Great Bay Ecosystem Service Assessment

A scenario-based approach to understanding how key habitats affect the provision of ecosystem services and their value

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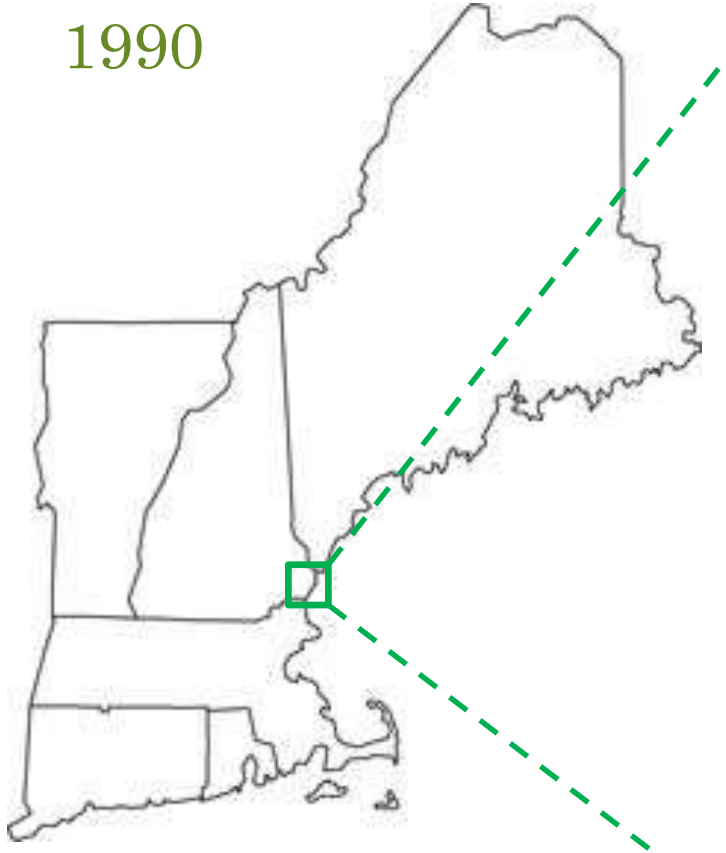
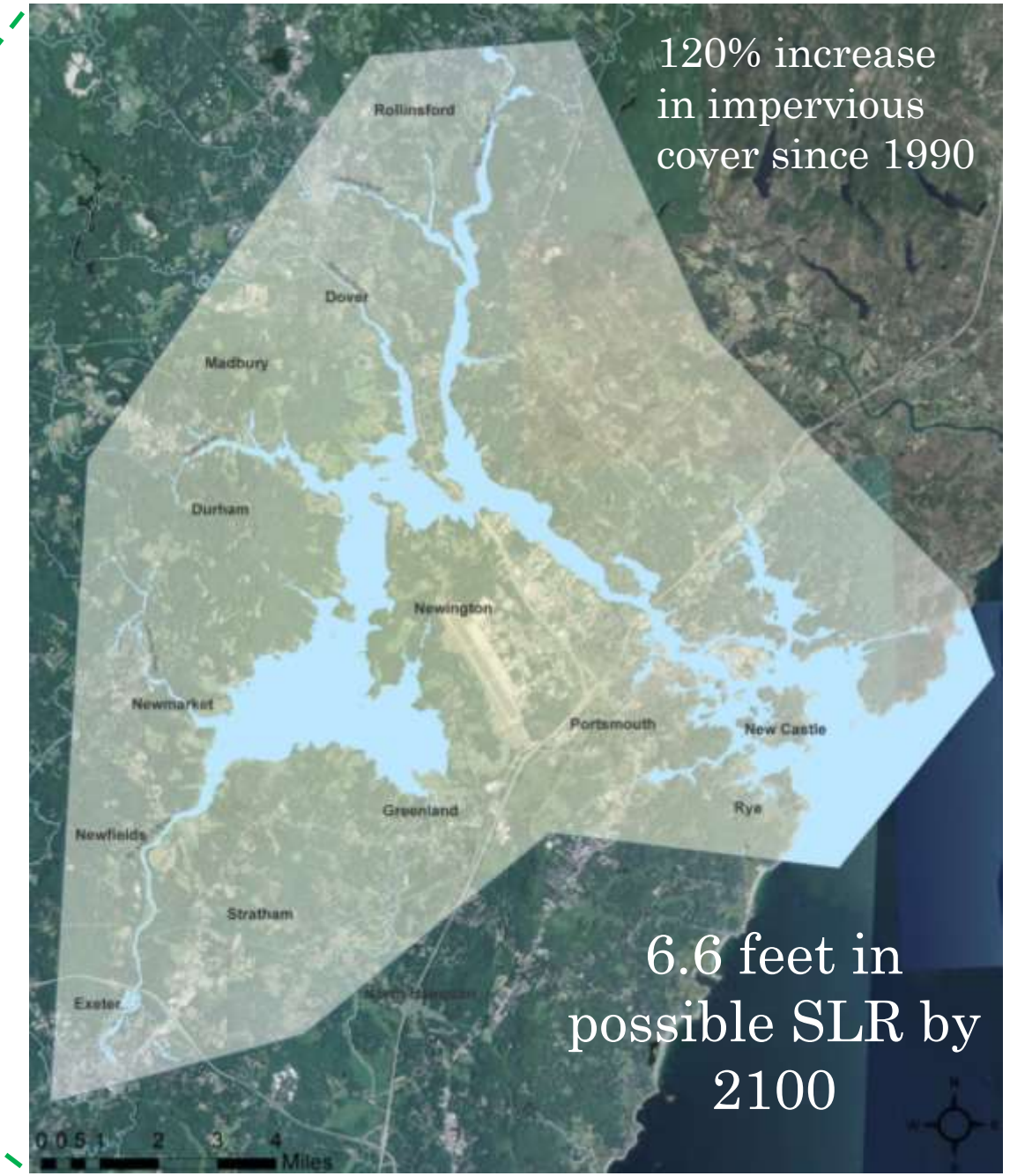
Background

19% population increase since 1990



38% eelgrass loss since 1990

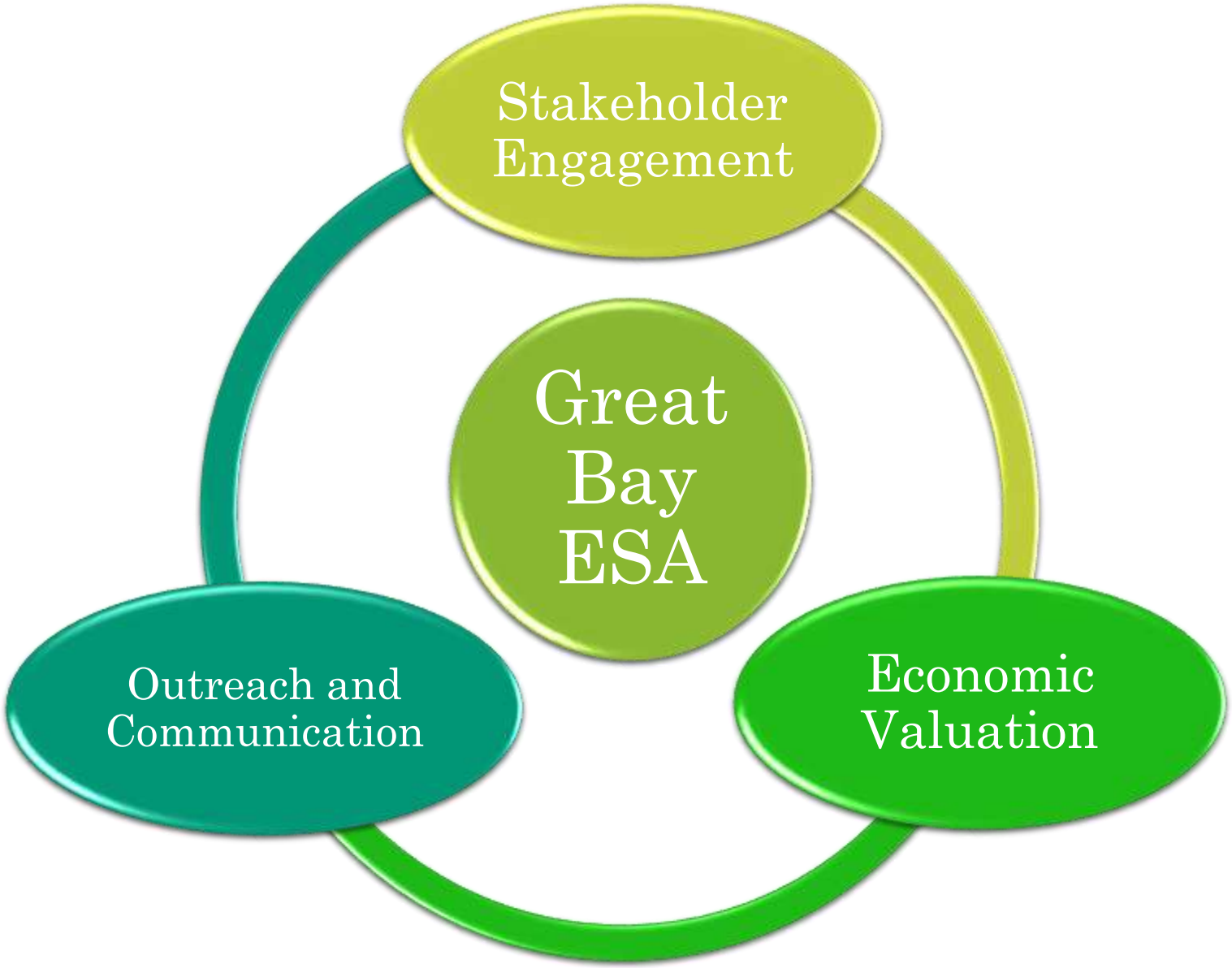


GBESA: Goal

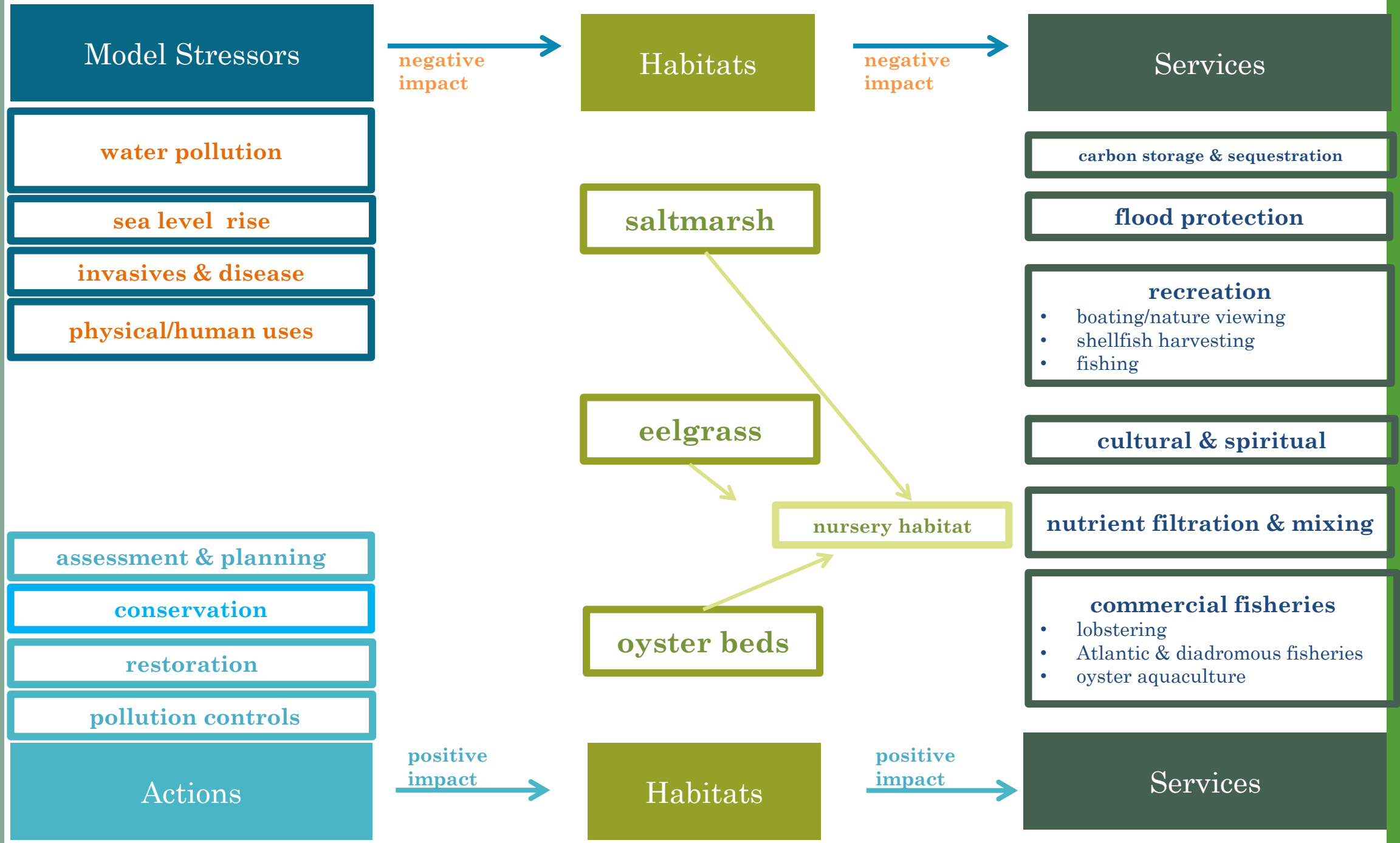
Better **understand** the ways **people benefit** from Great Bay estuary ecosystems and **inform decisions** to **sustainably maximize** those **benefits** while **reducing conflict**.

The Objectives

- Test an ecosystem services and economic valuation approach
- Spatial integrated assessment
- Outreach and communications materials
- Improve management and maximize ecosystem services
- Engage a variety of partner organizations


Stakeholder Engagement
Great Bay ESA
Outreach and Communication
Economic Valuation

Phase 1: Habitat Risk Assessment and Scenario Design


Model Stressors
water pollution
sea level rise
invasives & disease
physical/human uses
negative impact
Habitats
negative impact
Services
carbon storage & sequestration
flood protection
recreation
boating/nature viewing
shellfish harvesting
fishing
cultural & spiritual
nutrient filtration & mixing
commercial fisheries
lobstering
Atlantic & diadromous fisheries
oyster aquaculture
saltmarsh
eelgrass
oyster beds
nursery habitat
assessment & planning
conservation
restoration
pollution controls
Actions
positive impact
Habitats
positive impact
Services

Scenarios for 2025

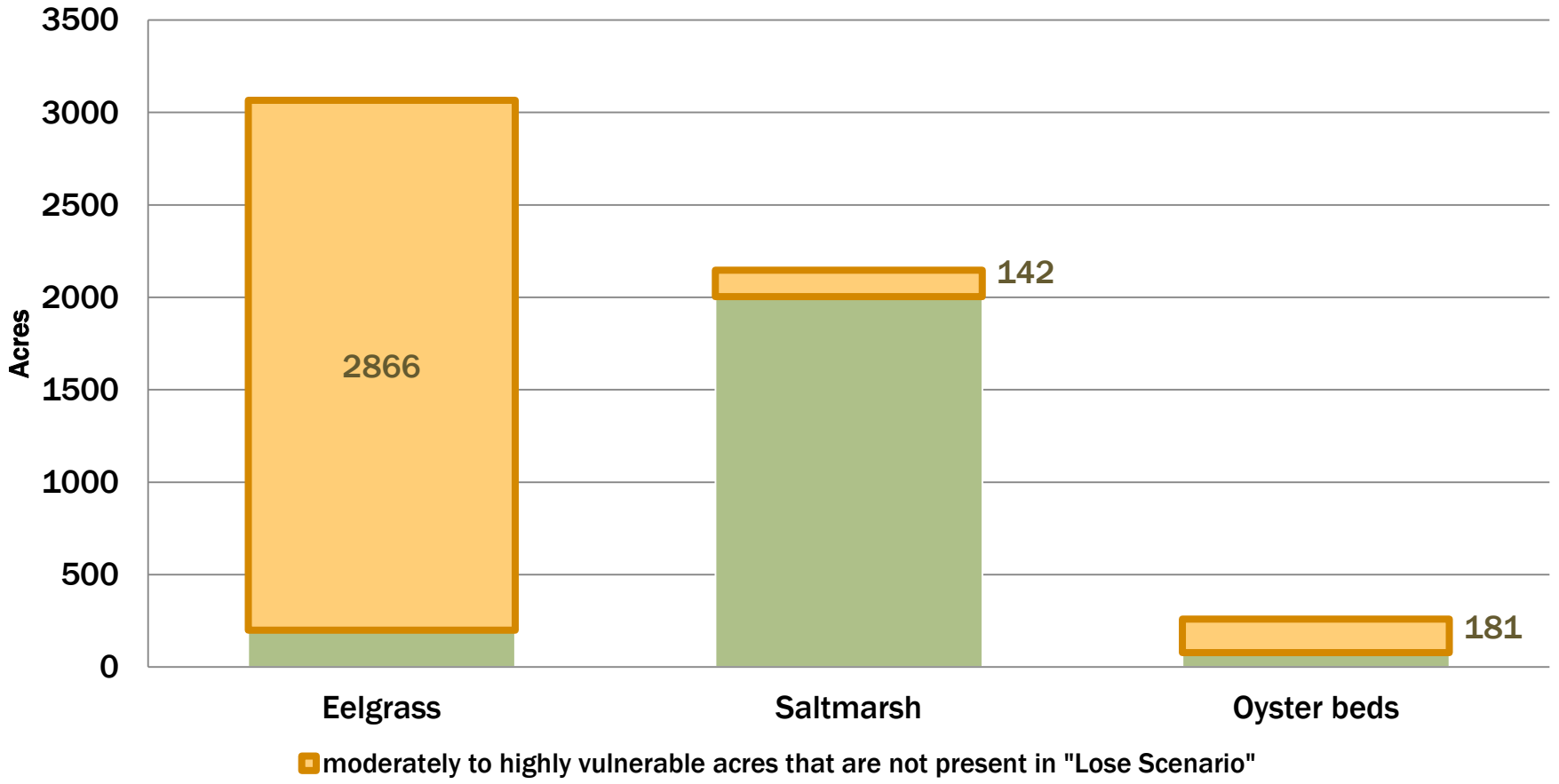
Lose Habitats and Benefits

- Depicts eelgrass, oyster, and saltmarsh area in 2025 if conditions and management result in habitat loss
- Water pollution intensifies
- No active habitat restoration
- Shoreline armoring, docks, and mooring fields do not avoid existing habitats
- Activities intensify and do not consider existing or future habitat

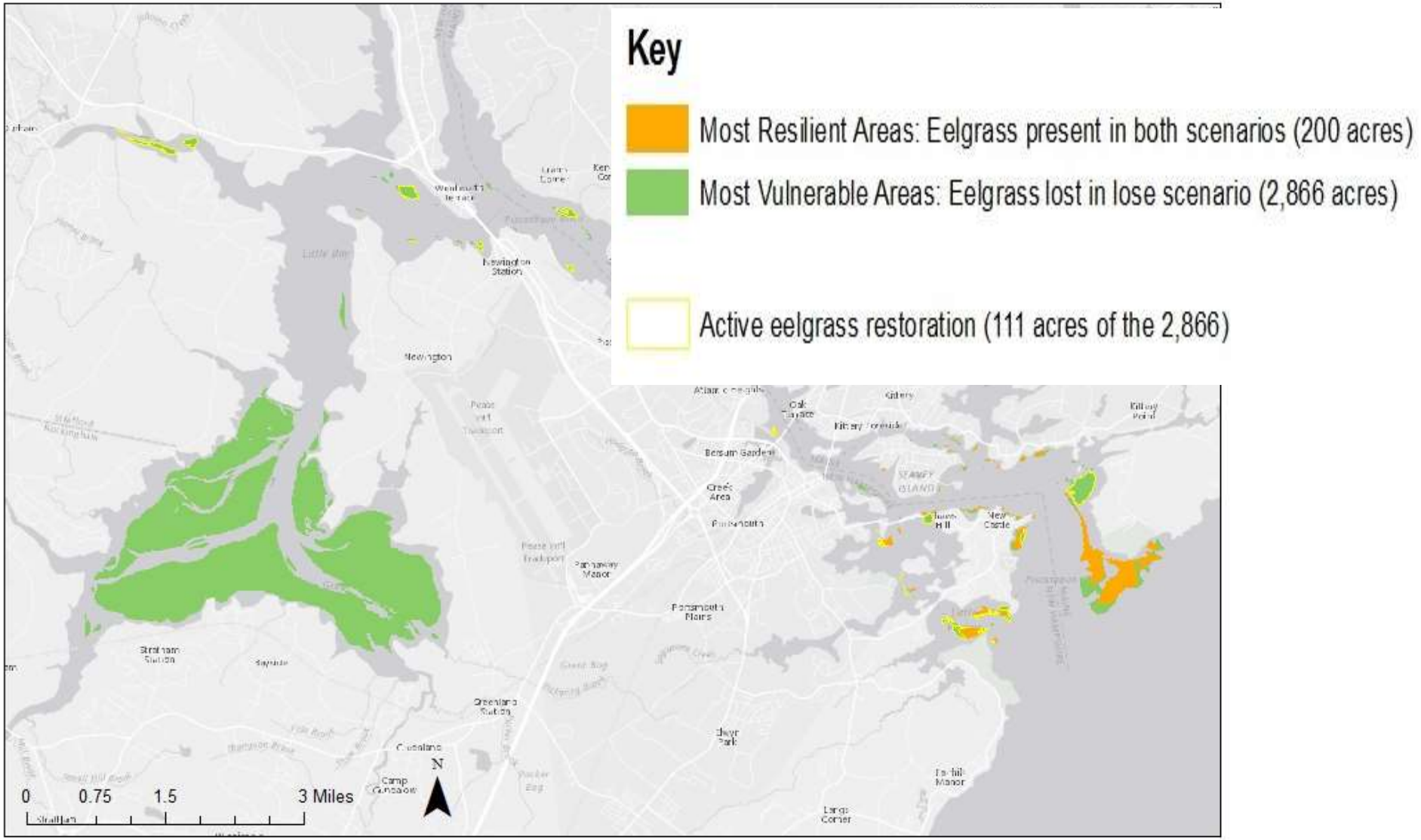
Gain and Sustain Habitats and Benefits

- Depicts eelgrass, oyster beds, and saltmarsh area in 2025 if conditions and management result in a significant expansion of habitat and improvement in habitat function
- Water pollution is reduced
- Activities take into account existing and future habitats
- Armored shorelines on public and conservation lands removed
- Oyster restoration

Difference in Acres between Scenarios

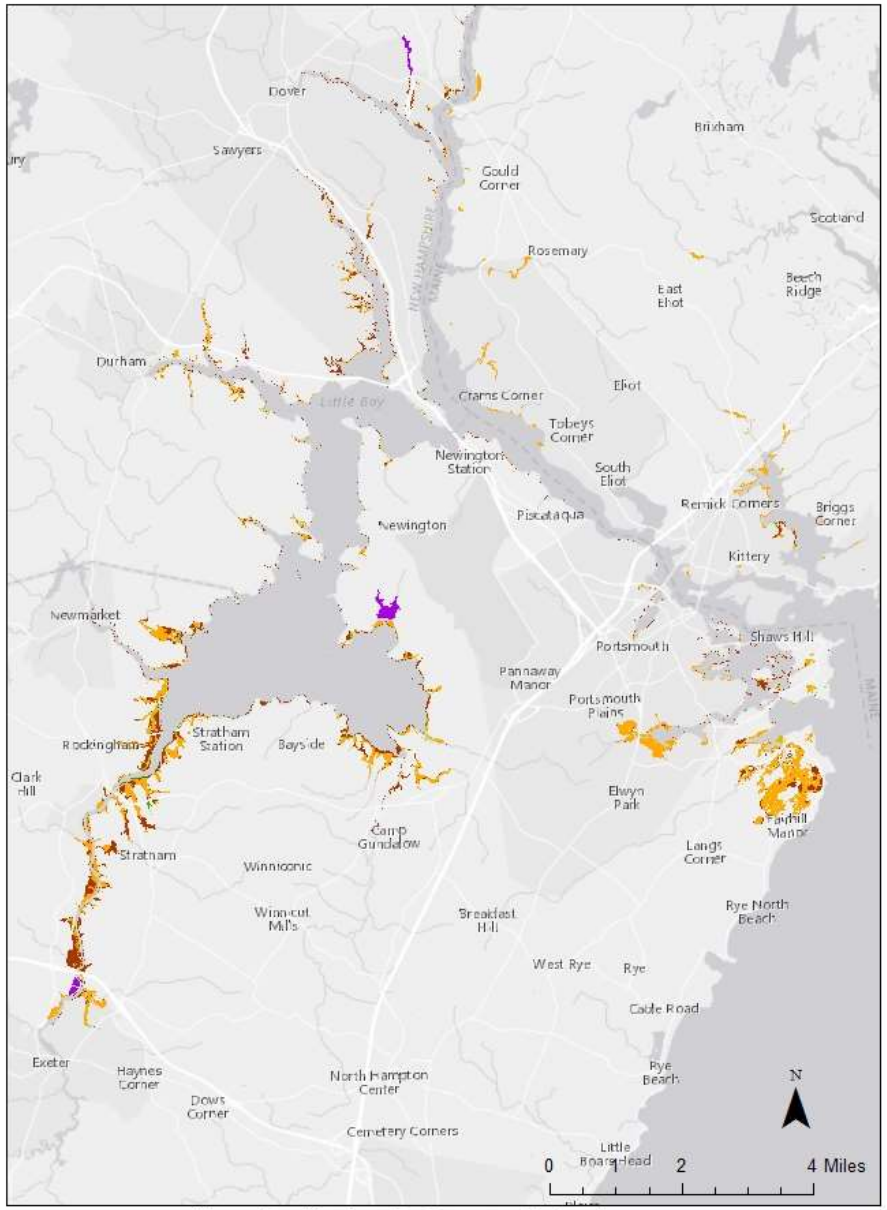


Vulnerable and Resilient Eelgrass Areas in 2025



Map produced for Great Bay Ecosystem Services Assessment by Kirsten Howard, NHDES Coastal Program, 10-2016

Vulnerable and Resilient Salt Marsh Areas in 2025



Map produced for Great Bay Ecosystem Services Assessment
by Kirsten Howard, NHDES Coastal Program, 10-2016

Key

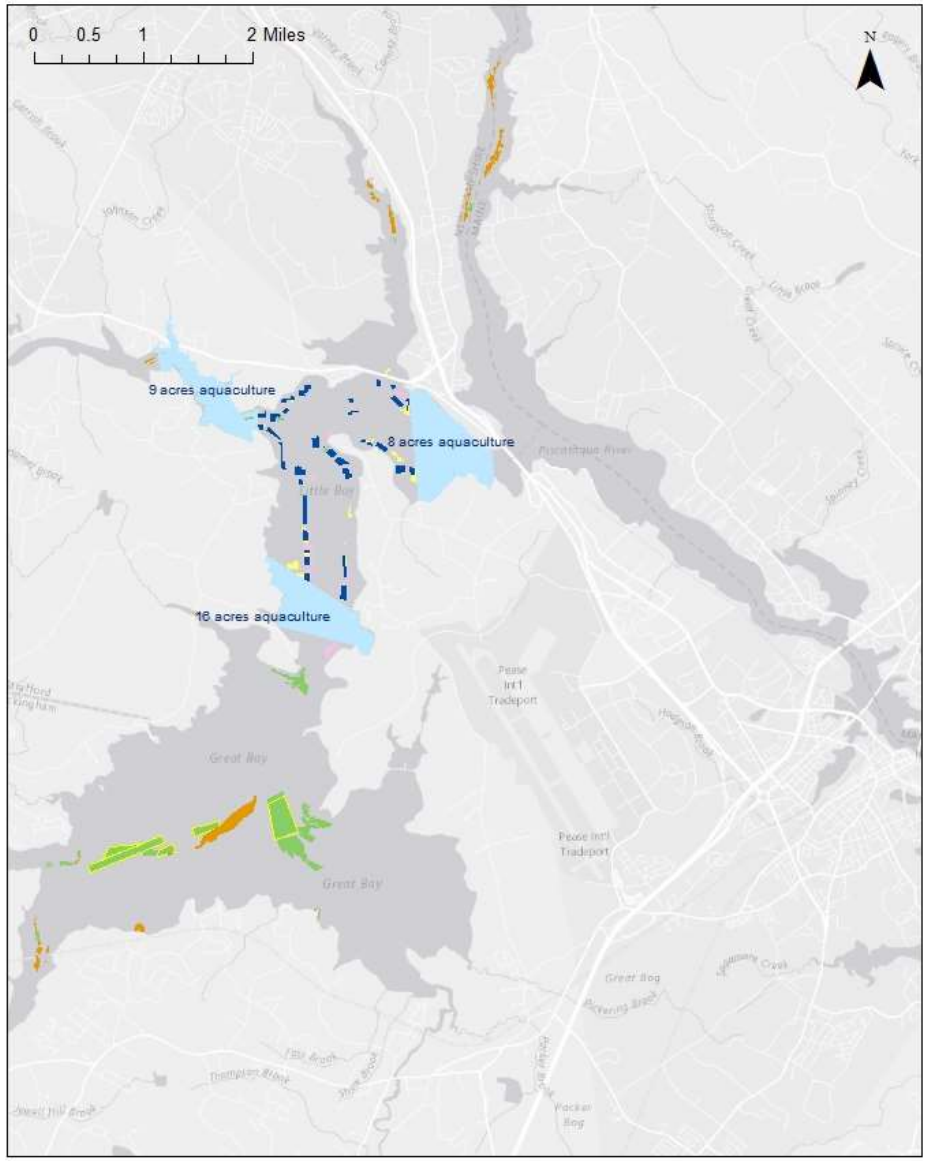
Most Resilient Areas: Salt marsh present in both scenarios (2,004 acres)

- high marsh (1,275 acres)
- low marsh (729 acres)

Most Vulnerable Areas: Salt marsh lost in "Lose Scenario" (142 acres)

- high marsh (29 acres)
- low marsh (34 acres)
- active restoration marsh areas (59 acres high marsh, 20 acres low marsh)

Vulnerable and Resilient Natural Oyster Bed Areas and Hypothetical Oyster Aquaculture in 2025



Key

Natural and Restored Oyster Beds

- Most Resilient Areas: Oyster beds present in both scenarios (78 acres)
- Most Vulnerable Areas: Oyster beds lost in "Lose Scenario" (259 acres)
- Active Oyster Restoration (100 of the 259 acres)

Oyster Aquaculture

- New Areas Open to Harvest & Aquaculture in "Gain Scenario" (33 unsited acres permitted)
- Permitted Areas in Both Scenarios (83 acres)
- Permitted Areas in "Gain Scenario" that avoid eelgrass areas (23 acres)
- Permitted Areas in "Lose Scenario" that don't avoid eelgrass areas (23 acres)

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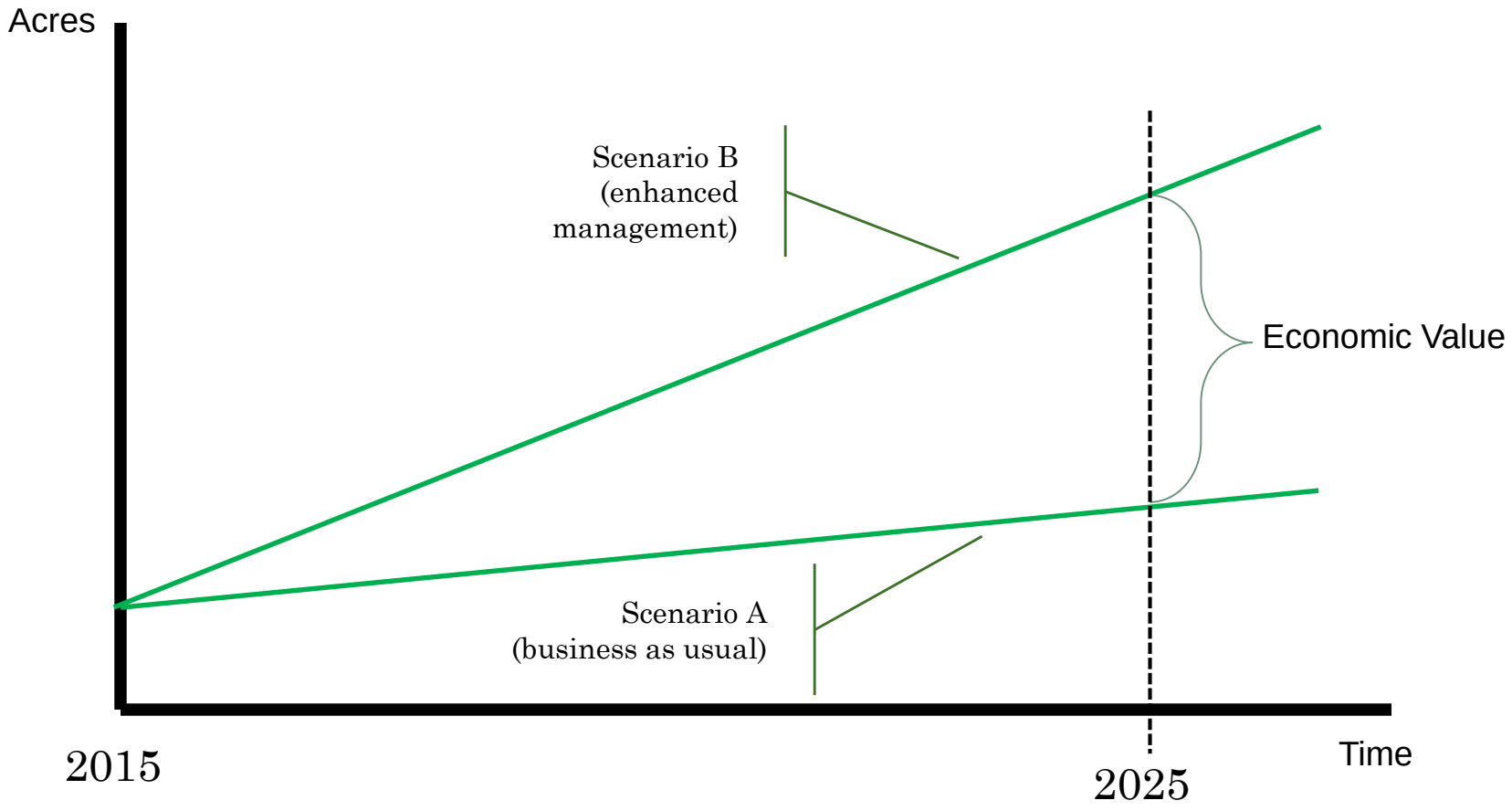
Phase 2: Ecosystem Service Assessment

Phase 2: Overview

- Define ecosystem service priorities
- Develop valuation estimates
- Develop outreach materials

Eelgrass	Salt Marshes	Oysters
Nutrient control Carbon sequestration Commercial fishing Recreational fishing	Nutrient control Carbon sequestration Storm damage protection	Nutrient control Commercial harvesting Recreational harvesting

Economic value comes from difference in acres in 2025



Valuation approach: benefit transfer

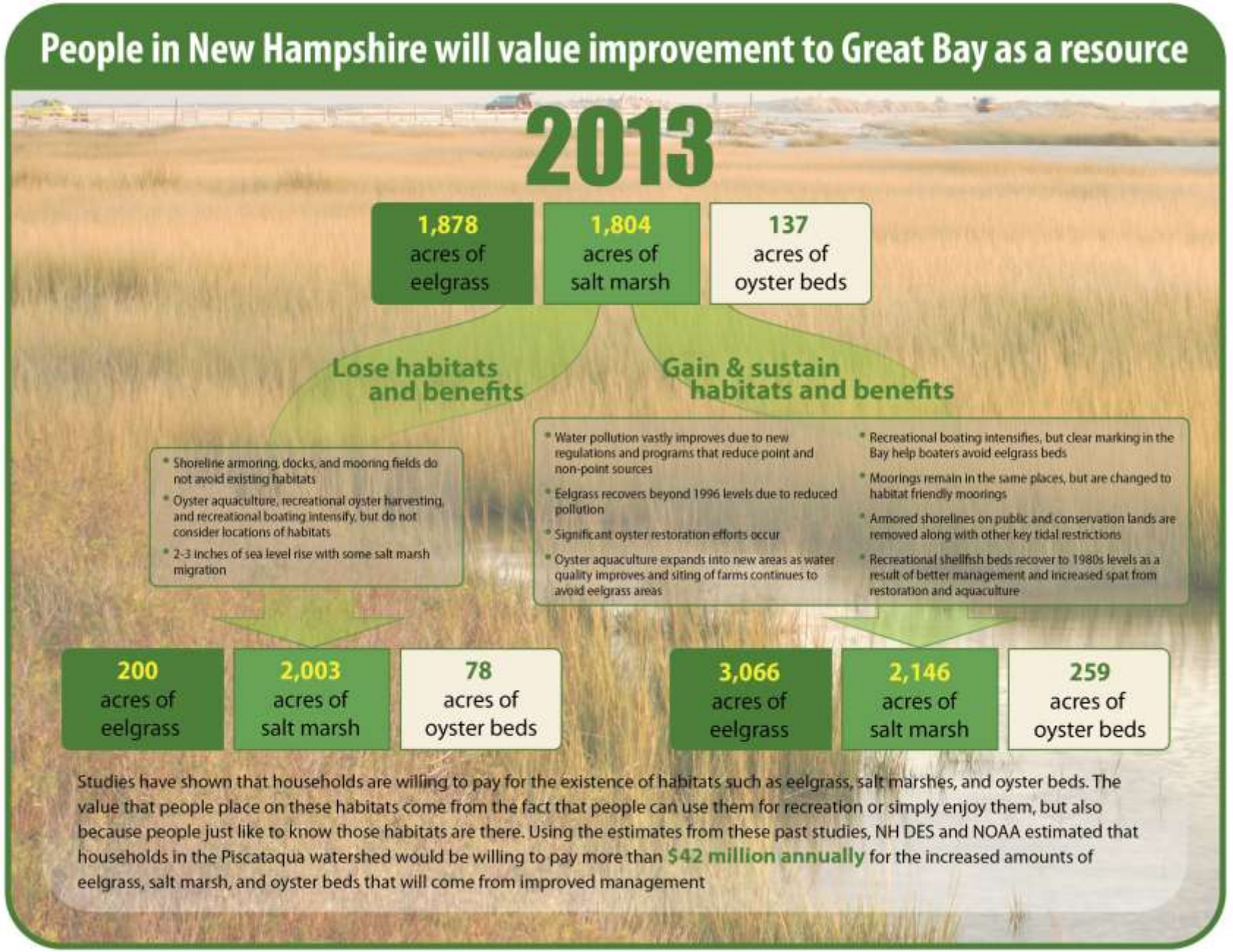
- Use values that were estimated in other areas
- Apply them to our situation
- Cost and time are usually driving factors
- There are principles and good practices to follow

Summary of estimates

Ecosystem Service	Habitat	Estimated Economic Value in 2025 (phrased in 2015 dollars)
Existence value	Salt marshes	$1.6 million
	Eelgrass	$40.2 million
	Oyster beds	$0.7 million
Recreational fishing	All	Variable; depends on turbidity and improvements in dissolved oxygen
Recreational oyster harvesting	Oyster beds	$23,700
Commercial aquaculture	Oyster beds	$131,200 - $142,100
Commercial fishing	Salt marshes	$4,473
	Eelgrass	$1.7 million
Carbon sequestration	Salt marshes	$3,400 - $16,300
	Eelgrass	$49,100 - $81,600
	Oyster beds	$2,700
Nitrogen removal	Salt marshes	$608,300 - $688,800
	Eelgrass	$13.1 million - $14.8 million
	Oyster beds	$5.3 million - $6.0 million

Outreach Materials

First Draft Presented to Stakeholders



The Future of the Great Bay Estuary

Now → 10 years from now

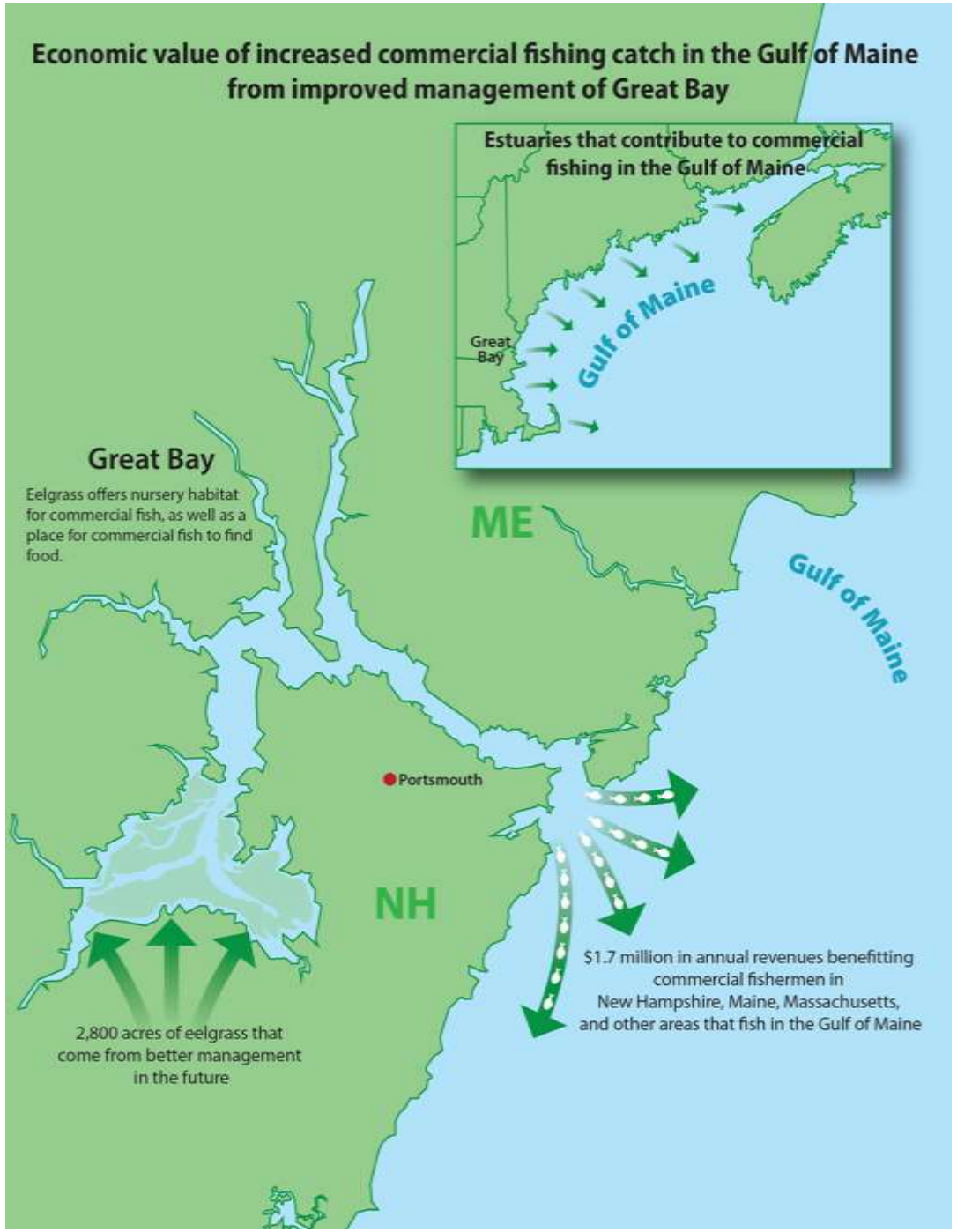
Gain & Sustain Habitats and Benefits

- active restoration and planning;
- less water pollution;
- some shoreline armoring removed;
- new oyster harvest areas;
- boating activity, new moorings and new oyster aquaculture avoid existing and historical eelgrass areas

The existence of is worth $42 million more than

Lose Habitats and Benefits

- no active restoration and limited planning;
- more water pollution;
- more shoreline armoring and docks;
- new moorings, new oyster aquaculture, and recreational boating overlap historical eelgrass areas


Economic value of increased commercial fishing catch in the Gulf of Maine from improved management of Great Bay
Estuaries that contribute to commercial fishing in the Gulf of Maine
Great Bay
Gulf of Maine
Great Bay
Eelgrass offers nursery habitat for commercial fish, as well as a place for commercial fish to find food.
ME
Gulf of Maine
Portsmouth
NH
$1.7 million in annual revenues benefitting commercial fishermen in New Hampshire, Maine, Massachusetts, and other areas that fish in the Gulf of Maine
2,800 acres of eelgrass that come from better management in the future

Next steps

Lessons learned

- Understand the decision context and the policy window
- Focus on results that are useful to stakeholders
- Pull in expertise as needed.
- Use frequent feedback loops with stakeholders.
- Work with stakeholders to define priorities.
- Educate the stakeholders throughout the process.
- Be mindful of stakeholder time commitments.
- Give time for stakeholders to understand and gain comfort with key project components.
- Develop outreach with stakeholder needs in mind.
- Invite someone from another NERR or another area to participate in the project as an observer.

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