

# Adaptation Through Legislation

## A Process to Inform the Development of a Watershed Climate Change Adaptation Strategy

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NRCan, 2000

# Lake Simcoe Watershed



- 3,300 sq. km
- lake = 722 sq. km.
- 350,000 people + 50,000
- tourism and recreation = \$200M
- 32 species at risk
- drinking water for 8 communities
- ecosystem goods and services at \$975M/year (Wilson, 2008)

LSRCA, 2010

# Background – Lake Simcoe

- **Policy 7.11** of the Lake Simcoe Protection Plan **commits** the Ministry of the Environment (MOE) to develop a **climate change adaptation strategy** for the Lake Simcoe watershed by June 2011, in collaboration with other ministries and partners
- The Plan states that in order to support the development and implementation of the climate change strategy, MOE in collaboration with other ministries and partners will:
  1. *Assess and **evaluate the risk** of climate change impacts on the watershed*
  2. *Conduct and **support additional research** to study the impacts of climate change in the watershed*
  3. *Develop an **integrated climate change monitoring program** to model the impacts of climate change on the watershed*
  4. *Develop **climate change adaptation plans** and promote the establishment of a Lake Simcoe adaptation planning Community of Practice (CoP)*
- The purpose of the strategy is to increase the resiliency of the Lake Simcoe watershed to the impacts of climate change

# Climate Change is a Reality in the Lake Simcoe

- ◆ Average global temperature has warmed by 0.76°C over the last century
- ◆ During the same period, Ontario temperature changes range from 0.2 to 1.4°C
- ◆ Modelled projections indicate further air temperature increases of 1.1 to 6.4°C depending largely upon how humans respond to GHG emissions issues
- ◆ Enhancing the adaptive capacity of natural and built systems to respond to changes will be important to the health and well being of people living and working in the Lake Simcoe Watershed in the next century and beyond

# Climate Change Adaptation Planning Components

1. Assessment of organizational readiness and where necessary improvement to the capacity of an organization's ability to respond.
2. Establishment or reconfiguration of a baseline upon which to measure change and adaptation success.
3. Development and use of climate scenarios and socio-economic scenarios to help envision future conditions.
4. Ongoing completion of vulnerability analyses using the future scenarios to assess strengths and weaknesses.
5. Identification and development of adaptation strategies.
6. Implementation of the adaptation strategies.
7. Monitoring of the strategies to evaluate success and the need for adjustment.
8. Adjustment of the management strategies decisions where needed.



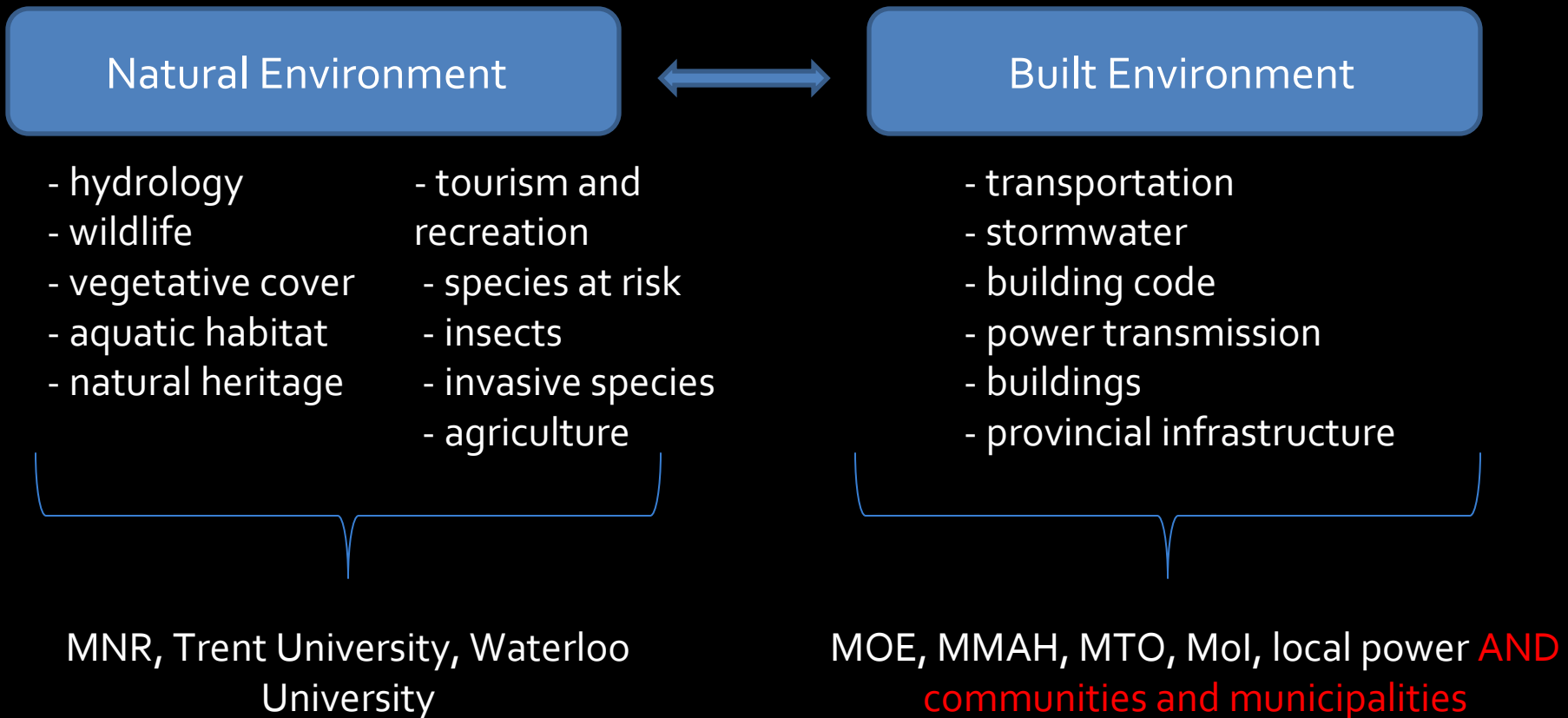
Figure 2. A climate change adaptation framework for ecosystems

# Step 1. Engage Experts and Identify Indicators

- ◆ 11 themes requiring adaptation measures selected
- ◆ The availability of expertise had a significant bearing on the selection of areas of inquiry for this pilot project
- ◆ Experts in the natural sciences sector were contracted to carry out detailed vulnerability analysis based on peer reviewed research and literature reviews
- ◆ Many groups polled for vulnerability of infrastructure - asked for responses based on their personal experience, knowledge and science

# Step 2. Vulnerability Assessments

Using a guiding framework, experts assessed the vulnerability of system components (both natural and built) to the impacts of climate variability and climate change in the context of current system stresses.



# Step 2. Vulnerability Assessments (cont'd)

## Lake Simcoe Climate Change Vulnerability Assessment Authors

Area of Study	Author	Affiliation
Hydrology	MacRitchie and Stainsby	MOE
Aquatic Habitat	Chu	Trent U
Wildlife	Walpole and Bowman	MNR/Trent U
Species at Risk	Brinker and Jones	MNR
Invasive Species	Sager and Hicks	Trent U
Vegetative Cover	Puric-Mladenovic et. Al.	MNR
Natural Heritage Areas	Lemieux et. al.	U Waterloo
Tourism and Recreation	Lemieux et. al.	U Waterloo
Insects	Beresford	Trent U
Agriculture	Jamieson	OMAFRA
Infrastructure	Communities, Prov Depts	Many + <b>LSRCA</b>

# Step 2. Vulnerability Assessments (cont'd)

## Infrastructure Questions for **Provincial Departments**

- How has the **infrastructure been challenged by historic weather and climate?** Include long term changes to means, variability and extreme events.
- List **non-climate stressors** and state how they may have contributed to current vulnerability. Consider land use changes, demographic/population changes, economic changes, etc and place these in the context of the point in life cycle, age, maintenance records, etc
- Based on responses above, how has the infrastructure/system responded to climate change? Discuss the **coping or carrying capacity of the infrastructure.**
- Given current vulnerabilities and assuming that climate will continue to change what vulnerabilities will be enhanced and **what new vulnerabilities will appear?** Consider 2 climate scenarios – low and high (defined).

# Step 2. Vulnerability Assessments (cont'd)

## Infrastructure Questionnaire for **Municipalities**

- Has your community experienced any of the weather-related events listed below within the last five years (with examples)? Yes-No-Not Sure
- To what extent has any of the above weather-related events impacted your infrastructure? Scale of 1-5
- Indicate the extent to which the weather-related events will impact the various classes of infrastructure. Scale of 1 to 5
- Which of the weather-related events from Question 1, pose the greatest threats to your infrastructure? List the top 3.
- And more

# Step 2. Vulnerability Assessments (cont'd)

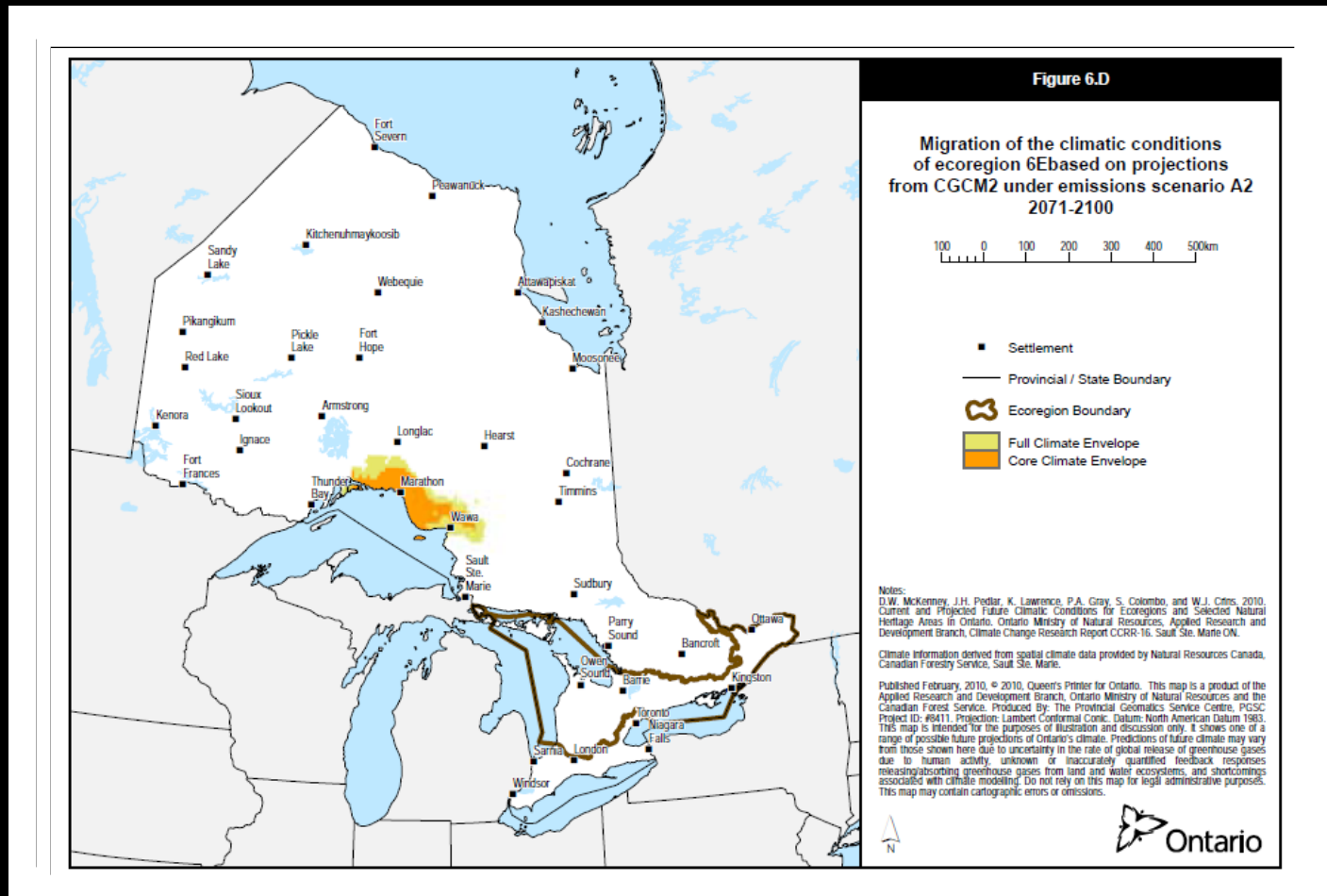
## Communities Information Meeting

- A brief overview of climate change, sample historic climate trends and projections of climate (temp and precipitation);
- (Vulnerability) questions similar to those in the survey were presented;
- Sought specific community vulnerabilities;
- Received some comments on adaptive measures and comments about process impediments.

# Step 3. Project Future Scenarios

Changes in climate will have major implications for composition, structure and function of ecosystems for the Lake Simcoe Watershed

Built infrastructure will be similarly challenged



# Step 4. Project Future Vulnerability

- All vulnerability information is posted on [www.climateOntario.ca/LakeSimcoeDelphi.php](http://www.climateOntario.ca/LakeSimcoeDelphi.php)
- Develop reports and present results at a forum – include 3 main consequences



# Step 5. Develop a Method to Generate Adaptation Ideas

– Policy Delphi selected for Lake Simcoe

## Overview of Policy Delphi Process

- Iterative, group-oriented, Idea Generating Strategy (IGS) that seeks to generate the strongest possible opposing views on the potential resolutions of a major policy issue
- Participants are afforded the freedom to present and challenge alternative viewpoints, and to think reflectively and independently between iterations

# Lake Simcoe Policy Delphi Process

- Electronic survey was used for the two rounds of questions
- First round provided survey participants with the climate change vulnerability reports prepared by the scientists, including the list of three primary consequences of climate change
- Survey contained 11 questions organized according to seven general categories: *legislation and policy, strategic planning, land use and/or resource management planning, management and operations, monitoring, research, and knowledge dissemination (communication)*
- Recommendations generated by the November 2010 workshop breakout groups and the first-round Delphi survey were used to develop a synthesized suite of adaptation options for each of the 11 themes.
- These recommendations were then evaluated in the second-round survey for their perceived priority and feasibility (affordability and ease of implementation)

# Policy Delphi Phase II Evaluation Criteria

Evaluation Criteria	Rating			
	1	2	3	4
<b>Priority</b>	<b>First-order priority;</b> a most relevant point; has direct bearing on major issues; must be resolved, dealt with, or treated	<b>Second-order priority;</b> is relevant to the issue; significant impact but not until other items are treated; does not have to be fully resolved	<b>Third-order priority;</b> insignificantly relevant; has little importance; not a determining factor to major issue	<b>No priority; no relevance;</b> no measurable effect; should be dropped as an item to consider
<b>Feasibility 1: Affordability</b>	<p><b>Definitely affordable,</b> can be implemented within current fiscal realities</p> <p><i>AND/OR</i></p> <p>High cost-sharing possibilities</p>	<p><b>Some indication adaptation is affordable;</b> possibility that adaptation can be implemented within current fiscal realities</p> <p><i>AND/OR</i></p> <p>Some cost-sharing opportunities</p>	<p><b>Some indication adaptation is unaffordable;</b> additional monetary resources, or re-allocation required to implement</p> <p><i>AND/OR</i></p> <p>Low cost-sharing opportunities</p>	<p><b>Definitely unaffordable;</b> adaptation cannot be implemented within current fiscal realities</p> <p><i>AND/OR</i></p> <p>No cost-sharing opportunities</p>
<b>Feasibility 2: Ease of Implementation</b>	<p><b>No identifiable internal or external barriers</b> (e.g., legal, political, institutional, social, etc.); <i>definitely can be implemented</i></p>	<p><b>Some identifiable internal or external barriers</b> (e.g., legal, political, institutional, social, etc.); <i>barriers most likely can be overcome</i></p>	<p><b>Some identifiable internal or external barriers</b> (e.g., legal, political, institutional, social, etc.); <i>barriers may be too significant to overcome</i></p>	<p><b>Obvious and significant internal and external barriers</b> (e.g., legal, political, institutional, social, etc.); <i>definitely cannot be implemented</i></p>

# Participant Response Rate

- 74 individuals were invited to participate in the first round of the policy Delphi survey
- 20 did not feel qualified to answer the questions.
- of the 54 participants, 43 (84%) responded
- of the 43 respondents to the first-round survey, 39 (88%) completed the second round survey
- 8 agricultural experts and practitioners provided advice to the agricultural representative who completed the first-round survey
- 16 municipal representatives completed the infrastructure survey
- 16 municipal representatives from 8 communities attended the February face-to-face meeting to further discuss community vulnerabilities.

# Recommendations

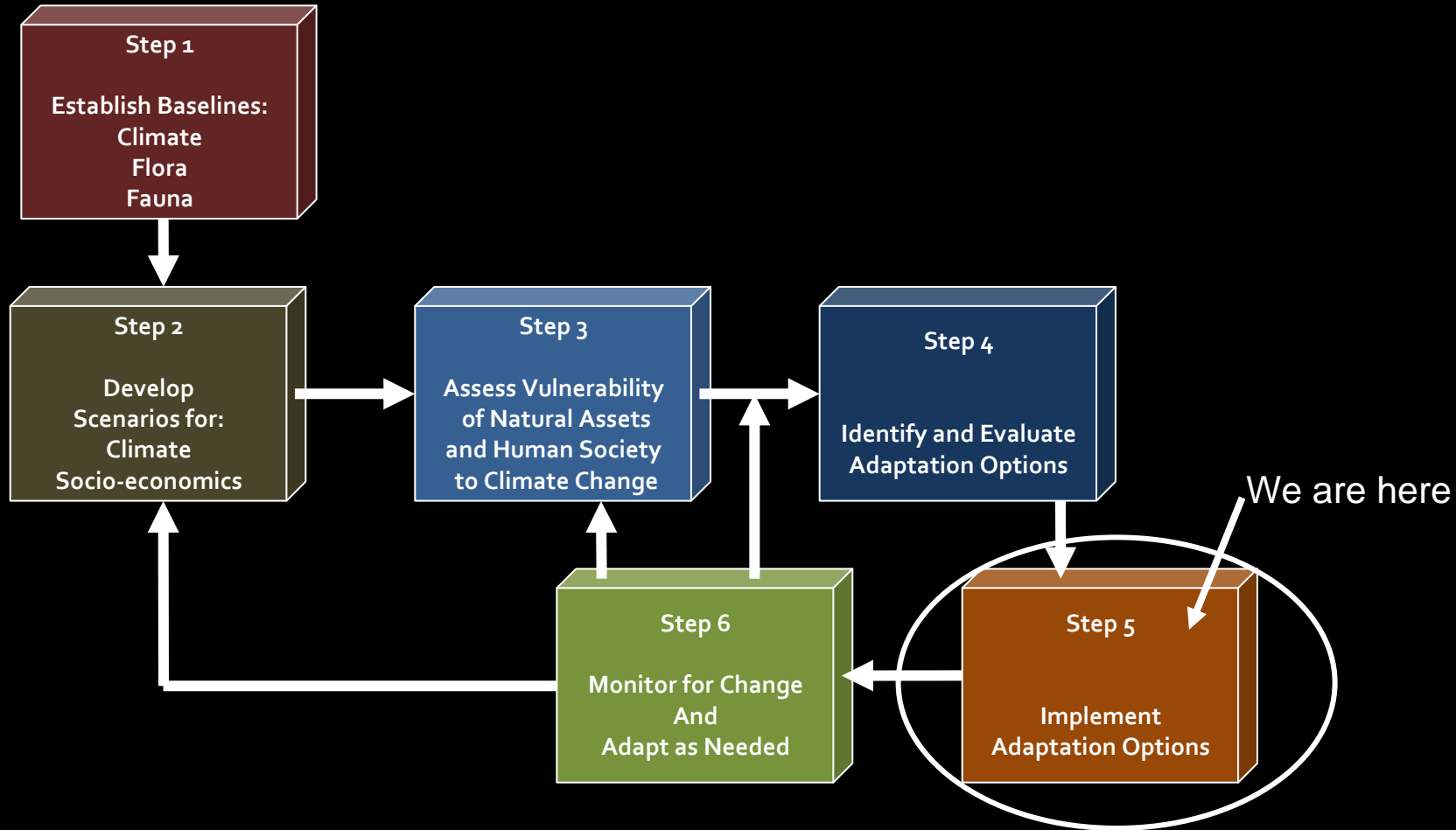
All themes except infrastructure

- more than **900 recommendations** were submitted by the 43 respondents to the first-round survey
- planning team reviewed the 900 recommendations, eliminated redundancies, and redrafted 695 recommendations in a consistent format for use in the second-round survey
- with the ranking system developed for the round-two survey, first-order or high priority adaptation options were identified
- in total, 92 recommendations were identified as first-order priority and an additional 48 recommendations were identified as first- or second-order priorities

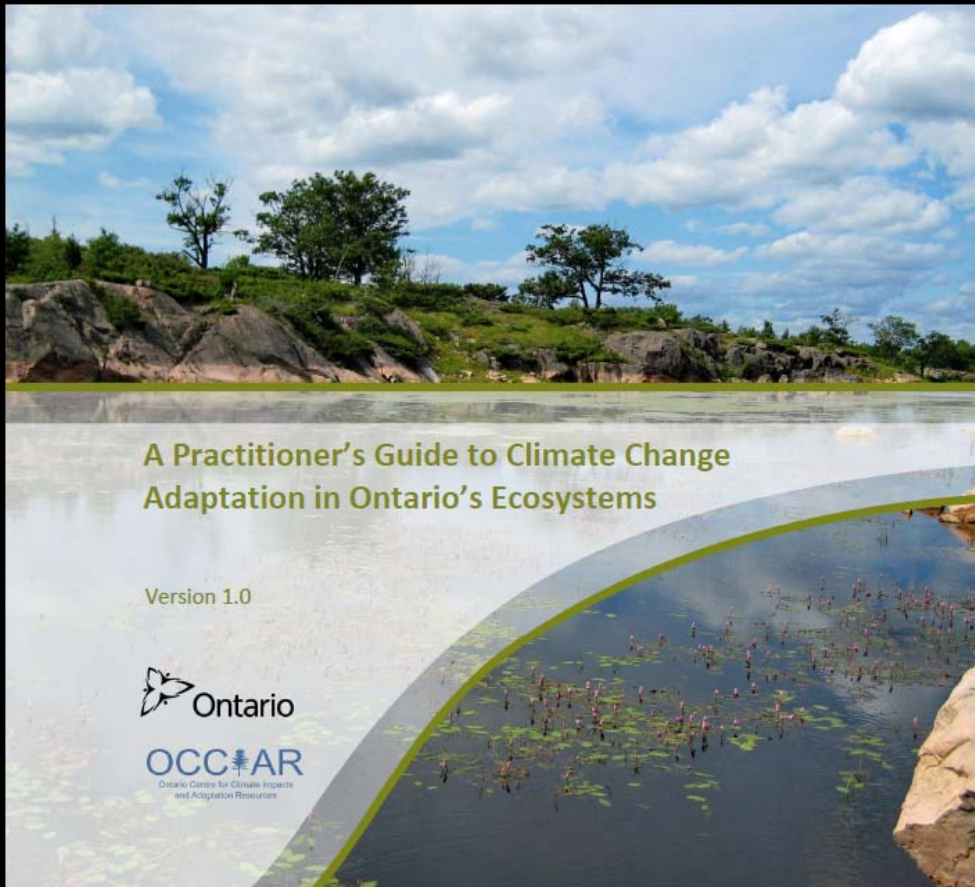
# Recommendations for Future Strategic Assessment (Hindsight)

- Use ensemble of climate models and scenarios when possible
- Engage stakeholders and experts early and substantively
- Scope needs to be comprehensive and include regional, national and international influences
- Ensure the appropriate expertise (capacity) is in place
- Allow adequate time to participate in climate change adaptation planning
- Provide incentives to participants
- Improve the capacity of the online-survey engine
- Engage communities
- Assessments of risks

# An Adaptive Management Framework



# Climate Change Adaptation Planning for Environmental Values



Practitioner's

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# Northeast Clay Belt Climate Change Vulnerability Assessment

Ministry of Natural Resources



*Natural. Valued. Protected.*

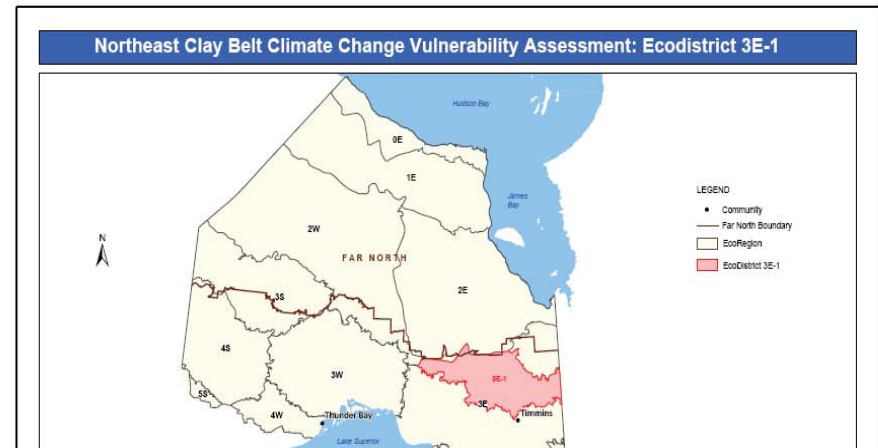
Science and Information Resources Division

## Northeast Clay Belt Climate Change Vulnerability Assessment

Ontario's climate is warming and becoming increasingly variable. Over the next century temperature, precipitation and wind patterns will continue to change, posing a number of challenges to ecosystems, biodiversity conservation, and natural resource management. Ministry of Environment's Climate Ready: Ontario's Adaptation Strategy and Action Plan as well as the Ministry of Natural Resources' (MNR) Sustainability in a Changing Climate strategy commit to completing vulnerability analyses to help develop and employ adaptive solutions to face these challenges.

### Assessing potential climate change impacts in the Clay Belt

The vulnerability assessment is one component of this pilot project that will identify where and how ecosystems within the Clay Belt are vulnerable to climate change by examining multiple environmental themes. Themes will include several forest-related issues such as forest composition, forest growth and productivity, fire, and forest health. Other themes such as wildlife, hydrology, substrates, species-at-risk, aquatic habitat,



# Northeast Clay Belt Climate Change Vulnerability Assessment

## Environmental Themes

- Forest composition, regeneration and growth
- Forest Fire
- Forest Health
- Wildlife
- Hydrology
- Substrate
- Socio-economics
- Aquatic Habitat

Thank you

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

