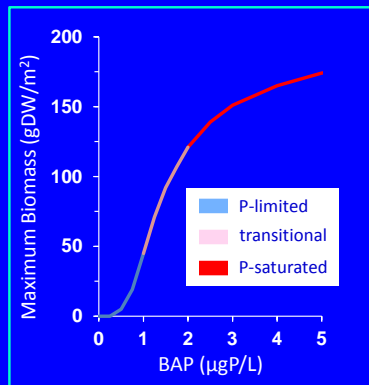
- 1) **Outfall extension** from 1 km to 3 km to increase separation of the discharge from *Cladophora* habitat and provide greater dilution.
- 2) **Enhanced treatment** with ballasted flocculation to reduce bioavailable phosphorus levels in *Cladophora* habitat to those unable to support nuisance algal growth.

		OUTFALL LENGTH →	
		1 km	3 km
← TREATMENT LEVEL	conventional	CURRENT CONDITION	EXTENDED OUTFALL
	advanced	ENHANCED TREATMENT	BOTH OPTIONS

What it's like today.

Testing Other Alternatives

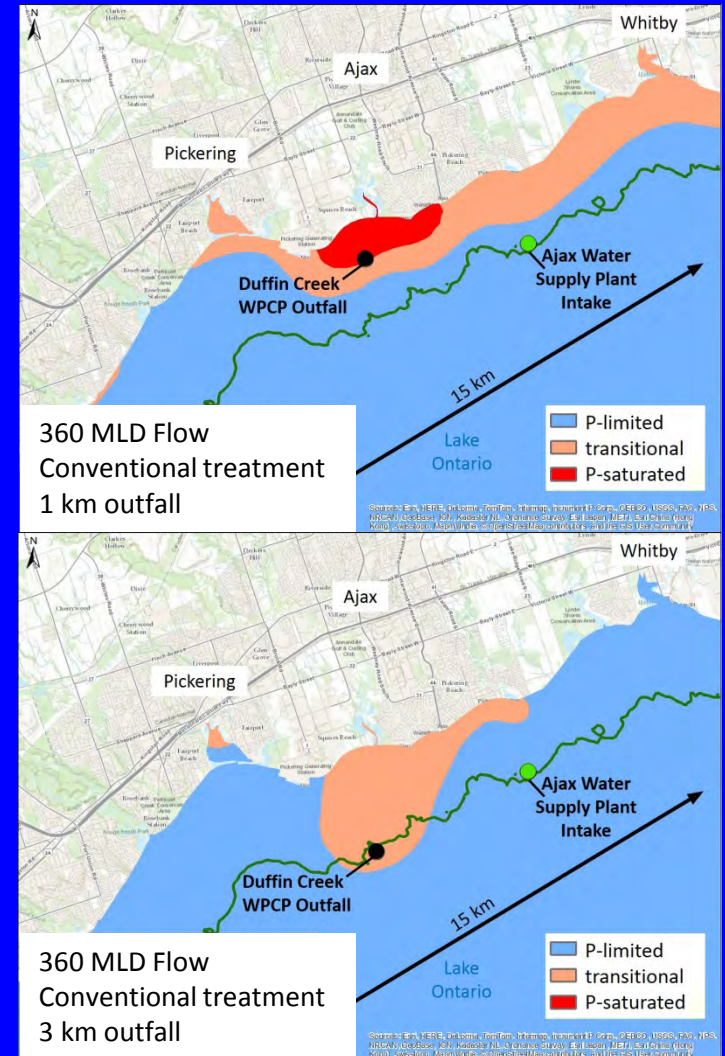
		OUTFALL LENGTH →	
		1 km	3 km
← TREATMENT LEVEL	conventional	CURRENT CONDITION	EXTENDED OUTFALL
	advanced	ENHANCED TREATMENT	BOTH OPTIONS



Current
Condition

Extended
Outfall

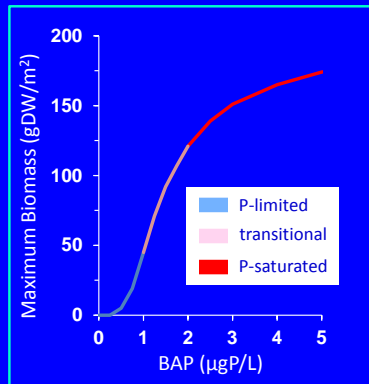
Note: simulations treat BAP as a non-reactive substance.



What it's like today.

Testing Other Alternatives

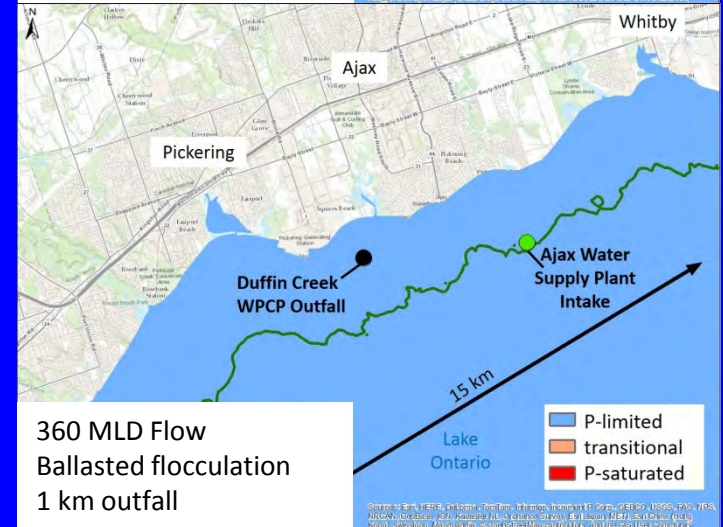
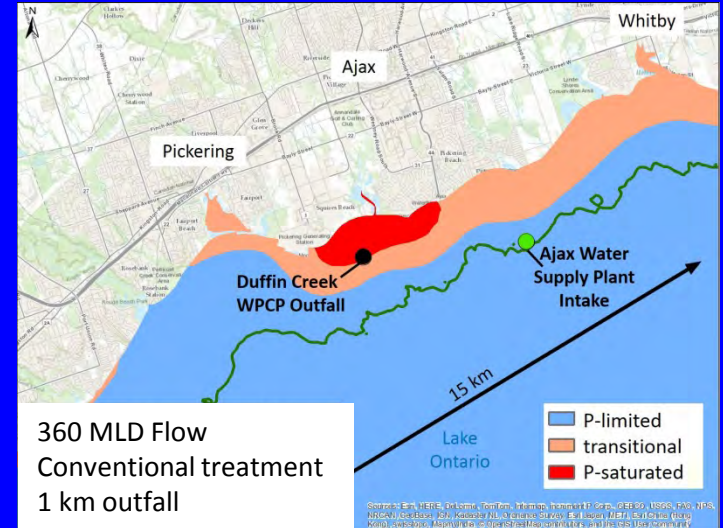
		OUTFALL LENGTH →	
		1 km	3 km
← TREATMENT LEVEL	conventional	CURRENT CONDITION	EXTENDED OUTFALL
	advanced	ENHANCED TREATMENT	BOTH OPTIONS



Current
Condition

Enhanced
Treatment

Note: simulations treat BAP as a non-reactive substance.



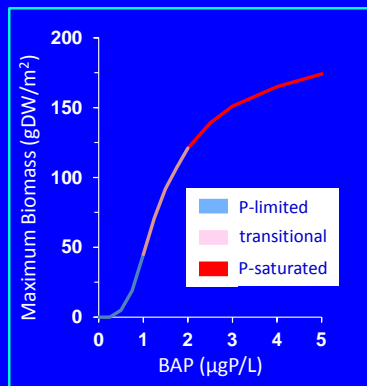
What it's like today.

Testing Other Alternatives

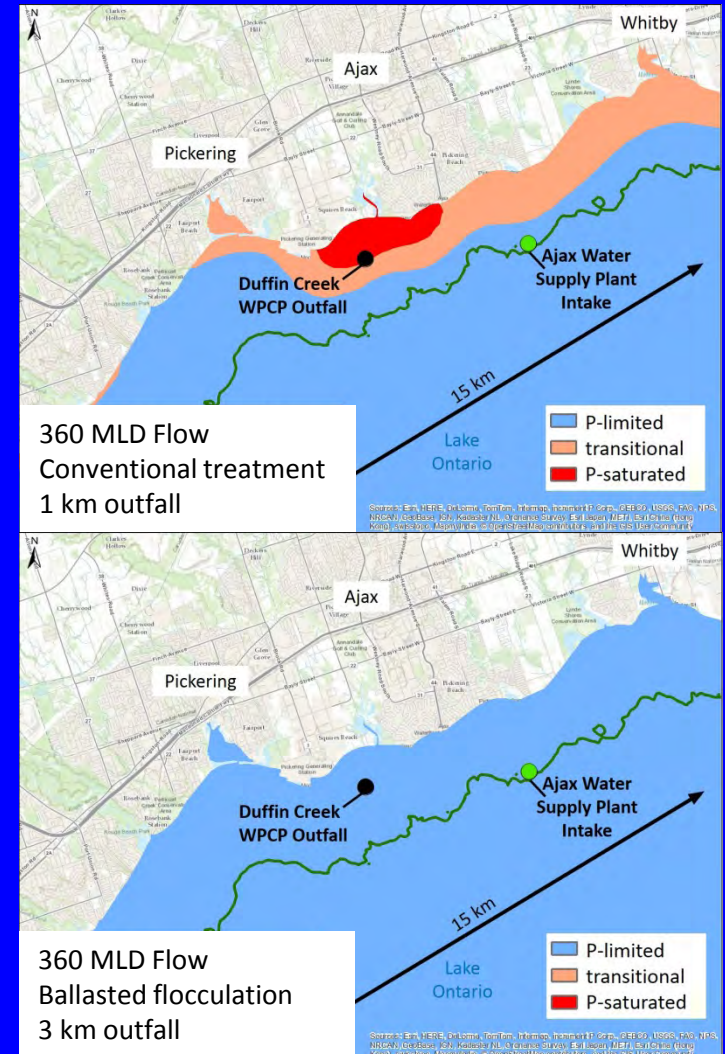
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		OUTFALL LENGTH →	
		1 km	3 km
← TREATMENT LEVEL	conventional	CURRENT CONDITION	EXTENDED OUTFALL
	advanced	ENHANCED TREATMENT	BOTH OPTIONS

Current Condition



Both Options



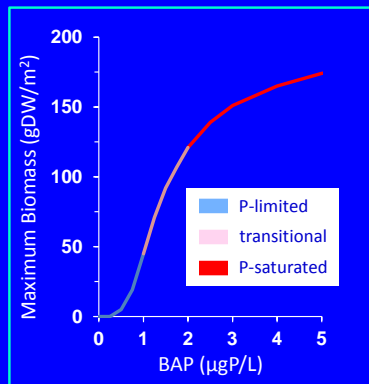
What it's like today.

The Town's Preferred Alternative

The Town has notified MOECC of its Preferred Alternative

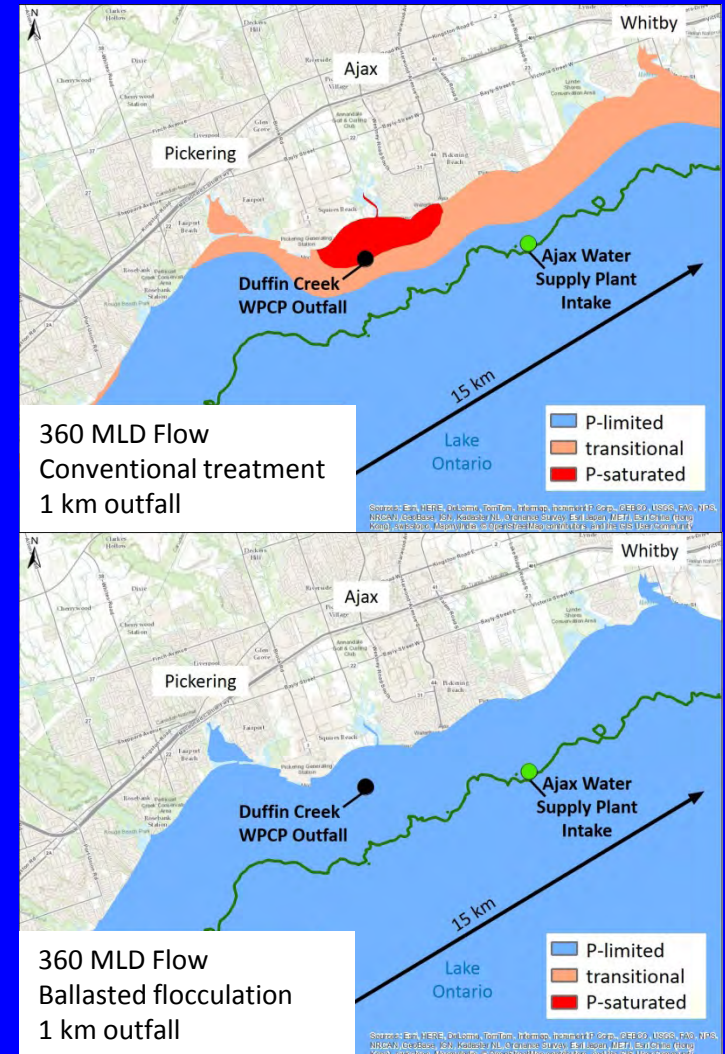
Current Condition

		OUTFALL LENGTH →	
		1 km	3 km
← TREATMENT LEVEL	conventional	CURRENT CONDITION	EXTENDED OUTFALL
	advanced	ENHANCED TREATMENT	BOTH OPTIONS



Enhanced Treatment

Note: simulations treat BAP as a non-reactive substance.



What it's like today.

The Minister Responds

The Minister received 90 **Part II Order requests, identifying significant outstanding issues** relating to outfall limitations at the Duffin Creek WPCP that were not addressed in the Class EA.

Concerns were raised about the state of the [Ajax] waterfront and the inability to use the waterfront as a result of **Cladophora growth that may be worsened due to phosphorus discharged from the WPCP.**

The Minister has determined that **further study** by the Regions is required before a decision on the Part II Order requests is made.



Here, for the first time, the Minister has formally recognized –

- **concerns that significant environmental degradation is occurring along the waterfront as a result of nuisance growth of *Cladophora* and**
- **that nuisance growth of *Cladophora* may be linked to phosphorus discharged from the WPCP and thus appropriately addressed as part of the Class EA.**

What it's like today.

The Minister's Order

A phosphorus reduction action plan (PRAP) shall be prepared to determine how WPCP phosphorus loads can be reduced to their **lowest achievable level**. The PRAP will include,

- a desktop study of optimization of [current] plant operations to reduce phosphorus loads
 - 👍 a necessary prelude to consideration of the Town's preferred alternative
- a study of **new methods** that could be employed to reduce phosphorus loads
- a strategy to **reduce** the amount of SRP (~BAP) in the WPCP effluent
- determination of an option that will result in the **lowest achievable level of TP** in the WPCP effluent, including implications regarding cost of modifications and operations
- identification of the **seasonal window** of nuisance *Cladophora* growth and how effluent TP may be further reduced during this time
 - 👍 all of these are consistent with the Town's preferred alternative

What it's like today.

The Minister's Order

- a determination of the feasibility of achieving a permanent (or ongoing) annual average TP concentration of 0.35 mg/L
 - 👉 the feasibility of achieving this limit has already been demonstrated (0.30 in 2013)
 - 👉 this limit will not provide relief from nuisance conditions of *Cladophora* growth
- a determination of the feasibility of achieving a permanent (or ongoing) annual average TP load of 190 kg/d
 - 👉 a TP load limit of 190 kg/d would represent an increase in the WPCP TP load by 42 and 17% over those achieved in 2014 and 2015, respectively
 - 👉 a TP load limit of 190 kg/d would offer limited opportunity for the WPCP to increase the flow treated

... and tomorrow?



In issuing the recent Order and outlining the terms of reference for the Phosphorus Reduction Action Plan, the minister had adopted many of the points made by the Town in developing its preferred alternative.

The Town notes that adoption of its preferred alternative (ballasted flocculation), applied seasonally in concert with the WPCP's current phosphorus removal technologies, will result in an average annual TP load of 150 kg/d. This result would provide relief from nuisance conditions of *Cladophora* growth while meeting the Minister's load limit at the EAC-approved total treatment capacity of 630 MLD.

The Town looks forward to seeing its preferred alternative selected by the Minister as the means for reaching the lowest achievable level of phosphorus loads.