



Applying Marxan in the Scotian Shelf Bioregion

A technical case study

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Outline

Design Principles

Why Marxan?

Data Layers

Settings & Targets

Results

Lessons Learned

Next Steps



Design Principles

Representation

- Include a range of habitats to support the variety of species in the region.

Ecologically and Biologically Significant Areas

- Include areas of known importance to support the health of the regional ecosystem.



Supporting Data

Representation

- recognized seabed features (banks, basins, canyons, etc)
- range of environmental conditions

Ecologically and Biologically Significant Areas

- important habitat for significant species
- areas of high biodiversity
- natural refuge areas
- sensitive species and habitats

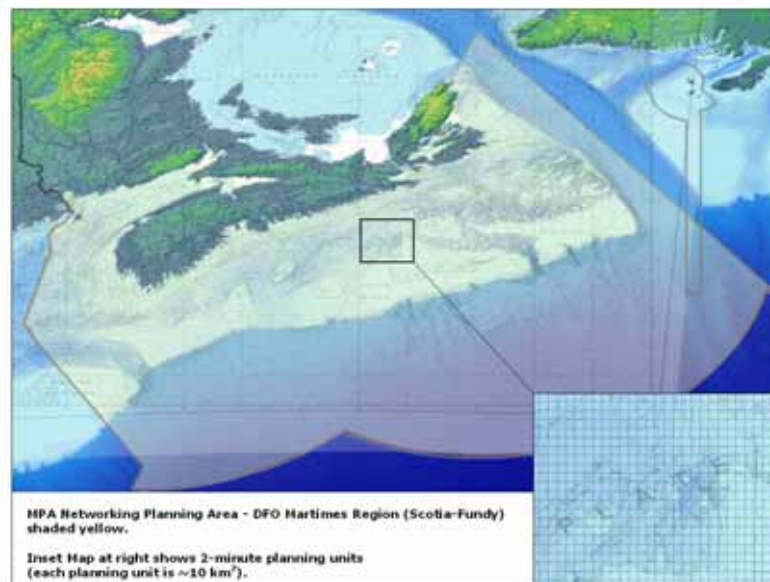


Why Marxan?

- Multiple objectives
- Flexible
 - Goals
 - Data types
 - Lock areas in & out
- Repeatable
- Internationally recognized



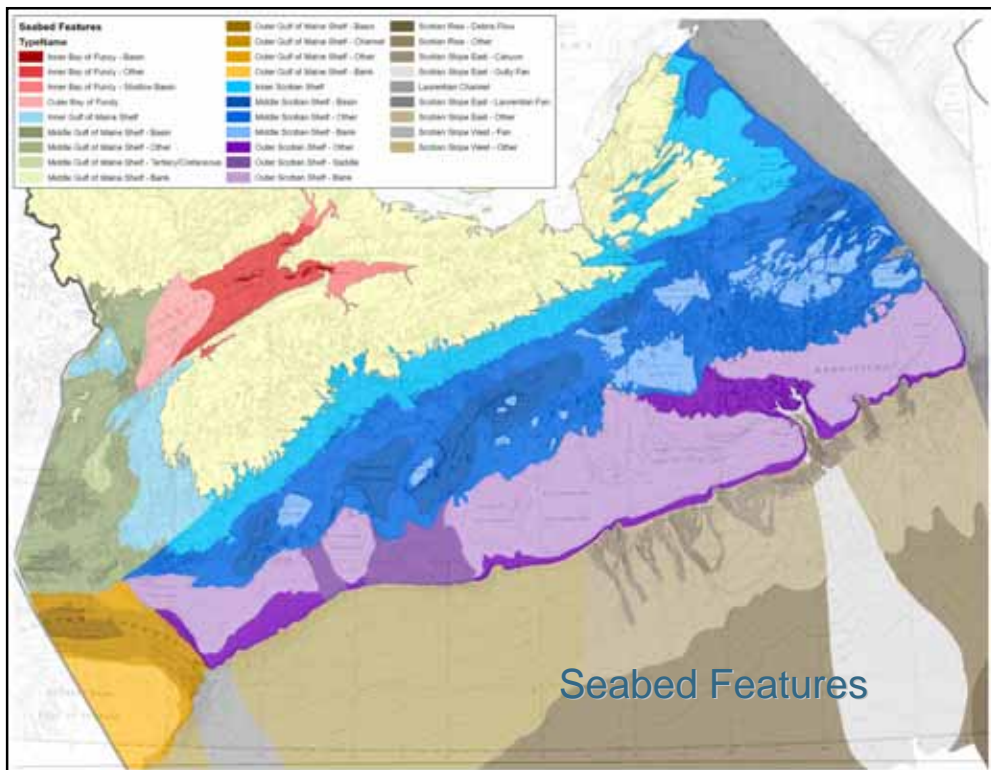
Study Area



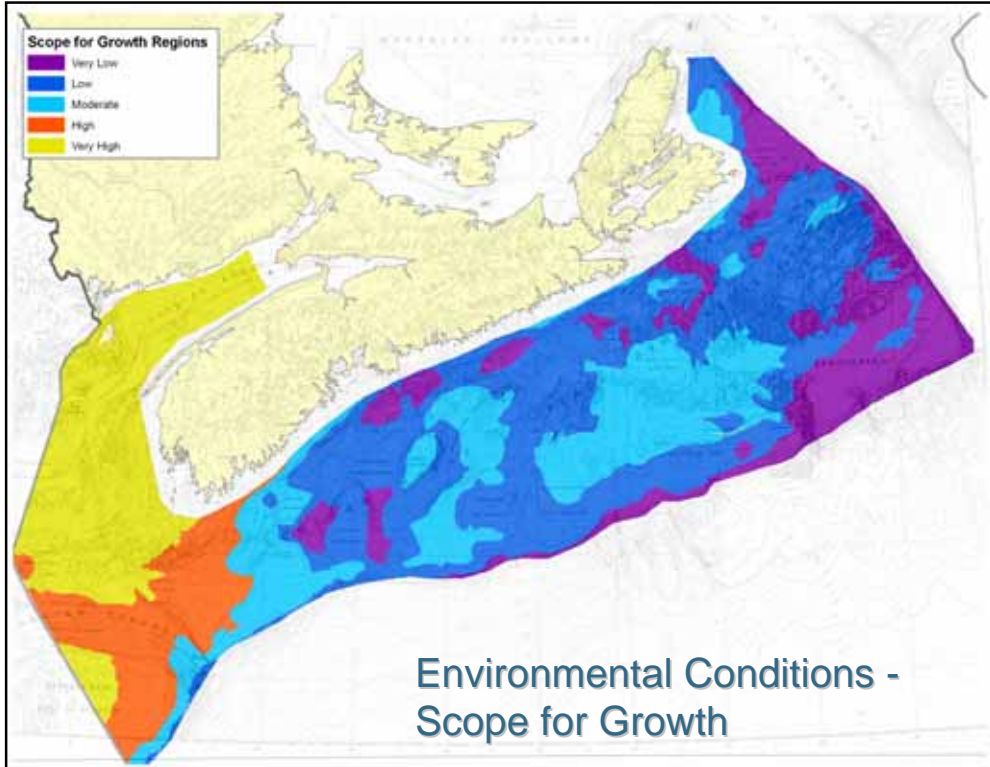


Data layers...

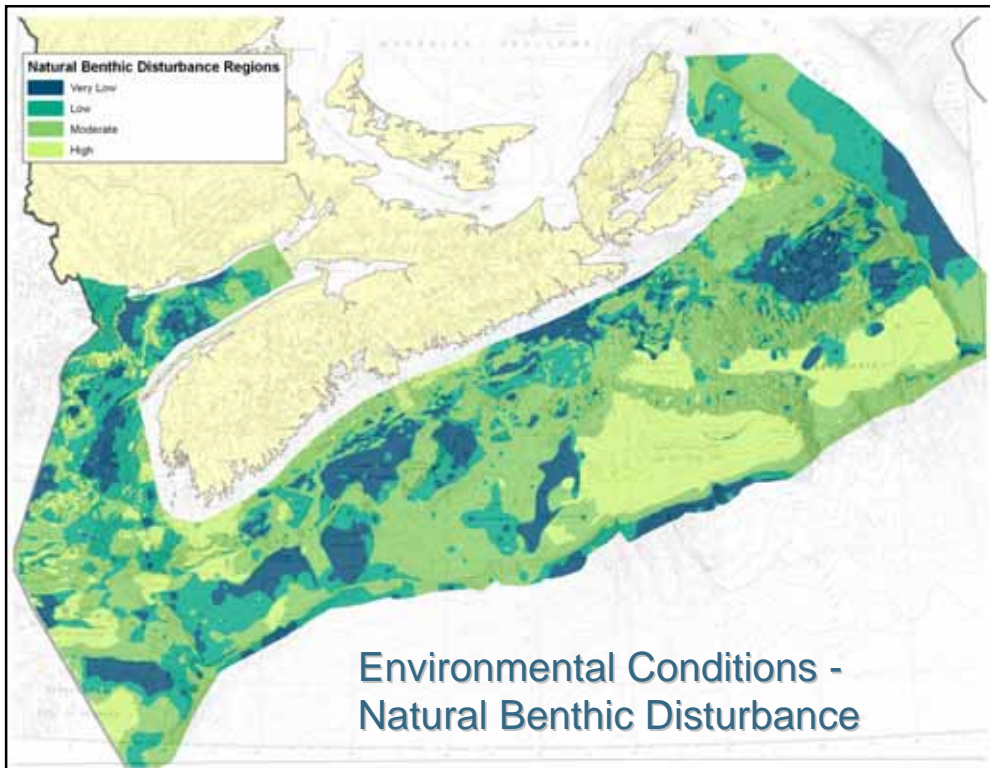
REPRESENTATION



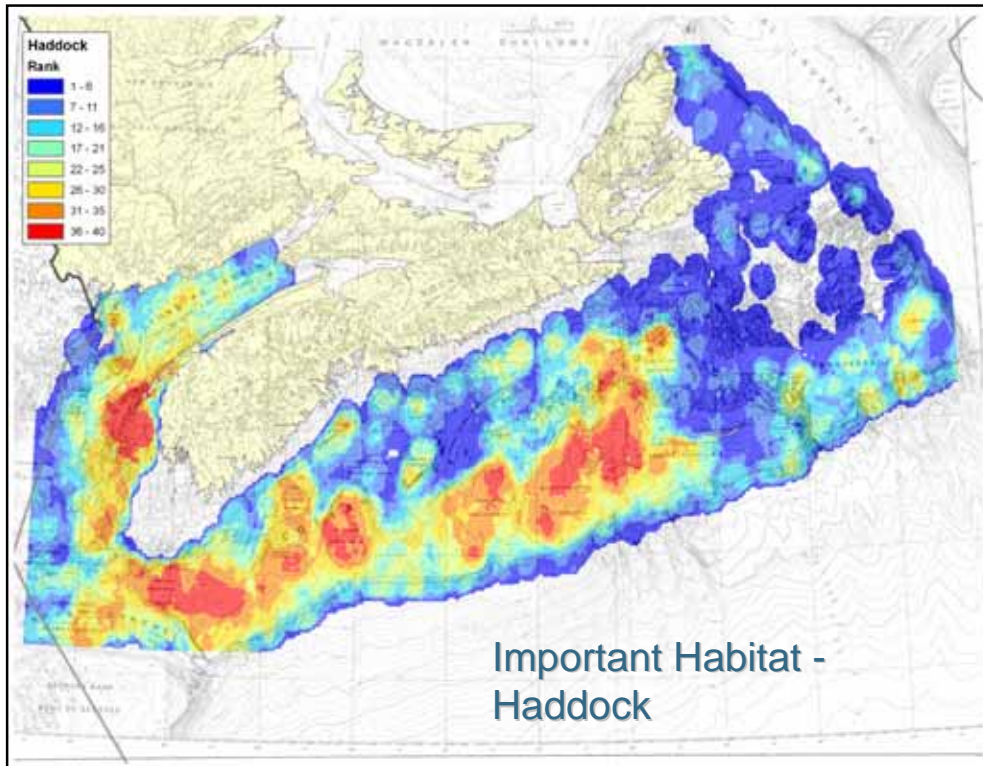
REPRESENTATION



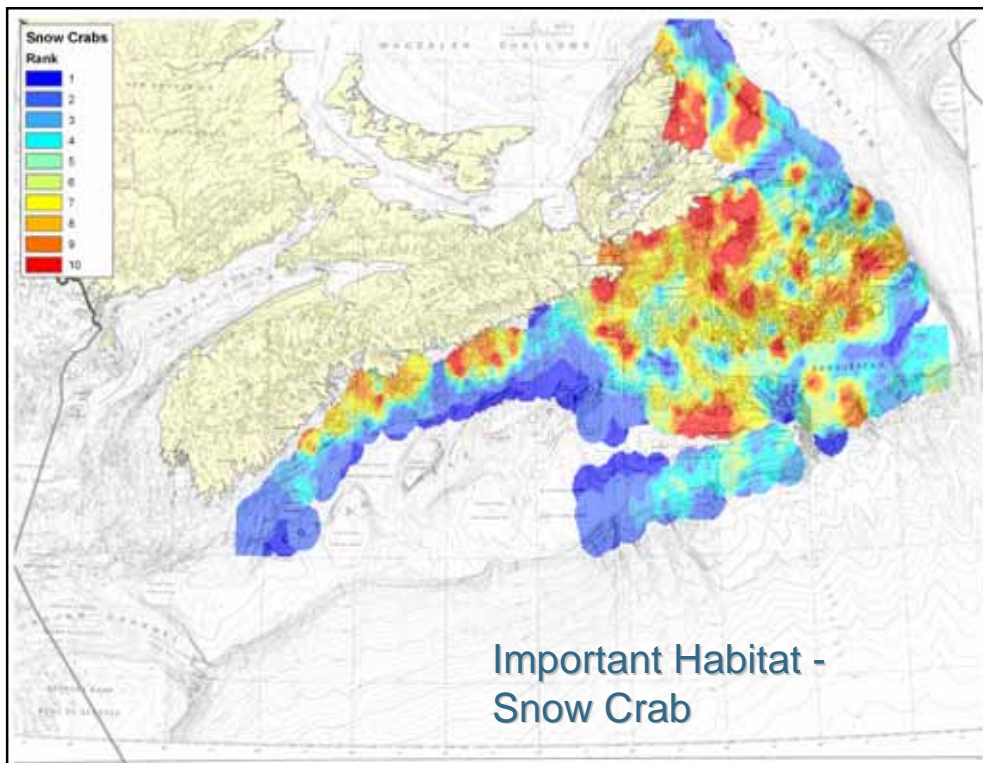
REPRESENTATION



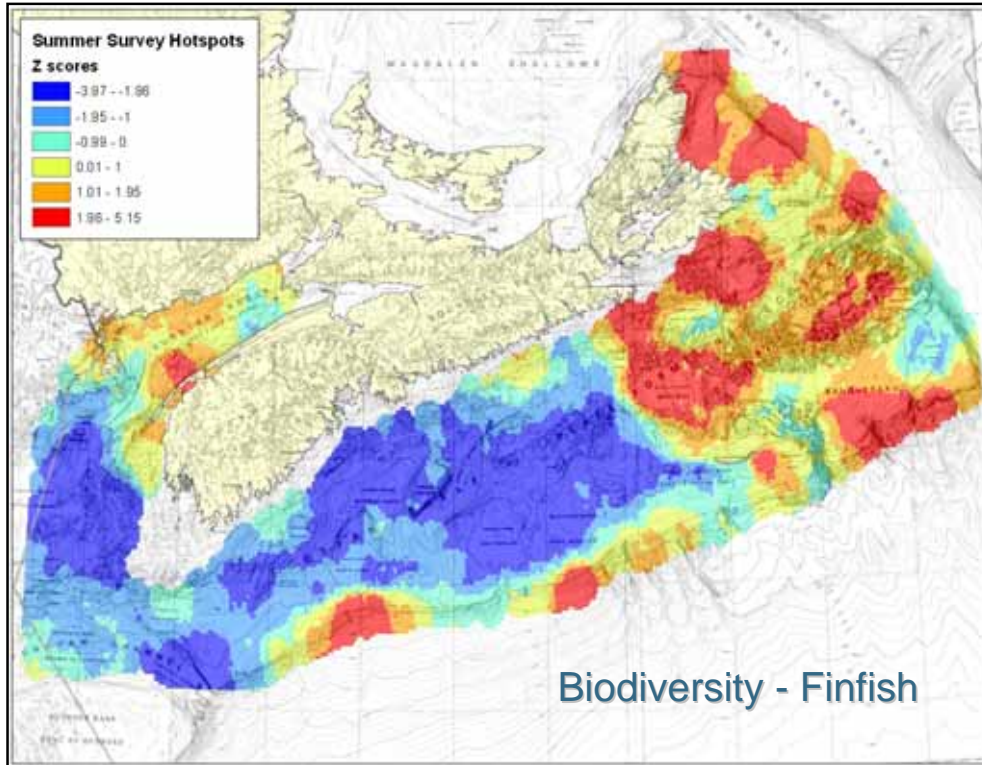
EBSA



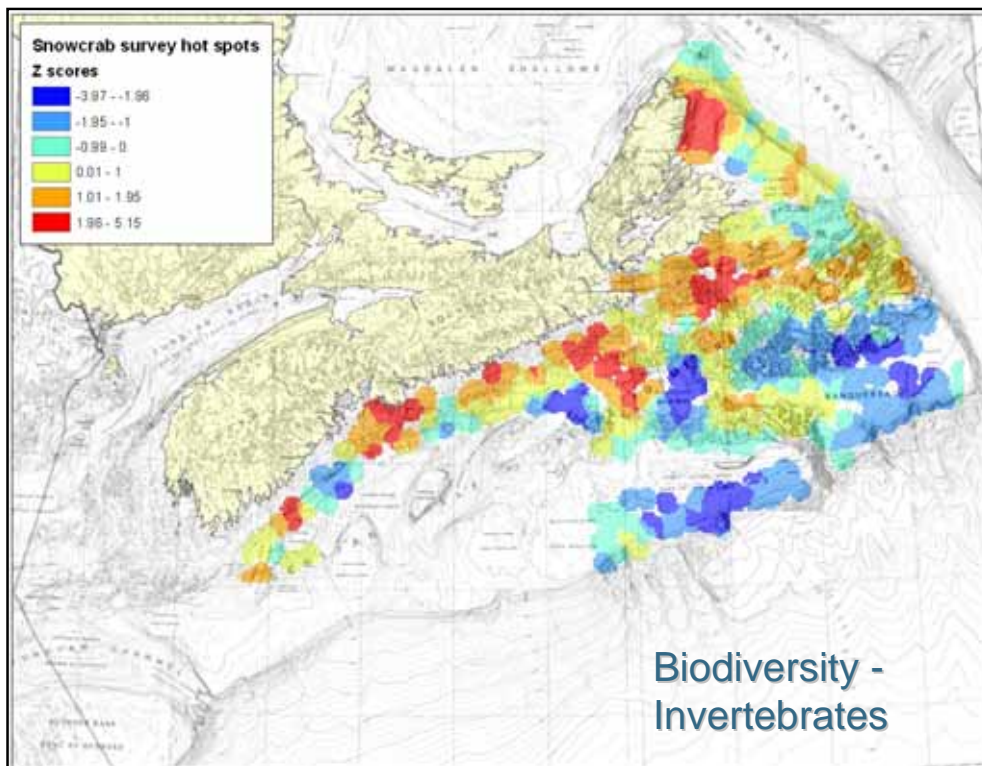
EBSA



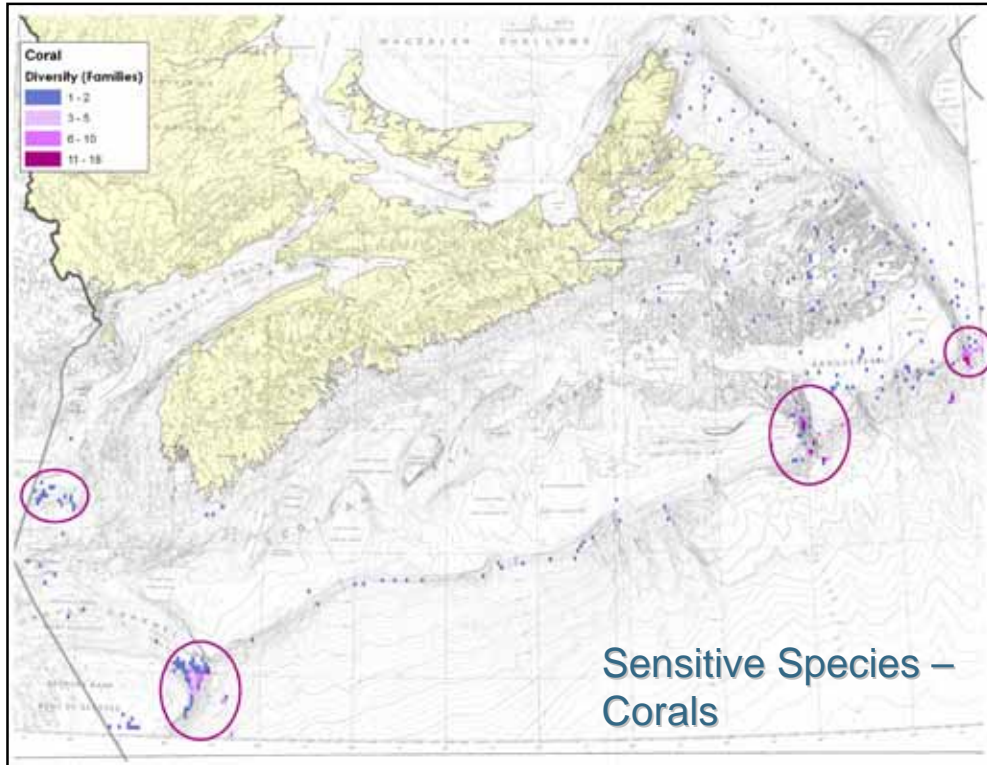
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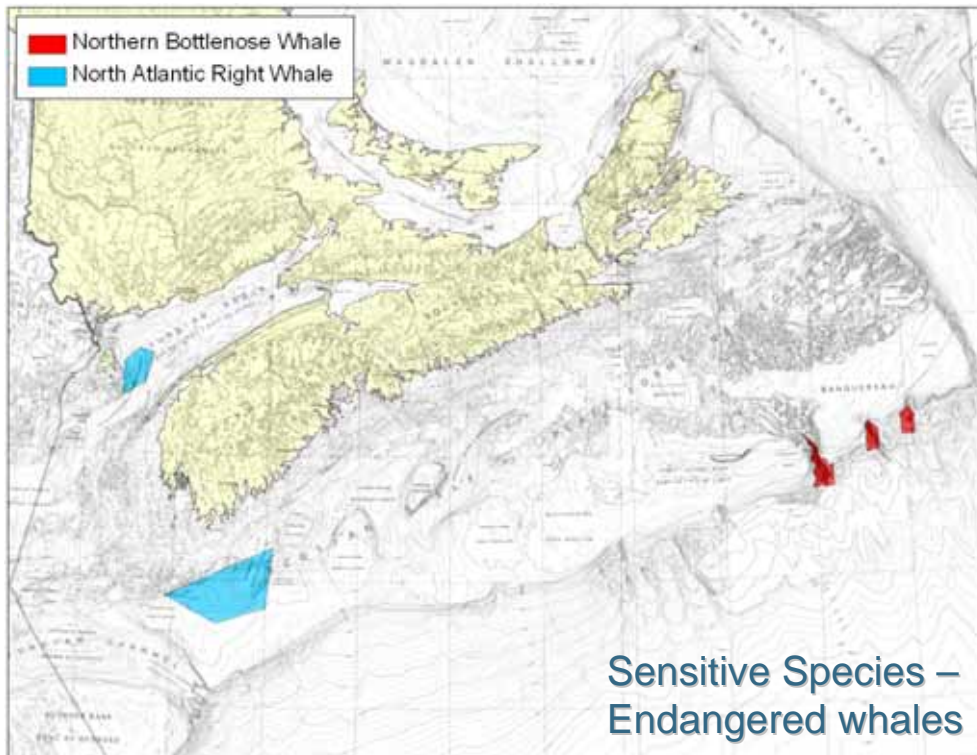
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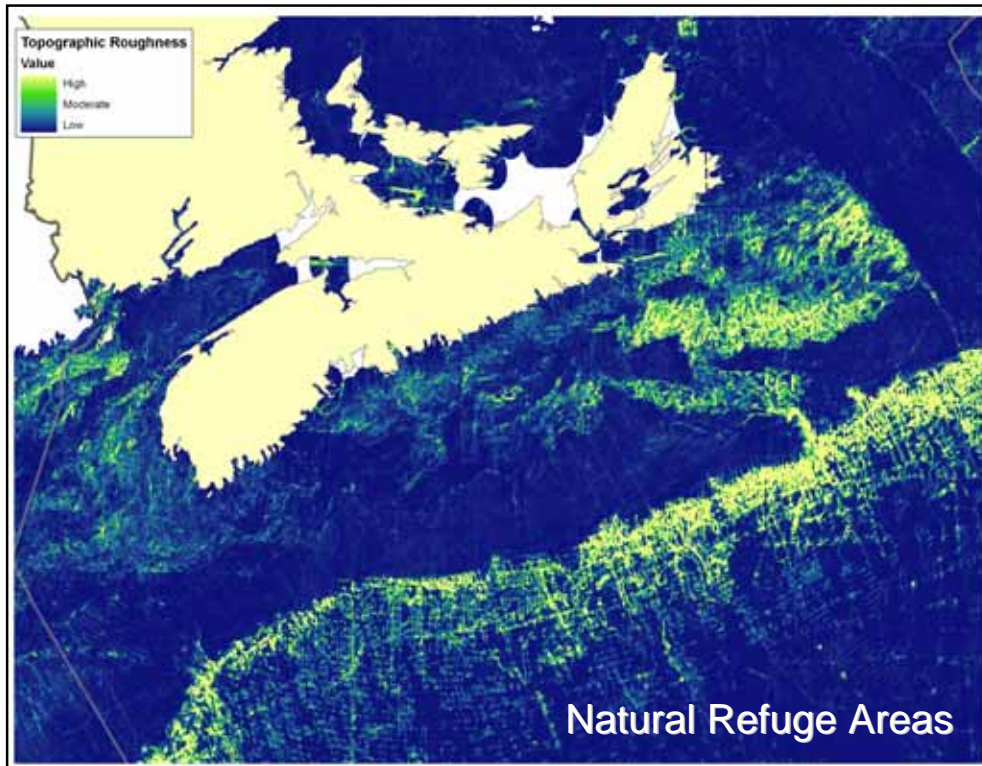


EBSA



EBSA





Data Layers

Representation

- Seabed features types (29)
- Scope for group regions (5)
- Natural disturbance regions (4)

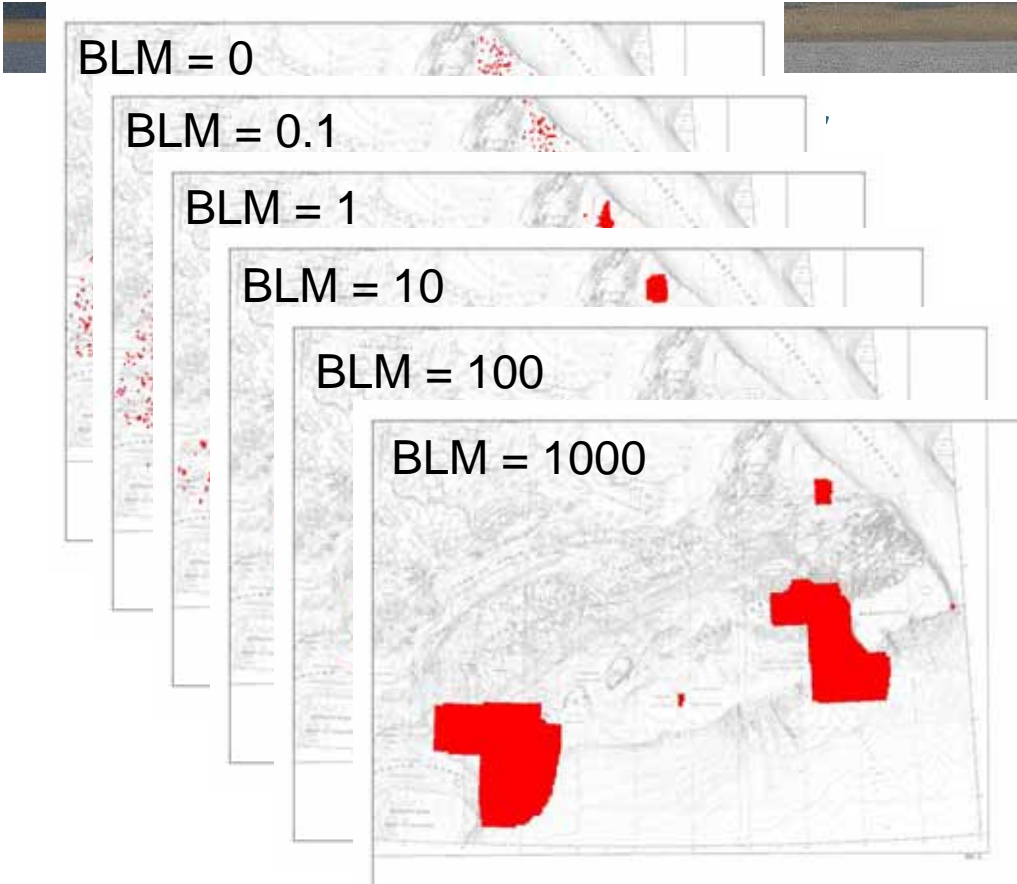
Ecologically and Biologically Significant Areas

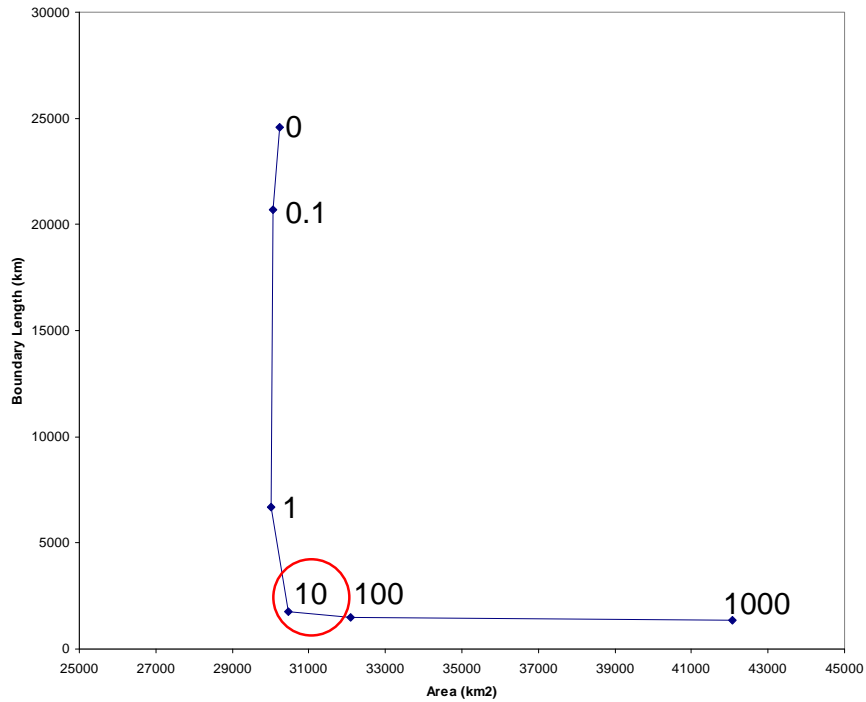
- Significant Species (26)
- Invertebrates (12)
- Depleted Species (6)
- Biodiversity (3)
- Coral (2)
- Whales (2)
- Natural refuge areas (1)



Settings

- PUs = 48,000
 - Rectangular
 - 2 minute/10km²
 - Cost = Area
- BLM = 10





Settings

- PUs = 48,000
 - Rectangular
 - 2 minute/10km²
 - Cost = Area
- BLM = 10
- SPF = 1
- Runs = 10
- Iterations = 100,000,000
- Existing areas = not locked in





Targets

How to set targets?

- Subjective
- Representation: 10-30%
- Higher targets for more sensitive features



Iterative process

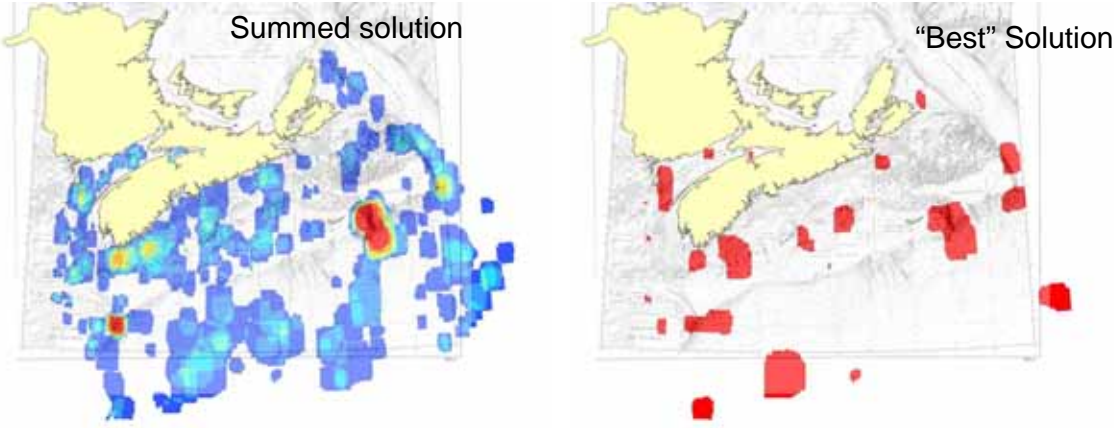
- Changed targets, layers, etc.
- ~60 scenarios



Initial Results...



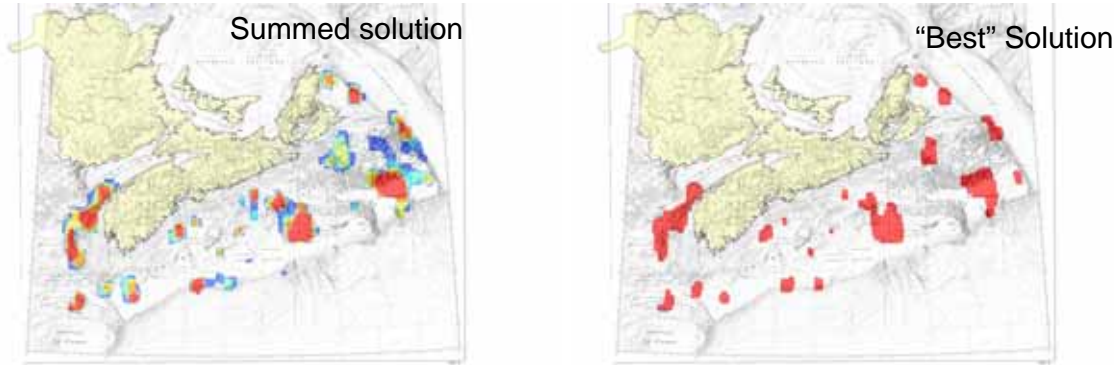
Initial Results (example)



Representative Habitat 10%, existing conservation areas "locked in"



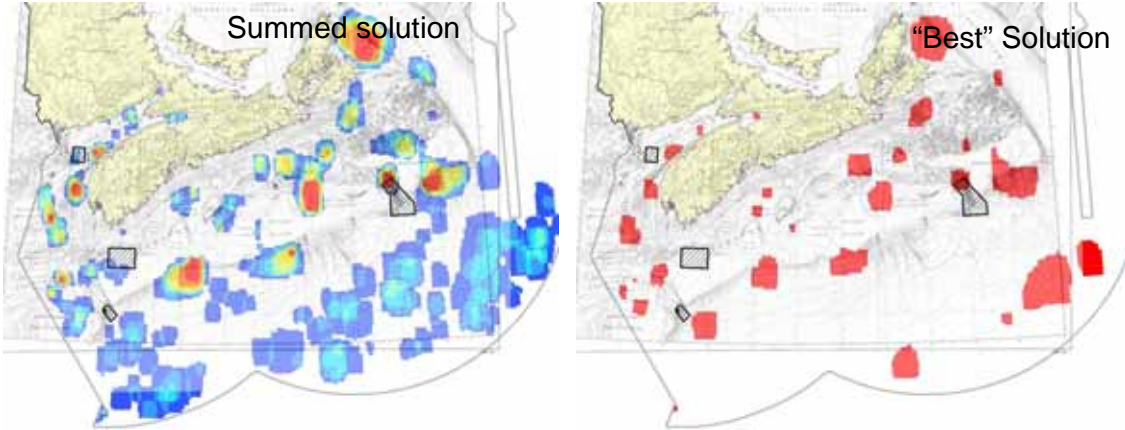
Initial Results (example)



Significant Fish Species Habitat 30%, existing conservation areas not "locked in"



Initial Results (example)



Representative Habitat 10%, Significant Fish Species Habitat 20%
 Biodiversity Index 30%, existing conservation areas not "locked in"



Final Conservation Targets

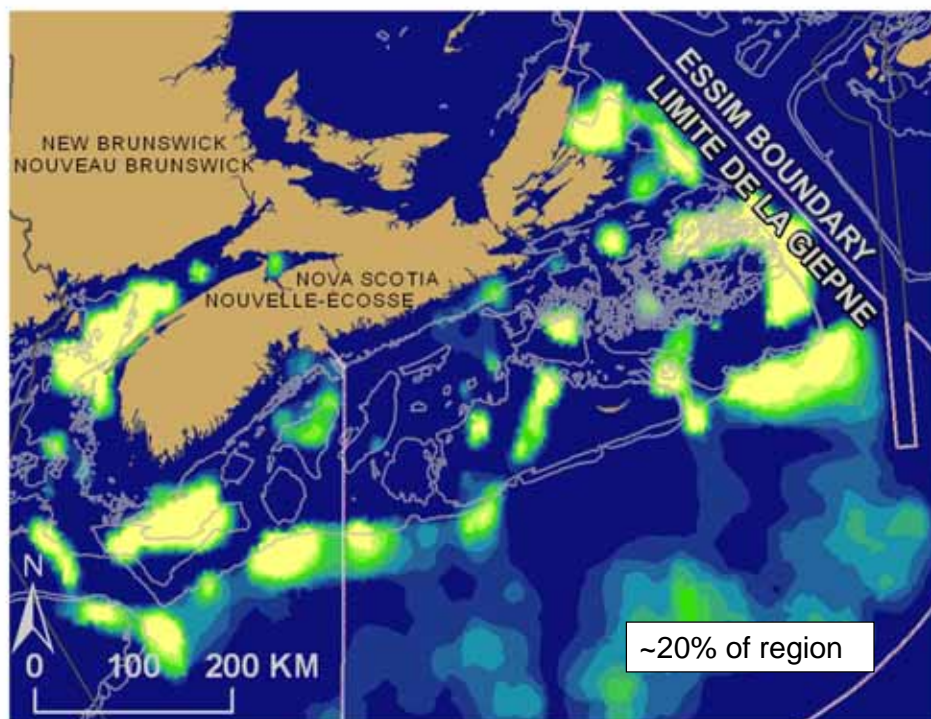
Type	Proportion
<u>Representation</u>	
• Scope for Growth	0.2
• Natural Disturbance	0.2
• Very Low Natural Disturbance	0.4
• Seabed Types	0.2
<u>Ecologically and Biologically Significant Areas</u>	
• Significant Species Habitat	0.2
• Invertebrates	0.2
• Natural Refuge areas	0.2
• Biodiversity Hotspots	0.3
• Depleted Species Habitat	0.8
• Coral density	0.8
• Coral diversity	1.0
• Whale Critical Habitat	1.0



“Final” Results...



Final Results





Lessons Learned

Challenges

- Setting targets
- Socio-economic info
- Stakeholder involvement & acceptance

What would I do differently?

- Socio-economic info
- Stakeholder involvement
- Science review

Tips

- Documentation! (spreadsheets, folders, etc.)
- Try everything



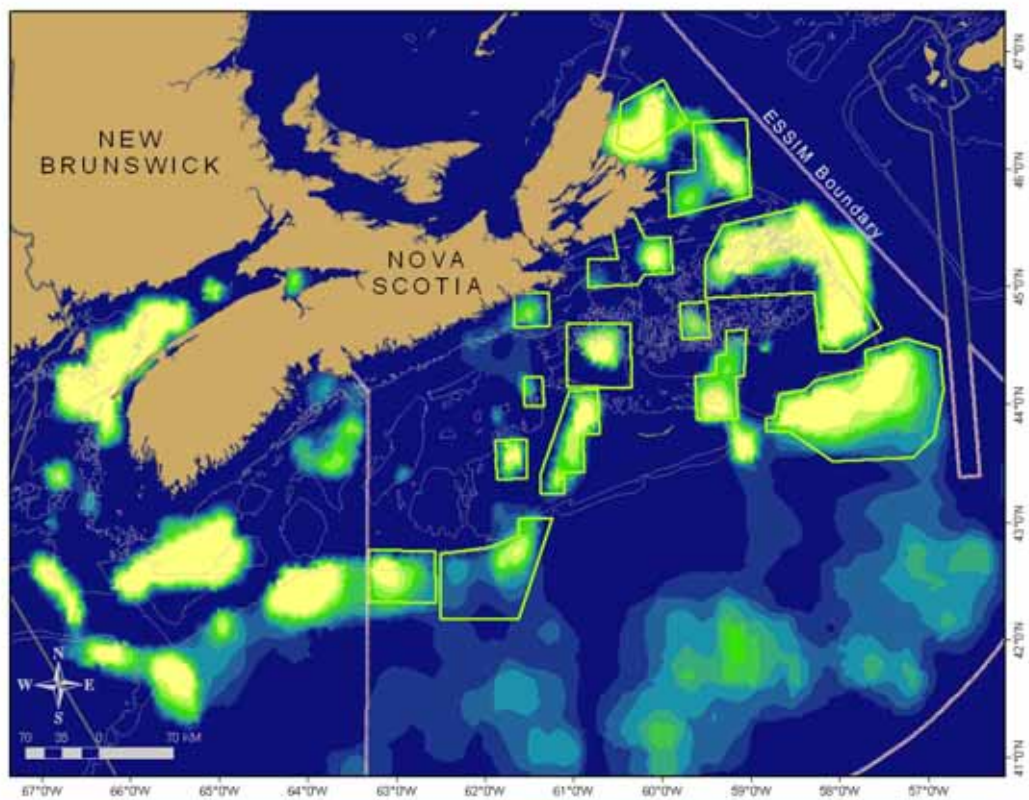
Next Steps

- Regional Advisory Process
- Marxan Analysis 2.0
 - Updated data layers
 - Socio-economic data
 - Stakeholder involvement

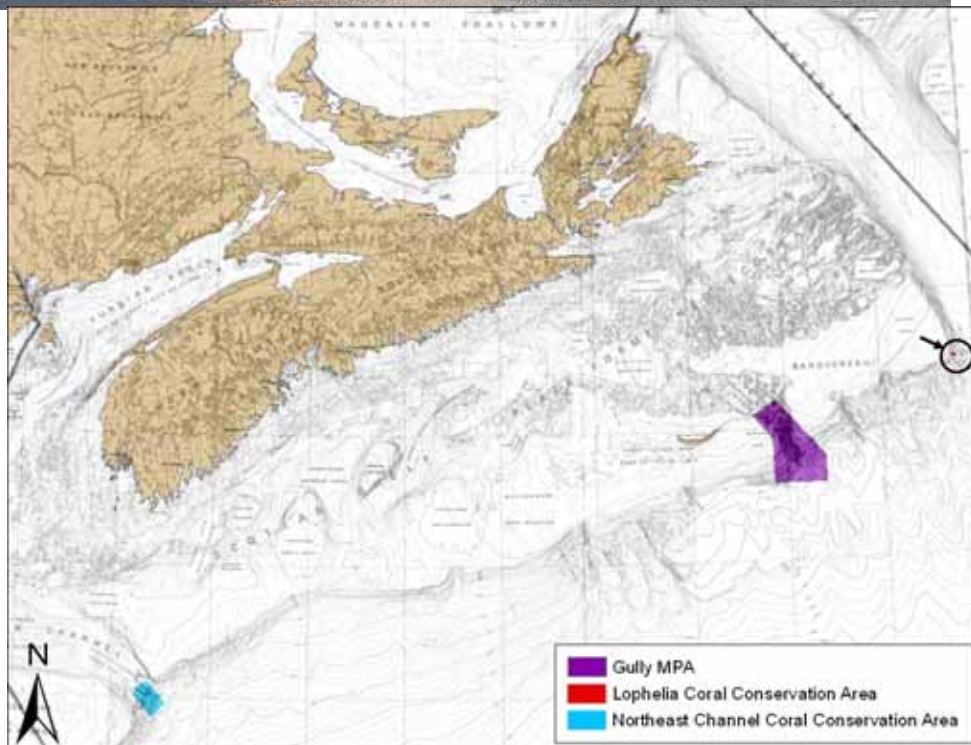
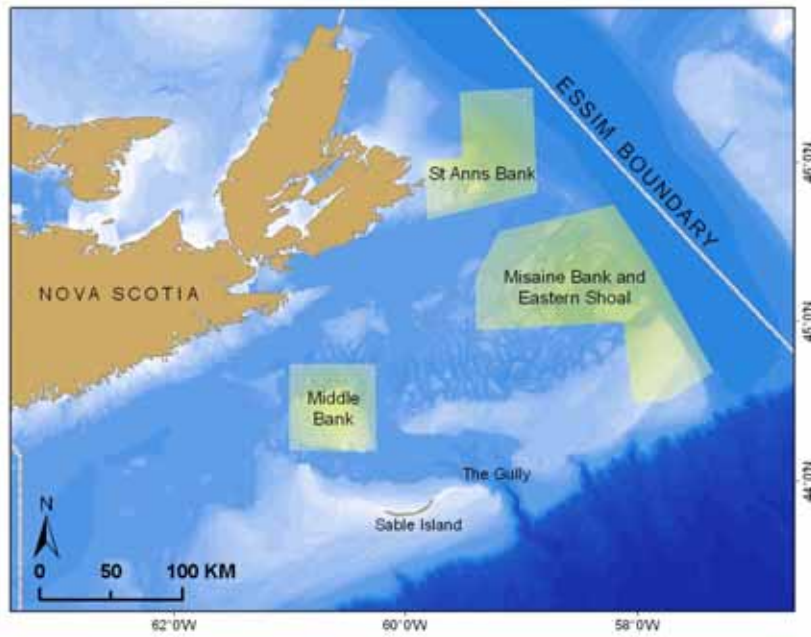


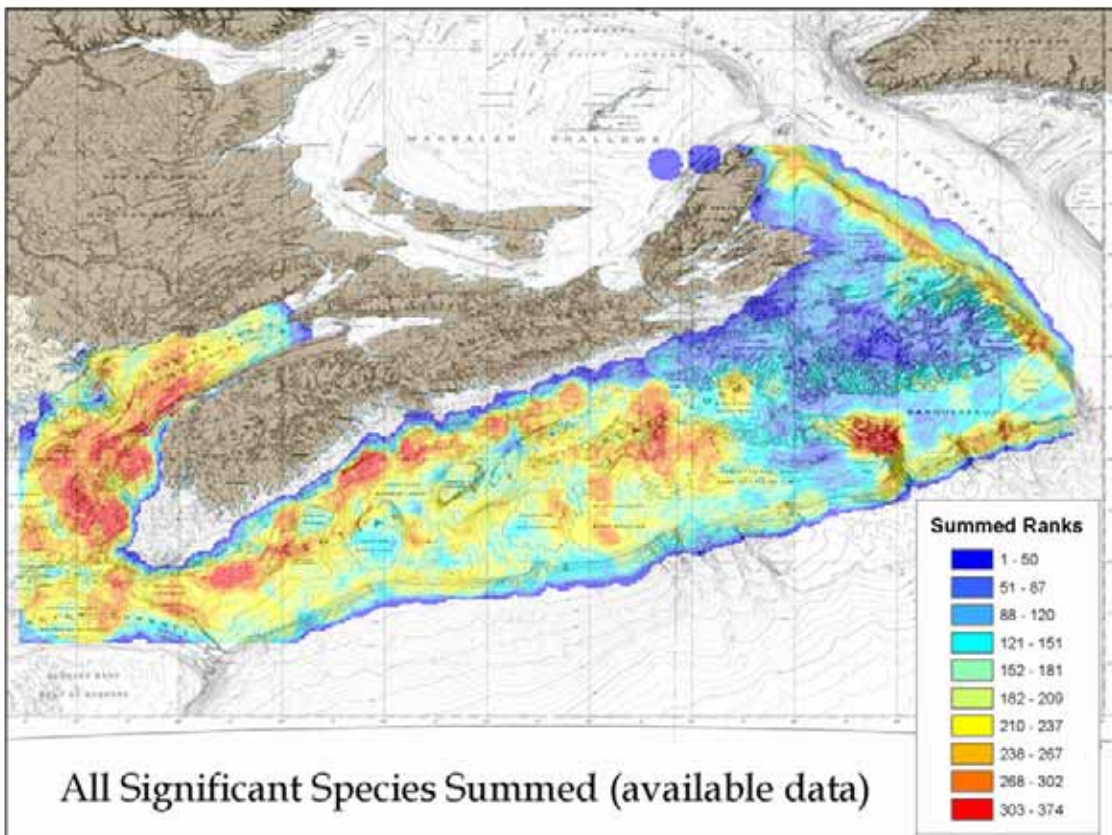
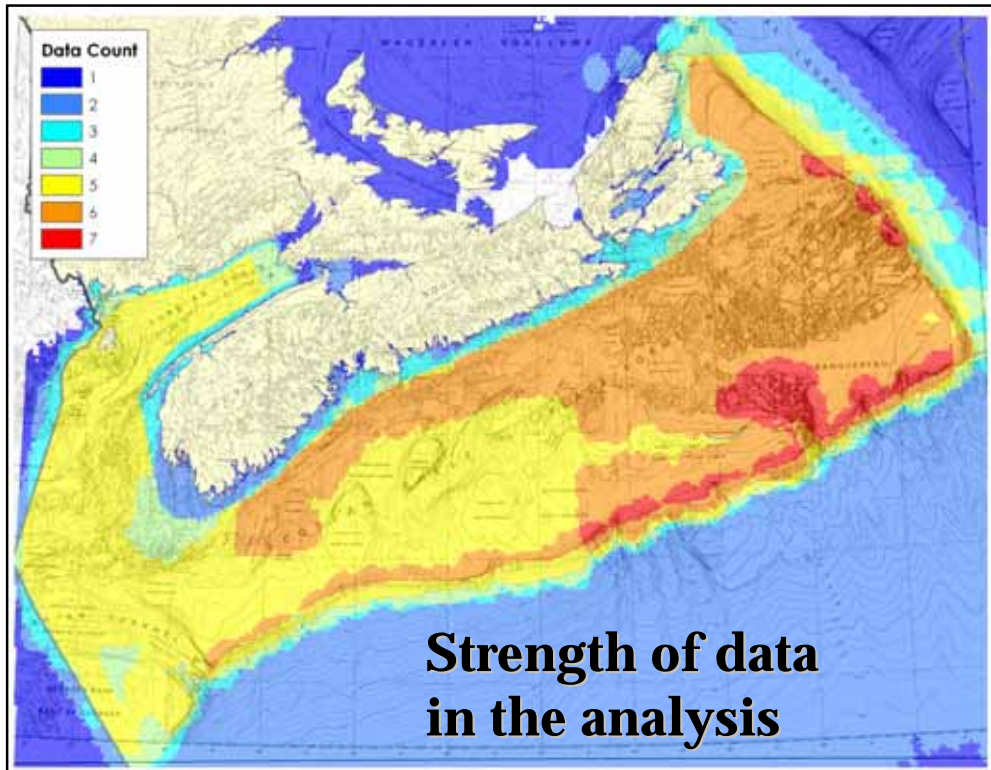


Questions?

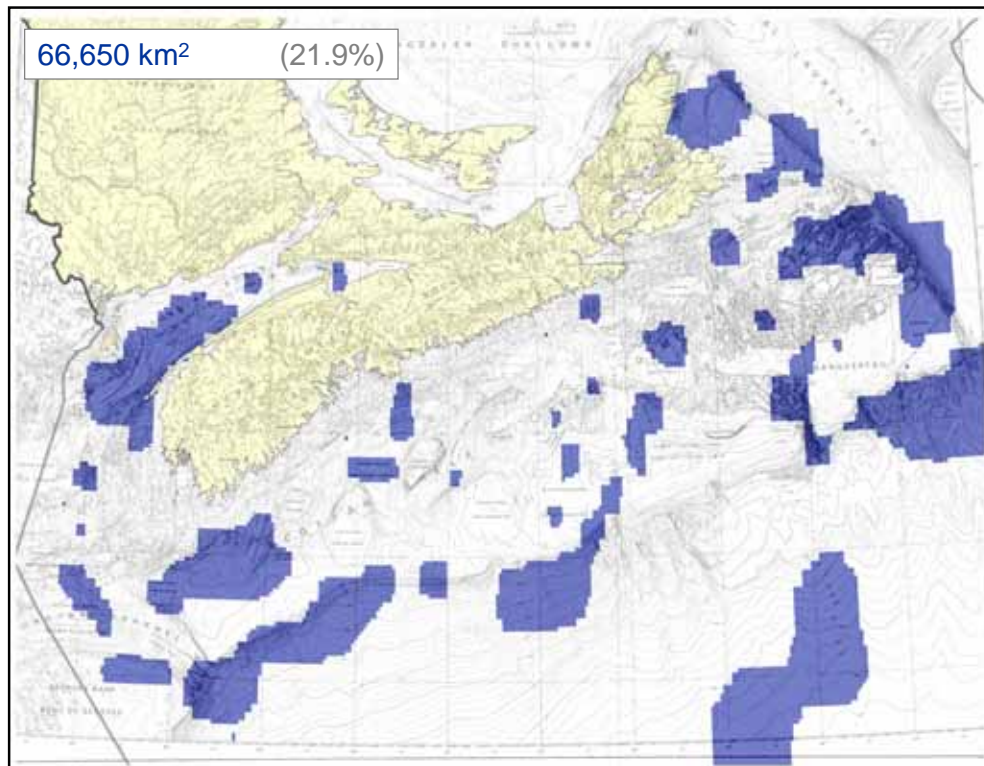


Candidate Areas of Interest





Solution



Objectives

- To provide MPA network options based on ecological objectives
- To be systematic:
 - explicit design principles and conservation goals
 - methods that are repeatable
 - methods that allow for flexibility in design