

Spill Remediation and Watershed Planning

- Congratulations to the City of Hamilton staff for the extensive work to date, and the collaborative work with the Royal Botanical Gardens and other stakeholders
- Information gathered and resulting actions will be critical to updates of the existing Wastewater and Stormwater Master Plans and ultimately delisting the Hamilton Harbour Great Lakes Area of Concern
- Information will be critical to restoring the broader function of Cootes Paradise Nature Sanctuary established under the RBG Act (1941)
- Watershed planning identified a number of priority projects



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Tys Theijsmeijer, Head of Natural Areas
January 2021

RBG Support for Chedoke Spill Remediation

Spill Technical Goal: Mitigate 47,000 kg Phosphorus and 312,000 kg Nitrogen from Kjeldahl Nitrogen

- Most of the spilled sludge has moved to the harbour
- All of the spilled water has moved to harbour, but with excess nutrients deposited in the bottom of both Cootes Paradise Marsh and Hamilton Harbour

TARGETED DREDGE Component

The goal of the targeted dredge project is to return the area to its estimated condition prior to the beginning of the spill event and to provide reasonable complementary **offsetting** remediation projects to account for additional environmental impacts that may not be addressed by dredging alone.

OFFSETTING PROJECTS

Some of the technologies which will be assessed over the course of the plan execution include, but will not be limited to:

- 1) Floating vegetated mats
- 2) Small scale Aeration systems
- 3) Shoreline plantings
- 4) Beneficial sediment reuse and sediment stabilization



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Overarching Goal of Cootes Paradise (RBG Act 1941)

(Reinvention of the 1927 Dundas Crown Game Preserve & 1860s commercial fish sanctuary)



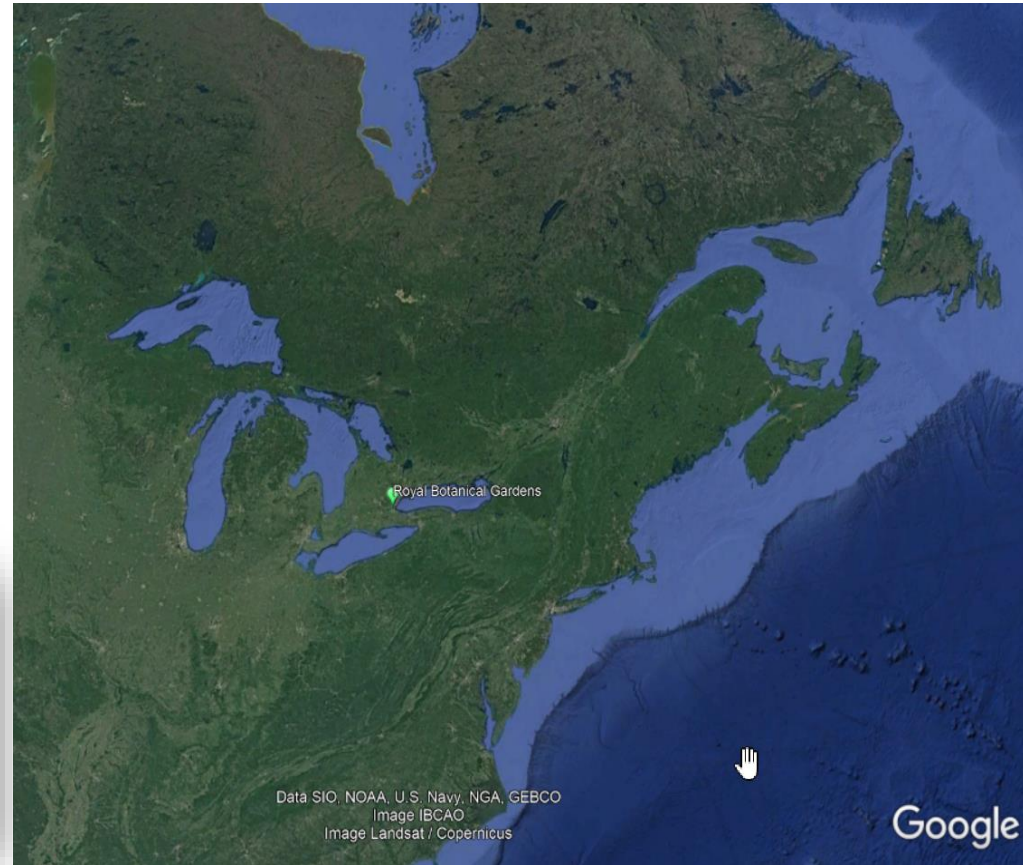
Paraphrased

1. Support international Ecosystems of Lake Ontario Fisheries and large-scale bird migrations
2. Protect locally and globally rare native species
3. Environmental and Human Well being Education
4. Low impact recreation

Royal Botanical Gardens Provincial Act 1941, rev1954, rev. 1959, rev1989

RBG Act 1989
Section 3.

Bill Pr7	ROYAL BOTANICAL GARDENS	1989
(b)	to maintain nature preserves;	
(c)	to protect specific environments and flora and fauna that are of special value as parental stocks or may be in danger of extinction;	
(d)	to exhibit its collections to the public in cultivated and natural areas, museums and galleries;	
(e)	to conduct botanical, horticultural and related biological research;	



Commercial Fishery Potential

Yellow Perch – Spring Spawning female from Cootes Paradise Fishway



04/02/2014

The Background of the Remediation

The Documents

1. Chedoke Watershed Water Quality Framework, the basis of the Cootes Paradise and West Harbour remediation
2. Lower Chedoke Creek Spill Remediation Plan
3. Cootes Paradise and West Harbour Remediation Plan – also called Cootes Paradise Remediation Plan
4. Royal Botanical Gardens 25 Year Masterplan Framework (2021)

Cootes Paradise Remediation (Chedoke Watershed Water quality Framework)

Current Challenges and Context Summary

1. **CSOs**
2. 403 runoff
3. Landfill leachate
4. Railyards
5. Urban stormwater

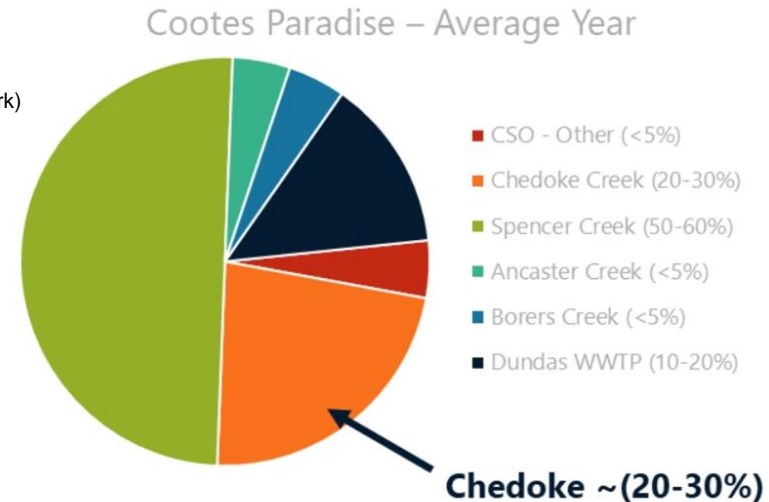
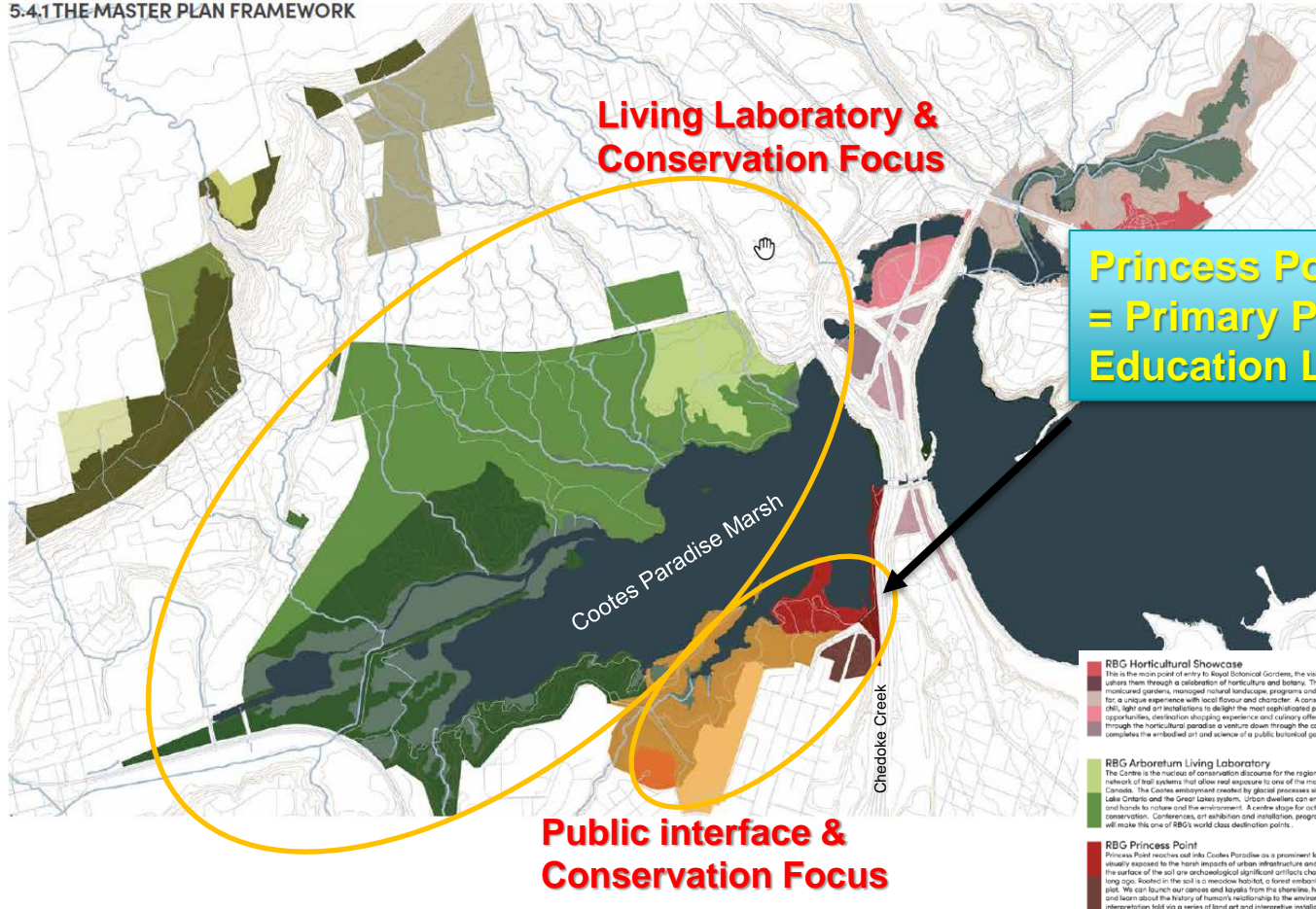


Figure 1. Cootes Paradise Average Year Total Phosphorus Loading
From Watershed Framework – Total Loadings

Royal Botanical Gardens Masterplan Framework

5.4.1 THE MASTER PLAN FRAMEWORK



Living Laboratory & Conservation Focus

Princess Point/Chedoke Inlet = Primary Public Access and Education Location

Cootes Paradise Marsh

Chedoke Creek

Public interface & Conservation Focus

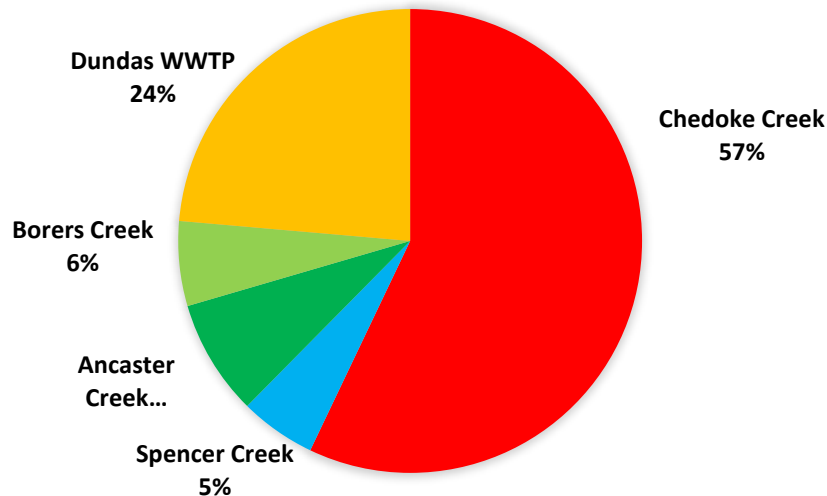
- RBG Horticultural Showcase**
 Entry to the Royal Botanical Gardens, the visitor centre welcomes the public and unites them through a celebration of horticulture and botany. The world-class offering of curated, monitored gardens, managed natural landscapes, programs and activities will offer visitors from near and far, a unique experience with local flavor and character. A conservatory series to soothe winter's harsh days, light and horticulturalists to design the most sophisticated gardens. Intimate concert and performance opportunities, destination shopping experience and culinary offerings that stand alone. After wandering through the horticultural paradise a venture down through the conservation showcase of Hendrie Valley completes the embodied art and science of a public botanical garden.
- RBG Arboretum Living Laboratory**
 The Centre is the nucleus of conservation discourse for the region. The Visitor Centre sits at the head of a network of trail systems that allow real exposure to one of the most dynamic ecological parcels of land in Canada. The Centre environment created by glacial processes sits at a critical point for observation of Lake Ontario and the Great Lakes system. Urban dwellers can engage in activities that connect our minds and hands to nature and the environment. A center stage for outfalls shared by the vision of conservation, conferences, art exhibition and installation, programs, concerts and performances, visitors will make this one of RBG's world class destination points.
- RBG Princess Point**
 Princess Point reaches out into Cootes Paradise as a prominent landmark that is both remote from, yet visually adjacent to the harsh impacts of urban infrastructure and past industrial development. Beneath the surface of the soil are archaeological significant artifacts charting the activities of its land's inhabitants long ago. Rooted in the soil is a meadow habitat, a forest embankment and a young Butternut restoration plot. We can touch our senses and layers from the shoreline, have a repair's edge lunch at the dock cafe and learn about the history of human's relationship to the environment through this landscape of interpretation told via a series of land art and interpretive installation.
- RBG South Shore Commons**
 Escarpment Commons Park, this once vibrant community park and hub, reclaims its purpose through the amenities, programs and offerings of RBG. The platform that interfaces with the community of Hamilton will speak a grassroots voice to all members of the local community and beyond. An urban park with a farmer's and crofter's market space, families with picnic boulevards can connect with each other before hitting the trails on the South Shore of Cootes Paradise. Food, wellness, and nature club activities will arm all community folk with the tools to live a healthy engaged life. Indoor and outdoor space is designed to bring people together to work, talk and move together.
- RBG Paradise Special Protection Zone**
 Human presence is an integral component of conservation science and action. Successful conservation requires that we identify a natural system's tolerance to human presence and respect the boundaries set by the capacity thresholds. The Special Protection Zone are globally recognized special habitat areas with species that are sensitive to many natural factors. The protection zone is a no-road zone for humans to encourage the unique migrant and resident species to flourish. The presence of the diversity organisms who rely on this zone are one of RBG's biggest success stories.
- RBG Escarpment Retreat**
 Nature has the power to heal, invigorate our souls and inspire us to take deep breaths and embrace the moment. Retreat to a nature immersion experience that is a break from the urban life. Hugging the top and base of the escarpment will engage in hiking, biking, climbing, outdoor education activities, outdoor sports, delicious food and beverage. The nature lover, the outdoor activity enthusiast will find a place to relax and a place to run and play in one of Ontario's most splendid natural landscapes.

Excess Nutrients Problem – Phosphorus Inflowing

(total inflowing vs standing excess concentrations)

PROBLEM PHOSPHORUS SUPPLIES

MAJOR WATER SUPPLIES TO COOTES PARADISE MARSH
(HAMILTON CONSERVATION AUTHORITY 2019 CREEK DATA)



Federal & Provincial Guidelines: < 30ug/l Phosphorus

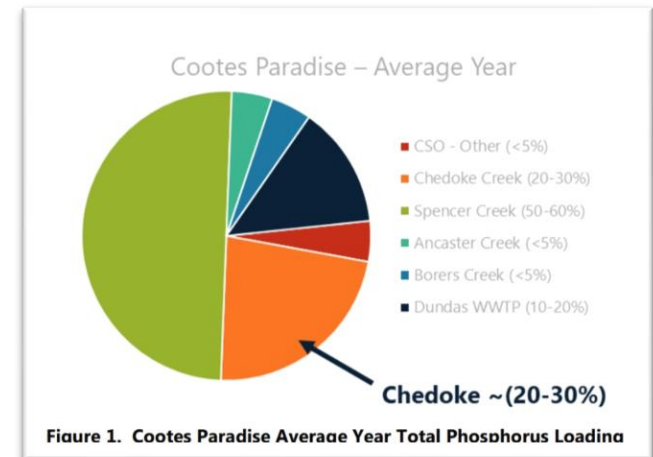


Figure 1. Cootes Paradise Average Year Total Phosphorus Loading

From Watershed Framework – Total Loadings

Smothering Algae That Occurs Annually

Federal & Provincial Guidelines < 30ug/l Phosphorus



Sheets of the bottom



Filamentous Rafts



Single Cell Water Column
(phytoplankton)

Spill Mitigation

Primary Measures

1. 47 tonnes of Phosphorus removed
2. 312 Tonnes of Nitrogen (TKN) removed

Process

A mix of off-setting projects, as much of the spilled sludge and all of the water have passed through Chedoke Cr and Cootes Paradise area

Focus CSOs (Combined Sewer Overflows)



Existing City of Hamilton Policy Wastewater Plan Objective:

- **1 overflow spill for a 5-year precipitation event** (Note: Main King CSO Tank design predates this)

Summary Table of CSO Events to Cootes Paradise in 2020

#	Receiving Waters	CSO Outfall	Total Events	Total Hours	Total Volume (m3)
1	Chedoke Creek	Main/King Tank ¹	7	91.4	191,213
2	Chedoke Creek	Royal Tank ¹	2	6.5	15,189
3	Chedoke Creek	Aberdeen Avenue ²	4	0.9	131
4	Chedoke Creek	Tope Road ²	13	24.8	11,390
5	Chedoke Creek	Glen Road	N.A.	N.A.	N.A.
6	Chedoke Creek	Royal #2 (Delbrook)	N.A.	N.A.	N.A.
7	Westdale Creek	Sterling Avenue ²	11	8.8	13,776
8	Ancaster Creek	Ewen/McMaster Tank ¹	1	0.9	258
9	Desjardins Canal	Dundas EQ tank ¹	1	N/A	N/A
		Total	39	133.5	231,957

¹ Numbers based on actual measurements of overflows provided by City's SCADA system.

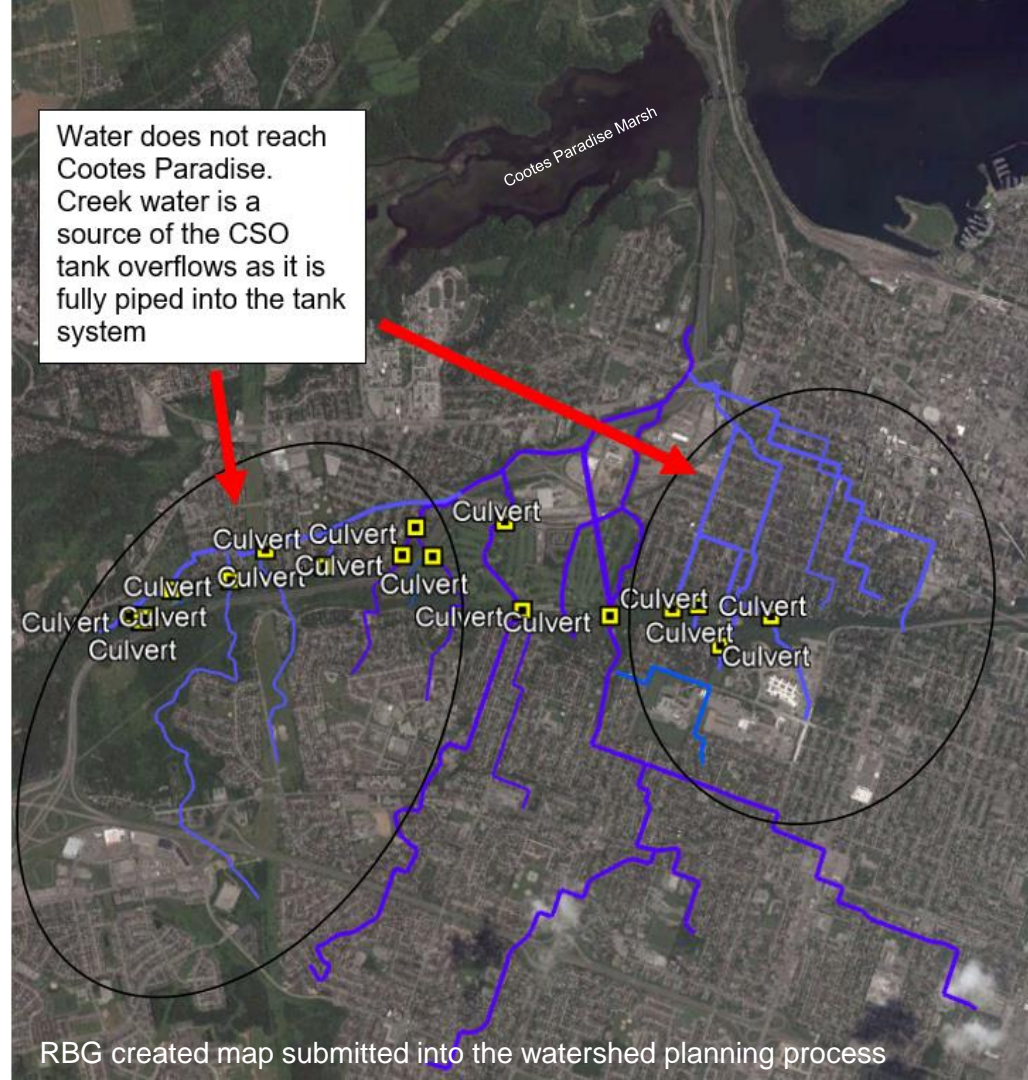
² Numbers based on estimates of computer simulations using Updated MIKE URBAN Detailed Sewer Model of combined and sanitary sewer system.

Note: ongoing operational improvements have been occurring at Main-King Tank to reduce spills

Chedoke Watershed Opportunities

RBG highlighted projects from the remediation plan collaboration

1. Royal CSO Tank creek separation
2. Local infiltration and downspout disconnection
3. Main channel daylighting in Aberdeen Avenue area
4. Separate Sewer system are, enhanced street sweeping
5. Cross connection issues resolved
6. **Short term** interim measures downstream to mitigate continuing issues



RBG created map submitted into the watershed planning process

- Chedoke Remediation is detailed, and a long-term project, and requiring interim mitigation steps.
- Chedoke is the number one source of pollution to Cootes Paradise & the West harbour overall and critical to Delisting of HHRAP
- RBG is ready to collaborate on remediation projects to recovery water quality and improve public access in support of Hamilton's Vision and growth into the future

Thank You



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Landscaping for urban stormwater runoff infiltration
"Rain Gardens"