DEVELOPMENT OF GUIDELINES FOR MANAGED REALIGNMENT TO MAXIMIZE ADAPTIVE CAPACITY & ECOSYSTEM SERVICES

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Maritime Provinces Spatial Analysis Research Centre

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Project Overview

PURPOSE: To develop guidelines and a framework for managed realignment (MR) of dykes to maximize future ecosystem services and adaptive capacity to climate change.

Time Frame: Report finalized May 2014 –available upon request

Funding: Environment Canada's Gulf of Maine Initiative

Priority Areas:

- Habitat conservation or restoration;
- Improved understanding of climate and enhancing collaboration on impacts and adaptation to change.

Project Objectives

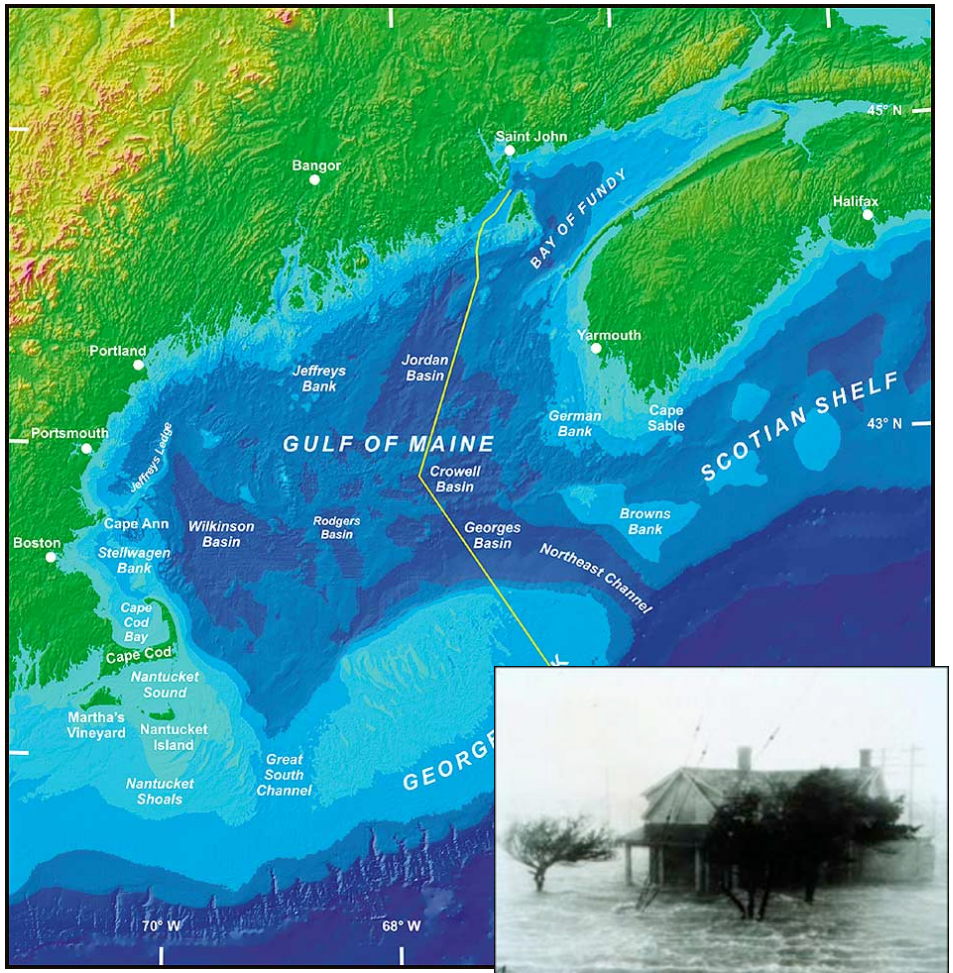
- Determine from the literature and key informant consultations key variables influencing the success of managed realignment projects

- Develop a suite of marshland assessment metrics within a geographical information system (GIS)
- Apply these metrics to the current extent of the NS Department of Agriculture marshlands atlas and assign marsh bodies to three classes of priority
- Consult with key stakeholders to identify potential areas for managed realignment in the present and future
- Develop a guidance document and framework for conducting an effective managed realignment project

Climate Change Impacts

Relative SLR projections for Atlantic

- 0.70-1.73 m by 2100 (including tidal expansion)
- Extreme 2.3 m with Antarctic melt
- Increase resultant impact of even minimal storm surge



Impacts:

- ↑ Flooding/Inundation
- ↑ Erosion
- ↑ Tidal Range
- Loss of Habitat
- Loss of Livelihood
- ↑ Dyke maintenance cost

Dykelands & Climate Change

- Approximately 85% of salt marshes in Fundy have been 'lost' since colonization due primarily to dyking.
- Primary line of defense before dykes or transportation infrastructure
- Increased development behind dykes = altered stormwater drainage, increased vulnerability of ponding

- Ecosystem engineers – drivers of habitat creation, productivity & carbon sequestration
- Coastal flooding and erosion can lead to significant economic, physical, cultural and social loss within communities

The Case for Managed Realignment

Managed realignment (MR), managed retreat, or set back, involves the deliberate breaching, or relocating of coastal defense structures (French, 2006).

The two main functions of MR are:

- Restoration of tidal wetlands
- Expanding the extent of sustainable coastal defenses while decreasing maintenance costs (Pendle 2013).

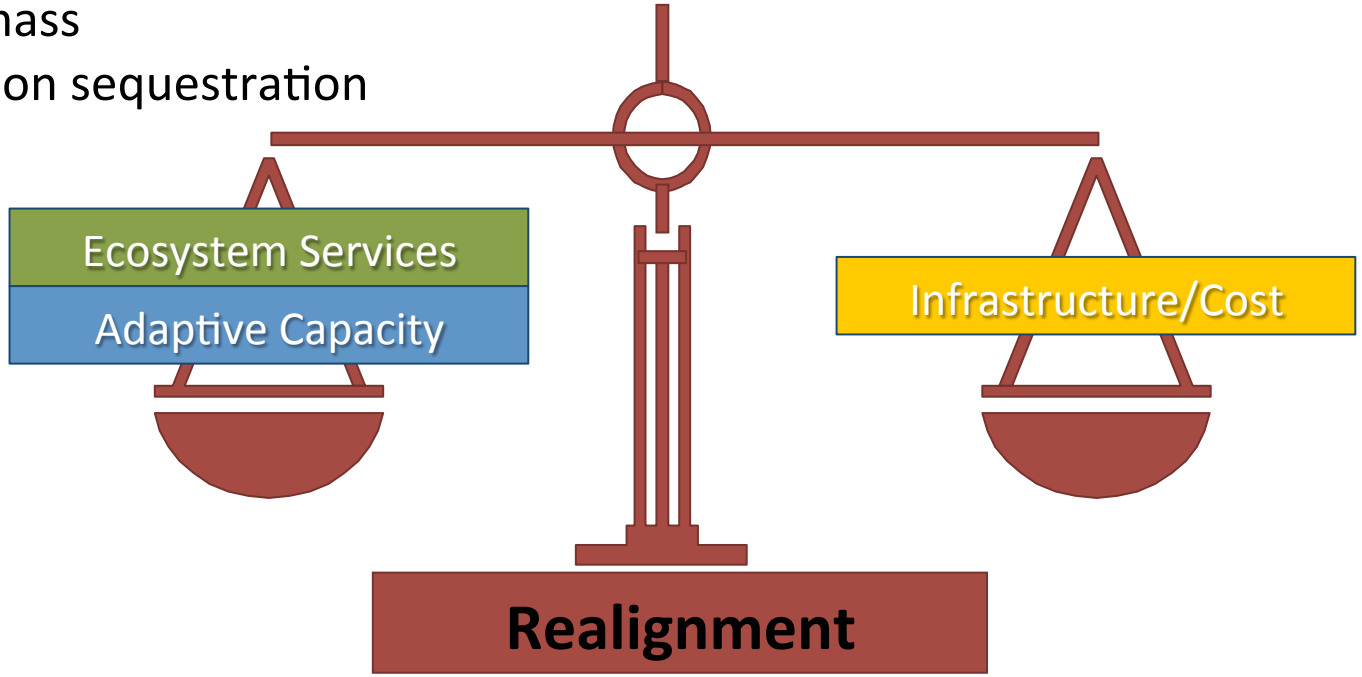
Abott Hall Farm, Blackwater Estuary, UK

Options or designs for MR, include: **retreating** to higher ground, **constructing** a set-back line of defense, **shortening** the overall defense length to be maintained (partial or complete removal), **reducing** wall or embankment **heights**, and/or **widening/restoring** coastal wetlands & river flood plains.

(Möller et al. 2001; Wolters et al. 2005; Shepard, et al. 2011; Luisetti et al. 2011; (DEFRA and EA 2002)

GIS Framework

- Habitat
- Biomass
- Carbon sequestration



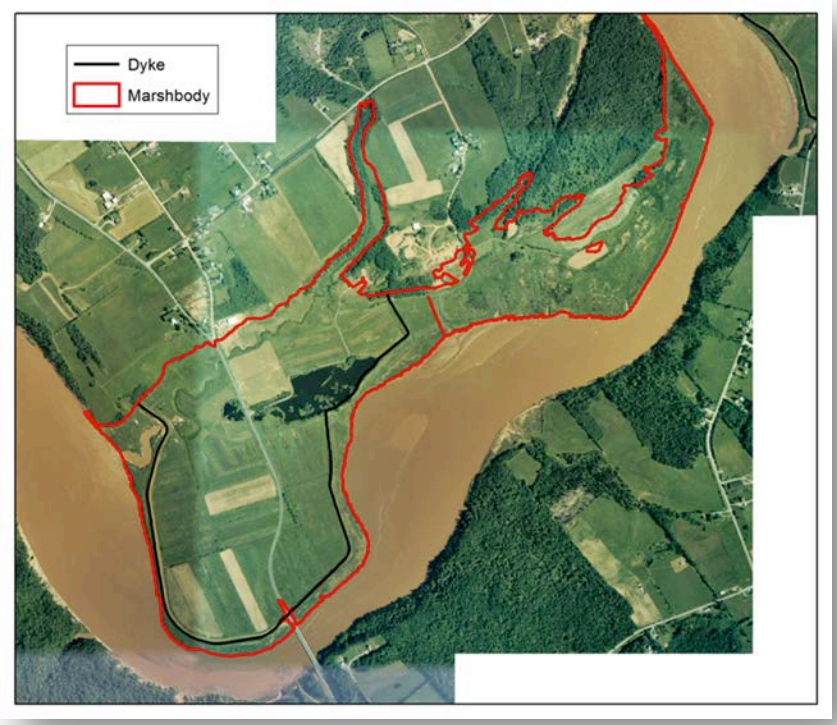
- Storm water retention
- Wave energy dissipation
- Water filtration

- Infrastructure affected
- Accommodation space
- Maintenance vs repair costs

Ecosystem Services

Quantify the potential ecosystem services provided by a realignment project and highlight the habitat quality or productivity of the site.

Morphology



Hydrology

Ecosystem Services

Habitat Quality

Flora and Fauna

Adaptive Capacity

Adaptation, according to the IPCC, is the "*The process of adjustment to actual or expected climate and its effects*" (IPCC 2013).

GOAL: Take advantage of the inherent characteristics of natural systems (i.e. salt marshes) to decrease erosion & reduce flooding impacts

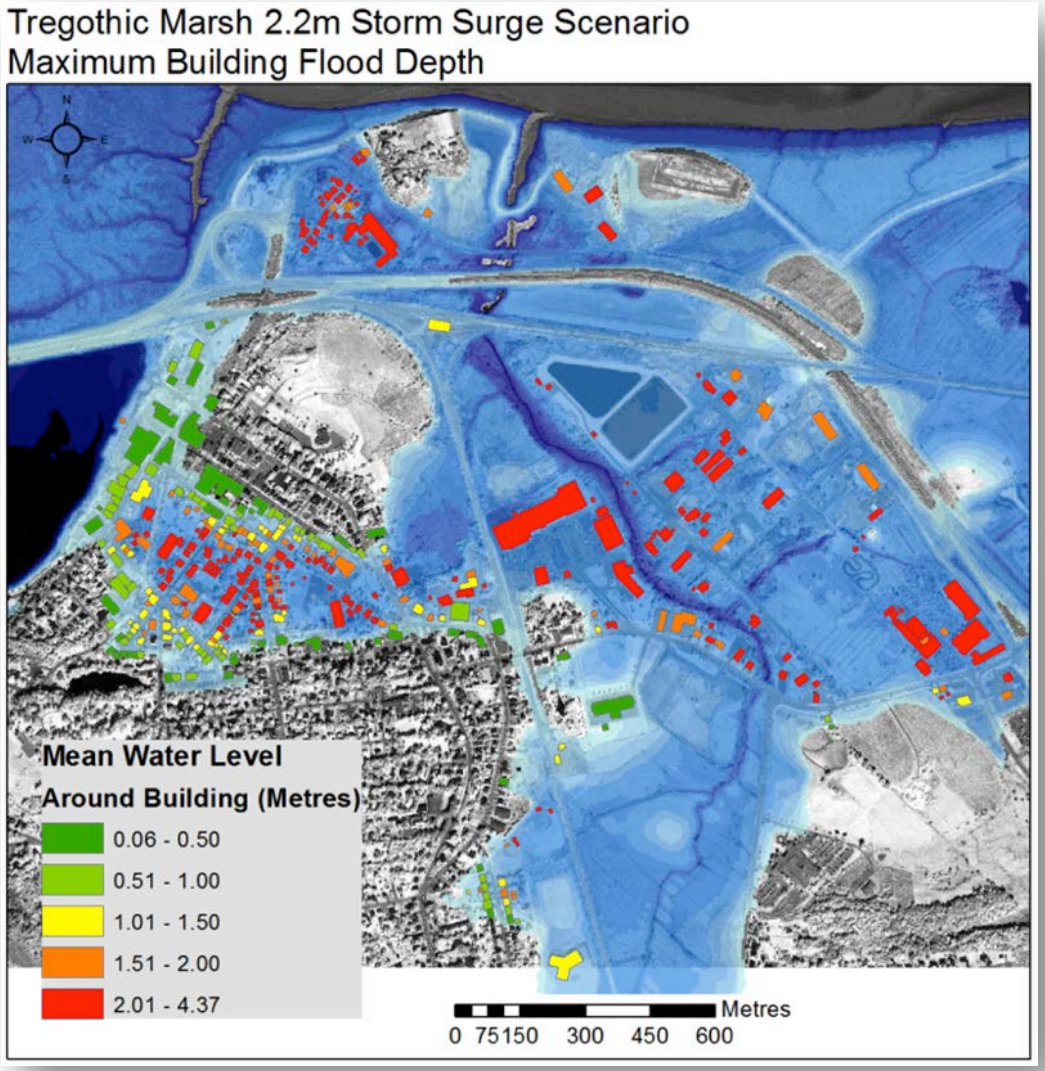
- Provide accommodation space
- Increase stormwater retention
- Wave energy dissipation

Adaptive Capacity

Overview of key variables influencing service provided climate change adaptation options

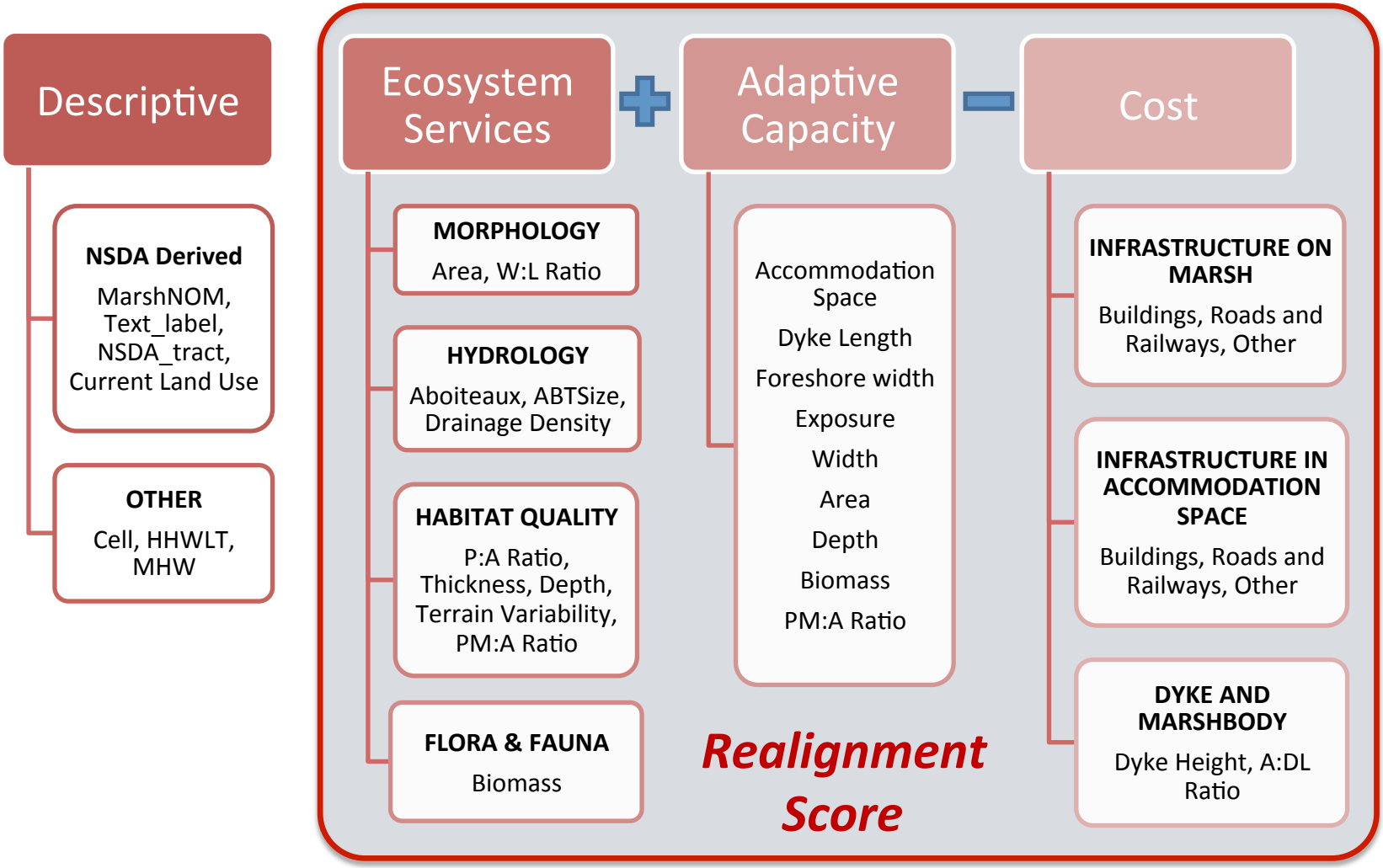
Service	Dyke Condition	Hydrogeomorphology and morphometrics	Sediment Dynamics	Fetch	Fauna and Flora	Existence of foreshore	Land use
Storm Water Retention	✓		✓		✓	✓	✓
Wave Energy Dissipation	✓		✓	✓	✓	✓	
Water Drainage	✓	✓	✓		✓	✓	✓
Sediment Recharge		✓	✓		✓		

Infrastructure Cost



- Infrastructure in marsh body
- Infrastructure within accommodation space
- Condition of dyke and marsh body

Assessment Metrics: Attributes



Feasibility & Design Issues

- Ultimate design will need to be site specific and account for challenges & opportunities for each site
- Maximize water exchange
- Minimize erosion (risk)
- Maximize habitat
- Minimize cost
- Need to place in context of wider basin processes

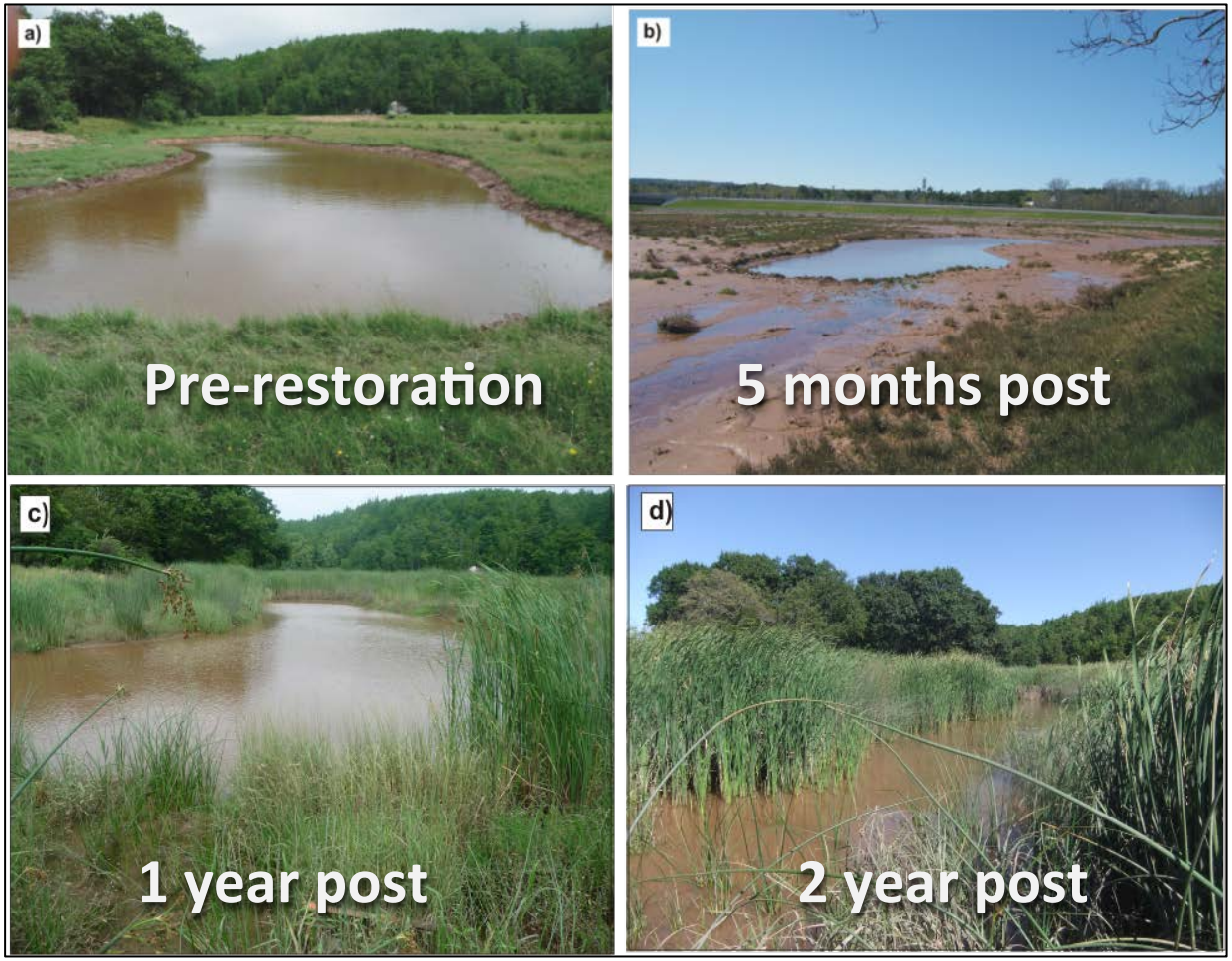
- Community consultation key at all stages

- Need for demonstration site

Fort Beausejour, NB

Conclusions

- Exp & science to support tidal wetland restoration
- MR is a viable option in Atlantic Canada
- Possible to maximize both ES and AC while minimizing costs
- Requires stakeholder buy-in & collaboration



St. Croix Restoration Site, NS

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