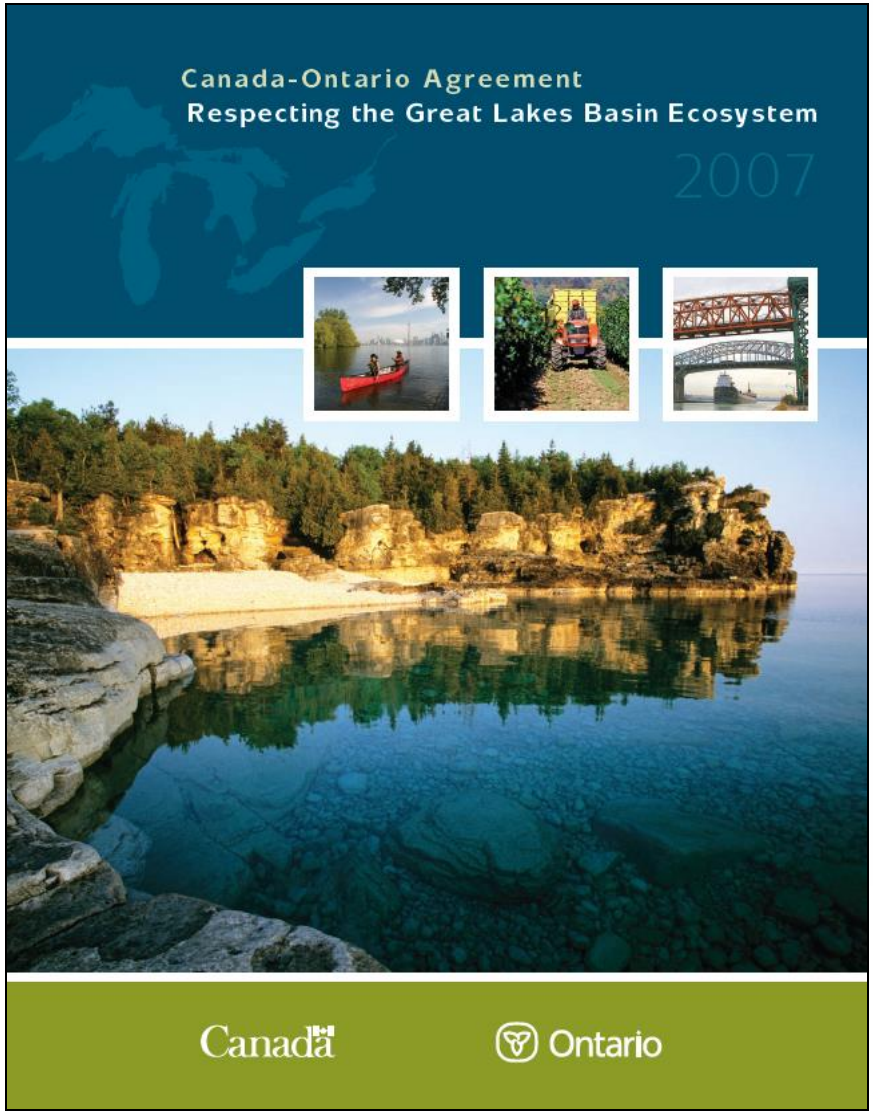
Canada-Ontario Agreement

Respecting the Great Lakes Basin Ecosystem



Agreement between Government of Canada and Ontario

- Six Federal Department Signatories

  8 Federal Agencies/Departments: Agriculture and Agri-Food; Environment; Fisheries and Oceans; Health; Parks Canada Agency; Natural Resources; Public Works and Government Services; and Transport

- Three Provincial Signatories

  3 Provincial ministries: Environment; Natural Resources and Agriculture, Food and Rural Affairs

- There have been seven COA's since 1971.

Canada-Ontario Agreement (COA)

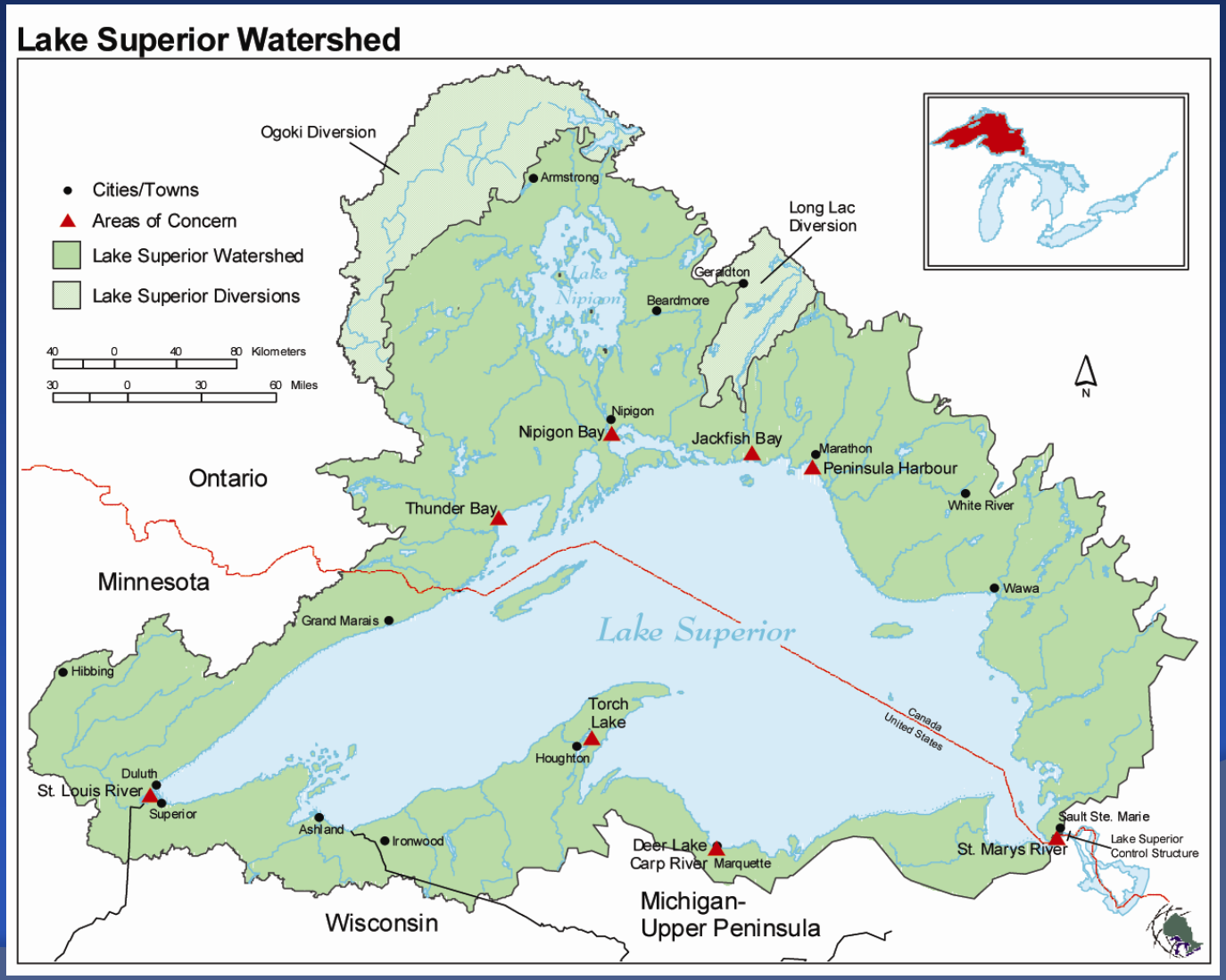
- Coordinates the governments of Canada and Ontario's efforts to achieve the vision of a healthy, prosperous and sustainable Basin Ecosystem for present and future generations.
- Key mechanism to engage the broader Great Lakes community and collaborate with other implementers to protect the Great Lakes
- Contributes to meeting Canada's commitments under the Canada-U.S. Great Lakes Water Quality Agreement
- Present – 2014 agreement http://www.ec.gc.ca/lcpe-cepa/default.asp?lang=En&n=46027E23-1
  - GLWQA revisions
  - Align Federal/Provincial Great Lakes funding

COA FRAMEWORK

AREAS OF CONCERN (Annex 1)	HARMFUL POLLUTANTS (Annex 2)	LAKE AND BASIN SUSTAINABILITY (Annex 3)	COORDINATION OF MONITORING, RESEARCH AND INFORMATION (Annex 4)
Complete priority actions for delisting in 4 AOCs, and make significant progress in others	Toward virtually eliminating persistent toxics and reducing other harmful pollutants, with an enhanced focus on human health	Responding to significant challenges such as harmful pollutants, invasive species and biodiversity conservation and new priorities climate change and source water protection	Coordinated scientific monitoring and research, and information management for tracking and reporting on environmental change

Canadian Areas of Concern

Lake Superior Areas of Concern



Overview COA Annex 1

Goals

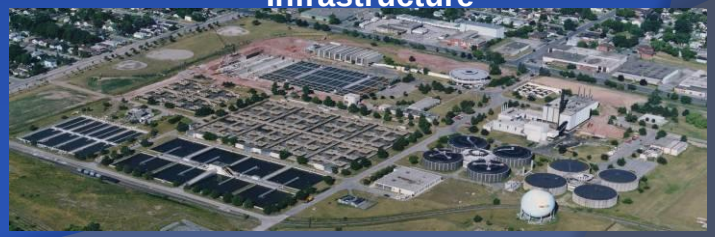
1. Complete priority actions for delisting in 4 AOCs: Nipigon Bay, Jackfish Bay, St. Lawrence River (Cornwall)

2. Make significant progress towards Remedial Action Plan (RAP) implementation, environmental recovery and restoration of beneficial uses in the remaining 11 AOCs.

Stormwater Control

Rural Non-point Pollution

Upgrading of Wastewater Infrastructure



Peninsula Harbour

Issues:

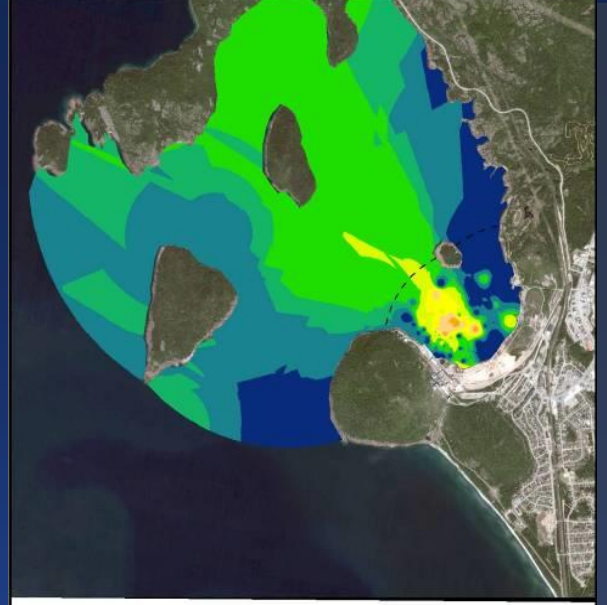
- Pulp mill and water pollution control plant
- Contaminated sediment

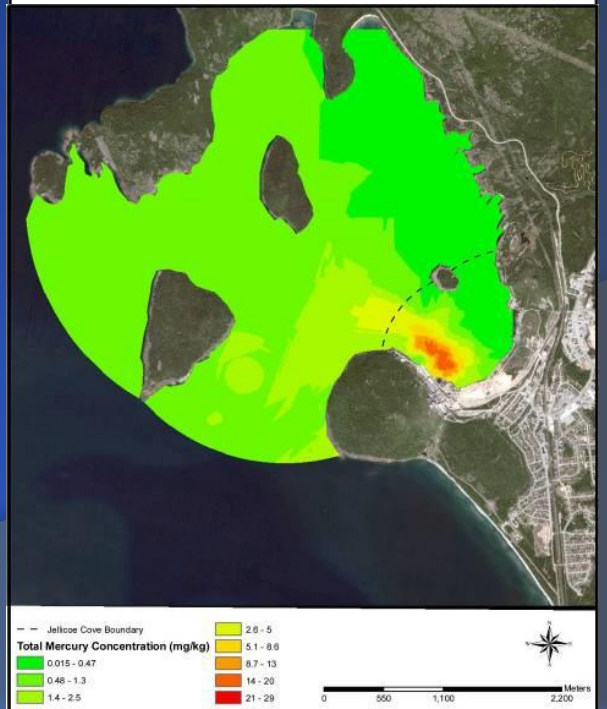
Accomplishments:

- Upgrades to water pollution control plant improved water quality(Mill closed in March 2009)
- Identified preferred sediment management option – thin layer capping

Outlook:

- Assess benthic community and fish habitat conditions outside sediment remediation area





Nipigon Bay

<u>Status</u>: Area of Concern

Reasons for AOC Designations

- Degradation of benthos
- Degradation of aesthetics
- Loss of fish habitat

- Success of fish habitat initiatives are being assessed
- Water management plan has been completed , implemented
- Degradation of benthos is related to municipal and industrial discharges (Domtar Red Rock Mill closed in 2006) assessment is ongoing

The following discussion is from the “inside” of Environment Canada. It presents a bleak picture.

About the author

“All this is of course in confidence since two and two could be put together and some of my hosts for my visit could end up in trouble.”

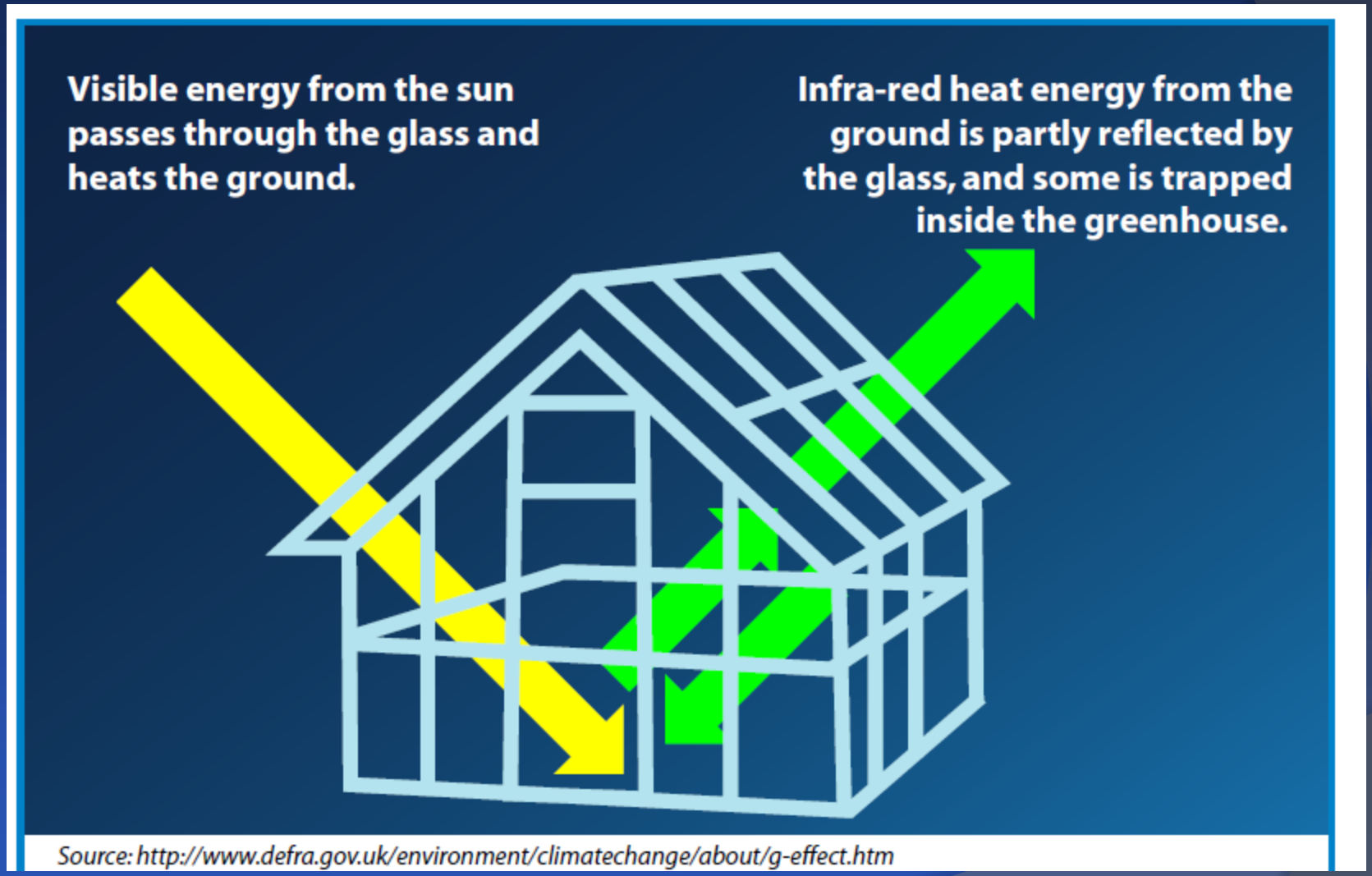
Most names and information that could identify people has been removed.

Assessing Climate Change Impacts in Ontario: Lake Superior and other Great Lakes

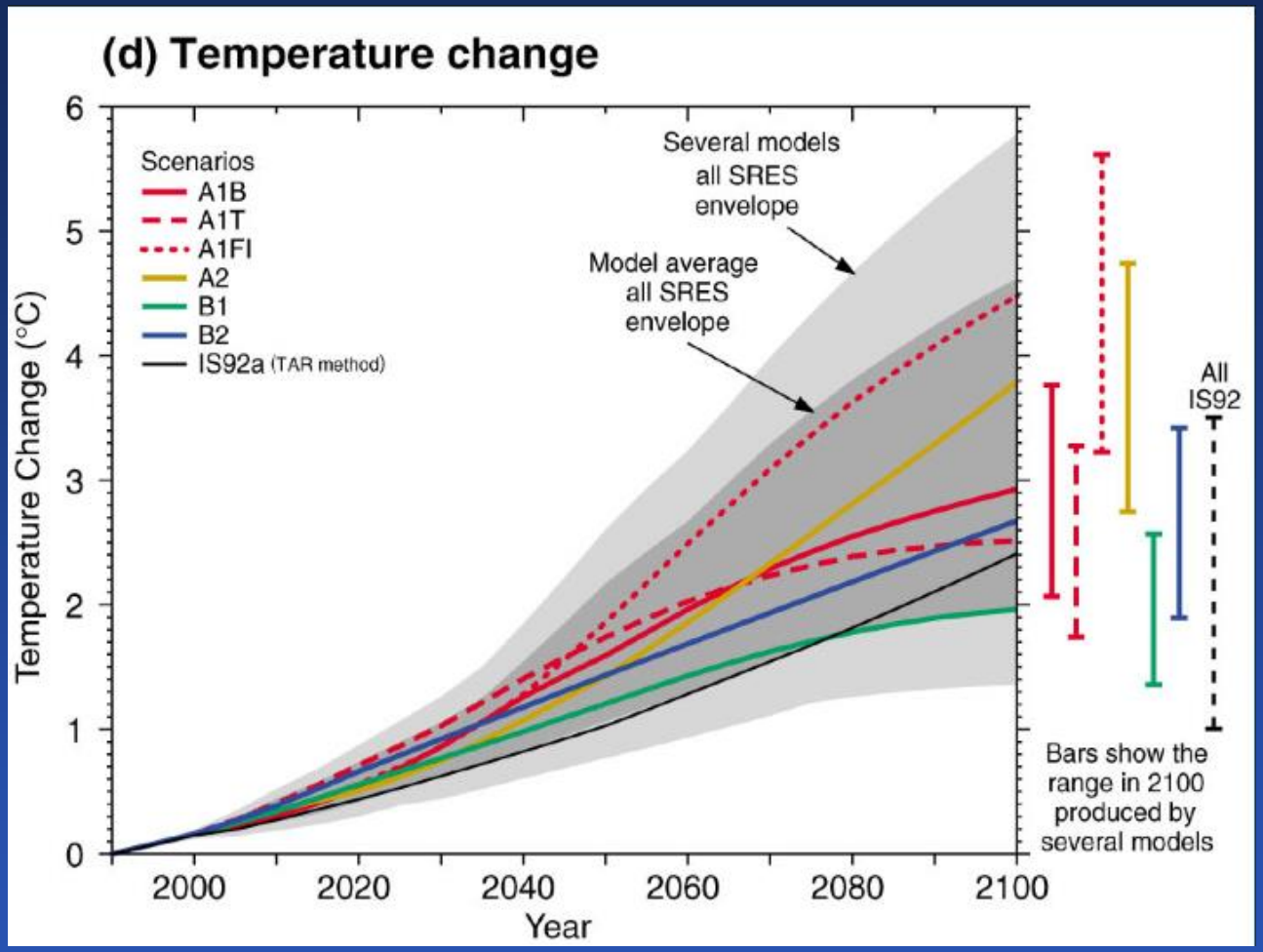
Navigating an Uncertain Future

Outline

- A Review of Climate Change
- Ontario
- Impacts of Climate Change on Lake Superior
  - Temperature and Precipitation
  - Ice Cover
  - Water Levels
  - Degradation of shoreline: Wetlands


Visible energy from the sun passes through the glass and heats the ground.
Infra-red heat energy from the ground is partly reflected by the glass, and some is trapped inside the greenhouse.
Source: http://www.defra.gov.uk/environment/climatechange/about/g-effect.htm

Climate Change Already Underway



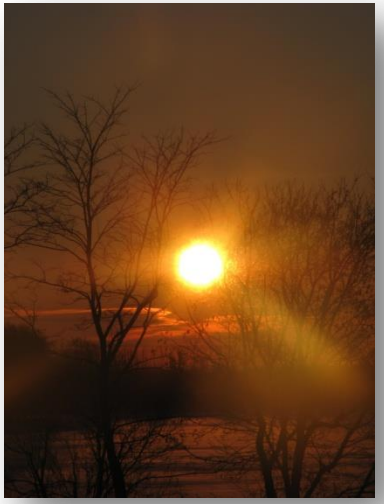
- 1000 to 1861 N. Hemisphere, proxy data
- 1861 to 2010, Global Instrumental
- 2010 to 2100, SRES projections

The Climate is Warming…

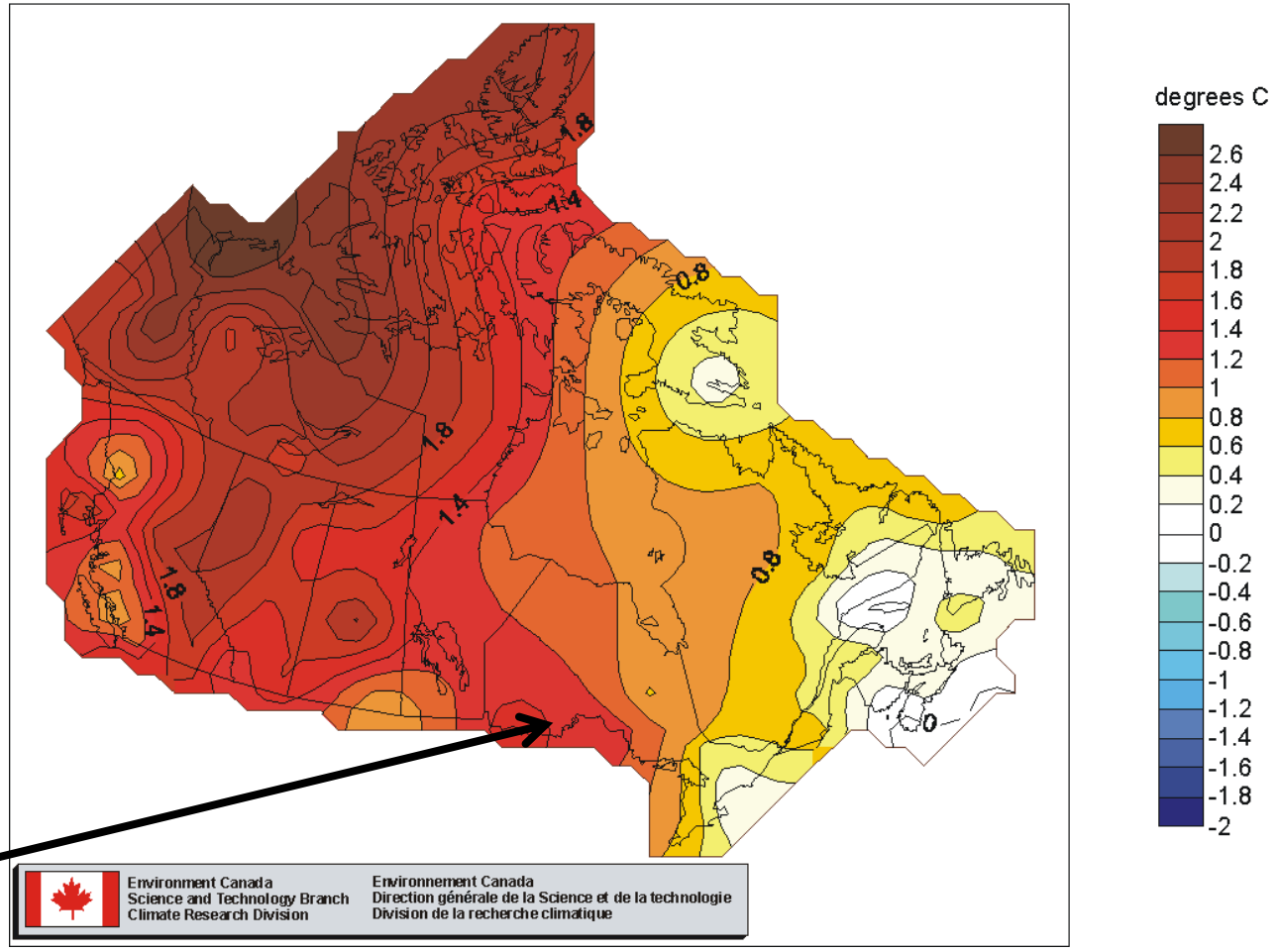
- Global surface temperatures have **increased about 1°C** over the period 1880 to 2014.

- Between 1948 and 2012, the largest average annual temperature increases in Ontario are about **1.8°C**. The greatest warming has been in the northwestern part of the province

- By 2050, the average annual temperature in Ontario could **increase by an additional 2.5°C**

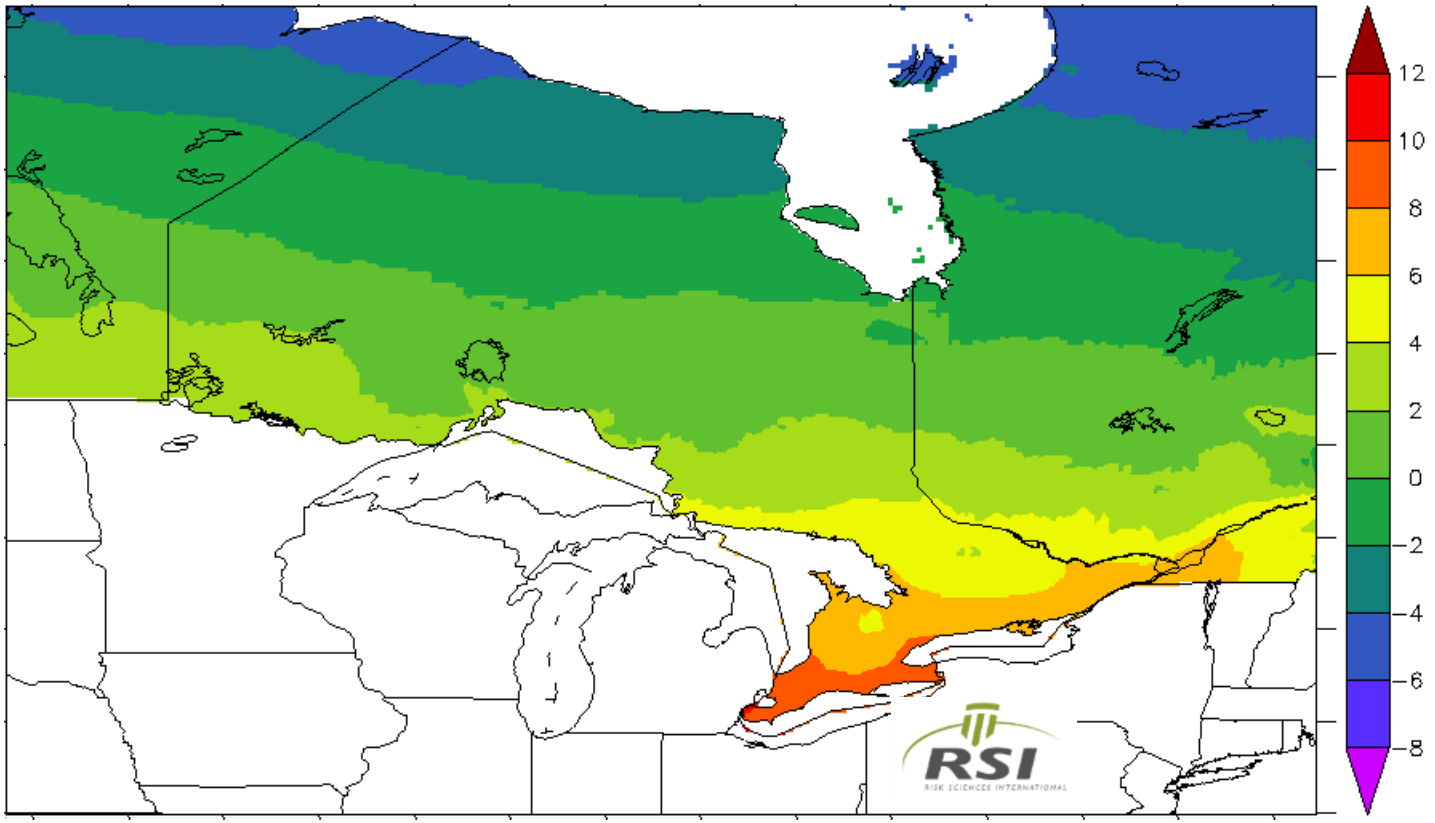


Annual Temperature Trend – 1948 to 2008



Thunder Bay

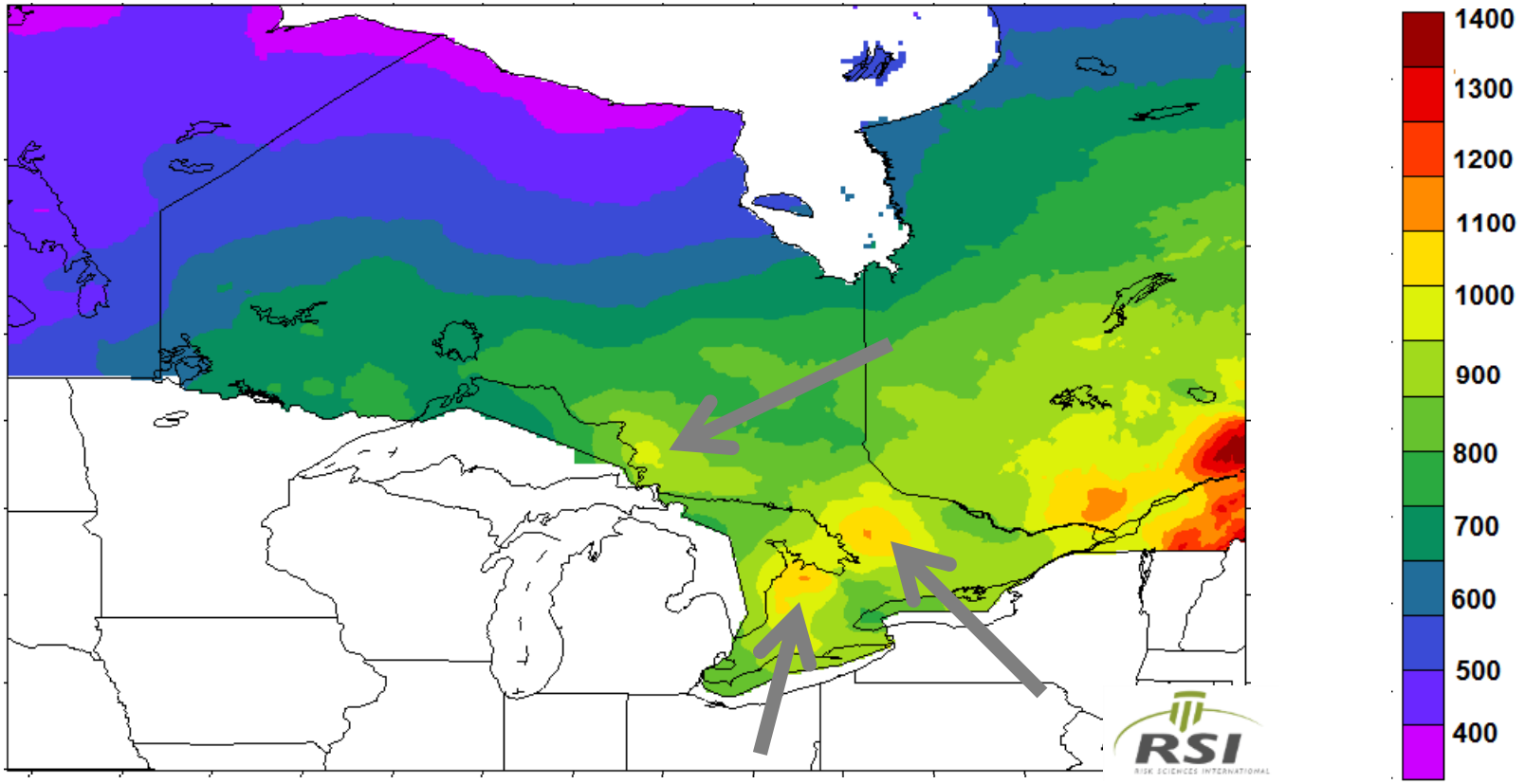
ONTARIO MEAN TEMPERATURE



Notice northward progression of warmer contours e.g. orange

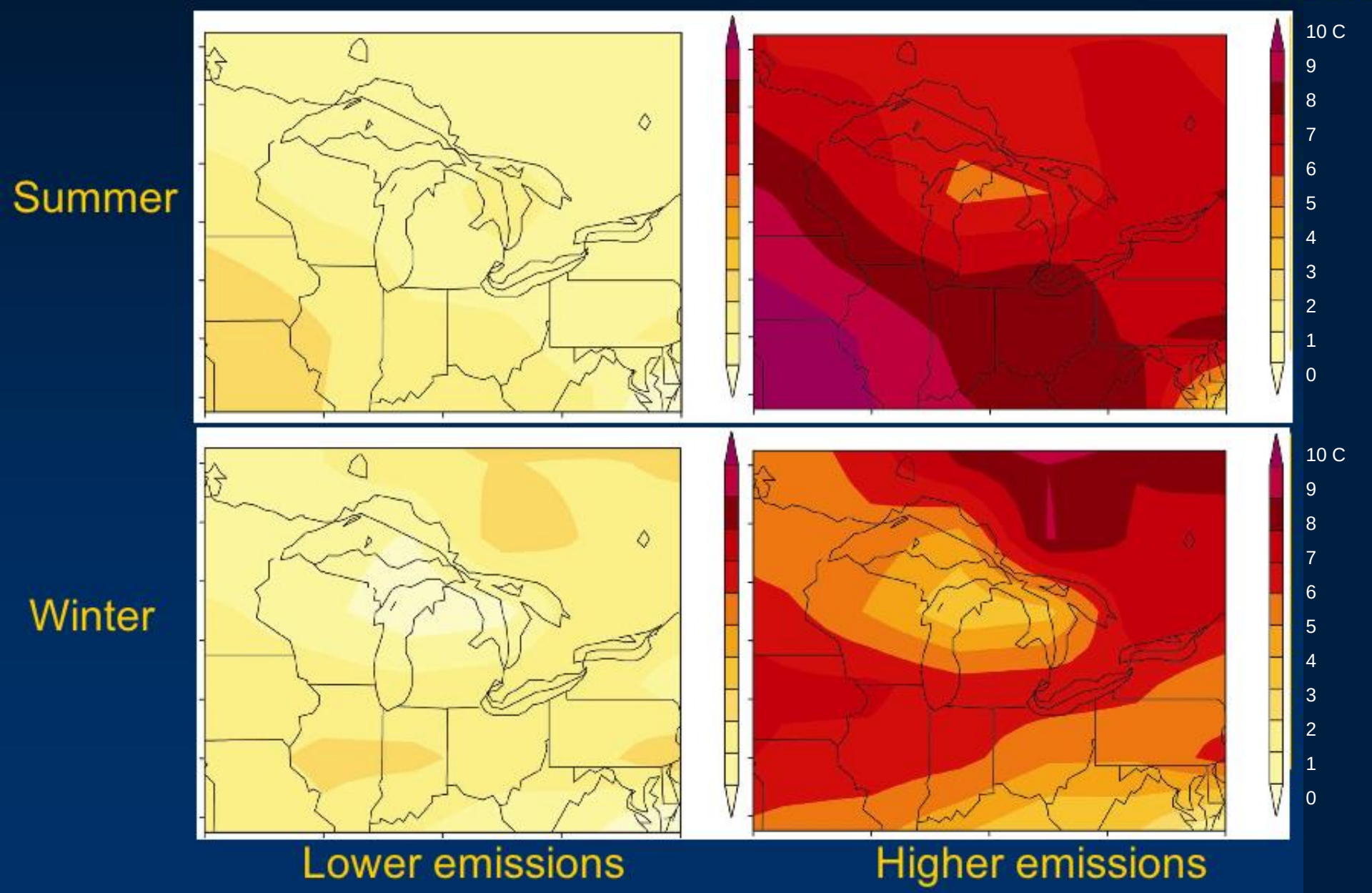
ONTARIO MEAN PRECIPITATION

1951-1980 + 1981-2010



Greatest Increases to lee of the Great Lakes – lake effect precipitation

Projected Temperature Increase in the Great Lakes Region (by 2070-2099)



Warmer Winter Temperatures

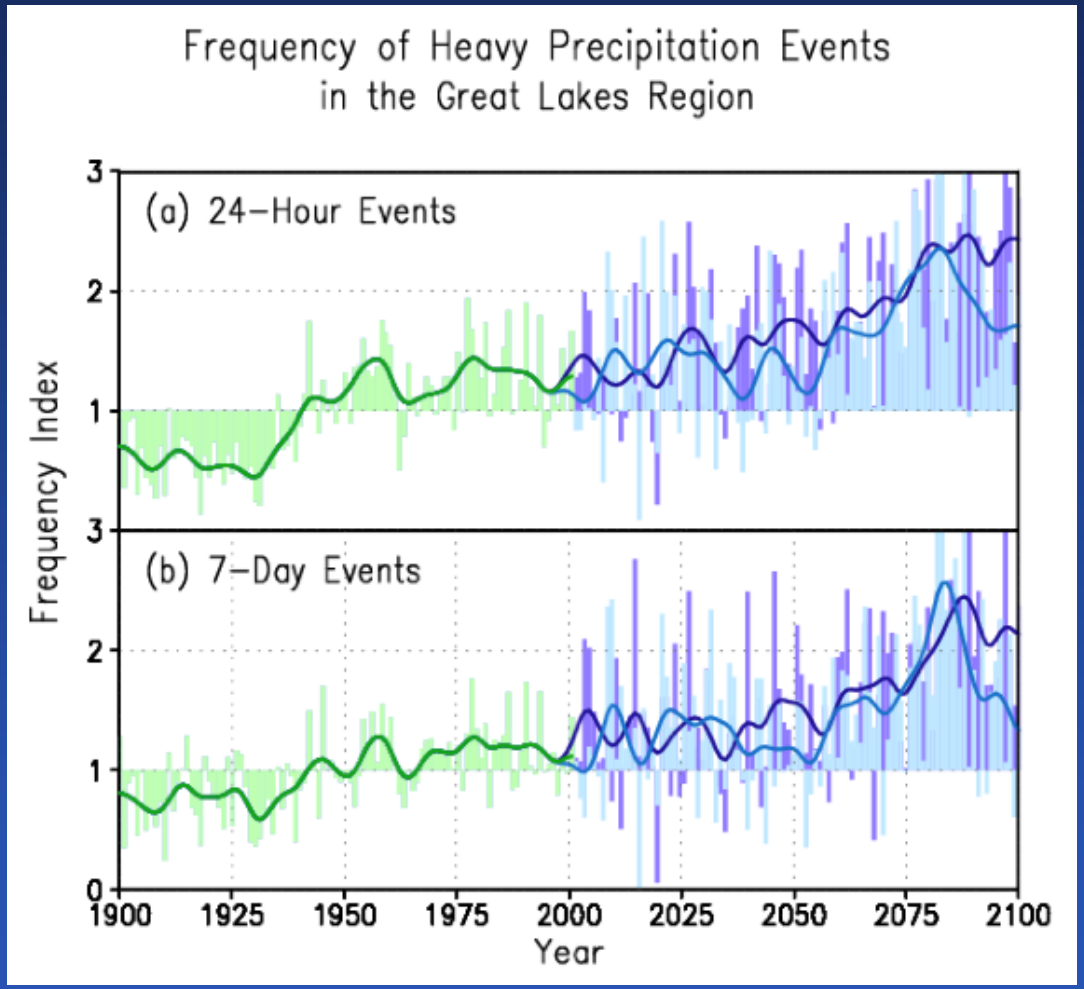
- Reduced ice cover on the Great Lakes
- Increased snowfall
- Increased viability of pests and disease
- Decrease in winter activities (e.g. snowmobiles, ice fishing, etc.)
- Increased freeze-thaw cycles

Changes in Precipitation

- **FLOODING**

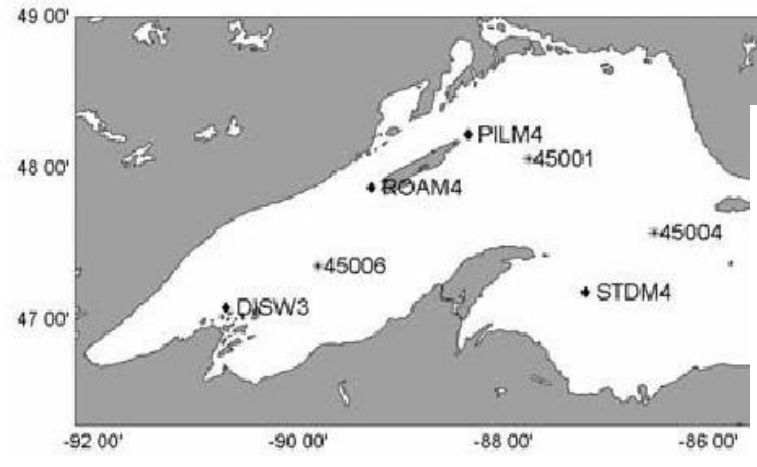
- **Degraded water quality**
- **Changes to peak flow in streams and rivers**
- **Potential for drought conditions and forest fires**

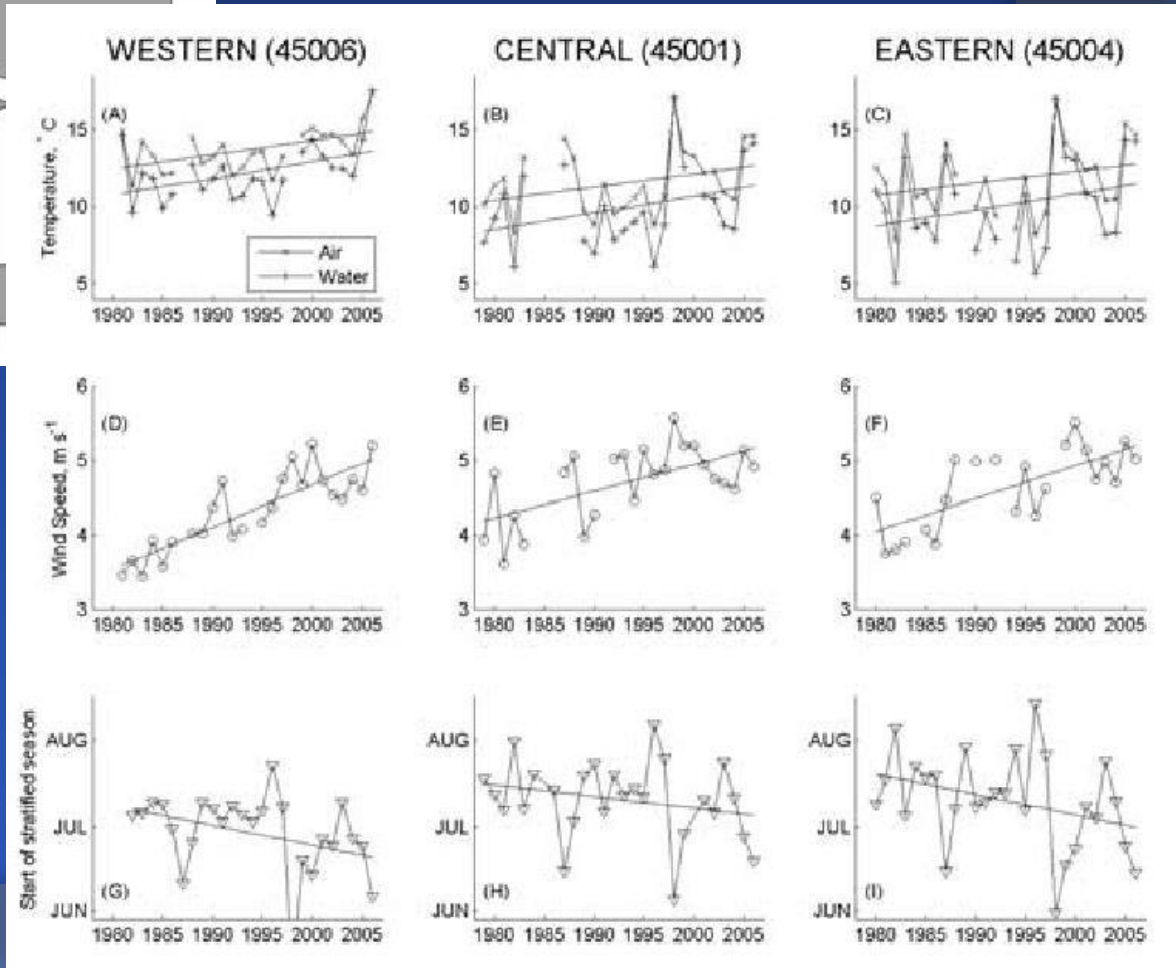
Projected Precipitation Changes in the Great Lakes Region (by 2070-2099)



- Doubling of heavy precipitation events
- Seasonal shifts in precipitation
  - More rain in winter and spring
  - Less rain during summer and fall growing seasons

Temperature (Lake Superior)

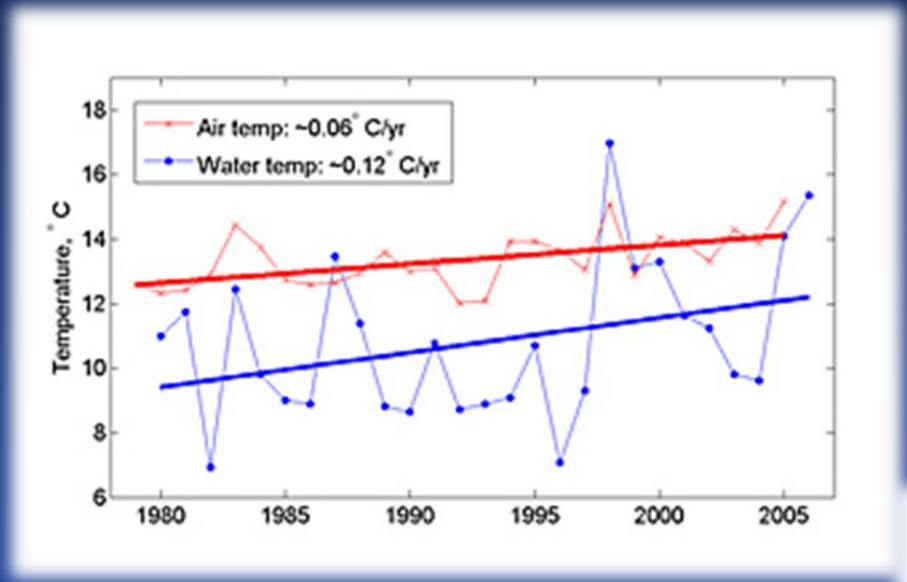


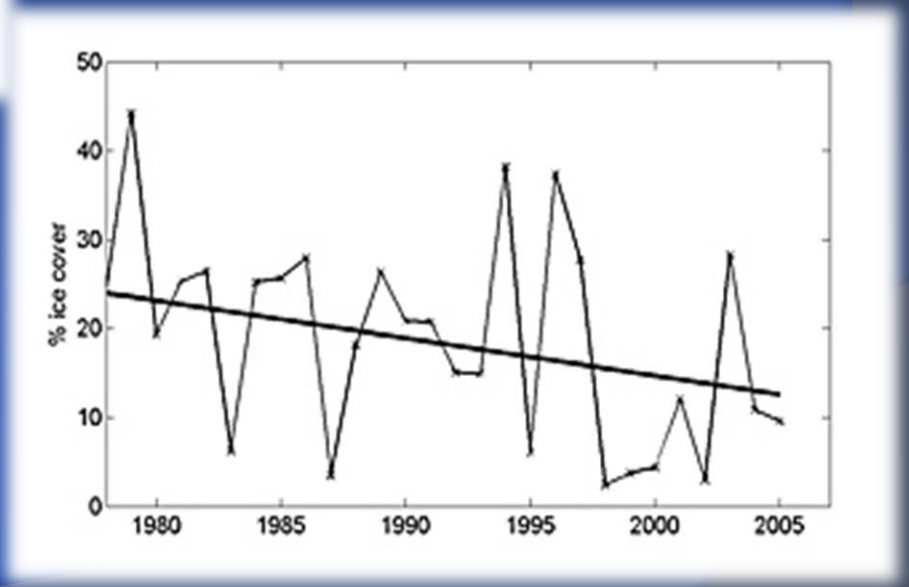


(Austin and Colman 2007)

Temperature and Ice Cover

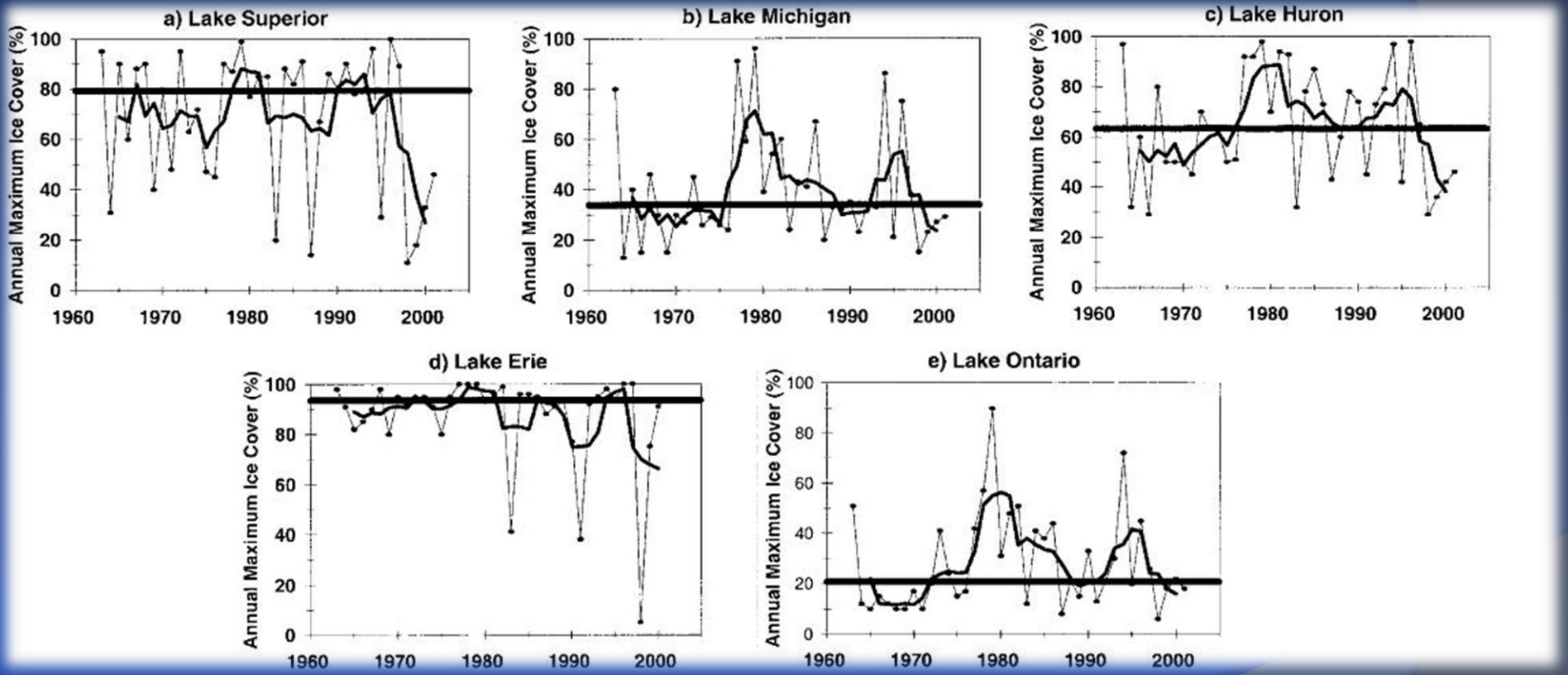
(Lake Superior)





(Austin and Colman 2007)

Ice Cover (Great Lakes)



(Assel et. al 2003)

Ice Cover (Lake Superior)

- Less ice exposes the surface area of Lake Superior
  - More evaporation occurring
  - Larger albedo effect
  - Increased temperatures
  - Wind, weather

Water Levels (Lake Superior)

- Lake Superior regulation is influenced by Plan 1977
  - Plan 1977 designed to balance the levels of Lake Superior and Michigan-Huron *(Hartmann, 1990)*
- IJC strives to keep Lake Superior's mean level between 182.8 and 183.4 m

Water Levels

- Shorter duration of ice cover will increase evaporation in winter
- Warmer air temperatures will increase evapotranspiration
- summers with decreased soil moisture

Lake Superior, the world's largest freshwater lake, has dropped to its lowest level in 81 years. The water is 20 inches below average and a foot lower than just a year ago.

- USA Today 6/14/07

Wetlands (Lake Superior)

- Formation of wetlands: necessity of excess precipitation, flat terrain or depression in landscape, and little permeability.

- Types of wetlands affected by climate change:
  - Confined wetlands
  - Shoreline Wetlands

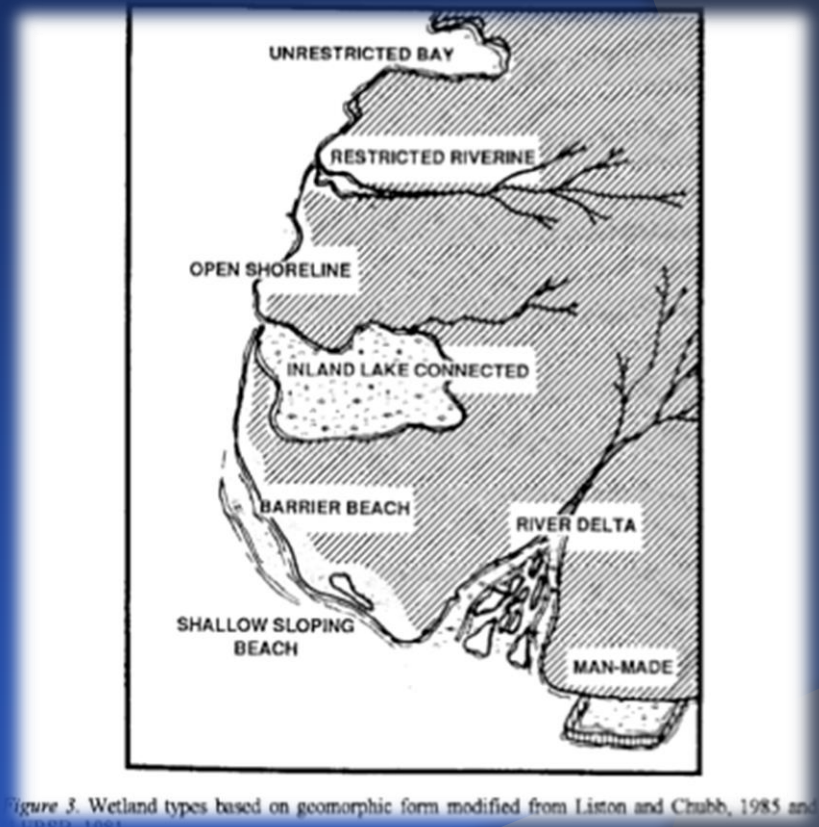


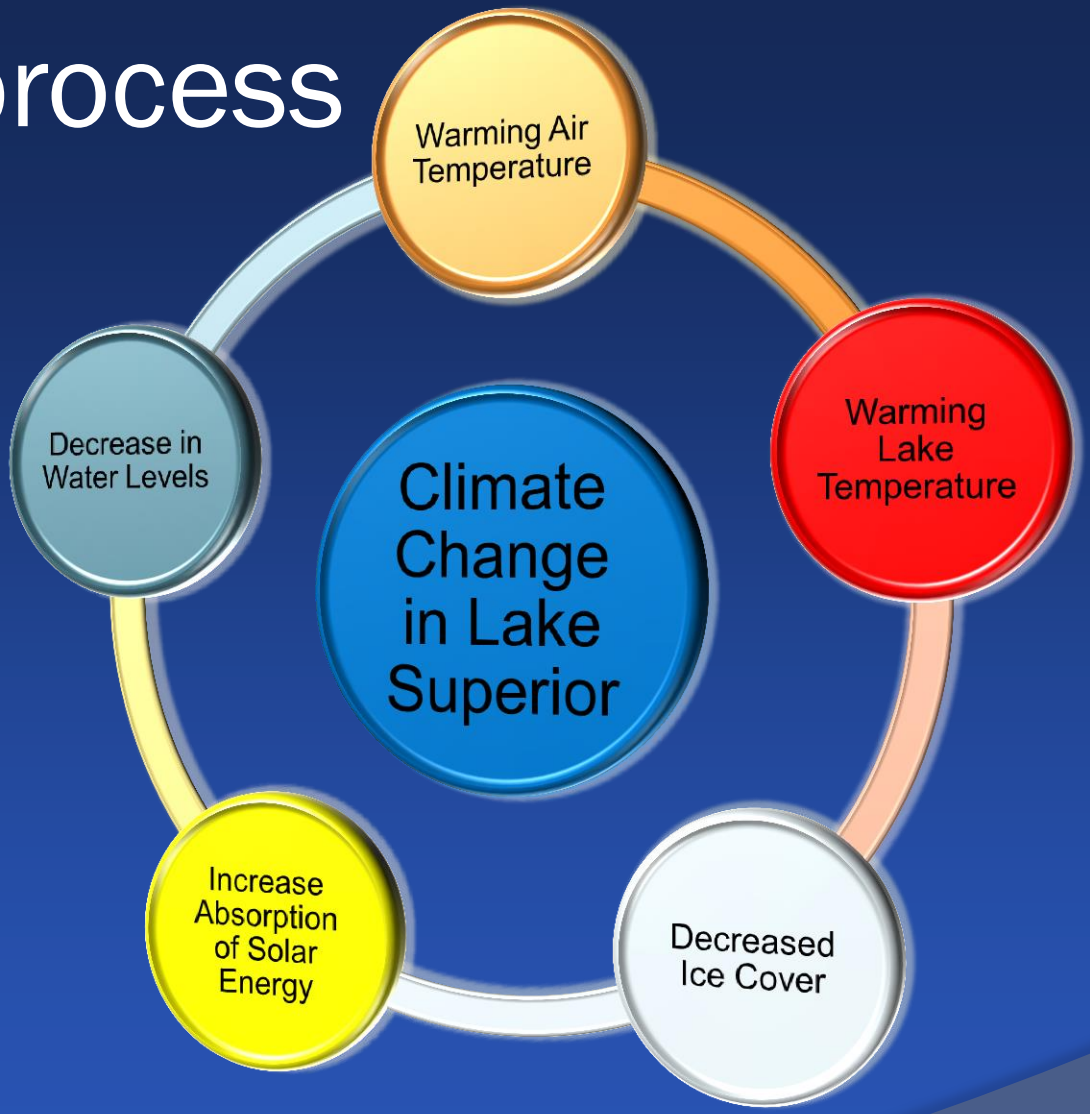
Figure 3. Wetland types based on geomorphic form modified from Liston and Chubb, 1985 and

Wetlands (Lake Superior)

- Similarly to the other effects, deterioration of wetlands will cause an impact to species within it's ecosystem
  - Such as: vegetation, soils, wildlife, and waterfowl

Scenario	Wetland Ecosystem Effects			
Climate Changes	Vegetation	Birds (Waterfowl)	Mammals (Muskrat)	Fish
◉Warmer air temperature ◉More rain or 'rain on snow' in winter ◉Less snowcover ◉Earlier spring melt ◉Earlier rise / drop in lake level ◉More evapotranspiration ◉Less runoff	◉Timing / degree of fluctuation important ◉High winter levels: emergent vegetation die-off ◉Summer levels low and winter levels high: wildlife use and productivity limited	◉Sensitive during breeding season: timing and success ◉Levels rise: less habitat, increased competition and disease ◉Levels decline: drying of habitat, nest desertion, increased predation	◉Timing affects reproduction success ◉Water drawdown in march: no litters ◉Water drawdown in May: 2 litters ◉Low winter levels reduce muskrat population from starvation, predation, disease	◉Low spring levels prevent fish from spawning areas ◉Water decline after egg laying exposes eggs ◉High levels during spawning and nursery: higher production ◉Low winter levels: decline in habitat and increased winter kill

Likely process



Coping with Climate Change

Vulnerability Approach to Adaptation Research

Engage stakeholders

- Those vulnerable to climate
- Key decision makers

Assess current vulnerability

Use experience to assess potential impacts and damages

Future conditions

- Climate scenarios
- Environment scenarios
- Socioeconomic scenarios
- Policy and development scenarios

Policy and implementation

Managing Climate Impacts

- Emergency Preparedness
- Industrial Sector Adaptations
- Public Health Improvements
- Infrastructure Adjustments
- Education!

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