



# Integration of Climate Change Impacts and Adaptation into Municipal Policy and Programs: A Focus on Water Management

BCPV, November 3, 2005

## TRCA Initiatives





## Major Storms and Flooding Events, Ontario, 2000-2005







## TRCA Climate Change Initiatives

The Strategic Plan of the TRCA , “ **Moving Toward The Living City**” identifies the integration of Climate Change as a critical component In achieving the objectives and goals of achieving a healthy, sustainable urban region extending into the 22<sup>nd</sup> century.





## TRCA Climate Change Initiatives

The TRCA identified Climate Change as an important issue related to our Watershed Management Mandate in the mid 1990's.

### PRINCIPLE ISSUE

- **With existing changes in urbanization already modifying the surface and sub-surface components of the hydrologic cycle, the additional stress of a changing climate altering the meteorological Inputs will create significant challenges to managing our watersheds in the future.**





## TRCA Climate Change Initiatives

In November of 1999, the TRCA with the assistance of the Ontario Ministry of Environment and Environment Canada hosted a symposium entitled:

### **Climate Change and Watershed Management**

**[http://www.trca.on.ca/water\\_protection/strategies/](http://www.trca.on.ca/water_protection/strategies/)**

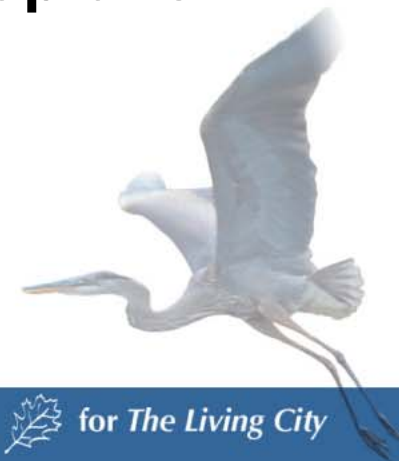




## TRCA Climate Change Initiatives

The outcome from the symposium identified two key findings:

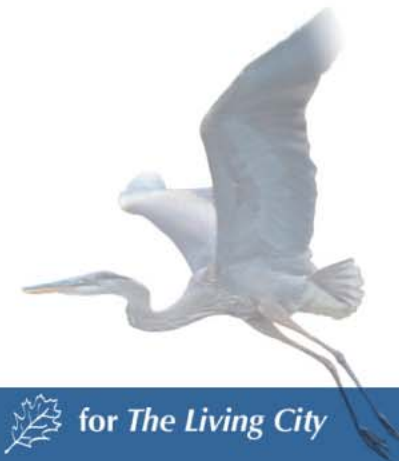
**1 ) The development of Watershed Plans as long range planning and implementation tools to manage both water resources and ecosystems provide a unique platform to integrate both climate change mitigation and adaptation opportunities. And..**





## TRCA Climate Change Initiatives

**2 ) The integration of climate change into watershed planning Initiatives provides for a scientific and defensible approach for assessing climate related impacts on issues of water management, such as flood risk and Infrastructure design.**

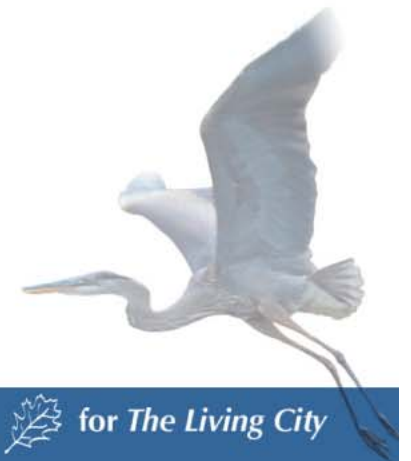




## TRCA Climate Change Initiatives

Until the Symposium, the TRCA's historical role had focused on managing **only the surface runoff component of the Hydrologic Cycle.**

- Flood Control
- Erosion Control
- Storm Water Management







## TRCA Climate Change Initiatives

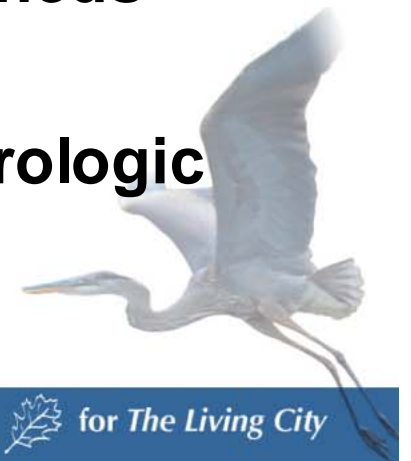
**Since the 1999 Symposium, the TRCA has and continues to undertake a number of initiatives to develop the baseline data and watershed analysis tools required to be in a position to effectively begin to Integrate climate change into watershed planning initiatives.**





## TRCA Climate Change Initiatives

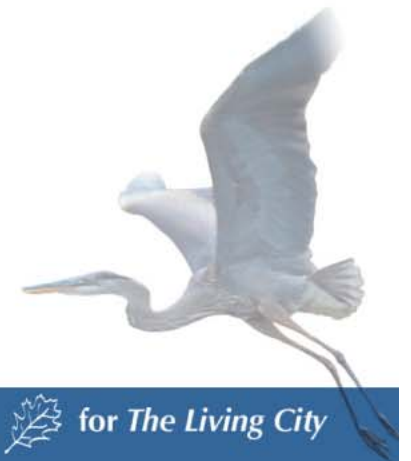
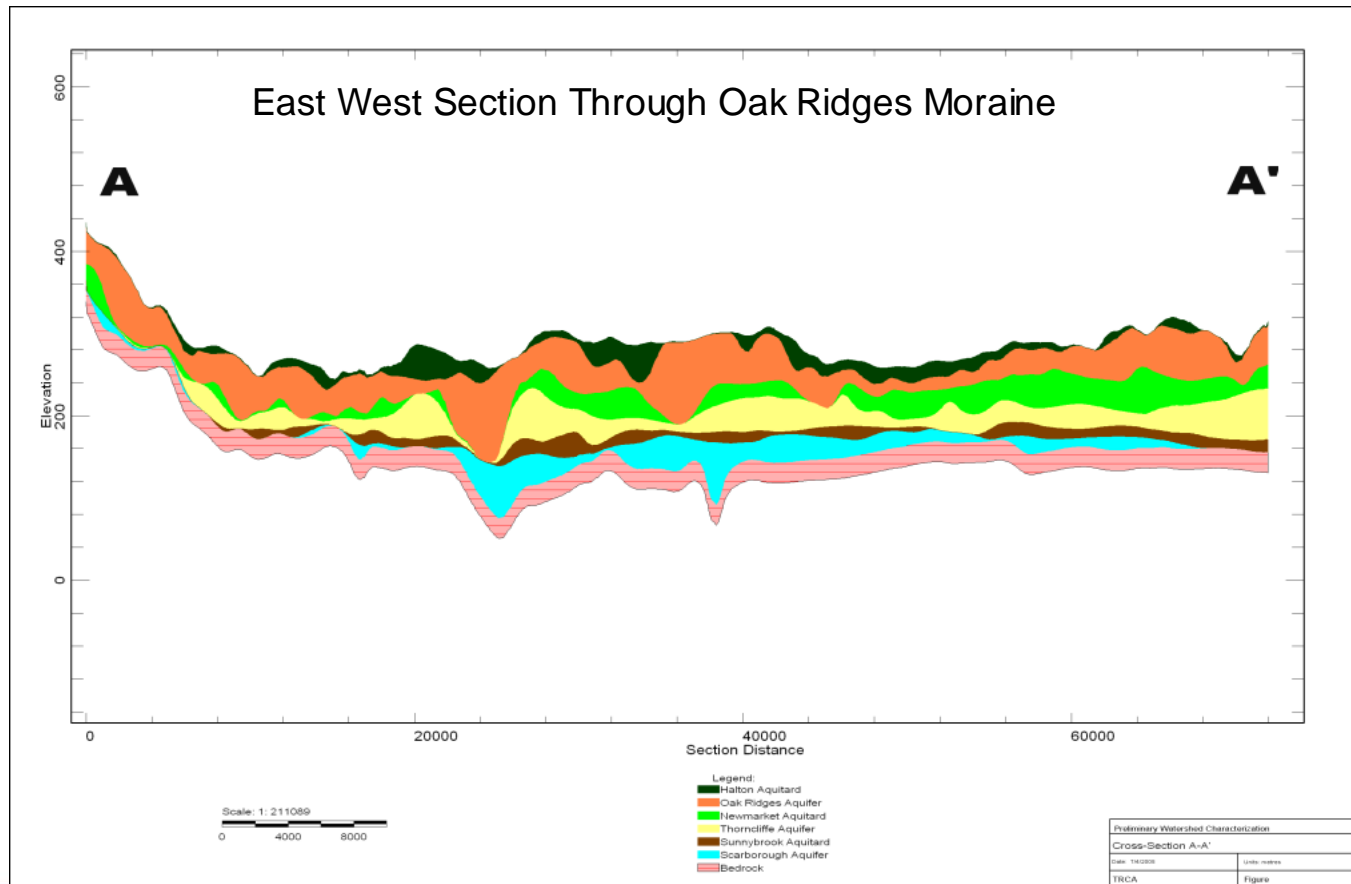
- **A comprehensive groundwater model for the overall jurisdiction is now in place.**
- **Development of base flow mapping and inventory of water users.**
- **Development of water budgets on all watersheds**
- **Development of continuous simulation hydrologic models ( WWFMP )**





## TRCA Climate Change Initiatives

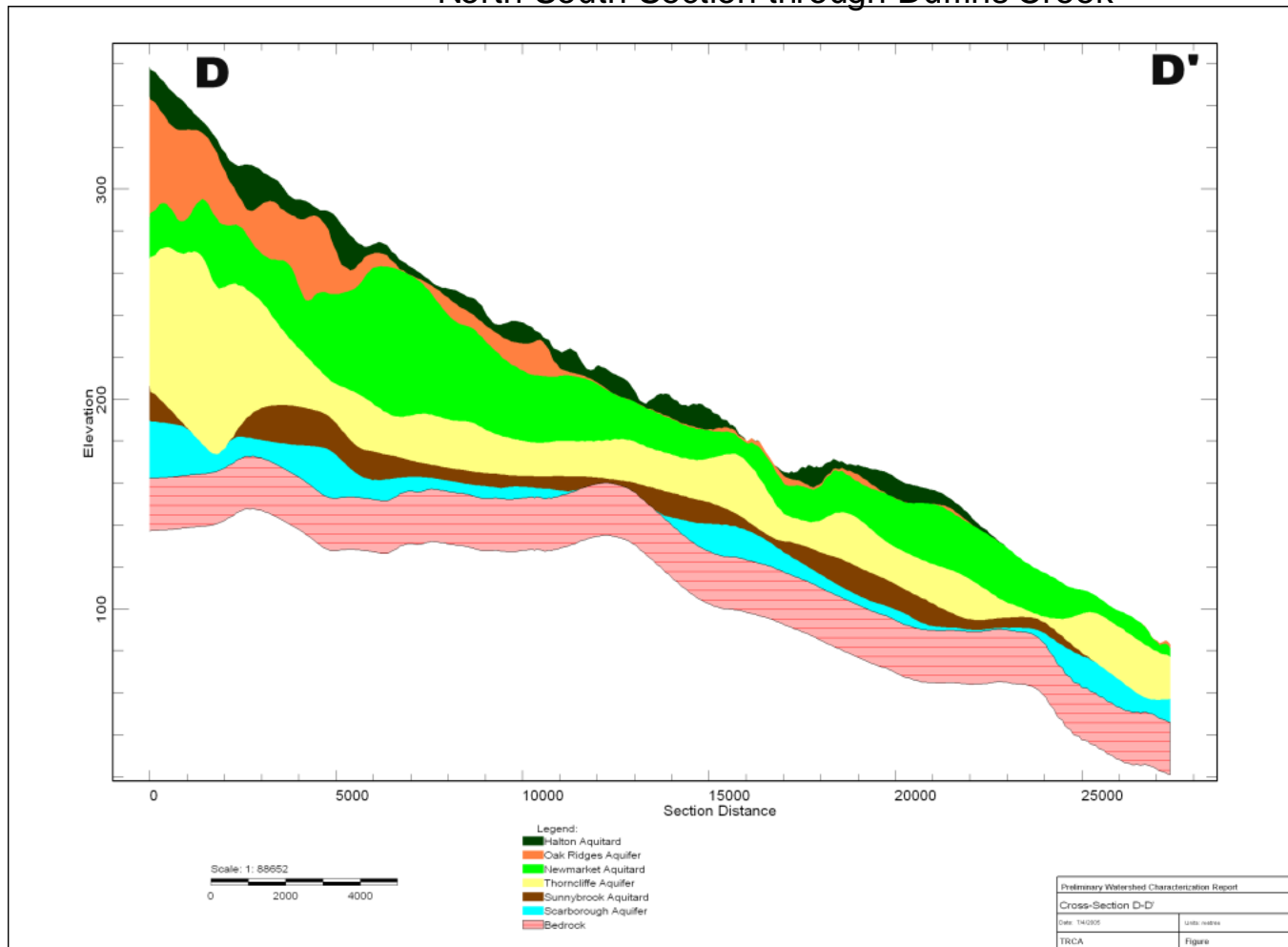
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## TRCA Climate Change Initiatives

North South Section through Duffins Creek



- The groundwater models will allow for analysis of changes to future base Flow and potable supplies.

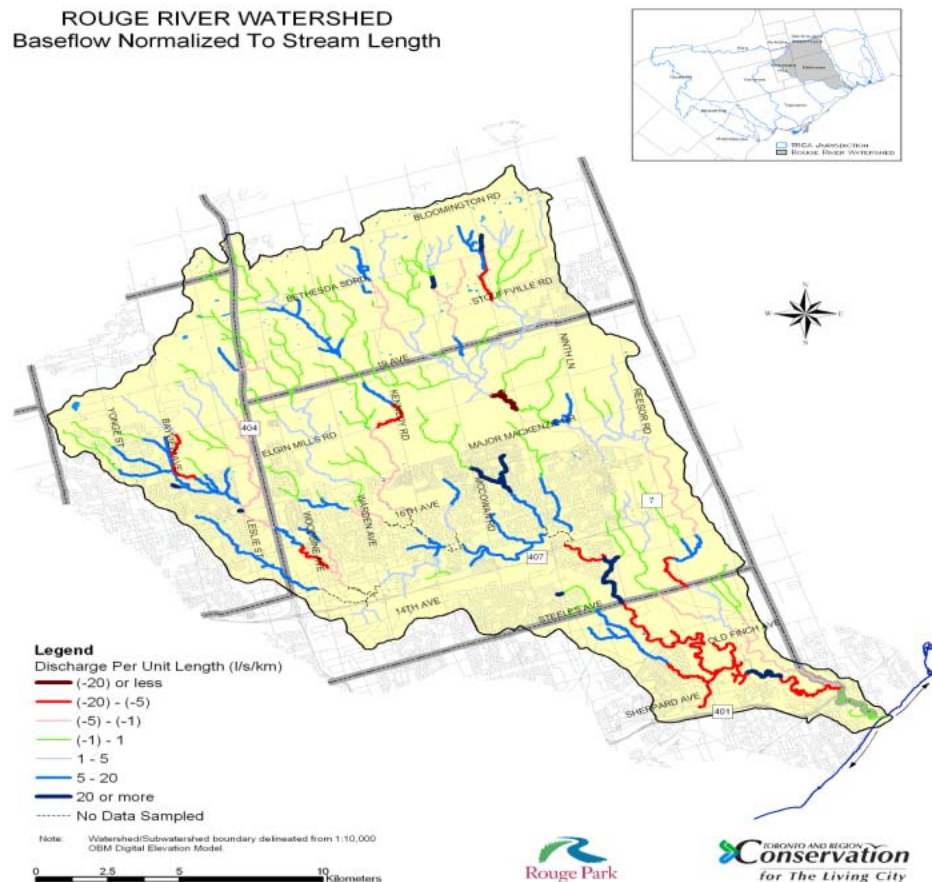






## TRCA Climate Change Initiatives

ROUGE RIVER WATERSHED  
Baseflow Normalized To Stream Length



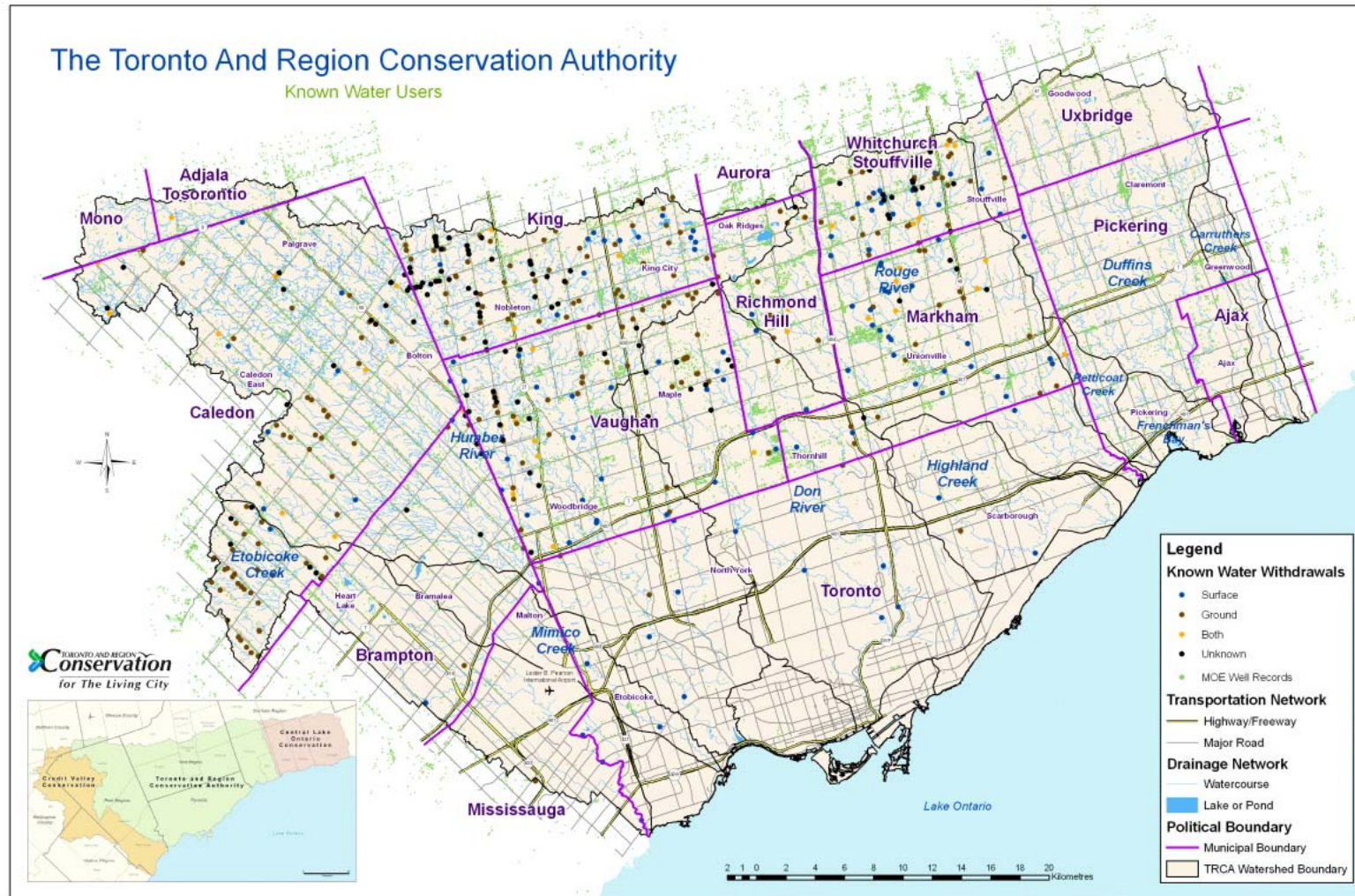
➤ Development of base flow mapping and inventory of water users.

- Allows for validation of Groundwater model and Assessment of water takings Under climate change.





## TRCA Climate Change Initiatives

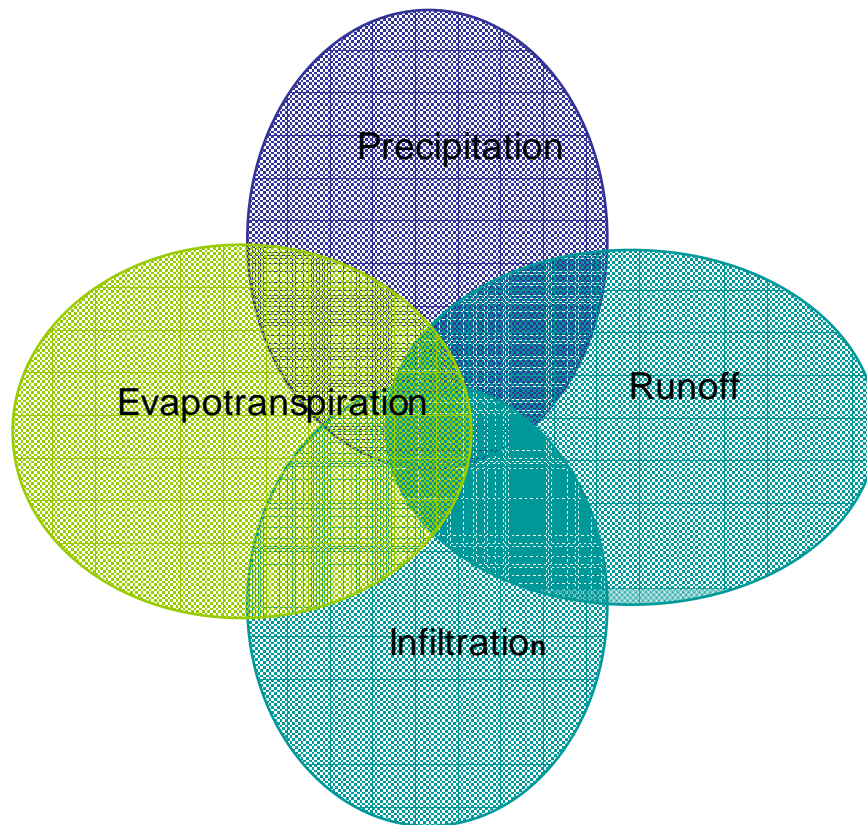






## TRCA Climate Change Initiatives

### ➤ Development of water budgets on all watersheds



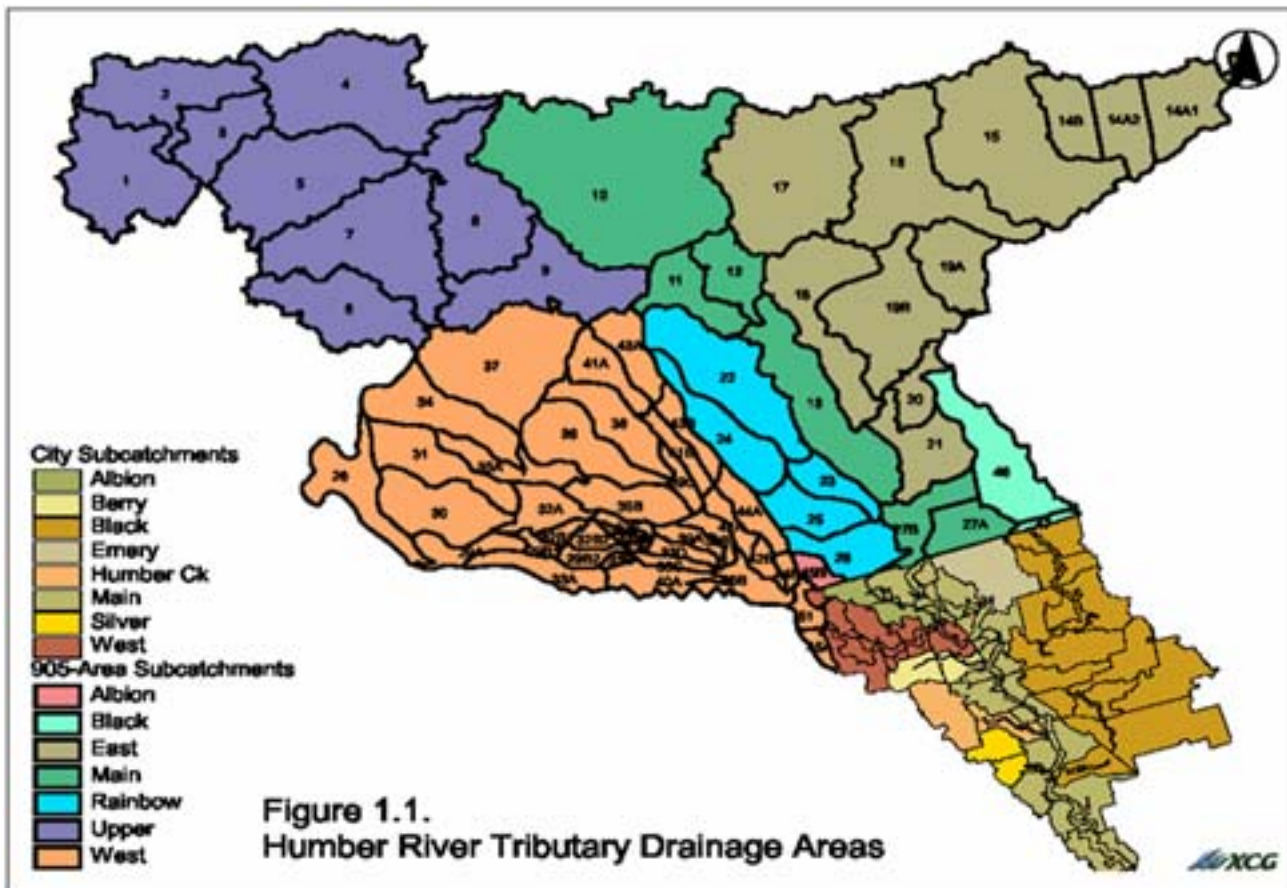
- Allows for assessment of Impacts to each hydrologic component in a clear and concise way





## TRCA Climate Change Initiatives

- Development of continuous simulation hydrologic models ( HSPF Model from Toronto WWFMP )



- Allows for climate trend assessment within a detailed watershed basis.



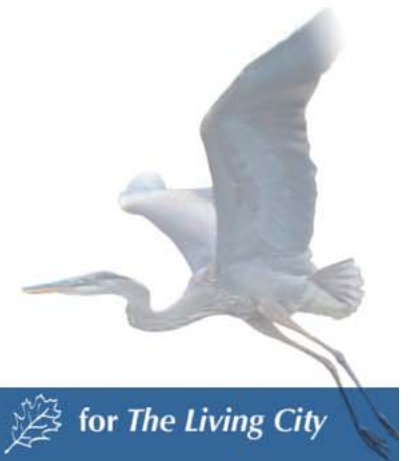




TRCA Climate Change Initiatives

# Current Initiatives

- **Integrating Climate Change into Watershed Planning, Rouge River Update**





## TRCA Climate Change Initiatives

# Rouge River Watershed Plan Update Climate Change Modeling ( currently underway)

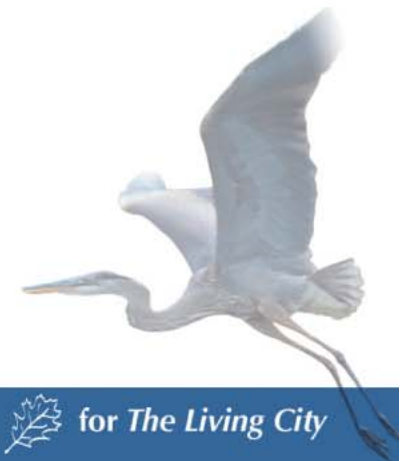
- **Two climate change scenarios have been selected to represent future conditions that are wetter and warmer in one and drier and warmer in another. These were selected from the family of model scenarios currently available from Environment Canada from several General Circulation Models (GCM's).**
- **In this way a range of possible future conditions can be bracketed. This approach recognizes the uncertainty associated with climate change simulation.**





## TRCA Climate Change Initiatives

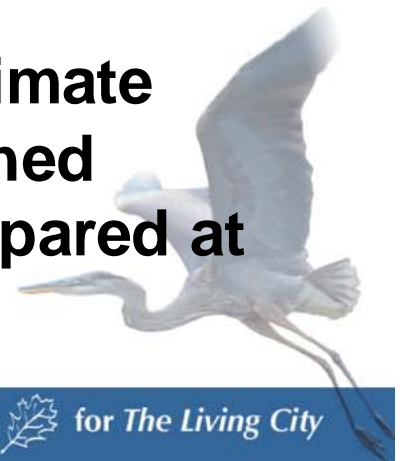
- **Two time frames have been selected, 2030 and 2080 as periods of interest in terms of land development horizons.**
- **The change fields will be compiled for all meteorological parameters for the two time frames and the two climate scenarios. These represent the average monthly departure from the base case climate normals.**





### TRCA Climate Change Initiatives

- **Recently collected meteorological time series data from local weather stations have been assembled and formatted for modeling existing conditions.**
- **This hourly time series will be modified to reflect the four climate change scenarios. For example, each air temperature value in the time series will be adjusted upwards or downwards by the change field for that month for that climate change scenario.**
- **HSPF Model runs will be conducted with four climate altered inputs under various land use and watershed management schemes. Model output will be compared at both the watershed and sub watershed scale.**







## TRCA Climate Change Initiatives

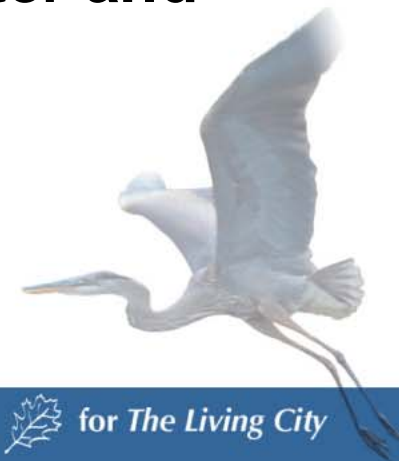
- **Following the completion of these model runs, an assessment of the trends to the water budget components will be undertaken, and potential future impacts defined to both natural systems and man made infrastructure.**





## TRCA Climate Change Initiatives

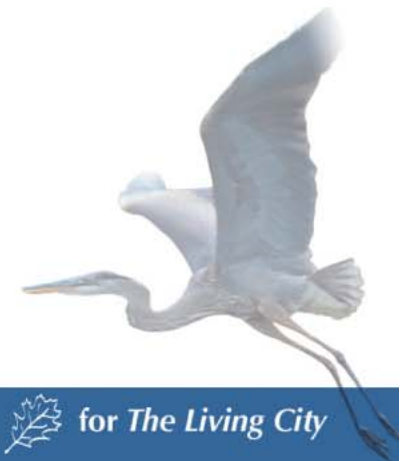
- **Assessment and integration of these climate change impacts will be integrated into the management programs and policies within the Rouge Watershed Plan components.**
- **Watershed component plans where climate change trends will be integrated include: natural heritage, planning, water quantity, both groundwater and surface water, fisheries and water quality both groundwater and surface water.**





## TRCA Climate Change Initiatives

# NEXT STEPS





## TRCA Climate Change Initiatives

Dependant upon the analysis of Climate Trends and potential impacts identified through the modeling;

- **Meet with our municipal partners within the Rouge Watershed to discuss climate related impacts on existing and future Municipal infrastructure / programs and assess potential integration into municipal infrastructure renewal and planning.**
- **Initiate the process of integrating climate change modeling and analysis on the remaining TRCA Watersheds, To move towards meeting the objectives of our Strategic Plan**







Member of Conservation Ontario

Toronto and Region Conservation  for *The Living City*