Introduction to Coastal Blue Carbon Concepts

RESTORE AMERICA'S ESTUARIES

Stefanie Simpson

Estuarine Research Center, Port Aransas, TX

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Who we are

www.estuaries.org

Outline

1. Why Blue Carbon
2. Greenhouse gases and tidal wetlands
3. GHG markets and methodologies
4. Blue Carbon approaches

We care about estuaries!

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U.S. Coastal Habitat Losses and Response

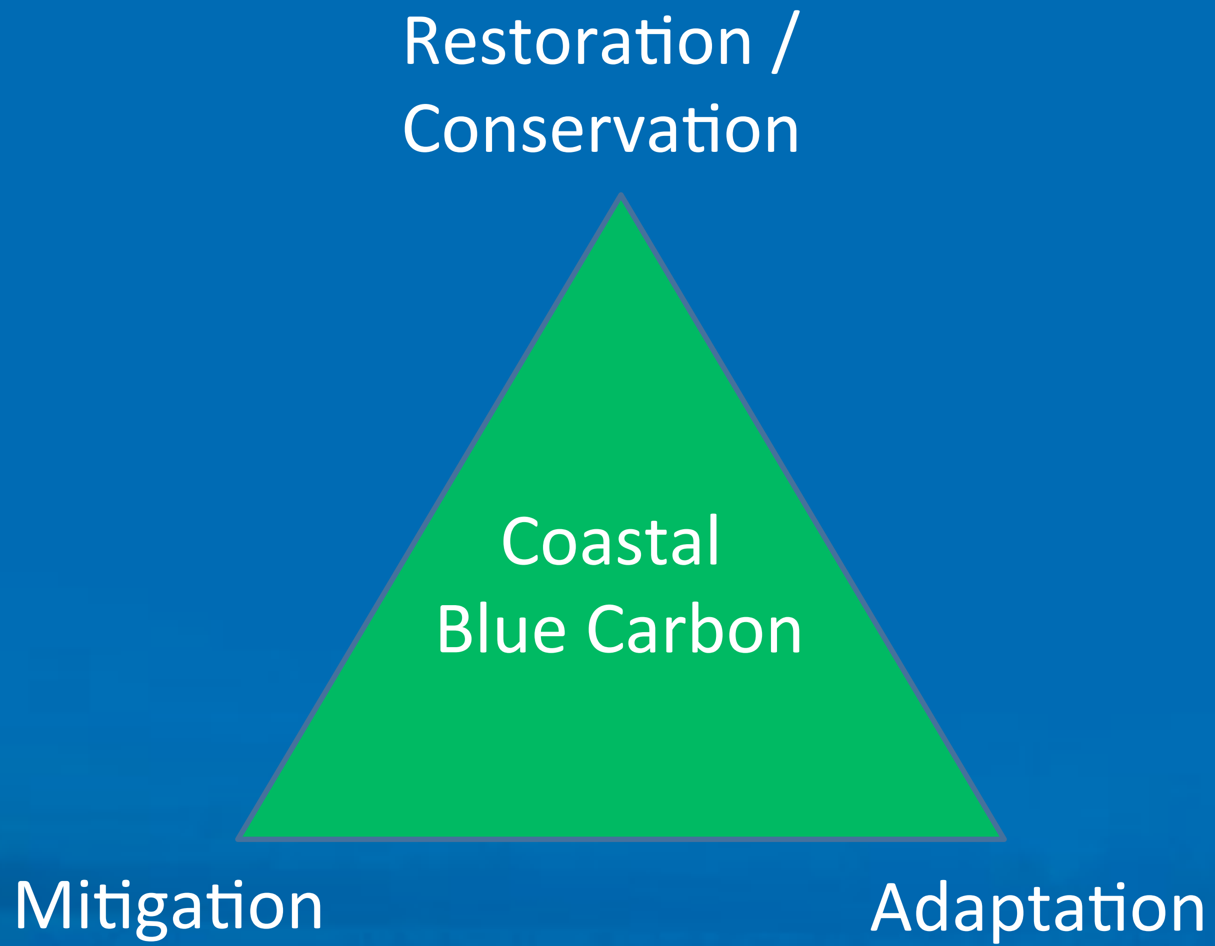
A “New” Ecosystem Service

“Blue Carbon”

the greenhouse gases (GHGs) stored in, sequestered by, and released by coastal marine ecosystems such as seagrasses, mangroves, salt marsh and other tidal wetlands.

<u>Goal:</u> Increase public and private investment in coastal habitat restoration and conservation.

Coastal Blue Carbon at the Nexus



Relevant Greenhouse Gases (GHGs)

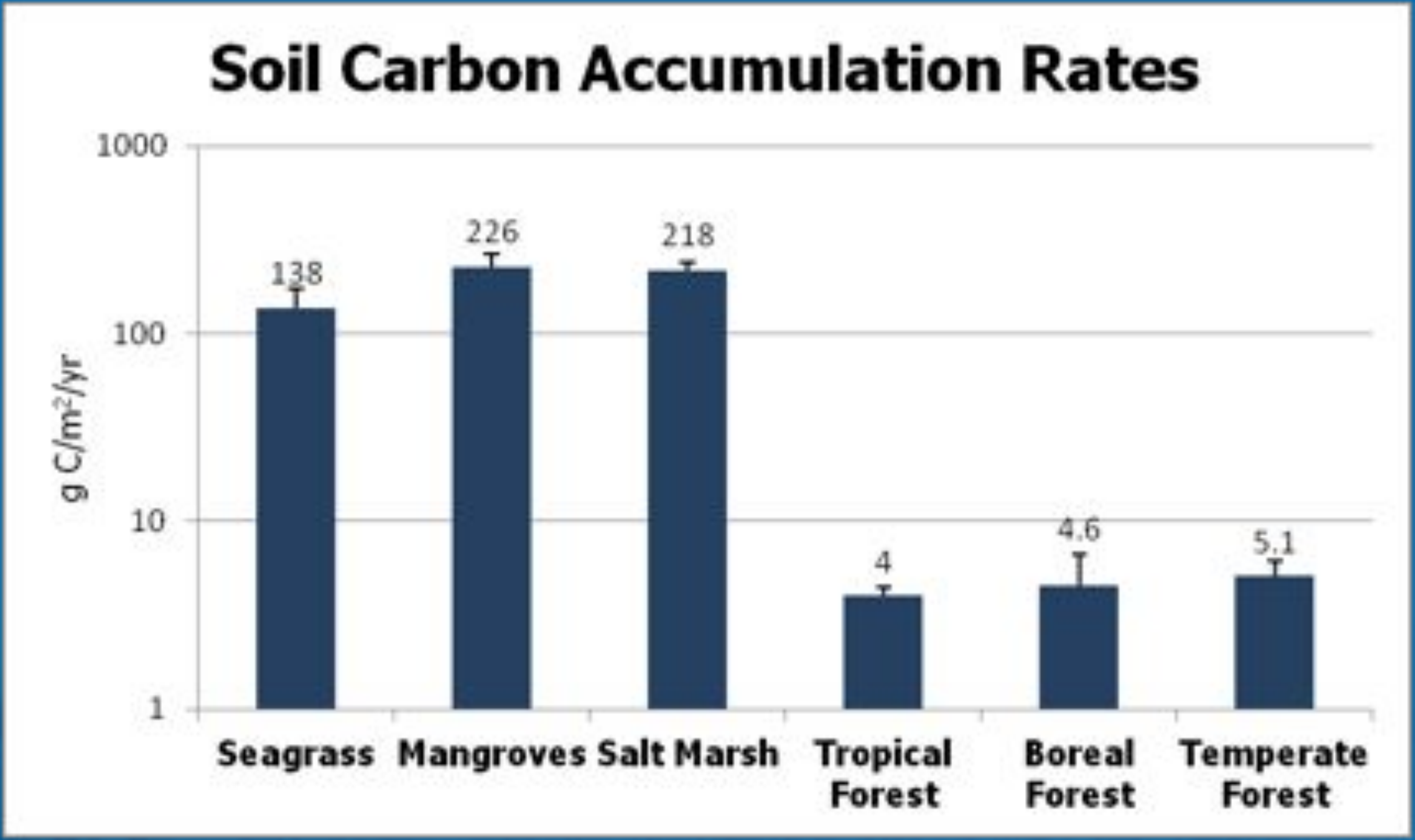
CO_2: Sequestered by plants and stored in plant material and soil

N_2O: Production is anthropogenic in wetlands and estuaries, x300

CH_4: Highly variable at <18 ppt salinity

Insignificant above 18-20 ppt, x 21 - 34

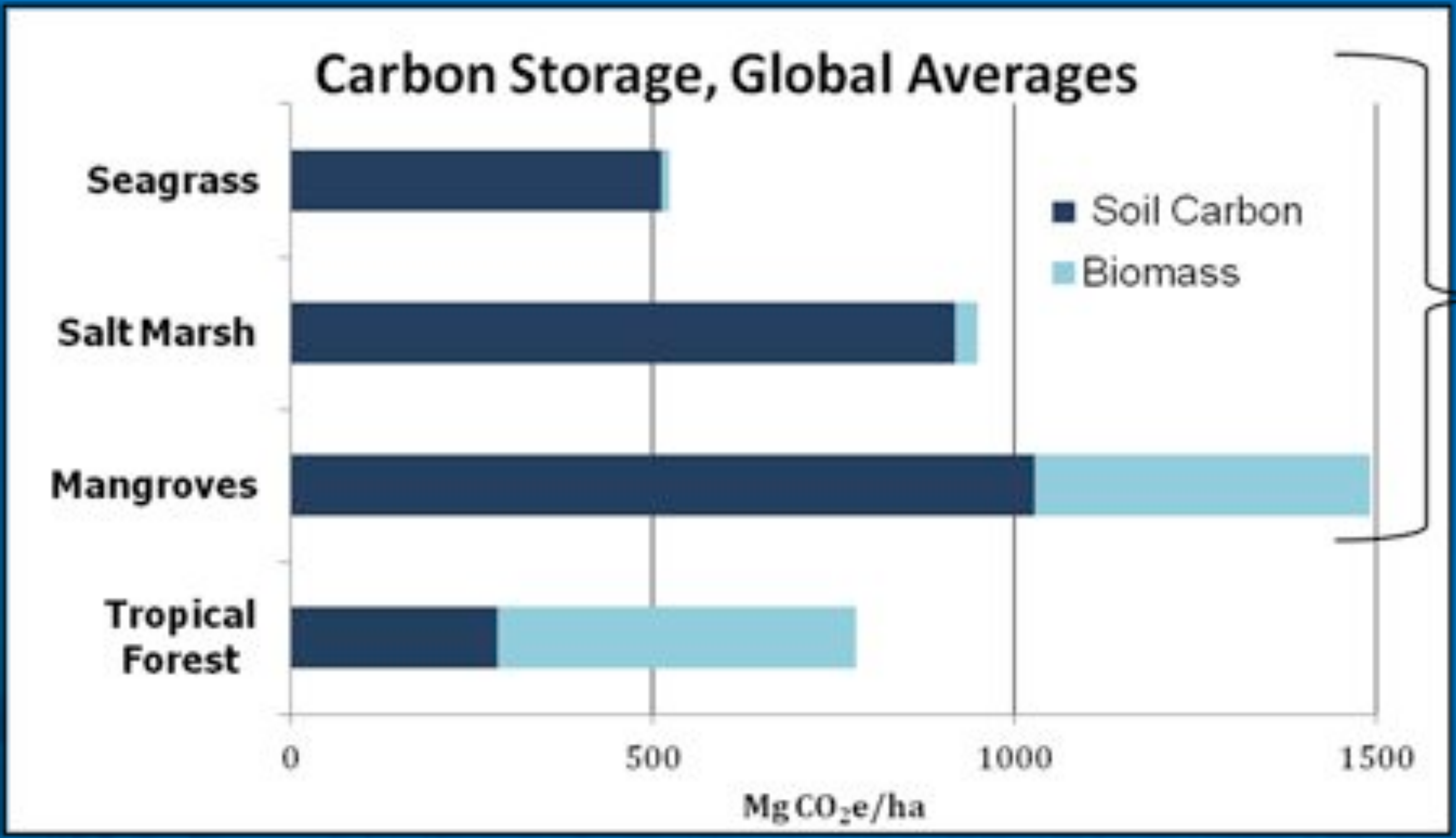
What Is Blue Carbon?



Source: Mcleod et al. (2011)

What Is Blue Carbon?

Primary Carbon Storage in Soils



Soil carbon values for 1st meter of depth only (total depth = several meters)

Source: Pendleton et al. (2012) and Pan el al, (2011)

Carbon Comparisons

Hummer driving 15,000 miles emits **11 tons** CO_2e (carbon dioxide equivalents)

Prius driving 15,000 miles emits **3.7 tons** CO_2e

....while just 1 hectare of Salt Marsh **REMOVES 8 tons** CO_2e every year.

Global Habitat Loss

- Global habitat loss 0.7-7% per year
- Half a billion tons CO_2 released annually (equivalent to Canada's yearly emissions*)

How much progress are we making?

1. Historic Loss >> 1,496,079 acres
2. Combined Goals >> 646,800 acres (59% of loss)
3. 2009-2012 annual average restored ~6,959 acres
4. Annual restoration rate ~1.08% of total goal
5. Average coastal wetland losses of 80,000 acres/yr

RAE Blue Carbon Strategy

Introduction into <u>Carbon Markets</u>

- VCS Requirements
- Restoration Methodology
- *Conservation Methodology*
- *Demonstration projects*

Support <u>Science</u>

- Snohomish Estuary Assessment
- Tampa Assessment

Explore <u>Policy and Regulatory</u> Options

- e.g. 'Carbon reserves'

<u>Coordinate</u> Blue Carbon Initiatives

- e.g. National Working Group

Raise <u>Awareness</u> and Build <u>Capacity</u>

How Much Blue Carbon Is in an Estuary?

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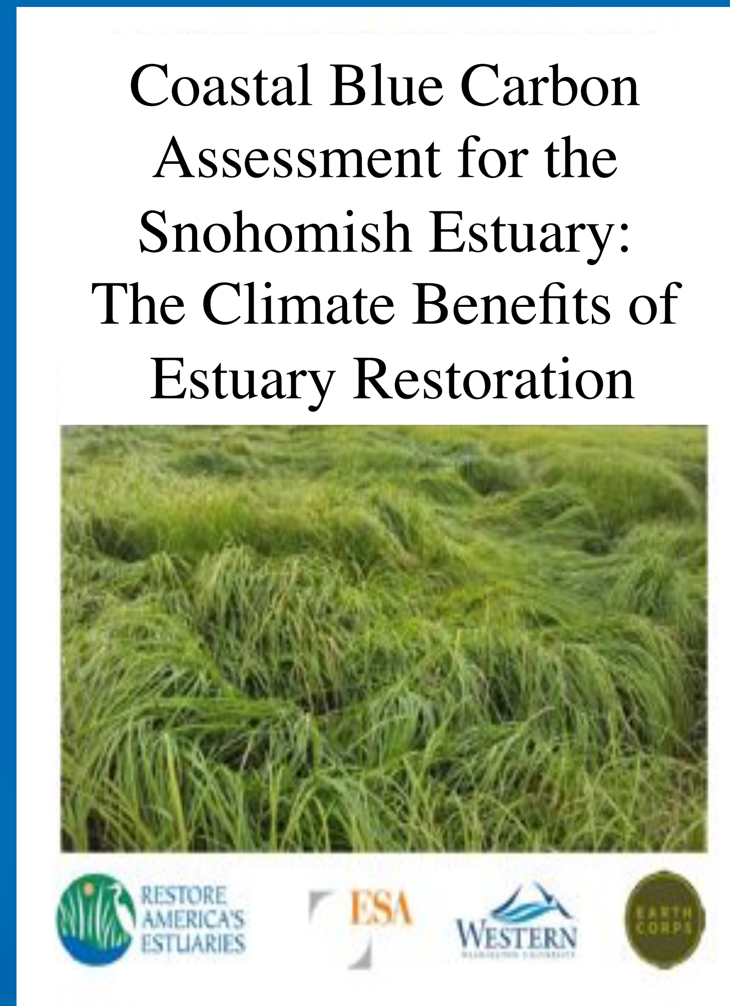
Snohomish Estuary, Puget Sound, WA

- Current restoration plans:
  2.55 million tons CO_2
  1-year emissions 500,000 cars

- Full restoration 4700 ha:
  8.9 million tons CO_2
  1-year emission 1.7 million cars


Coastal Blue Carbon Assessment for the Snohomish Estuary: The Climate Benefits of Estuary Restoration

https://www.estuaries.org/bluecarbon-science

Blue Carbon at Waquoit Bay NERR

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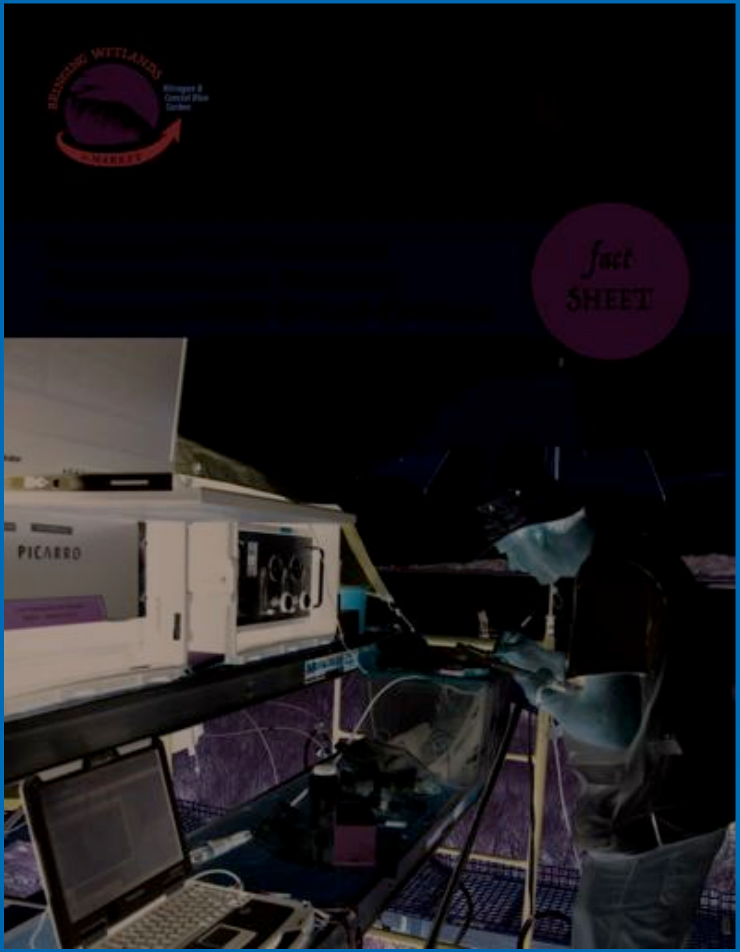
Bringing Wetlands to Market

- Quantify GHG emissions and C sequestration in salt marshes
- Understand processes to predict fluxes with change
- Develop user-friendly model for managers and policy makers
- Develop market tools



http://www.waquoitbayreserve.org/research-monitoring/salt-marsh-carbon-project/

Activities with Potential GHG Benefits

Restoration of tidal wetlands and seagrasses

Creation of tidal wetlands (e.g. beneficial use, lowering water table)

Conservation/avoided loss of existing tidal wetlands and seagrass beds

Restoration Scenarios

Levee/dike breach to restore salt marsh on former agricultural land

Scenario: Levee Breach

	CO_2	CH_4	N_2O
Baseline	Drained soils = emissions.		
"With Project Scenario"			

Scenario: Levee Breach

	CO_2	CH_4	N_2O
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Scenario: Levee Breach

	CO_2	CH_4	N_2O
Baseline	Drained soils = emissions.	Wet soils = emissions.	Fertilizer = emissions.
"With Project Scenario"	No emissions. Restore C sequestration.	Salinity changes impact emissions.	Reduced emissions likely.

Restoration Scenarios

Beneficial Use of Dredged Material

Scenario: Beneficial Use

	CO_2	CH_4	N_2O
Baseline	Open water = no emissions.		
"With Project Scenario"			

Scenario: Beneficial Use

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Scenario: Beneficial Use

	CO_2	CH_4	N_2O
Baseline	Open water = no emissions.	= no emissions.	= no emissions.
"With Project Scenario"	Restore C sequestration.	Fresh to brackish wetlands = emissions likely.	N/A

Restoration Scenarios

Seagrass restoration by re-seeding

Photo Courtesy of Dr. Robert Orth, Virginia Institute of Marine Science

Scenario: Seagrass Restoration

	CO_2	CH_4	N_2O
Baseline	Degraded beds, short term emissions likely.	?	?
"With Project Scenario"			

Scenario: Seagrass Restoration

	CO_2	CH_4	N_2O
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"With Project Scenario"	No emissions. Restore C sequestration.	?	?

Carbon Offsets

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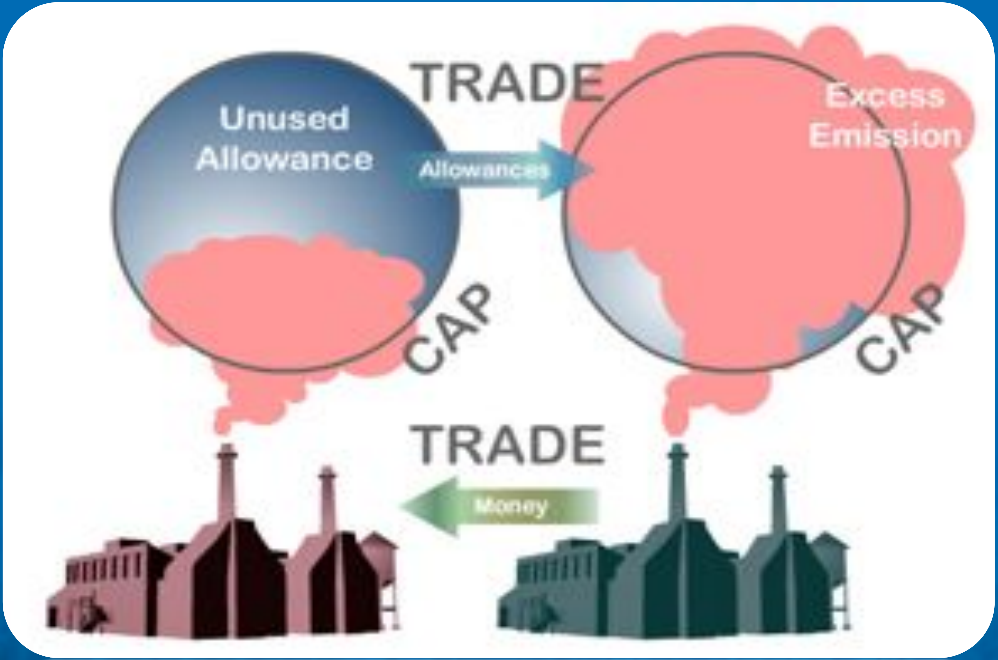
Compliance Markets

REQUIRES private sector participation by capping emissions

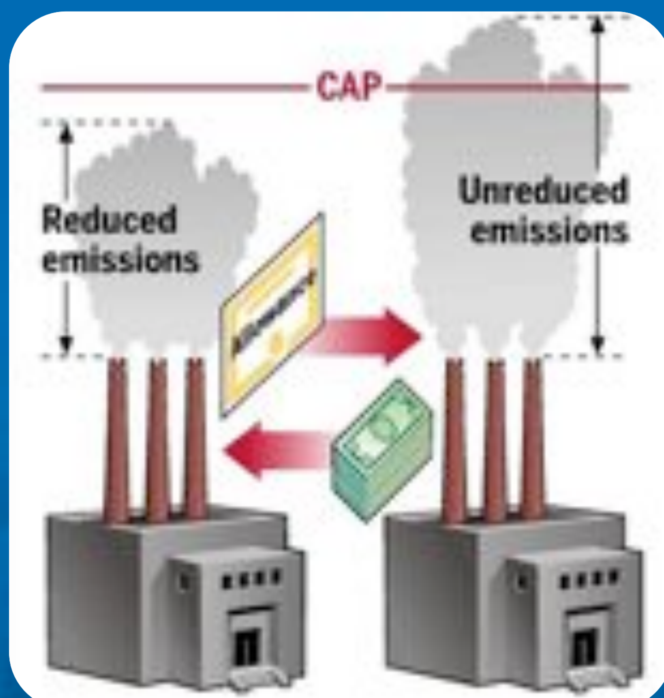
- California Global Warming Solutions Act
- Regional Greenhouse Gas Initiative (New England states)



CA's Global Warming Solutions Act

- Reduce state's GHG emissions to 1990 levels by 2020
- All major industries and 85% of emissions sources
- 2nd largest compliance market in the world
- CA ARB auctions allowances, proceeds of > $500 million
- Allows offsets up to 8% of obligation (but no wetlands.. yet)
- $25 million invested in wetlands and watershed restoration

Auction for Allowances



Purchase offset credits

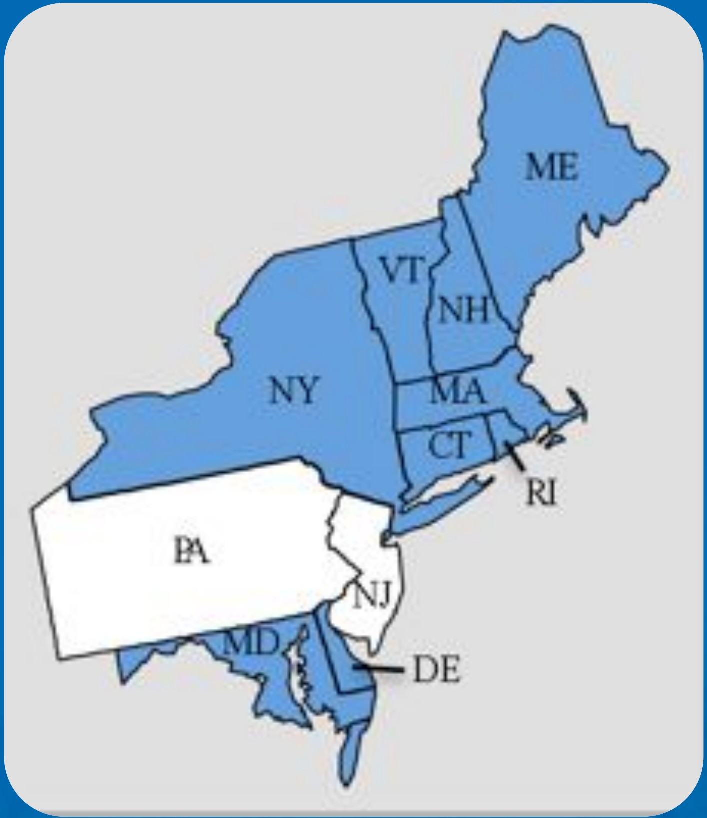
CA's Global Warming Solutions Act

- Allows offsets, up to 8% of obligation
- Five approved offset types: livestock, destruction of ozone depleting substances from US projects, US forestry and urban forestry, and coal mine methane
- Considering rice cultivation and Reduced Emissions from Deforestation and Degradation (REDD) forest projects from Brazil and Mexico

Sources: Ecosystem Marketplace and EDF

Regional Greenhouse Gas Initiative

- 9 NE states
- In addition to allowances, RGGI allows offsets:
  - Improved forest mgmt, avoided conversion/ reforestation, consistent with ARB
  - landfill CH4 capture & destruction
  - sulfur hexafluoride reduction in the electricity sector
  - avoided agricultural CH4 emissions and
  - energy-efficient building projects

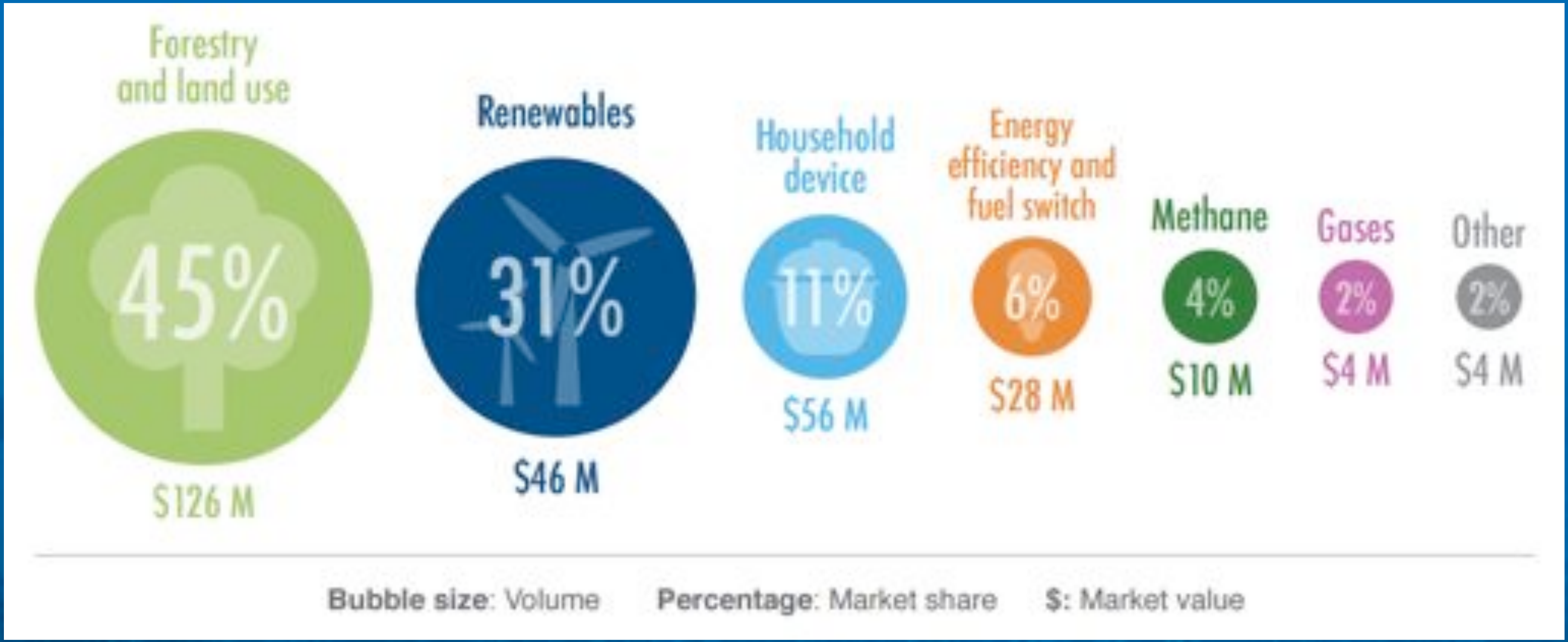


Sources: Ecosystem Marketplace

Voluntary Carbon Market

- $78 million in N. America-2013
- Anticipated growth of 300% by 2020
- 45% of offsets are from forestry/land use
- Verified Carbon Standard largest issuer, 47%

Market Share and Value by Project Category, 2013. Ecosystem Marketplace.



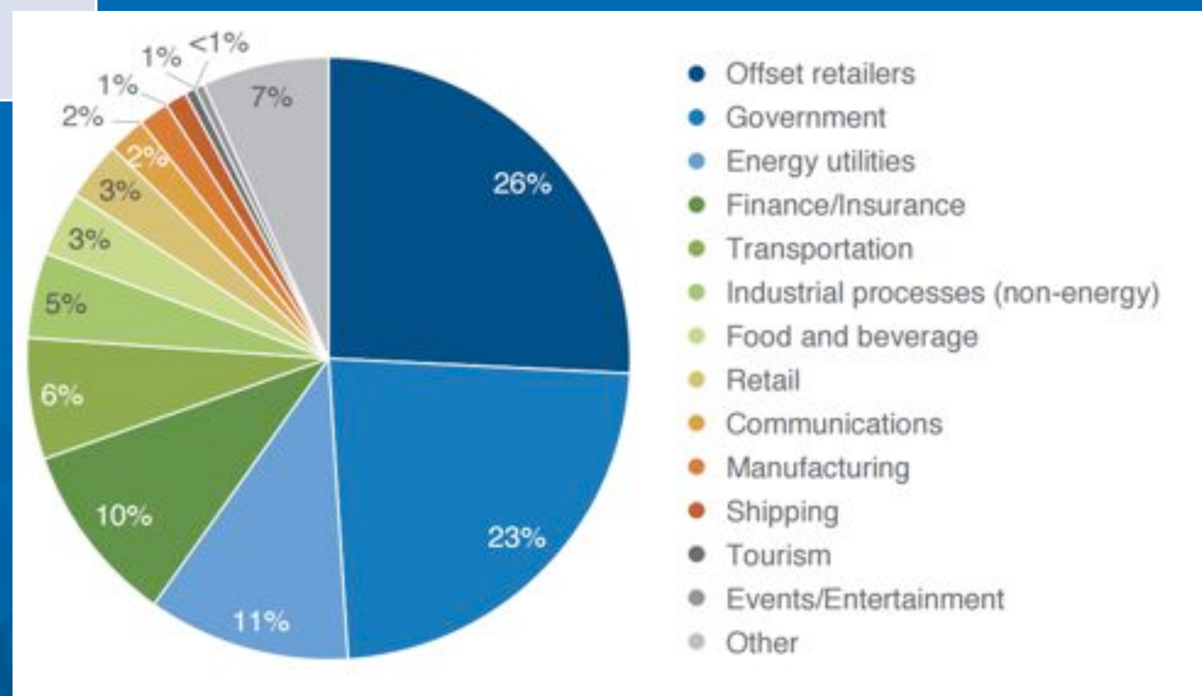
Voluntary Carbon Market

Offset End Users' Top Offsetting Motivations, 2013. Ecosystem Marketplace

Motivation	Ranking by % Share
Climate-driven mission	20%
Corporate Social Responsibility	19%
Demonstrating climate leadership	14%
Engaging customers/clients	10%
Incentivizing supply chain practice change	2%

Who is buying and why?

Market Share by Buyer Sector, 2013. Ecosystem Marketplace



Carbon Markets

Standards ensures quality and integrity of carbon offsets

- General requirements & guidance on GHG accounting
- Procedures for validation and verification

Registries ensure credits are tracked, prevent double-counting

Project Requirements

Real	Demonstrate that reductions have actually occurred
Additional	Ensure reductions result from activities that would have not happen in absence of GHG market
Permanent	Mitigate risks of reversals
Verified	Provide for independent verification that emissions are real
Not harmful	Avoid negative externalities
Practicality	Minimize project implementation barriers
Ownership	Ownership of GHG reductions must be clear

Carbon Markets

Methodologies provide step-by-step requirements for quantifying GHG benefits following scientific good practice

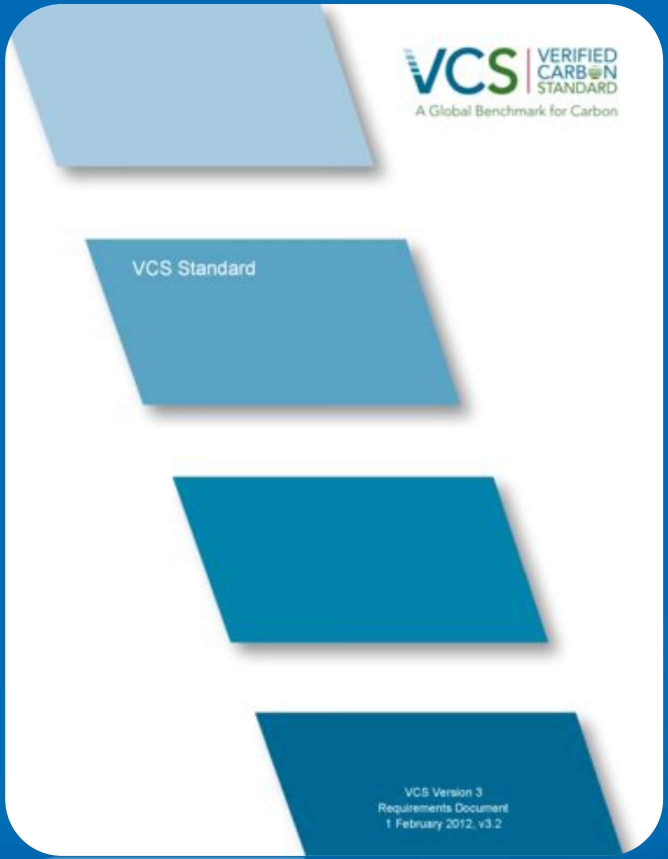
Verified Carbon Standard

Agriculture, Forestry and Other Land Uses (AFOLU) Category

- Afforestation, Reforestation, Revegetation (ARR)
- Agricultural Land Management (ALM)
- Improved Forest Management (IFM)
- Reduction Emissions from Deforestation and Degradation (REDD)
- Avoided Conversion of Grasslands and Shrublands (ACoGS)
- Wetlands Restoration and Conservation (WRC) – ***2012***

VCS – AFOLU Requirements

- Project Requirements
- Methodology Requirements
- Validation and Verification Requirements



Market Opportunities

WRC Requirements

Methodology Development

Project Development

GHG Emission Reductions and Removals

Wetland Methodologies

- Coastal Wetland Creation (VCS) – LA CPRA
- Restoration of Degraded Wetlands of the MS Delta (ACR) – Tierra Resources
- Global Tidal Wetland and Seagrass Restoration Methodology (VCS) – RAE *(approval imminent)*
- Global Tidal Wetland and Seagrass Conservation Methodology – initiated by RAE

Tidal Wetland and Seagrass Restoration Methodology

Habitats – all tidal wetlands and seagrasses, globally

- Marshes, all salinity ranges
- Mangroves
- Seagrasses
- Forested tidal wetlands

Eligible Activities

- Restoration via enhancing, creating and/or managing hydrological conditions, sediment supply, salinity characteristics, water quality and/or native plant communities.

Additionality

- Standardized approach: **In U.S., all voluntary tidal wetland restoration is additional (!)**
- Seagrass restoration and non-US projects must follow project tool

Tidal Wetland and Seagrass Restoration Methodology

- Submitted to Verified Carbon Standard December 2013
- Draft available at www.v-c-s.org, search "wetland"
- Final approval 2015

Authors

- Dr. Igino Emmer, Silvestrum
- Dr. Brian Needelman, University of Maryland
- Steve Emmett-Mattox, RAE
- Dr. Stephen Crooks, ESA
- Dr. Pat Megonigal, Smithsonian Env. Research Center
- Doug Myers, Chesapeake Bay Foundation
- Matthew Oreska, University of Virginia
- Dr. Karen McGlathery, University of Virginia
- David Shoch, Terracarbon

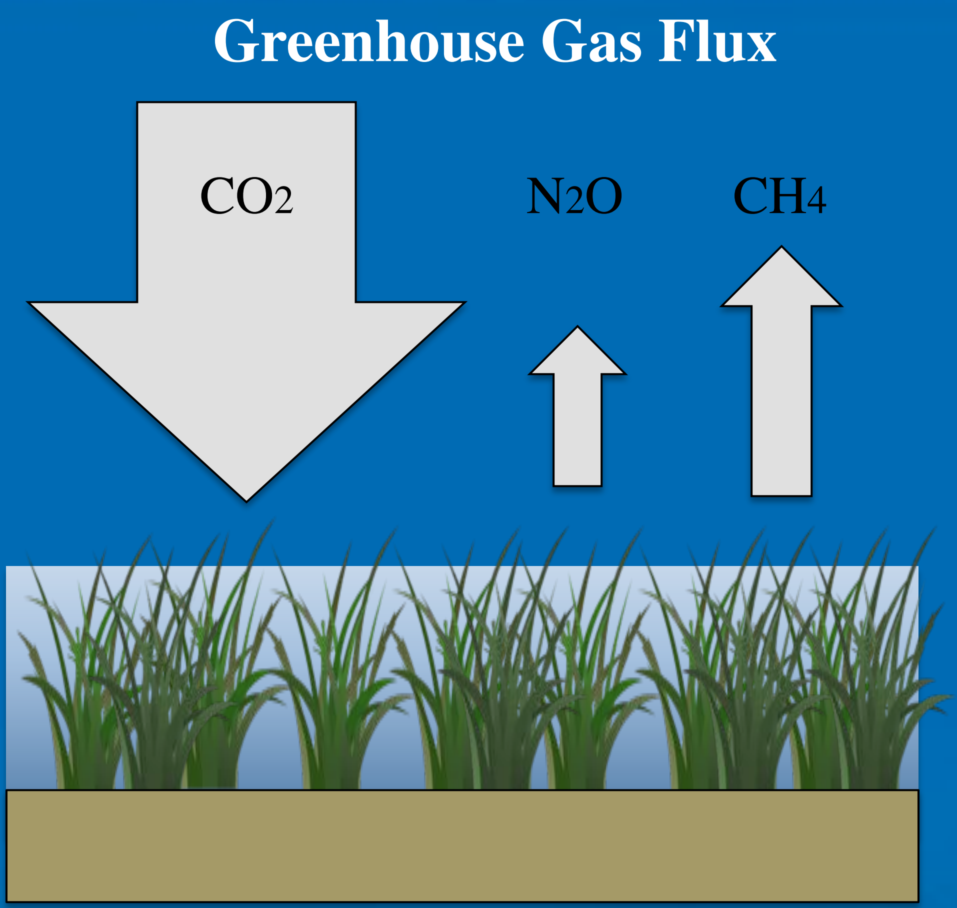
Greenhouse Gas Accounting

CO_2

- Biomass
- Soils
- Fuel emissions

Methane (CH_4)

Nitrous Oxide (N_2O)

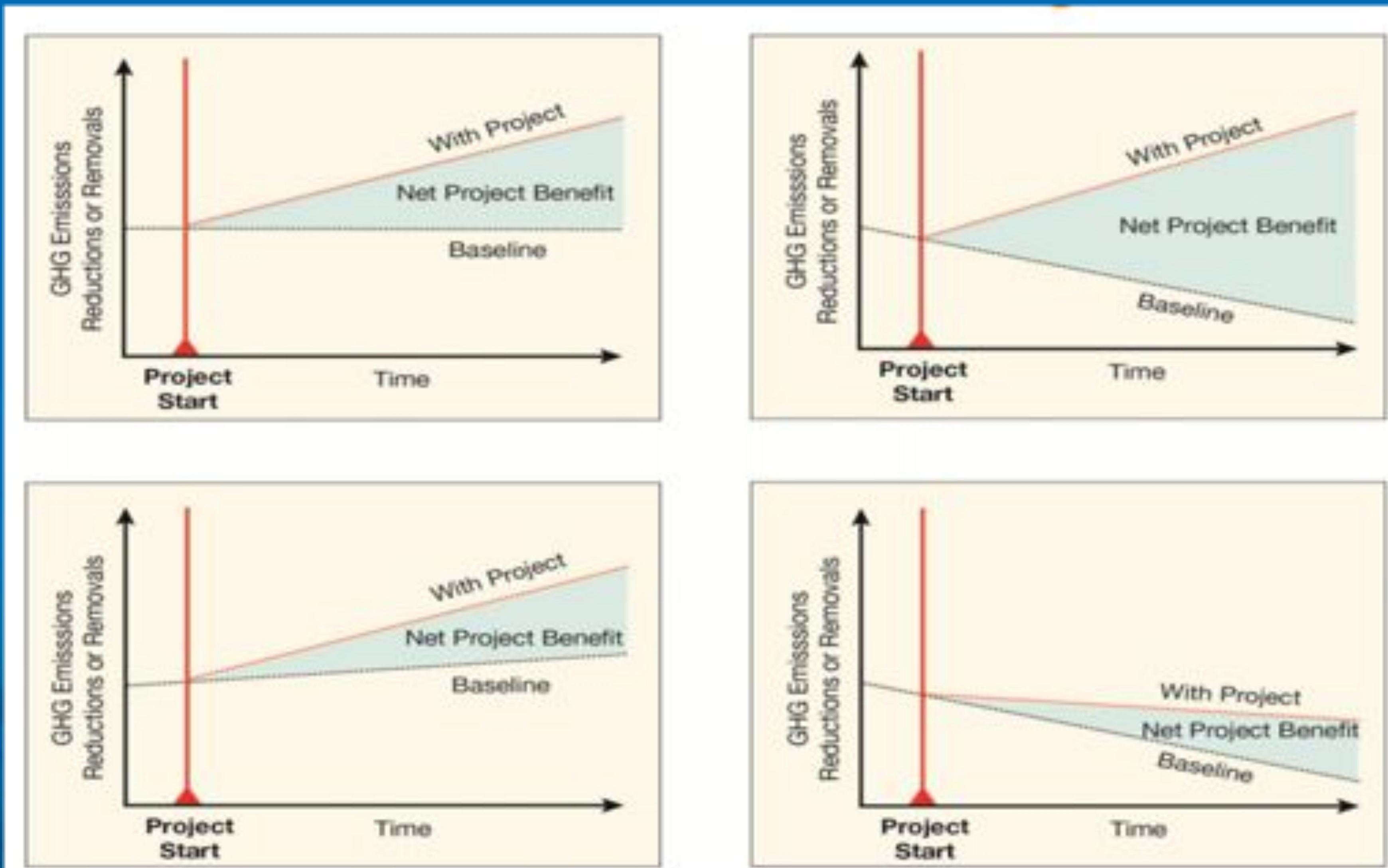


Account for baseline and with-project scenarios

→**Feasibility Study**

Scenarios for GHG Benefits

Baseline versus with-project scenario



Source: Forest Trends

Applicability Conidtions

- No leakage (activity shifting or market)
- Lowering of the water table limited to:
  - Open water conversion
  - Maintain wetland conditions
- No N fertilizers

Greenhouse Gas Accounting

- Published data
- Default values

1.46 Mg C / ha / year for marshes and mangroves

- Emission factors
- Field-collected data
- Proxies
- Models

Where science is insufficient, burden of proof is on project developers to demonstrate

Project Development

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✓ Identify appropriate methodology

✓ Feasibility Study to verify carbon benefit

Evaluate potential opportunities

What are my options?

Feasibility Assessment based on ***VCS Restoration Methodology***

Is this a good offset project? What do we need to do?

Implement Project

Promote GHG benefits of project. Make it happen! Get credit!

Project Development

Guidance document

- Assist with project development
- How to address issues of SLR and permanence
- Manage risks
- Grouping of projects to cut cost
- Release with Methodology

Are Wetland GHG Offsets Attractive?

- Tidal wetland and seagrass restoration creates “co-benefits”
- Climate mitigation and corporate social responsibility are primary reasons to buy
- AFOLU offsets sell at a premium
- Wetlands offsets could be highly charismatic in the marketplace

“We like projects that have co-benefits and side benefits in addition to just pure GHG benefits… and we’re really drawn to reforestation projects in particular that have watershed protection, habitat rehabilitation as well as a GHG component.” – Bob Antonoplis, Assistant General Counsel for The Walt Disney Company

Value of CO2 for Marsh Restoration

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(3 tons CO_2/yr/acre for 50 years)

Price per ton CO_2	100 acres	1000 acres
$5.00	$75,000	$750,000
$10.00	$150,000	$1,500,000
$20.00	$300,000	$3,000,000
$40.00	$600,000	$6,000,000

Before subtracting accounting costs
Adapted from a slide by Brian Needelman, UMD

Carbon Finance Discussion

- Price of carbon too low to fully support activities
  - SCC $40
  - Voluntary Market $4-5
  - CA ARB $8-12
- Cost-sharing common in land use sector projects
- ‘Grouping’ projects may reduce carbon accounting costs, achieve economies of scale
- Offset income could support typically underfunded project elements – e.g. monitoring and adaptive management
- Need creative strategies to maximize carbon benefits while increasing conservation actions

Other Blue Carbon Approaches

- Integrate blue carbon into regulatory and policy approaches
- Make recommendations for improved coastal management
- Explore offsets with lower transaction costs – outside existing standards
- Strengthen funding requests
- *Creative approaches needed*

Goal: Good understanding of full value of habitats to better promote restoration/conservation

Analysis of Federal Policies

- Examined where coastal blue carbon could be included in implementation of Clean Water Act, Natural Resources Damage Assessment, and Coastal Zone Management Act
- Determined: No new regulations or statutory changes needed
- **Incorporation of carbon services in these policies could lead to more habitat conservation**

Sutton-Grier et al. 2014. Marine Policy
Slide courtesy of Amber Moore and Arianna Sutton-Grier, NOAA

Thank you to our partners!

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NOAA NERRS Science Collaborative,
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NOAA's CTP,
Weeks Bay Foundation,
TerraCarbon

The Curtis and Edith Munson Foundation,
The Ocean Foundation,
Commission for Environmental Cooperation,
Tampa Bay Environmental Restoration Fund,
Tampa Bay Estuary Program

Thank you!

Stefanie Simpson
ssimpson@estuaries.org

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