

# Adapting to Climate Change: Natural Systems Vulnerability Assessments at TRCA

Presented by:

Namrata Shrestha, Ph.D.  
Senior Research Scientist, Ecology  
RKM, Policy Planning Division

Glenn Milner, MCC  
Senior Program Manager  
OCC, Watershed Strategies Division

07 March, 2019



## Presentation Outline

1. Peel Region Natural Systems Vulnerability Assessment
  - a. Context
  - b. Approach
  - c. Results
2. Rollout to TRCA Jurisdiction & Other Applications
3. Moving Forward

*The information contained in this presentation is copyright © Toronto and Region Conservation Authority*

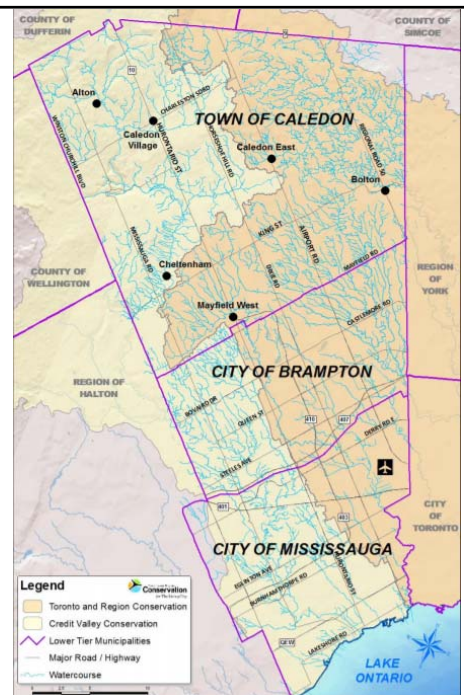
Context & Approach

## PEEL REGION NATURAL SYSTEMS CC VA

### Study Area: Region of Peel

- **Qualitative vulnerability assessment** of natural systems (and key ecosystem services) to climate change.
- **Natural Systems:** Groundwater, Aquatic and Terrestrial Systems
- **Management Recommendations** to reduce vulnerabilities.

**“Vulnerability encompasses ... sensitivity or susceptibility to harm and lack of capacity to cope and adapt.”**



## Team Structure & Overarching Guidance

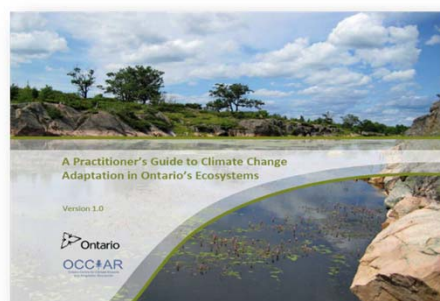
**Core Advisory Team (CAT):** Peel Region, CVC, MNRF, OCCAR and University of Waterloo

**Climate Scenario:** RCP 8.5, CMIP5 Models, Mid-Century (2050s)

**Climate Scenario:** Hotter, Wetter Year; Drier Summer

**Subject Matter Expert Consultation**

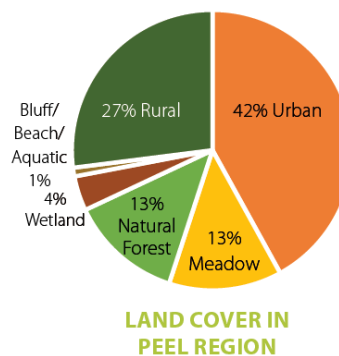
**Stakeholder Workshops**

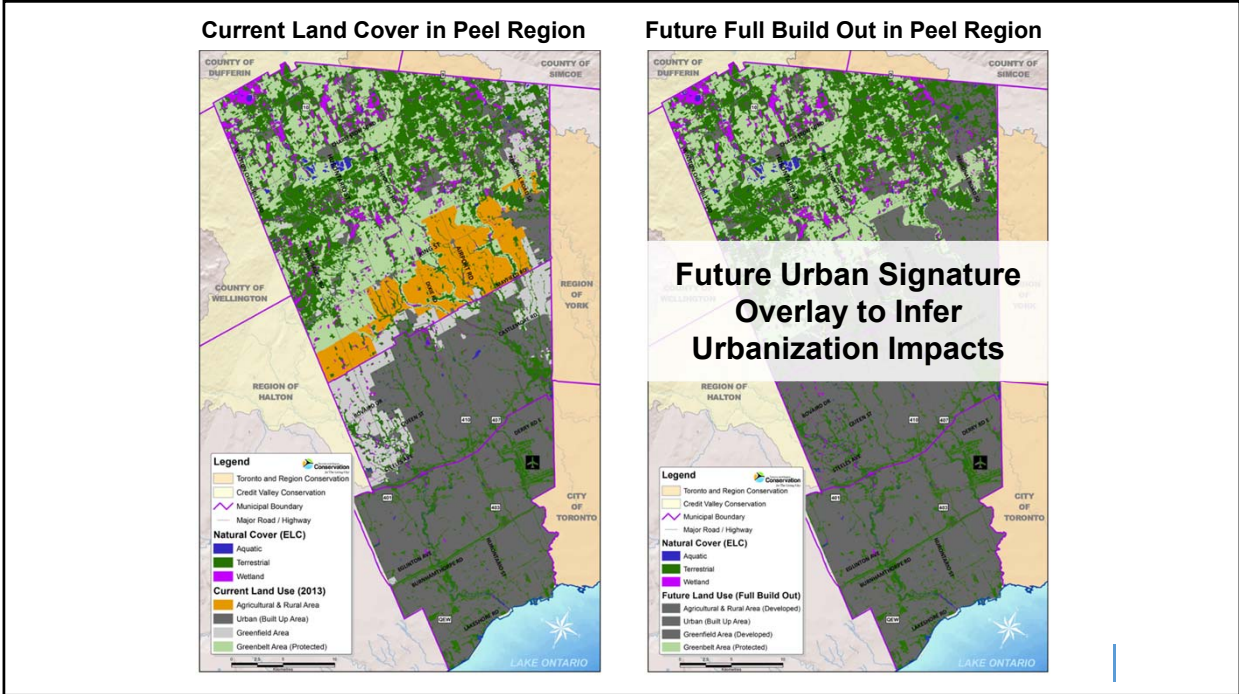


## Vulnerability Indicator-based Assessment

“Vulnerability Indicators” represent vulnerability factors locally in Peel and were selected from a long list using a set of criteria classified as *Feasibility of Assessment*, *Importance of Assessment* and *Scientific Validity of Assessment*.

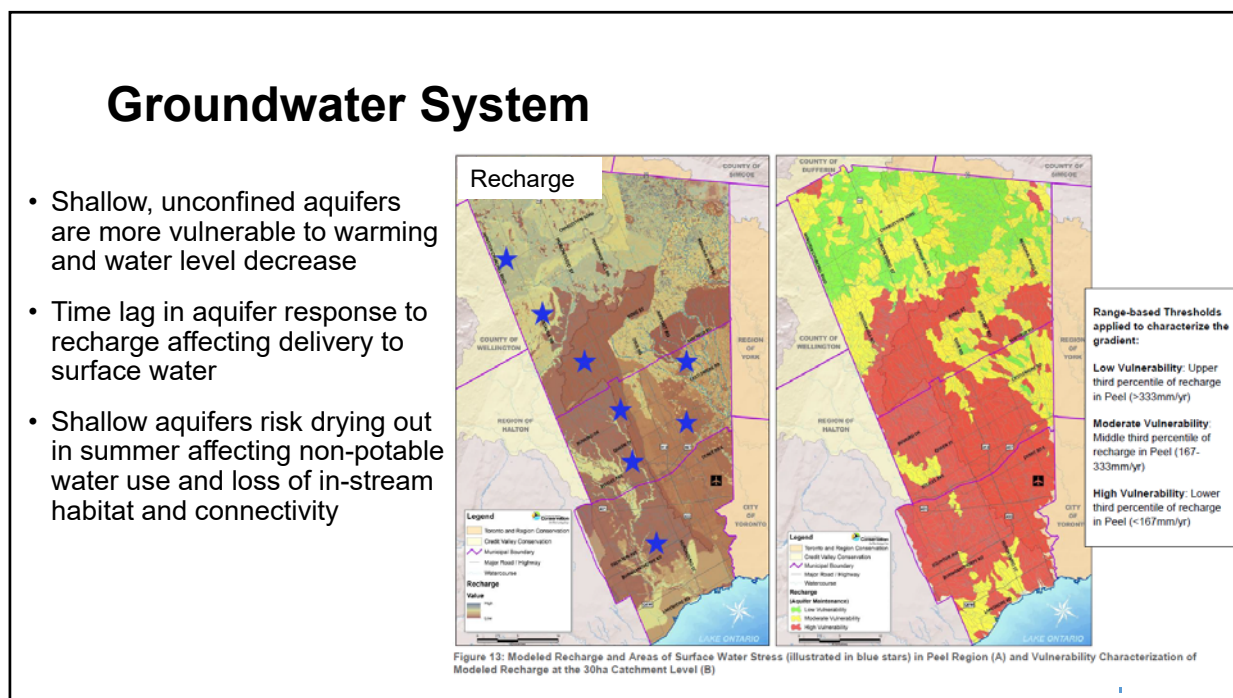
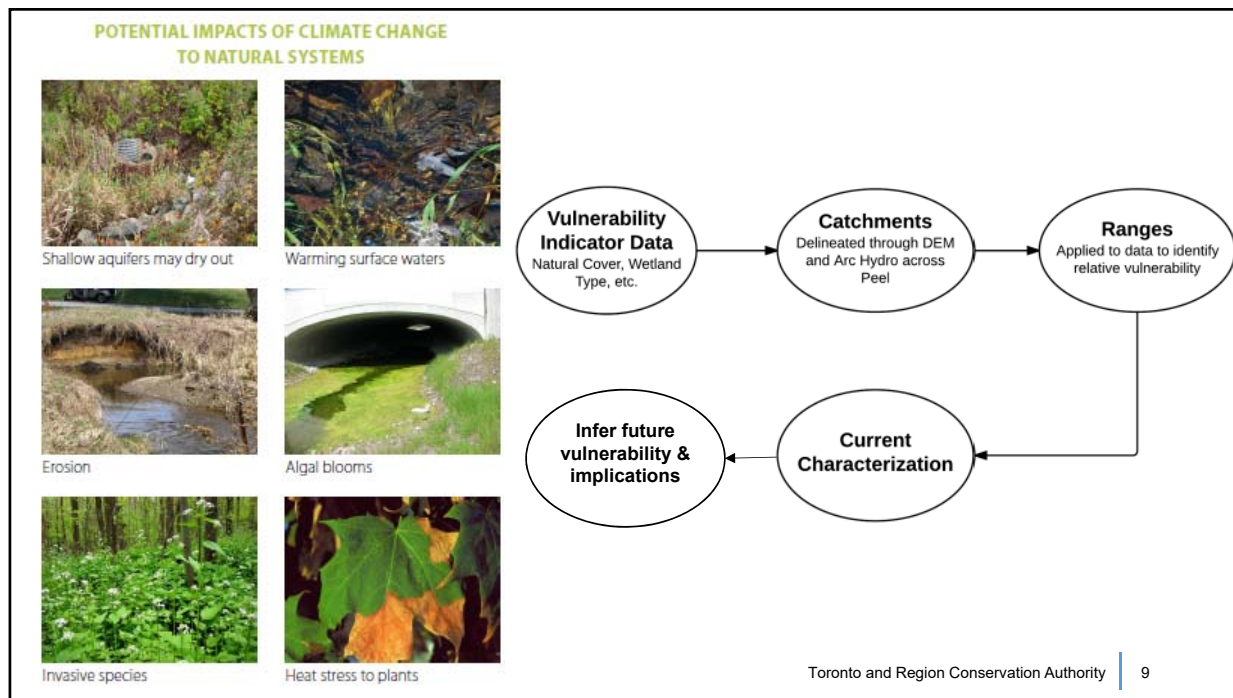
1. Natural Cover Type and Distribution
2. Baseflow
3. Climate-Sensitive Native Vegetation
4. Soil Organic Carbon Content in A-Horizon Layer
5. Soil Drainage Rating
6. Total Phosphorous (Aquatic)
7. Water Levels (surface and ground)
8. Water Temperature
9. Wetland Type (Hydrology)
10. Land Surface Temperature
11. Recharge





Results

# PEEL REGION NATURAL SYSTEMS CC VA

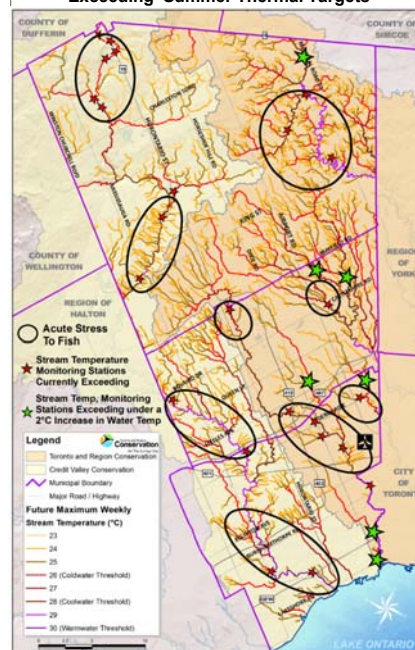


## Aquatic System

### 9 highly vulnerable streams:

- Elevated stream temperatures, low flow conditions, elevated nutrients, habitat fragmentation
- Areal extent of at least four highly vulnerable stream areas is predicted to expand and urbanization will exacerbate these conditions
- Loss of cold-water habitat, overheating of warm-water habitat, decrease in water quality, invasive spread, altered winter ecology

Future Max Weekly Streamwater Temperature Exceeding Summer Thermal Targets



## Terrestrial System: Natural Areas

- Low and stressed natural cover - urbanization and fragmentation affects
- Increased drying effects and other edge effects
- Changes in vegetation and cascading effects – even in protected areas
- Loss of habitat, connectivity, and other ecosystem services

1. Natural cover – forests, wetlands
2. Habitat patch quality
3. Climate sensitive vegetation
4. Wetland vulnerability

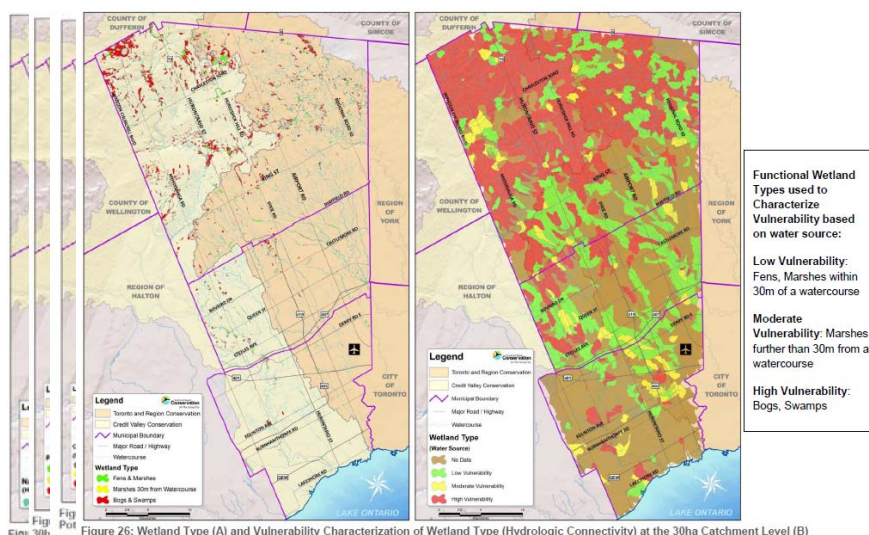


Figure 26: Wetland Type (A) and Vulnerability Characterization of Wetland Type (Hydrologic Connectivity) at the 30ha Catchment Level (B)

## Terrestrial System: G. Surface Temperature

- Temperature close to 50C in urban areas thus highly vulnerable to heat impacts
- Some urban valley corridors and Lake Ontario's shoreline has cooling effect
- Hotter temperatures expected in urban areas due to urban heat island effects
- Urbanization likely to increase thus increasing high vulnerable areas

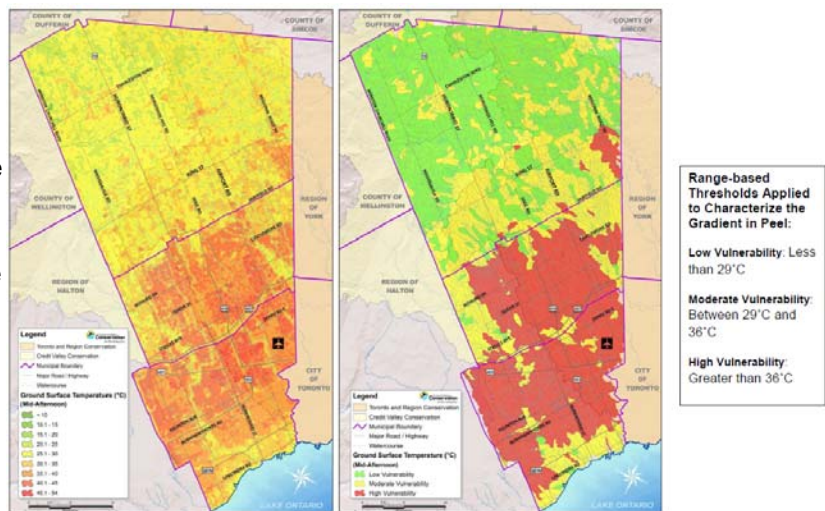


Figure 30: Mid-Afternoon Ground Surface Temperature on June 18, 2014 (A) and Vulnerability Characterization of Mid-Afternoon Ground Surface Temperature at the 30ha Catchment Level (B)

## Terrestrial System: Urban Canopy

- Provides shading, habitat and refuge in urban context
- Present mostly along valley corridors and older neighbourhoods but stressed conditions
- Increased vulnerability due to hotter and drier conditions plus urbanization impacts
- But also has higher management opportunity

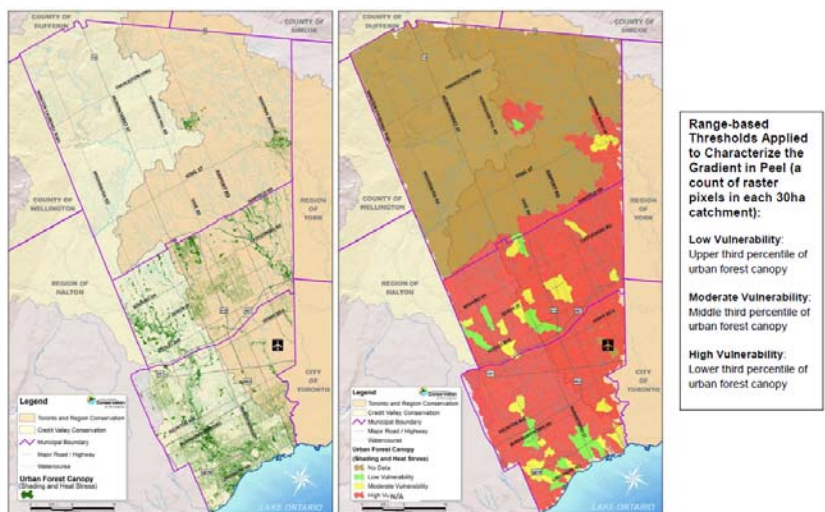
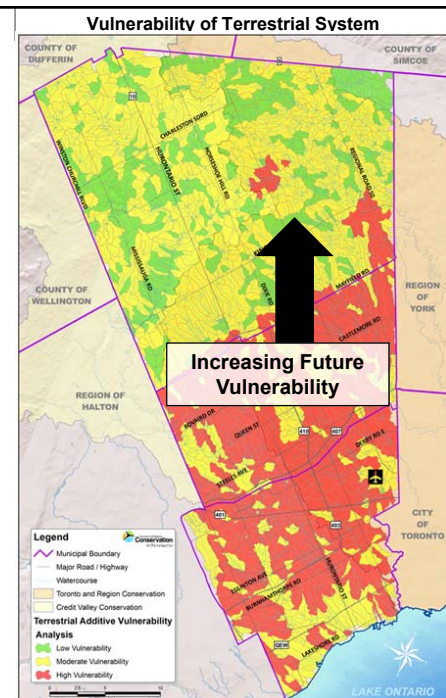


Figure 27: Urban Forest Canopy (A) and Vulnerability Characterization of Urban Forest Canopy (Heat Stress & Shading) at the 30ha Catchment Level (B)

## Terrestrial System: Overall

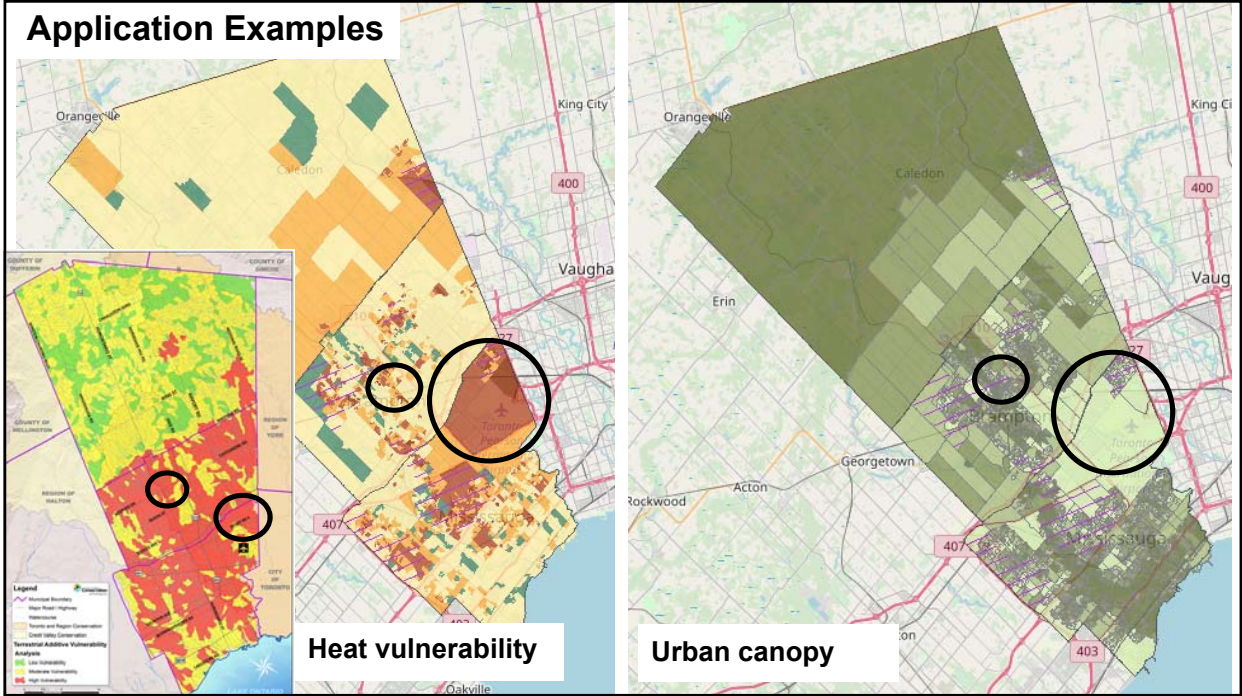
- 55% of Peel's terrestrial system is highly vulnerable, mostly in urban and urbanizing areas
- Increasing trend, especially as urbanization expands
- Complex interactions
  - Degradation of habitat function
  - Decreased habitat connectivity
  - Higher impacts of urban heat island effects
  - Decreased flood attenuation.



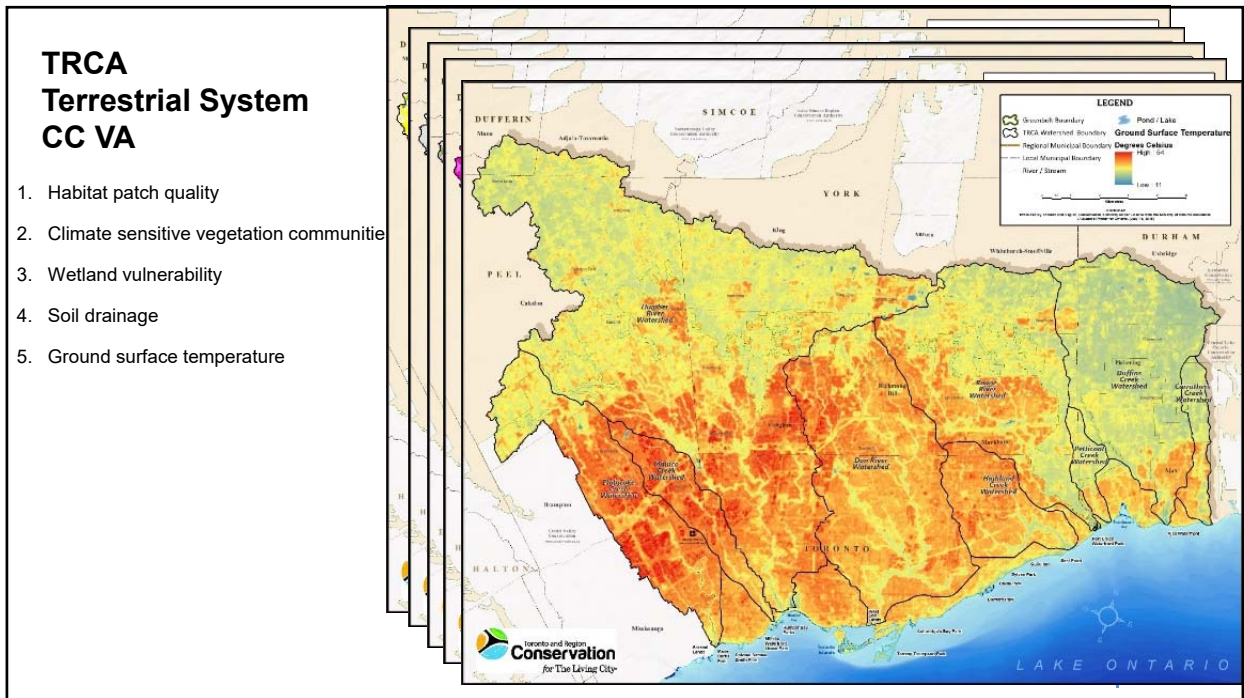
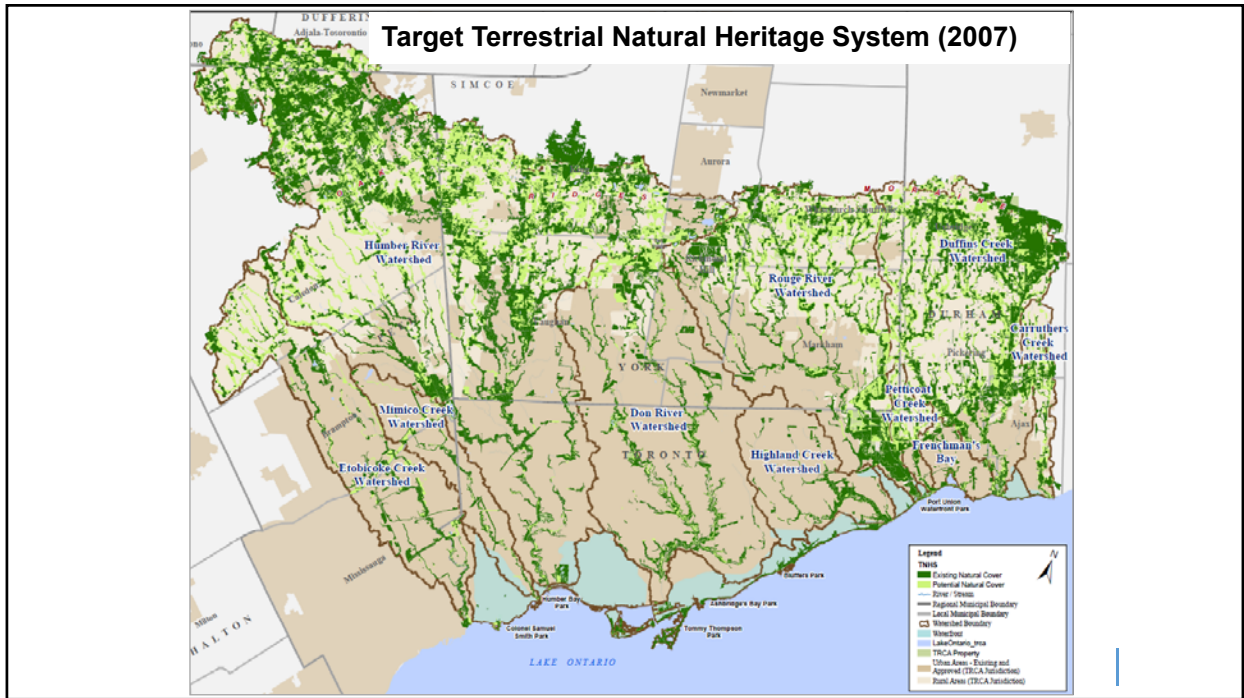
## Recommendations in Peel NS CC VA

1. Enhance urban tree canopy to regulate temperature for terrestrial & aquatic systems
2. Incorporate climate adaptation in NHS and watershed planning and implementation
3. Account for climate vulnerabilities in natural cover protection and restoration
4. Increase habitat connectivity to allow for climate adaptation
5. Promote effective collaboration, information sharing and partnerships

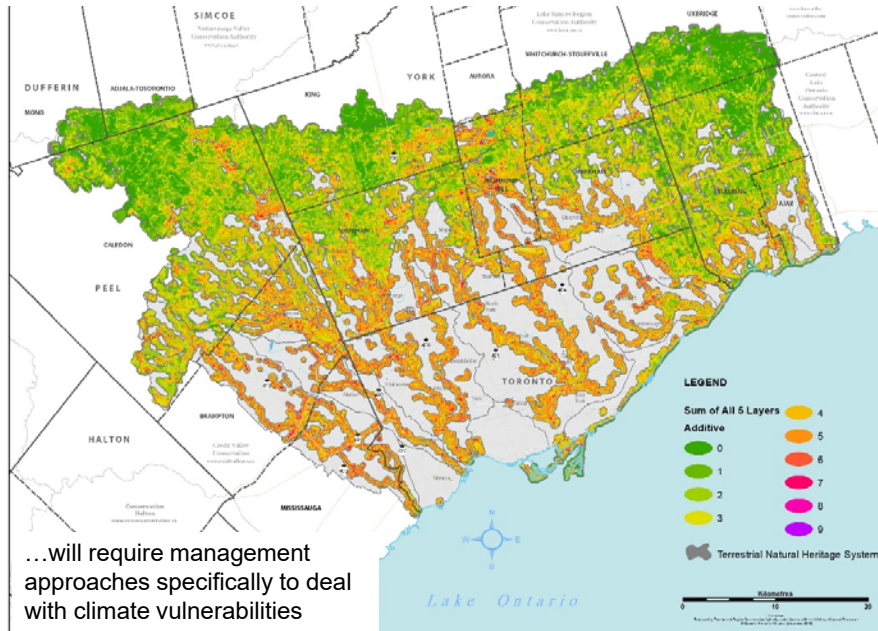




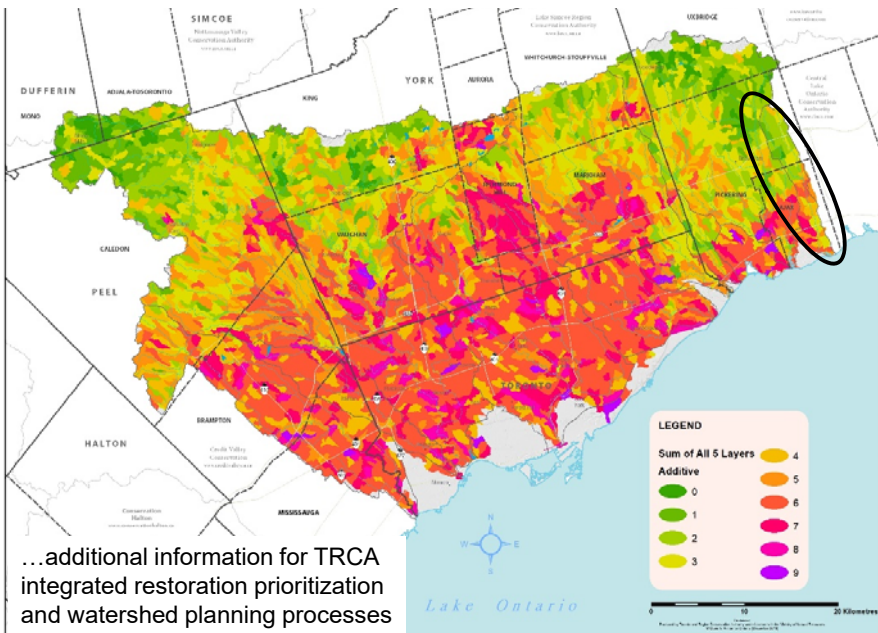
# TRCA ROLLOUT & APPLICATIONS



### Climate Vulnerability of Target Terrestrial Natural Heritage System (2007)

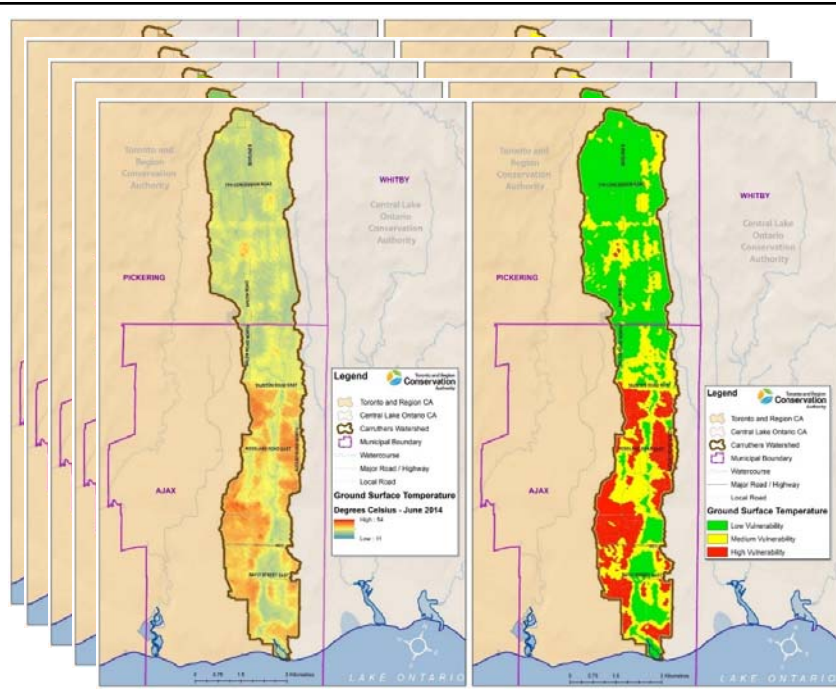


### Climate Vulnerability Summarized for 30 ha Catchments



## Carruthers Terrestrial System CC VA

1. Habitat patch quality
2. Wetland vulnerability
3. Climate sensitive vegetation communities
4. Soil drainage
5. Ground surface temperature



## Moving forward...

- Peel NS CC VA results are being used to inform with other initiatives (e.g. urban canopy, heat resiliency, planting priorities)
- Incorporate explicit climate lens in the updated TRCA NHS
  - Complete aquatic system climate vulnerability assessments
  - Complete habitat suitability analysis under future climate for target guilds
  - Consolidate all data to inform the NHS update and id management actions
- Inform watershed planning processes and municipal MCR processes
- Continue working with partners to highlight best practices

**THANK YOU!**

[www.trca.ca](http://www.trca.ca)

