Blue Carbon Calculator, Quantifying an Ecosystem Service

Accounting for blue carbon in coastal wetlands, a new tool to promote ecological restoration to mitigate GHG pollution and adapt to climate change.

Matthew Beaton, Secretary, Executive Office of Energy and Environmental Affairs
George Peterson, Commissioner, Mass Department of Fish and Game
Tim Purinton, Director, Mass Division of Ecological Restoration

EXECUTIVE OFFICE of ENVIRONMENTAL AFFAIRS

Commonwealth of Massachusetts Department of Fish & Game

Commonwealth of Massachusetts Division of Ecological Restoration
Invested in Nature and Community

Abt ASSOCIATES

Commonwealth of Massachusetts

Division of Ecological Restoration

Tim Purinton, Director

Invested in Nature and Community

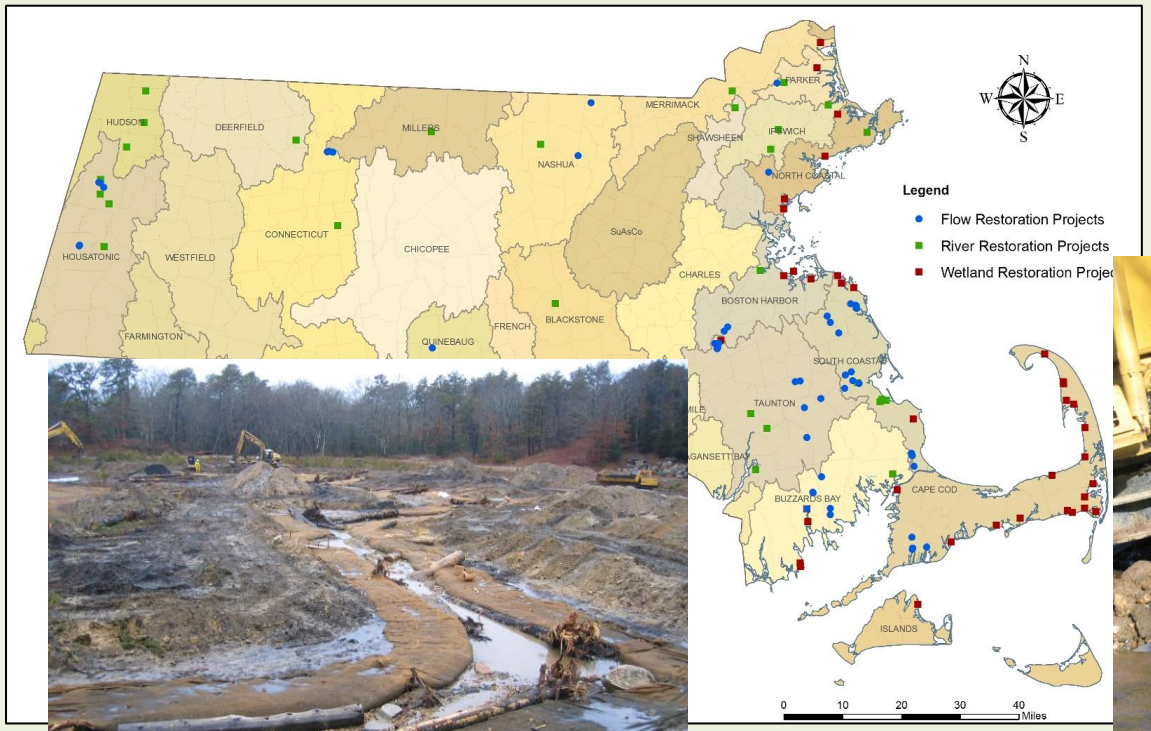
Commonwealth of Massachusetts
Department of Fish & Game

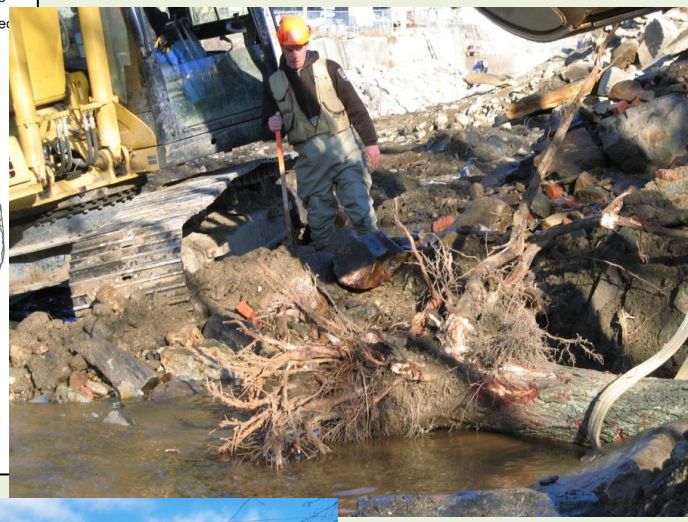
George Peterson, Commissioner

The mission of the Division of Ecological Restoration is to restore and protect the Commonwealth's rivers, wetlands and watersheds for the benefit of people and the environment.

Top: Beth Lambert, Hunt Durey, Tim Purinton, Megan Sampson, Georgeann Keer, Nick Wildman. Middle: Alex Hackman. Bottom: Kris Houle, Eric Ford, Eileen Goldberg, Kristen Ferry, Tim Chorey, Michelle Craddock, Cindy Delpapa, Carrie Banks.

On-the-Ground Restoration





Ecological Restoration, a Mitigation & Adaptation Strategy

- Flood attenuation and mitigation
- Storm surge protection
- Water quality improvement
- Enable salt marshes to migrate
- GHG sequestration and emission reduction

Healthier marshes are more resilient

Courtesy NWF and Doug Stewart

U.S. Fish & Wildlife Service

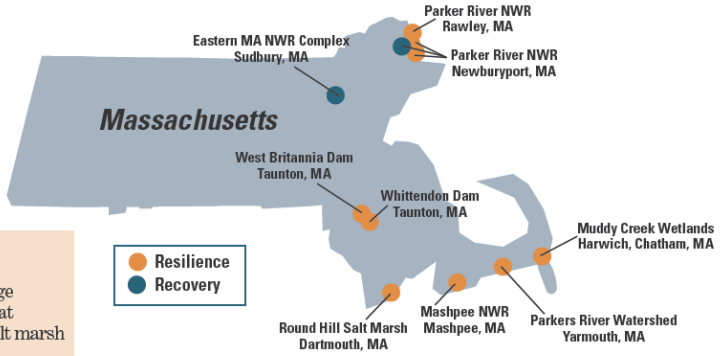
Building a Stronger Coast in Massachusetts

Hurricane Sandy Recovery and Resilience Projects

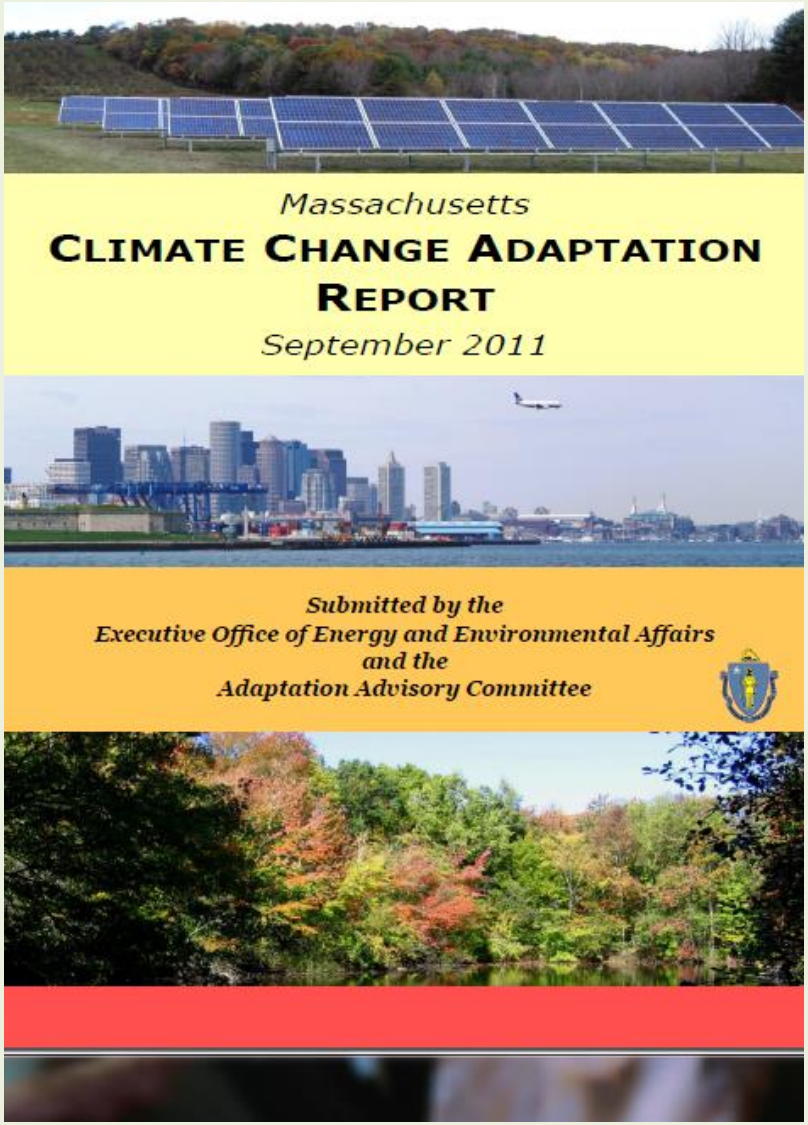
The U.S. Fish and Wildlife Service, through the Disaster Relief Appropriations Act of 2013, is investing $15.6 million in projects to help Massachusetts recover from impacts of Hurricane Sandy and to better withstand future storms. The projects will restore and add resilience to saltwater and freshwater habitats, and repair and restore national wildlife refuge (NWR) facilities for safe visitor and staff access.

Eight planned projects will:
- Evaluate two dams for removal
- Open 31 miles of stream for fish passage
- Improve 156 acres of freshwater habitat
- Protect and improve 27,131 acres of salt marsh

Total funding: $11,595,341



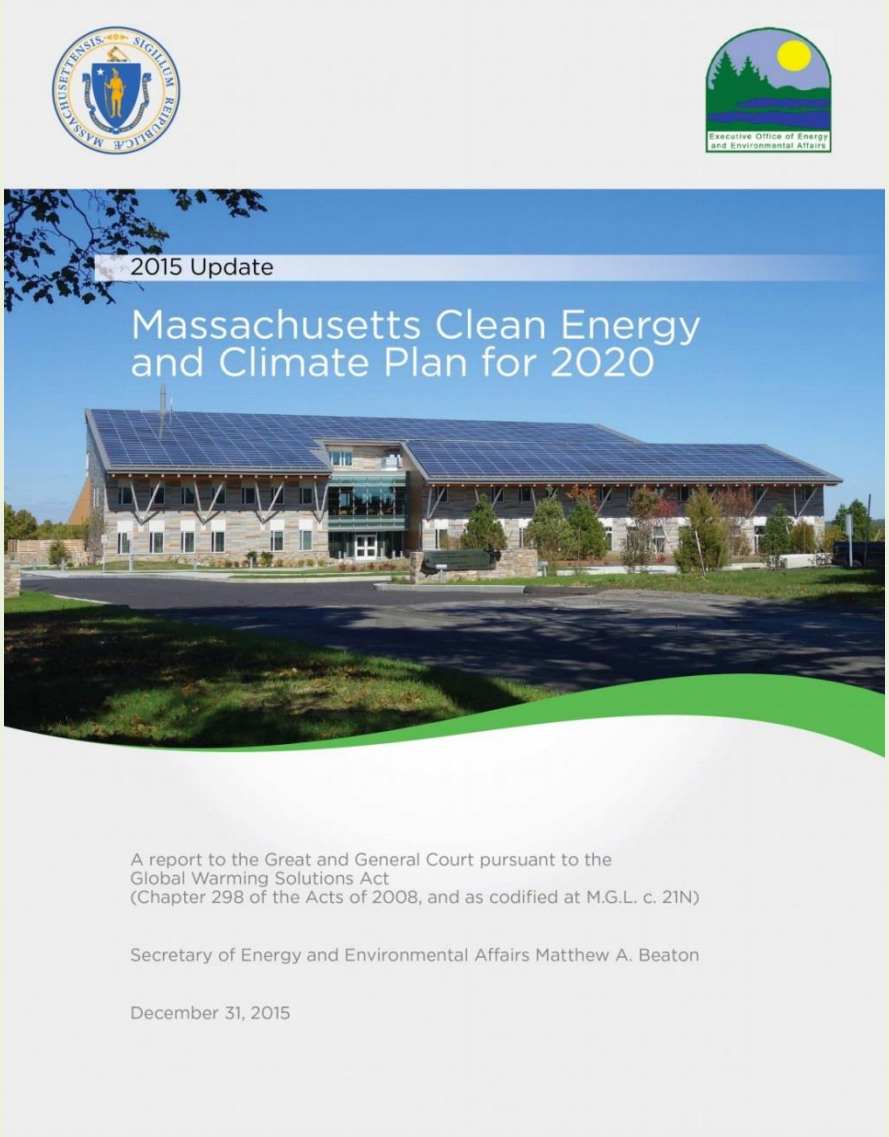
Mass Climate Adaptation Plan



Highlight:

Salt marsh restoration is a recognized adaptation strategy

Mass Climate Action Plan:
Global Warming Solutions Act

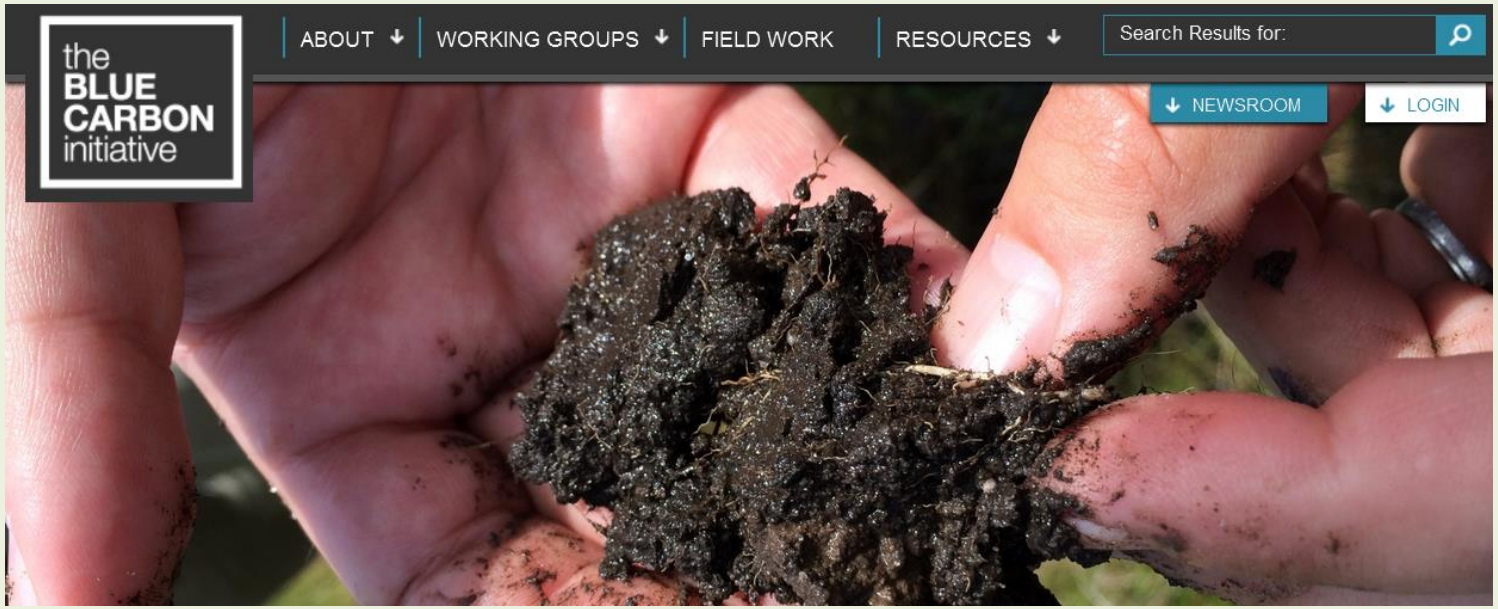


Highlight:

- Explicitly recognizes blue carbon
- IDs DER's blue carbon calculator

What is Blue Carbon?

- Blue Carbon (C): C stored in coastal and marine ecosystems
- Marine ecosystems sequester C significantly faster than other ecosystems
- Blue carbon is stored in peat and locked-in due to anoxic conditions
- Restoration of coastal habitats not only stores C, but reduces methane which has ~25X more global warming potential than C



Blue Carbon Calculator - Basics

- User enters wetland change pre & post on the “Data Entry” worksheet.
- Annual emissions from each activity are calculated
- Calculations are based on formulas provided by IPCC
- Annual emissions are calcualted for 1 to 50 yrs.
- Outputs:
  - Tonnes CO_2-C: mass of C resulting from CO_2
  - Tonnes CH_4-C: mass of C resulting from CH_4
  - Tonnes CO_2e: mass of CO_2 equivalents (CO_2 + CH_4)
  - Gallons of gasoline

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Location	Soil Type	MA DEP Wetland Category	Land Use Management Activity: Wetlands Destruction – Extraction: Pre-Extraction Area (acres)	Wetlands Destruction – Extraction: Post-Extraction Area (acres)	Wetlands Destruction – Draining: Pre-Drained Area (acres)	Wetlands Destruction – Draining: Post-Drained Area (acres)	Wetlands Creation – Rewetting: Pre-Rewetting Area (acres)	Wetlands Creation – Rewetting: Post-Rewetting Area (acres)	Wetlands Restoration – Wetlands Remaining Weltands: Pre-Restoration Area (acres)	Wetlands Restoration – Wetlands Remaining Weltands: Post-Restoration Area (acres)	Calculator Lan
Coastal Wetland	Organic	PHRAGMITES DOMINATED - WETLAND							3.2		Phragmites Wet
		SALT MARSH - HIGH								3.2	
		SALT MARSH - LOW								8.8	
		BARRIER BEACH-BOG									SW/brackish We
		BARRIER BEACH-SALT MARSH									
		BARRIER BEACH-DEEP MARSH									
		BARRIER BEACH-MARSH									
		BARRIER BEACH-SHRUB SWAMP									
		BARRIER BEACH-WOODED SWAMP DECIDUOUS									SW/brackish For
		BARRIER BEACH-WOODED SWAMP CONIFEROUS									
		BARRIER BEACH-WOODED SWAMP MIXED TREES									
		OPEN WATER (SALT)							16.9		Open water salt
		BARRIER BEACH-OPEN WATER									
	Mineral	PHRAGMITES DOMINATED - WETLAND									Phragmites Wet
		SALT MARSH - HIGH									
		SALT MARSH - LOW									
		BARRIER BEACH-BOG									SW/brackish We
		BARRIER BEACH-SALT MARSH									
		BARRIER BEACH-DEEP MARSH									
		BARRIER BEACH-MARSH									
		BARRIER BEACH-SHRUB SWAMP									
		BARRIER BEACH-WOODED SWAMP DECIDUOUS									SW/brackish For
		BARRIER BEACH-WOODED SWAMP CONIFEROUS									
		BARRIER BEACH-WOODED SWAMP MIXED TREES									
		OPEN WATER (SALT)									Open water salt
		BARRIER BEACH-OPEN WATER									
		TIDAL FLAT								8.1	

Instructions | Data Entry | Extraction Calculator | Drainage Calculator | Rewetting Calculator | Wetlands-Wetland

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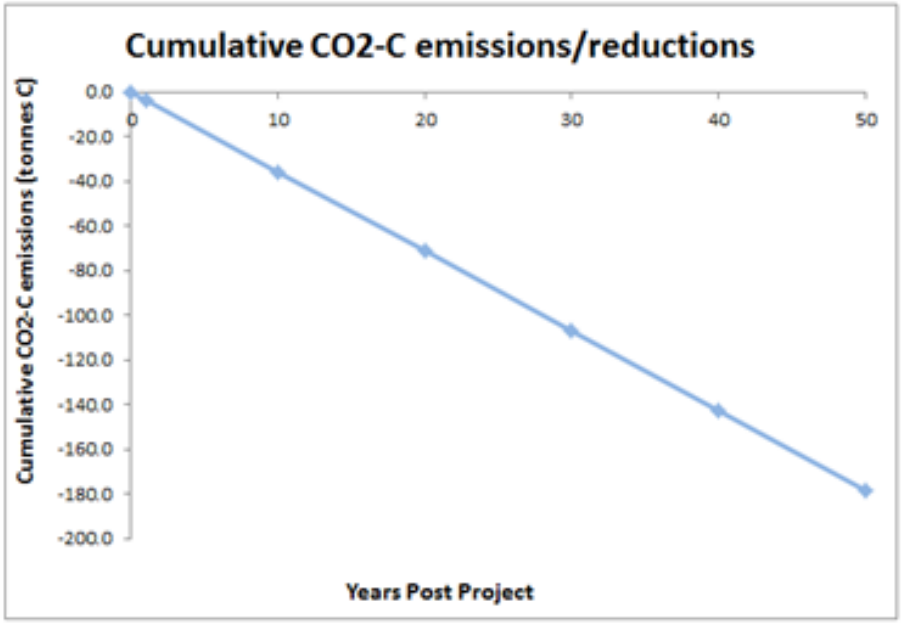

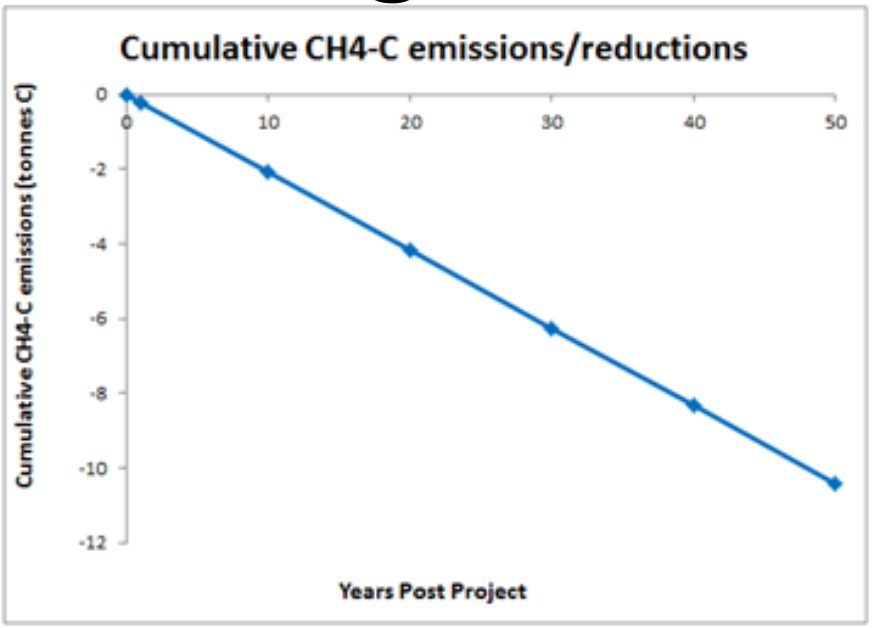

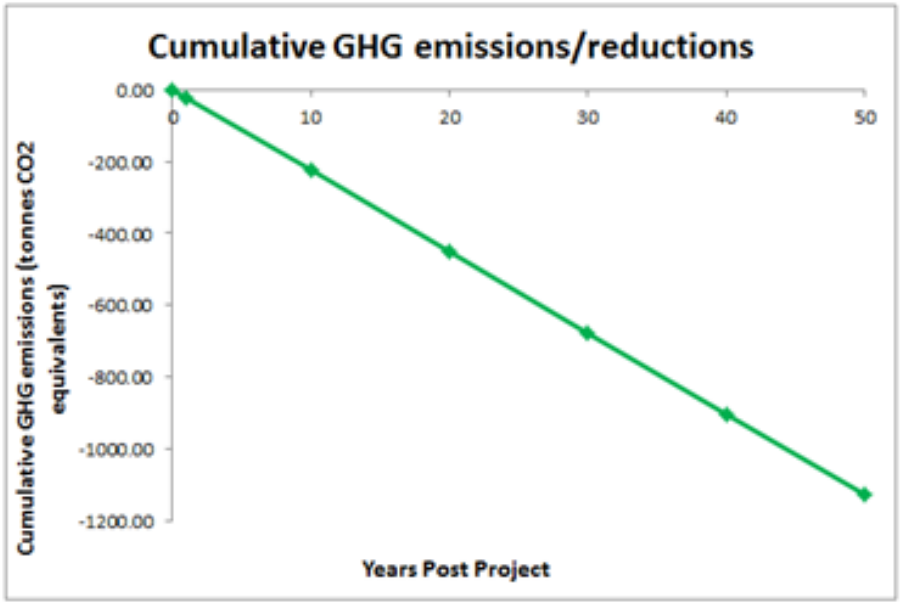

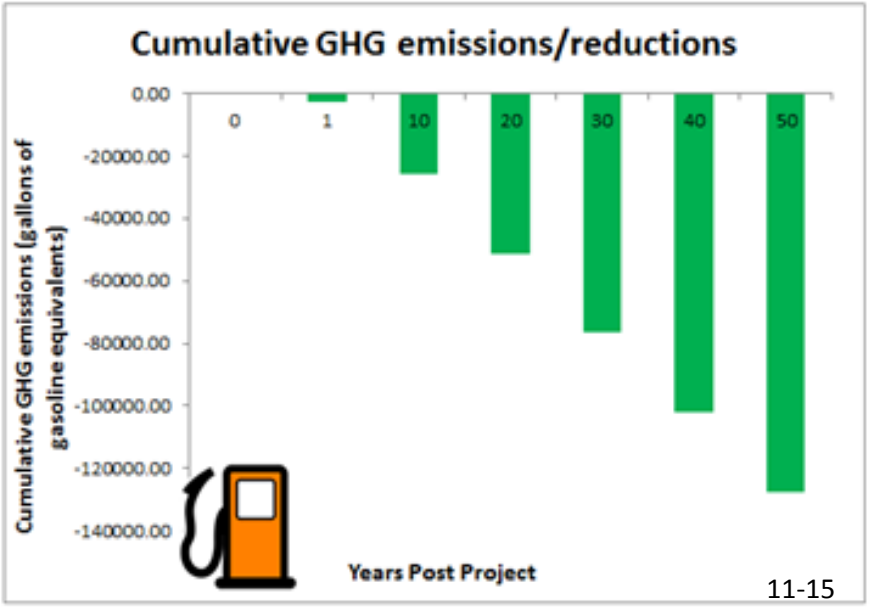

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CH_4 emission reductions and CO_2 sequestration associated with a conversion in wetland area, from 3.2 acres of *Phragmites australis* dominated wetland to 3.2 acres high saltmarsh and 8.8 acres low salt marsh

Emission Benefits

- Converting *Phragmites australis* dominated wetland to native salt marsh results in a reduction of CH_4 emissions
- 902 fewer tonnes of CO_2 equivalents in the atmosphere, equal to not burning 101,937 gallons of gasoline (over 50 yrs.)

Sequestration Benefits (From Separate Study – ICF International[1])

- Converting open water and fresh water conditions to native, saline rich salt marsh results in the sequestration of 2,889 metric tons of CO_2 (through 2050)
- Applying the Social Cost of Carbon this has a value of $86,414 and is equivalent to 306,474 gallons of gasoline

[1] Estimates of Ecosystem Service Values from Ecological Restoration Projects in Massachusetts, Summary of Report Findings, MassDER, Jan. 2014 http://www.mass.gov/eea/docs/dfg/der/pdf/eco-services-summary-ma-der.pdf

Blue Carbon Policy/Planning Opportunities in Massachusetts

States are labs of innovation

Regulatory

- Wetland Protection*
- Wetland Mitigation*
- GHG Mitigation Inventory/Targets
- GHG Offsets (RGGI)

*(federal, state and local)

Non-regulatory

- Ecological Restoration
- Land Protection
- Climate Change Adaptation/Resiliency Planning
- Carbon Foot-printing/Sustainability Accounting
- BWM – Voluntary carbon/GHG sale and trading

Summary

- Blue Carbon strategies can help MA reduce GHG emissions
- This is only one ecosystem service benefit of restoration projects
- Rough screening tool
- GHG accounting can assist with project selection, prioritization and offset carbon impacts associated with construction or other land-use activities (e.g. freshwater wetland restoration)
- The Calculator *does not* measure sequestration (soil and biomass), account for nitrous oxide (N_2O) emissions or incorporate region-specific emissions data (yet)
- Herring River evaluation will help reveal market possibilities of blue carbon and new $ for wetland preservation and restoration (emerging voluntary markets)
- Under CA climate action plan 12 wetland restoration projects funded

Next Steps

- Continue to enhance data set with regional or local data (eelgrass, salt marsh, open water, etc.)
- Pilot Herring River as a national model of quantifying and selling carbon credits to the voluntary carbon offset market