Introduction to Blue Carbon: Science, Offsets and Opportunity

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August 24, 2017

www.estuaries.org
Who we are

Restore America's Estuaries is dedicated to the protection and restoration of bays and estuaries as essential resources for our nation.

www.estuaries.org
Tidal Wetland Ecosystem Services

- Increased resilience
- Key marine habitat
- Improved water quality
- Shoreline protection
- **Climate Mitigation**
What Is Blue Carbon?

“Blue Carbon”
The greenhouse gases (GHGs) stored in, sequestered by, and released from coastal marine ecosystems such as seagrasses, mangroves, salt marsh and other tidal wetlands.

Goal:
Enhance management of, and
Increase public and private investment in coastal habitat restoration and conservation
RAE Blue Carbon Strategy

Introduction into Carbon Markets
VCS Requirements
Restoration Methodology
Conservation Methodology
Demonstration projects

Support Science
Snohomish Estuary Assessment
Tampa Assessment

Explore Policy and Regulatory Options
e.g. ‘Carbon reserves’

Coordinate Blue Carbon Initiatives
e.g. National/Regional Working Groups

Raise Awareness and Build Capacity
Relevant Greenhouse Gases (GHGs)

**CO**$_2$
Sequestered by plants and stored in plant material and soil

**N**$_2$O
Production is anthropogenic in wetlands and estuaries, x300

**CH**$_4$
Highly variable at <18 ppt salinity
*Insignificant above 18-20 ppt, x 21 - 34

*Poffenbarger et al. (2011) *Wetlands*; Holm et al. (2016) *Wetlands*
Carbon uptake by photosynthesis (sequestration)

Stored in soil

Stored in biomass

Slide Credit: Jennifer Howard, Conservation International
Ability to build up C stores over time
Blue Carbon Science

Annual Rate of Carbon Burial

McLeod et al. 2011, Frontiers
Primary Carbon Storage in Soils

Source: Pendleton et al. (2012) and Pan et al. (2011)
Global Habitat Loss

- Global habitat loss 0.7-7% per year (E. Pidgeon, 2009)
- U.S. habitat loss ave 80,000 acres/year (2013 Status and Trends Report, NOAA/FWS)
- Half a billion tons CO$_2$ released annually (Pendleton et al. 2012)
Why Is Blue Carbon Important?

• Drained/degraded wetlands release stored carbon
  (~500M tons emitted per year)
• Low restoration rate in the U.S.
• Driver for increased conservation and restoration
  ✓ Increased resilience
  ✓ Key marine habitat
  ✓ Improved water quality
  ✓ Shoreline protection
  ✓ Climate mitigation
• Climate adaptation
What is the blue carbon benefit of estuary restoration?

Current restoration plans of 3,300 acres:
• 2.55 million tons CO₂
• 1-year emissions 500,000 cars

Full restoration 11,600 acres:
• 8.9 million tons CO₂
• 1-year emission 1.7 million cars

Executive summary and Full report available at: www.estuaries.org/bluecarbon-science
Blue Carbon Finance Considerations

Motives are two-fold:
1. Achieve real, additional and measurable GHG emission reductions or removals (in support of any ecosystem benefits, ecological, economic, social, etc.)
2. Tap into additional funding

Optimizing the carbon finance component should inform the project from the start.
Carbon Offsets

1 Carbon Offset = 1 ton CO$_2$eq
Standards ensures quality and integrity of carbon offsets
• General requirements & guidance on GHG accounting
• Procedures for validation and verification

Methodologies provide step-by-step requirements for quantifying GHG benefits for a particular project activity

84 mil tons offsets in 2015, $278 mil
Who is buying offsets? Energy, transportation, finance/insurance, events/entertainment and service sectors)
“Companies primarily concerned with co-benefits often seek highly charismatic projects such as those that protect critical (and photogenic) ecosystems or provide benefits to vulnerable people.” – Buying In, Ecosystem Marketplace 2016.
Where are offset purchases?

Buyers show preference for local offset projects

Tidal Wetland Activities with Climate Benefit

Restoring Wetland Ecosystems (RWE) – reducing emissions and/or increase sequestration in a degraded wetland

Conservation of Intact Wetlands (CIW) – reduce GHGs by avoiding degradation/conversion
Blue Carbon: Low Hanging Fruit

1. Protection of existing stocks
   Organic soils and biomass

2. Reconnection of impounded waters (formerly tidal)
   Methane reduction

3. Rewetting of drained organic soil
   Stopping carbon loss

4. Restoration of wetlands
   Complimentary with above
Pathway to Market Opportunities

Methodology Development

Feasibility Analysis

Project Design Document

GHG Emission Reductions and Removals
Coastal 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
- Global Conservation Methodology - initiated by RAE
Blue Carbon Toolbox

Restoration Methodology

Project Guidebook

Field Manual

These resources and more at www.estuaries.org/bluecarbon-resources
Pilot Projects

Bringing Wetlands to Market

Herring River Restoration Project
- 1000 acres, tidal re-introduction
- Methane emission reductions

Fruit Farm Creek Project
- 300+ mangrove habitat
- Improving hydrology
- CO2 emission reductions + sequestration

http://www.waquoitbayreserve.org/research-monitoring/salt-marin-carbon-project/
Offsets on Public lands

- Precedent transactions on public lands by several state DNRs and USFWS in southeast.
- 80k acres of ag land restored to bottomland hardwood forests with C funding.
- Agencies can accept donations that are conditional on donor claiming C rights.

...if donation is compatible with the agency’s mission.

Slide credit: TerraCarbon
Blue Carbon & Sustainability

Sustainability plans in FL
• Resiliency to storms, flooding, SLR
• Action plan for reducing GHGs
• Integrating natural elements for infrastructure improvements
• Increase green space for GHG reduction and resident quality of life

“Triple bottom line benefit – economic prosperity, environmental quality, and community quality of life”
Coastal wetland benefits:
• Shoreline stabilization – SLR and erosion
• Storm and flood protection – Improve CRS rating
• Adaptable to changing coast line (vs hard infrastructure)
• Carbon capture and storage
• Many other ecosystem benefits supporting economy
Florida Blue Carbon: Summary of blue carbon activities

• Florida east coast (academic studies):

  • Doughty et al. (2016) **Mangrove range expansion rapidly increases coastal wetland carbon storage.** *Estuaries & Coasts.*
    • Examined above- and below-ground C stock in transitional wetlands (marsh-mangrove) in the northern Indian River Lagoon

  • Simpson et al. (2017) **Carbon storages along a climate-induced coastal wetland gradient.** *Wetlands.*
    • Examined above- and below-ground C stock in transitional wetlands (marsh-mangrove) from West Palm Beach to St. Augustine along FL east coast

• Both studies find greater C stock in mangrove than marsh habitats
- **Florida West Coast/SW Florida:**

- RAE/ESA Tampa Bay Blue Carbon Study – modelling and field assessments around Tampa Bay

- USF/FWC/UCF/UMD – Blue Carbon Project funded by USDA Joint Carbon Cycle Science Program (PIs: Smoak, Rosenheim, Moyer, Radabaugh, Chambers, Logamasino)
  - Assessing above-ground carbon stocks in SW Florida (S Charlotte Harbor to Ten Thousand Islands)
  - Assessing below-ground carbon stocks in same locations
  - Assessing long-term sequestration potential and rates of below-ground burial on multiple timescales

- USGS activities
  - SET network (tracks elevation changes) in Tampa Bay and Ten Thousand Islands. Additional below-ground stock assessments

- Fruit farm creek – RAE/Rookery Bay/USGS & others
  - Blue carbon feasibility study – more on this later

Slide credit: Ryan Moyer, FL FWCC
Existing Networks:

- U.S. National Working Group – led by RAE, NOAA
- N. American CEC – Blue Carbon Working Group
- Global Blue Carbon Network and Database – CI, USGS, SERC
Thank you!

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