Bringing people with diverse perspectives together to solve problems they could never solve by working alone.

BWM: Wetlands Restoration Carbon Economics

Preliminary Analysis of Herring River Tidal Restoration

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Overview of BWM Project Economic Analyses

1. Identify appropriate inputs to support analysis of the potential for tidal restoration GHG economic benefits—spotlight on methane (CH_4).

2. Develop site specific inputs for a case study approach that explores ‘real world’ application of the benefits assessment methods.

3. Estimate overall societal benefits of methane reductions from marsh restoration—monetized based on social cost of carbon (SCC).

4. Evaluate the potential for selling carbon credits to reduce project costs, including an analysis of transaction costs.

5. Make available methods and materials to help others considering tidal restoration projects.

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Presentation Outline

- **Social Cost of Carbon**—basis for estimating economic benefits of GHG reductions.
- Herring River--preliminary economic assessment of carbon benefits
- Sale of carbon credits—initial insights
- Future refinements to the analysis

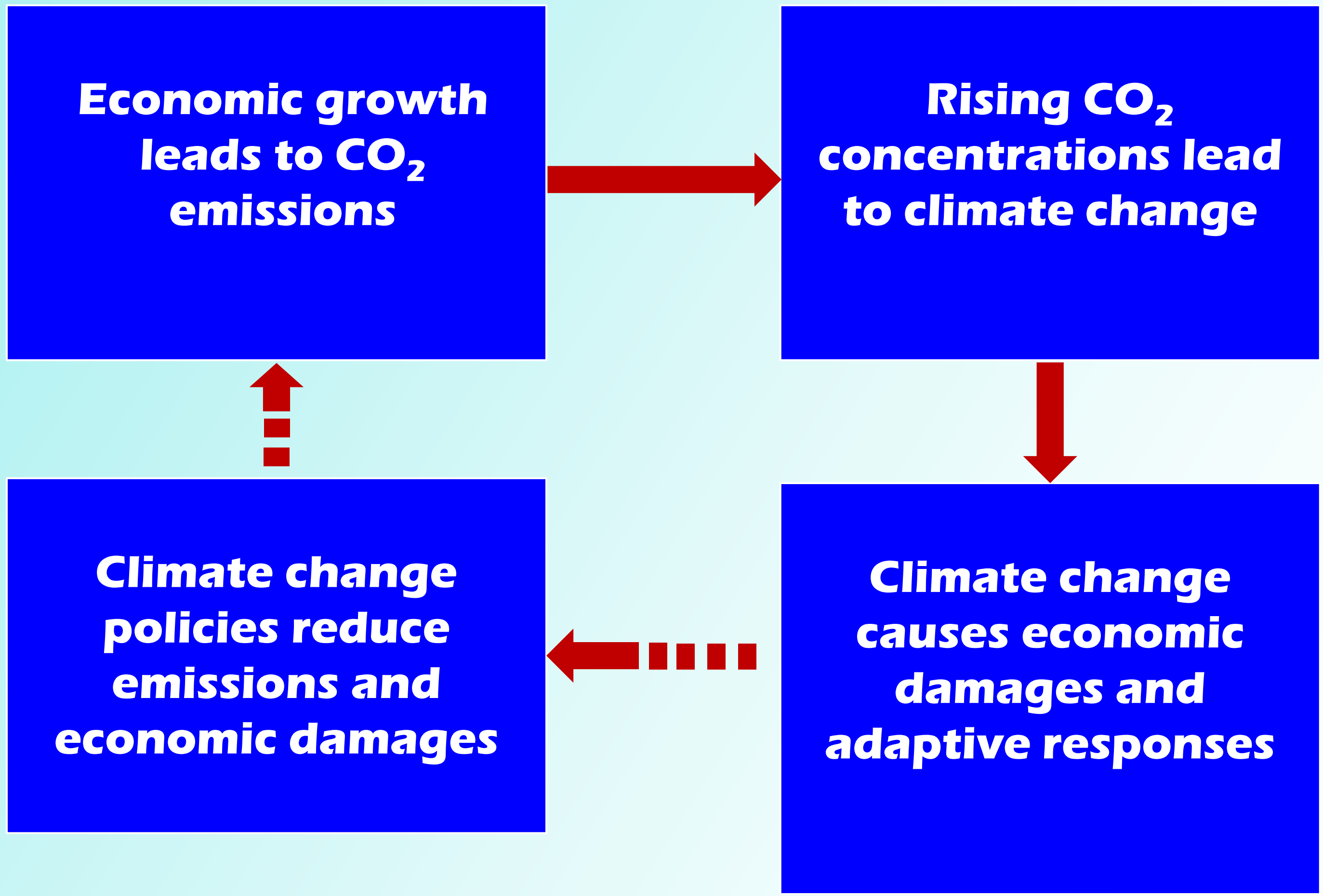
Social Cost of Carbon

BWM Approach to Estimating Methane Benefits of Tidal Restoration

- Identify appropriate measures of the social cost of carbon—damages per ton of carbon (CO_2) released.
- Estimate CH_4 emissions change for Herring Creek and convert to CO_2 equivalents.
- Apply social cost of carbon to CO_{2e} reductions from Herring Creek project.

Social Cost of Carbon

Integrated Assessment Models



Source: Nordhaus, W. 2013. The Climate Casino. Yale University Press. © William Nordhaus

Social Cost of Carbon
Estimated Values for CO_2

"The 'social cost of carbon' is an estimate of the monetized damages associated with an incremental increase in carbon emissions in a given year."

Revised Social Cost of CO_2, 2010 – 2050 (in 2007 dollars per metric ton of CO_2)

Discount Rate Year	5.0% Avg	3.0% Avg	2.5% Avg	3.0% 95th
2010	11	32	51	89
2015	11	37	57	109
2020	12	43	64	128
2025	14	47	69	143
2030	16	52	75	159
2035	19	56	80	175
2040	21	61	86	191
2045	24	66	92	206
2050	26	71	97	220

Source: Interagency Working Group on Social Cost of Carbon, United States Government (May 2013)

Benefits (2013$, 3% discount rate)

- 1 metric ton CO_2 each year for 100 years. **$2,068**

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Herring River Carbon Fluxes with Tidal Restoration

- Evaluate impact of tidal restoration on the major carbon pools:
  - Methane—conversion of high methane to low methane generating conditions (low salinity to high salinity)
  - Soil carbon—potential changes in carbon accumulation rates
  - Above-ground vegetation—losses due to restoration of tidal flows to shrub and woodland areas
- Focus today is only on methane which likely will be the major driver of blue carbon benefits for this project.
- Over the longer run we will consider all significant carbon pools.

Preliminary Methane Emission Rates for Herring River Analysis

Adjusted Poffenbarger Mean Values			Methane Emission Rates (Mg CO2e/ha/y)	
	Salinity (ppt)	Samples	Original GWP (25)	Revised GWP (34)
Fresh	<0.5	8	10.5	14.3
Organolhaline	0.5-5.0	5	37.5	51.0
Weighted Average (< 5 ppt)		13		28.4
Mesohaline	5.0-18.0	8	4.1	5.6
Polyhaline	>18	10	0.3	0.4

Source: Poffenbarger, Needleman & McGonigal (2011)

Herring River Habitat Changes

Estimated Coverage of Vegetation Cover Types (hectares)

Existing

		409

Herring River—Preliminary Estimate of Social Benefits of Methane Reduction

Habitat Type	Methane Emission Rate (Mg CO2e/ha/y)	Baseline (hectares)	Baseline Emissions (Mg CO2e/y)	Post-Project (hectares)	Post Project Emissions (Mg CO2e/y)
Wet Forest		30.4		0	
Wet Shrub		116.6		27.1	
Freshwater Marsh		69.6		40.1	
Total (Freshwater Habitat <5 ppt)	28.4	216.6	6152.1	67.2	1908.9
Brackish Marsh (5-18 ppt)	5.6	14.6	81.3	39.7	221.2
Salt Marsh (>18 ppt)	0.4	5.3	2.1	236.8	96.6
Total			**6235.5**		**2226.7**
Herring River Annual CO2e Impacts					**-4008.8**
			Per Mg CO2e (100 years)		$ **2,068**
			Present Value Total Project Benefit:		**$ 8,289,944**

- More recent literature on social cost of methane emissions suggests GWP method may actually understate benefits.

(Very) Preliminary Thoughts on Marketability of Methane Credits

Herring River

- Investigating feasibility of selling carbon credits from the Herring River project under Verified Carbon Standard (VCS) wetland protocols.

- Social cost of carbon higher than the market price for carbon credits—current credit prices approximately 20-25% of SCC.

- Transaction costs of selling carbon credits substantial, particularly for early entrants to wetland carbon markets.

- Nonetheless, based on carbon flux analyses presented earlier and initial cost analysis, sale of carbon credits from the Herring River project looks promising.

General Considerations

- Acceptance of models or proxy analyses could significantly reduce transaction costs.
- Approaches for aggregating projects will increase the feasibility for smaller projects to sell credits.

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Summary of Initial Insights

- Potential exists for significant GHG economic benefits from tidal restoration projects—but needs to be verified through further on-site quantification of carbon fluxes.

- Larger tidal restoration projects may find it economically beneficial to sell carbon credits even given relatively high transaction costs.

- Where selling credits isn't economically feasible, there's still the potential for significant societal economic benefits from methane reductions and these should be part of any benefit-cost analysis of tidal restoration projects.

- And last but certainly not least…..don't forget about all those other non-carbon ecosystem services from restoring coastal marsh—maybe $5,000-$10,000 per hectare per year.

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Future Refinements

- Revisit GHG benefits analysis using carbon flux data better tailored to Herring River—including other carbon pools.
- Complete the transaction cost analysis for Herring River to determine potential for credit sales to reduce project costs.

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