



# Developing marine indicators for National Parks in Canada

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## Talk outline

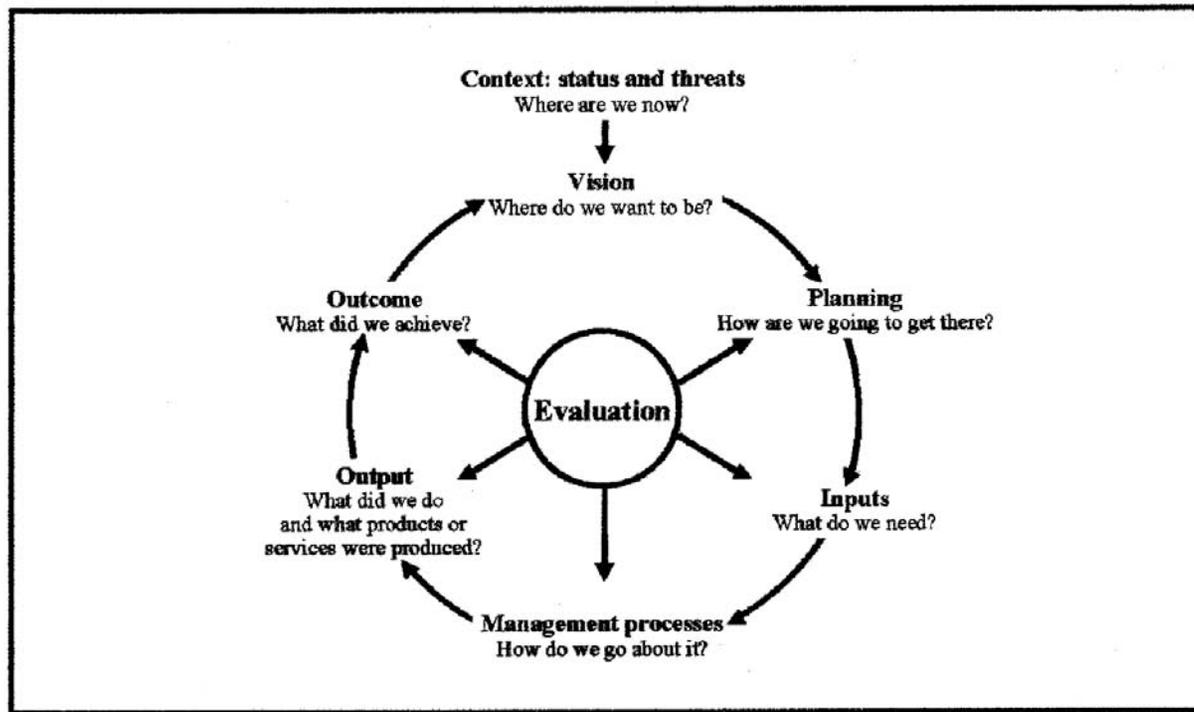
1. A framework for evaluating management effectiveness and Parks Canada's history
2. The general approach for developing ecological integrity indicators
3. The Bioregional Approach and Pacific Rim National Park Reserve
4. Challenges in developing marine indicators





# Framework for evaluating management effectiveness

Figure 2.1 The management cycle and evaluation



From: Hocking and Stolton 2000. Evaluating effectiveness: A framework for assessing the management of protected areas. Best Practices Protected Areas Guide #6, IUCN





## The Parks Canada story

Context	Planning	Input	Process	Output	Outcomes
Where are we now?	Where do we want to be?	What do we need?	How do we go about it?	What were the results?	What did we achieve?
1) 1994 –Bow Valley Study -State Parks Rep. 2) 10/1998- Ecological Integrity Panel 3) 2000 – EI Panel report: 127	1) 2/2001 – New Canada National Parks Act 2) 10/2002 - Minister’s Action Plan	1) 3/2003 - funded at about 25% of what was requested to meet EI panel rec.	1) 12/2003 - New EI approach - Monitoring Program review 2) 4/2004 --	To Be Determined (2004-08)	To be Determined (2008)

recommend.

### EI: Ecological Integrity

Implement

EI approach



## Ecological Integrity (EI)

EI means, with respect to a park,

- “a condition characteristic of its natural region and likely to persist
- “including abiotic components and the structure/function of biological communities”.

The National Parks Act of Canada states that “Maintenance of EI through the protection of natural resources shall be the first priority when considering park zoning and visitor use in a management plan.”

About 37% of NPs have marine components



# New EI Program Elements - National

- CEO “6-8 indicators” ~ biologists “6-8 indices”
- “Iceberg model” for indicator development
- Bioregional approach
- Senior management involvement and approval
- Stakeholder involvement in program development
- Focused on answering:
  - What is the state of EI in the park?
  - What are we doing to improve it?



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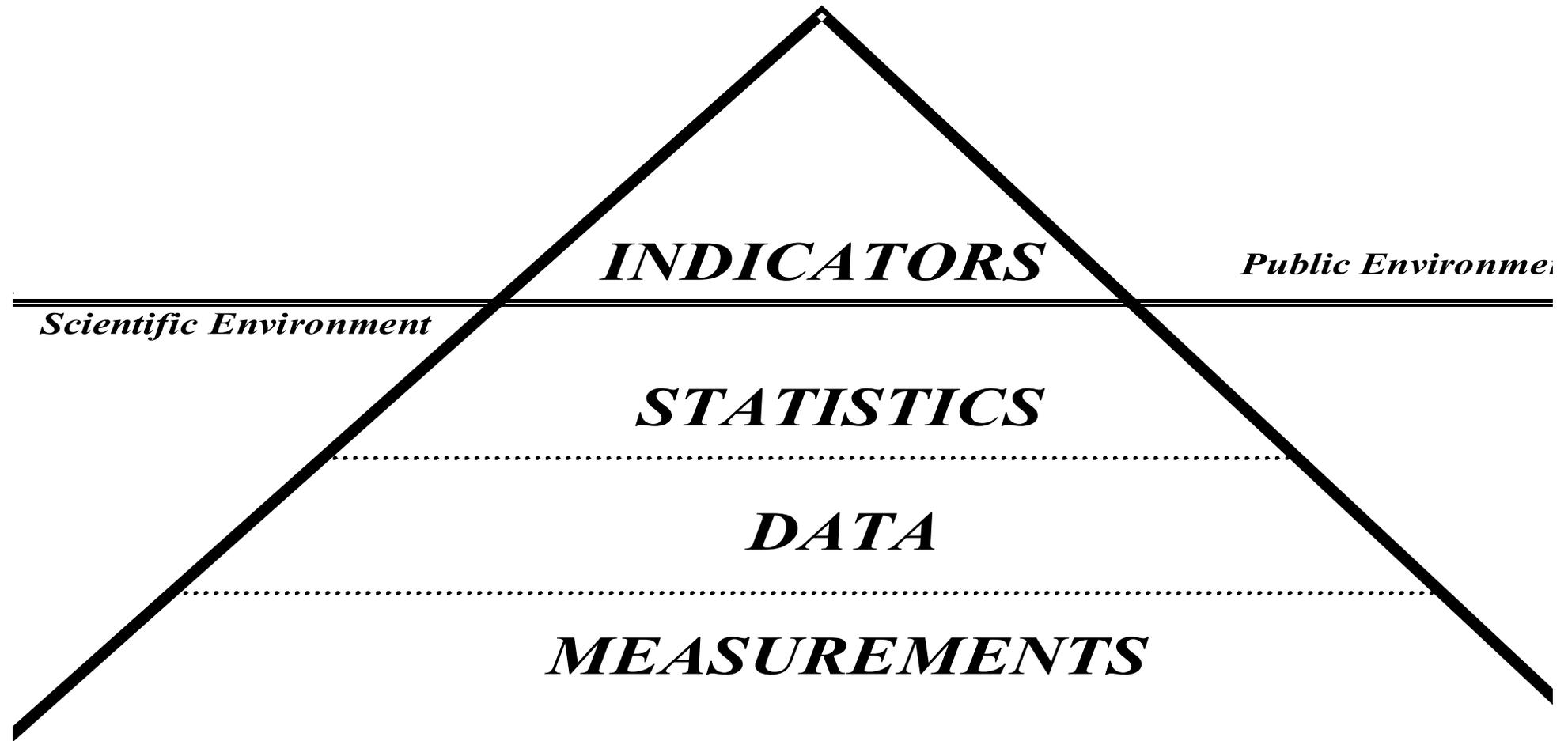
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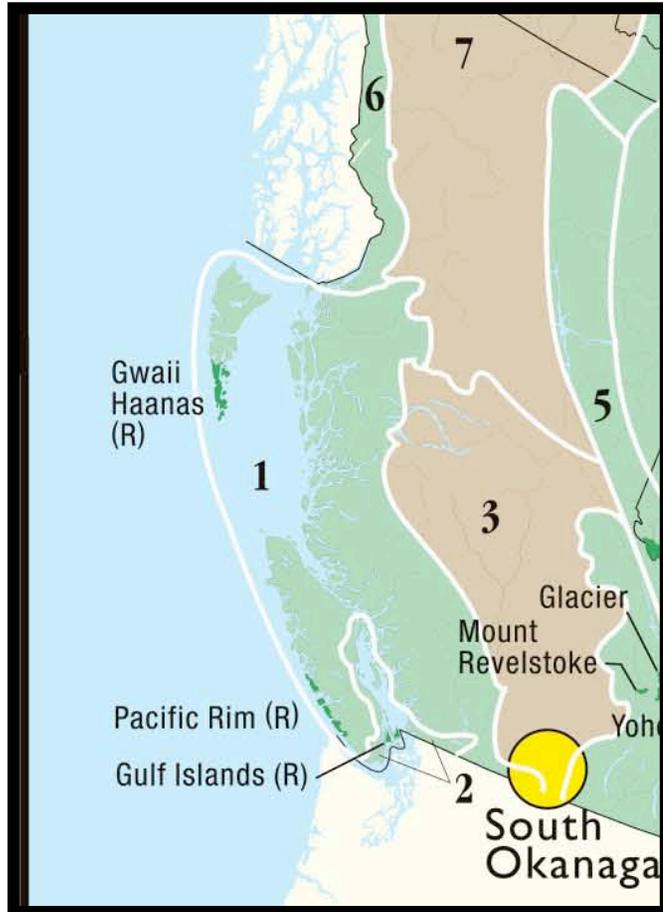
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# THE INFORMATION ICEBERG

## Finding Common Language





## The Bioregional Approach

### Pacific....

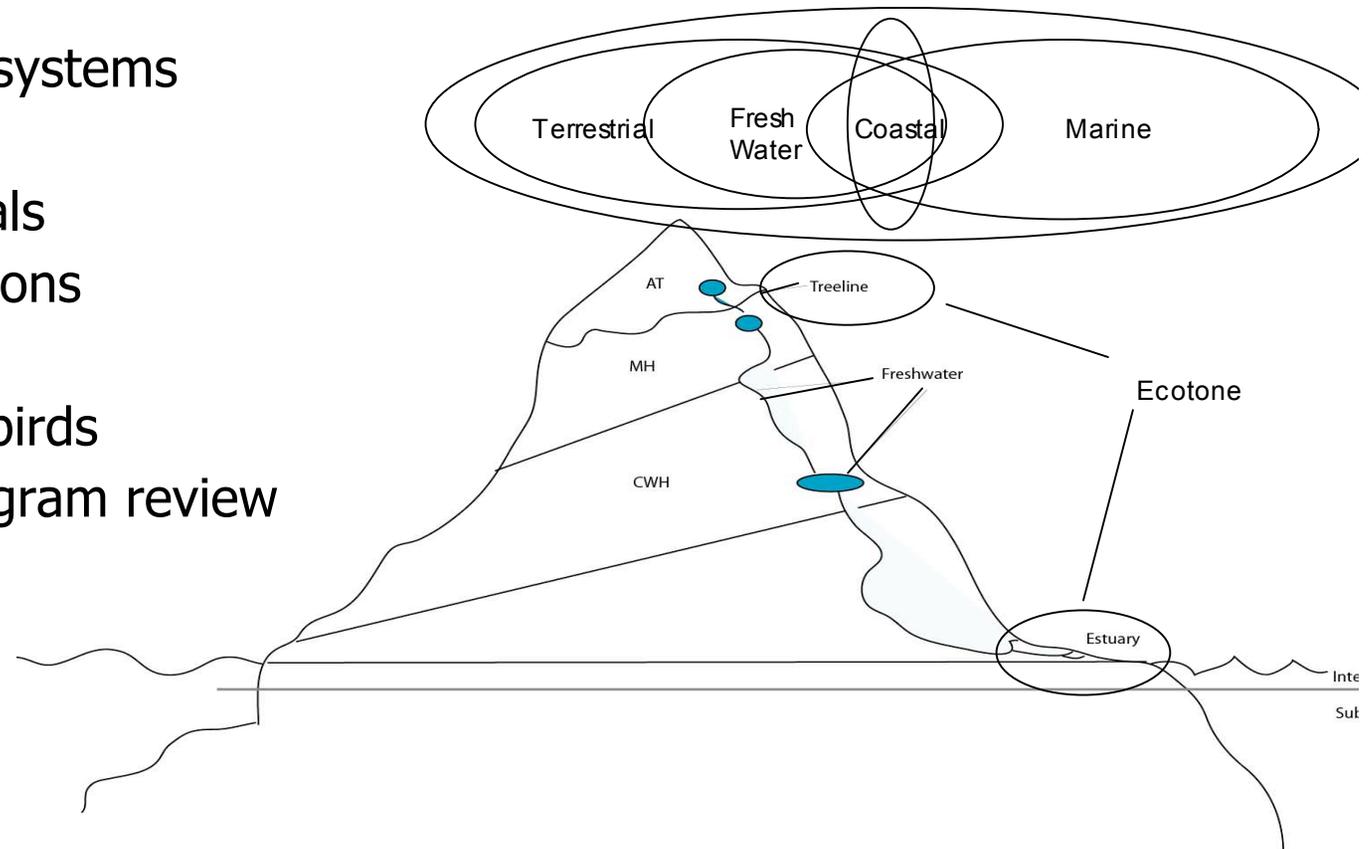
- 1) Pacific Rim NPR
- 2) Southern Gulf Island NPR
- 3) Gwaii Haanas NPR





# Pacific Bioregion Marine Monitoring Priorities

- near shore ecosystems
- water quality
- marine mammals
- human dimensions
- watersheds
- seabirds/shorebirds
- monitoring program review





# Pacific's coastal-marine indicators

## 1) Biodiversity

- Ecosystems and species
- species: richness, evenness, relatedness
- exotic species

## 2) Ecosystem function

- Primary, secondary, tertiary production
- Nutrient dynamics (nitrates)

## 3) Physical/Chemical Processes

- Ocean climate
- Land-sea interactions

## 4) Human Influence

- Land-use/marine use
- Fragmentation
- Climate change
- Fishing





## **Near shore ecosystems.....**

**Kelp beds (annual, perennial)**

**Eelgrass beds (fringe, flats)**

**Sand beaches**

**Pocket beaches (sheltered, semi exposed, exposed)**

**Rocky intertidal (bedrock, boulder)**

**Mudflats**



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## Monitoring for EI in eelgrass ecosystems (*Zostera marina*) of Pacific Rim National Park Reserve of Canada



- Inside vs outside park
- Index period (mid June-early August)
- Environmental and bed properties,
- Fish and invertebrate diversity



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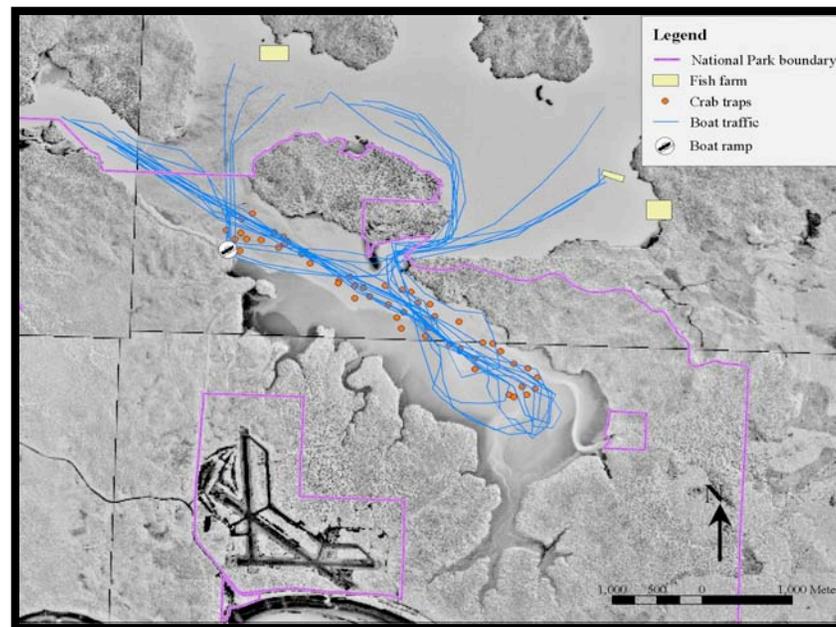
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## Major stressors to eelgrass in Pacific Rim:

1. Activities that increase nutrient loading and turbidity
2. Boating activities that cause physical damage



Marine use





# 1) Field studies

## Eelgrass bed properties

Density/Biomass

Leaf area index

Percent silt/clay

Bed size and max Z



## Environmental properties

SST/SSS

Bottom DO

Fluorescence/turbidity

Nitrates/ammonium



## Other properties

Epiphyte species/biomass

Percent epiphyte load

Adjacent land/marine use

Relative exposure



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## 2) Indices

### **Index of Biotic Integrity Approach** (after Karr 1981)

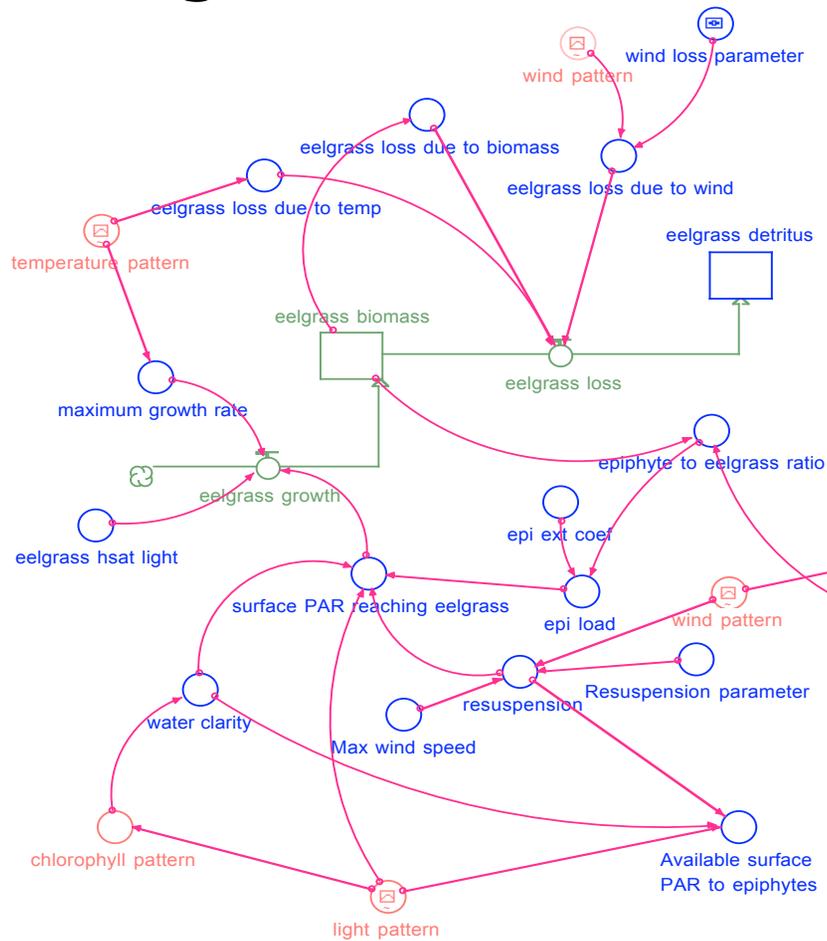
Can the health of an ecosystem be assessed by evaluating the structure and function of fish assemblages?

<b>Metric category</b>	<b>Example metric</b>
<b>1. Species richness and composition</b>	Number of species, relatedness, evenness
<b>2. Abundance</b>	Abundance, dominance, Percent benthic spp
<b>3. Nursery function</b>	Abundance YOY rockfish,
<b>4. Trophic function</b>	Percentage of specialists, detritivores
<b>5. Sensitive and tolerant species</b>	Abundance of residents (e.g., pipefish)
<b>6. Individual health and condition</b>	Incidence of lesions, parasites

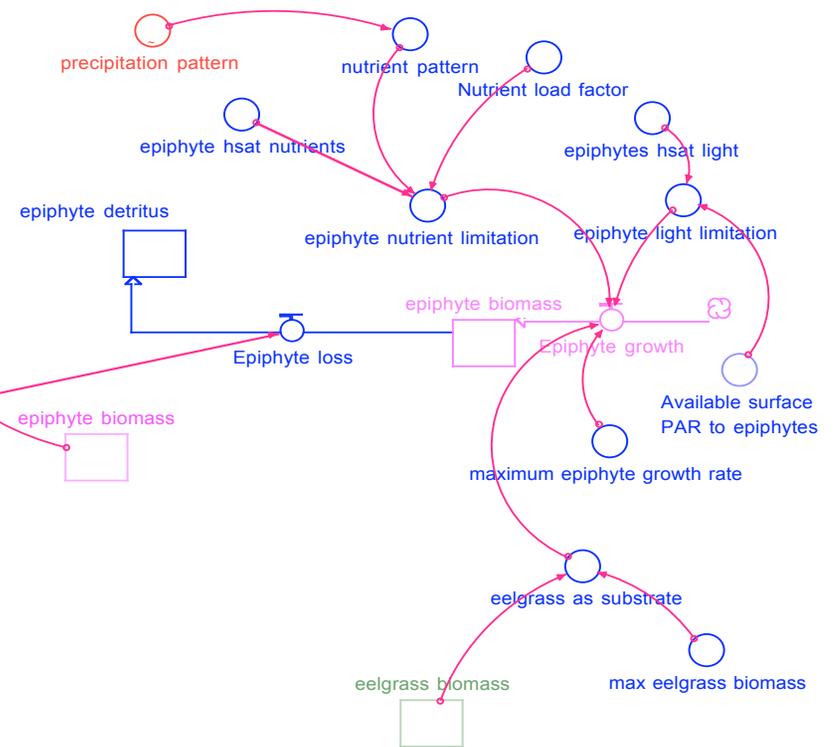




### 3) Modelling



### Cumulative effects on eelgrass production





## **In summary,**

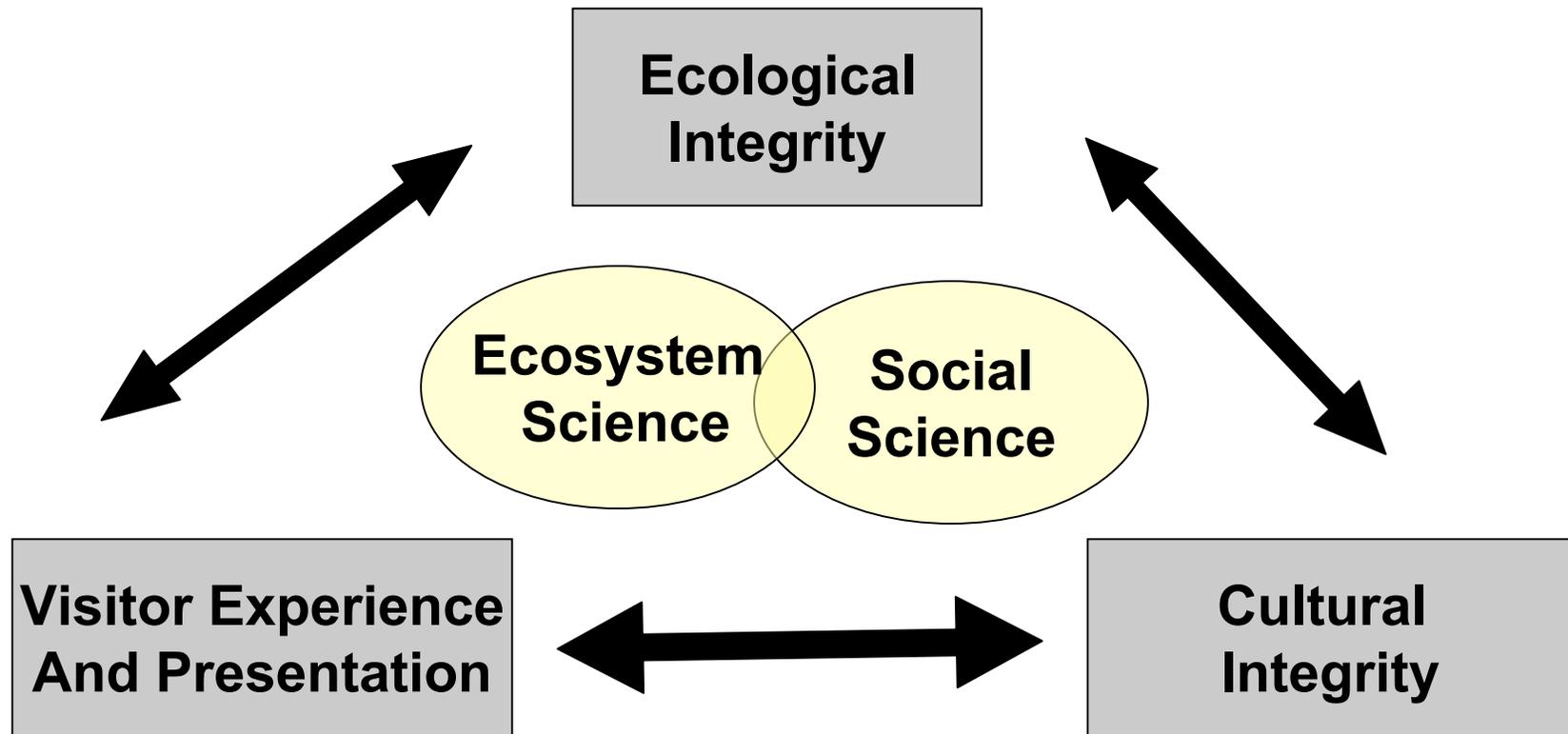
Parks Canada's challenges for developing effective marine indicators:

- Conforming to the National EI program requirements
- Diverse seascapes (Pacific, Arctic, Atlantic, Great Lakes)
- Land-sea interactions
- PCA capacity issues
- Coordinating with OGDs, First Nations, partners
- Reporting status of indicators
- Balancing local park, bioregional, and national needs
- Balancing the needs of the marine with terrestrial





Big Challenge: Human dimension is a 'stressor' but...





## To manage MPAs effectively, indicators must be ..

- *Affordable* - with ongoing and new EI funds
- *Achievable* – capacity and resource issues
- *Scientifically-defensible* – to peers, partners, AG
- *Ecologically meaningful* – spatial/temporal scales
- *Targeted* – to our reporting responsibilities
- *Connected* - to park management and neighbours
- *Responsive* – to legislative requirements
- *Communicated* – role ups to managers, all Canadians

