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Protected Areas and Climate Change: Mitigation and Adaption Activities in Canada's Protected Areas

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Parks Canada Parcs Canada

Canada

Ecological Integrity

An ecosystem has integrity when it is deemed characteristic for its natural region, including the composition and abundance of native species and biological communities, rates of changes and supporting process

(Panel on Ecological Integrity Report, 2000)

- The maintenance of ecological integrity must occur at temporal and spatial scales that are often larger than the age and size of the protected area in question.

- This is paramount in the face of climate change

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There is now greater recognition by many countries that protected areas will be a key tool for climate change adaptation. By establishing more parks and restoring the health of existing parks, we will be strengthening the resilience of Canada's environment by protecting water sources and providing safe havens for wildlife in the future.

Speech for
The Honourable Peter Kent, P.C., M.P.,
Minister of the Environment,
Senate Standing Committee on Energy, the Environment and Natural Resources
Tuesday, October 4, 2011

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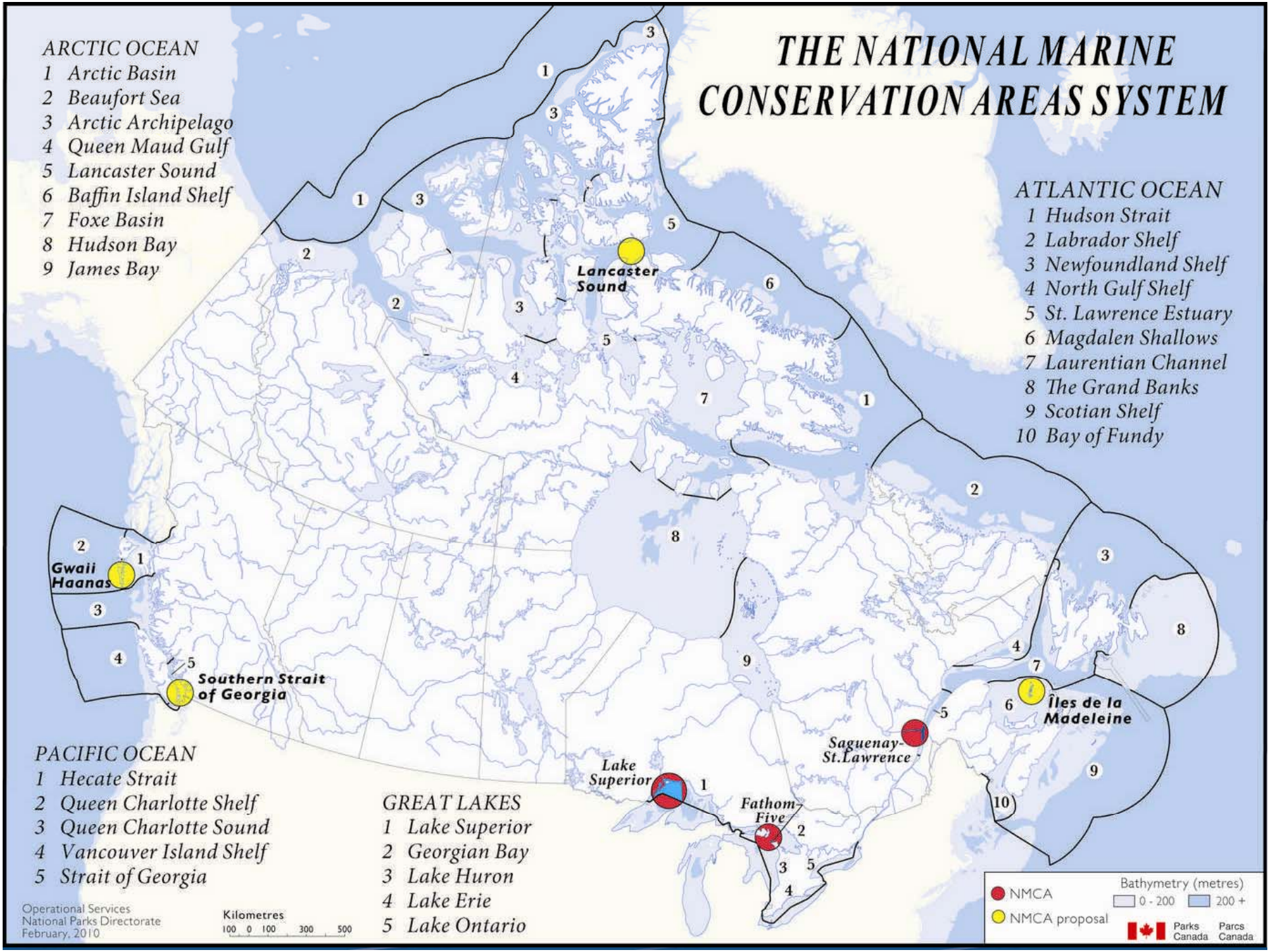
Canada's National Parks System Plan


THE NATIONAL MARINE CONSERVATION AREAS SYSTEM
ARCTIC OCEAN
1 Arctic Basin
2 Beaufort Sea
3 Arctic Archipelago
4 Queen Maud Gulf
5 Lancaster Sound
6 Baffin Island Shelf
7 Foxe Basin
8 Hudson Bay
9 James Bay
ATLANTIC OCEAN
1 Hudson Strait
2 Labrador Shelf
3 Newfoundland Shelf
4 North Gulf Shelf
5 St. Lawrence Estuary
6 Magdalen Shallows
7 Laurentian Channel
8 The Grand Banks
9 Scotian Shelf
10 Bay of Fundy
Lancaster Sound
Gwaii Haanas
Southern Strait of Georgia
Lake Superior
Fathom Five
Saguenay-St.Lawrence
Îles de la Madeleine
PACIFIC OCEAN
1 Hecate Strait
2 Queen Charlotte Shelf
3 Queen Charlotte Sound
4 Vancouver Island Shelf
5 Strait of Georgia
GREAT LAKES
1 Lake Superior
2 Georgian Bay
3 Lake Huron
4 Lake Erie
5 Lake Ontario
Operational Services
National Parks Directorate
February, 2010
Kilometres
100 0 100 300 500
NMCA
NMCA proposal
Bathymetry (metres)
0 - 200
200 +
Parks Canada
Parcs Canada

Emerging Consensus

Ecosystem protection and effective management help:

- Nature and people **adapt** to climate change by building resilience, securing ecosystem services, and generating additional social and economic benefits
- **Mitigate** climate change by reducing impacts that can accelerate carbon release and by encouraging processes that sequester additional carbon

Parks Canada's Actions to date

- 1990s: State of Parks Reports: recognized as significant stress
- 2000: Screening level impact assessment for national parks
- 2003: Climate scenarios compiled for all national parks
- 2005 – 2009:
  - Publications, presentations, web pages
  - Greenhouse gas emission reductions met 2012 target
  - Site-specific integrated studies
  - Monitoring, research, and assessments of impacts and adaptation options
  - Active management and restoration to improve ecological integrity and resilience

Opportunities for Parks and Protected Areas Agencies

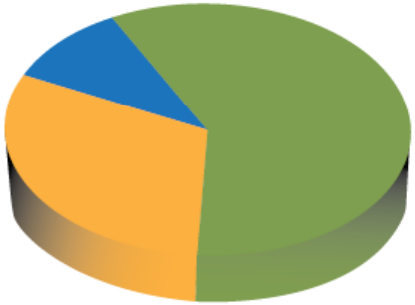
- Large intact ecosystems on land and sea
- Excellent science to inform decision-making
- Existing partnerships and cooperative arrangements
- Carbon-rich ecosystems
- Existing visitor and outreach programs
- Potential to contribute to a coordinated conservation strategy that integrates climate change considerations and includes a key role for parks and protected areas

Solutions: Protect, Connect, Restore

- **Protect** sufficient core areas
- **Connect** protected areas and people
- **Restore** ecosystems , human spirits, and cultural connections

Protect large, intact ecosystems on land and sea, thereby securing....

- Refuges for viable populations of species, including some of our most vulnerable
- Globally important carbon stores
- Ecosystem services for people

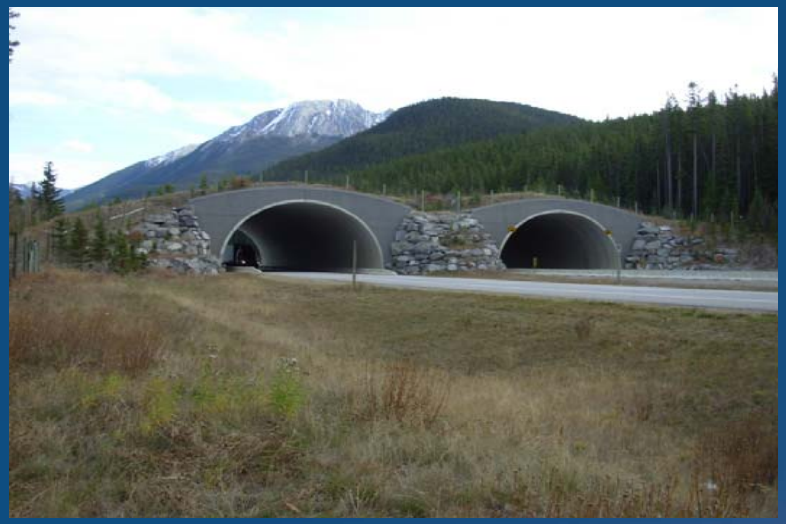


Carbon Storage by Global Forest Biomes

- Boreal Forest (703Pg)
- Tropical Forest (375Pg)
- Temperate Forest (121Pg)

Connect protected areas in conservation networks by....

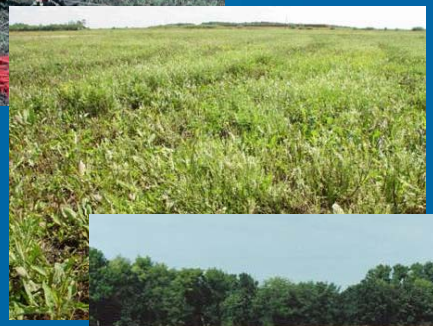
- Re-connecting fragmented habitat
- Sustainably managing intervening landscapes

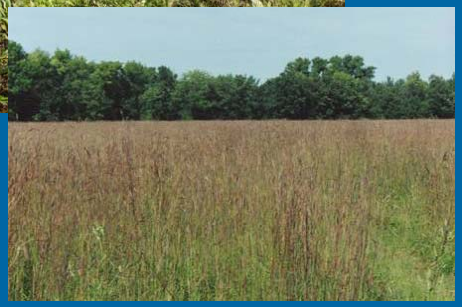


Thereby facilitating species movement and gene flow

Restore Ecosystems:

- Re-establishing ecological integrity and connectivity within and between protected areas





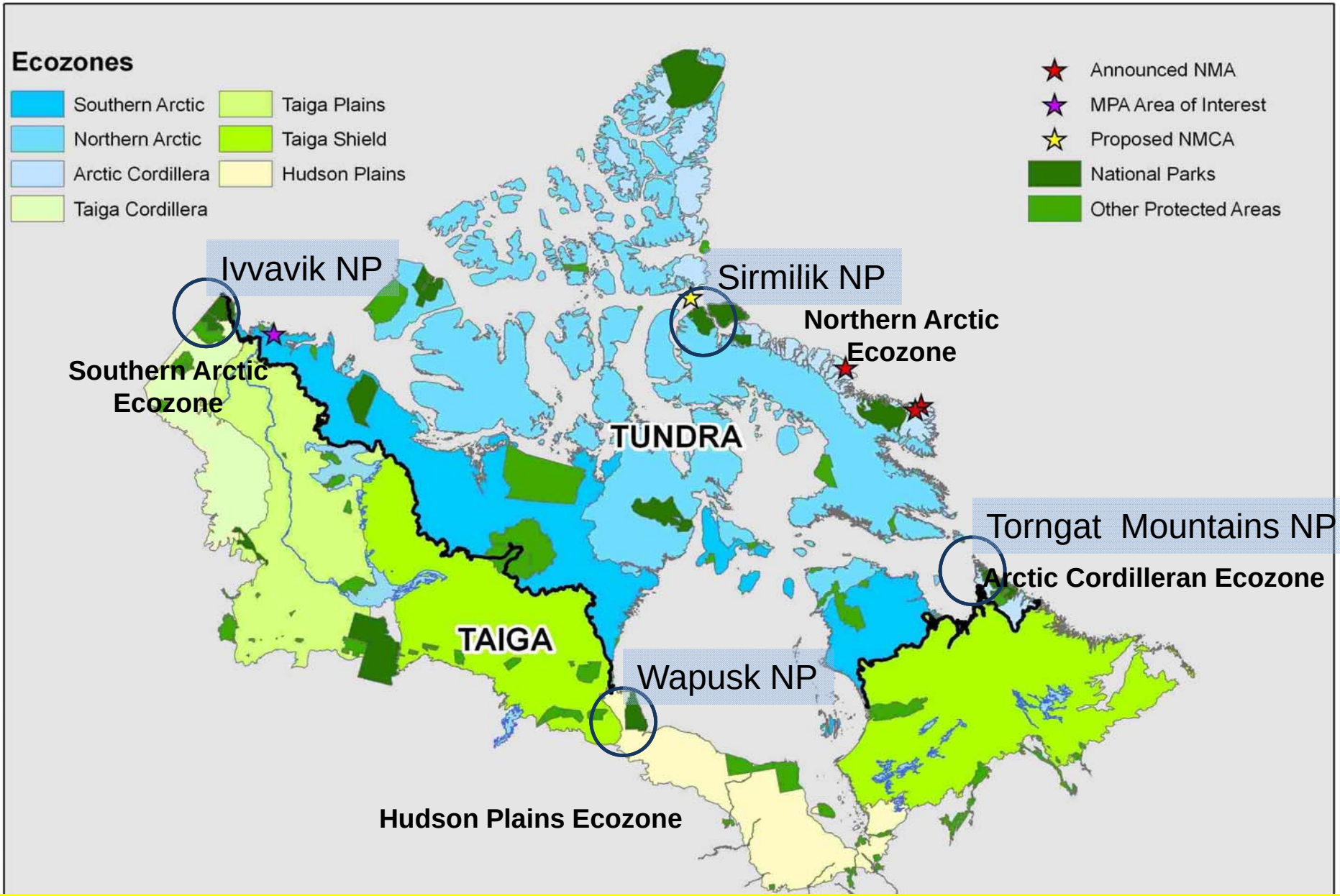
Thereby enhancing ecological and social resilience to change

Some Parks Canada Climate Related Initiatives

- Northern Ecological Integrity Monitoring
- Bioclimate Envelope Modelling and Temporal Connectivity in BC

- Comparison of carbon dynamics in and around Canada's national parks (CBM-CFS3).

- Holocene carbon dynamics in western Canadian National Parks.

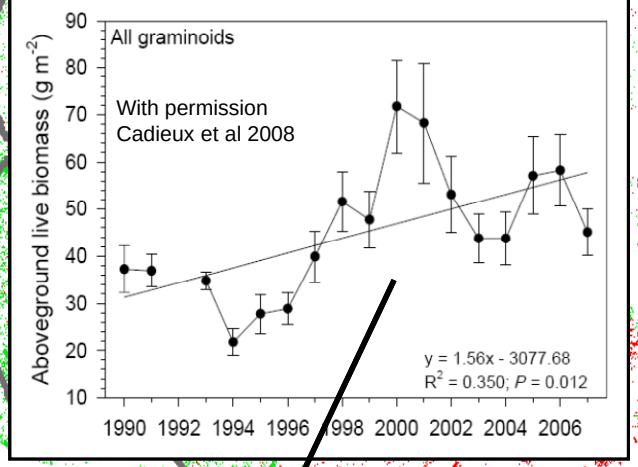


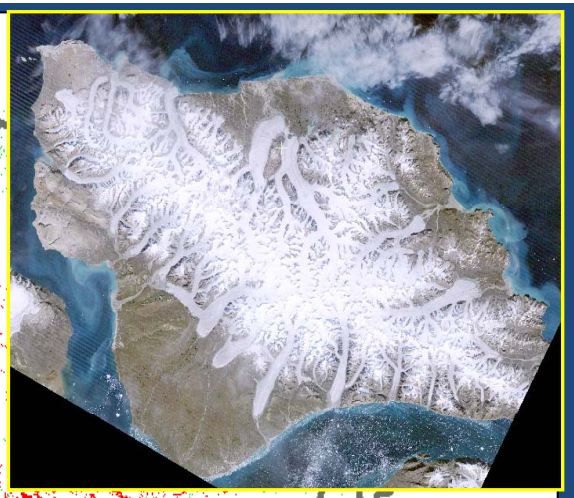
Arctic Ecosystems – the 'front line' of climate change

Sirmilik NP

- increased ‘greening’
- increased productivity
- permafrost slumping
- lemming cycle dampening

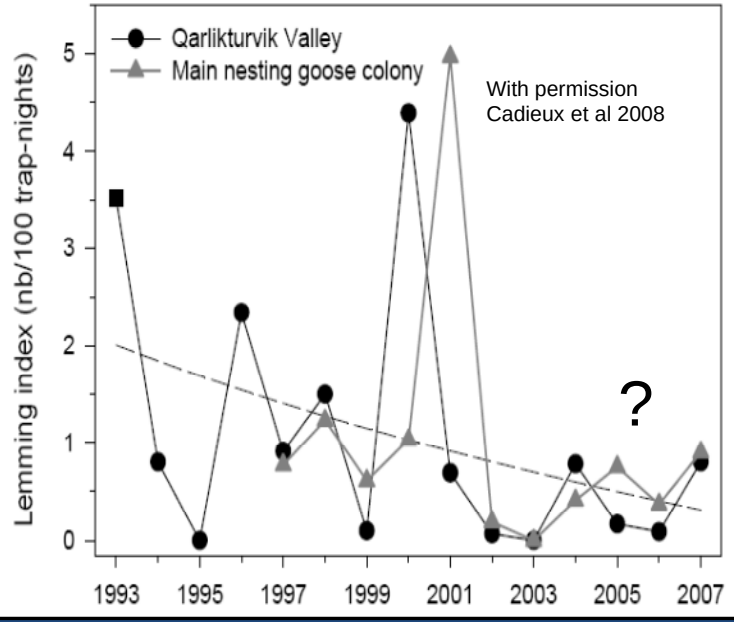
Increased productivity





Permafrost Melting

Dampening of Lemming Cycles

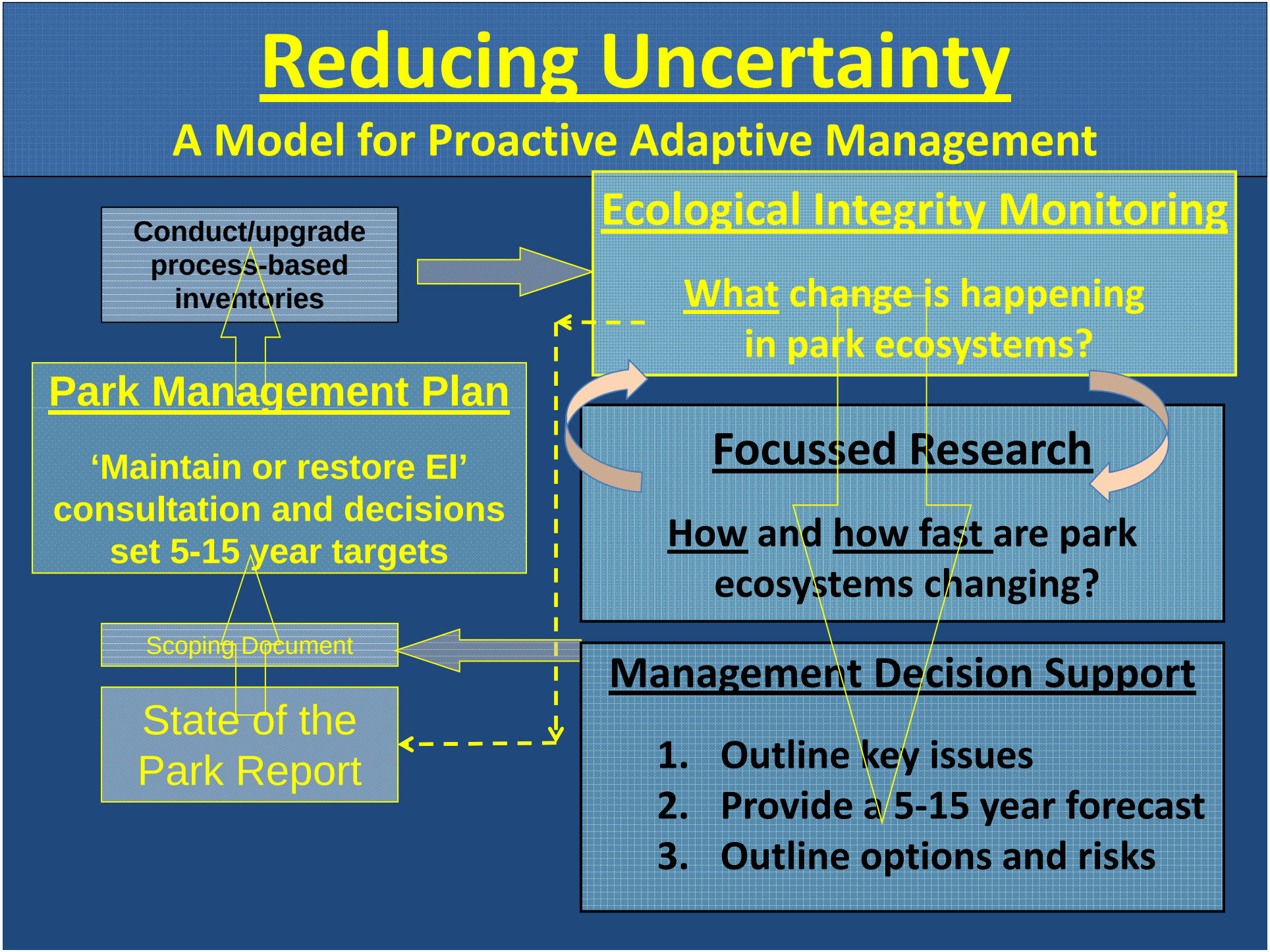


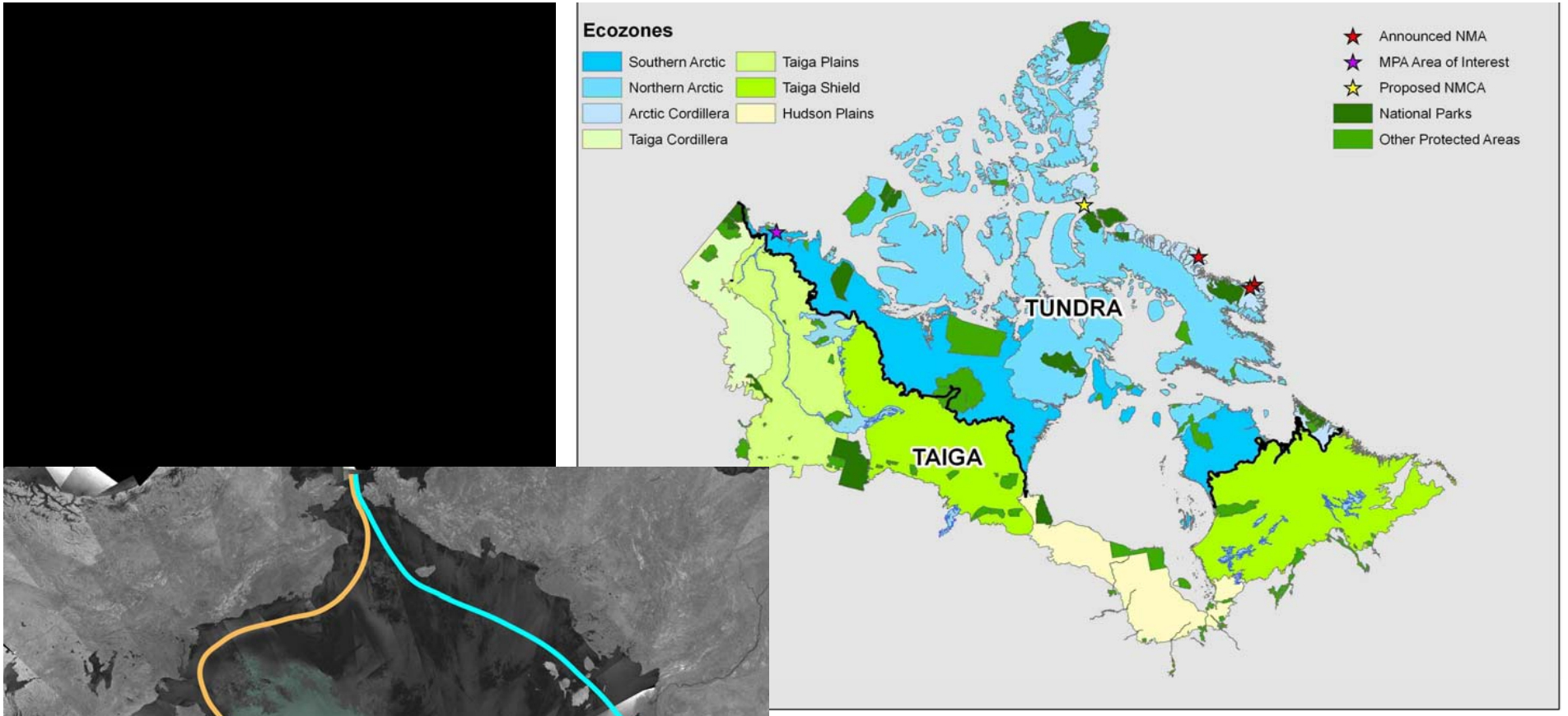
Kilomet
0 5 10 20 30 40

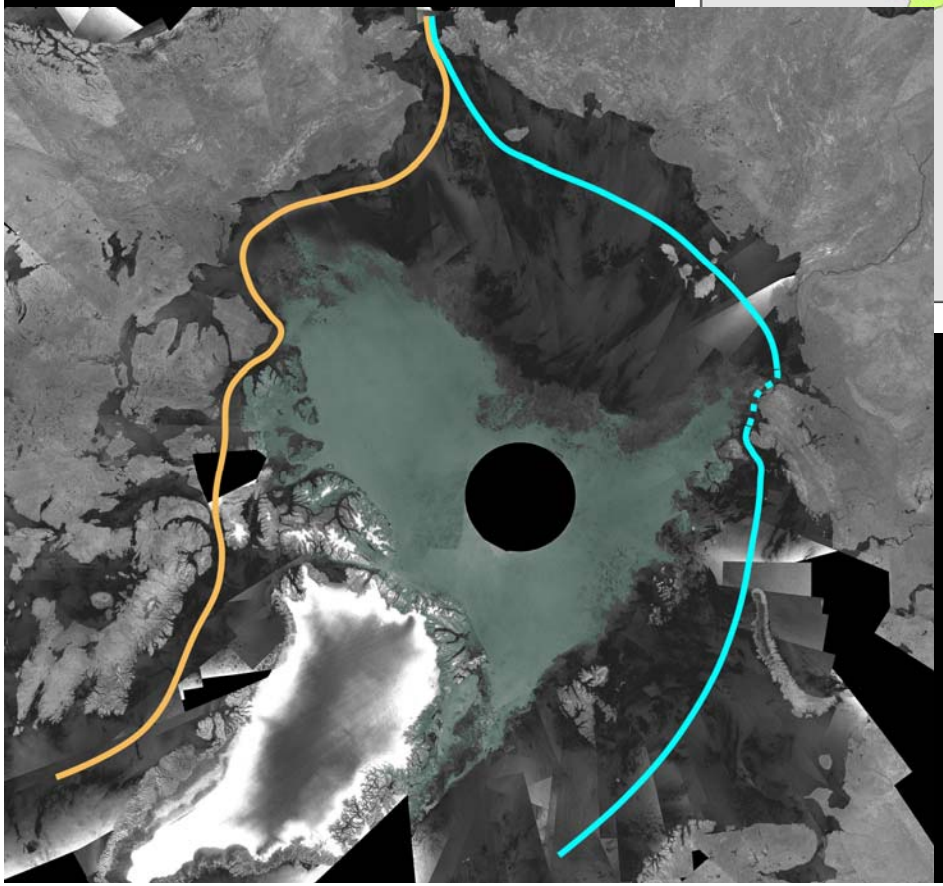
Analysis by Rob Fraser and Ian Olthof, CCRS

Reducing Uncertainty

A Model for Proactive Adaptive Management







An Ice free Northwest Passage

Climate Change Impacts, Mitigation and Adaptation

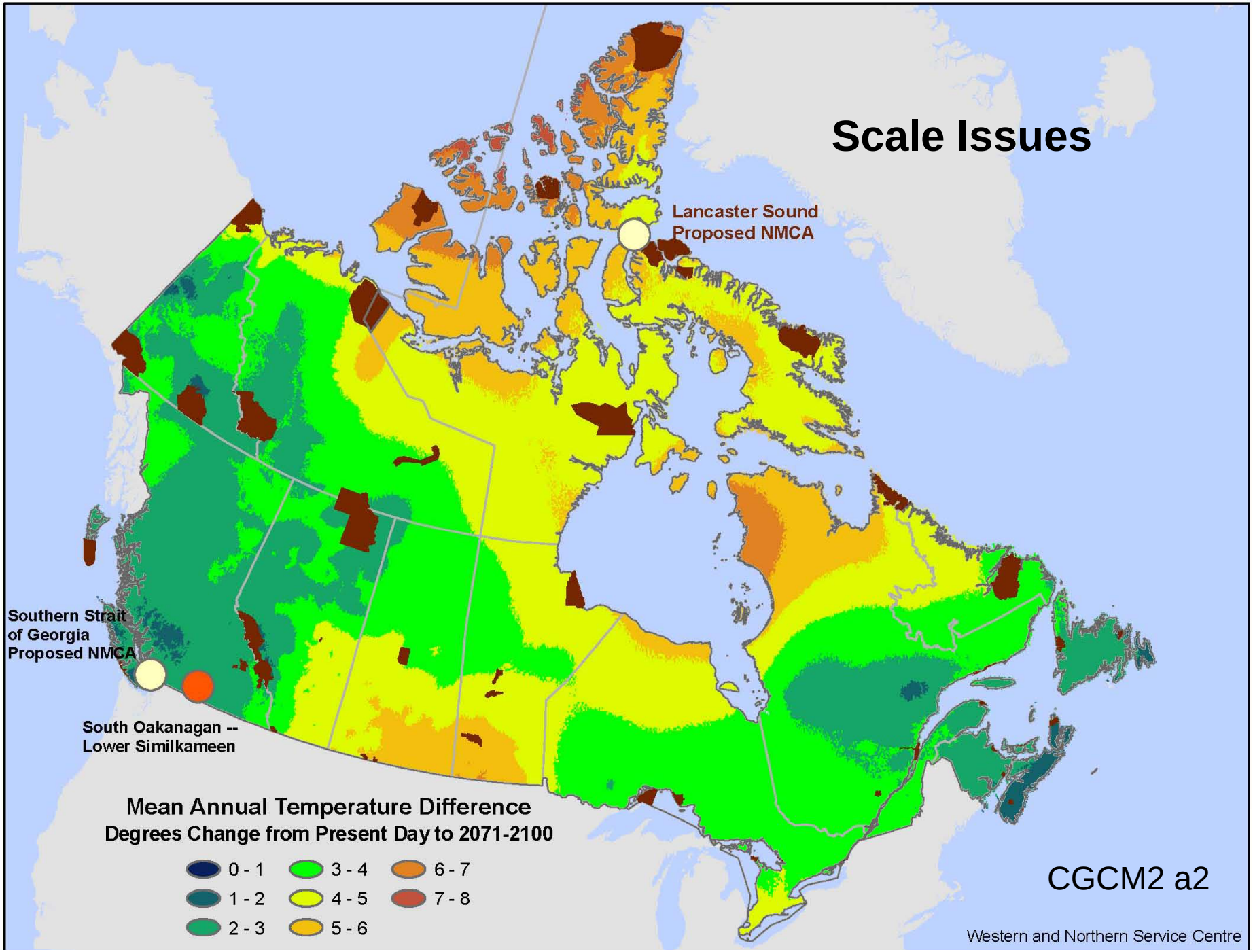
- To develop a comprehensive strategy regarding anthropogenically induced climate change that can be integrated into protected heritage area management.

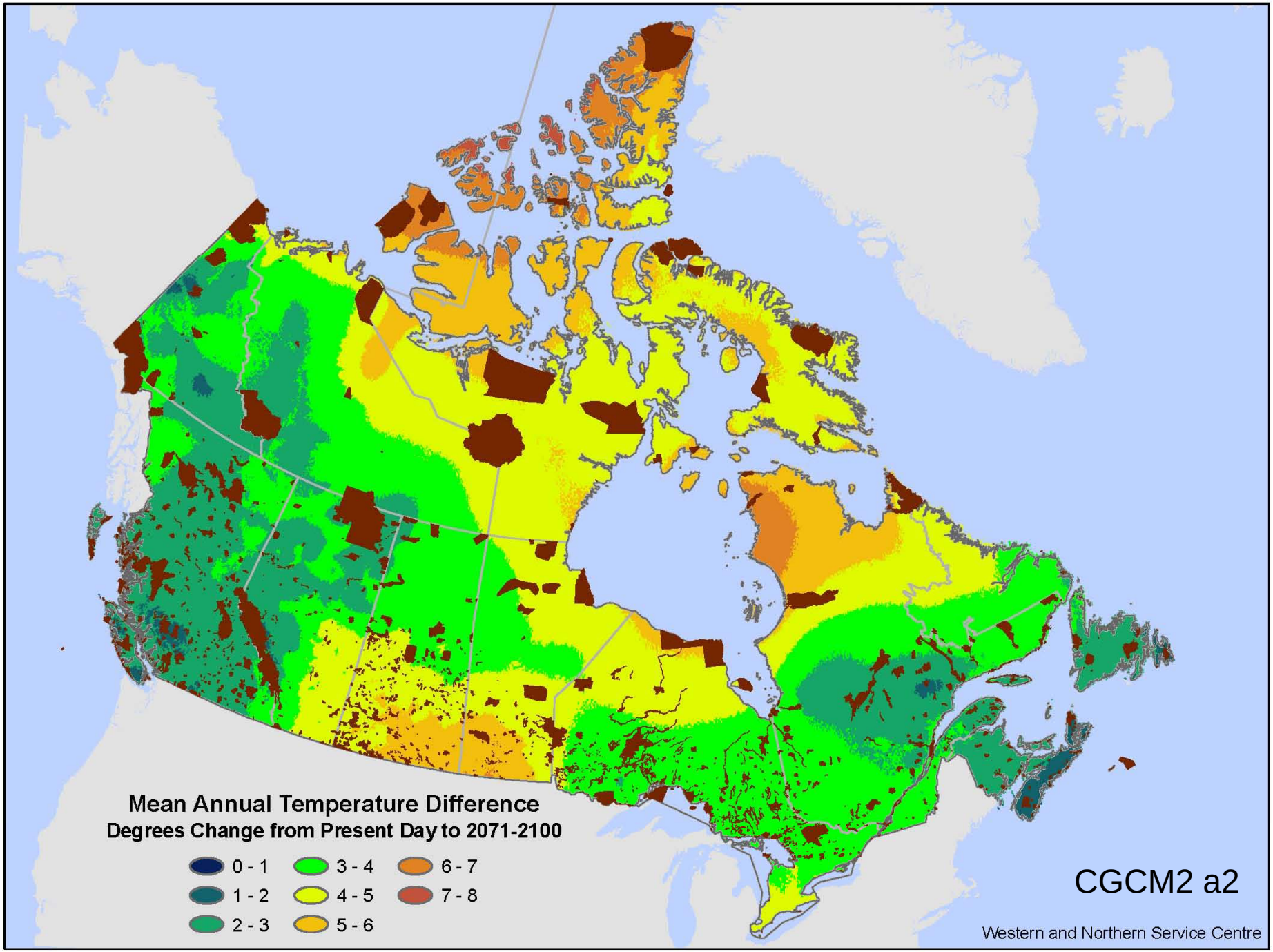
Concerns Regarding Ecosystem Change

- The land (alpine/tundra, treeline, coastal squeeze, grasslands, fire, disease, invasives …..).
- Freshwater (temperature changes, loss of hypolimnion, melting glaciers, eutrophication).
- The ocean (acidification, warming, circulation changes, salinity changes).

So What Can Parks Canada Do About Climate Change?

- Local models / local impacts.
- Consider climate change when planning long-term activities.
- Safety of staff and visitors.
- Migration corridors and connectivity among protected areas.


Scale Issues
Lancaster Sound
Proposed NMCA
Southern Strait
of Georgia
Proposed NMCA
South Oakanagan --
Lower Similkameen
Mean Annual Temperature Difference
Degrees Change from Present Day to 2071-2100
0 - 1
1 - 2
2 - 3
3 - 4
4 - 5
5 - 6
6 - 7
7 - 8
CGCM2 a2
Western and Northern Service Centre


Mean Annual Temperature Difference
Degrees Change from Present Day to 2071-2100
0 - 1
1 - 2
2 - 3
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5 - 6
6 - 7
7 - 8
CGCM2 a2
Western and Northern Service Centre

Bioclimate Envelope Modeling for Garry Oak Ecosystems


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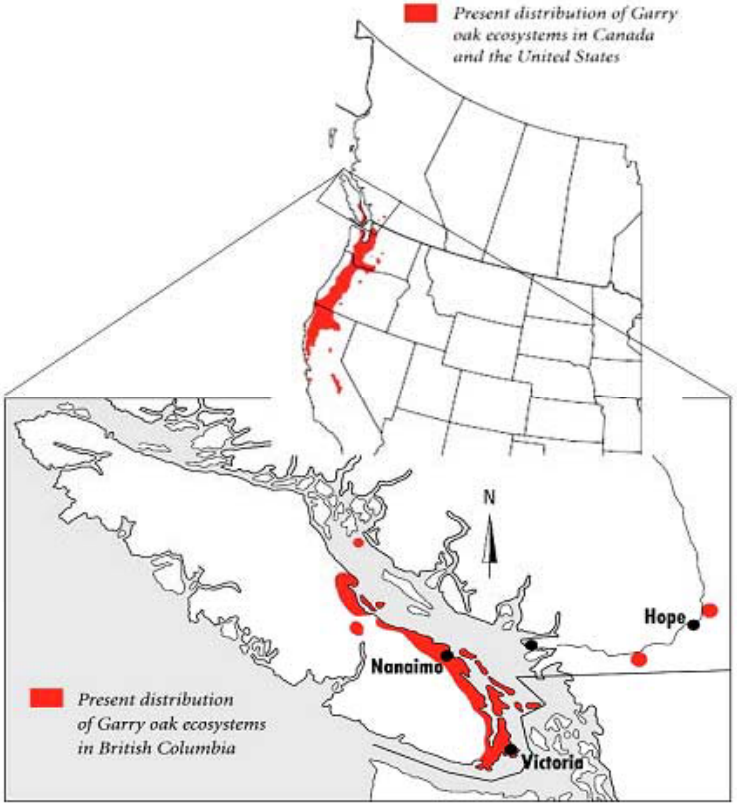
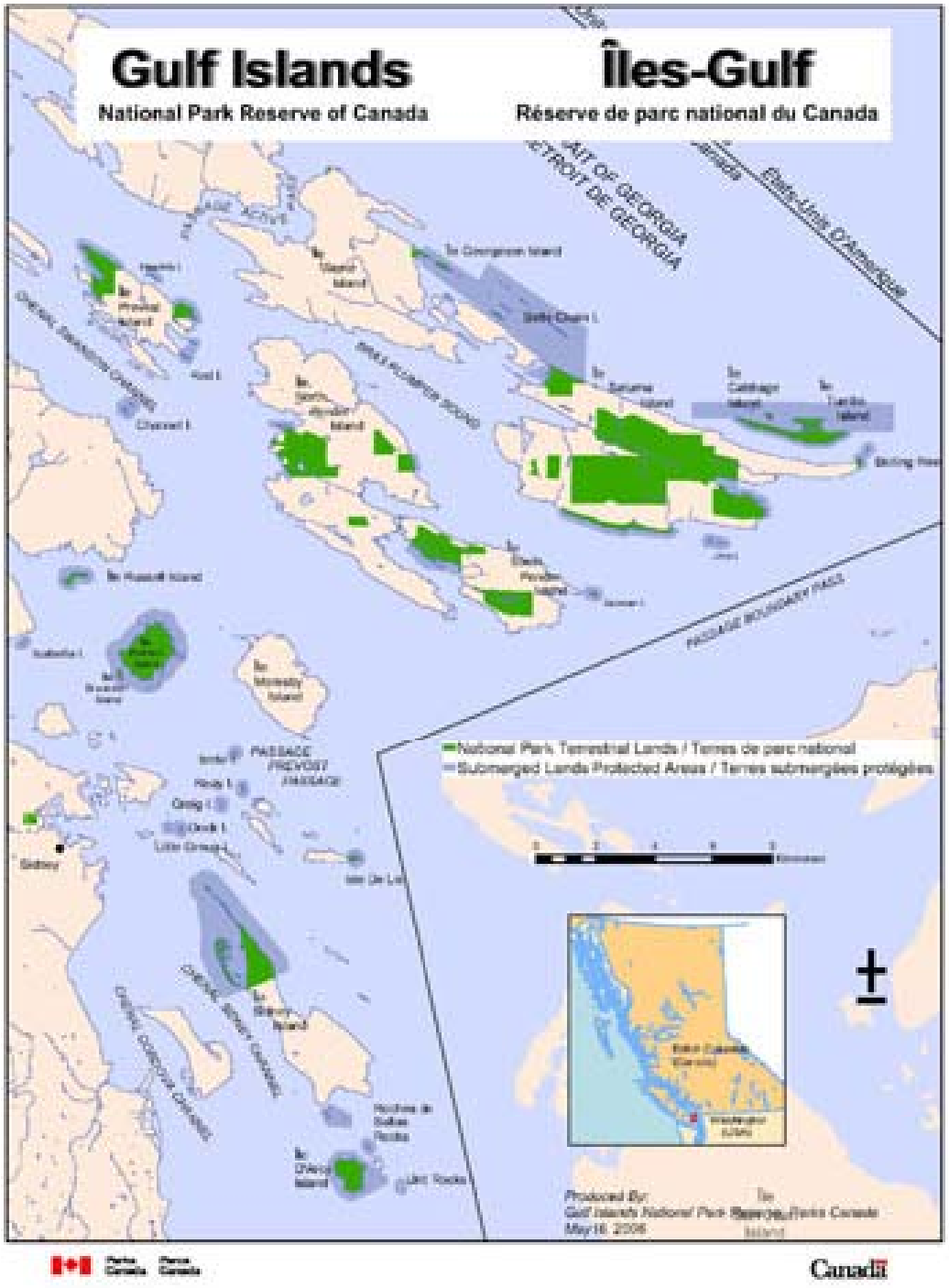
Image NASA
Google


Present distribution of Garry oak ecosystems in Canada and the United States
N
Hope
Nanaimo
Victoria
Present distribution of Garry oak ecosystems in British Columbia


Gulf Islands
National Park Reserve of Canada
Îles-Gulf
Réserve de parc national du Canada
National Park Terrestrial Lands / Terres de parc national
Submerged Lands Protected Areas / Terres submergées protégées
Produced By:
May 16, 2006
Parks Canada
Canada

Less than 5% of Garry oak ecosystems remain in a near-natural condition. More than 100 species of plants and animals are listed as "at risk of extinction". Several species have already been extirpated.

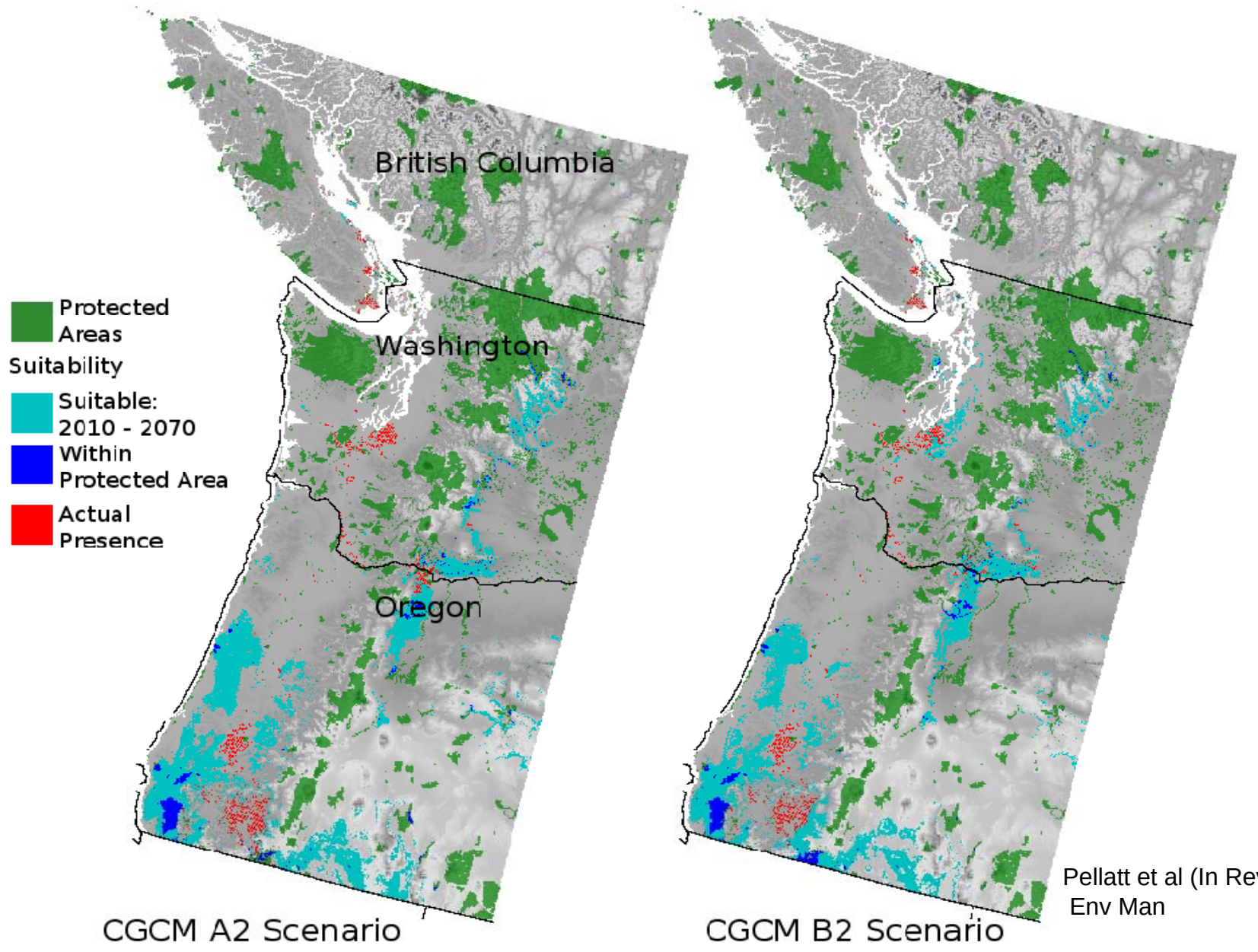
The number of "at-risk" species and loss of habitat in the surrounding region make this park one of the most vulnerable in Canada.

- We used location data for current Garry oak sites and environmental predictors including 33 climate variables (baseline conditions from 1961-1990).

- Four geographic variables derived from a digital elevation model (DEM).

- We constructed models using Random Forest and the CGCM2 output to generate climate suitability and temporal connectivity data for Garry oak in SW British Columbia, Washington, and Oregon.

Garry Oak Extent, Climate Suitability and PAs



Pellatt et al (In Rev) Env Man

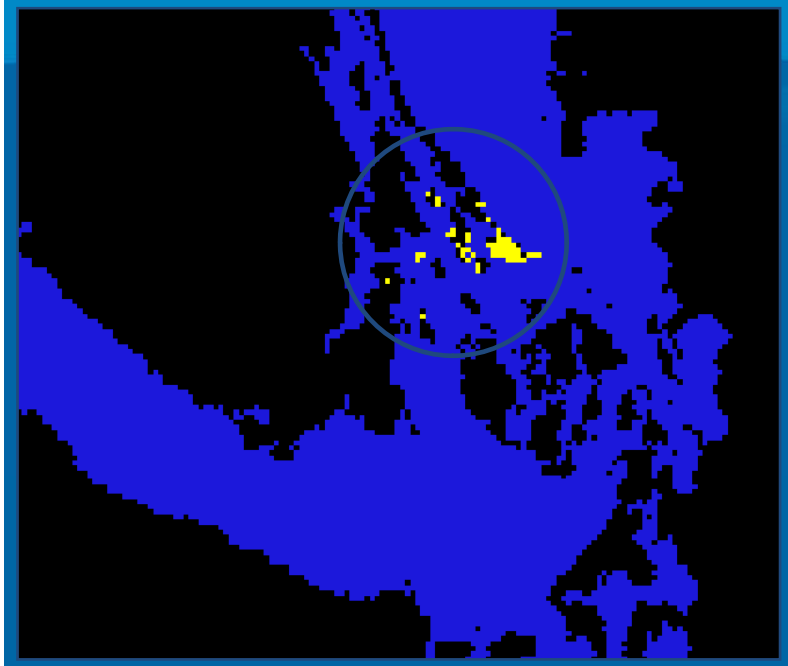
Climatically Suitable Area for Garry oak

Scenario A2

	Region (km^2)	Protected Areas (km^2)
2010 – 2039	52861	3262
2040 -2069	80712	4500
2070 - 2099	133980	9741
Temporally Connected	28863	1898

Scenario B2

	Region (km^2)	Protected Areas (km^2)
2010 – 2039	52942	3077
2040 -2069	63598	3873
2070 - 2099	83364	4763
Temporally Connected	25725	1887



How suitable is the Gulf Islands National Park Reserve for Garry oak? (1 – 10)

	Now	2020s	2050s	2080s
Random Forest model	9.3	5.5 - 7.0	5.9 - 7.6	7.2 - 8.3

- Although climatically suitable Garry oak habitat will increase somewhat, primarily in the USA, it will not be well represented in IUCN Classes I through V Protected Areas (5.6 to 7.3%).

- Of this area only between 6.6 and 7.3% will be "temporally connected" between 2010 and 2099.

Outcomes

- Biodiversity conservation
- Protection of carbon stored in ecosystems
- Ecological and social resilience to change
- Relevance in a changing world

Challenges

- Given that the IPCC has concluded that Earth's climate is very likely changing at a pace unprecedented in the last 10,000 years, how do we best protect the values of our lands and renewable resources for both ourselves and for future generations?

Stakeholder Needs

- Down-scaled niche-models (i.e., bioclimate envelope models based on documented ranges).
- Carbon Models and empirical measurements in non-forested ecosystems.
- Information on marine CC impacts at scales relevant to PA management.
- Connectivity and systems planning.

Steps Forward

- Parks Canada's Climate Change Task Team and emerging strategy on climate change mitigation and adaptation.
- Canadian Parks Council Climate Change Working Group.
- IUCN Natural Solutions
- Cooperation