

Climate Change and Adaptive Management: Lessons from Ontario

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Pollution Probe

- An established Canadian environmental NGO – donor based
- Celebrating our 40th year – U of T (1969)
- Based in Ontario with a National focus
- Achieve positive environmental change through The Probe Approach
- Main programme areas include;
 - Water, Air, Climate Change, Energy, Transportation
 - Special initiatives, e.g., toxics (mercury)

Outline

- New Approach to Water Management in Canada
 - Includes developing the tools needed to support adaptation to climate change
- Adapting to Climate Change in Ontario
 - Implications for Water Management
- Ottawa-Gatineau Watershed Atlas
 - Local tools and open source data for effective watershed management



Towards a Vision and Strategy for Water Management in Canada

**Final Report of the Water Policy in Canada:
National Workshop Series**

April 2007



A New Approach to Water Management in Canada

Vision and Strategy

March 2008

Cross-Canada Workshop Series

- **5 Workshops on water policy - across Canada with 35-65 participants in each workshop – several hundred in total**
- **69 Presentations**
 - 16 NGOs
 - 13 academic
 - 13 federal
 - 10 provincial
 - 9 private sector
 - 4 independents
 - 3 municipal
 - 1 First Nation
- **2006**
 - Feb - Winnipeg, Manitoba
 - March – Lethbridge, Alberta
 - April – Wolfville, Nova Scotia
 - June – Guelph, Ontario
 - October – Moncton, New Brunswick

Why This, Why Now?

- Escalating concerns about water across Canada
- Federally, 1987 is the most recent omnibus statement about water – has it stood the test of time?
- Concerns about water increasingly deal with real scarcity issues, in addition to pollution-related concerns
- Water sustainability is the question of the 21st century
- What are the policy gaps and how can they best be closed?

The Issues

- **Climate change impacts**
 - Too much, too little, changing conditions
- Pollution
- Loss of ecosystem services
- Population growth and urban development
- Competing demands
- Water diversion threats
- Inadequate drinking water treatment

The Challenges

- An inclusive **watershed-based approach** to governance is needed
- A **widely shared knowledge base** fueled by appropriate, useful and timely data is needed. Common standards are required to ensure that databases are accessible and can be shared.
- Effective watershed management requires **coordinated monitoring and research agendas** that are responsive to the needs of communities.
- A **knowledge base** that informs effective decision making.

- The need exists for **new institutions** that manage both the human and ecological dimensions of the watershed.
- **The concept of Place**, the restructuring of decision making that offers more robust and distributed governance, and the development of a broadly shared stewardship ethic.
- A **stewardship ethic** that motivates Canadians in all walks of life to contribute to sustainable watershed management.
- Sound financial decisions will need to take a long-term, asset management approach that views **water resources as natural capital** that must be sustained for future generations.

Climate Change

Implications for Ontario

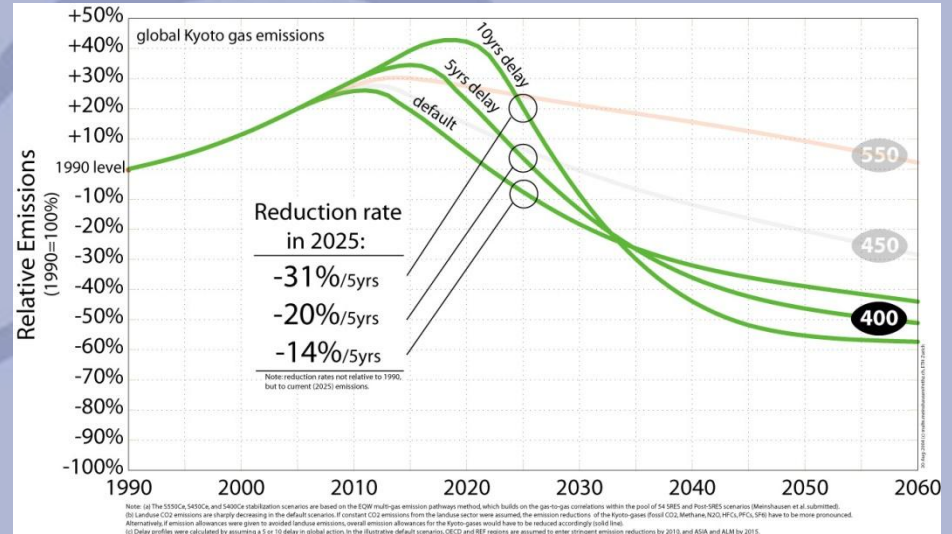
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The Inevitability of Climate Change

“The overwhelming majority of scientific experts, whilst recognizing that scientific uncertainties exist, nonetheless believe that human-induced climate change is inevitable. . The question is not whether climate will change... but rather how much... how fast, and where”

Robert Watson, Chair of IPCC to CoP6 Delegates, The Hague, November 2000

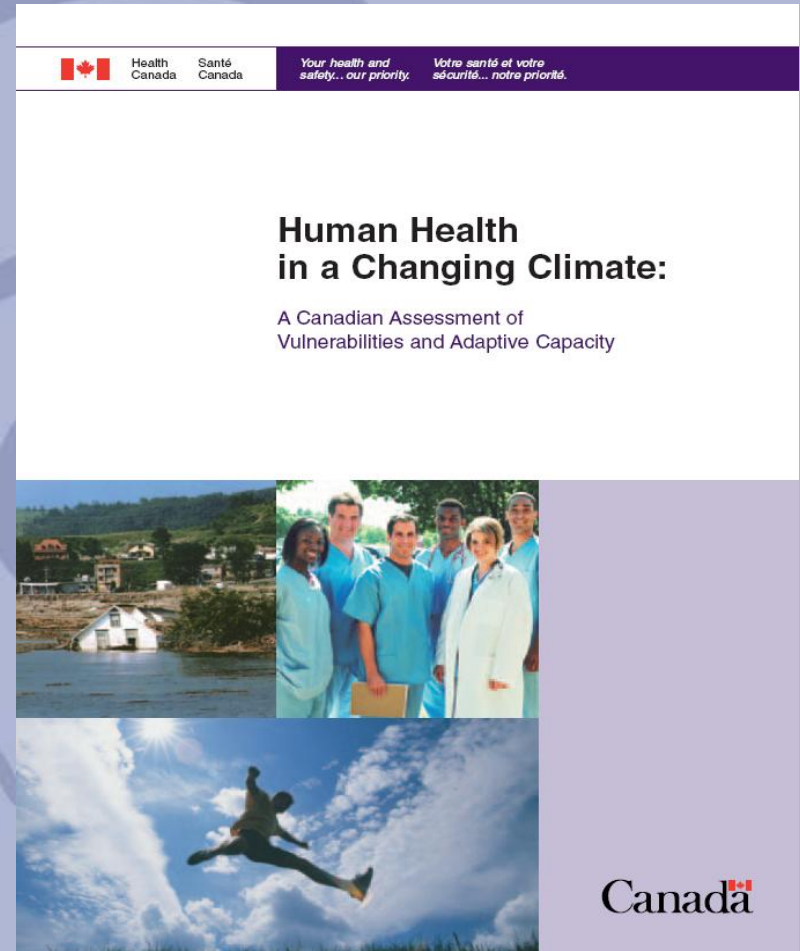
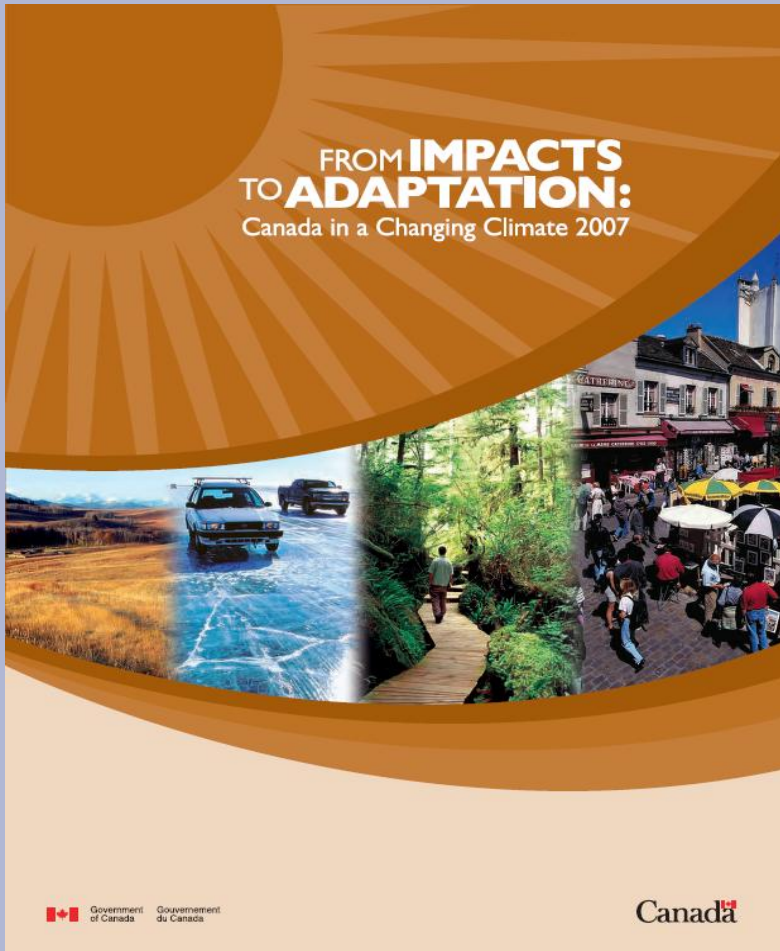


10-15 Years Window

More mitigation is needed

Adaptation is absolutely necessary

Impacts and Adaptation: Two National Assessment Reports

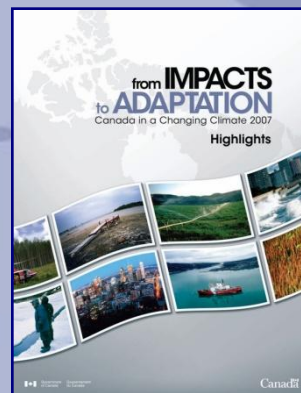
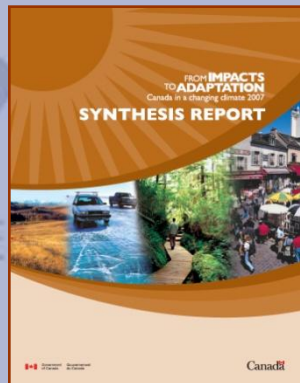


http://www.adaptation.nrcan.gc.ca/assess/2007/index_e.php

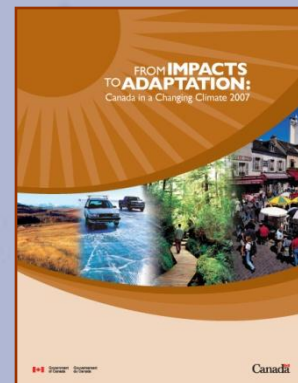
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- The report reflects the advances made in understanding climate change impacts and adaptation in Canada.
- It highlights key issues facing each region of the country (Northern Canada, Atlantic Canada, Quebec, Ontario, Prairies and BC) in a policy-relevant manner.
- It provides a concise, credible up-to-date source of information that will inform adaptation decision-making.
- There are three main products:

Synthesis



Highlights



Full Scientific Report

Key Findings

- The results from the assessment provide sound scientific evidence that Canada's climate is changing and that the impacts from of a changing climate are already evident in every region of the country.
- It is anticipated that climate change will exacerbate many current climate risks, while presenting new risks and opportunities, especially for communities, infrastructure and ecosystems.
 - **Reduced water quality & quantity**
 - **Increasing demand for water**
- While Canada has a relatively high capacity to adapt, this capacity is unevenly distributed between and within regions and populations.

CHAPTER 6
Ontario

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Chapter 6: Ontario
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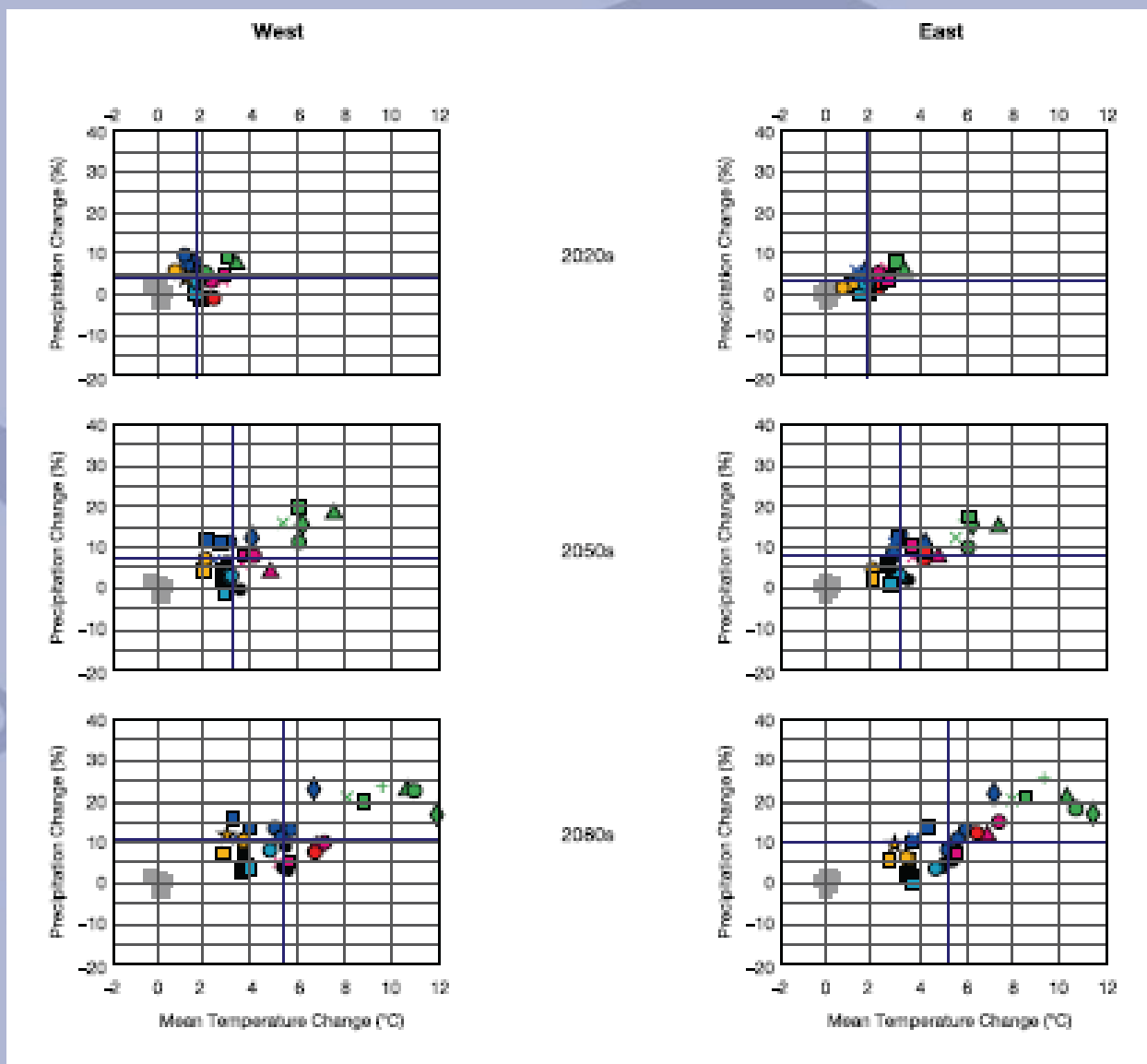
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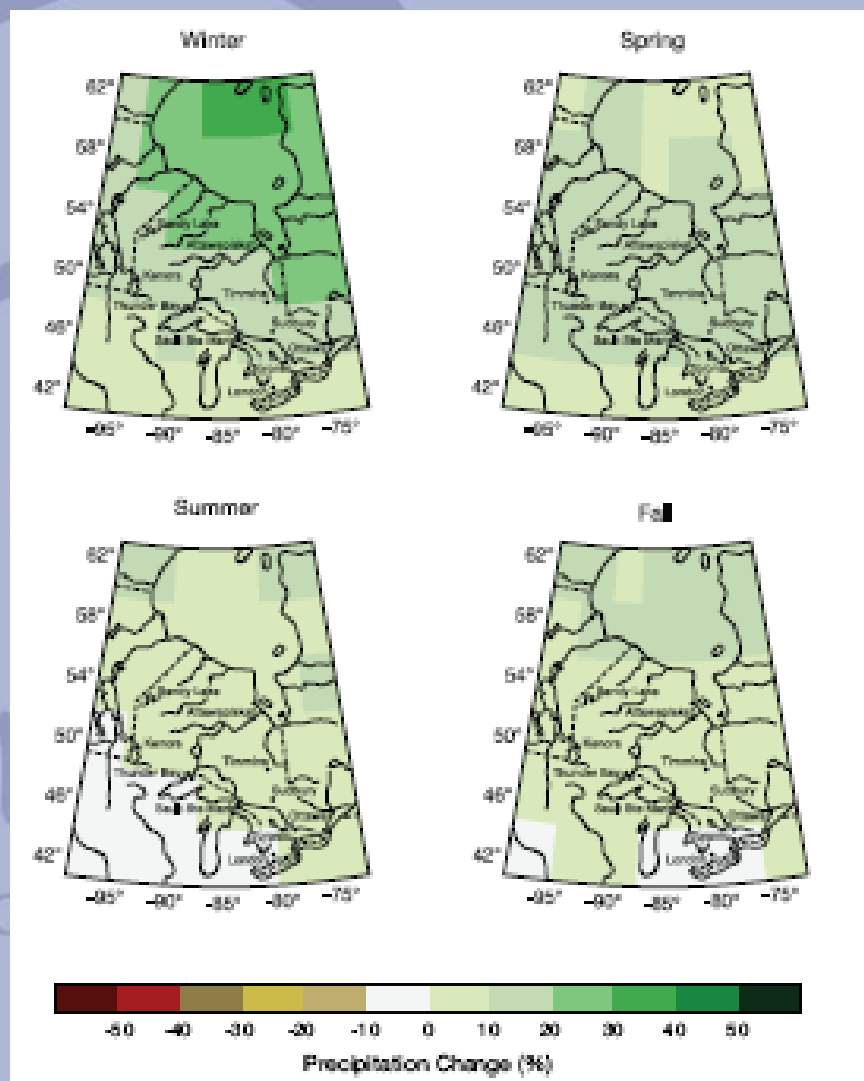
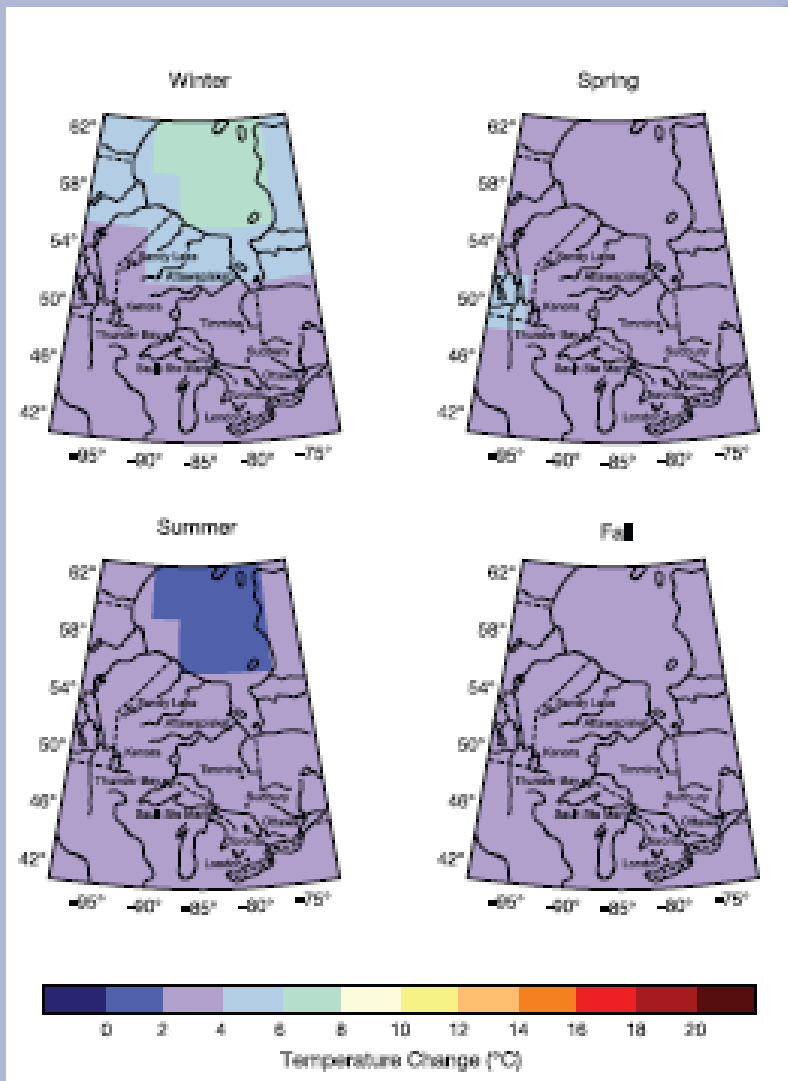


Annual Change: Mean Temperature and Precipitation



Projected seasonal change (median of models) in temperature by the 2050s

Projected seasonal change (median of models) in precipitation by the 2050s



Trends and Projections for Ontario

- Increase in annual temperature since 1948 – 1.4°C
 - Warmer nights; fewer cold days
 - More rain but more variable and higher intensity storms
-
- Warming larger than global average, more in winter than summer
 - Projections of 2°C increase by 2020, 3.5°C by 2050 and 5.5°C by 2080
 - Number of hot days doubling by 2050, tripling by 2080
 - Precipitation: slight decrease to moderate increase
 - More intense and frequent storms

A future very different than the past 100 years

- Substantial temperature increases in all seasons
- Changes in the seasonal distribution of precipitation
 - More in the winter and less in the summer, but less snow and more rain
 - Earlier spring freshet
 - Extremes, in the form of droughts and high-intensity rainfall events, also expected to become more common
- Evapotranspiration also expected to increase

North sub-region

Ecosystems

- Observed changes in fish species

Water

- Decreased flows documented for Severn, Winisk, Ekwan, Attawapiskat, Albany and Moose rivers
- Further reductions projected
- Spring and ice-jam flooding a problem – Attawapiskat evacuated 4 times between 1998 and 2004; Kashechewan evacuated in 2005, 2006 and 2008 (in addition to water quality evacuation)

C L E A N A I R . C L E A N W A T E R .

Central sub-region

Flooding

- Recent shift in timing, from spring run-off, to heavy rainfall, or rain on snow events
- 2002 flood: \$31M damage, lengthy road and rail disruption

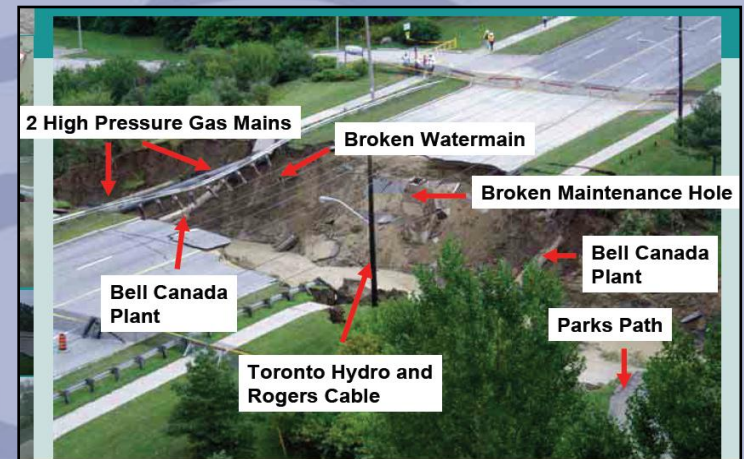


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South sub-region

Water

- Reduced summer flows, seasonal shortages
- Warmer temperatures reduce water quality
- Increases in frequency and intensity of heavy rainfalls



City of Toronto

Ecosystems

- Observed changes in fish species

South sub-region

Energy

- Reductions in hydro output
- Increasing water temperatures reduce efficiency of nuclear and coal-fired cooling systems

Tourism and Recreation

- Reduced ski season (able to compensate with snow-making)
- Ice fishing season 52% shorter in 1997/1998
- Winterlude season decrease to 20-49 days by 2050s (current average 50)

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Great Lakes

Transportation

- 2.5 cm decline = 100 to 270 tonnes of lost ship capacity

Energy generation

- Projections range from small increase to 50% decline in hydro output – 1,000 Mw

Tourism and recreation

- Lower levels have “major” or “devastating” impact on marinas

Water supply

- Water supply pipelines may require relocation

Gradual Change vs Severe Weather

Impacts from Gradual Change

- Ecosystem shifts
- Lyme disease
- Winter roads
- Increased demand for electricity in summer
- **Lower Great Lakes water levels**
- **Water shortages**
- Winter tourism/spring tourism
- Forest pest outbreaks
- **Degradation of wetlands**

Impacts from Severe Weather

- **Storm water flooding**
- Electricity transmission failure
- **Water-borne disease outbreaks**
- Heat stress
- Smog episodes
- **Water shortages**
- Loss in agricultural productivity
- Increase in forest fires

Potential Impacts on Ecosystems and Implications

- Changes in frequency of extreme rainfall events
- Changes to runoff
- Changes to groundwater recharge and discharge
- Changes in lake levels
- Changes to ice cover
- Changes to water temperature
- Changes to soil moisture

Impacts on Water Resources

- Hydrological cycle very sensitive to changes in temperature, precipitation and evaporation
- Future hydrological regimes may be statistically different than the past: changes in streamflows, lake levels, water quality, groundwater infiltration, and patterns of groundwater recharge and discharge

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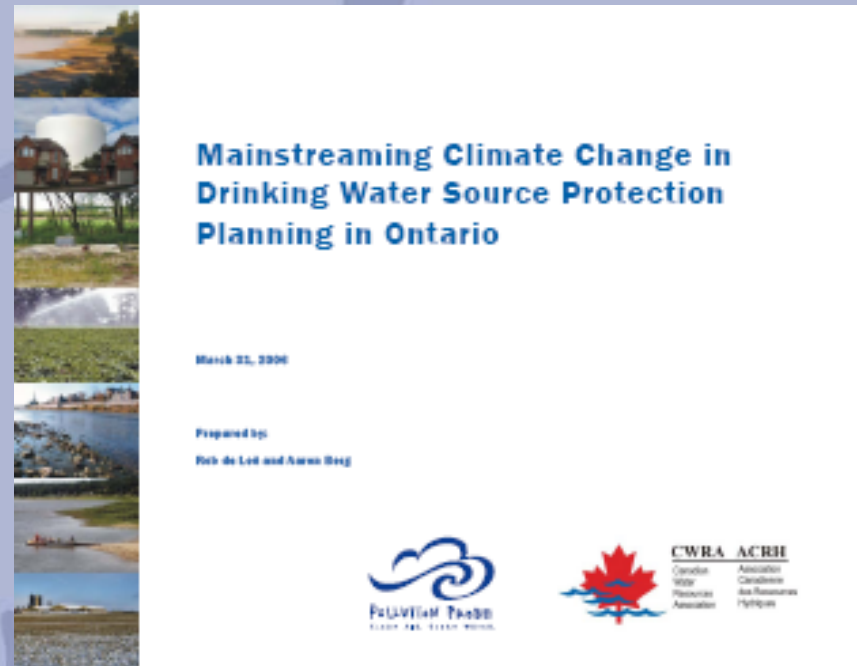
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Water Management

- High intensity rainfall events will become more frequent across the province. Financial impacts will increase in southern Ontario.
- Some communities in the Greater Golden Horseshoe region are “vulnerable” when projected water shortages are combined with projected growth.
- Surface water quality will decrease, with implications across the province and for First Nations communities.
- Factors contributing to compromised adaptive capacity include: recent institutional restructuring, overlapping responsibilities, conflicting management objectives and reliance on voluntary implementation.
- *Clean Water Act* offers an opportunity for communities to deal with changing climate conditions.

Opportunities for Mainstreaming

- Source Water Protection Planning
- Low water response programs
- Storm Water Management
- Lake Simcoe Protection Plan
- Great Lakes





Water Topics

- Water Basics
- Water Quality
- Water Flow
- Land Use
- Wildlife
- Climate Change
- Community Activities
- Policy and Regulations
- What Can We Do Locally?

My Watershed

- Gatineau
- Lièvre
- Mississippi
- Ottawa
- Rideau
- South Nation

Administration

► Create content

Ottawa Gatineau Watershed Atlas

<http://www.ogwa-hydrog.ca/en/home>



What is the OGWA Project?

- Free, bi-lingual, interactive watershed information tool
- Designed by watershed community and stakeholder representatives
- Built using free open source software
- Uses standardized geospatial data and metadata
- Where possible linking to data through distributed networks i.e. data that is “closest to source”
- Uses free web 2.0 technology to improve communication and engage local communities



Water Topics

Water Basics

Water Quality

Water Flow

Land Use

Wildlife

Climate Change

Community Activities

Policy and Regulations

What Can We Do
Locally?

My Watershed

Gatineau

Lièvre

Mississippi

Ottawa

Rideau

Water Quality

Water Flow

Land Use

Wildlife

Climate Change

Community Activities

South Nation

Upcoming Events

"The Watershed Where
We Live" Lecture

(2 days)

The Rideau River Watershed Profile

The Rideau River flows through Eastern Ontario, Canada. From its beginning at Upper Rideau Lake the River flows north until the Ottawa River at Ottawa, Canada's capital. It passes through varied landscapes, which are at first forested and agricultural but become increasingly developed.

- **Drainage Area:** over 4,000 square kilometres of Eastern Ontario
- **General Direction of Flow:** Northerly
- **Headwaters:** Upper Rideau Lake near Newboro
- **Confluence:** At Rideau Falls it flows into the Ottawa River.
- **Towns and Cities:** 18 Municipalities including; Ottawa, Portland, Perth, Smiths Falls, Merrickville, Kemptville, and Manotick.
- **Approximate Population:** 620,000 people including a large part of the City of Ottawa.
- **Total Length:** The longest part of the watershed is about 180 km.
- **Elevation:** 204 m.
- **Predominant Land Cover:** Forestry (an estimated 40% of the watershed)
- **Predominant Land Use:** Agricultural, include dairy, beef and cash crop farming.
- **Rivers and Tributaries:** Rideau River, Kemptville Creek, Jock River, Tay River, Rideau Lakes.
- **Original Settlement:** Around 1790
- **Other:** At Newboro, an artificial canal was constructed by Colonel By in 1832 to connect the north flowing Rideau with the south flowing Cataraqui system to create the Rideau Canal. Its original purpose was defence against American attack but now serves as a major navigational and recreational boating waterway.



The Rideau Canal

With a length of 202 km, the Rideau Canal connects Lake Ontario at Kingston to the Ottawa River at Ottawa. It comprises a chain of lakes, rivers and artificial channels. Upper Rideau Lake, near Smiths Falls, is the highest point along the Canal. From there, the water flows both northeast toward Ottawa in the Rideau River and southwest toward Kingston in the Cataraqui River.

The Rideau River is one and the same as the Canal for most of the River's length. The River diverges from the Canal in Ottawa. Only the Canal provides access for boats to the Ottawa River. A system of 47 locks overcomes the 83-m decrease in elevation between the Upper Rideau Lake and the Ottawa River, and the 50-m decrease between this lake and Lake Ontario. The locks also allow the water level to be maintained at not less than 1.5 m deep for the passage of boats.

The historical value of the Rideau Canal, as well as the ecological value of the lakes and rivers that comprise it, were recognized in 2000 with the designation of the Rideau Canal Waterway as a Canadian Heritage River.



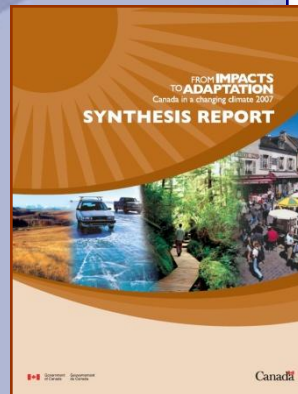
Improving Decision-making

- **For the public**
 - Increase local community watershed awareness and engagement in decision-making
- **For all watershed stakeholders**
 - **Encourage the use of ‘Distributed Networks’ for more transparent, efficient data sharing**
 - **Increase the value of data being collected in the region**
- **For watershed managers**
 - Improve inter-watershed communication, and data awareness and sharing

MORE INFORMATION

- Synthesis and Highlights available on-line:
<http://adaptation2007.nrcan.gc.ca>

- Download pdfs
- Read author bios
- Order copies of the report



- Full report released on March 7th 2008
- Questions? Contact NRCan at: adaptation@nrcan.gc.ca