



Green Infrastructure and Flood Resilience

Event: Building Resilient Infrastructure Systems in Ontario: A Focus on Climate Change and Water

Date: September 26, 2019

Clara Blakelock

GIO Coalition Members



Over 40 general members:

- Businesses
- Industry and professional associations
- Municipal and Regional governments
- Conservation Authorities
- ENGOS

GIO Steering Committee



1

Fed. and Prov. infrastructure funding for green infrastructure projects:

- The Federal government - **\$120 billion** over 10 years.
- The Province of Ontario - **\$160 billion** over 12 years.

2

Green infrastructure integrated in to:

- Asset Management Planning
- Growth Planning
- Climate Change Plans
- Stormwater Management Guidelines

Since 2014, green infrastructure has been included in:

- Provincial Policy Statement, 2014
- 2017 Ontario Asset Management Planning Regulation
- Pan Canadian Framework on Clean Growth and Climate Change
- Federal Infrastructure Clean Water and Waste Water Fund
- Ontario Growth Plan and Greenbelt Plan
- MOECC Stormwater LID Guidelines
- *Municipal Act*
- *Great Lakes Protection Act*
- Ontario's Climate Change Strategy



Communications & Other Activities



- Participated in federal infrastructure roundtables with Minister Sohi.
- Published :
 - State of the Urban Forest in the GTA (2016)
 - The Case for Green Infrastructure In Ontario (2012)
 - A Green Infrastructure Guide for Small Cities, Towns, and Rural Communities (2017)
 - State of Large Parks in Ontario's Golden Horseshoe (2019)
- Hosted workshops and sponsored conferences:
 - Soak it Up: Green Stormwater Infrastructure Toolkit
 - Green Infrastructure Asset Management
 - Grey to Green Conference
- Publish Bi-monthly Newsletters highlighting green infrastructure policy progress and initiatives in Ontario and around the world.

Green infrastructure has many benefits.



- Maintains the natural water balance between infiltration, evaporation and runoff;
- Sequesters carbon;
- Reduces runoff pollution ;
- Reduces or eliminates sewage overflows;
- Neighbourhoods are resilient to extreme weather;
- Drinking water resources are protected;
- Streams, lakes and rivers are healthy;
- Local waterbodies are safe for recreational activities.



200 year old tree at the lakeshore in Ajax, Ontario.



Parking lot rain garden in Peterborough, Ontario.

Types of flooding

- High river, lake or ocean levels
- Backup through sewer systems
- Overland flooding away from waterbodies
- Overwhelmed sewage treatment plants



What role can green infrastructure play in building resilience to these different types of flooding?

Types of Green Infrastructure

Upstream green Infrastructure	Urban green infrastructure	Green riverine or coastal infrastructure
Wetlands Forests Meadows Leaky dams	Rain gardens Bioswales Permeable pavement Green roofs	Naturalized shorelines Creek daylighting Reclaiming flood plains Fish-friendly infrastructure



Photo: Saskatchewan Research Council. Wetland near Swan River, MB



Photo: Green Venture, Hamilton. Ecoraster permeable pavement.



Photo: City of Edmonton. Mill Creek Daylighting.

Upstream green infrastructure

What it does

Reduces runoff entering rivers, streams and lakes before it gets to cities (preventing riverine flooding/high water levels)

Holds back water upstream.

What it doesn't do

Solve most basement flooding problems which are caused by urban infrastructure failures and/or overland flows

In extreme events where soils are saturated, runoff/high water levels will still occur



Case studies: Upstream green infrastructure

- [Greenseams](#): protecting land upstream from Milwaukee.
- Ducks Unlimited: [restoring wetlands](#).
- [ALUS Canada](#): natural infrastructure.
- [Leaky dams in the UK](#).



Leaky dam. [Image source](#).



Prairie wetland. [Image source](#).

Urban green infrastructure

What it does

- Reduces runoff within urban areas.
- Delays peak flows.
- Eliminates ponding and localized flooding (in some cases).
- When implemented at a wide scale, can reduce downstream riverine/lake flooding.
- Takes pressure off of overburdened sewer systems, reducing sewer backup and combined sewer overflows.

What it doesn't do

- Accommodate extreme storm events (1 in 100 year storms – in most cases).
- Solve all infrastructure problems in older neighbourhoods.
- Some types of green infrastructure are not designed to provide flood control benefits.



Roadside rain garden in Peterborough Ontario.



Urban forests slow down and absorb rainfall.

Case studies: Urban green infrastructure

- Brighton Beach bioswale.
- New Hampshire: [modeling flood impacts from green infrastructure retrofits.](#)
- [Elmer Avenue, Los Angeles.](#)



Elmer Ave, LA. [Image source.](#)



Before and after, Brighton Beach Bioswale. Photos via Conservation Halton.

Green riverine or coastal infrastructure

What it does

Makes room for flooding to occur (as in nature).

Allows water to flow instead of holding it all back.

Allows fish passage through flood protection infrastructure.

What it doesn't do

Prevent all flooding from occurring.

Protect all existing development (that was built in flood plains).



[Image source.](#)



[Image source.](#)

Case studies: Coastal green infrastructure

- Don mouth naturalization and
Portlands flood protection project.
- Sawmill river daylighting,
Dartmouth, NS.



Broadview and Eastern Flood protection. [Image source.](#)



Sawmill River daylighting. [Image source](#)

Avoiding grey versus green

- Both are needed! They work together.
- One size fits all solutions do not exist.
- Existing systems and processes favour grey infrastructure.
- Green infrastructure offers additional benefits in many situations.



Parking lot bioswale, Ajax, ON



Underground infiltration chamber. [Image source.](#)

www.greeninfrastructureontario.org

Join GIO – Visit the website
Follow us on twitter @GreenInfraOn
Sign up for the GIO newsletter

Email: programs@greeninfrastructureontario.org

