Biodiversity and Climate Change

Parc des Grands Jardins, Quebec; photo J. Brisson

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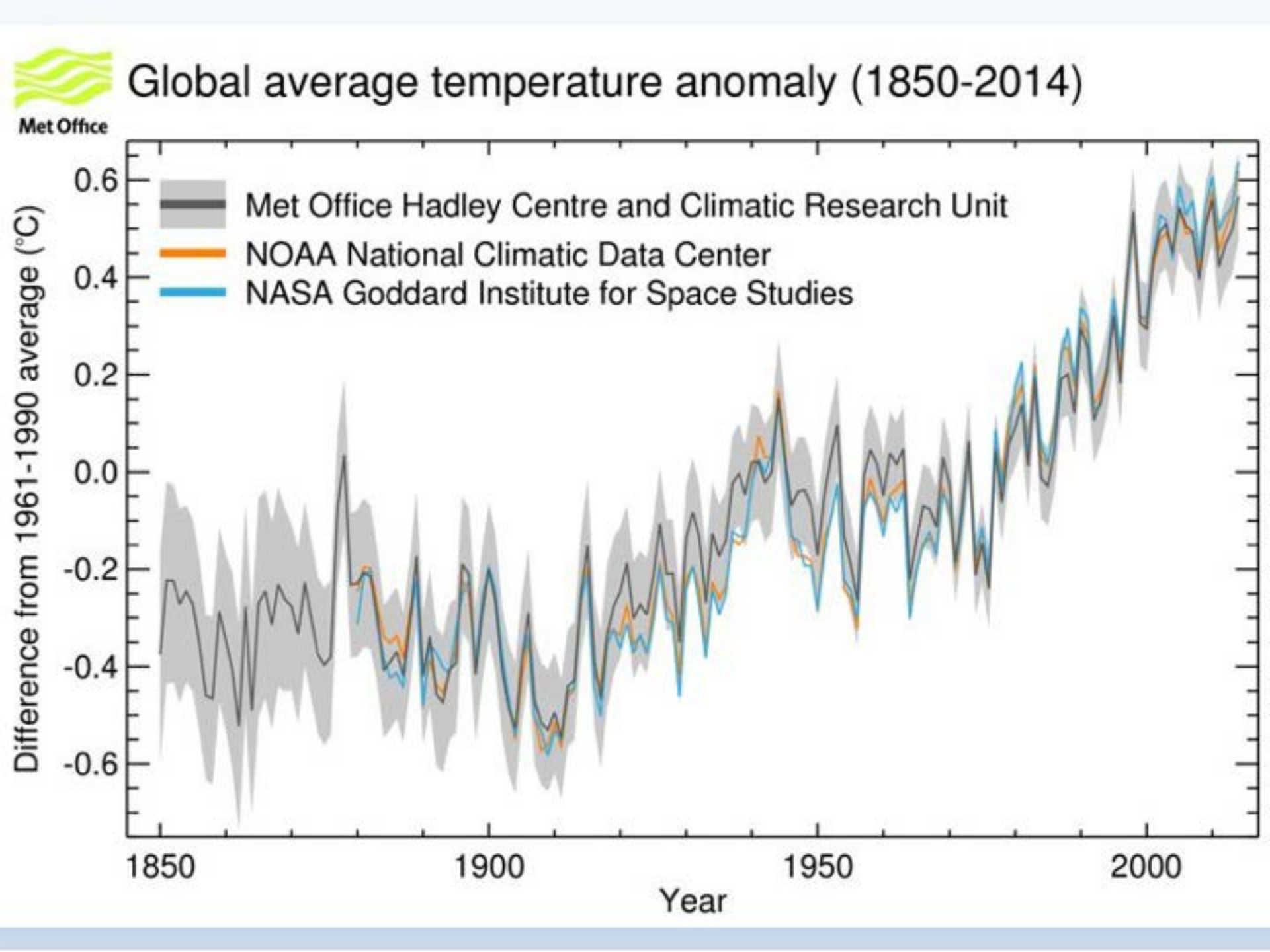
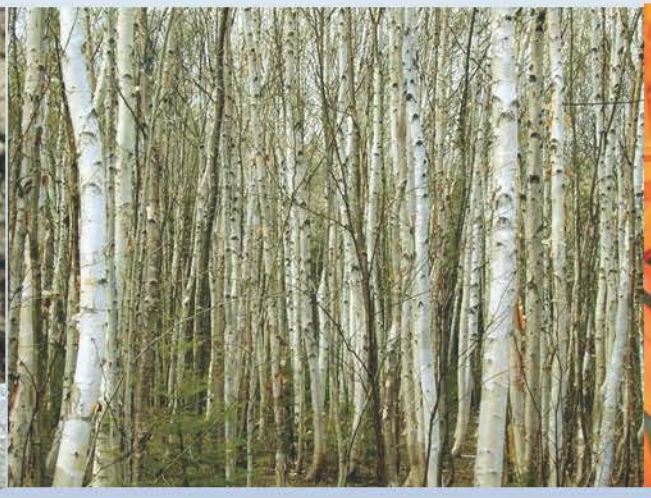
Commission For Environmental Cooperation, JPAC Public Forum, ***Merida, September 2016***

Polar Bear, Coats Island, Nunavut, summer 2016


Met Office
Global average temperature anomaly (1850-2014)
Met Office Hadley Centre and Climatic Research Unit
NOAA National Climatic Data Center
NASA Goddard Institute for Space Studies
Difference from 1961-1990 average (°C)
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
1850
1900
1950
2000
Year

What do we know about biodiversity?

Biodiversity refers to the variety and variability of life on Earth


What do we know about biodiversity?

It took time – deep time - to get a biodiverse Earth: millions of years of evolution

Biodiversity represents the many different solutions life has found, over time, to cope with environmental challenges

What do we know about biodiversity?

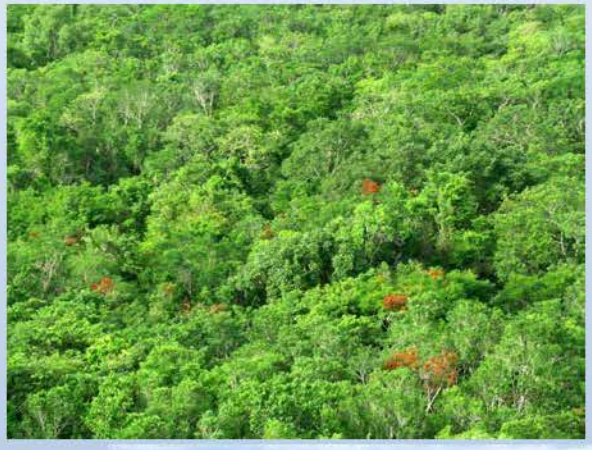
Biodiversity shows spatial structure:
North America characterised by strong geographic gradients

Species composition and species richness change with climate, with generally fewer species as you go north

With species migrating northward, is our biodiversity future to the south? Implications for transboundary conservation?

What do we know about biodiversity?

Biodiversity provides services on which we depend



e.g., Regulation of carbon cycle by forests or wetlands; water filtration, sediment retention, erosion control

These services are important given the need for carbon sinks and for coastal buffers against increasing sea level or storm

What do we know about biodiversity?

Benefiting from these services depends on retaining ecosystems and species that provide them

TorontoTraffic.jpg

hcoastalcare.org

Assess land cover changes in relation to loss of ecosystem functions or services critical to CC mitigation or adaptation

Retain capacity of ecosystems and species to migrate inland, upward or northward in response to warming trends and increasing sea levels ('coastal squeeze')

Consider opportunities for restoration

What do we know about biodiversity?

Diverse landscapes, ecosystems and species communities generally function better than less diverse ones

What do we know about biodiversity?

At ecosystem and community level, diversity provides:

- **Functional redundancy** : different species provide a similar function. You can loose some species but retain the function
- **Functional complementarity**: different species provide different functions depending on conditions; some species can take over when conditions change
- **Resilience** or stability: the capacity to resist or rebound from changes
- **Capacity for adaptation** in the short term and the long-term

What do we know about biodiversity?

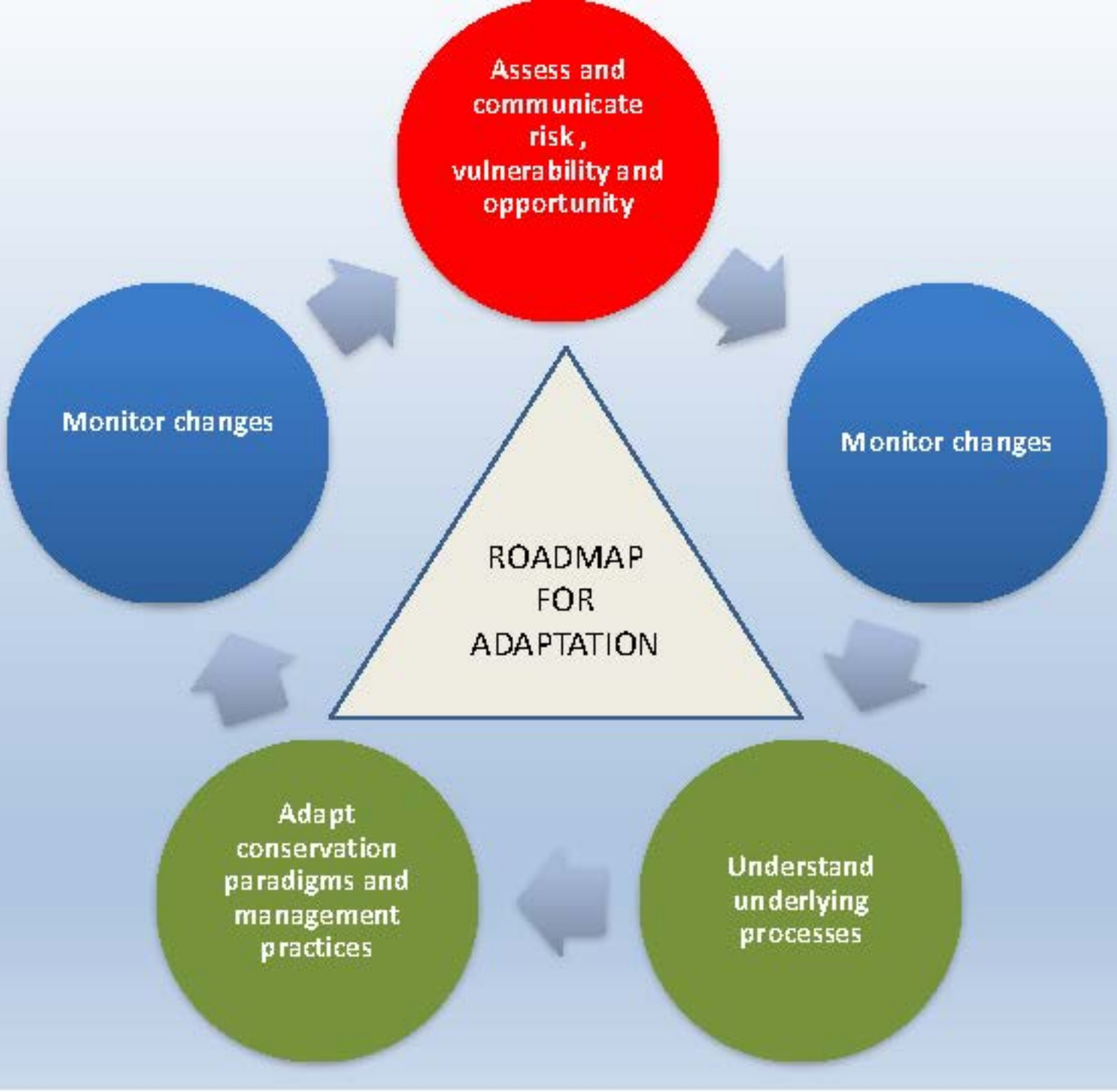
Street trees in Montreal and Emerald Ash Borer

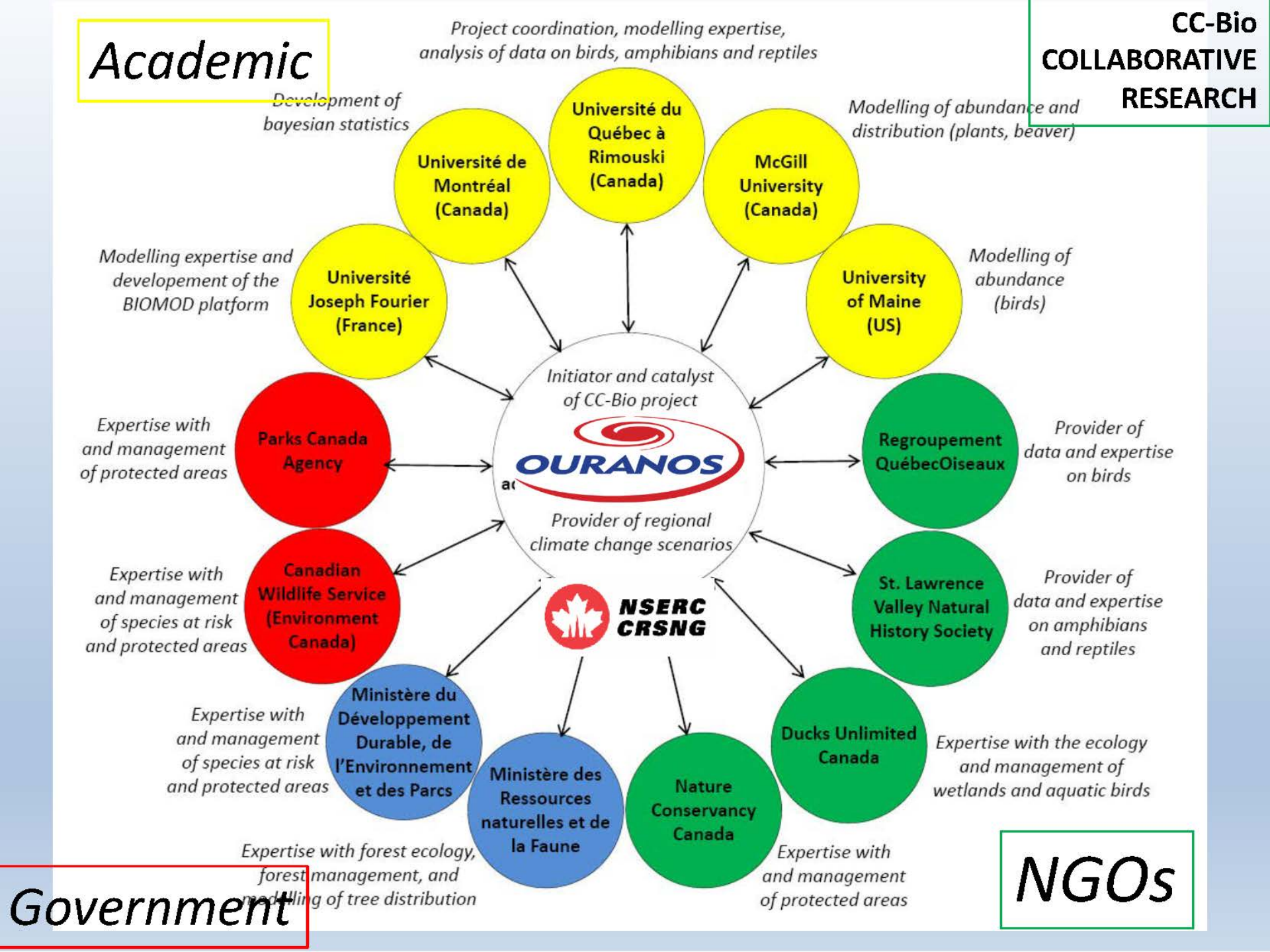
Bottom line: diversify, diversify, diversify!

Even more important when conditions are changing and there is much uncertainty … as with climate change

- Preserve functions and services even if species or conditions change
- Allow nature to adapt
- Allow humans to adapt

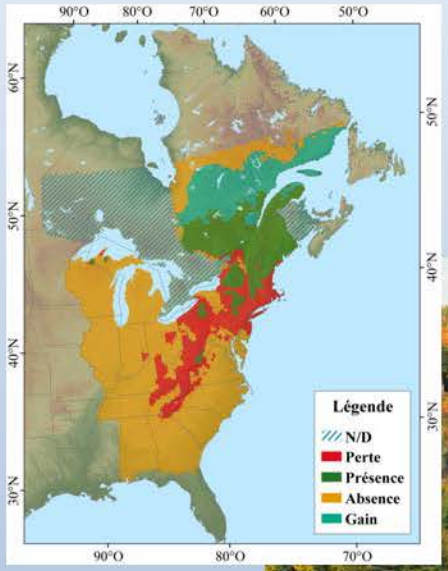
Indigenous agricultural landscape, Guatemala. Photo: G. MacEwan, McGill University

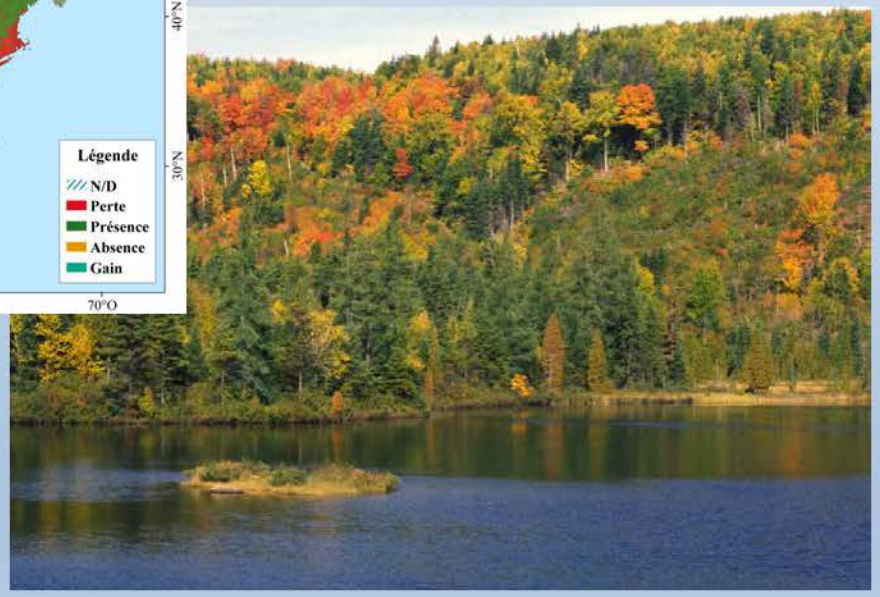

Assess and communicate risk, vulnerability and opportunity
Monitor changes
Understand underlying processes
Adapt conservation paradigms and management practices
Monitor changes
ROADMAP FOR ADAPTATION


CC-Bio
COLLABORATIVE
RESEARCH
Academic
Project coordination, modelling expertise, analysis of data on birds, amphibians and reptiles
Development of bayesian statistics
Université de Montréal (Canada)
Université du Québec à Rimouski (Canada)
McGill University (Canada)
Modelling of abundance and distribution (plants, beaver)
Modelling expertise and developement of the BIOMOD platform
Université Joseph Fourier (France)
University of Maine (US)
Modelling of abundance (birds)
Initiator and catalyst of CC-Bio project
OURANOS
Provider of regional climate change scenarios
Parks Canada Agency
Expertise with and management of protected areas
Regroupement QuébecOiseaux
Provider of data and expertise on birds
Canadian Wildlife Service (Environment Canada)
Expertise with and management of species at risk and protected areas
NSERC
CRSNG
St. Lawrence Valley Natural History Society
Provider of data and expertise on amphibians and reptiles
Ministère du Développement Durable, de l'Environnement et des Parcs
Expertise with and management of species at risk and protected areas
Ministère des Ressources naturelles et de la Faune
Nature Conservancy Canada
Ducks Unlimited Canada
Expertise with the ecology and management of wetlands and aquatic birds
Expertise with forest ecology, forest management, and modelling of tree distribution
Expertise with and management of protected areas
Government
NGOs

Risk

Dominant tree species vulnerable to climate change over large portions of their northern range

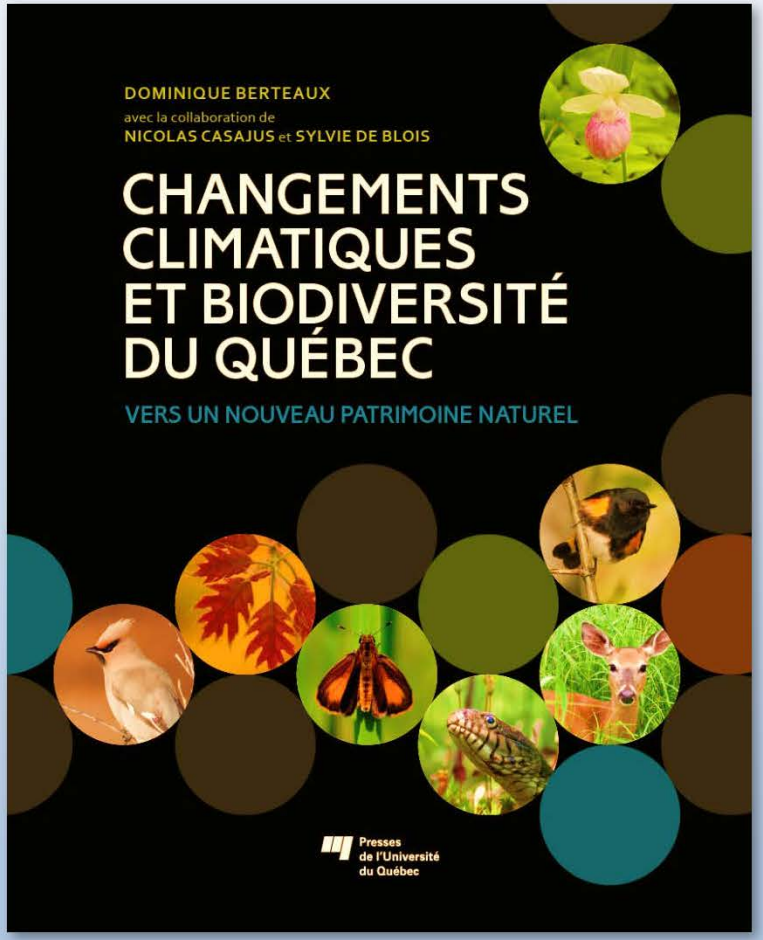




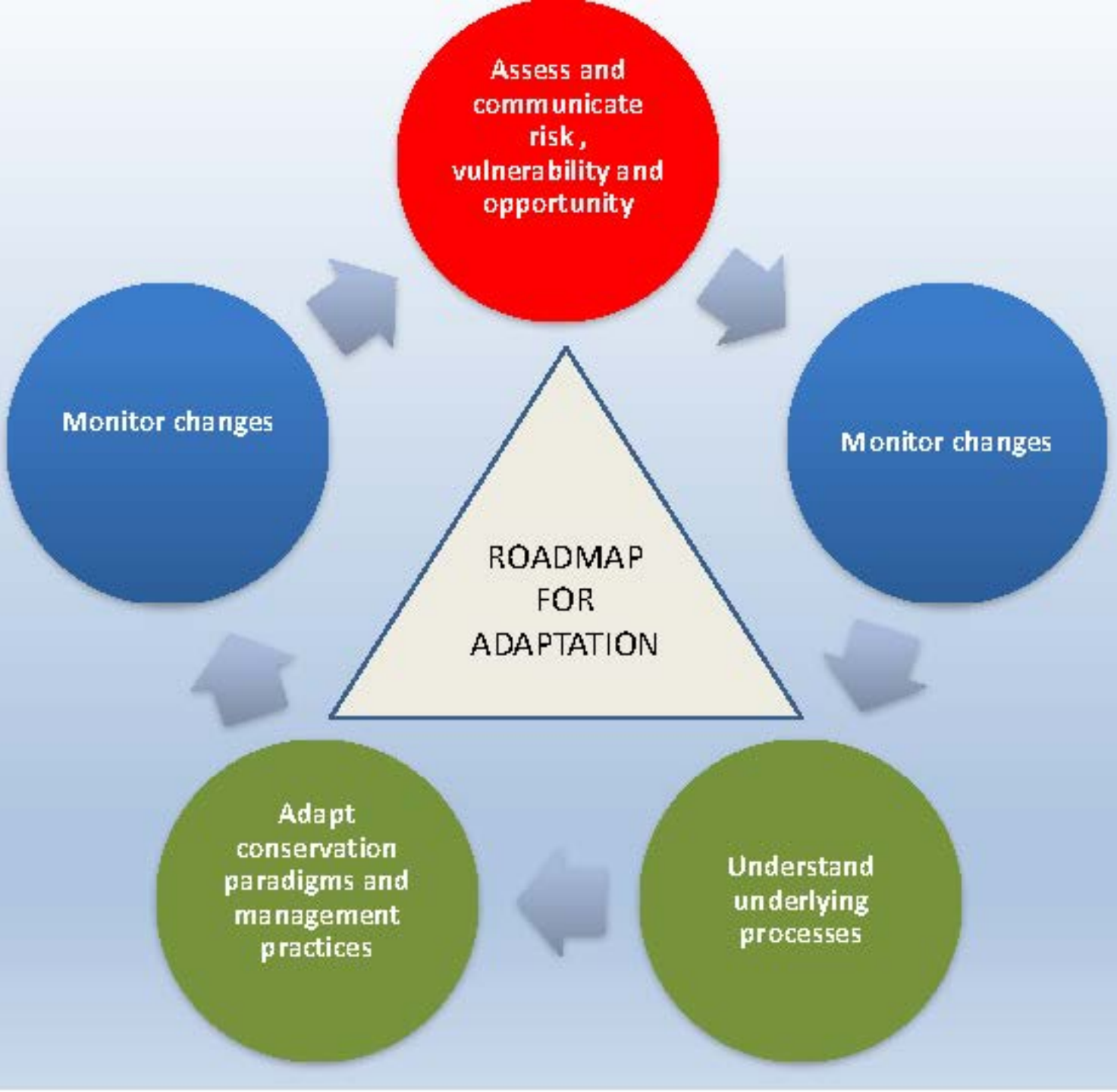
Depending on species, 5–21% of currently climatically suitable habitats are projected to be at risk of becoming unsuitable with climate change in this century

Périé and de Blois. 2016. Dominant forest tree species potentially vulnerable to climate change over large portions of their range even at high latitudes. PeerJ 4:e2218; DOI 10.7717/peerj.2218

CC-Bio: Climate Change and Biodiversity



Berteaux D., Casajus N., de Blois S. 2014. Changements climatiques et biodiversité du Québec : vers un nouveau patrimoine naturel. *Presses de l'Université du Québec*, Québec, Canada. 202 pages.
http://cc-bio.uqar.ca/english/en_atlas.html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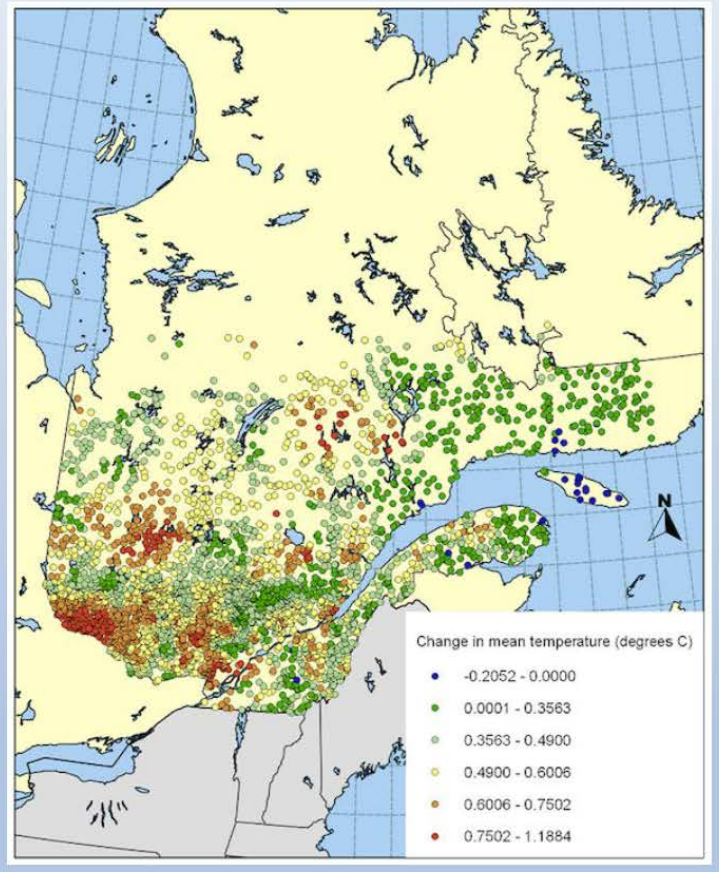
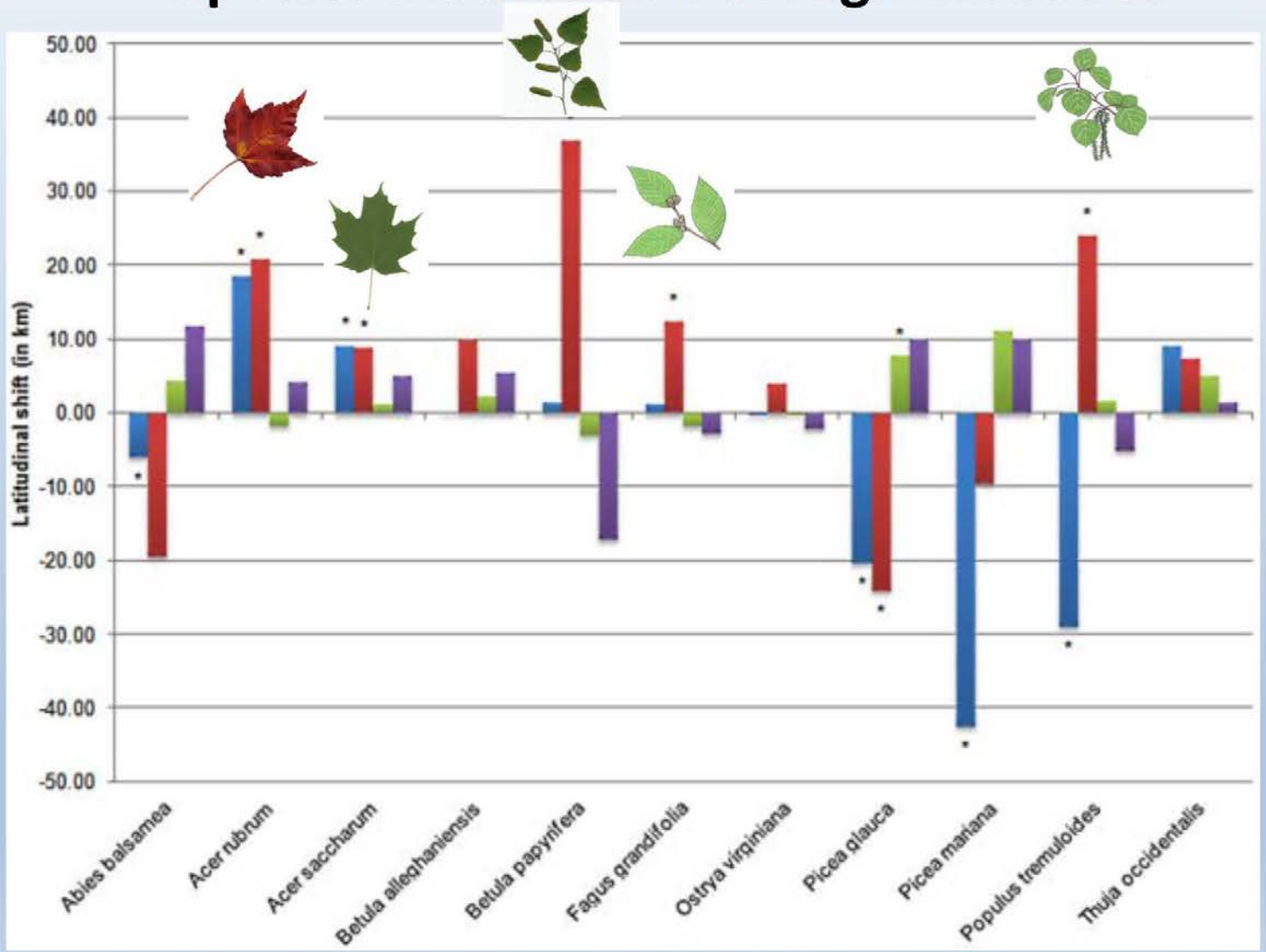


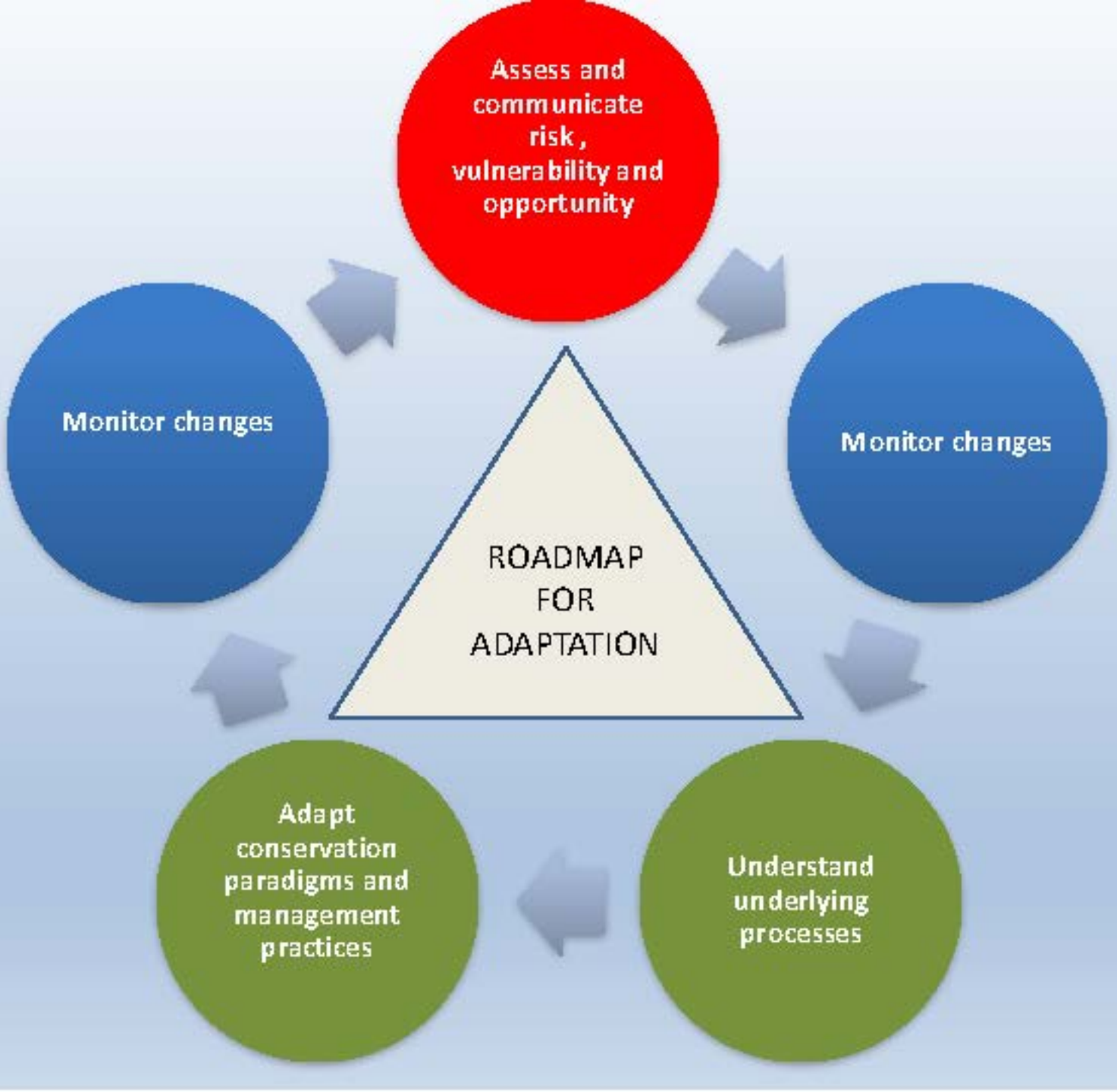
Forest inventories (Quebec) since the 1970s

How did forests respond to <u>recent</u> warming?

Shifting with Climate? Evidence for Recent Changes in Tree Species Distribution at High Latitudes



Boisvert-Marsh L, Périé C, de Blois S. 2014. Shifting with climate? Evidence for recent changes in tree species distribution at high latitudes. Ecosphere 5(7):83. http://dx.doi.org/10.1890/ES14-00111.1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Rethink conservation paradigms ?

Adapt

Current conservation efforts are largely:

- **Species-specific (e.g., Species at Risk Act, Endangered Species Act); focus on status of species (rare vs common species, native vs exotic species)**

- **Aimed at conserving specific areas for their ecosystem 'integrity' or 'representativeness'**

- According to the *Canada National Parks Act*, the law governing national parks in Canada, "ecological integrity" means, with respect to a park, "...a condition that is determined to be **characteristic** of its natural region and **likely to persist**, including abiotic components and **the composition and abundance of native species** and biological communities, rates of change and supporting processes." *www.pc.gc.ca*


Muchas gracias
Merci
Thank You