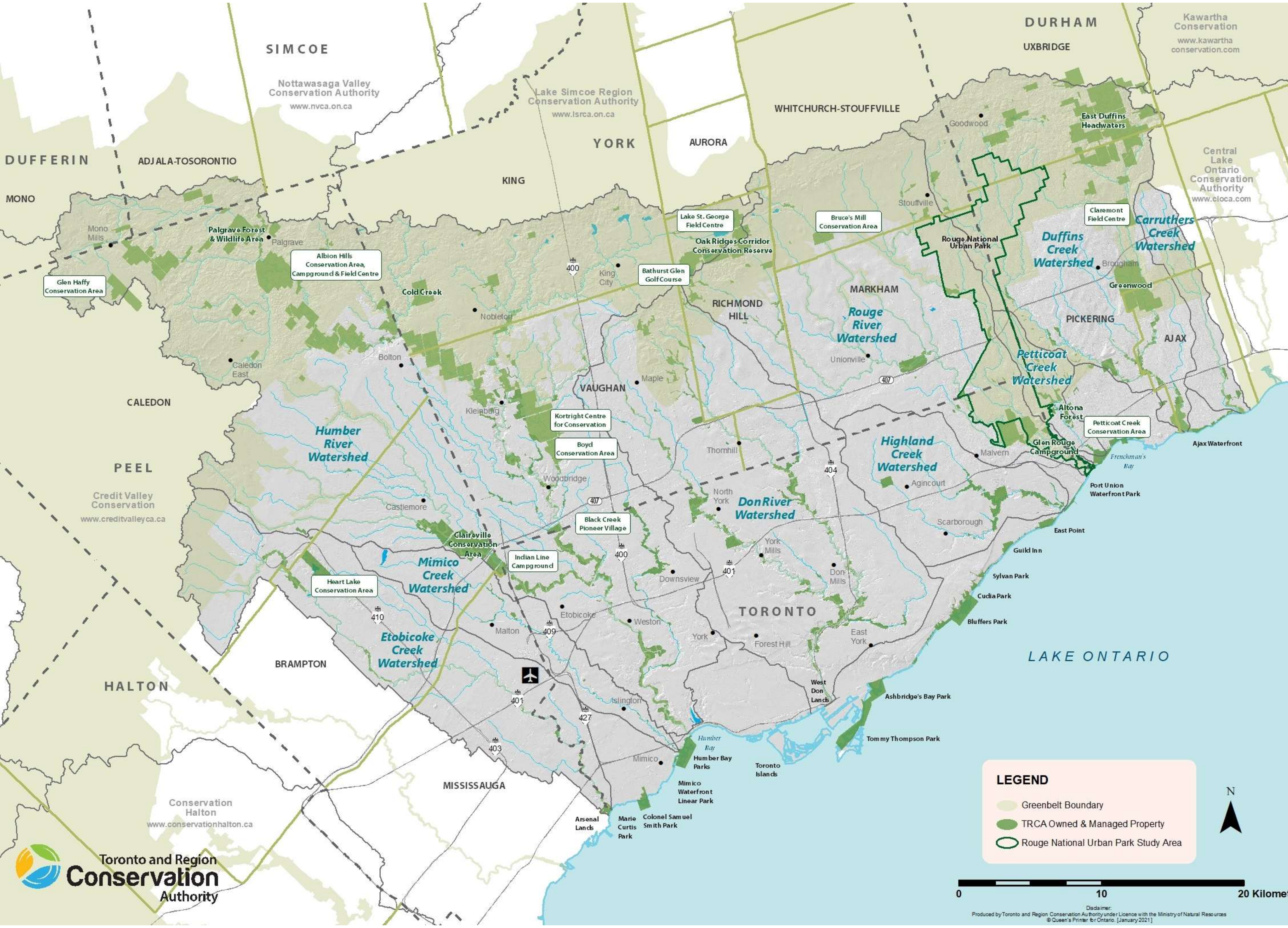
Town of Oakville Council Workshop:

Green Infrastructure & Climate Change

June 11, 2024

Toronto and Region Conservation Authority



TRCA's Jurisdiction

By the numbers:

- 9 river watersheds
- 6 upper-tier and 15 lower-tier municipalities
- ~5 million people live within TRCA-managed watersheds
- ~72 km of Lake Ontario waterfront
- > 18,000 hectares of TRCA-owned lands, making TRCA one of the largest landowners in the GTA

Green Infrastructure

Green Infrastructure

Green infrastructure encompasses the natural vegetative systems and green technologies that collectively provide society with a multitude of economic, environmental, social, and health benefits

GREEN INFRASTRUCTURE (GI)

Nature-based Solutions (NbS)/Nature-based Climate Solutions

Natural Infrastructure (NI)

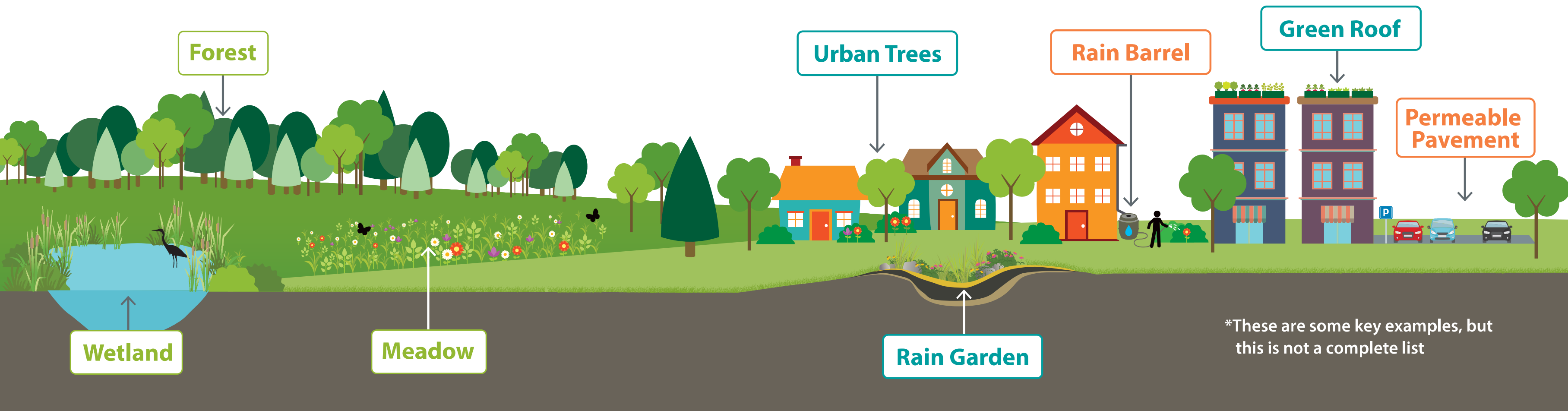
Low Impact Development (LID)

NATURAL ASSETS:*
- Wetlands
- Forests
- Parks
- Meadows
- Lawns and gardens
- Soil

ENHANCED ASSETS:*
- Rain gardens
- Green roofs and walls
- Bioswales
- Urban trees
- Naturalized stormwater ponds

ENGINEERED ASSETS:*
- Permeable pavement
- Rain barrels
- Cisterns
- Perforated pipes
- Infiltration trenches

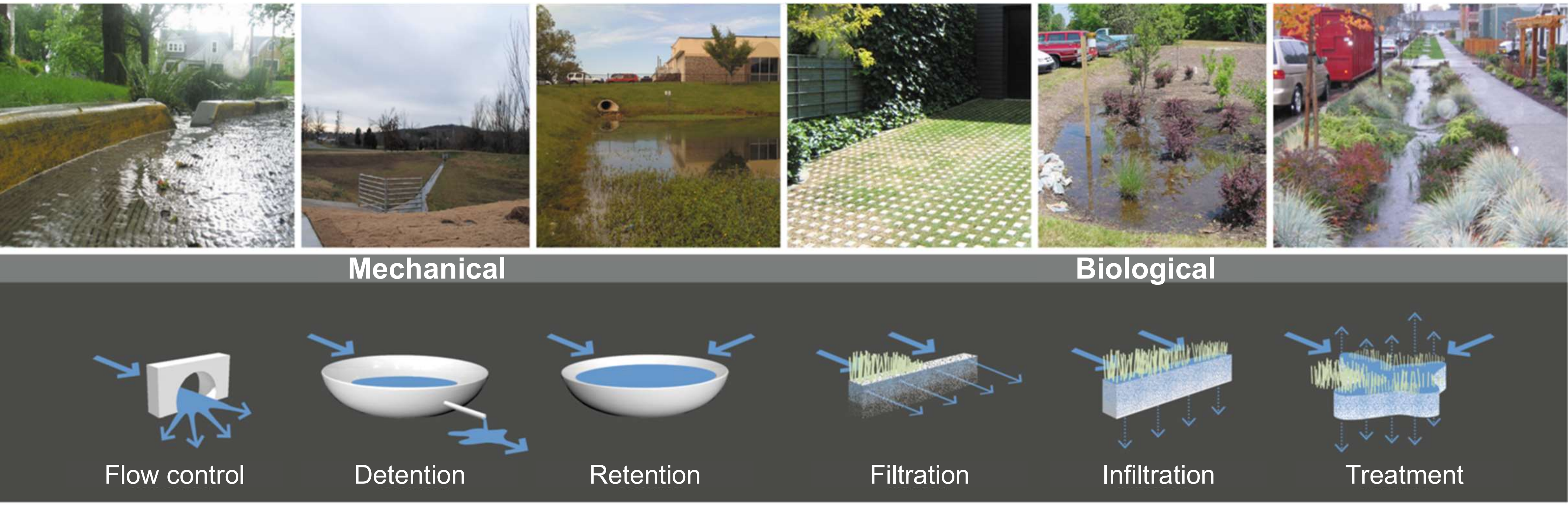
GREY INFRASTRUCTURE:*
- Bridges
- Roads
- Parking lots
- Culverts
- Pipes



Green Infrastructure Ontario

*These are some key examples, but this is not a complete list

Low Impact Development (LID)

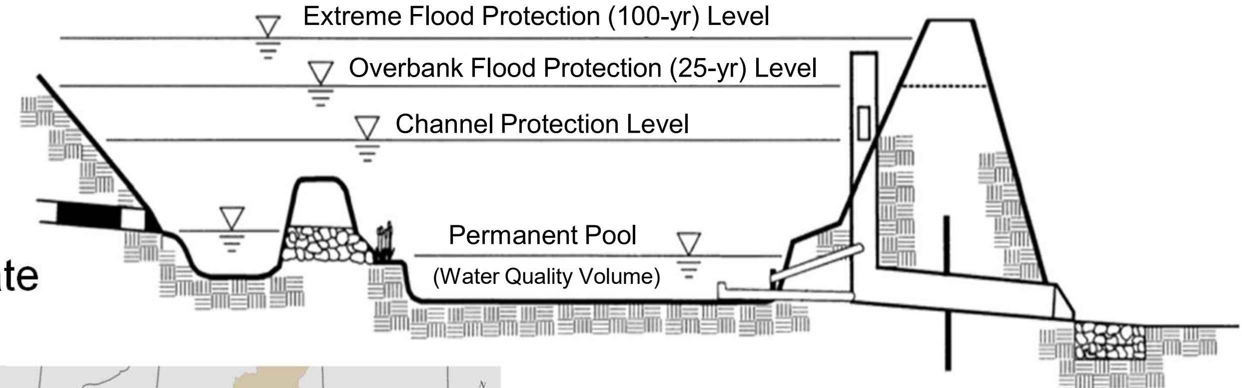


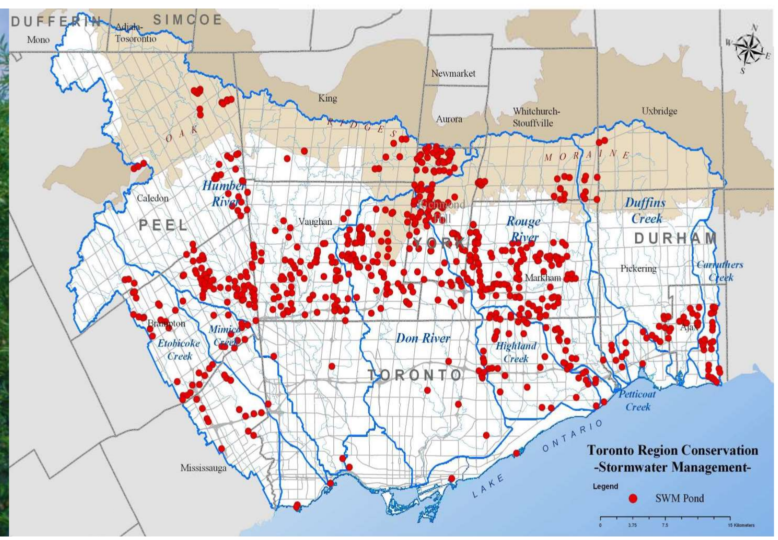
Slow → Spread →

University of Arkansas Community Design Center

Conventional Stormwater Management has not fully resolved the problem

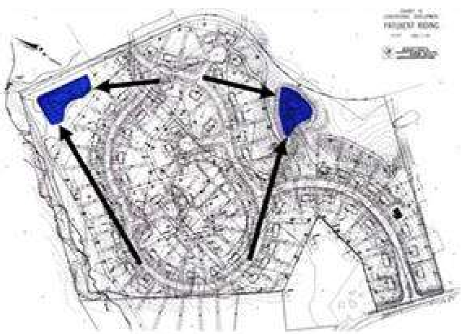
- One-dimensional approach: end-of-pipe detention and controlled release
- Assumes excess runoff can be stored and released at a “safe” rate





- 1970s: Original focus on downstream flood control
- 1990s: Principle extended in attempt to manage water quality and downstream erosion

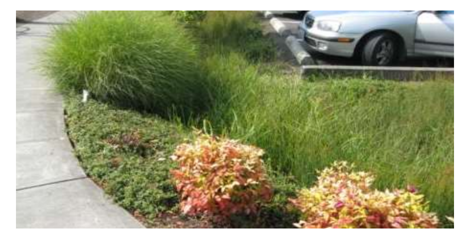
Rethinking Stormwater Infrastructure



Large, centralized → **Small, distributed**

Single function → **Multifunction**

Pipes, sewers, curbs and gutters → **More integrated green and grey approaches** (e.g., soils, vegetation)



Manage flow rates → **Manage the water cycle**

Grey Infrastructure and LID

Source Controls

Bio-Retention Cell

Conveyance Controls

Etobicoke Exfiltration System

End-of-Pipe Controls


Imagery ©2012 DigitalGlobe, First Base Solutions, GeoEye

Sustainable Technologies Evaluation Program (STEP) - Water

- Established by TRCA in 2004
- STEP Water partnership was formalized in 2018 as a collaboration between TRCA, CVC, LSRCA, along with other government and industry partners

Objectives

- Evaluate clean water technologies;
- Assess barriers to/opportunities for widespread implementation;
- Develop and disseminate knowledge through on-line publication of reports, guidelines, articles, tools and databases; and
- Professional training, advocacy, and technology transfer.





Active Projects

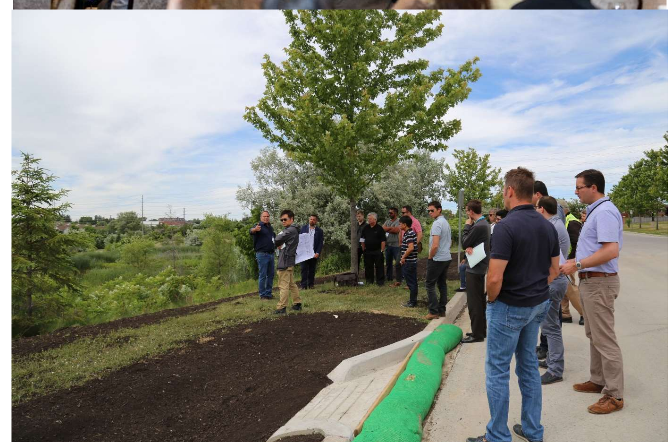
Municipal Stormwater Management Technical Services

- **Technical Peer Reviews for Green Infrastructure Projects**
- **Inspections, Maintenance Prioritization, and Improvements**
- **Performance Monitoring:** Low Impact Development and Conventional SWM Features

Active Projects

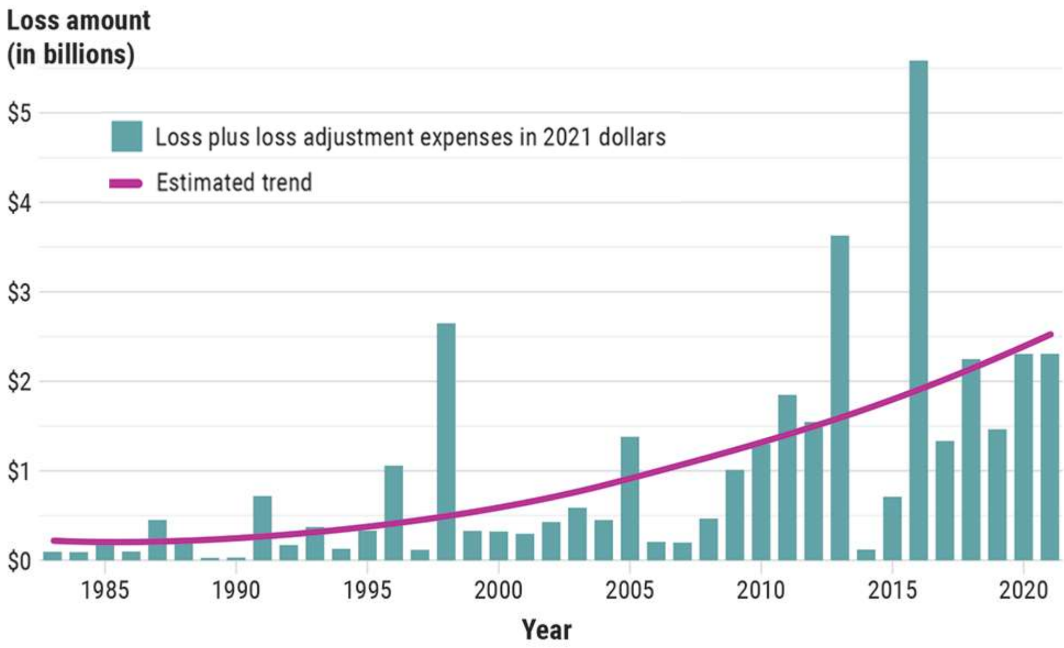
Training and Outreach

- **Annual municipal SWM Pond and LID Inspection & Maintenance Field Training** – Free municipal training delivered to over 100 municipal staff in 2023. At least 3 events to be offered this year.
- McMaster professional certificate in **Low Impact Development and Climate Resilience** – 10 courses delivered annually by STEP staff at TRCA, CVC & LSRCA.
- **STEP website** – main hub for all things STEP, includes all past research, resource library, list of all training opportunities
- www.sustainabletechnologies.ca



Climate Change

Our existing infrastructure was built to perform well in a climate that no longer exists



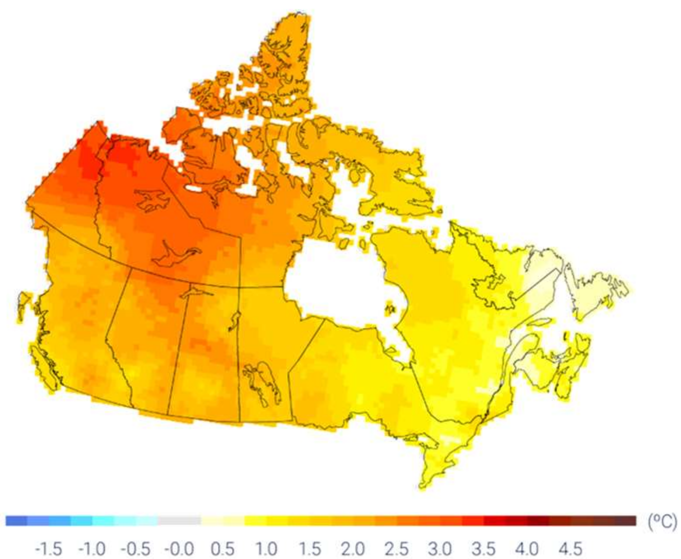
- Climate change affects our ability to provide services at current levels into the future
- Vulnerable populations are disproportionately impacted by climate-related risks

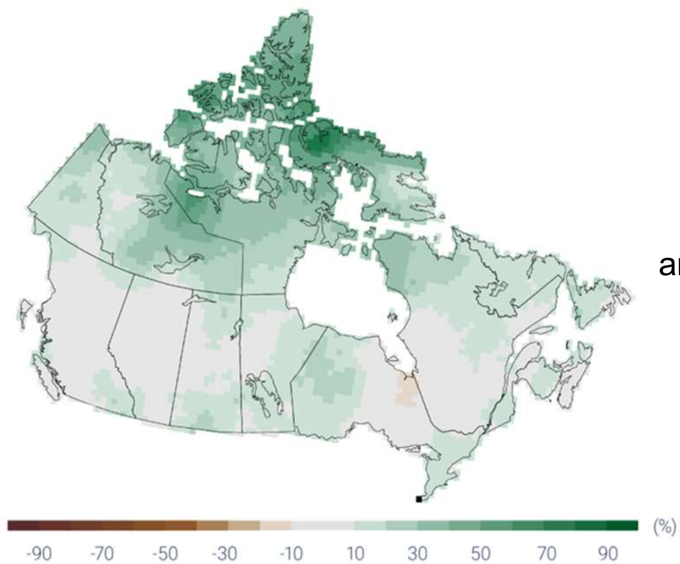
Commissioner of the Environment and Sustainable Development (2023)

Canada is warming at roughly twice the global rate, with some areas in the north warming three times as fast

- Between 1948 and 2016, average annual temperature is estimated to have increased by 1.7ºC in Canada (as a whole) and 2.3ºC in northern Canada

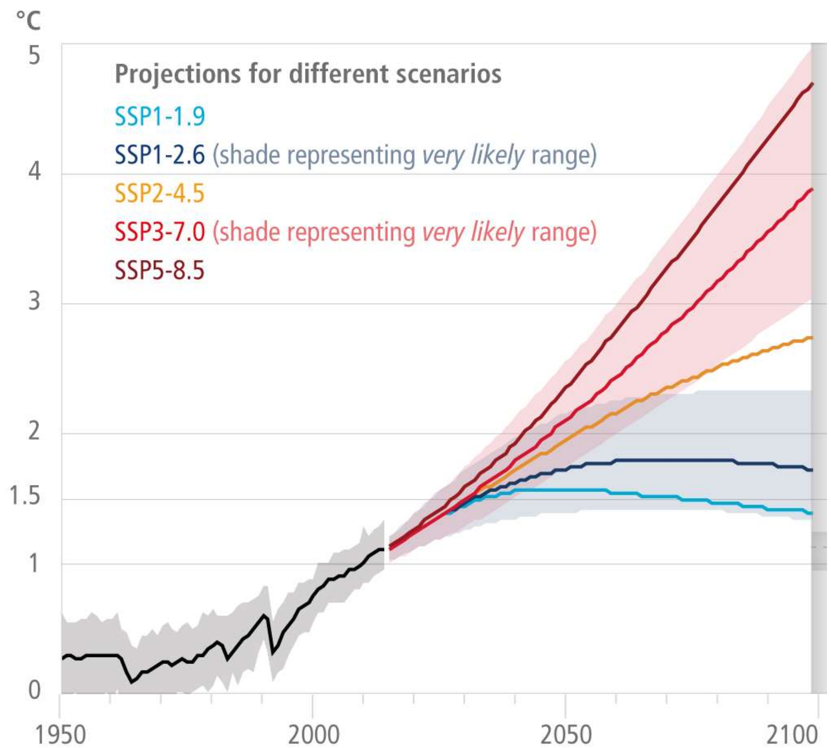
Map of observed changes (°C) in annual temperature across Canada, 1948–2016

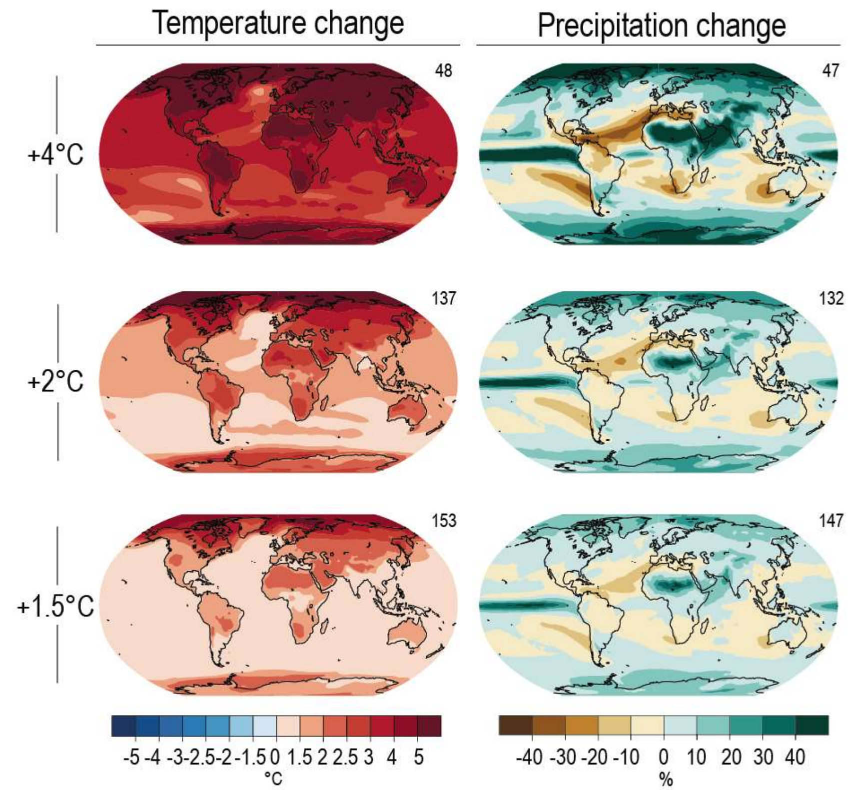




Map of observed changes (%) in annual precipitation across Canada, 1948–2012

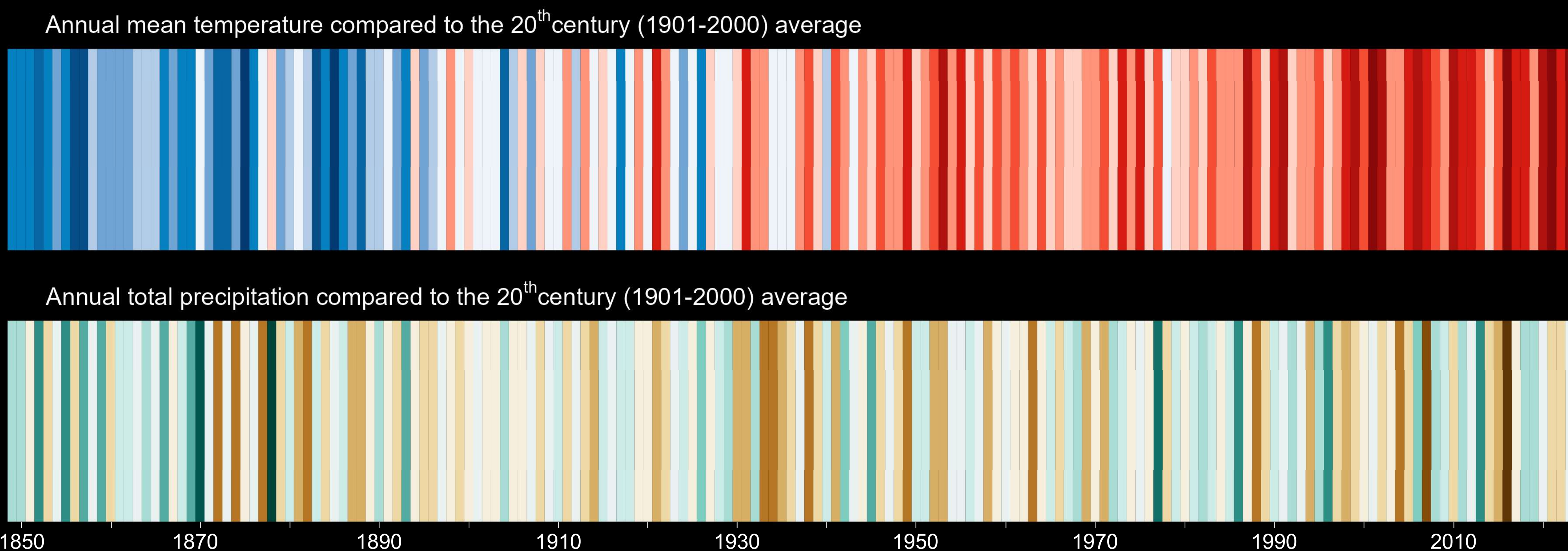
Climate change will continue without rapid and sustained social and economic transformation



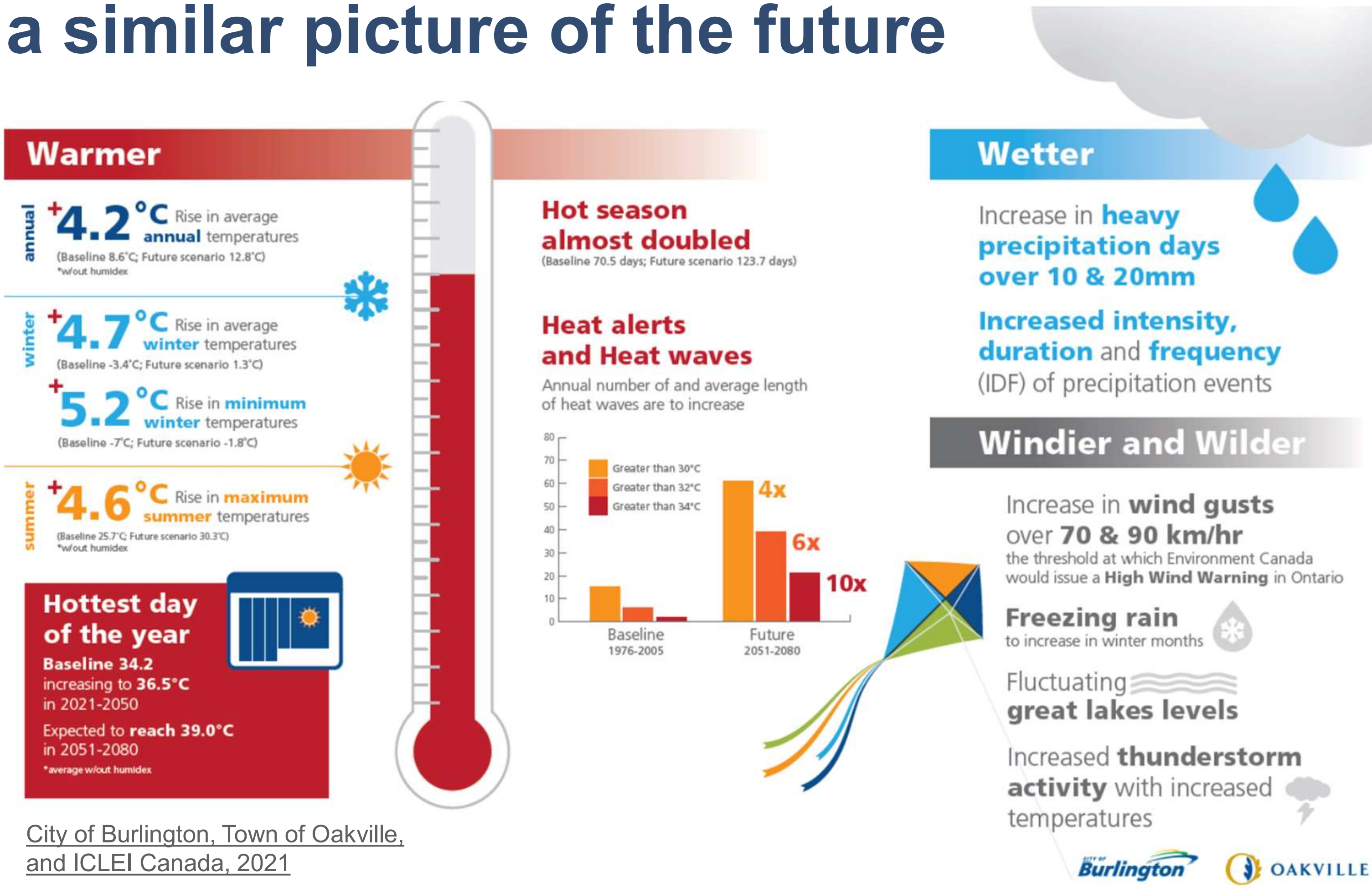


IPCC Sixth Assessment Report

Based on observed climate data, Toronto is getting warmer and wetter



Oakville’s climate projections paint a similar picture of the future



City of Burlington, Town of Oakville, and ICLEI Canada, 2021

2051-2080 compared to 1976-2005 under a high emissions scenario (RCP8.5)

Climate-related impacts are already being felt in Oakville and other parts of Ontario

2013 ice storm
E. Riehl / Metroland Media Group


2017 rainstorm
C. Bridge / Metroland Media Group


2017 high lake levels
B. Gray / Oakville News


2019 high lake levels
G. Paine / Torstar

Climate-related risks

Physical Risks
Acute shocks (e.g., flooding, ice storms) and chronic stresses (e.g., warmer winters, drier summers)

Transition Risks
Potential for more stringent environmental regulations and new technologies as society transitions towards a low-carbon economy

Litigation & Liability Risks
Litigation and liability (e.g., for failing to protect people, property, and infrastructure from extreme weather)

Reputational Risks
Changing social norms, needs, and mismatched expectations

Financial Risks
Increased cost of damages, limited availability and increased cost of insurance and the ability to attract investments, supply chain impacts

N. Iwanyshyn

Climate impact risks to grey stormwater infrastructure

Example risks include:

- Increased storm sewer backups
- Increased overtopping of roads (and increased closures)
- Increased maintenance and inspections needs (e.g., catch basins and culverts)
- Increased damages due to extreme heat, leading to cracking and buckling
- Increased damages and service disruptions due to flooding, erosion, and extreme weather events
- Decreased asset durability and lifespan

Climate impact risks to green stormwater infrastructure

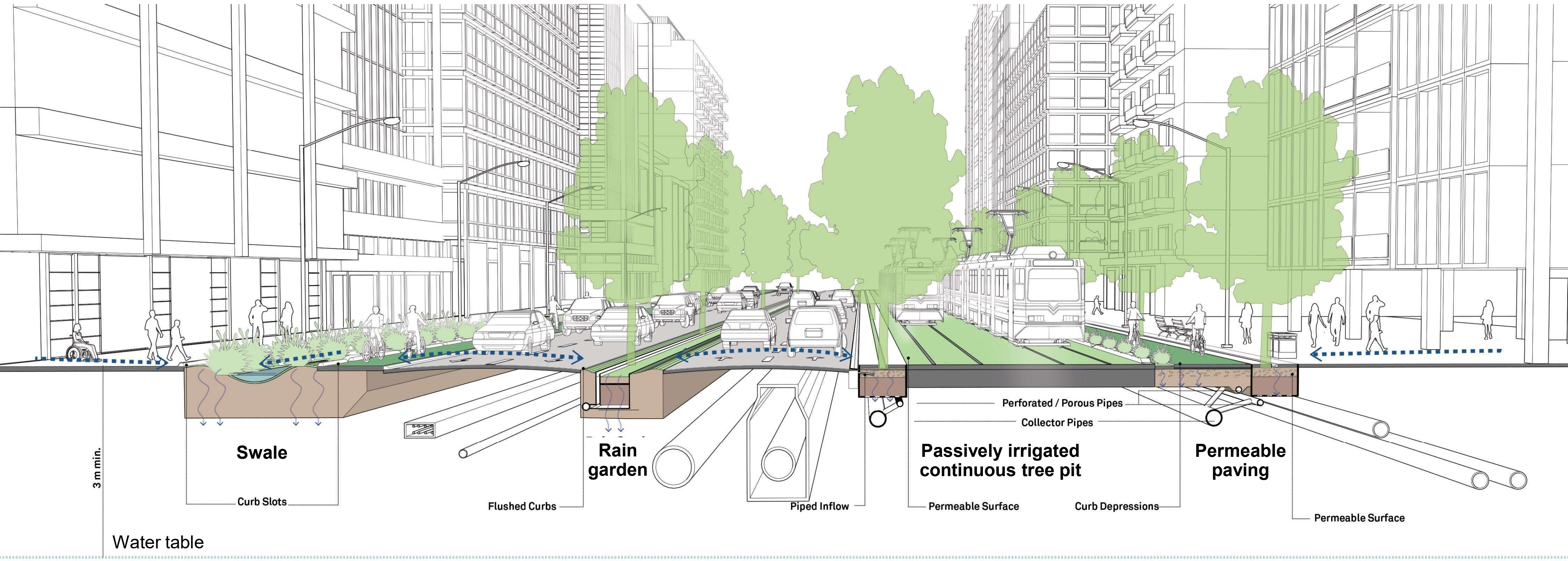
Example risks include:

- Reduced water quality and increase in harmful algal blooms, which may pose a threat to people's health
- Increased flooding and erosion along creeks, streams, and Lake Ontario
- Increased water stress with hotter and drier summers and possibly more drought affecting trees and vegetation
- Increased spread of invasive species and pests, affecting tree and woodland health

B. Gray

Town of Oakville

Grey and green stormwater infrastructure work together to increase climate resiliency



Integrated solutions are needed – green infrastructure can help complement grey infrastructure, while providing many other community benefits

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