ONTARIO CLIMATE CONSORTIUM

Making Climate Information Relevant to Local Decision-Makers in Ontario

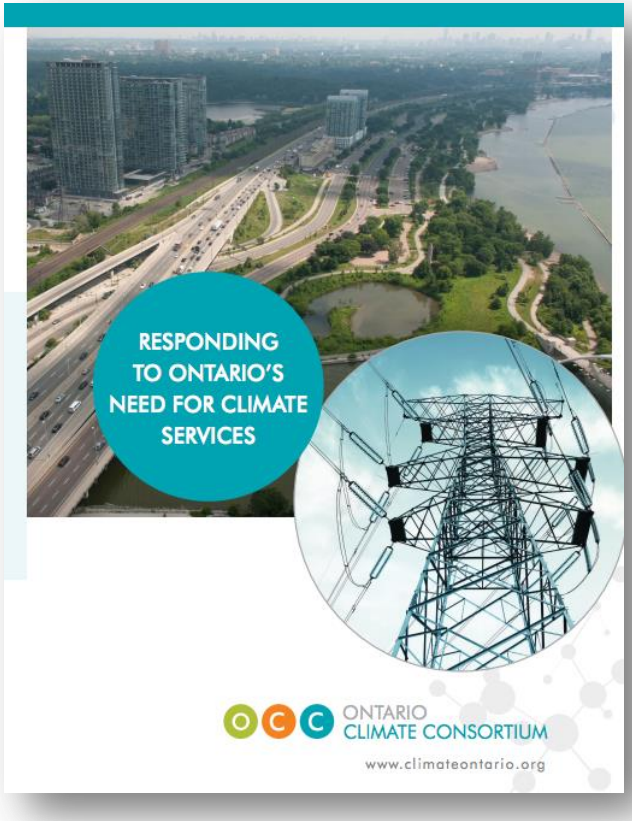
Glenn Milner
Analyst, Ontario Climate Consortium
Toronto and Region Conservation Authority

With support from: YORK UNIVERSITÉ UNIVERSITY, McMaster University, Western, Region of Peel Working for you, University of Guelph, Toronto and Region Conservation for The Living City

Outline

- About the Ontario Climate Consortium
- Climate Data in Ontario
- Translating Climate Data into Information for Decision Makers
- Case Study:
  - Drought in the West Humber Subwatershed, Peel Region, ON
- Final Key Messages

About the Ontario Climate Consortium



The OCC was established in 2011 as a centre of expertise and boundary organization providing research and analysis services to municipalities, conservation authorities, and the broader public sector:

1. Climate Science & Information
2. Resilience Planning & Implementation
3. Reporting & Evaluation

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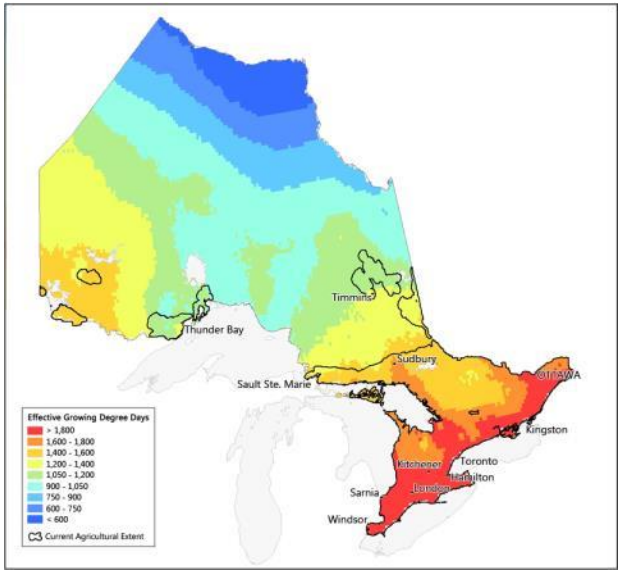
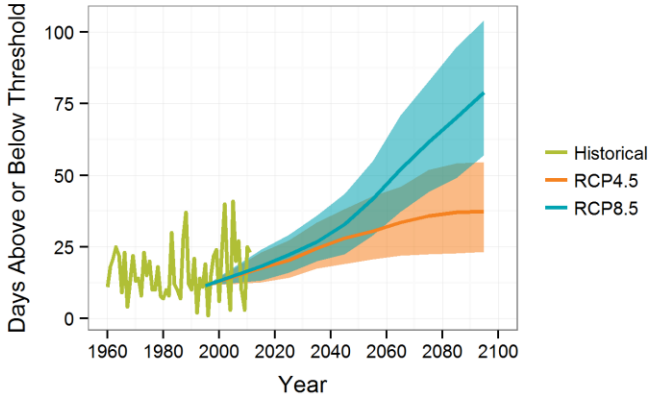
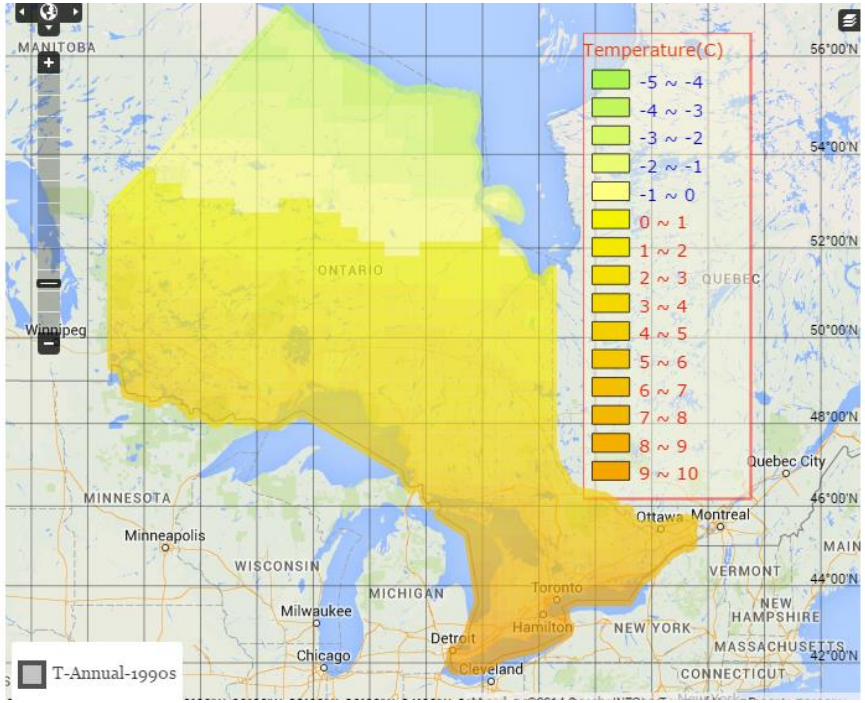
What is Climate Information?

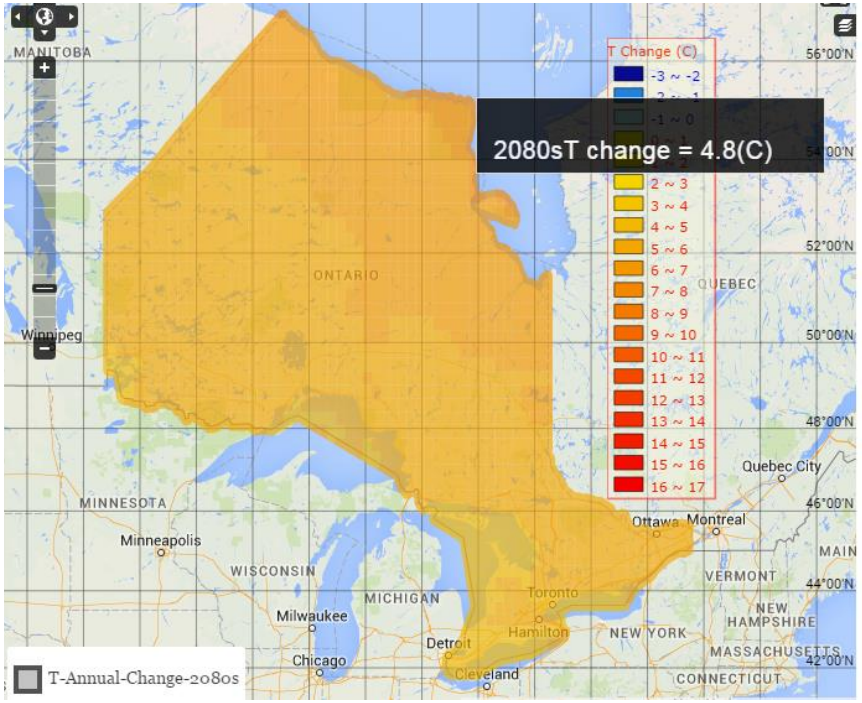
- Climate Information is the interpretation of observed and modeled data
- Information is processed and comes in a meaningful form – generates knowledge
- Confidence limits, variability, etc.





Adapted from: UNEP (2009) Climate information and capacity needs for Ecosystem Management under a Changing Climate.





Climate Data in Ontario

Where can Ontario users get climate data?

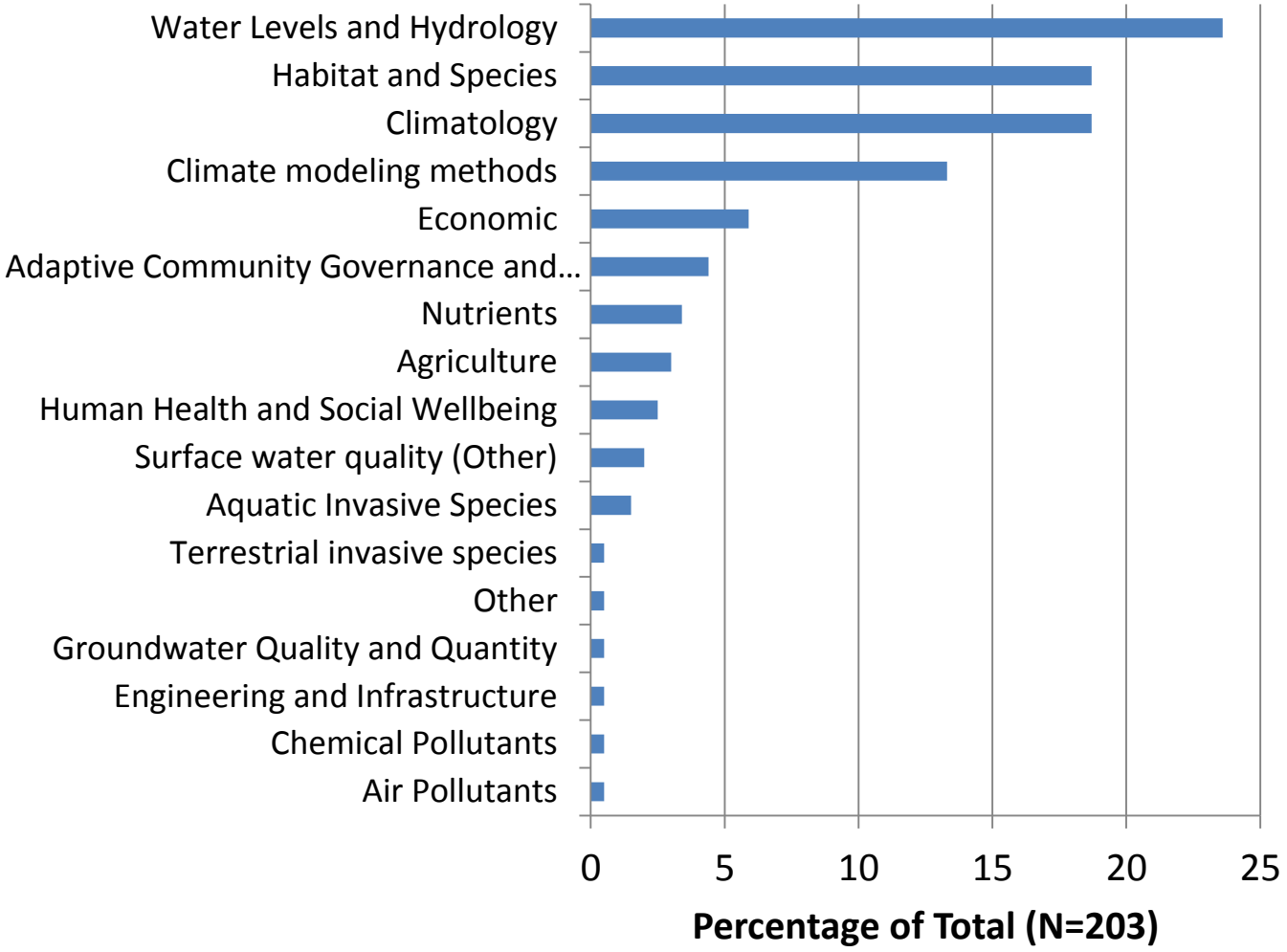
Historical Data:

- At least 14 different gridded or infilled station historical data products
- Environment Canada data archives
- Other public and private monitoring networks (e.g., TRCA monitoring gauges)

Future Projections:

- At least 21 different publically available future climate datasets, many with multiple subsets
  - GCMs, RCMs
  - Dynamical, Statistical downscaling
- Custom analysis by intermediaries agencies, universities, and consultants

What kinds of studies are climate data being used for?



From State of Climate Change Science in the Great Lakes Basin (2016)

Ontario Climate Data Needs

- A*vailability* of climate data is generally not a problem in Ontario

- Ad-hoc use throughout province is leading to:
  - Inconsistent methods and incomparable results
  - Insufficient reflection on uncertainty and scale
  - Potentially inefficient or ineffective adaptation measures

- Ontario users need help with *application*
  - What data is required, and from what datasets?
  - How can we interpret data for the system?
  - What shouldn't be attempted with the data?

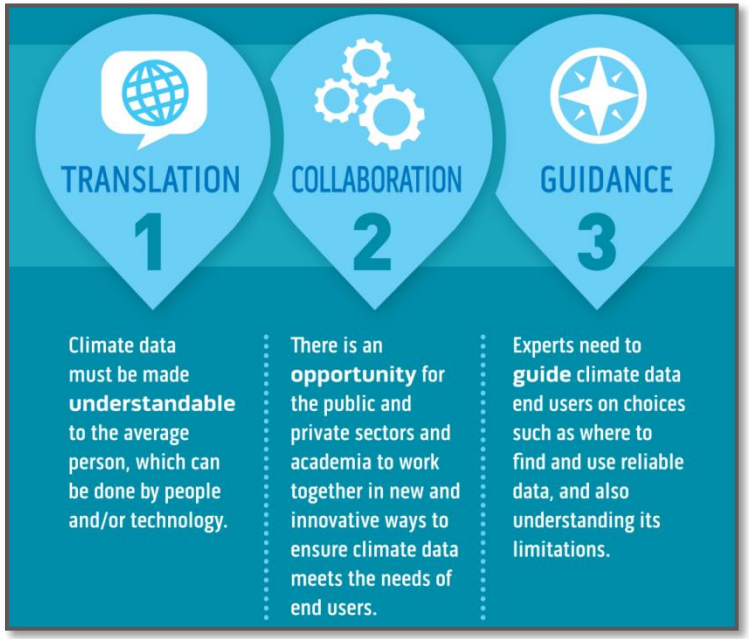
The Problem

Confusion with climate data slows adaptation

Data on climate change can get "lost in translation"

- Environmental Commissioner of Ontario, 2015

The Response

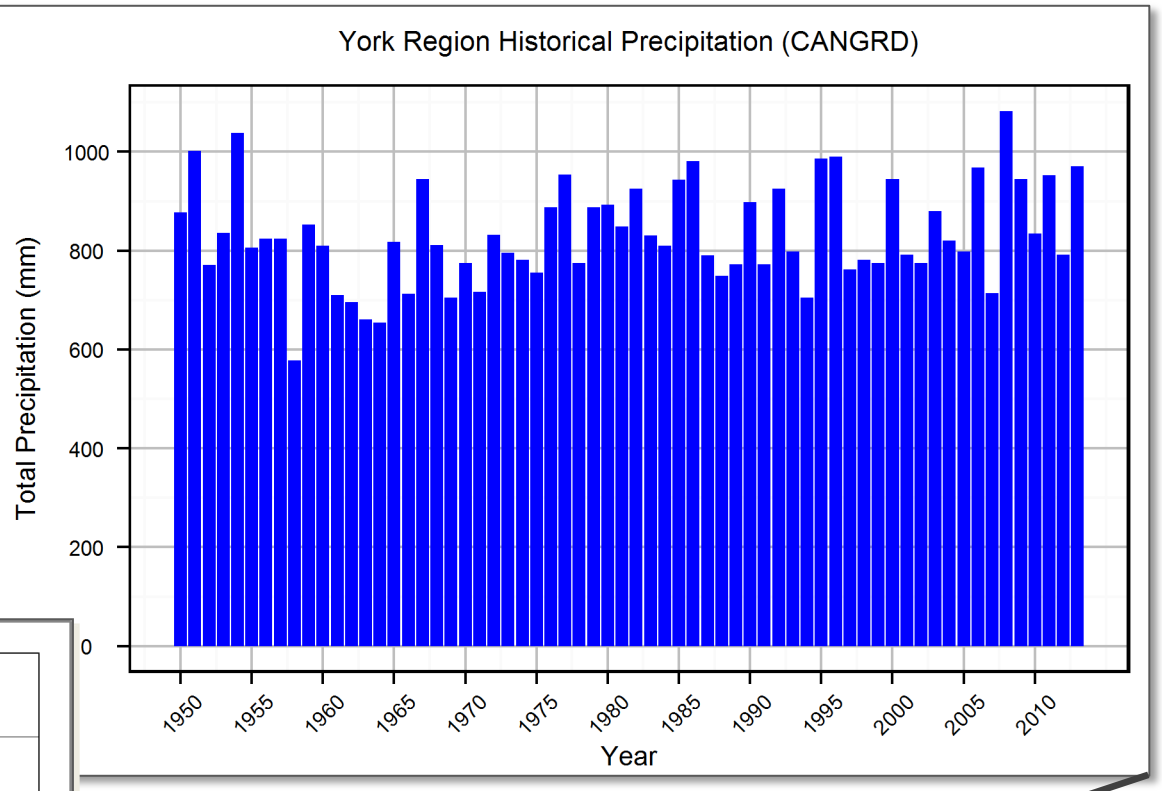


Translating Climate Data into Information for Decision Makers

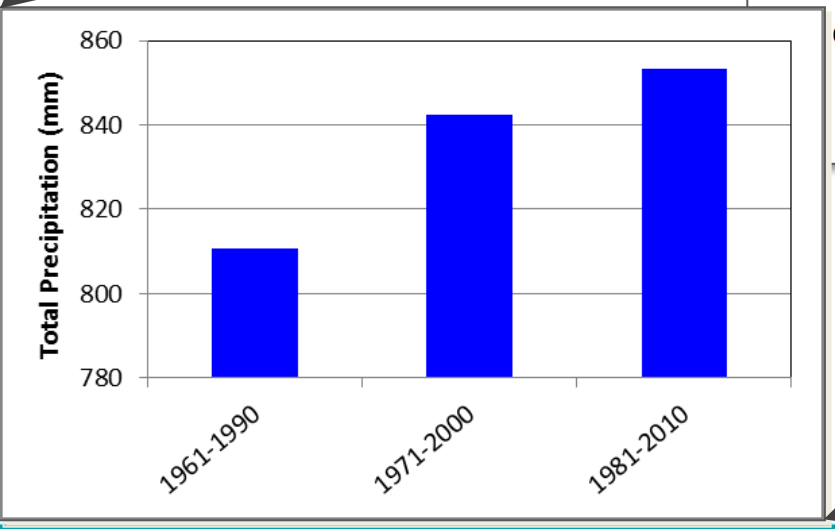
Translating Climate Data into Information for Decision Makers

1. Interpreting Historical Climate Data
2. Selecting Climate Indicators
3. Communicating Uncertainty in Future Climate Projections

Interpreting Historical Climate Data



Total Precipitation (30 Year Climate Normal Averages)



Selecting Climate Indicators

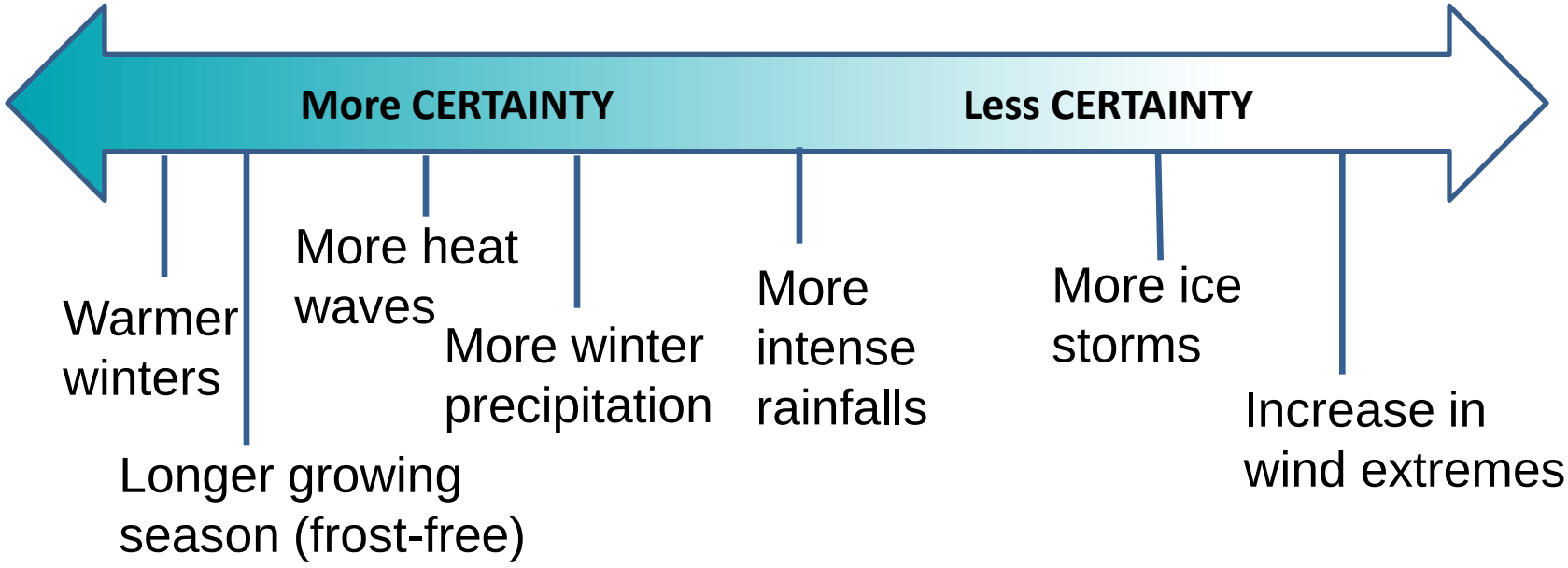
- Scoping with stakeholders can identify most relevant climate indicators for an analysis or assessment

Climate Driver	Indicator
Seasonal Temperature	Mean monthly temperature [°C]
Seasonal Precipitation	Total seasonal precipitation [mm]
Wind Patterns	Mean seasonal surface windspeed [m s^{-1}]
Extreme Winds	About as Likely as Not; unavailable historically in some locations
Extreme Precipitation Intensity	Likely; available and modeled but challenging to replicate local convective storms
Extreme Precipitation Frequency	Total annual precipitation in the 95th percentile [mm]
	Total annual precipitation in the 99th percentile [mm]
Extreme Heat	Very Likely; data available in high quality, models converge and are largely in line with historical conditions
Snowpack / Snowcover	No local indicators available
Drought	Moisture index (precipitation – evapotranspiration) [mm]
Weathering (Freeze-Thaw)	Days with maximum temperature > 0 and minimum temperature < 0

Communicating Uncertainty in Future Climate Projections

Climate models more effective at means and large-scale weather systems / storms

Difficult to resolve convective storms in climate models / historical analysis



Case Study

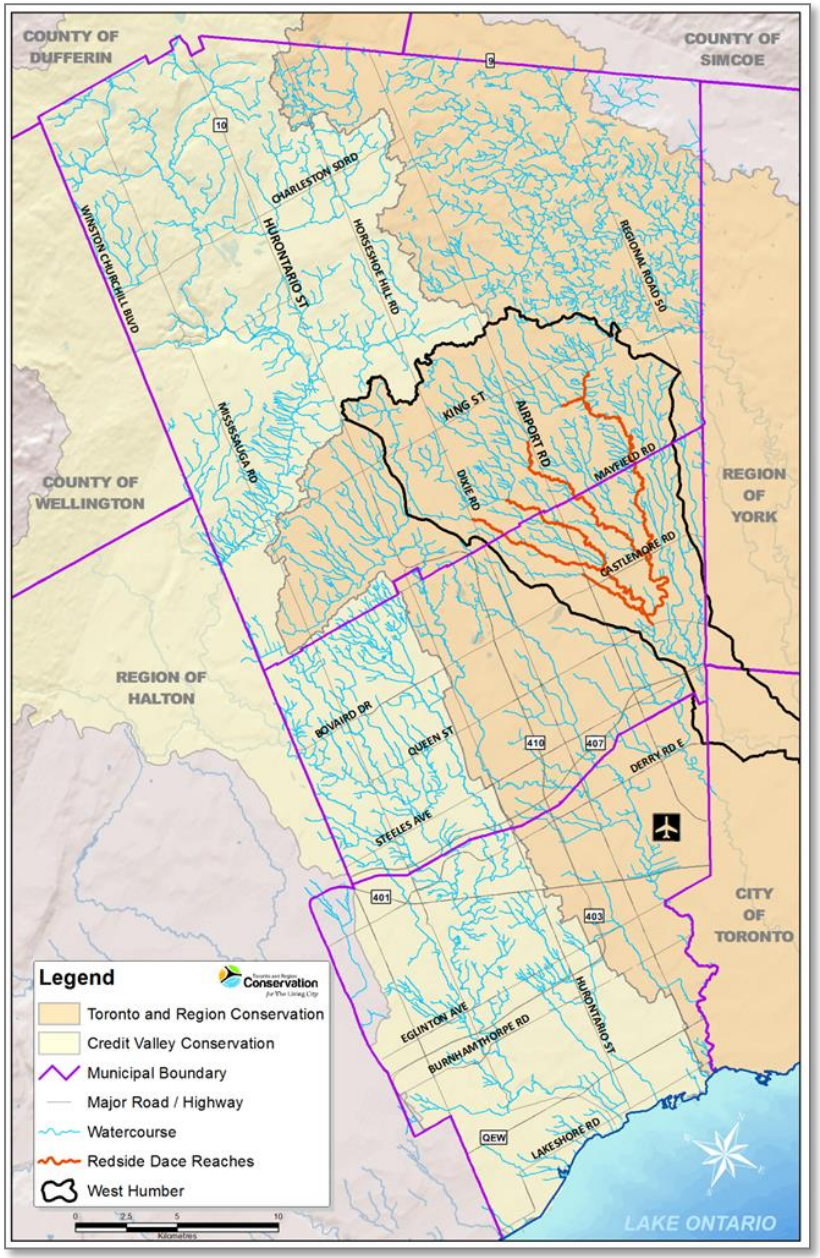
Drought in the West Humber Subwatershed

A part of:

Natural Systems Vulnerability Assessment in the Region of Peel

Context of the West Humber (Peel Region)

- Current Vulnerability:
  - Shallow Groundwater system
  - Low Gradient
  - Minimum Flows Below Targets in Summer
  - Important Redside Dace Habitat for Toronto Region
- Future Vulnerability?



Identifying Relevant Climate Indicators and Climate Information from Research

Climate Assessment Framework Tool

Natural Environment, Rivers and Streams

Factors identified making the component more/less vulnerable (ex: water levels, area-to-depth ratio, low gradient streams, shallow groundwater system, etc.)

Climate Driver	System	Component	Reference	Information	Climate Thresholds				Component Vulnerability		Impact	Impact Level / Impacts Estimate
					Seasonality	Intensity	Frequency	Duration	Vulnerability Factor	Vulnerability Factor Class		

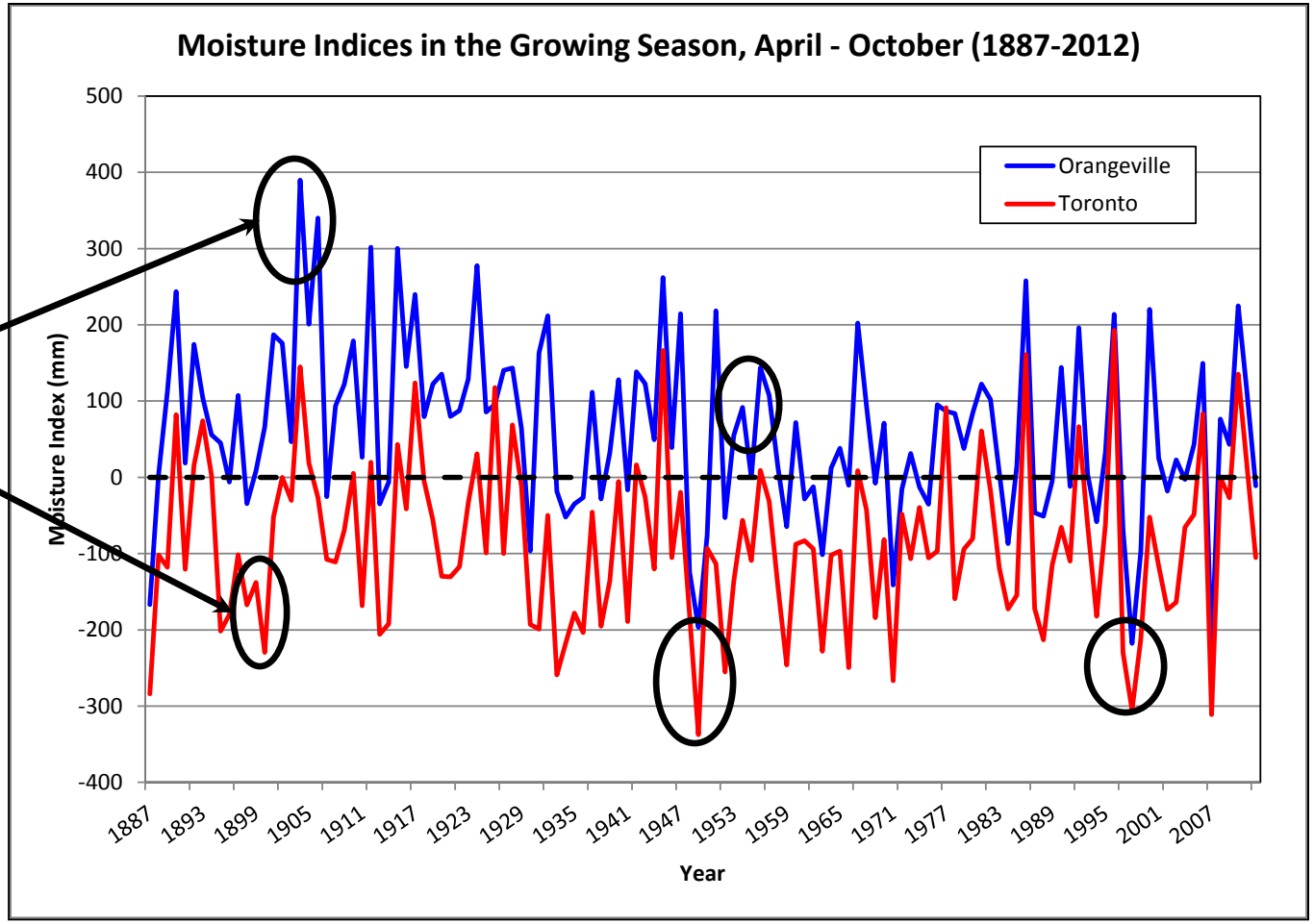
Precipitation

Summer seasonal rains less than 77mm/month

Potential Impacts on component (loss of fish habitat, flows below minimum targets)

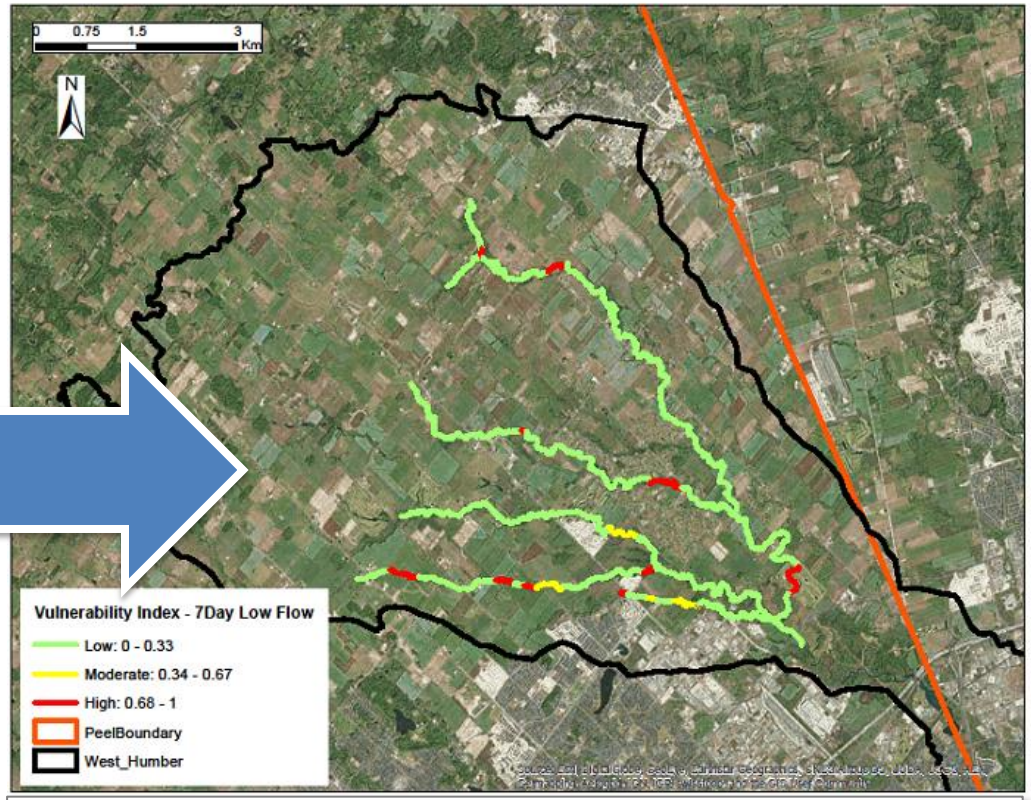
Historical Drought: What have we observed in the past?

Scenarios for Modeling



Current Vulnerability: How sensitive is the system to drought?

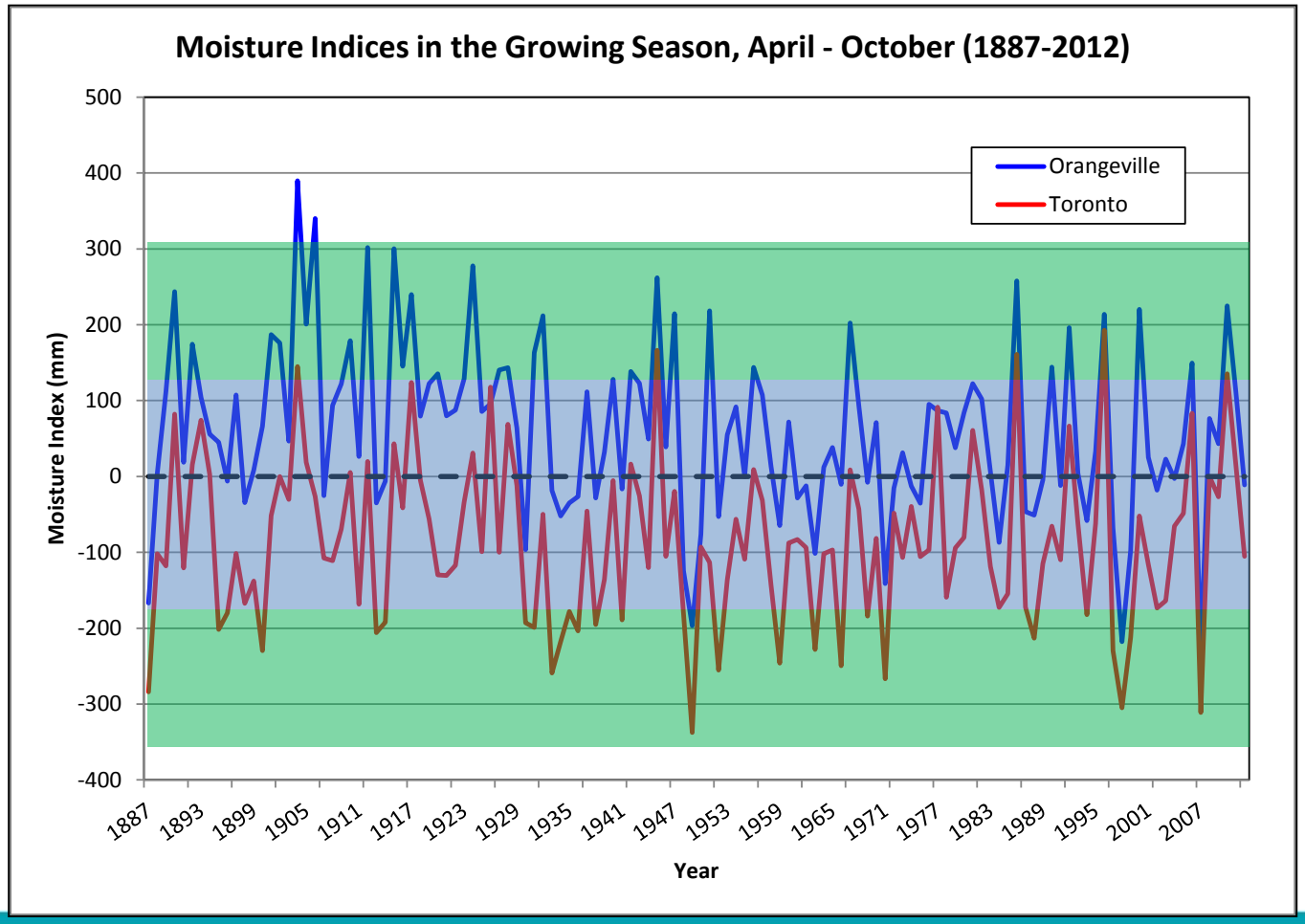
Scenarios of Drought	
Minimum	1996-2000 (Tor)
10th Percentile	1949-1953 (Tor)
25th Percentile	1996-2000 (Orvl)
50th Percentile	1991-1995 (Tor)
75th Percentile	1969-1973 (Orvl)
90th Percentile	2005-2009 (Orvl)
Maximum	2002-2006(Orvl)



Vulnerability Index to Drought (7Day Low Flow)

How might drought shift by 2050s?

Historical (1981-2010) Average Moisture Index: **-0.3mm**
Future (2041-2070) Ensemble Average Moisture Index = **-13.5mm**



25th - 75th percentile Range (CMIP5 Ensemble for 2050s)

10th - 90th percentile Range (CMIP5 Ensemble for 2050s)

Future Vulnerability in the West Humber Subwatershed

- Disruptions in water source to surface features likely to increase slightly as drier conditions become more common (less hydrologic connectivity)
- Some stream reaches are highly vulnerable – these may worsen into the future
- A degree of resilience does exist in numerous reaches though – these likely will buffer dry conditions into future
- Monitoring of flows important under climate change and future urbanization for ecosystem health under drought conditions

Key Messages

1. **Translating climate information can be challenging**

2. **Climate information will not solve all our problems!**
   - Uncertainty exists as well with impact response of systems to climate change

3. **Climate information is among other pillars required in adaptation initiatives**
   - Research & Stakeholder consultation also needed

Thank You!

For more information, please visit:

www.climateconnections.ca | ww.trca.on.ca

Glenn Milner
Analyst, Ontario Climate Consortium
gmilner@trca.on.ca