EI Monitoring in Canada's National Parks

Use of Remote Sensing Data

NARSEC 2007

Santa Fe, March 6-8, 2007

PCA Legislation

Parks Canada and Ecological Integrity

"*Maintenance or restoration of ecological integrity*, through the protection of natural resources and natural processes, shall be the first priority of the Minister when considering all aspects of the management of parks."

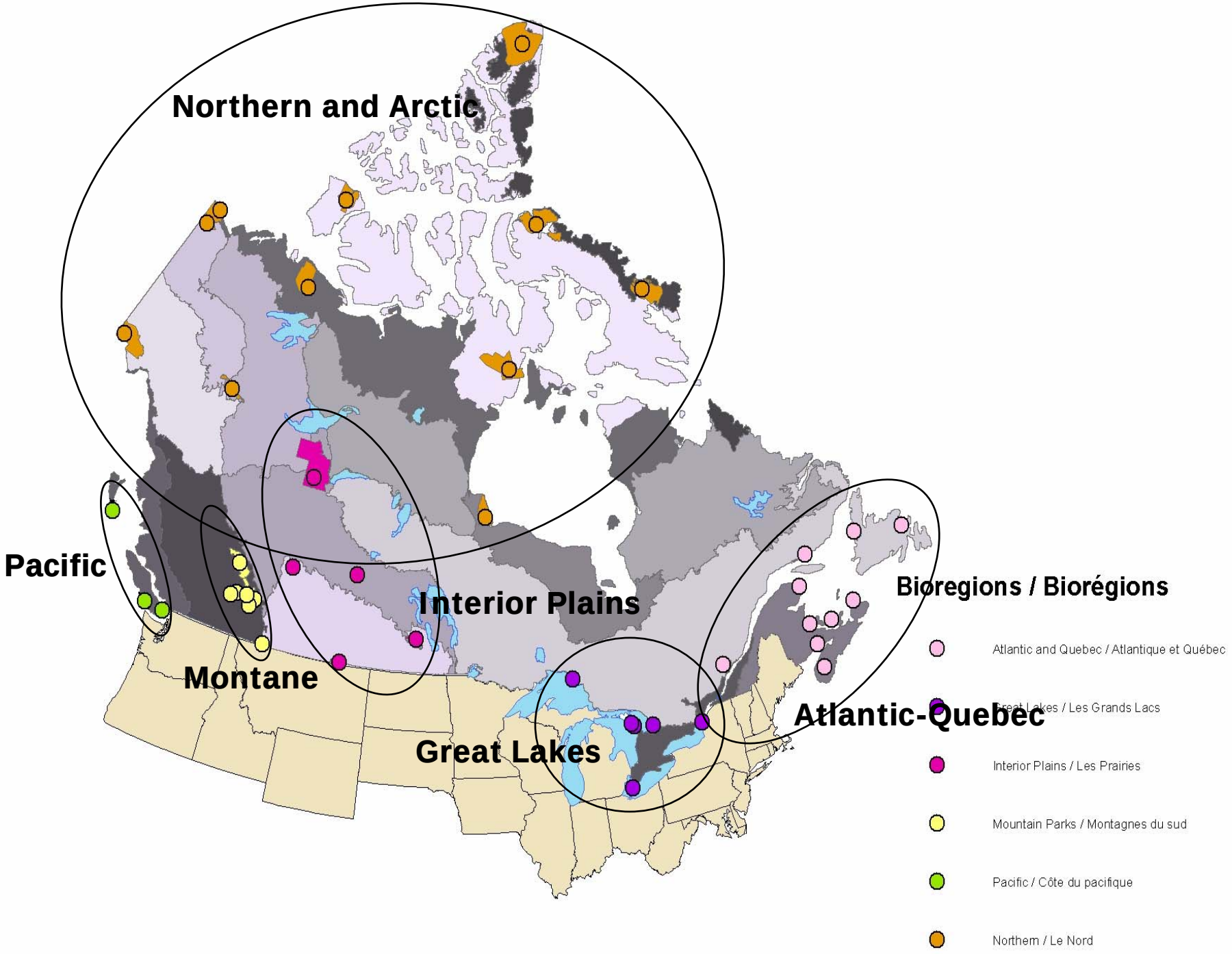
Section 8. (2) Canada National Parks Act (2001)

Ecological Integrity

"….'ecosystem 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".

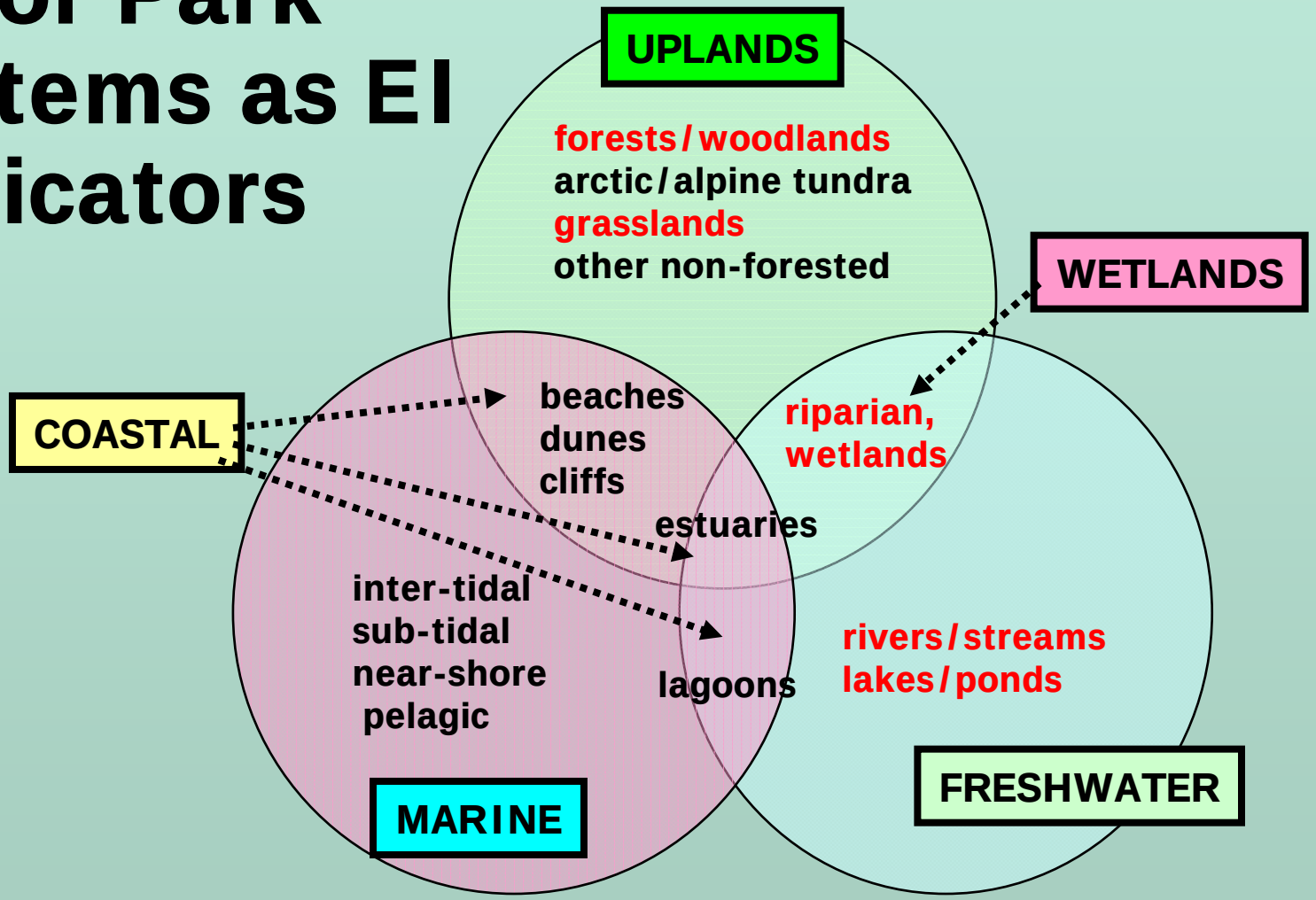
Section 2. (1) Canada National Parks Act (2001)

Bioregional Groups of Canada's National Parks by Ecozone
Les groupes biorégionaux des parcs nationaux de Canada, par écozone



February 2004

Major Park Ecosystems as EI Indicators



*MPEs for Great Lakes Bioregion

BIOREGIONAL INDICATORS

The North	Pacific	Interior Plains	Great Lakes	Quebec Atlantic	Southern Mntns
Forest	Forests and woodlands	Forest	Forest	Forest	Terrestrial Ecosystems
Tundra	Non-forest	Grasslands	Non-forest	'Barrens'	
Wetlands	Lakes	Wetlands	Wetlands	Wetlands	Aquatic Ecosystems
Freshwater	Streams and rivers	Lakes	Lakes	Freshwater	Native Biodiversity
Glaciers	Islets/shorelines	Streams	Streams		Geology and landscapes
Coastal	Inter-tidal		Great Lakes Shore	Coastal	Climate and atmosphere
Marine	Sub-tidal			Marine	support for EI

PCA EI MONITORING FRAMEWORK

Biodiversity

Species Lists
- native species
- alien species

Focal Species
- mortality/natility
- immigration/emigration
- viability/persistence

Trophic Structure
- size class distribution
- predation levels

Structure & Processes

Local Ecosystems
- suite of measures that monitor most important structure and process changes at a local ecosystem scale

Landscapes
- suite of measures that monitor most important structure and process changes at a landscape ecosystem scale

Inside Park
- most critical in-park stressors

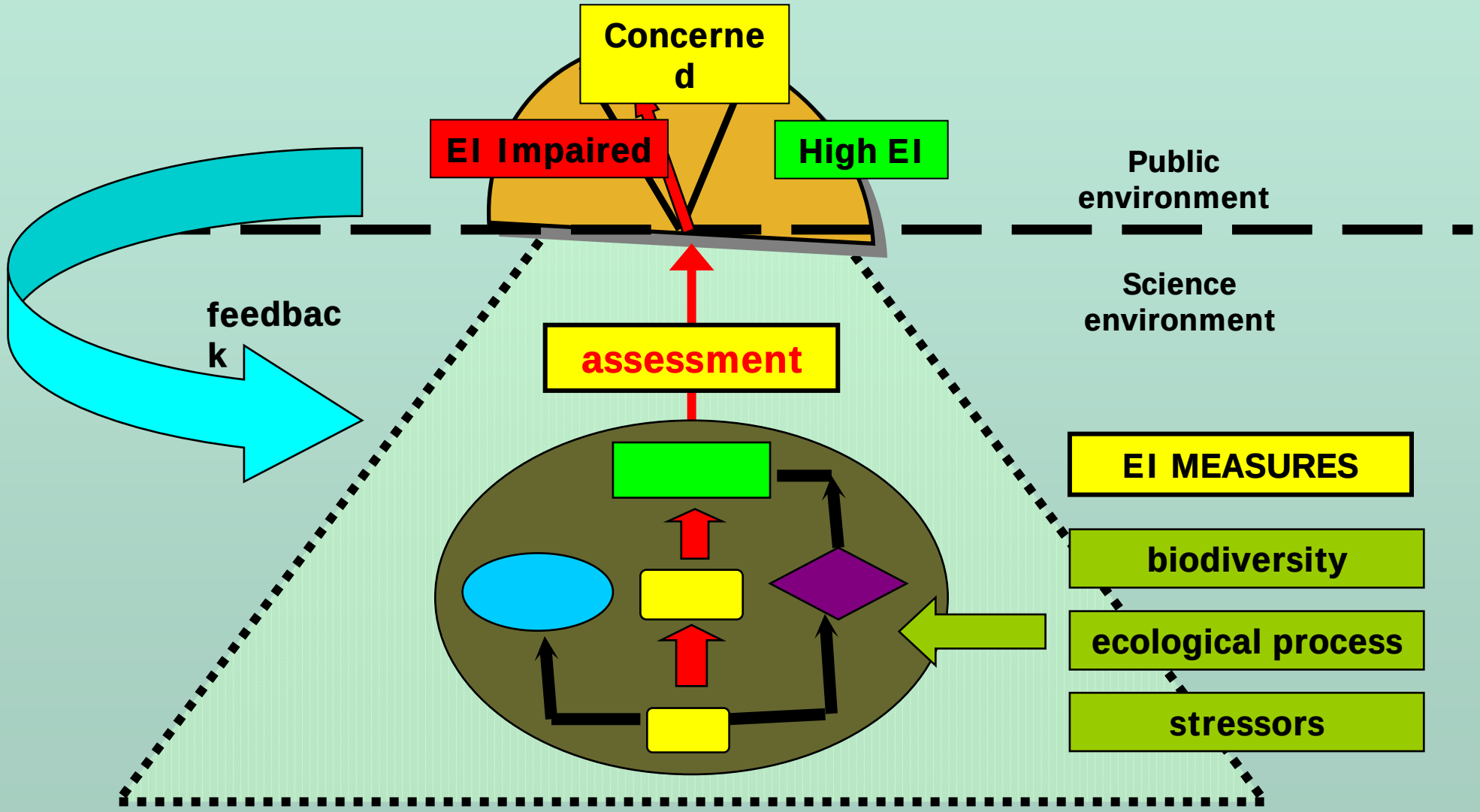
Outside Park (GPE)
- most critical GPE stressors

Outside Park (Long Distance)
- most critical long distance stressors

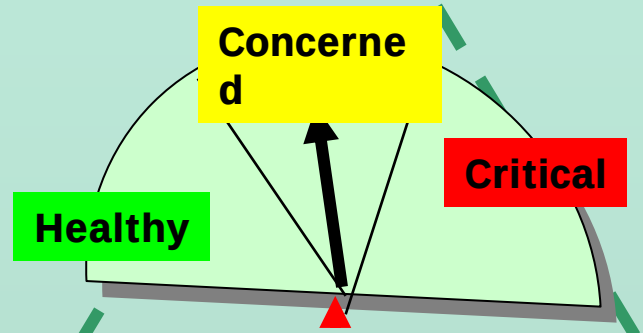
Ecologically Comprehensive

EI INDICATOR	EI FRAMEWORK		
	Biodiversity	Processes	Stressors
Forests	√	√	√
Wetlands	√	√	√
lakes	√	√	√
streams	√	√	√
dunes	√	√	√
lagoons	√	√	√
estuaries	√	√	√

EI Indicator 'Iceberg'



Forest EI Indicator



Models

Measures

Data

Stand Level Forest EI

tree productivity, songbird index, salamander populations change, foliar nutrient index, decomposition efficiency

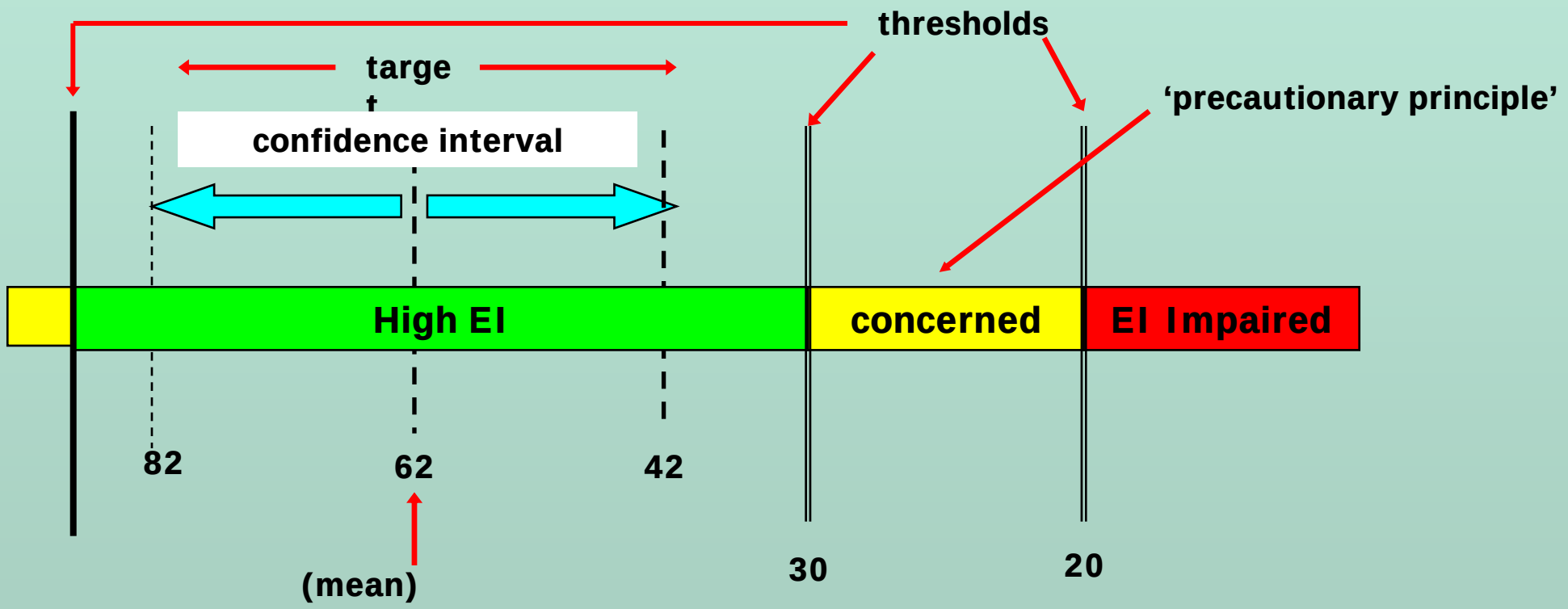
dbh, canopy condition, species composition, chopstick dry weight loss, songbird/salamander density, relative soil arthropod abundance, foliar nutrient concentrations

Landscape Level Forest EI

FF BioD Index (SAR, top predators, ungulates), CFBioD Index (ecosystem representation), connectivity, productivity

SAR and other species population assessments, relative ecosystem abundance, Fragstats, AVHRR

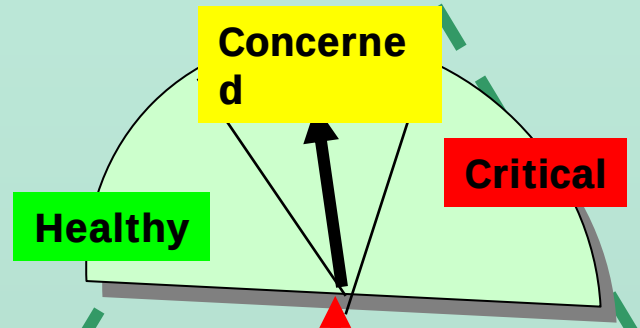
Targets and Thresholds



Dry Weight Loss of Wood Decomposition Standard

(percent dry weight loss)

Forest EI Indicator



Stand Level Forest EI

Landscape Level Forest EI

Models

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tree p rd index, salamander populations change, foliar nutrient index, decomposition efficiency

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State of the Park Report Summary
Gros Morne National Park

Indicator: Ecosystem Type	Percentage of Park Area	Condition and Trend	Rationale
Forest	44	↓	High moose density - regeneration affected. Habitat loss from forestry. High percentage non-native mammals
Barrens	35	↓	Woodland caribou decline. Increasing human use. Increasing non-native species
Wetland	11	↓	Damage from snowmobiles. Woodland caribou declines.
Freshwater	8.8	↔	Healthy fish and invertebrate populations.Atlantic salmon, brook trout concerns
Seacoast	0.2	↑	Recovering from historic grazing, trampling and human use. Seabird populations healthy
Marine	1	↓	Over-exploitation of fish species, pollution, garbage

CSA/GRIP Project (1)

Work with CCRS/UOttawa to develop operational methodologies for assessing landscape change in and around national parks – 5 main themes

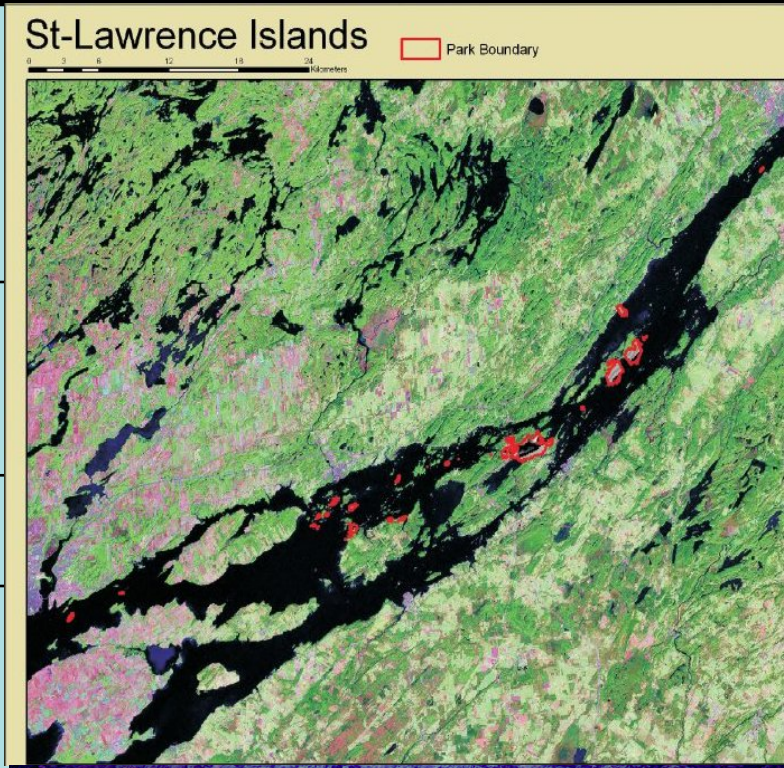
1. **Vegetation cover change**
2. **Vegetation pattern**
3. **Biodiversity modeling**
4. **Terrestrial ecosystem productivity - NPP**
5. **Outreach and communication**

CSA/GRIP Project (2)

1. 6 model parks across a range of ecosystems, park size and landscape context
2. 5 time steps – 1985, 1990, 1995, 2000, 2005
3. Landsat 5 data - focus on operational methodologies with broad application
4. NARSEC 1: presentation of early results
5. NARSEC 2: final products presented for review

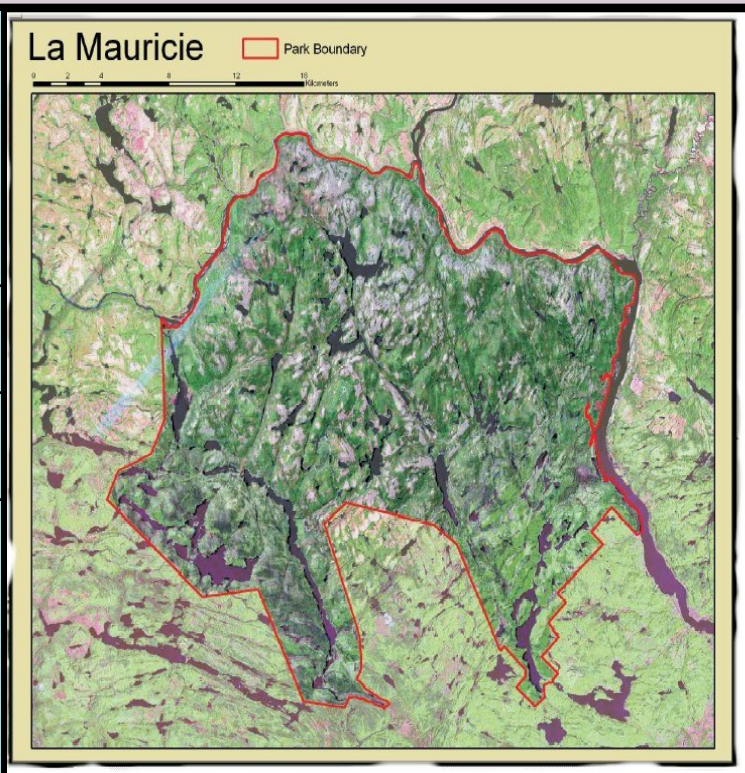
St.Lawrence Islands NP

Purpose	To represent the Central Great Lakes/St. Lawrence Precambrian Region of Canada – Natural Region no. 19b / Ecozone : Mixedwood Plains. Biosphere Reserve since 2004
Year established	1904 (operated by the Department of Interior as a park open to visitors as early as the mid 1870's).
Park & GPE Area	Park: 6km^2 ; GPE: 4,300 (Thousand Islands Ecosystem)
Ecological Features	Transition zone for flora and fauna, very diverse flora.
Visitation	69,369 (1998 figure); ~ 75,000 at present
Species at Risk	28
Stress/impacts	Human disturbance / urbanization, transportation and utility corridors / exotic species (vegetation and invertebrates) / sport fishery / heavy metals / climate change / forestry



La Mauricie NP

Purpose	To represent the Canadian Shield – the Central Great Lakes – St. Lawrence Precambrian Natural Region- Natural Region no. 19b. / Ecozone : Boreal Shield
Year established	1970
Park & GPE Area	Park: 544 m^2 ; GPE: 1,962 m^2
Ecological Features	Rolling plateau with low, rounded hills, lakes, and streams; diversified aquatic and riparian fauna reflecting a boreal transition; intact herbivore-carnivore system
Visitation	~ 225,000
Species at Risk	9
Stressors	fragmentation / water regime modification / hunting, trapping, and poaching / forest harvesting/ forest fire control, insect epidemics/ exotic and invasive species colonization / recreational fishing / solid waste management



Remote Sensing Methods

a. Are these methods scientifically sound? Do they represent the latest thinking in the landscape ecology and RS technology science communities?

b. How can the methods be improved to make them more useful, general and/or operational?

c. What will be the largest problems with the operationalization of these methods across 42 national parks and a wide range of biomes and GPE land use?

d. What will be the effect of changes in RS satellite platforms and other technological developments on measuring and assessing landscape change over the long term?

Targets and Thresholds for Landscapes

Desired Landscape Condition

a. What are some key general rules for establishing targets and thresholds for GPEs that will apply across a wide range of natural systems and land use practices?

b. How will these rules change between biomes and under various intensity and kind of land use?

c. Are the alternatives presented on Day 3 useful, scientifically valid, and can they be operationalized?

d. What suggestions can be made for further refining our development of targets and thresholds for GPEs?

For more information contact:

Donald McLennan, PhD
National EI Monitoring Ecologist
Parks Canada Agency
donald.mclennan@pc.gc.ca