

**CANADA-ONTARIO AGREEMENT (COA) RESPECTING THE GREAT LAKES BASIN
ECOSYSTEM**



**GROUNDWATER – SURFACE WATER MONITORING FOR
CLIMATE CHANGE IN ONTARIO
Phase III - Implementation**

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COA Project

Assess the **PGMN** and **PWQMN** for their effectiveness to provide relevant data for climate change *detection* and *adaptation*.

A partnership project with Conservation Ontario.

Technical Working Team: MOE, CO, OMAFRA, MNR

A multi-phase, multi-year project.

Phase 1 and 2 completed

Phase 3 in progress

Reports available at <http://www.conservation-ontario.on.ca>

LINKAGES

Canada-Ontario Agreement (COA) Respecting the Great Lakes Basin Ecosystem, 2007: Annex 3: Lake and Basin Sustainability Annex 3, Goal 5:

“Improving the Understanding of Impacts of Climate Change on the Great Lakes Basin Ecosystem composition, structure and function including water quality and quantity”

Canada-Ontario Agreement (COA 2007) Project: Review of PGMN and PWQMN Networks for use in Climate Change Monitoring in Ontario; Conservation Ontario and Ministry of the Environment; 2008-2010. *Recommendations for integrated CC monitoring.*

Ontario’s Climate Ready Adaptation Strategy and Action Plan 2011: Goal4, Action 31 identifies the need for ***Enhanced Climate Related Monitoring to Achieve a Better Understanding of Future Climate Change Impacts in Ontario***

Regional Adaptation Collaborative: *Provided support funding for integrated monitoring stations.*

Phase III – Building Integrated Climate Water Monitoring Stations

- Document guidelines for the selection of integrated climate change monitoring sites in Ontario;
- Based on the criteria, select key sites for integrated climate change detection or adaptation monitoring;
- In cooperation with conservation authorities and Environment Canada, MNR, initiate the construction of integrated monitoring stations in key Ontario watersheds.

Climate Change Detection vs. Adaptation Monitoring

Detection:

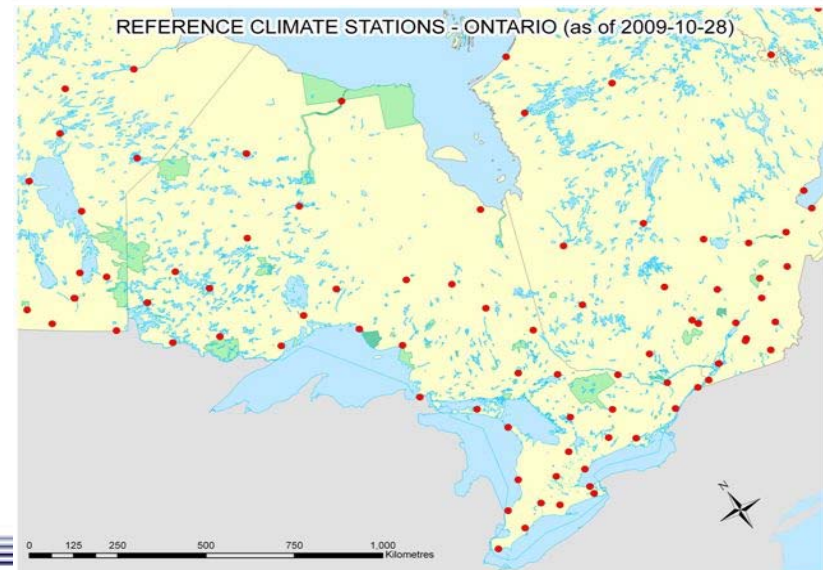
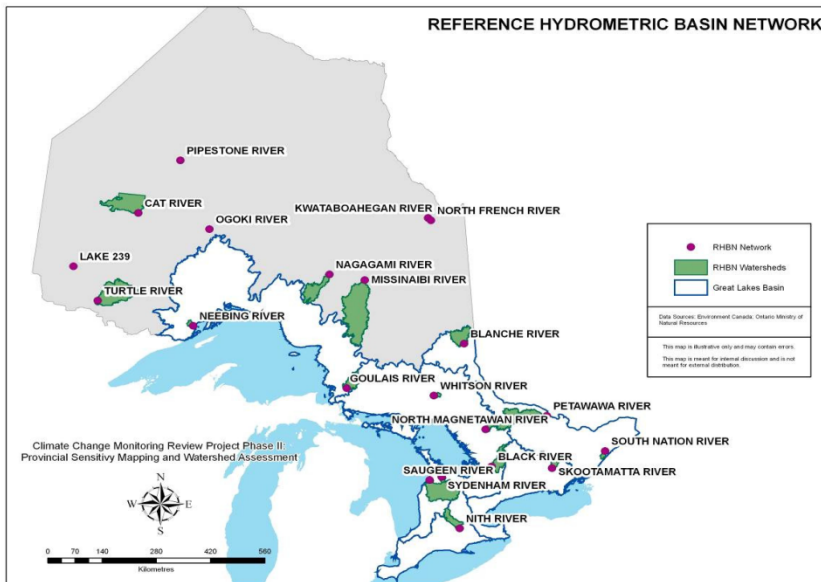
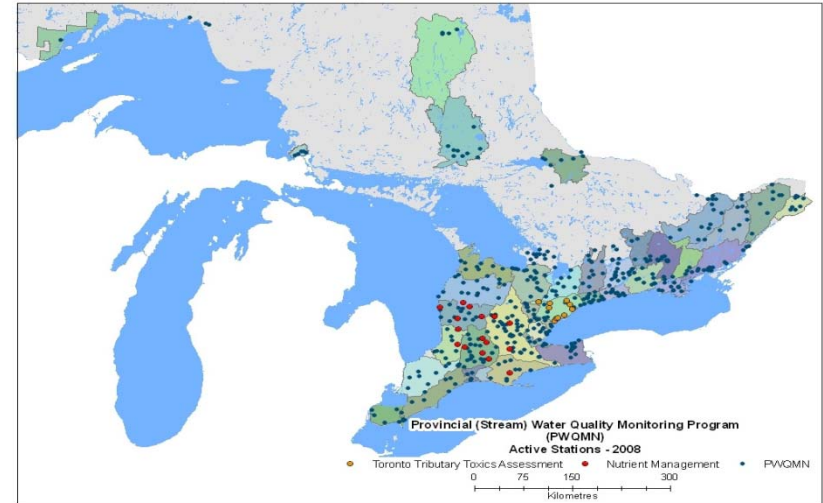
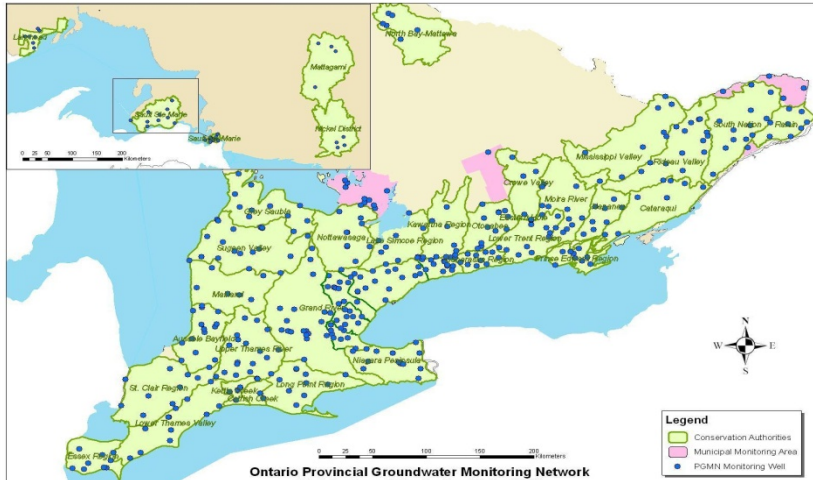
- Suited to watersheds that remain in natural undeveloped condition, with relatively stable land use
- Monitoring **long term trends** for impact on groundwater and surface water resources
- Such watersheds are found mainly in Northern Ontario and some isolated regions in S. Ontario
- Provides historical data on surface water / groundwater/ climate linkages to **reduce uncertainty in predictions** of climate change impact

Climate Change Detection and Adaptation Monitoring

Adaptation:

- Watersheds exposed to other stressors eg. growth pressure and land use change
- Climate change will exasperate existing problems in water use and demand
- Difficult to isolate impact of climate change
- Integrate monitoring to provide for **development of adaptation plans and measure effectiveness of adaptation**

Existing Networks Monitoring Locations



Selecting Sites for Integrated CC Monitoring – Approach

- Select indicators for climate change in Ontario,
- Map indicators and define sensitivity ratings for quaternary watersheds in Ontario,
- Select most sensitive watersheds to climate change
- Assess existing networks for use in integrated CC monitoring,
- Select priority sites based on criteria and local CA knowledge,
- Integrate HYDAT, PGMN, PWQMN, climate monitoring at the selected sites.

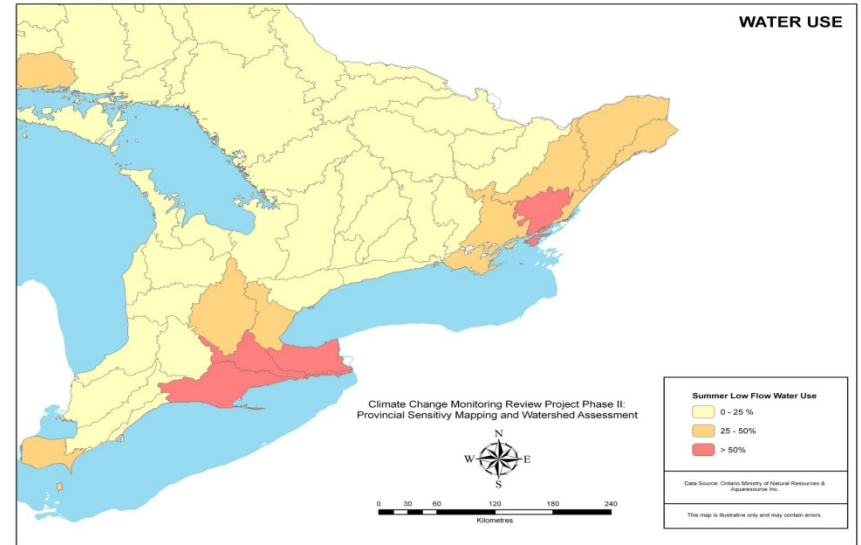
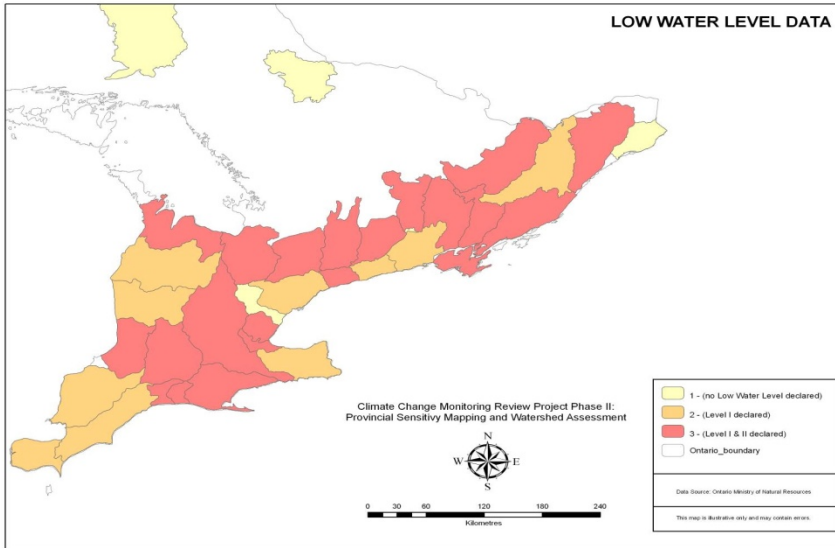
SENSITIVITY FACTORS SELECTED

- Low Water Level (drought levels)
- Water Use (permits)
- Stream Water Quality (PWQMN)
- Shallow Well Vulnerability (MOE well records)
- Baseflow Index (Piggott)

SENSITIVITY FACTORS CLASSIFIED INTO 3 LEVELS

- (1) – LOW sensitivity to Climate Change
- (2) – MODERATE sensitivity
- (3) – HIGH sensitivity

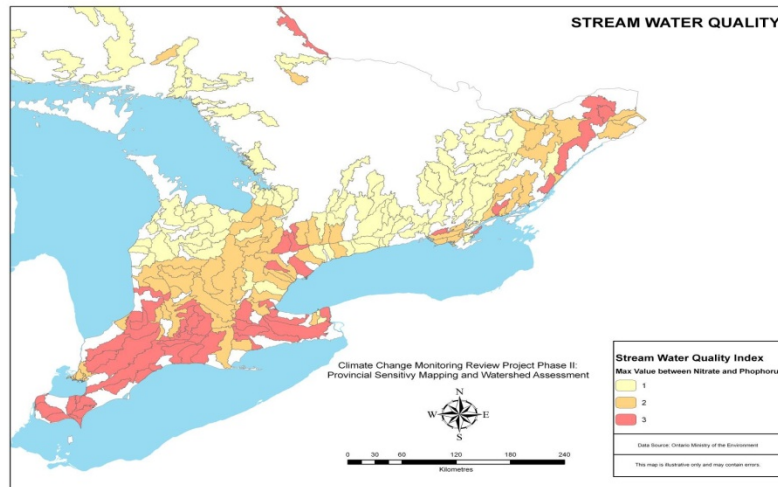
Sensitivity Factors



Based on data from 2001 – 2008 for OLWRP
Rating (1) - no low water level declared
(2) - Level I declared
(3) - Level II declared (No Level III declared in period 2001-2008)

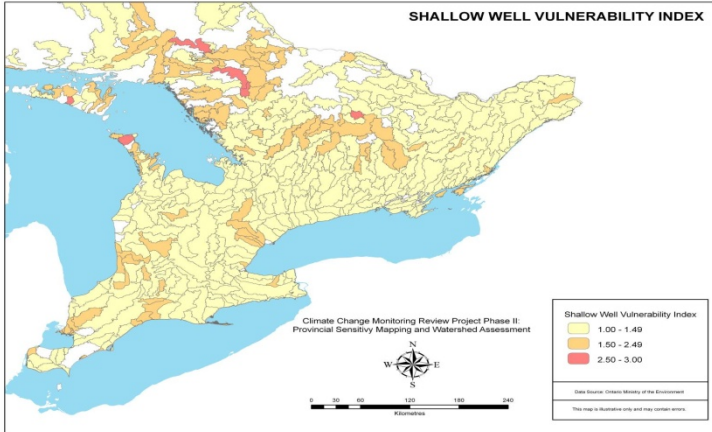
Use annual average flow & summer low flow (highest demand) period

Rating (1) < 25% water used (2) 25 – 50% (3) > 50%



Stream Water Quality:
 Developed two index values for each watershed using Nitrate and Phosphorus data for the period 2003 – 2007

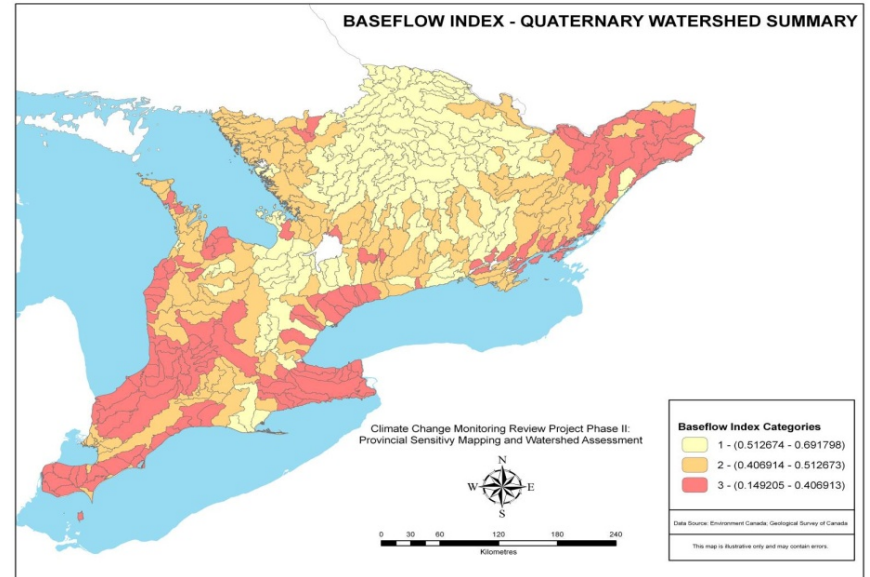
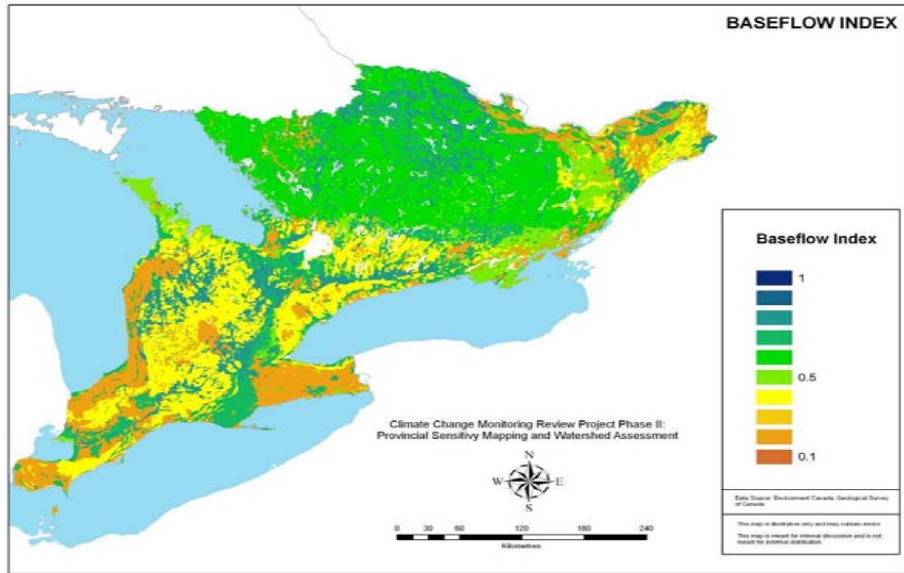
Sensitivity Factors



Well Depth// Specific Capacity //Sensitivity (WWIS)

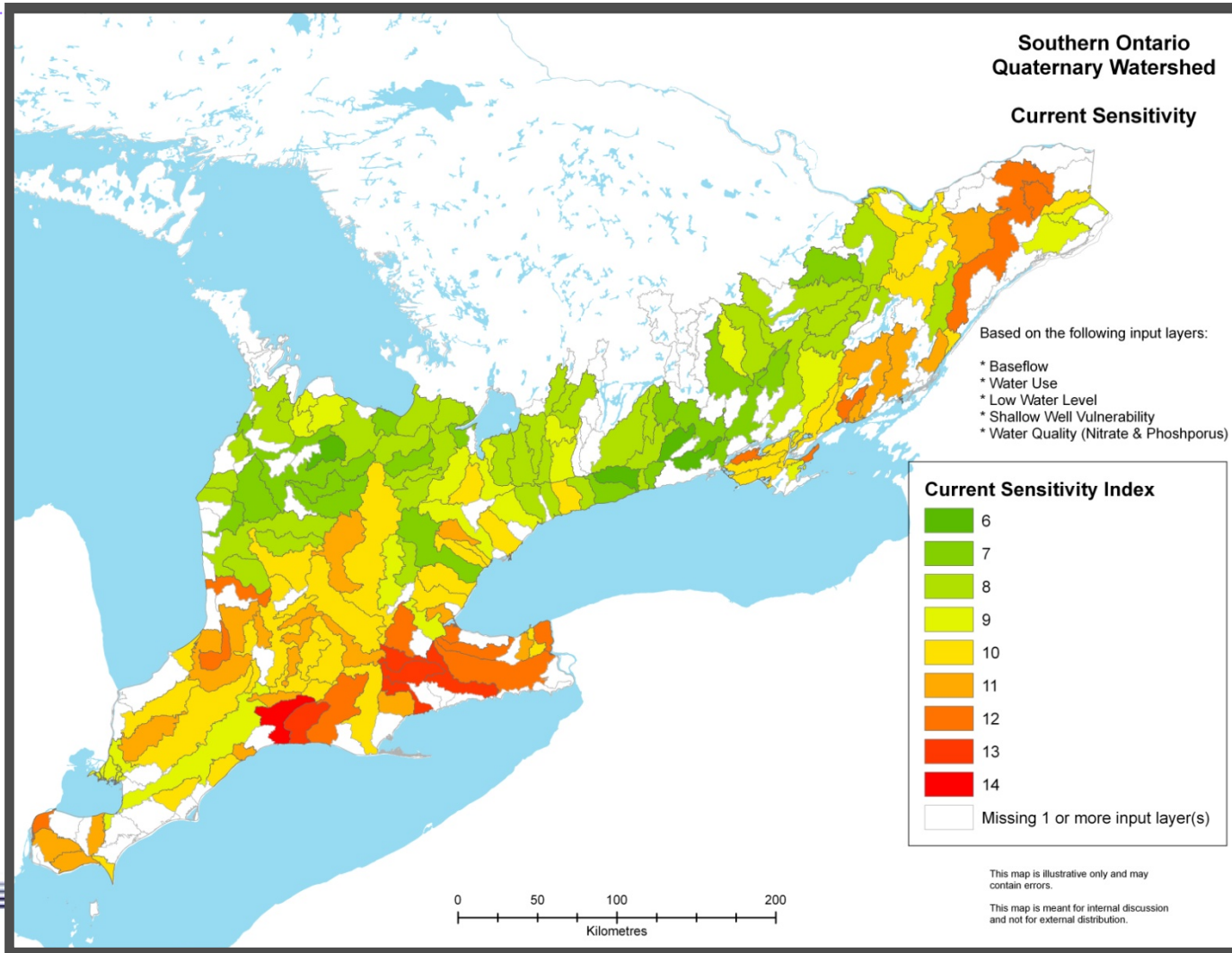
Score :

- < 10 m > 5 l/min/m (1)
- 5 – 10 m < 5 l/min/m (2)
- < 5 m < 5 l/min/m (3)

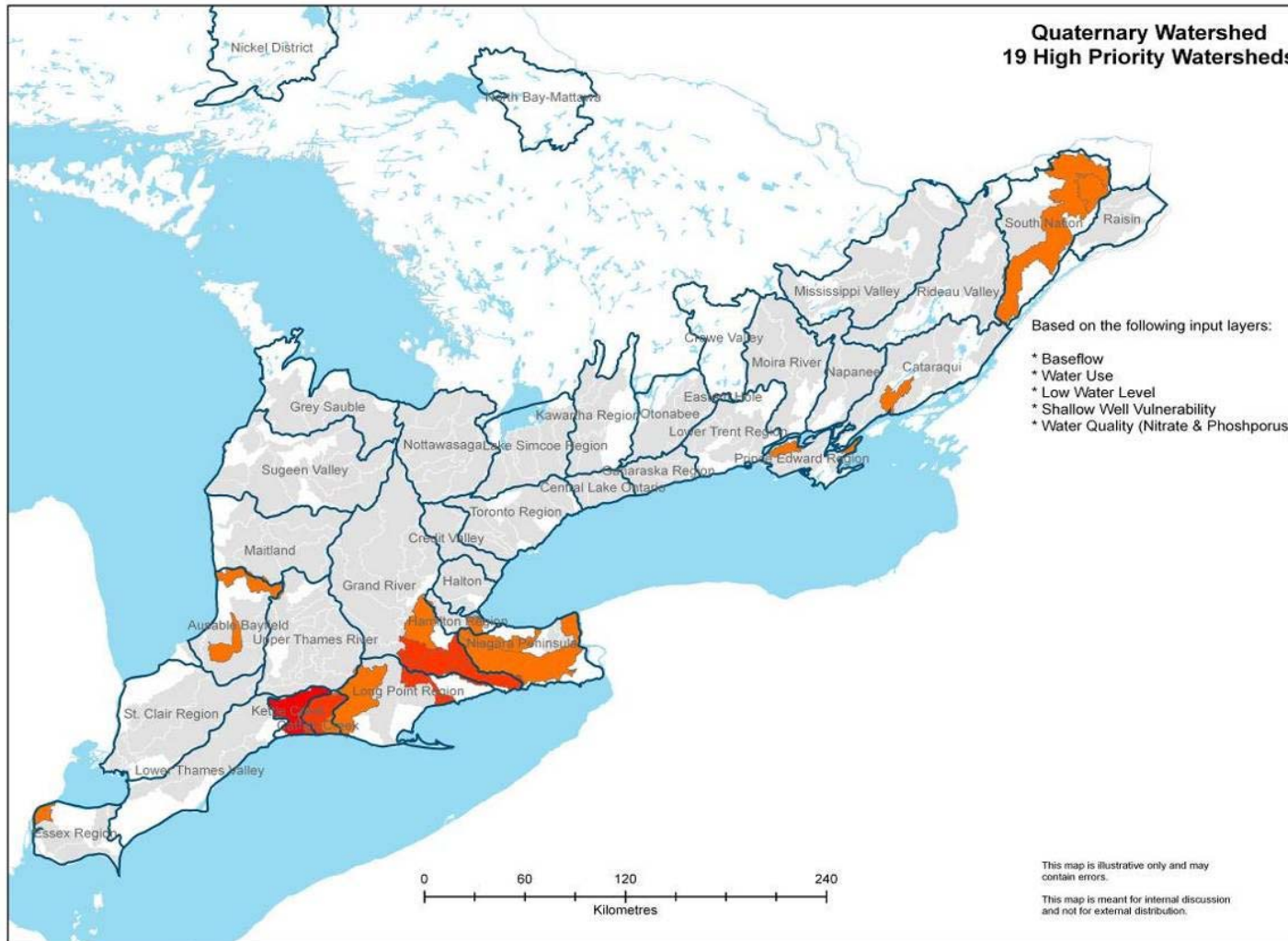


Defined as: “long term average of baseflow relative to streamflow and is a dimensionless value between zero and one where increasing values of the index indicate increasing groundwater discharge and baseflow” (Piggott)

Current Sensitivity Assessment of Southern Ontario



Identifying High Priority Watersheds



**Sensitivity Score
range 6-14 divided into
3 categories:**

Score 6-8 low

Score 9-11 mod

Score 12-14 high

**19 quaternary
watersheds – high
sensitivity**

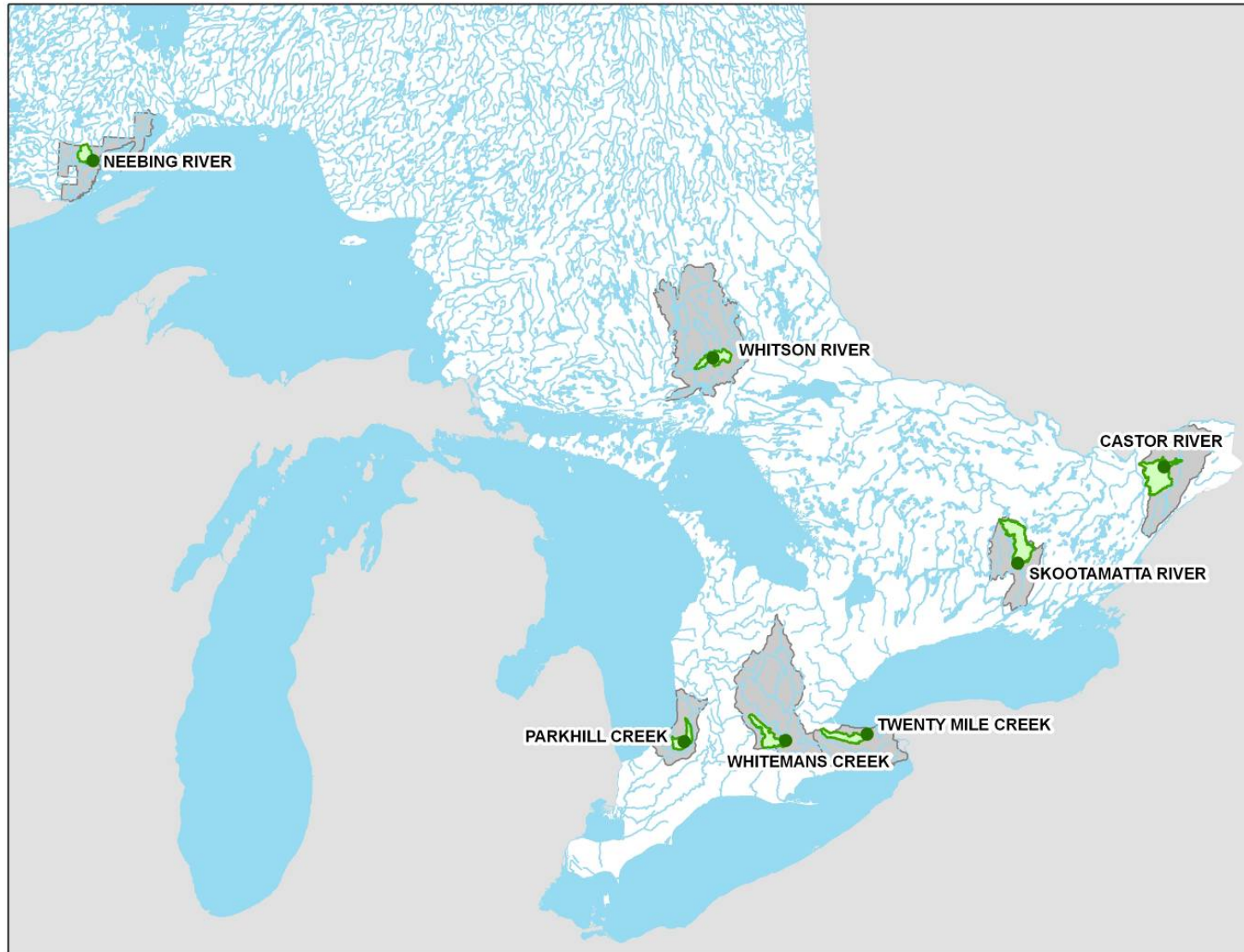
Assessment of High Sensitivity Watersheds for Integrated CC Adaptation Monitoring

- Provincial mapping shows **19 H sensitivity quaternary watersheds** in 11 conservation authority areas
- 10 conservation authorities assessed same watersheds to review provincial findings and add **local knowledge**:
Ausable-Bayfield; Catfish Cr.; Cataraqui; Essex Region; Grand R.; Kettle Cr.; Long Point Region; Niagara Region; South Nation and Quinte.
- 7 quaternary watersheds selected for integrated CC adaptation monitoring in 2011

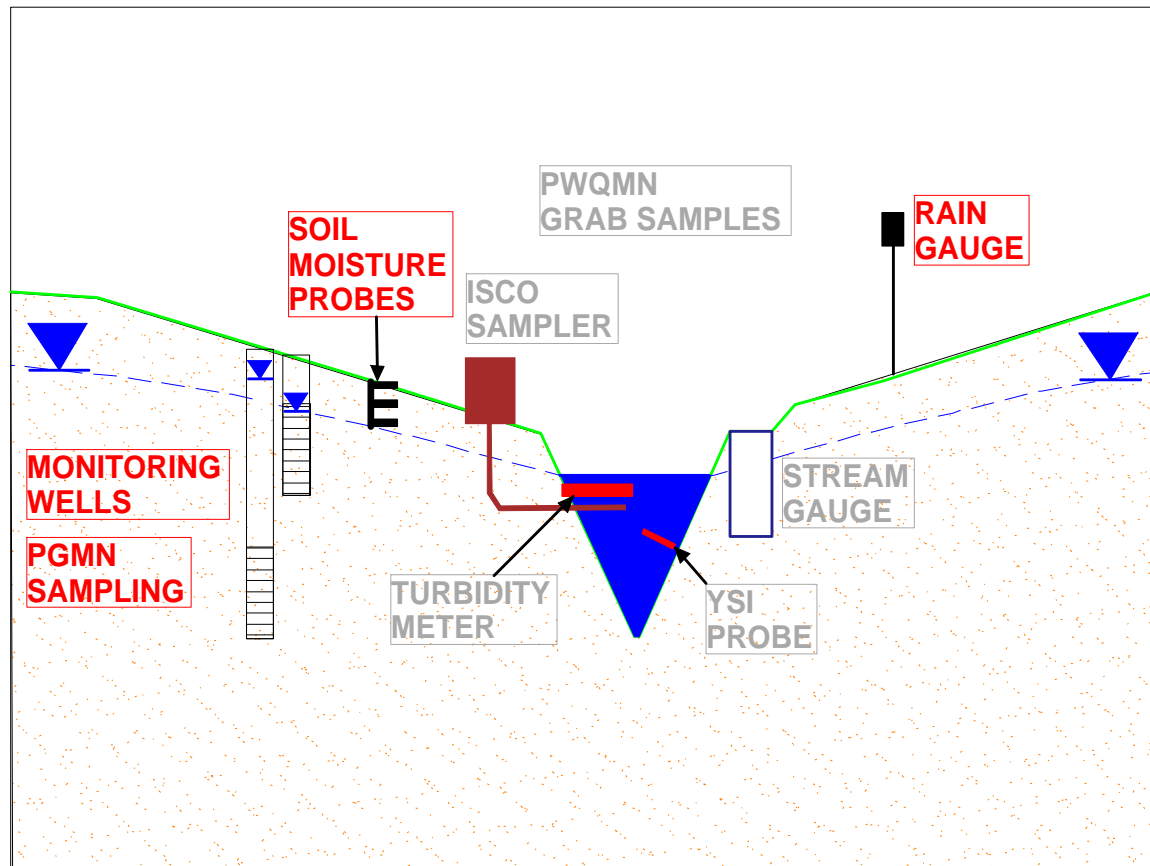
Assessment of RHBN Watersheds for Integrated CC Detection Monitoring

- 11 RHBN watersheds and HYDAT stations were reviewed for suitability for integrated CC detection monitoring
- 5 stations found suitable according to evaluation criteria
- 3 stations selected for integrated monitoring in 2011
 - Lakehead CA – **Neebing R.** nr. Thunder Bay
 - Nickel District CA – **Whitson R.** at Val Caron
 - Quinte Cons. – **Skootamatta R.** nr. Actinolite

Integrated CC Monitoring Sites – Ontario - 2011



Phase 3: Integrated Monitoring for Climate Change



Proposed Next Steps

- Complete installation of 7 sites in 2011,
- Conduct sensitivity mapping of other key watersheds draining to the Great Lakes, including near North
- Identify gaps in integrated SW/GW/Climate monitoring for climate change detection, adaptation and linkage modelling
- Extend integrated monitoring installations to other priority watersheds in the Great Lakes basin.

Acknowledgement

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