C.H.A. Lake Stewards Meeting

Saturday Sept 21, 2013

- **International, national, provincial and regional perspectives on Climate Change Adaptation and Biodiversity Conservation**
- **Examples of how some organizations are reacting to Climate Change**
- **What MNR is doing**
  - **A Practitioners Guide to Adaptation Planning**
  - **Adaptation Planning Tool Box**
  - **Mainstreaming Climate Change Adaptation and Biodiversity Conservation**

Gary Nielsen
Climate Change Project Coordinator
Ontario Ministry of Natural Resources

"Climate change is likely to become one of the most significant drivers of biodiversity loss by the end of the century"

Millennium Ecosystem Assessment, 2005

State of the Ecosphere

- Consider the Earth as our “living bank account”.
- We’re in the “red”.
- Natural capital is being drawn down faster than it is being replenished.
- The Global Footprint Networks calculation of Earth Overshoot Day comes earlier every year

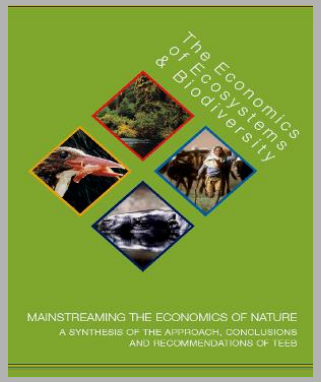
  the approximate date our resource consumption for a given year exceeds the planet’s ability to replenish

  Sept. 27, 2011 → August 22, 2012

The Economics of Ecosystems and Biodiversity

- Nature is a form of infrastructure requiring investment and protection just like built infrastructure.

- However, exactly the reverse is happening. Nature's infrastructure is being destroyed by human activities representing a stunning estimated loss of 2.5 to 4.5 trillion dollars a year for each of the last 25 years.



- Pavan Sukhdev, TEEB Report Nov. 2009

The International Framework Conventions on Biological Diversity and Climate Change

Biodiversity Convention Framework International target for 2010:

- "to achieve by 2010 a significant reduction of the current rate of biodiversity loss at the global, regional and national level as a contribution to poverty alleviation and to the benefit of all life on Earth."

Climate Change Convention Framework Kyoto Protocol:

- to stabilize worldwide greenhouse gas emissions at 6% below 1990 levels…

Global Outlook

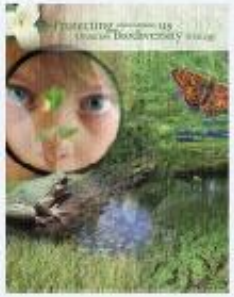
- Global pressures on biodiversity are increasing.
  - Rates of decline for most species groups continue or are intensifying.
- Kyoto Protocol did not meet its goals and expired Dec 2012
  - GHG concentrations in the atmosphere continue to rise
- **Bottom Line:** internationally we have failed to achieve a significant reduction in the rate of biodiversity loss or GHG emissions.
  - Lots of progress at sub national levels however the main goals remain elusive

Climate Change and Biodiversity

- *For the good of the planet, the time has come for a major initiative to reunite climate change mitigation and adaptation efforts with biodiversity conservation and wilderness protection.*
  - From: THE CHAIRMAN AND EXECUTIVE COMMITTEE OF WILD9: THE 9TH WORLD WILDERNESS CONGRESS, Nov. 13, 2009

Ontario's Biodiversity Conservation Timeline

2005
Ontario Government Released Ontario's Biodiversity Strategy *Protecting What Sustains Us*



2005
The Ontario Biodiversity Council was formed along with 3 working Groups; The Biodiversity Education and Awareness Network; the Stewardship Network of Ontario and the Ontario Biodiversity Science Forum

Ontario Biodiversity Council

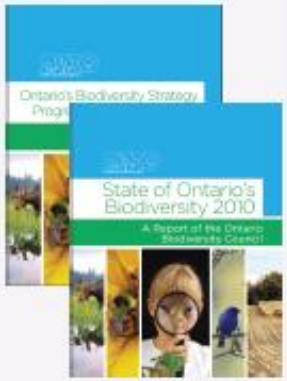
BEAN Biodiversity Education and Awareness Network

Stewardship Network of Ontario

Ontario Biodiversity Science Forum

2008
Ontario Biodiversity Council released an Interim Report on Ontario's Biodiversity

2010
Ontario Biodiversity Council released the first ever State of Ontario's Biodiversity 2010 report and the Ontario's Biodiversity Strategy Progress Report

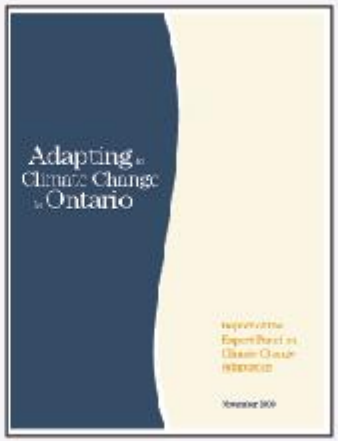


2011
Ontario Biodiversity Council renews its commitment to Protecting What Sustains us with Ontario's Biodiversity Strategy, 2011

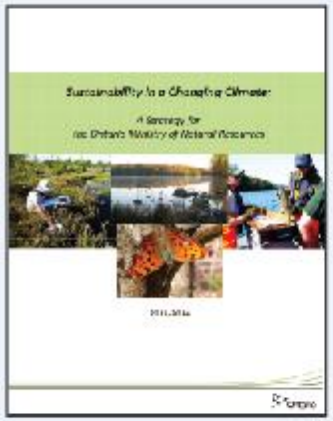
Ontario's Climate Change Timeline

2007
Release of Ontario's first ever climate change plan (with GHG targets)

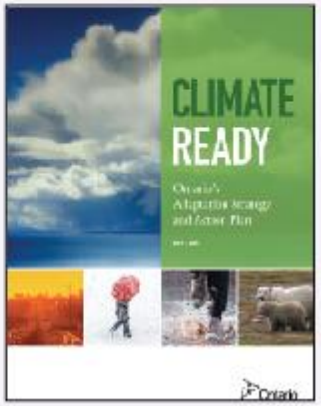
2010
Experts Panel on Climate Change Adaptation releases 59 recommendations for government



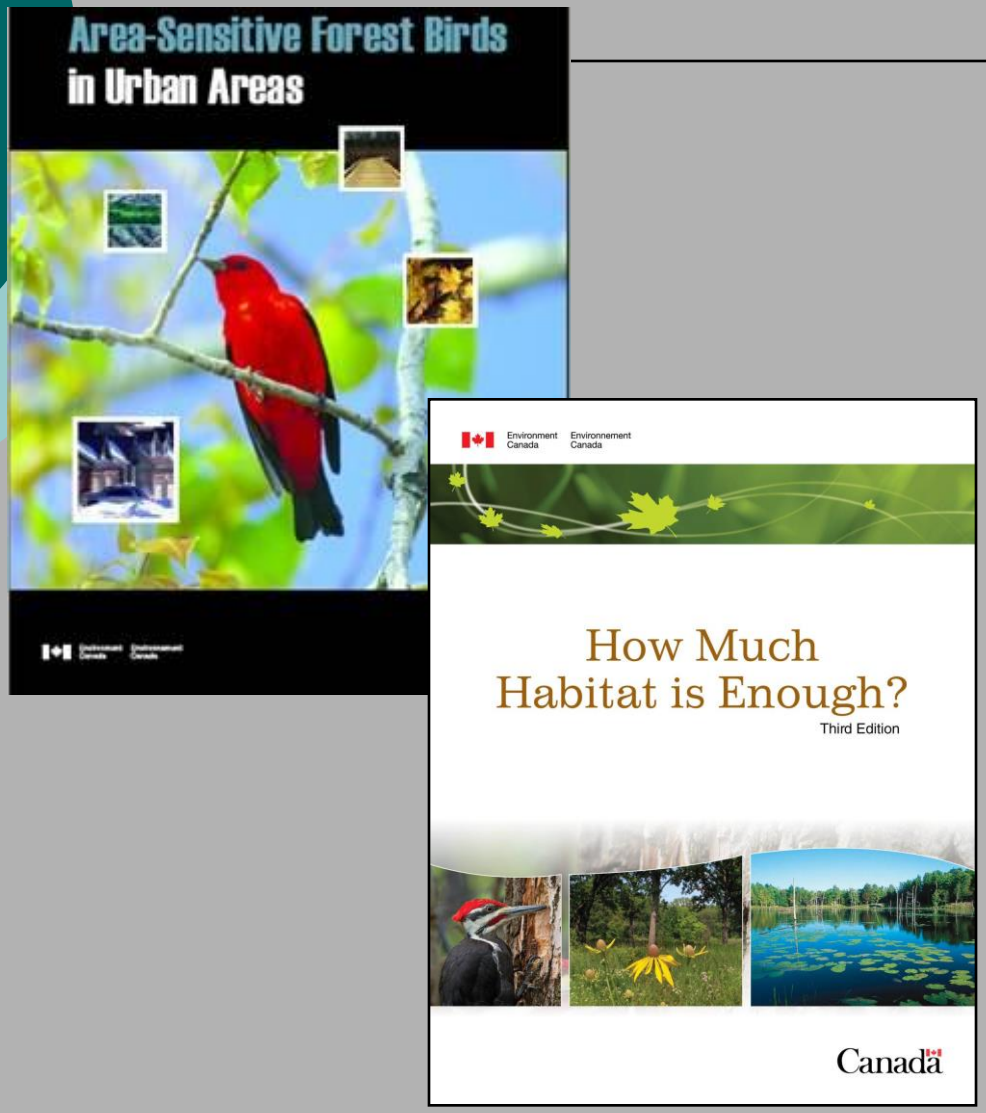
2011
MNR's internal climate change program strategy released



2011
Government releases first ever adaptation strategy



Using the best available science to guide natural resources management and restoration

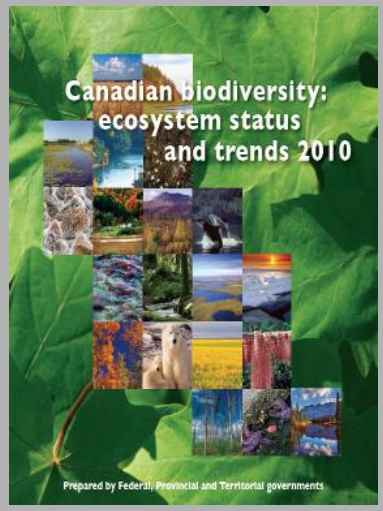


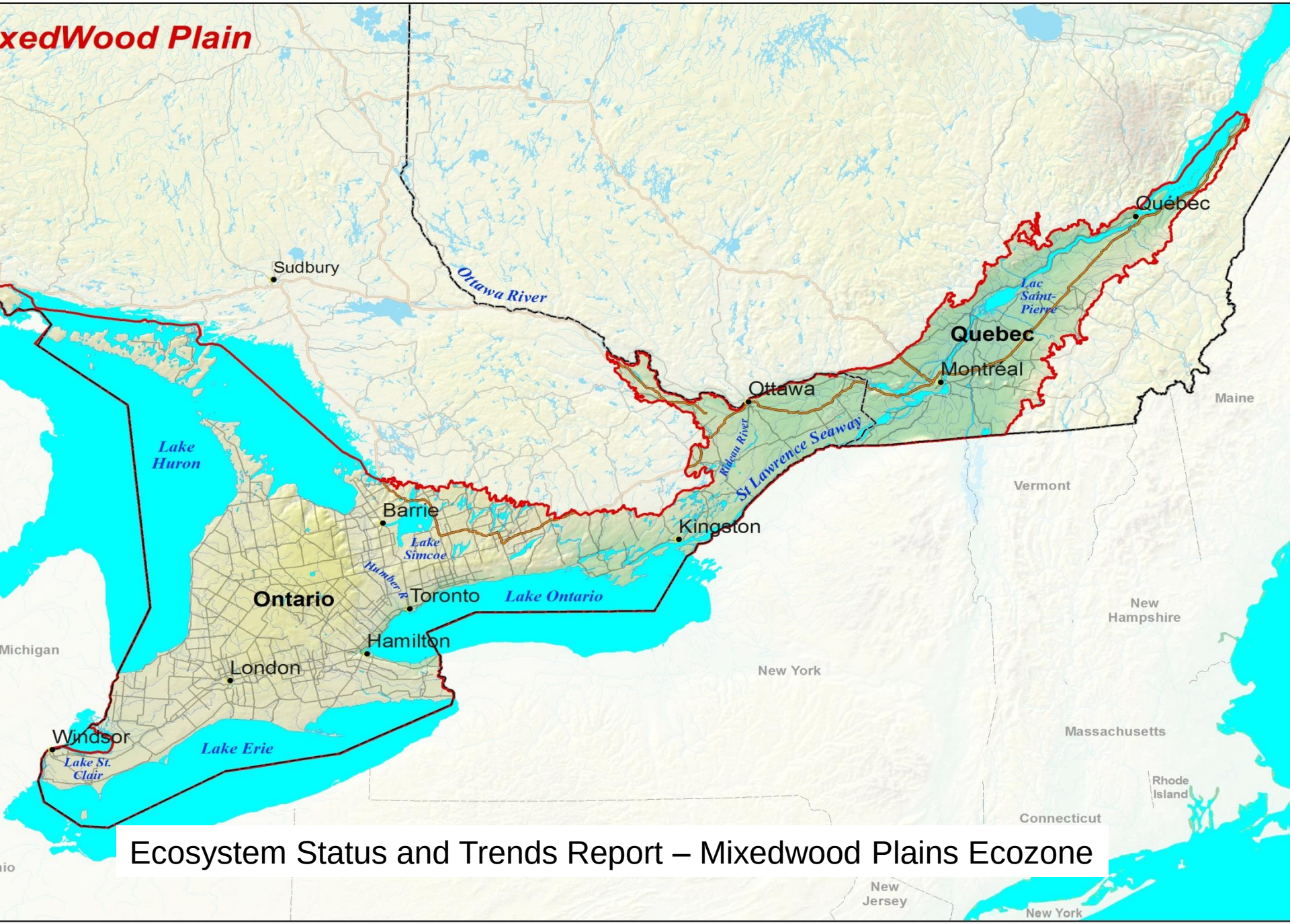
- Published sources, e.g. How much habitat is enough?
- Information from the landscape characterization (What do I actually have?)
- Expert and traditional knowledge of your landscape (What is important here?)
- Finding new ways of analyzing and describing ‘thresholds or targets’ – eg natural areas provide functions – 40% natural cover = 100% of pollination services

State of Biodiversity in Canada

- Canada's Living Planet Index – Tracks population trends of some 393 vertebrate species for which we have long-term data.
  - Canada's Living Planet Index - **declined by 25% since 1995.**

- Canadian Biodiversity: Ecosystem Status and Trends 2010 Report. Mixed results, but clearly all is not well





Ecosystem Status and Trends Report – Mixedwood Plains Ecozone

Cumulative Human Impacts– Key Findings

Landscape near Tilbury Ontario – Google Earth

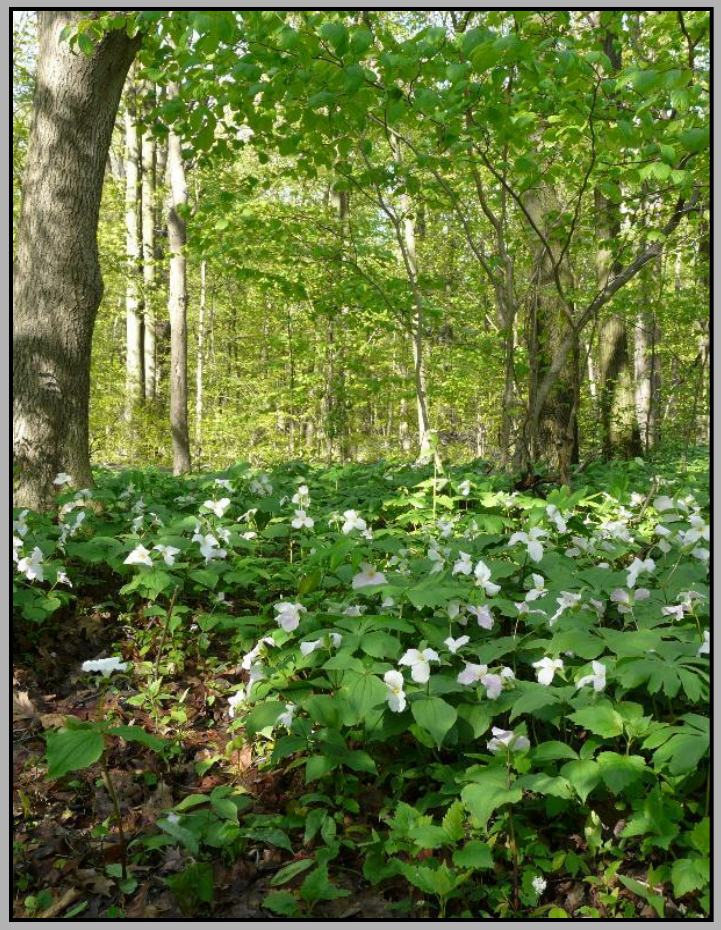
- Net loss of habitat –decrease in amount of natural area
- Loss of connectivity between habitat causing genetic isolation and localized extinctions
- Habitat deterioration from pollution and human use
- Urban areas have tripled, fewer sparsely populated areas, much more semi-urban land, with much of the land being converted from agriculture to urban use.
- The projected human population growth of 30% by 2031 will put additional stress on the ecosystem and will likely only partly be mitigated through good community planning.

Cumulative Human Impacts - Key Findings

- More invasive species than any other part of Canada (139)
- Invasives are found in all ecosystem types (natural and anthropogenic, aquatic and terrestrial) and are a leading threat to Species at Risk.
- Invasives forest pests have major negative economic impacts (ie: EAB)
- Invasive earthworms are altering nutrient cycling and soil food web interactions as well as having negative impacts on some rare species. They increase N_2O emissions which contributes to greenhouse gases.

Lumbricus rubellus – an invasive earthworm species.

Natural Landscapes

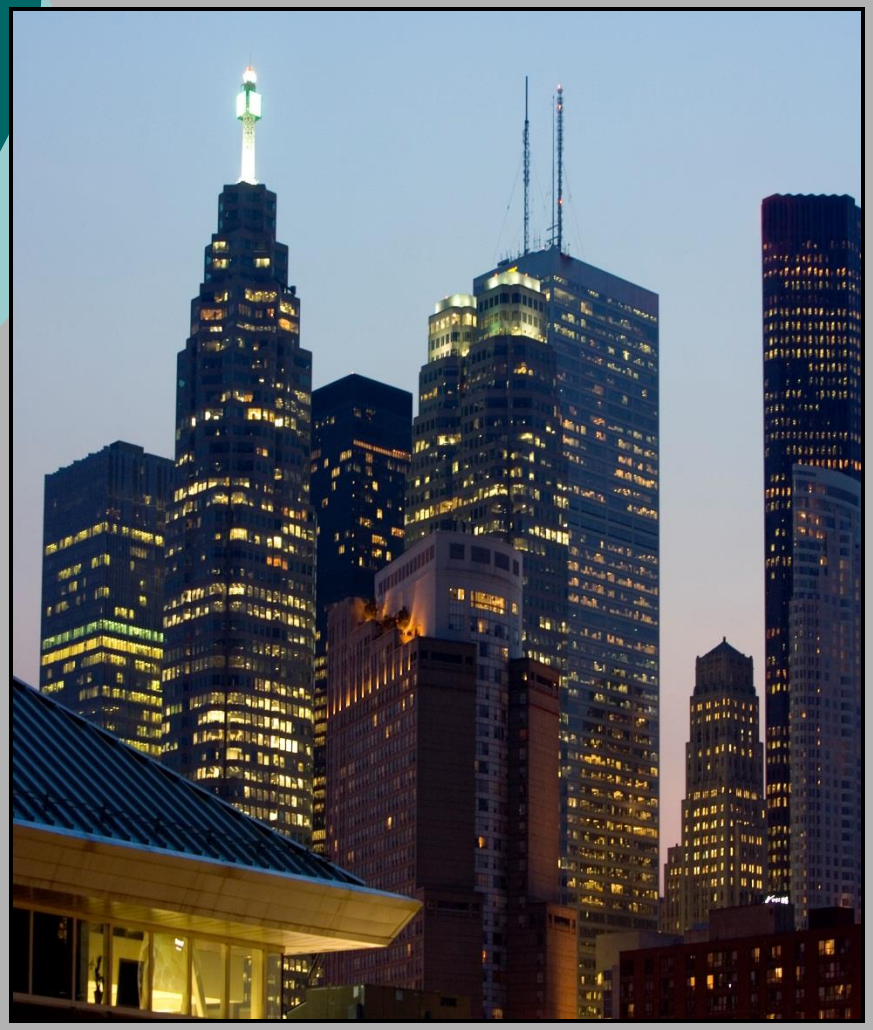


- Forest declined from > 80% to < 11% by 1920s and have since rebounded to +/- 25% and may still be increasing however upland forests declined by over 94% and forest cover is currently decreasing near urban areas
- Forests older than 120 years occupies < 0.07% of remaining forests
- Current forests;
  - have less old stands
  - less large stands
  - less remote stands
  - more early successional stands
  - Less highly productive, climax forest (more red maple vs sugar maple)
- Savanna and tall grass prairie < 3% of former area
- Wetland decline: >70%

Agricultural Lands

- Ecozone has 9% of the agricultural land in Canada and accounts for 37% of Canada's agricultural production
- 67% of the ecozone's land cover is agricultural
- The amount of agricultural land has decreased slightly (-.13%) while farm size is increasing

Urban



- 53% of Canadians live in this ecozone
- Between 1971 and 2006 the population of the ecozone increased by 51%
- Steepest growth in semi-urban areas (suburbia).
- Urbanization is occurring at a rate of 22.8 km2 per year (1990-2005).
- Toronto and Montreal have the fastest growth.

Ecological Footprint

- Measures how much nature we use

Ecological Footprint

- Global share of ecologically productive lands and waters per person (7 billion people) = 2.1 gha
- Global average demand = 3.15 gha
- Global ecological overshoot = 50%

Ontario's Ecological Footprint

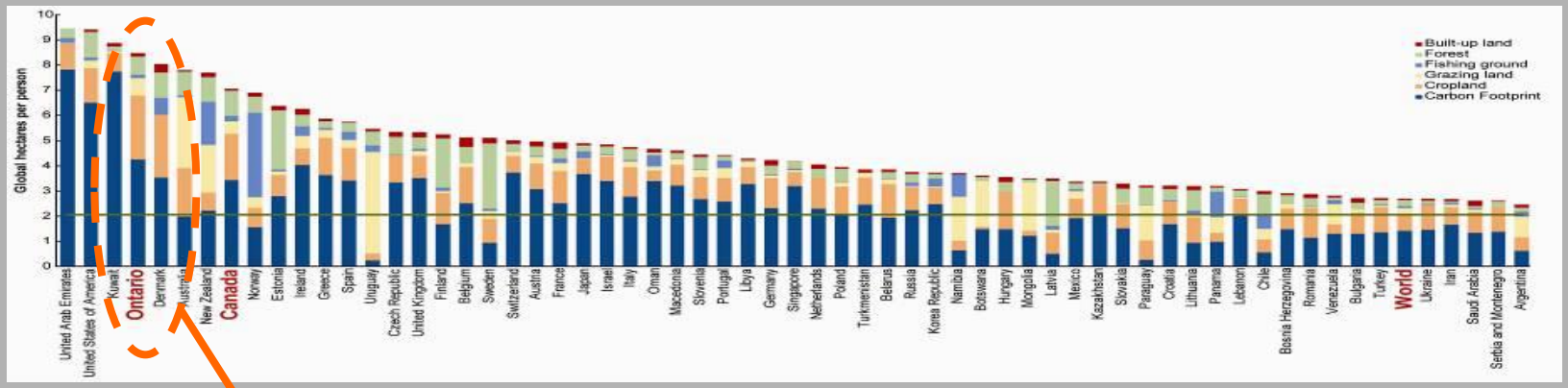
In Ontario we use 8.5 global hectares per person!

Globally there is only 2.1 global ha per person.

Ontario's Biodiversity Strategy
Protecting what sustains us

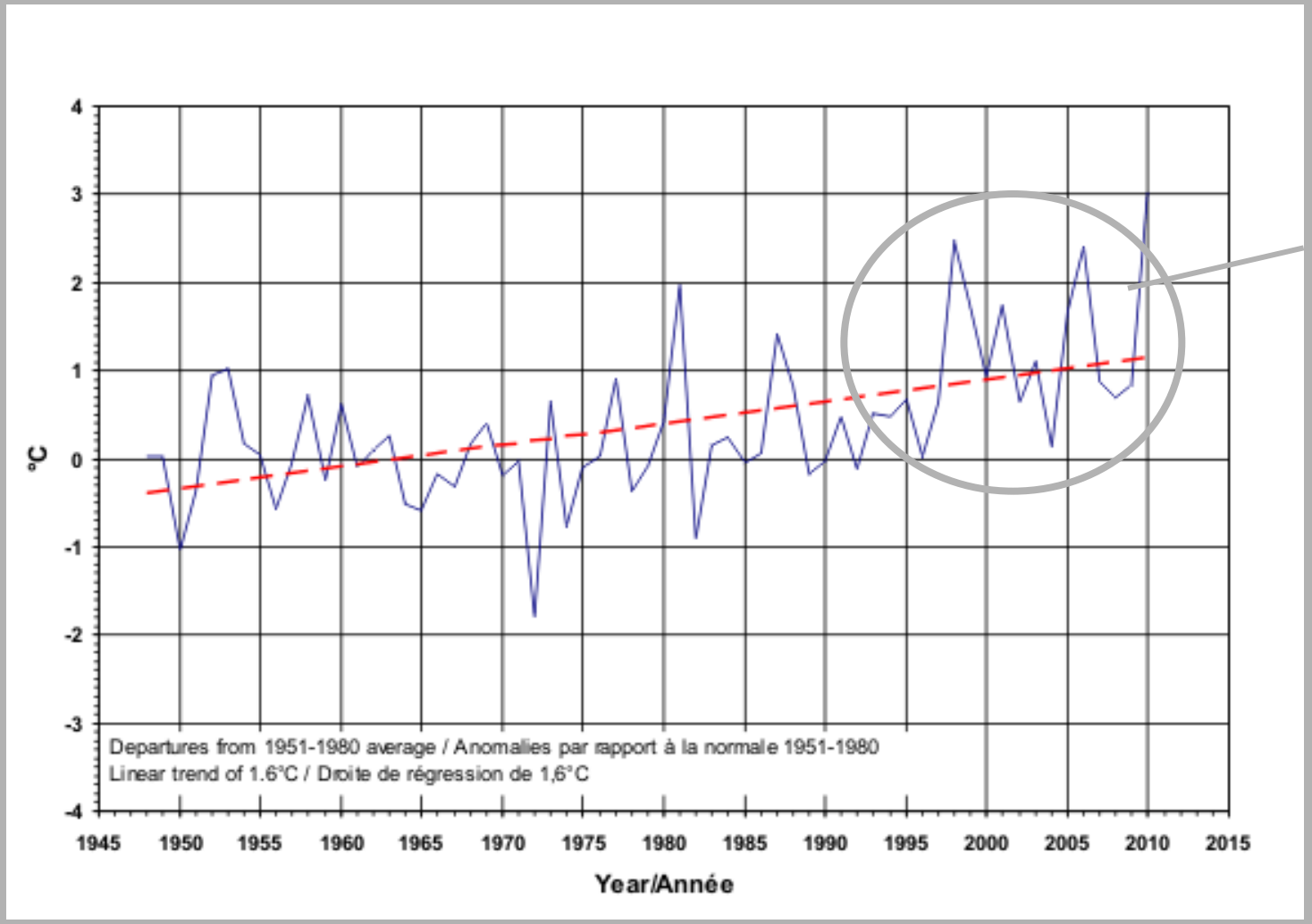
Ontario's Ecological Footprint

- Ontario's Ecological Footprint is equivalent to its available Biocapacity, but exceeds the world average by more than **four** times.



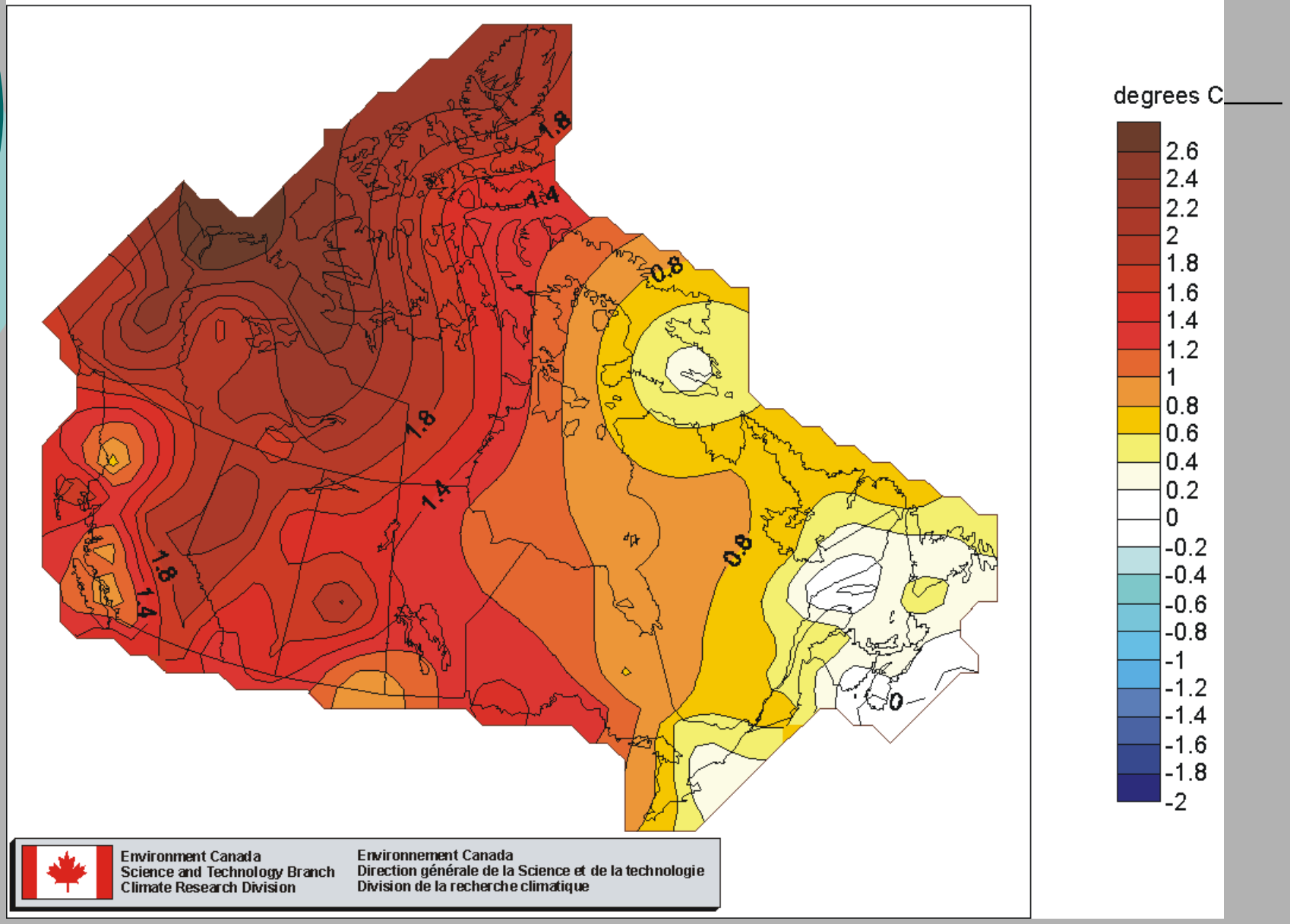
If everyone in the world lived comparable lifestyles to Ontarians, it would require the resources of four planets to support humanity.

Observed change in temperature in Canada 1948-2010



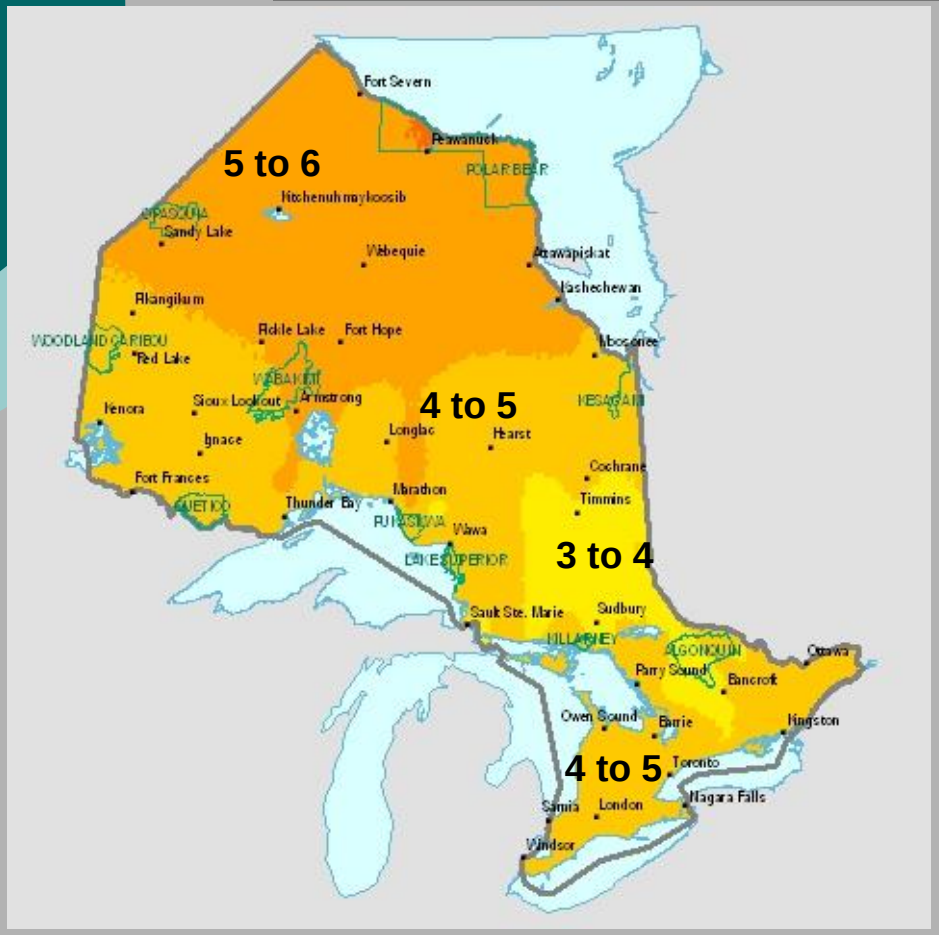
Of the 10 warmest years, 4 have occurred within the last decade

Annual Temperature Trend, 1948-2008

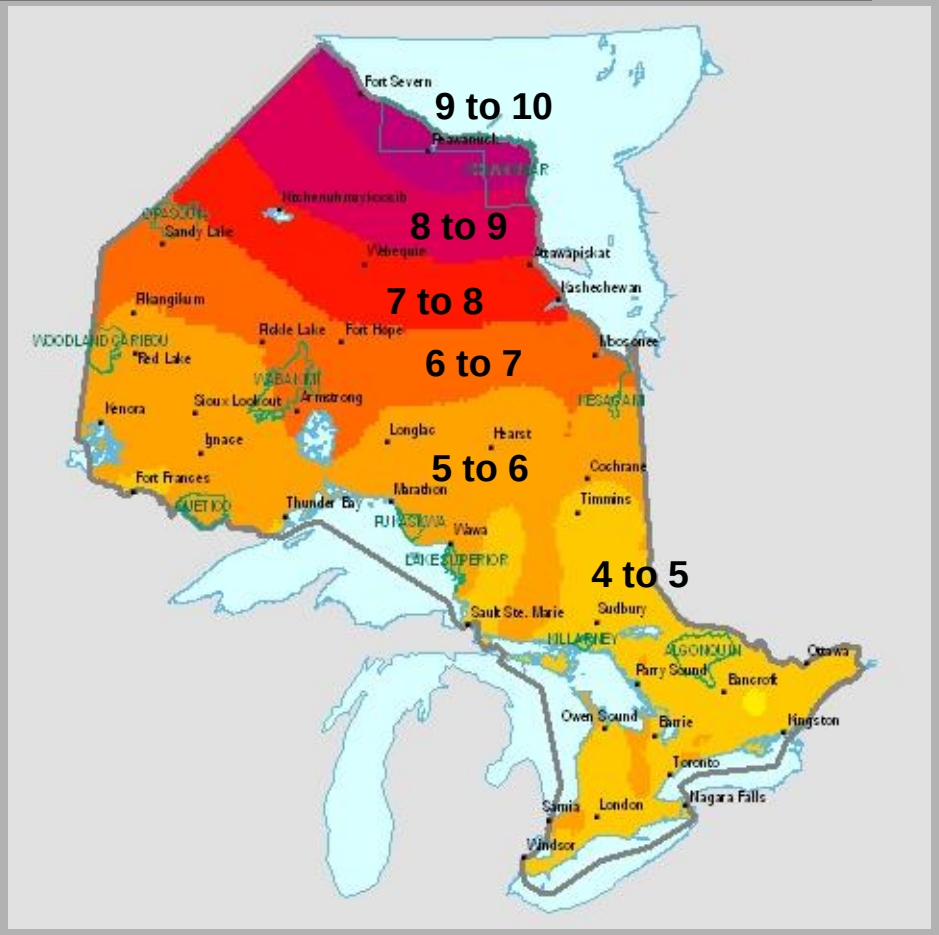


Increase by 2071-2100

Average Summer Temperature

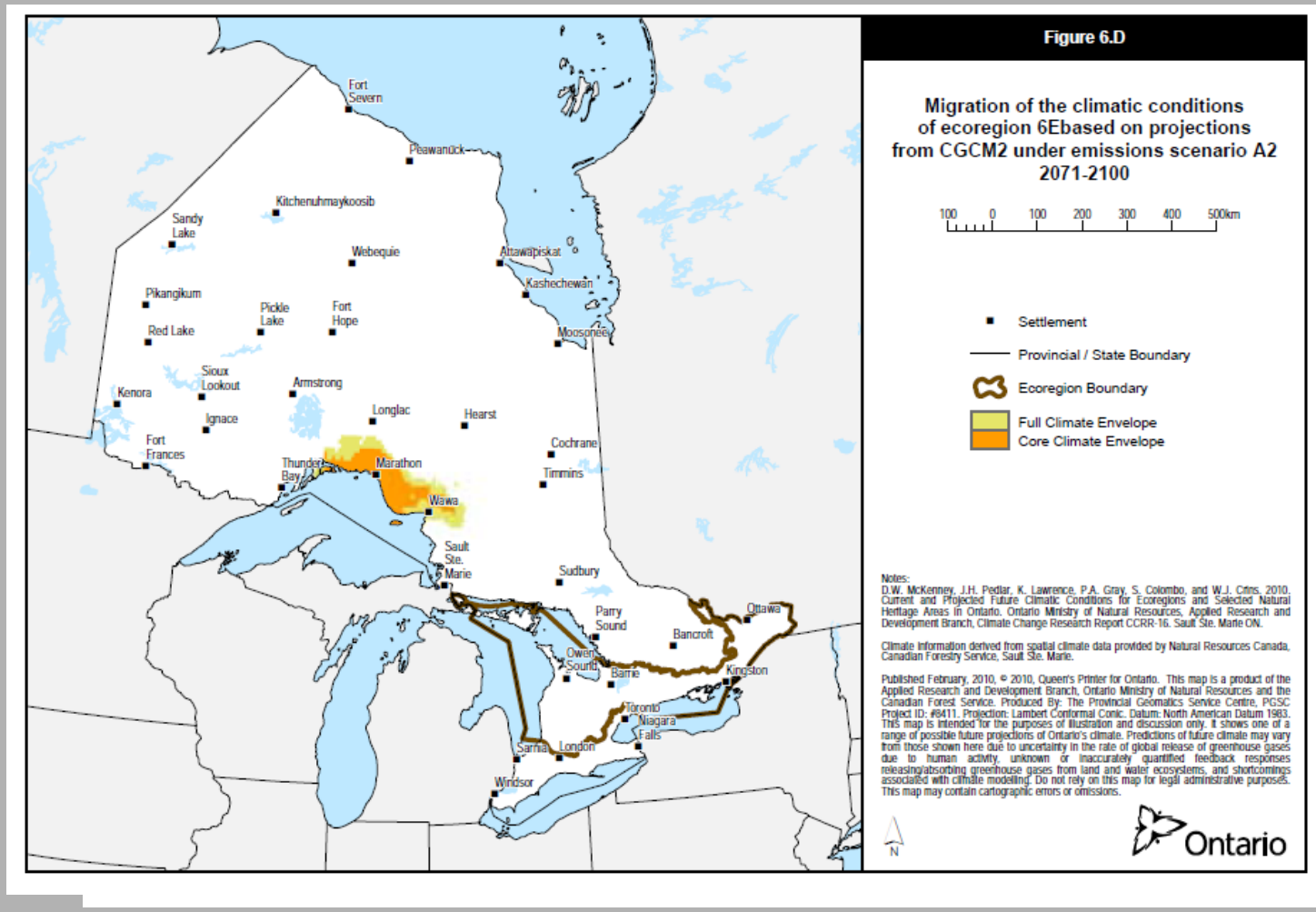


Average Winter Temperature



CGCM2, A2 scenario

Climate Envelops are predicted to shift having major implications for composition structure and function of ecosystems




Fort Severn
Peawanuck
Kitchenuhmaykoosib
Sandy Lake
Webequie
Attawapiskat
Kashechewan
Pikangikum
Pickle Lake
Fort Hope
Red Lake
Moosonee
Sioux Lookout
Armstrong
Kenora
Longlac
Hearst
Ignace
Fort Frances
Cochrane
Thunder Bay
Marathon
Timmins
Wawa
Sault Ste Marie
Sudbury
Parry Sound
Ottawa
Bancroft
Owen Sound
Barrie
Kingston
Toronto
Niagara Falls
Sarnia
London
Windsor

Climatic Migration for Site District 7E
Present to 2100

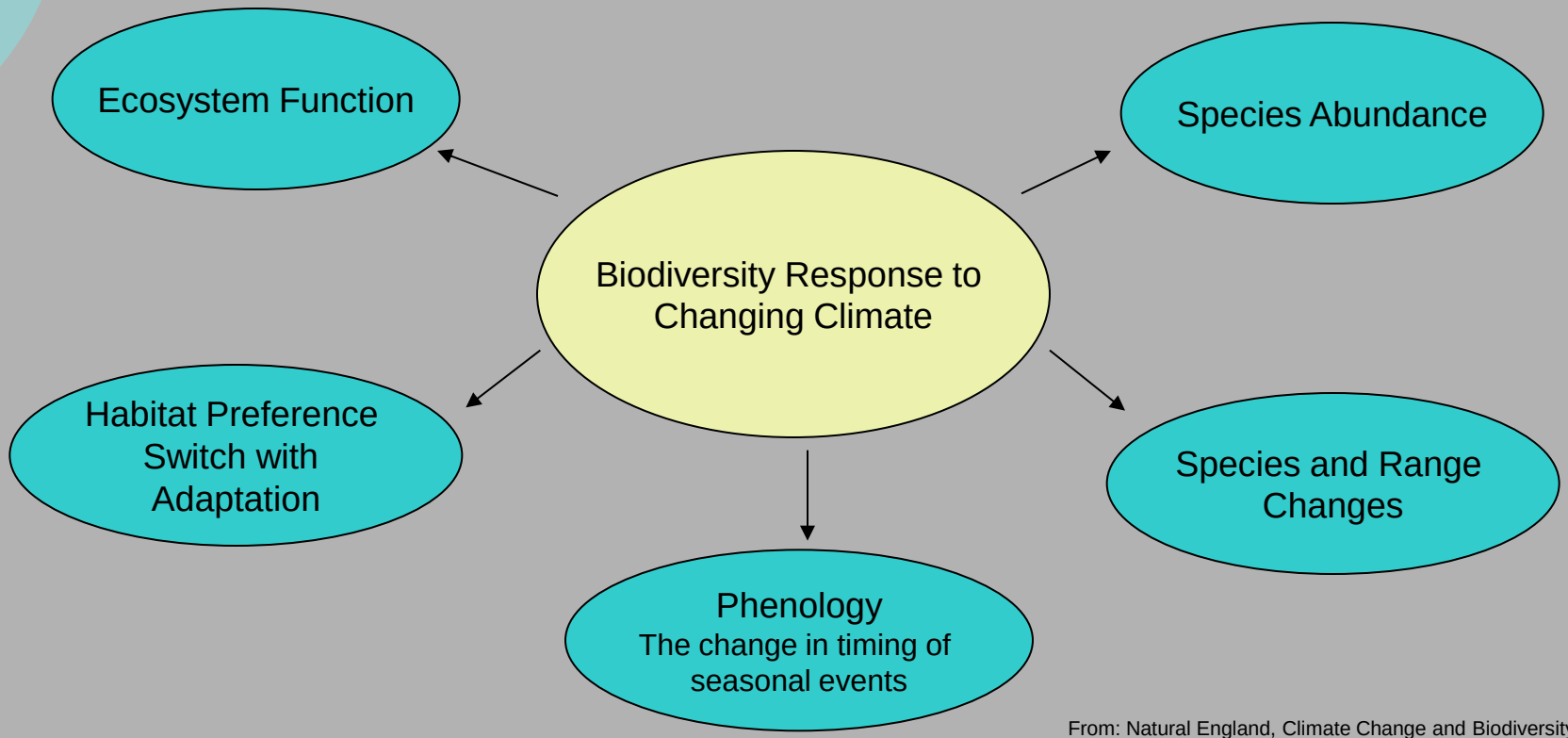
CGCM2,
A2 Scenario

Interconnectedness of the two issues of Biodiversity Conservation and Climate Change Adaptation that is of concern to MNR!

- Widely recognized that climate change and biodiversity conservation are interconnected
  - Biodiversity and associated ecosystem services are threatened by climate change
  - Enhancing Biodiversity is part of the solution to climate change




1. Climate change: a threat to biodiversity



From: Natural England, Climate Change and Biodiversity Adaptation

2. Biodiversity: part of the solution to climate change

- Resilience of ecosystems can be enhanced and the risk of damage reduced by adopting biodiversity-based adaptation and mitigation strategies, such as:
  - maintaining and restoring native ecosystems,
  - protecting and enhancing ecosystem services,
  - managing habitats for endangered species,
  - creating refuges and buffer zones, and
  - establishing networks of terrestrial, freshwater and marine protected areas

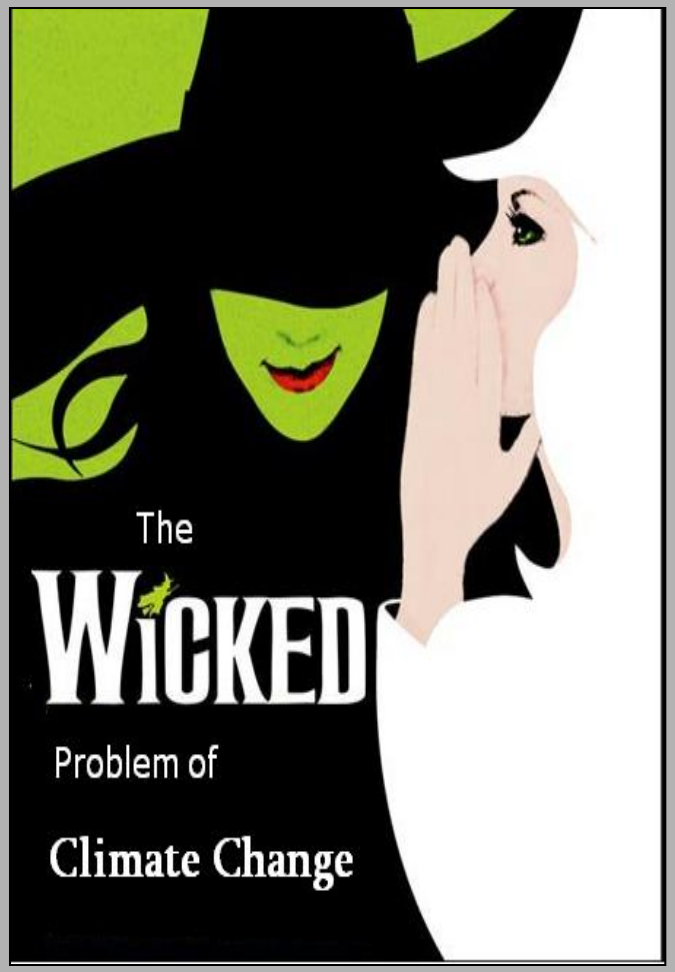
Other commonalities

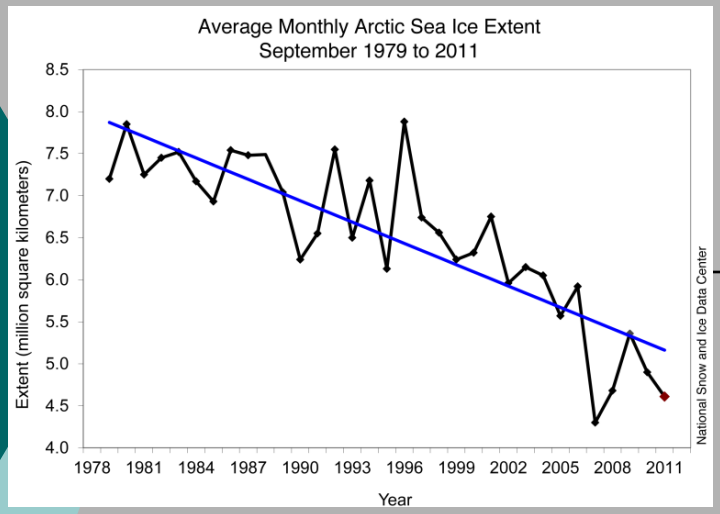
- Global in scale: Resolution of local issues by one or a small number of jurisdictions does not solve the problem
- Driven by global trends in human population growth, consumption, and resource management
- Subject to cumulative effects that amplify impacts
- Resisted by powerful sectors and lobby groups with vested interests in the status quo
- Accelerating exponentially, the clock is ticking

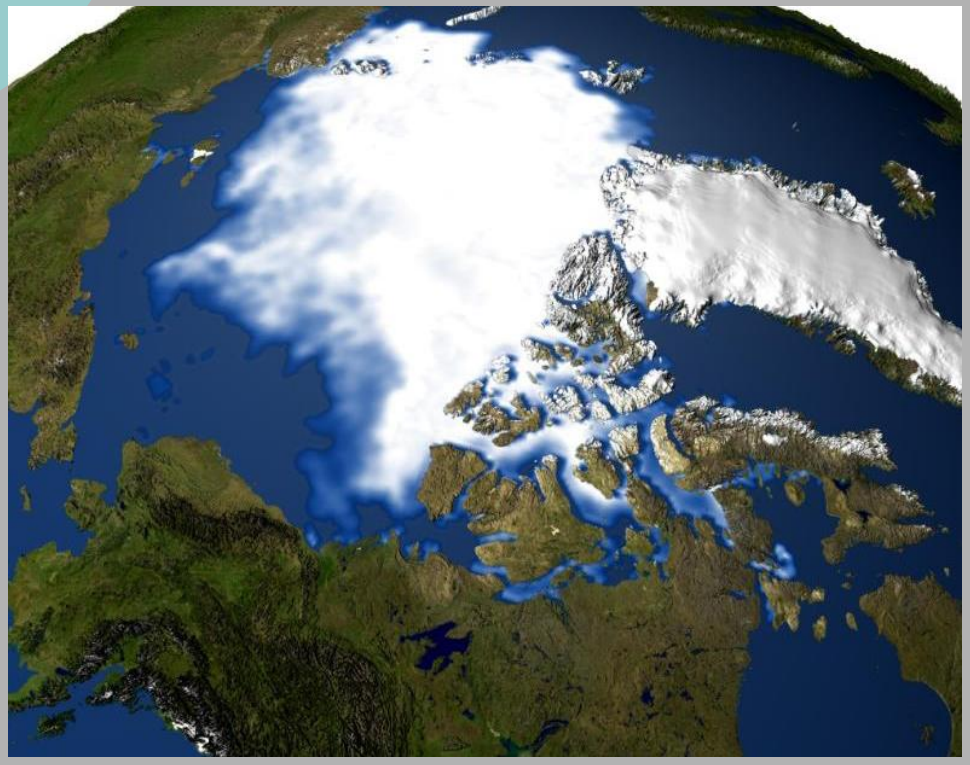
Climate Change and Biodiversity Conservation are Classic 'Wicked Problems'

Elements of a "Wicked" Problem:

- Many different owners
- No clear solution
- Cannot be solved but must be managed
- Potential to create winners and losers
- Significant impacts will occur
- Time matters







Step Change: One example

- 2011 average arctic temp 2.28°C above 1951-80 average
- Lowest sea ice volume yet recorded (76% decline from 1979)
- Threatened extinction of key species such as polar bears, walruses, ice-dependent seals and more than 1,000 species of ice algae
- The changes could represent a climate-related 'point of no return' triggering region-wide permafrost thawing with a net impact > current world-wide deforestation

Ecosystem Flips Will Occur

Thermokarst (indicating degraded permafrost) in a birch forest.

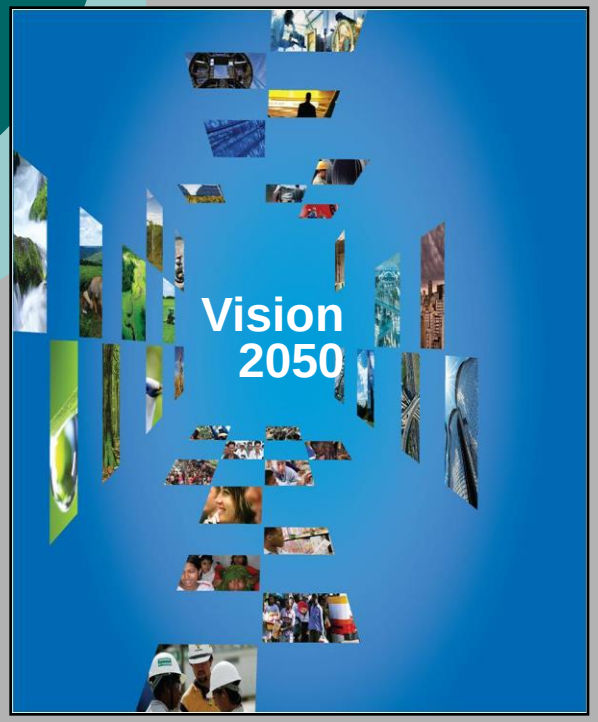
Spruce and birch forests on the Tanana Flats, which are part of a large lowland basin in interior Alaska.

(Source: Racine and Ferrick, 2005)

Ecosystem Integrity will be challenged

- Globally the average northward movement of climate envelops are predicted to be .42 km/yr (ranging up to14 km/yr depending on latitude)
- Tree species ability to migrate typically < 1 km/yr, Holocene post glacial re-colonization is estimated to have occurred at 100m to 2 km/yr
- Anticipated migration lag - Habitats will change in unknown ways
- Reaction to changing climate will be “species specific”
- Adaptable species will be those that are mobile, able to tolerate wide ranges, have a high reproductive rate, not located primarily at the northern of southern limit of traditional range
- Less adaptable species will be those in fragmented or isolated habitats, low mobility, lack of genetic diversity, already at risk
- Disturbance vectors of invasive species, insects, disease and severe weather will play a role

Climate Change and Biodiversity
A business view



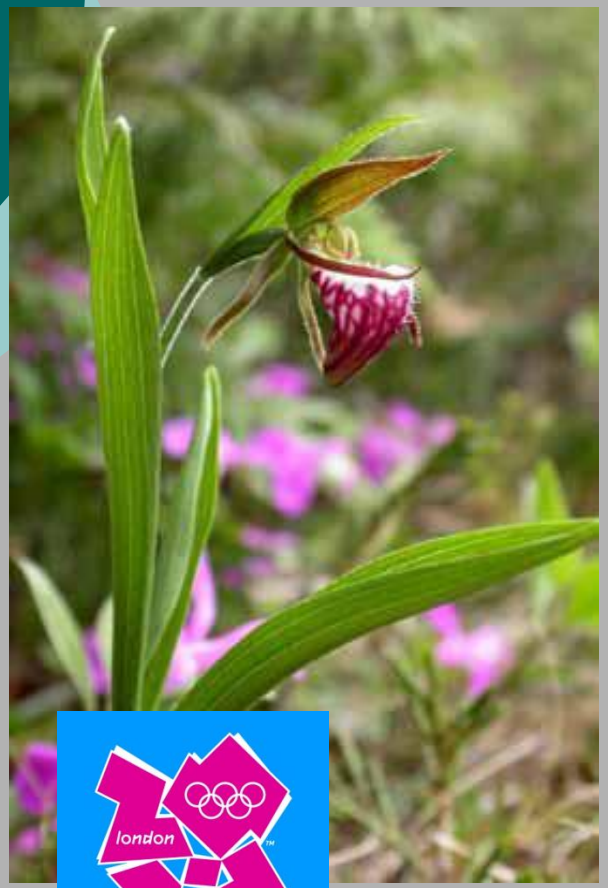
- World Business Council on Sustainable Development
  - Vision 2050
  - Business leaders with a shared commitment to sustainable development through economic growth, ecological balance and social progress.
- Sustainable development is seen by the private sector as a business destiny issue.
  - Companies that have been in business for a hundred years plan on being vibrant and profitable a hundred years from now
- The Vision: In 2050, some 9 billion people live well, and within the limits of the planet.
  - An aggressive pathway from "business as usual" through the next 4 decades, "turbulent teens" through the "transformation time" to 2050
- A reassuring yet challenging agenda for those who think that government has to solve these problems alone

Climate Change and Biodiversity
A World Bank view

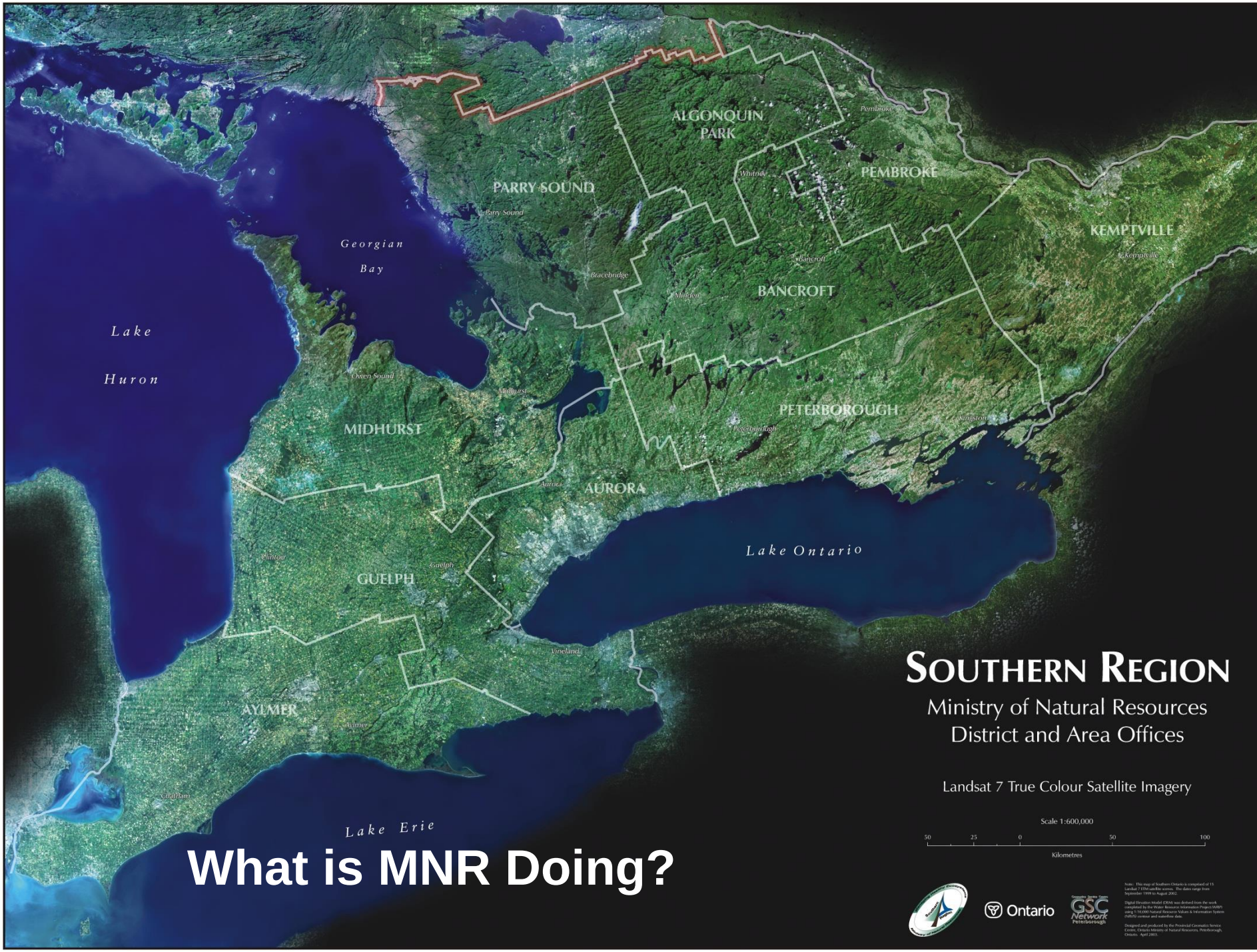
IFC
International Finance Corporation
World Bank Group

- Sustainability Framework Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources
  - To protect and conserve biodiversity.
  - To maintain the benefits from ecosystem services.
  - To promote the sustainable management of living natural resources through the adoption of practices that integrate conservation needs and development priorities.
- Updated in 2012 to include climate change
  - Projects required to implement, "technically and financially feasible and cost-effective options to reduce project-related GHG emissions

Climate Change and Biodiversity
An Olympian view



- 2012 London Olympics Vision: ‘Use the power of the Games to inspire lasting change’
- Climate Change - Overview
  - Minimize carbon footprint through the design of the venues, the provision of low carbon energy across the site and the inclusion of climate change adaptation measures in its designs.
  - Achieve a 50 per cent reduction in carbon emissions for the built environment by 2013.
- Biodiversity - Overview
  - Olympic Park ~250 hectares site transformed from an area of relatively poor environmental quality into the largest urban park in Europe.
  - At least 45 hectares of new wildlife habitat is being delivered, with the potential to become Sites of Importance for Nature Conservation (SINC).



What is MNR Doing?

MNR Divisions and Branches are being to engage in the Climate Change issue

Based on projected changes, what should <u>Forestry</u> do?
OFRI, 2012

- Enhance protection from disturbance?
- Lower stand density to reduce effects of drought?
- Shorten rotations of affected stands?
- Develop decision-support models for seed allocation in light of climate change (assisted migration)?

…and when should we do it?

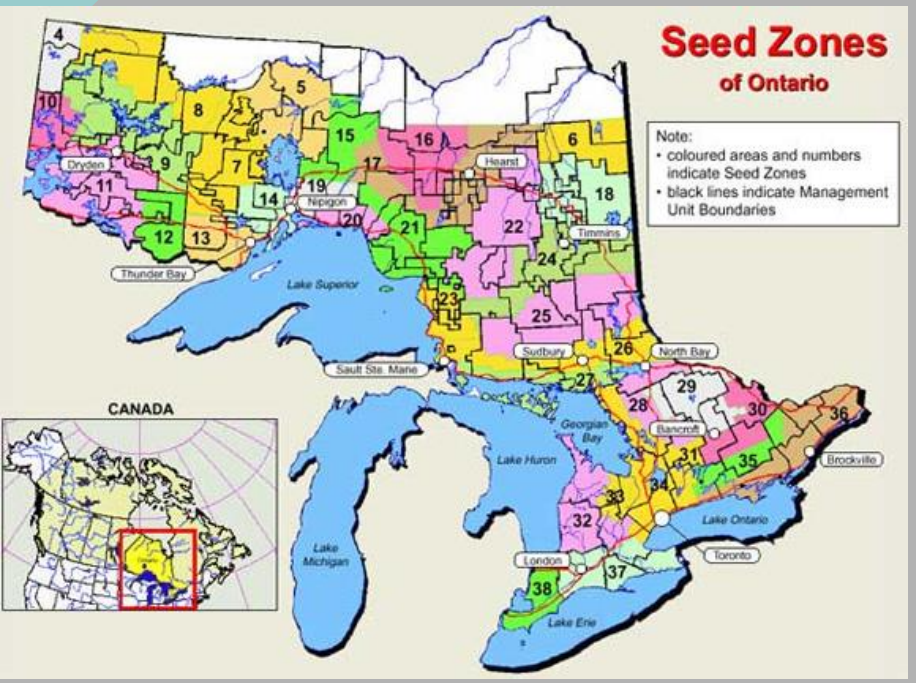
Can we reduce the expected increase in frequency & extent of wildfire?

Of insects?

Ontario uses climate-based seed zones

Can existing seed zones be used with future climate?

- Seed zones relate variation of growing season length (climatic parameters) within each zone to variation in commercial tree species in the province.
- The Ontario Climate Model was used to develop the seed zones. The model helped to balance climatic variability and risk within each zone.



- The Ontario Climate Model combines climatic data with a Digital Elevation Model (DEM) to generate and map climatic "surfaces"
- These surfaces show areas where the climatic is more similar than surrounding areas.

Source: http://www.mnr.gov.on.ca/en/Business/Forests/2ColumnSubPage/STEL02_166255.html

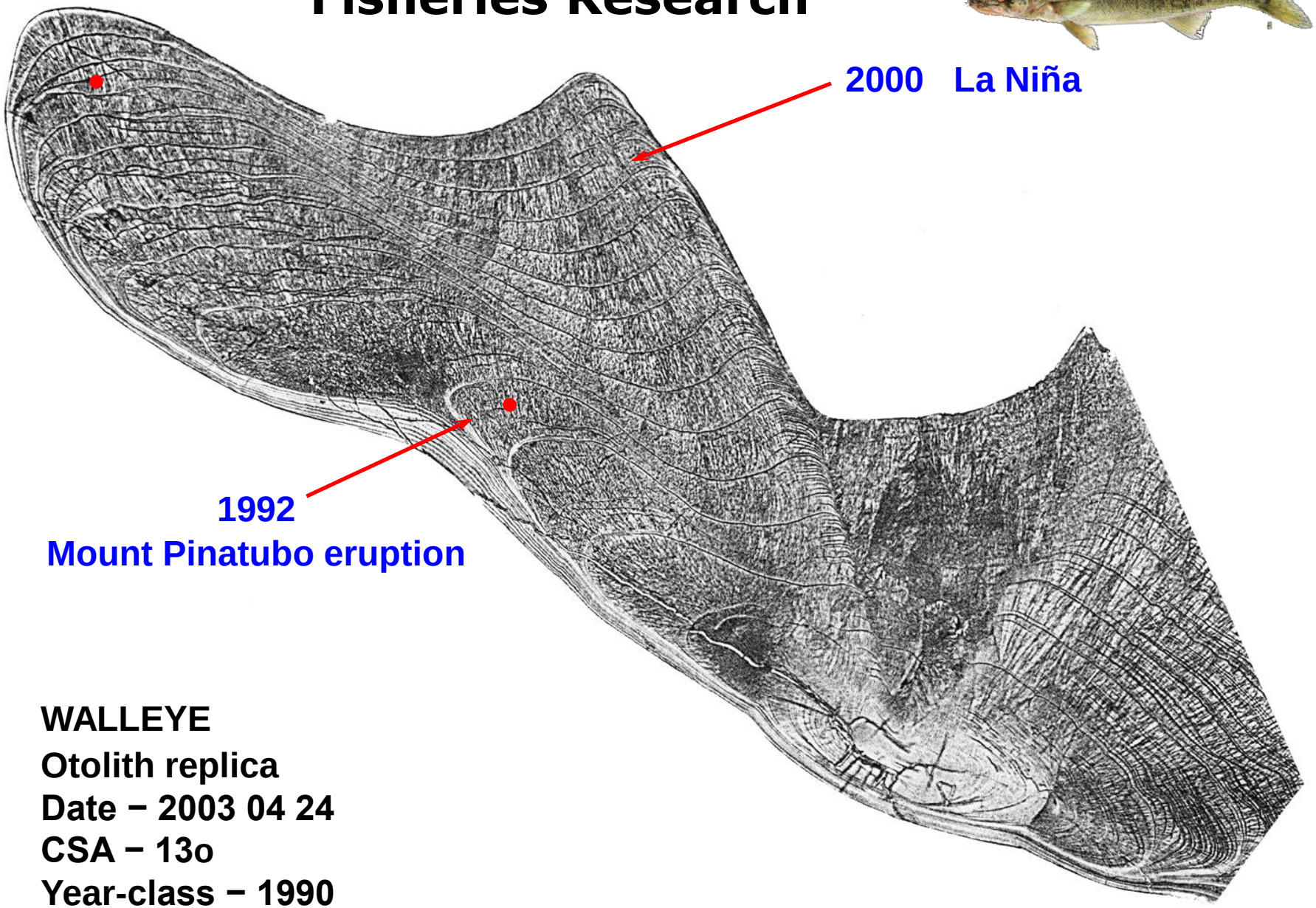
Range wide white pine provenance study

- Established ~1955
- 20 plantations in the US and 2 in Canada (36-48°N)
- 31 seed sources from NE and NC U.S., Ontario, Nova Scotia, New Brunswick

New Research

- MNR has produced a world class body of research into Climate Change impacts on a variety of Natural resource Management themes
- 350+ publications available on the Climate Change website
- Climate Change Research Report Series
- Climate Change Research Note Series
- Peer reviewed journal publications

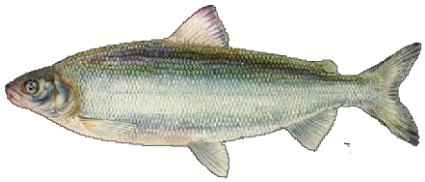
Fisheries Research

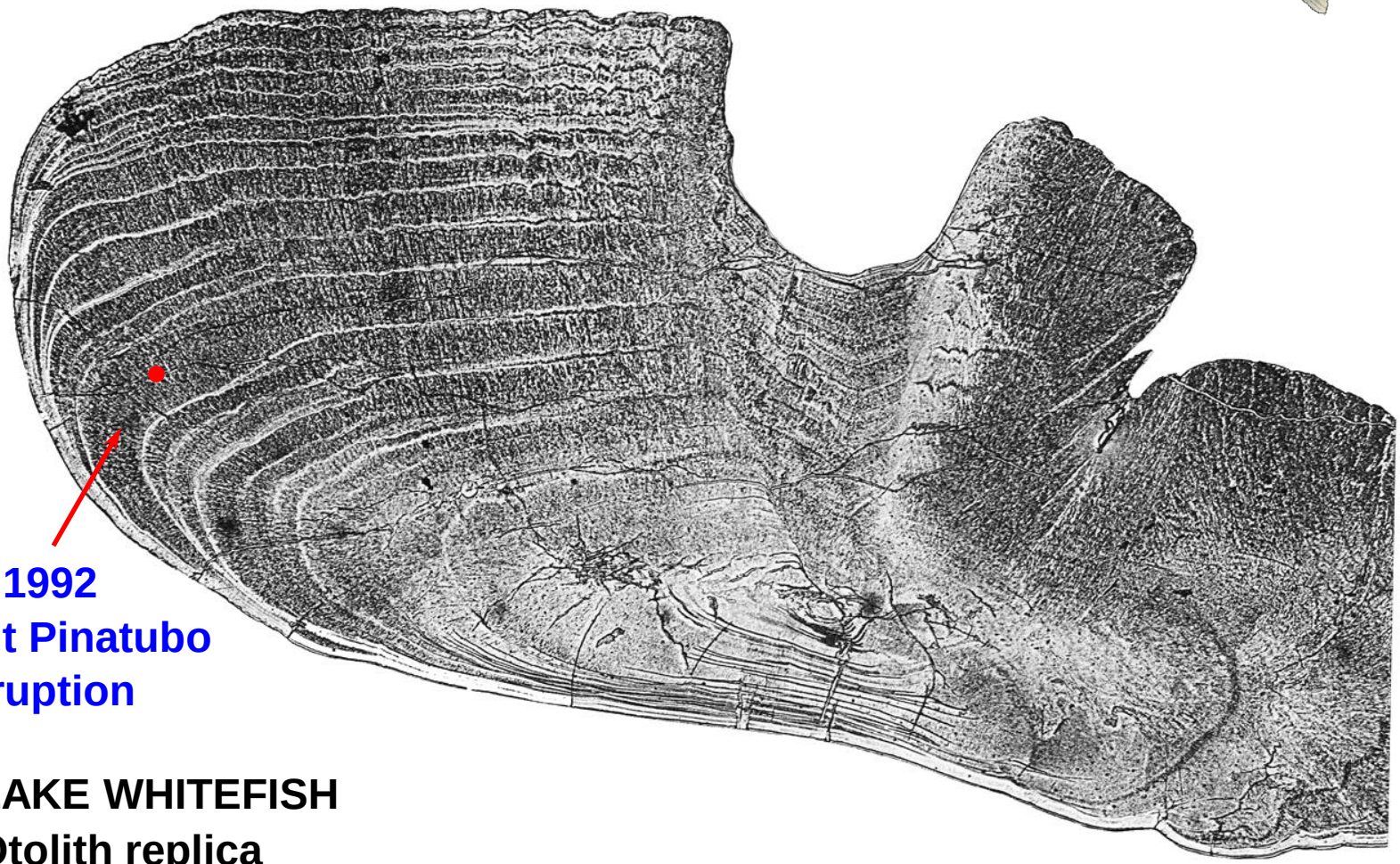


WALLEYE
Otolith replica
Date – 2003 04 24
CSA – 13o
Year-class – 1990
Lake Ontario

Image from Otolith Section

A





1992
Mount Pinatubo eruption

LAKE WHITEFISH
Otolith replica
Date − 2002 10 17
CSA − 15o
Year-class − 1988
Lake Ontario

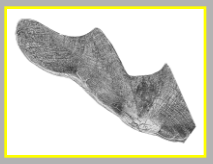
Image from Otolith Section

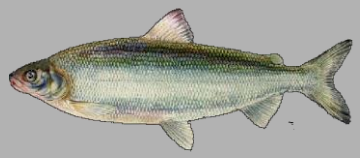
B

Temperature requirements of typical freshwater fish of the three major thermal groupings. ***Essential for understanding thermal response !***

Thermal grouping	Species	Thermal habitat: Spawning	Optimum	Preferred	Mean
Warm-water	bluegill	23.7	30.2	31.3	30.8
	white perch	20.1	28.8	29.8	29.0
	smallmouth bass	18.0	27.0	27.4	27.2
	Mean	20.6	28.7	29.5	29.0
Cool-water	yellow perch	9.3	22.5	23.3	22.9
	walleye	8.0	22.6	21.7	22.2
	northern pike	6.9	20.0	23.5	21.8
	Mean	8.1	21.7	22.8	22.3
Cold-water	brook trout	8.7	15.0	13.0	14.0
	lake whitefish	5.7	15.2	11.1	13.2
	lake trout	10.6	11.7	11.2	11.5
	Mean	8.3	14.0	11.8	12.9

Relative change in otolith growth and body length and weight for Lake Ontario smallmouth bass, walleye, and lake whitefish in an increasing nearshore summer temperature regime.



Species	Temperature		Otolith growth (%)	Change in body size (%)	
	Mean (ºC)	Change		Length	Weight
Smallmouth bass	22.6	0			
	23.6	+1º	+9.4	+9.2	+33.0
	24.6	+2º	+19.0	+18.1	+68.4
	25.6	+3º	+28.2	+27.6	+92.0
Walleye	22.6	0			
	23.6	+1º	+10.1	+9.1	+32.8
	24.6	+2º	+20.3	+18.1	+63.3
Lake whitefish	22.6	0			
	23.6	+1º	- 11.0	- 4.5	- 14.3
	24.6	+2º	- 22.1	- 9.4	- 28.1
	25.6	+3º	- 33.1	- 14.4	- 41.2

SUMMARY: RECRUITMENT CHANGE AND COMMUNITY STRUCTURE

A summary of relative changes for typical warm-water, cool-water, and cold-water species in an increasing temperature regime of 1-3°C.

Thermal grouping / Species	Recruitment change			Community structure (%)		
	+1°C	+2°C	+3°C [a]	0°C	+1°C	+2°C
Warm-water						
smallmouth bass	+2.5x	+6.0x	+14.7x	33	69[b]	93[c]
Cool-water						
northern pike	-2.4x	-17.9x		33	12	1
Cold-water						
lake trout	-1.5x	-2.4x	-20.1x	33	19	6

[a] Extrapolated

[b] Recruitment would increase by 2.1x with a 1°C increase

[c] Recruitment would increase by 2.8x with a 2°C increase

Trends that may matter to Ontario Fisheries

Changes to the hydrological cycle across Eastern north America

- Less precipitation as snow and less snow accumulation
- Earlier snow melt
- Earlier and lower spring flows
- Increased winter flows
- Higher flood levels
- Shorter period of ice cover
- More extreme weather events including drought

Changes to water chemistry

- Increased Water Temperatures
- Decreased dissolved oxygen
- Deeper metalimnion with stratification extending later into the fall
- Increase nitrate levels in streams

Key Points

- Climate change is happening in aquatic ecosystems in Ontario

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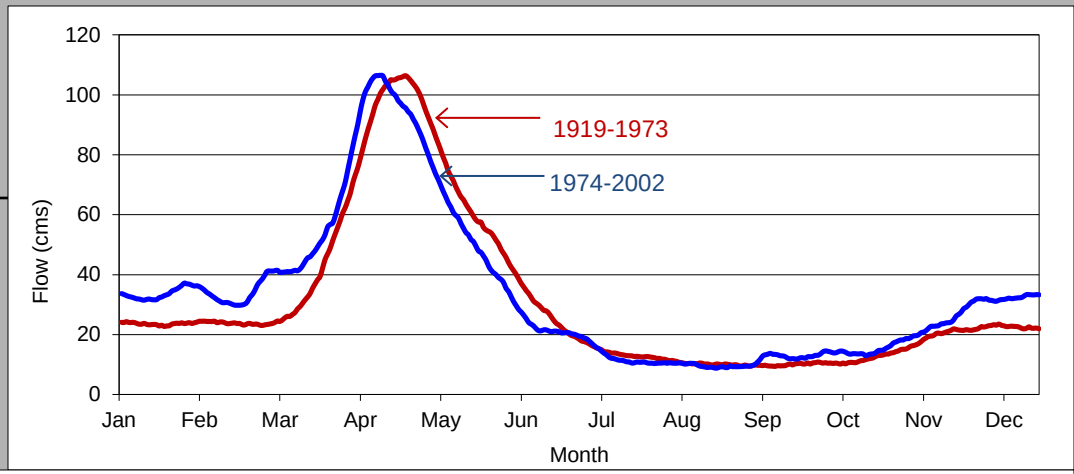
- Climate patterns operating at oceanic scales affect us here in Ontario ~ a global phenomenon

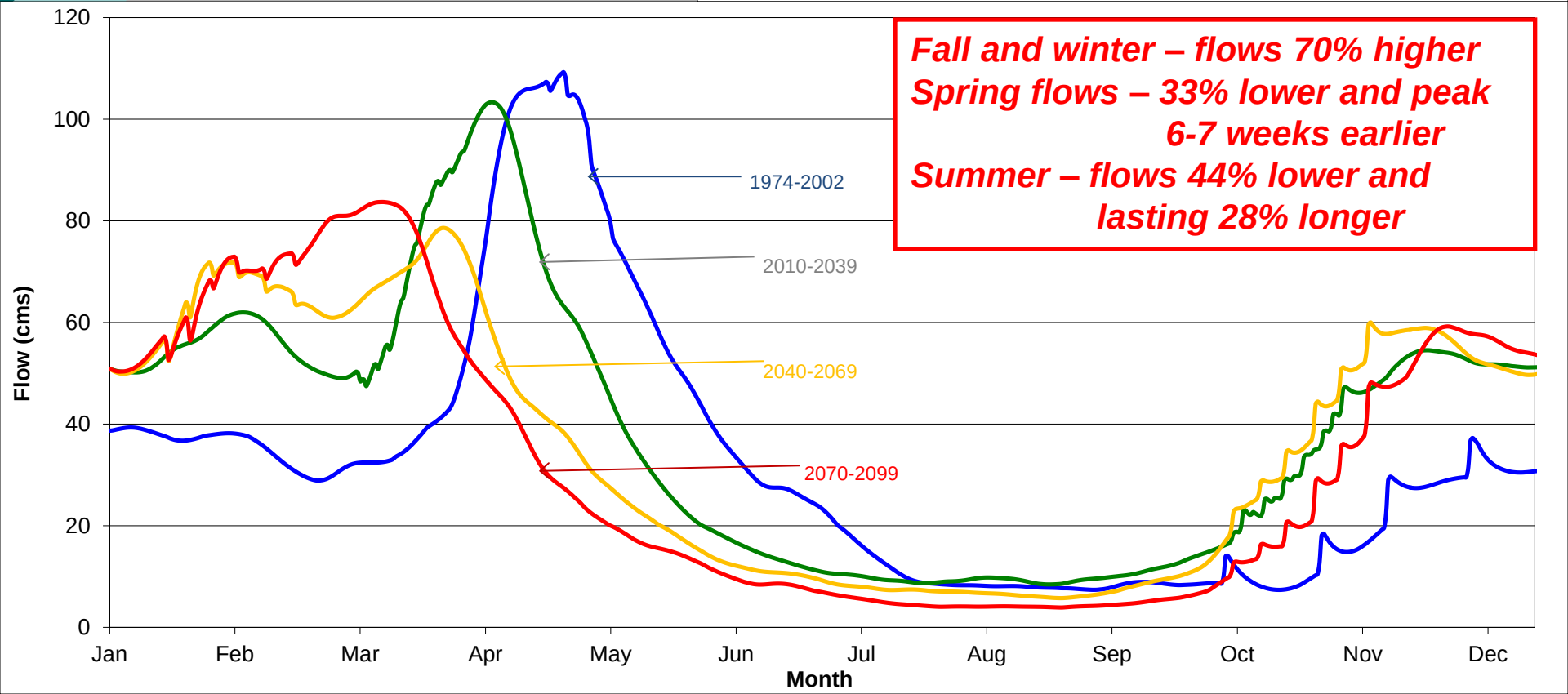
- In general:
  - Species at the northern limit of their range will do better having the potential opportunity for range expansion to the north
  - Cold water species will be affected negatively
  - Cool water species will see gains and losses
  - Warm Water species will benefit
  - Bass spawning season is earlier.
  - Bass nesting numbers are higher.
  - Bass fishing season has already been adjusted in some jurisdictions

- Smallmouth bass are a climate 'winner' in projections of future climate change, Lake Trout will be challenged by climate change

Hydrological Modeling, Mean Daily Stream Flow

Mississippi River at Appleton (WSC 02KF006)



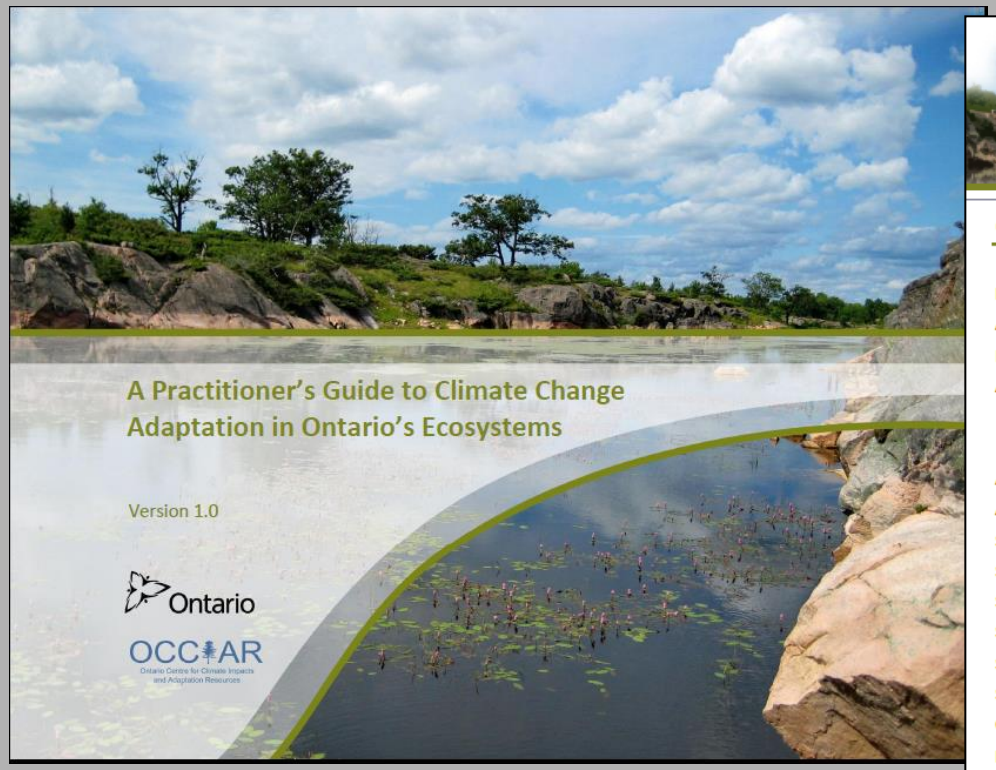


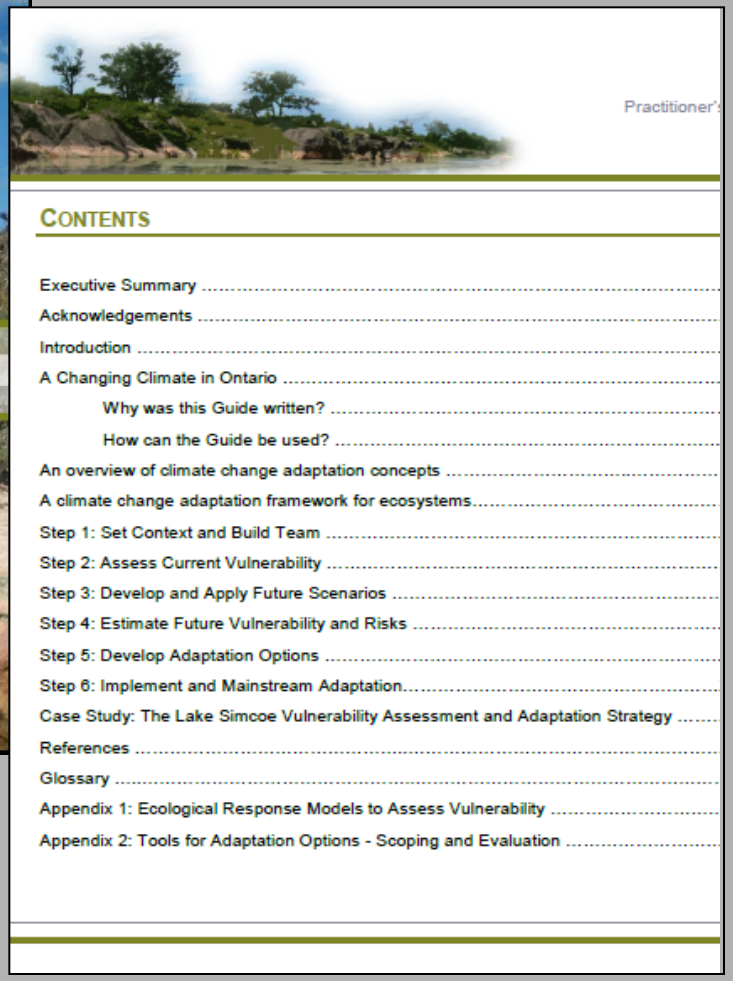
Fall and winter – flows 70% higher
Spring flows – 33% lower and peak 6-7 weeks earlier
Summer – flows 44% lower and lasting 28% longer

This all comes together in Climate Change Adaptation Strategies, … so a Practitioner's Guide was created

- To help organizations and natural resource practitioners prepare for climate change.
- To demonstrate how a suite of tools (e.g. vulnerability assessments) can be used to inform adaptation efforts.
- To provide a general framework and worksheets that can be used by practitioners from a variety of disciplines.

Climate Change Adaptation Planning for Environmental Values





Practitioner's

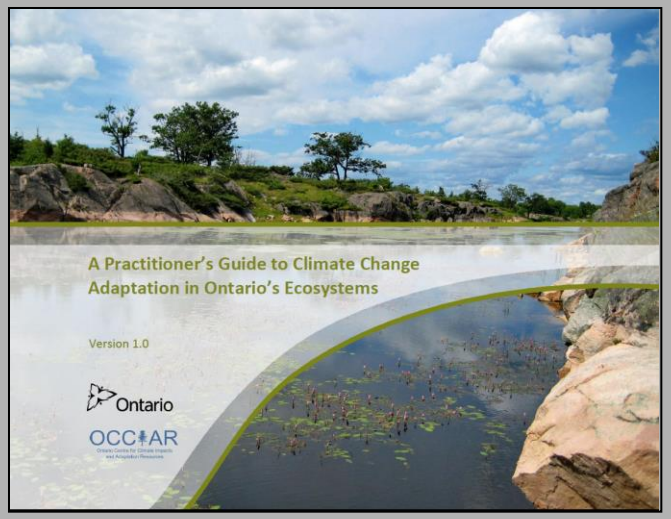
CONTENTS

You can find the Guide at:

http://ontario.ca/s364

Key elements of Practitioner's Guide

- Introduces climate change adaptation, vulnerability and risk
- Describes vulnerability and risk assessment tools and techniques that can be used
- Outlines a framework for action
- Provides examples of projects



Examples of vulnerability assessments

Lake Simcoe watershed:

- Vulnerability assessment of wildlife, hydrology, invasive species, species-at-risk, aquatic habitat, tourism
- Development of local adaptation plan with actions to address projected impacts

Northeast Clay Belt:

- Vulnerability assessment of forests (composition, fires, blowdown, insects), wildlife, aquatic habitat, soils, tourism
- Scoping adaptation options to cope with projected impacts

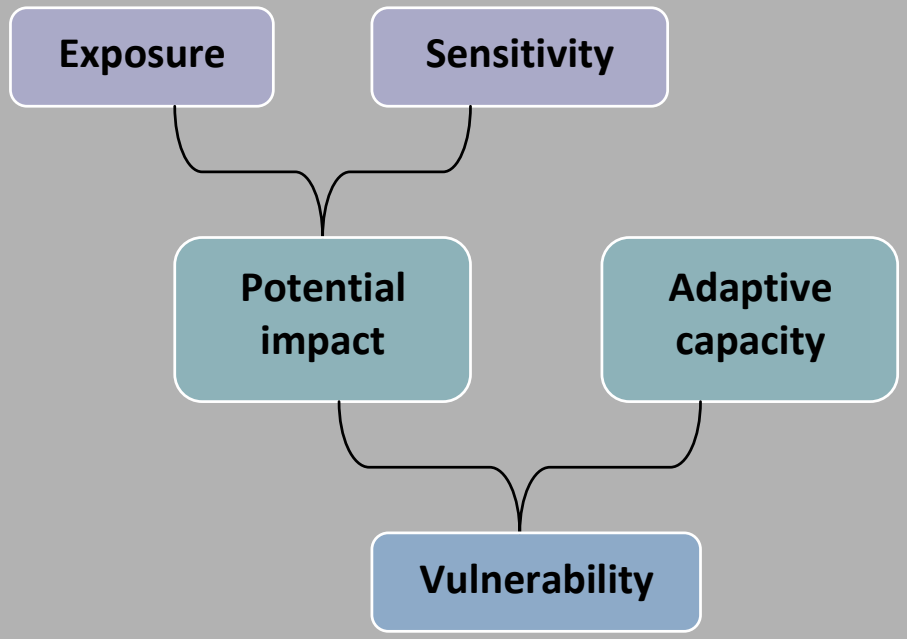
An adaptation framework

Step 1	Set context for assessment and build team
Step 2	Assess current vulnerability
Step 3	Develop and apply future scenarios
Step 4	Estimate future vulnerability and risks
Step 5	Develop adaptation options
Step 6	Implement and mainstream adaptation

Step 4 — Estimate future vulnerability and risks

- Risk assessment used in many fields to think about future issues.
  - A complimentary approach called 'vulnerability assessment' may provide valuable insights, particularly from an ecosystem perspective.
- "Vulnerability to climate change is the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes."

IPCC, 2007. Fourth Assessment Report: Impacts, Adaptation and Vulnerability.



A sensitive species example of vulnerability: Eastern Hemlock (*Tsuga canadensis*)

Hemlock, an important tree species found in the Great Lakes-St. Lawrence forest ecosystem, can be used as an example of how the components of vulnerability relate to one another. Brief definitions introduce each component.

Exposure: the nature and extent to which the species or system is exposed to significant climate variation. More extreme weather events, including extended droughts and heat waves, are projected with climate change throughout Ontario, including southern and central Ontario where hemlock grows.

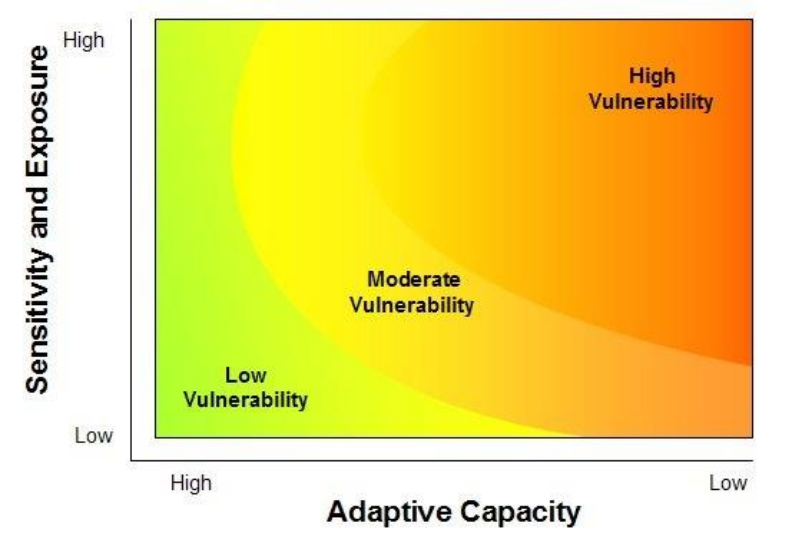
Sensitivity: how affected a species or system is by being exposed to a stress. Eastern hemlock requires cool, moist sites to regenerate and thrive. It is quite sensitive to dry and hot conditions and experiences significant stress under these conditions. In addition, hemlock is a preferred browse species of white-tailed deer; since warmer winters result in less snow cover, hemlock seedlings would be exposed to more browsing pressure.

Adaptive Capacity: the ability or potential of a species or system to respond successfully to climate variability and change. Hemlock's natural ability to adapt to climate change stresses is limited. Its slow growth rate as a seedling makes it less adaptable to heat and drought conditions that would limit its growth, cause significant mortality, and make it less competitive than other Great Lakes-St Laurence tree species. Strategies to keep hemlock in the Great Lakes-St. Lawrence forest ecosystem could include management techniques such as seeding and planting of hemlock on suitable sites around water bodies and assisted migration to appropriate sites further north.

Hemlock [Stan Vasiliauskas, MNR]

Step 4 — Estimate future vulnerability and risks

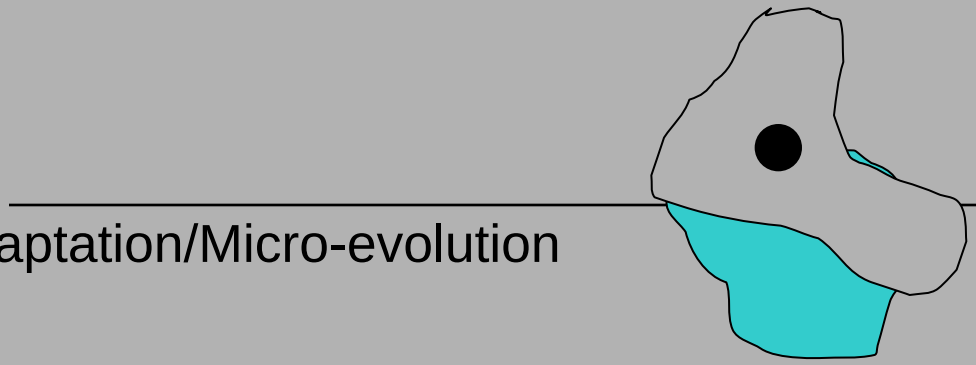
- Using results of analysis, identify and describe future vulnerabilities
  - Rank each indicator's future vulnerability High, Medium, or Low using information about sensitivity, exposure and adaptive capacity



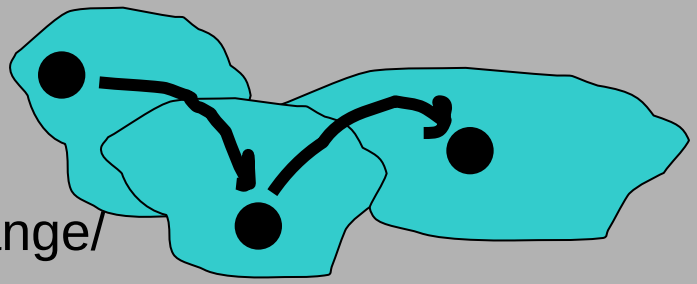
(adapted from Alberta Sustainable Resource Development, 2010)

- Consider the consequences and likelihood of the vulnerabilities from different risk perspectives (financial, safety, operational etc.)

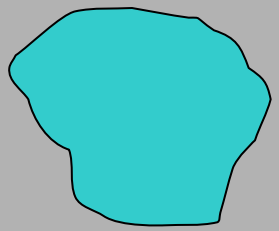
Adaptive Capacity: Organisms will respond to Rapid Climate Change [Adapt, Move, or Die]



Adaptation/Micro-evolution



Home Range Change/
Migration



Extirpation/Extinction

CAT FOUND!

-Black and tan w/ gray
-No collar
-Male
-**Not** friendly!! I think he might be scared!
-Not house broken!!
-Found @ 27th & A1A 711 by dumpster

If this is your cat please call Tyler ASAP @ 386-690-5801

TYLER 386 690 5801

Step 5 — Develop adaptation options

- Climate change adaptation actions helps to reduce or eliminate vulnerabilities and risks

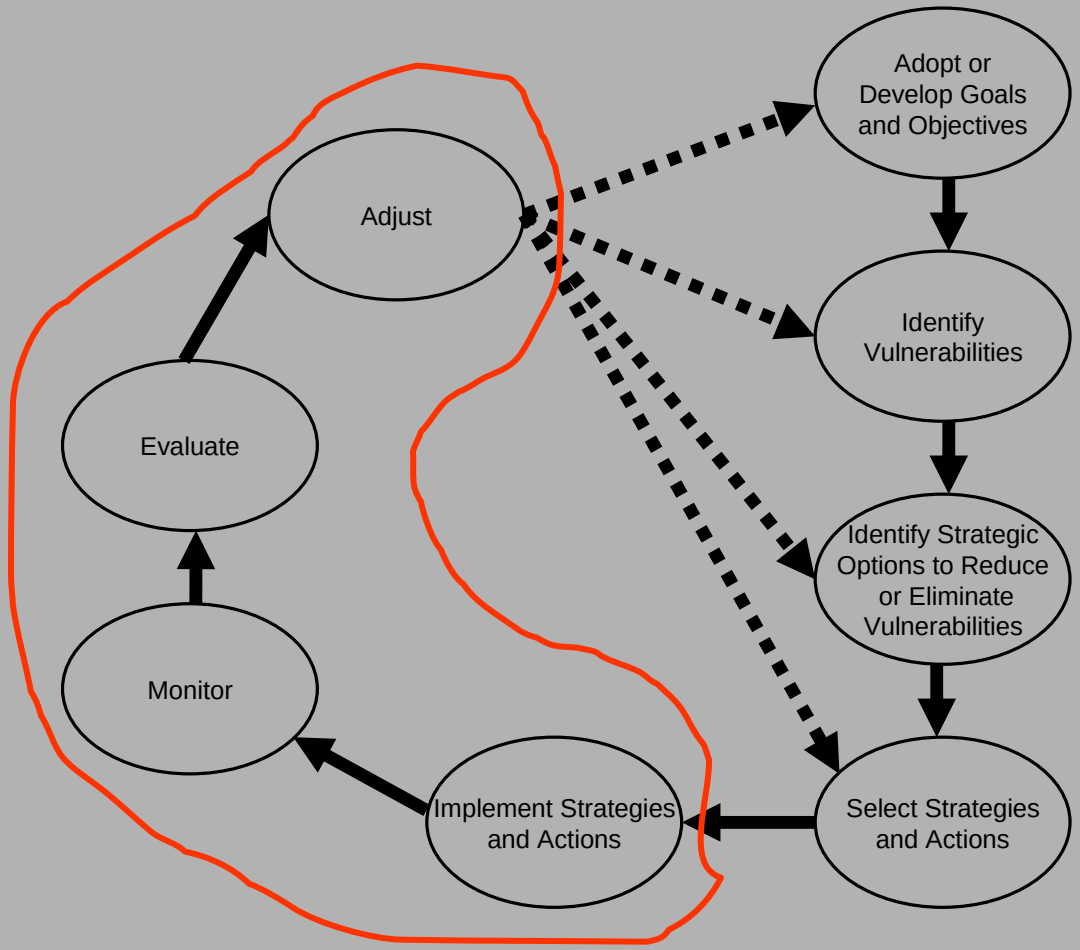
- Adaptation options come in all forms, shapes, sizes and can:
  - Reduce threats
  - Enhance resilience
  - Engage people
  - Improve knowledge

- Recommended to involve partners, stakeholders, public and organizations that will implement the actions in an evaluation of:
  - Implementation costs
  - Technical and institutional feasibility
  - Likely benefits
  - Social acceptability
  - Ecological suitability etc.

Step 6

Implement and mainstream adaptation

Implementation of climate change adaptation plans and strategies will require an adaptive management approach



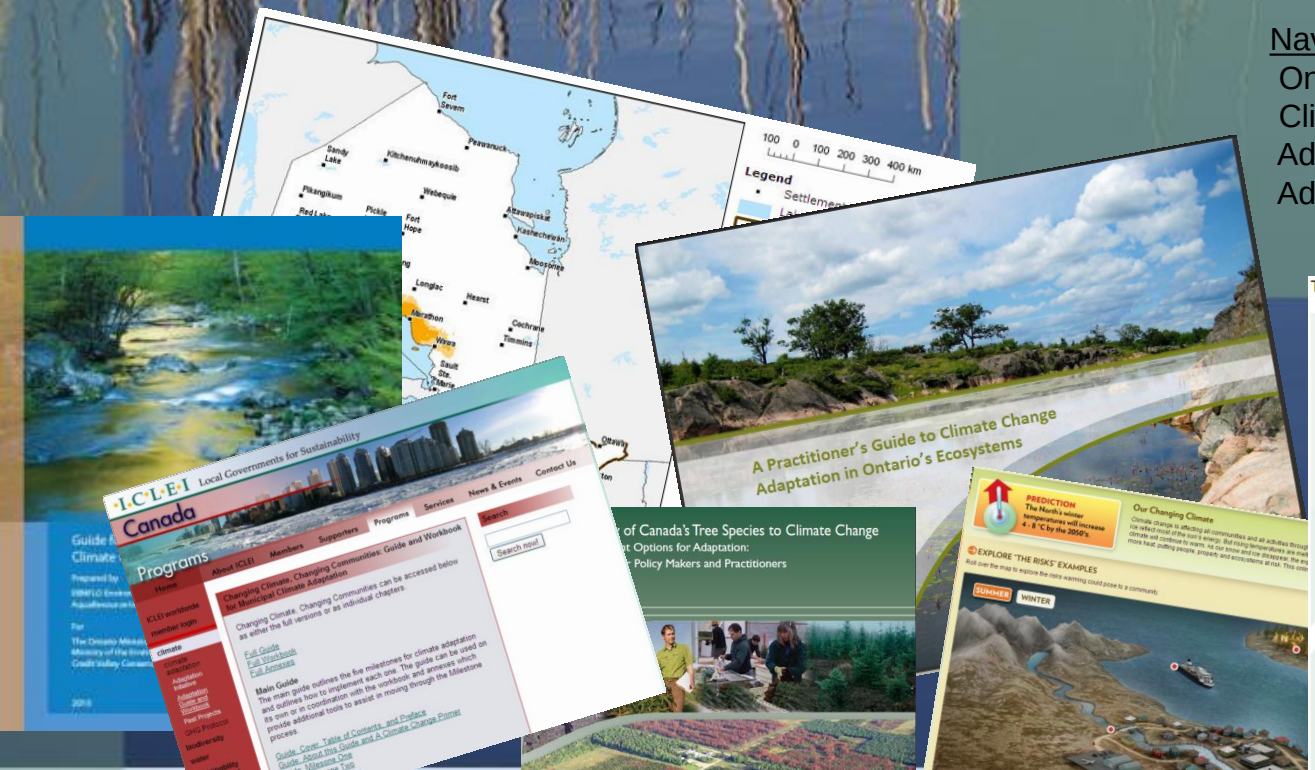
Ministry of Natural Resources

Ontario

Natural. Valued. Protected.

Climate Change Adaptation Toolbox

Cool Tools for a Hot Climate!



Navigate to:

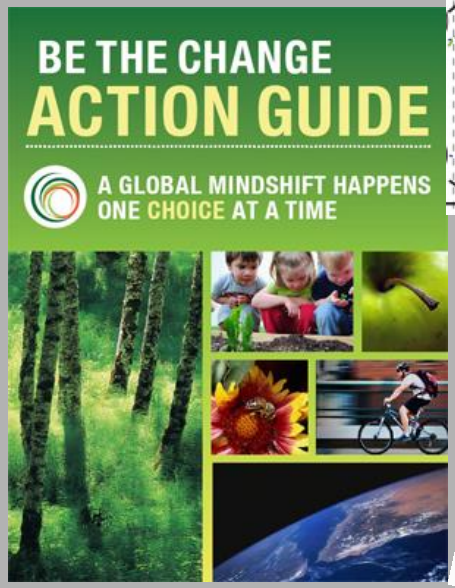
Ontario Ministry of Natural Resources
Climate Change
Adapt
Adaptation toolbox

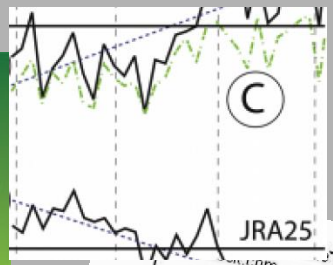
The General Idea…

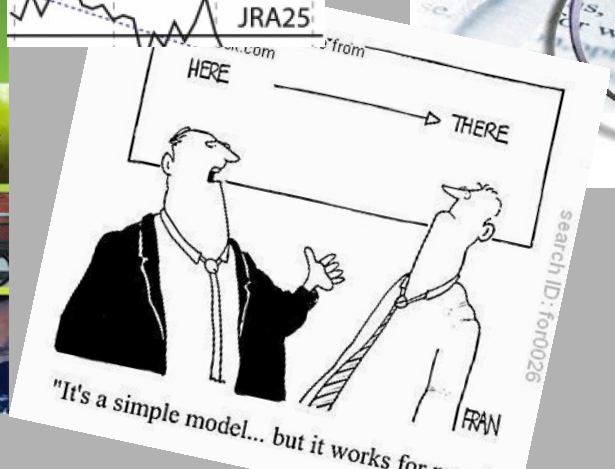
Tool type: models, guides, data sets, case studies and interactive mapping tools

Audience: conservation practitioners, resource managers, planners, policy makers, and Aboriginal communities

Theme: aquatic, terrestrial, general climate or community







Cool Tools for a Hot Climate!

Name	Organization ▲	Description	Type	Theme
Circuitscape Project (2009)	Circuitscape.org	Circuitscape predicts patterns of movement, gene flow, and genetic differentiation among plant and animal populations, information that can be used to identify and prioritize important areas for activities such as connectivity conservation.	Interactive Tool	Terrestrial
Climatic Atlas (2009)	Environment Canada	Environment Canada's climatic atlas is a five volume series of historic climate data (eg. temperature, precipitation, and solar radiation, etc.) portrayed visually on national maps. The archive provides over 400 maps of climate data!	Data set	Climate
A Practitioner's Guide to Climate Change Adaptation in Ontario's Ecosystems (2011)	Ministry of Natural Resources	This guide introduces the concepts of climate change adaptation, vulnerability and risk. It also provides assessment tools and techniques for these concepts, and a framework to support adaptive management. The guide identifies ways that climate change vulnerabilities and risks can be integrated into decision-making processes.	Guide	Climate
Climate Change Publications (various publication dates)	Ministry of Natural Resources	This link to MNR's climate change publications includes guides, technical papers and the Climate Change Research Report series.	Guide	All

Peel Climate Change Strategy

A Strategic Plan for Climate Change for the Geographic Region of Peel

Updated June 20, 2011

www.peelregion.ca/climatechange

In Summary

- Climate Change, seen as a science problem that has be solved by technology and regulation is not getting the traction required to solve the issues involved
- Solutions that do not address “hearts and minds” will not be effective
- Solutions acceptable to the general public will come together at the level of “Achieving Sustainability” and “Maintaining Quality of Life”

At the end of the day, Climate Change Adaptation involves a lot of common sense,

…Just keep the trees

Sustainable Landscape Management

…Maintaining and Increasing natural cover (forests, wetlands, grasslands) on the landscape of southern Ontario is a value added solution to many of our problems and issues

Lake Stewardship

… Everything that we already know we have to do to maintain healthy lakes is also what we have to for enhancing our resilience to climate change

Adaptation:
Managing what we cannot avoid!

Confederation Bridge

Constructed 1 metre higher to account for sea level rise under climate change

Mitigation:
Avoiding what we cannot manage!

Extensive Frost Damage in North-Western Ontario, Spring 2012

"We have, as a species, stone-age emotions. We have medieval institutions and we have God-like technology. And that's a dangerous combination"….E.O. Wilson

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"What is the use of having developed a science well enough to make predictions, if in the end all we're willing to do is stand around and wait for them to come true?"
…..Sherwood Rowland (discovered ozone hole)

End Note:
Slides for this presentation have been stolen from: Paul Gray, Steve Colombo, John Casselman, Steve Hounsell, and many others