Blue Carbon in Louisiana: Overview of State Efforts

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Guerry Holm and Brian Perez, CH2M

Blue Carbon Workshop
June 28, 2016

CPRA
Coastal Protection and Restoration Authority of Louisiana

committed to **our coast**

CPRA Blue Carbon: Objective

CPRA has a 50-year Coastal Master Plan to provide for ecosystem stability and protection to its citizens

Overall objective:

Capitalize on the values that our coastal systems provide by using carbon markets to support and fund our ability to implement additional restoration and protection projects

Contributors

CPRA's Carbon Team:

- CPRA: Rick Raynie, Chuck Killebrew, Jim Pahl
- CH2M: Guerry Holm, Doug Huxley, Brian Perez, Matthew Wilson
- Equator, LLC: Jessica Orrego
- EKO Asset Management Partners: Eron Bloomgarden
- ECO Partners: Ryan Anderson, Kyle Holland, Paul Spraycar

CPRA's Advisory Panel:

An advisory group provided expertise to CPRA on market, economic, and science issues

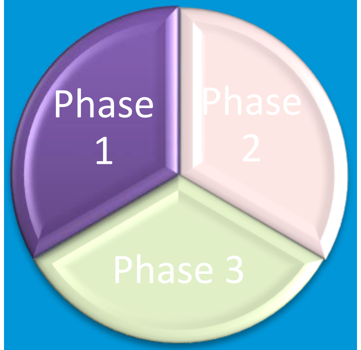
- Ricardo Bayon, *EKO Asset Management Partners*
- Brian Bergamaschi, *USGS*
- John Calloway, *University of San Francisco*
- Pat Megonigal, *Smithsonian Environmental Research Center*
- Patrick Traylor, *Hogan Lovells LLP*

CPRA Blue Carbon: Approach

- **Phase 1**: Market Assessment
- **Phase 2**: Feasibility
  - Policy Issues
  - Methodology Development and Project Selection
  - 'Early Project Case'
  - Science
- **Phase 3**: Program Implementation

P1: Carbon Offset Potential

- Investigate **potential for leveraging** coastal wetland restoration and protection activities with the development and sale of carbon credits by the Louisiana CPRA.
- Provide an informed opinion as to whether it is in the State of **Louisiana's best interest** to pursue and invest in carbon.
- **Define the gaps** in scientific knowledge and policy and market-related issues that must be resolved.



P1: Carbon Offset Potential

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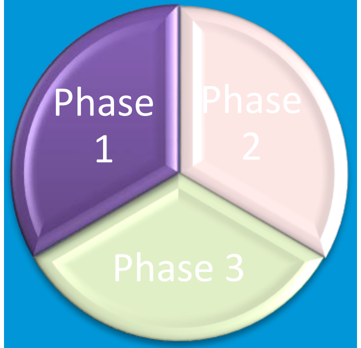


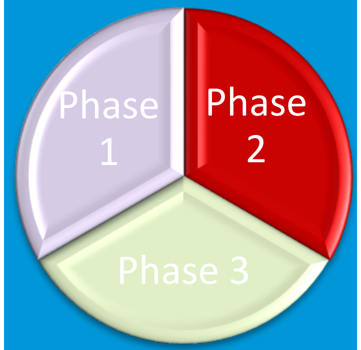
- The **consensus** of the project team was that:
  - **no fatal flaws** are apparent at the time
  - **potential for net positive cash flow** to result from implementation of such a program
  - **immediate steps could be taken** to engage market and policy makers

P2: Feasibility

- **2a: Policy Issues**

Three alternative pathways were investigated as options for the State to pursue related to risk/reward:

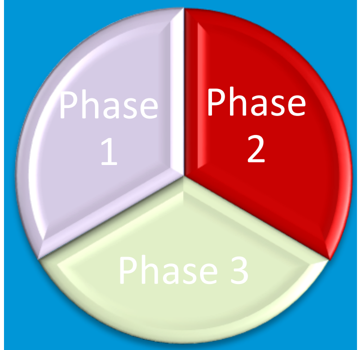
- CPRA Full Project Development and Sale
- Forward Sale of Credits
- Third Party Investment / Public Private Partnership (P3)



P2: Feasibility

- **Key Policy Issues identified for Consideration**

  a) Ownership of Carbon
  b) Property Owner Rights
  c) Marketing and Sale of Credits



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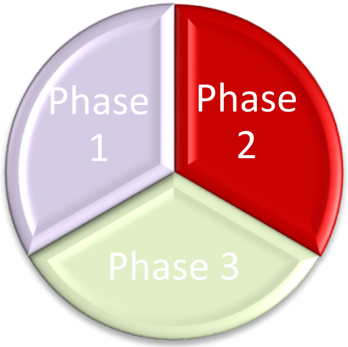
P2: Feasibility



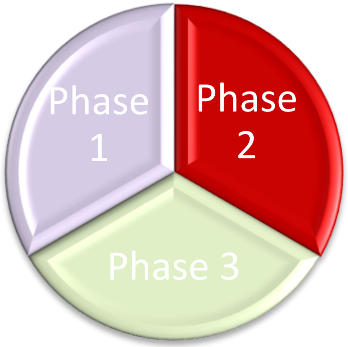
a) Ownership of Carbon:

- ***Strengthen definition of carbon*** offset credits in ***statute*.**
- Strengthen ***state claim to ownership*** to include carbon offset credits generated by a ***wetland creation project***.

Two existing statutes that define the ownership of carbon offset credits in the State.
"Any monetary compensation derived from the sequestration of carbon … is the property of the owner of the land or water bottom … ***unless (a)*** *contractually assigned to another party; or* ***(b)*** *the sequestration, uptake, or prevention of emission of greenhouse gases is directly related to the* ***avoided conversion or avoided loss attributable to a project carried out or sponsored by the Coastal Protection and Restoration Authority*** *…. In such instance, the monetary compensation is the property of the State."*

- *Direct creation of wetlands is **NOT** one of the restoration methods defined*

P2: Feasibility



b) Property Owner Rights:

The current practice for CPRA involves the State entering into a contractual property agreement with individual landowners prior to construction.

For the State to commercialize carbon credit transactions, two conditions that relate to property owner agreements must be satisfied:

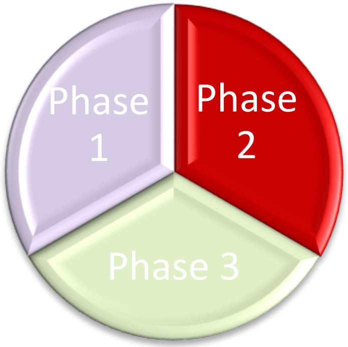
- **Clear ownership** of carbon offset credits resulting from a project must be established

Land ownership in Louisiana's coastal zone is very complex: potentially multiple land ownership scenarios that need to be evaluated. For projects conducted on private property, the carbon offset credits must be contractually assigned to the State for the State to make a sale.

- Property owner agreements should **fulfill requirements of the VCS Standards**

One of the requirements from VCS is to execute a Registration Deed for the project identifying the "Project Proponent" (control and responsibility) and "Registration Representor" (Project Proponent or assigned).

P2: Feasibility



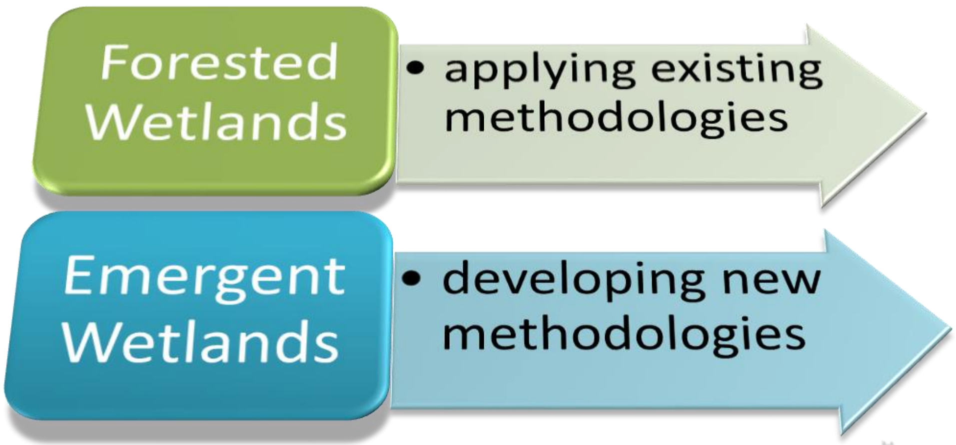
c) Marketing and Sale of Carbon Credits:

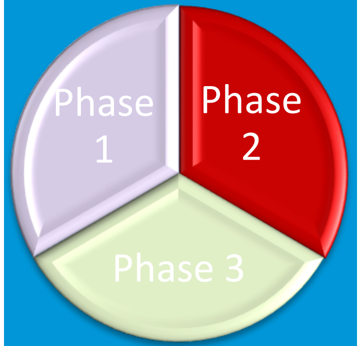
In the voluntary market, organizations are interested in purchasing certain types of carbon offset credits that align with sustainability goals and a sense of corporate social responsibility (CSR).

1. Marketing carbon offset credits on the voluntary market will create the best value for CPRA in the near term.
2. Need to verify whether the Coastal Protection and Restoration Financing Authority has authority to market and sell carbon offset credits.
3. Would need to follow state laws for competitive bidding or auction. Possibly look at state sale of timber as an analog.

P2: Methodology and Project Selection

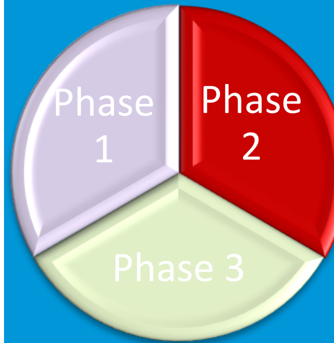
- Dual Track



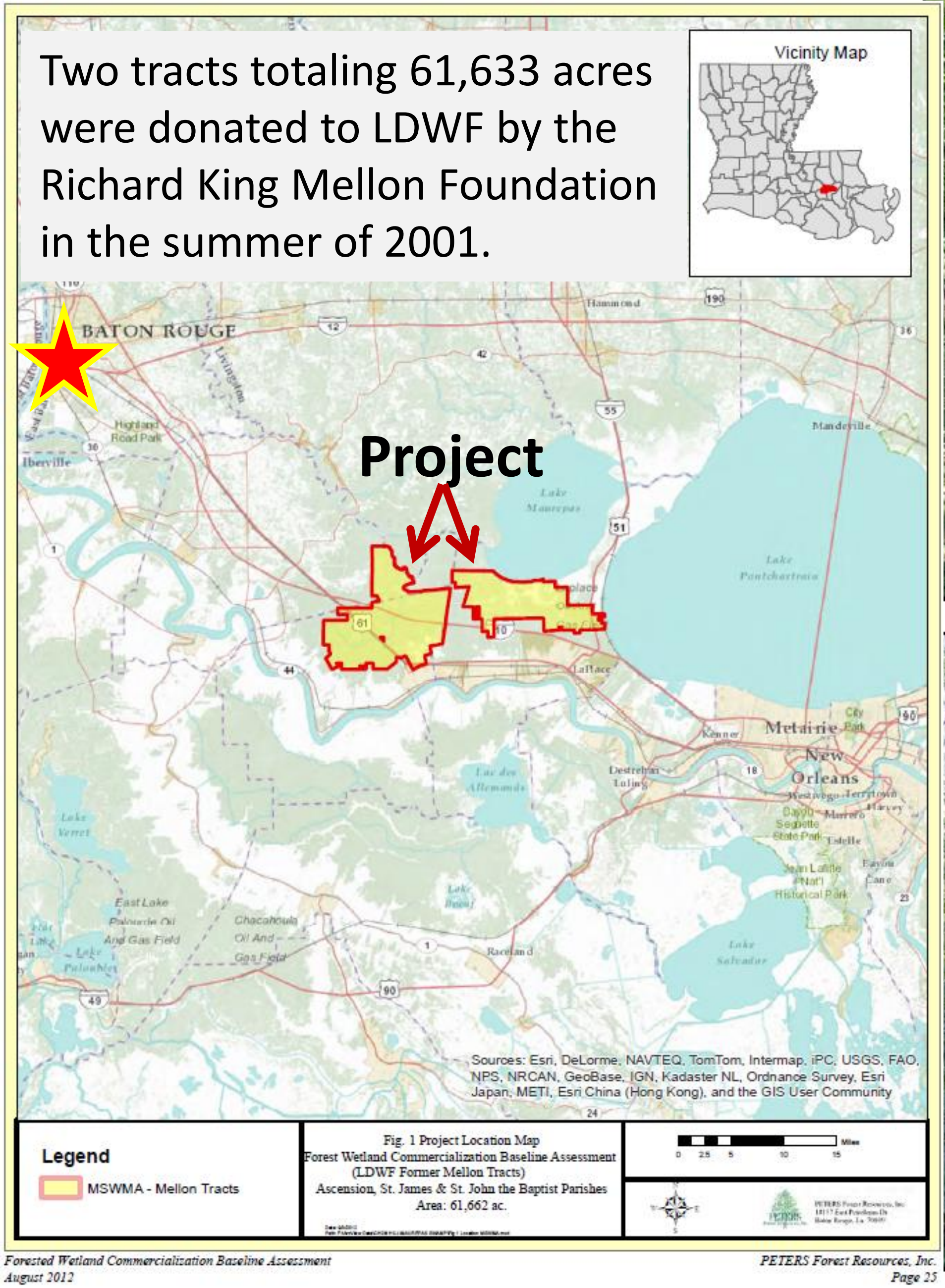


P2: 'Early Project Case'

- **Forested Wetlands**
  - California: existing compliance carbon market for forest offsets in the United States
  - Under the forest protocols of the **Climate Action Reserve (CAR)** and the **California Air Resources Board (ARB)** projects must present a project baseline.
  - This **baseline** must represent what would have realistically occurred on the project site in the absence of the carbon project.



Two tracts totaling 61,633 acres were donated to LDWF by the Richard King Mellon Foundation in the summer of 2001.



View E of cypress-tupelo swamp class 2 habitat N of St. James Boat Club

View ESE of bottomland hardwood class 1 habitat along 642

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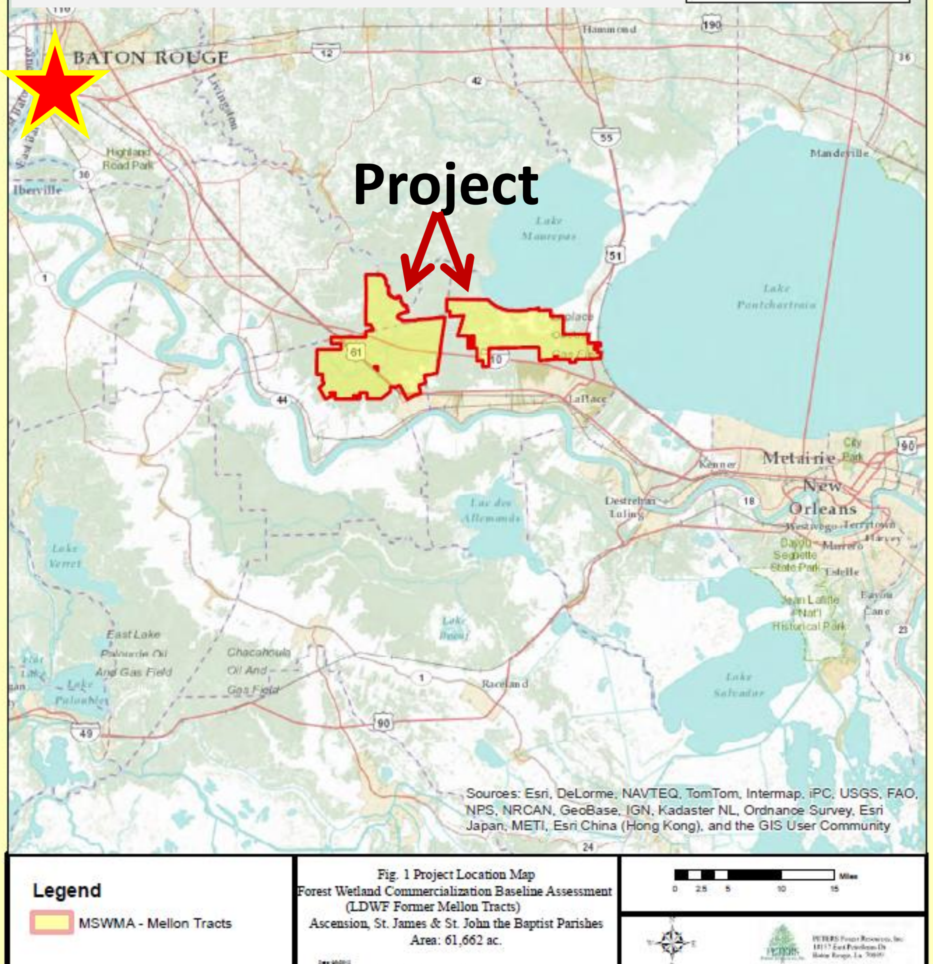

Forested Wetland Commercialization Baseline Assessment
August 2012

PETERS Forest Resources, Inc.
Page 25

The total yield could have approached 875,000 merchantable green tons.

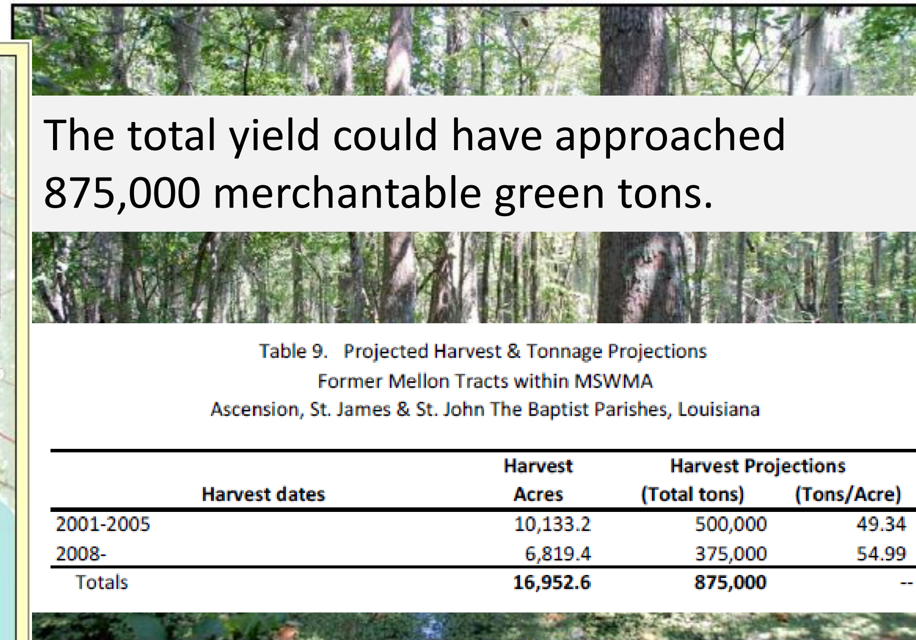

Table 9. Projected Harvest & Tonnage Projections
Former Mellon Tracts within MSWMA
Ascension, St. James & St. John The Baptist Parishes, Louisiana

Harvest dates	Harvest Acres	Harvest Projections (Total tons)	Harvest Projections (Tons/Acre)
2001-2005	10,133.2	500,000	49.34
2008-	6,819.4	375,000	54.99
Totals	**16,952.6**	**875,000**	--

View E of cypress-tupelo swamp class 2 habitat N of St. James Boat Club

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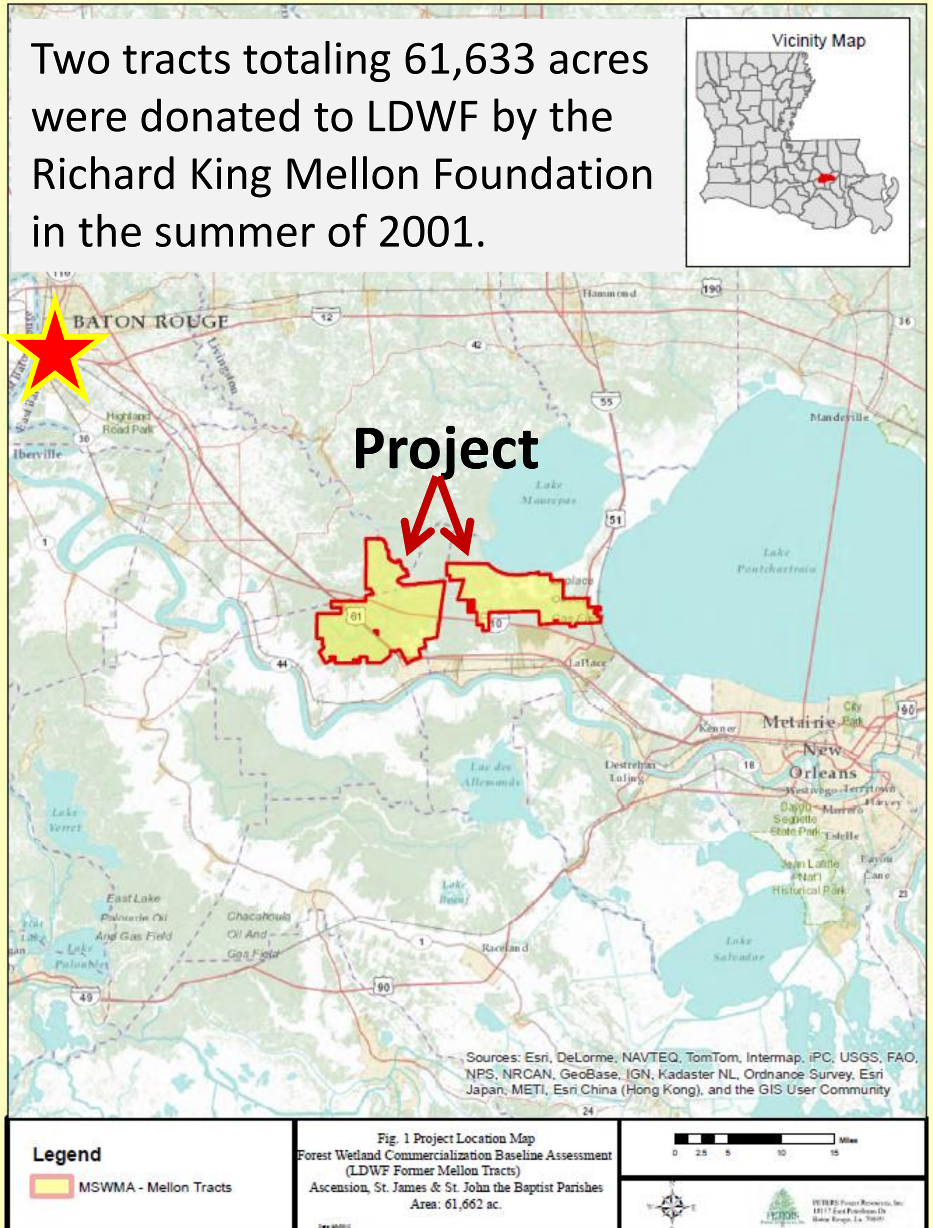

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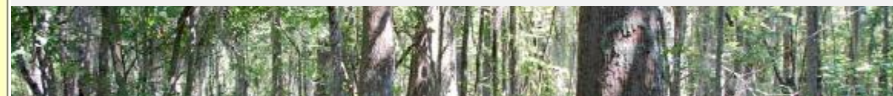

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View E of cypress-tupelo swamp class 2 habitat N of St. James Boat Club

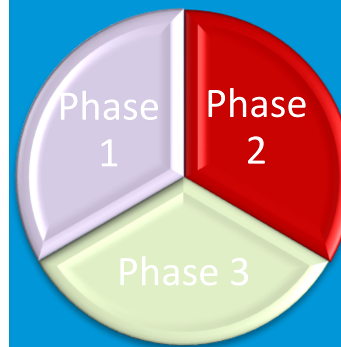
By the end of 2005, all logging in baldcypress-tupelo swamp in the lower Maurepas swamp basin was basically halted by the USACE and Section 10 permits were required.

Could not provide documentation that USACE permit would have been issued.

View ESE of bottomland hardwood class 1 habitat along 642

P2: Methodology Development

- Dual Track
  - Forested Wetlands
  - **Emergent Wetlands (tidal marshes)**



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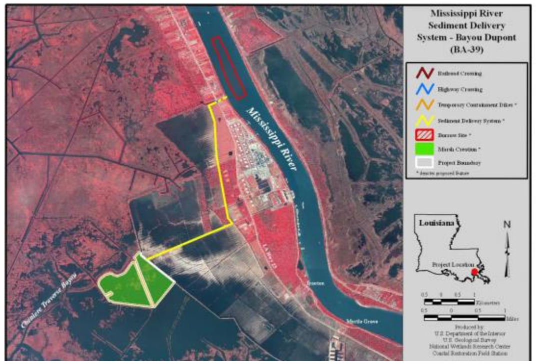
Methodology Project Types

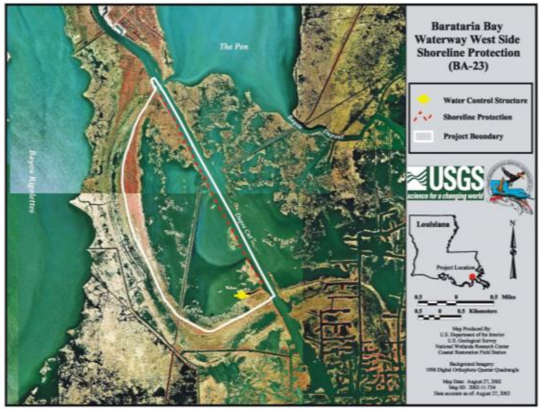
Wetland Creation

- Bayou Dupont



Avoided Conversion

- Barataria Bay Waterway

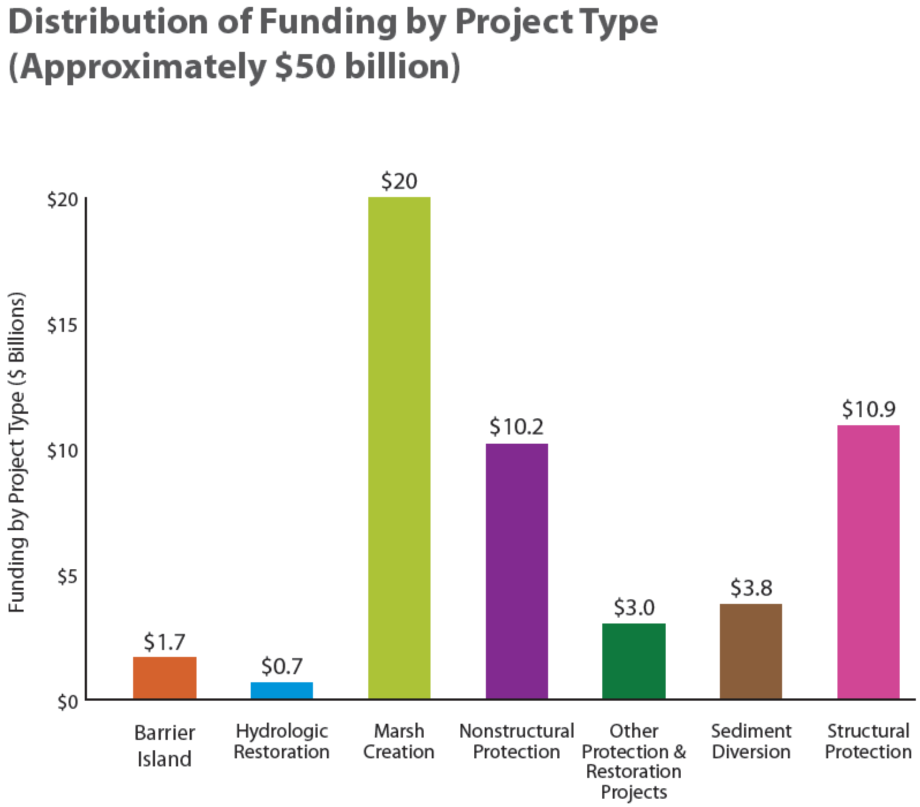


Avoided Conversion & Enhancement

- Caernarvon
- Davis Pond

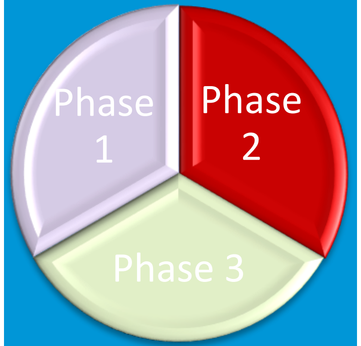
Methodology Selection
Marsh Creation Projects

- Primary restoration tool
- Defined boundary of project
- Engineered lifespan
- Baseline less complex
- Quickest path to market



P2: Carbon Program Selection

- **Verified Carbon Standard (VCS)**
  - Restore America's Estuaries: Pathway for Wetland Restoration Projects (2012)
  - Credibility
  - Technical Rigor
  - Market Share
  - Trading Pricing and Volume

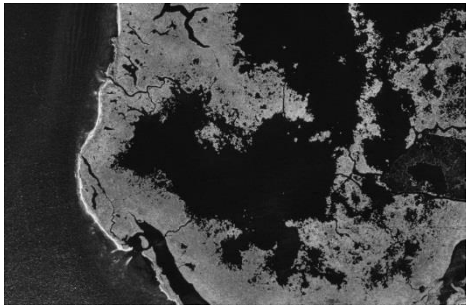


P2: Methodology Completion

CPRA's Methodology for Coastal Wetland Creation (VM0024)

- 2014 CPRA methodology approval for *wetland creation* project types that use dredged sediments
- The first application of the VCS Wetlands Restoration and Conservation (2012) requirements
- In Louisiana, we have 25 MCY per year that can be more wisely used for wetland creation
- Nationwide, there are 200 MCY of dredged sediments each year



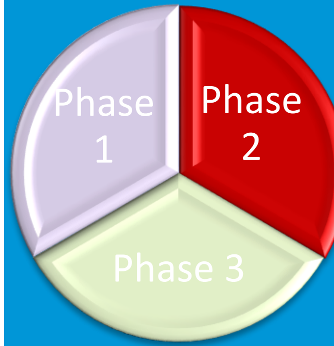



Methodology Highlights

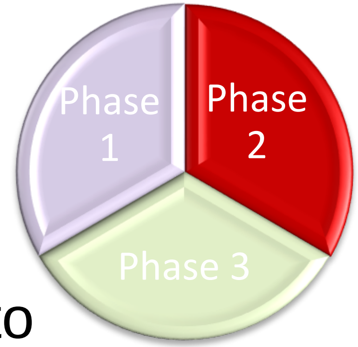
- Marsh creation using dredged sediments must account for fossil fuel emissions
- Emissions are *de minimis,* if project dredging results in a reduction of downstream dredging for navigation
- Marsh creation projects can be aggregated to reduce project validation costs
- Research and tools are still needed to reduce monitoring costs for all project types

P2: Advancing Science

- Remove uncertainties related to potent GHG's, methane and nitrous oxide
- Quantify carbon sequestration for natural and created wetlands (baseline and project)



P2: Advancing Science



- Goals of GHG research and monitoring
    - Evaluate methane along the salinity gradient to improve its use as a proxy for monitoring
    - Develop an integrated carbon budget (methane release and carbon dioxide flux) for freshwater and brackish wetlands

Focus on two sites

Factors

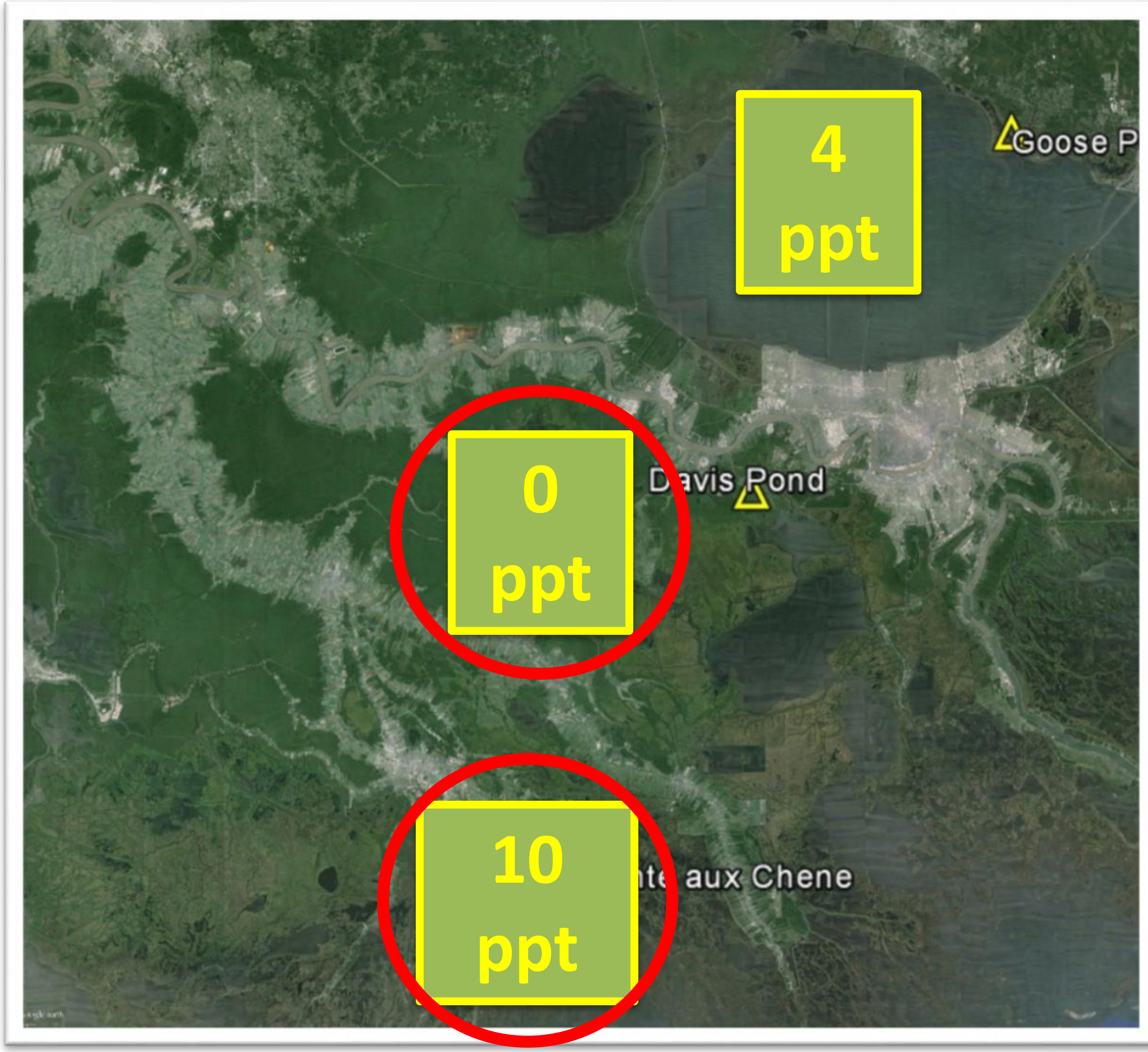
*Salinity

*Diversion

Created vs Natural

Locations

Goose Point	1 yr
Davis Pond	**2 yr**
P. aux Chenes	**1 yr**

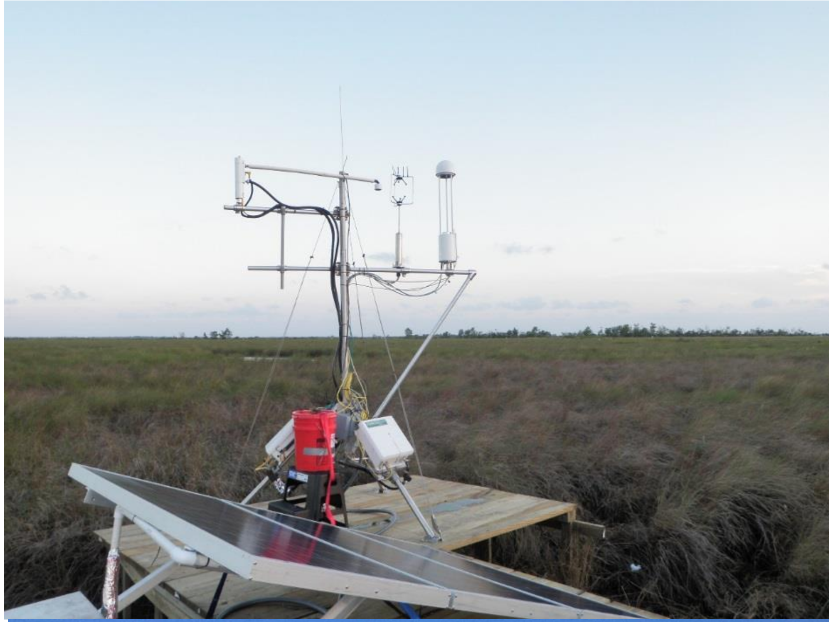


Natural Wetlands, Fresh and Brackish

a. Brackish marsh

Point aux Chenes WMA

- 425 days of data
- *Spartina patens*
- healthy, then rapid deterioration



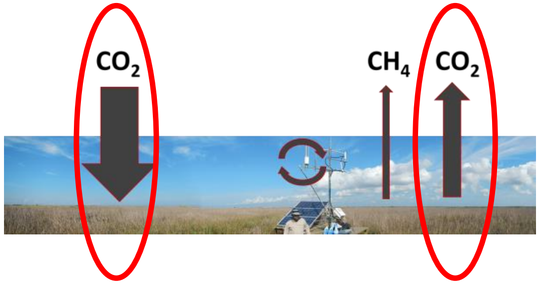
b. Freshwater marsh

Davis Pond WMA

- 737 days of data
- *Sagittaria* (bulltongue) and grasses
- low and typical years of discharge from the diversion

CO_2

Carbon dioxide uptake and release

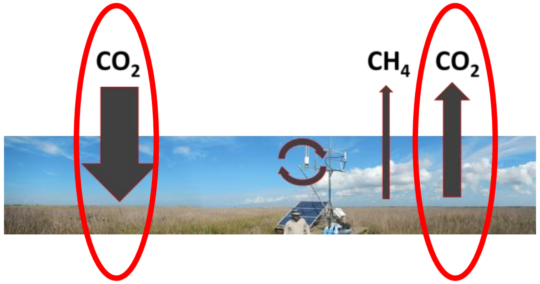


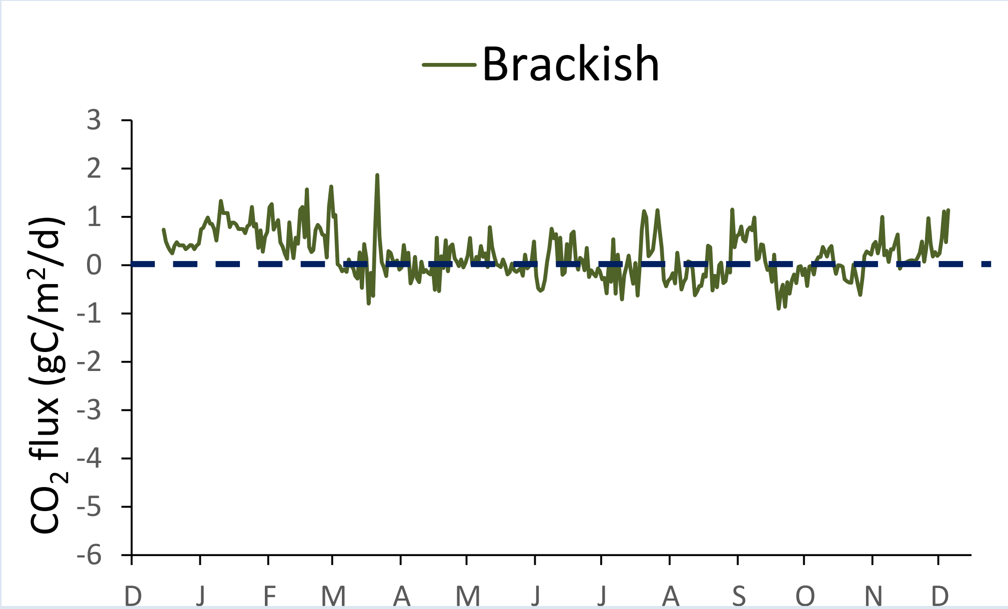
1. comparison ***between*** brackish and fresh sites for 1-yr

2. Davis Pond 2-yr budget under different discharge regimes in fresh marsh

CO_2

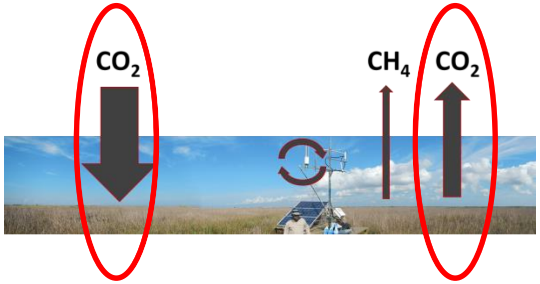
1. Comparison of CO_2 fluxes:
between freshwater and brackish marshes



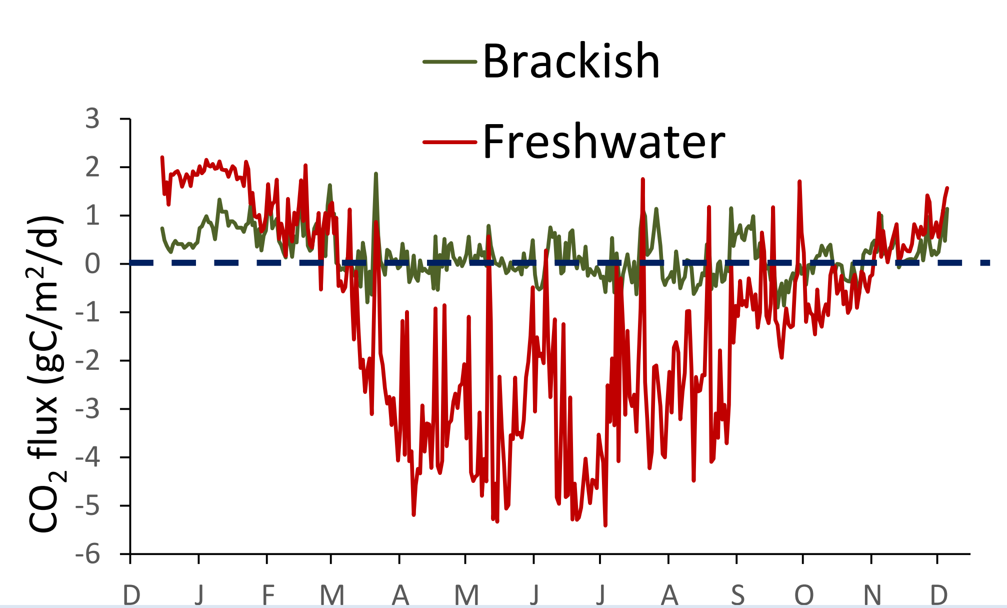


CO_2

1. Comparison of CO_2 fluxes:
between freshwater and brackish marshes

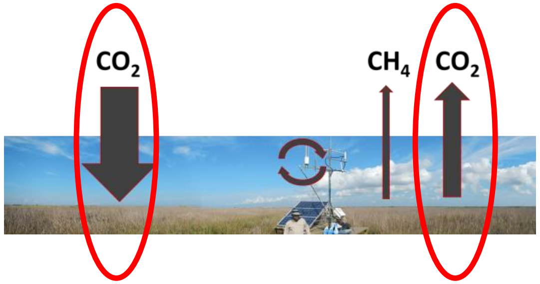


- brackish marsh was a source of CO_2
- freshwater marsh was strong sink for carbon



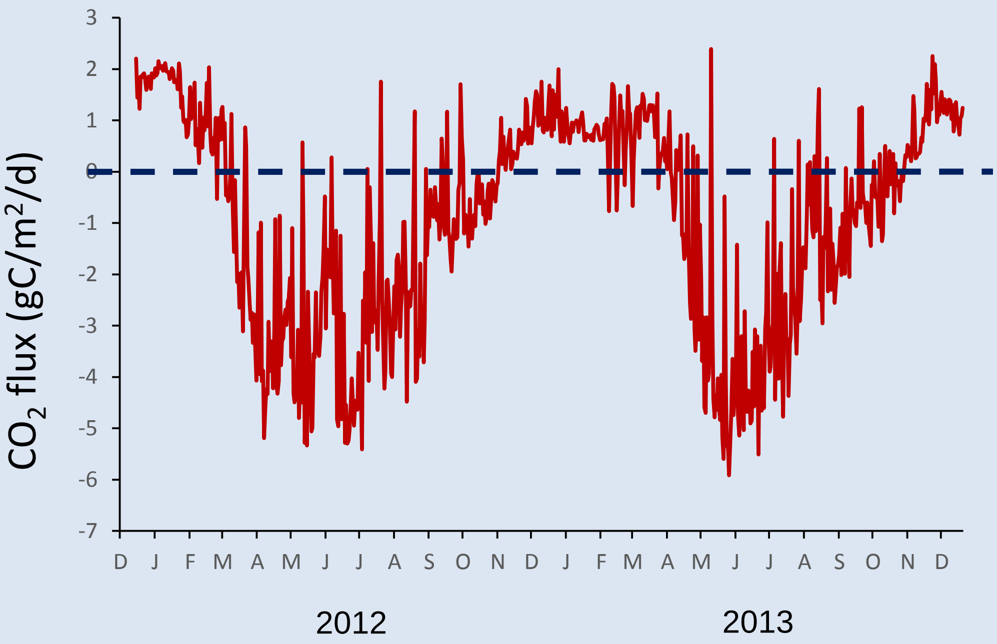
CO_2

2. Comparison of CO_2 fluxes:
2-yr comparison at Davis Pond freshwater marsh site



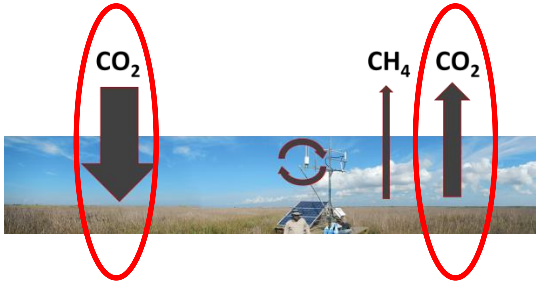
- both years freshwater marsh carbon assimilation was relatively high

- integration over 737 days
  - -677 g C/m^2
  - **-0.92 g $C/m^2/d$**
  - mean = -337 g $C/m^2/yr$ uptake



CO_2

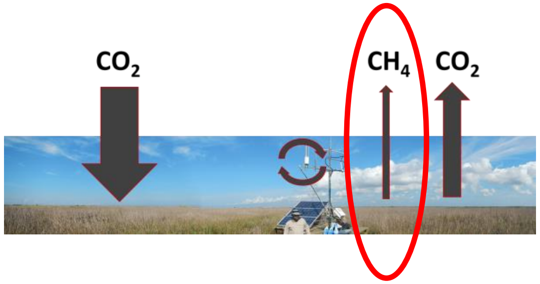
2. **Carbon dioxide** budget for both sites (period of record)



Site	Total C flux/days	Daily integrated C flux ($gC/m^2/d$)	Annual uptake or release ($g C/m^2/yr$)
Freshwater	- 677 g C 737 days	- 0.92	**- 337 (uptake)**
Brackish	199 g C 425 days	0.47	**171 (release)**

CH$_4$

Methane release

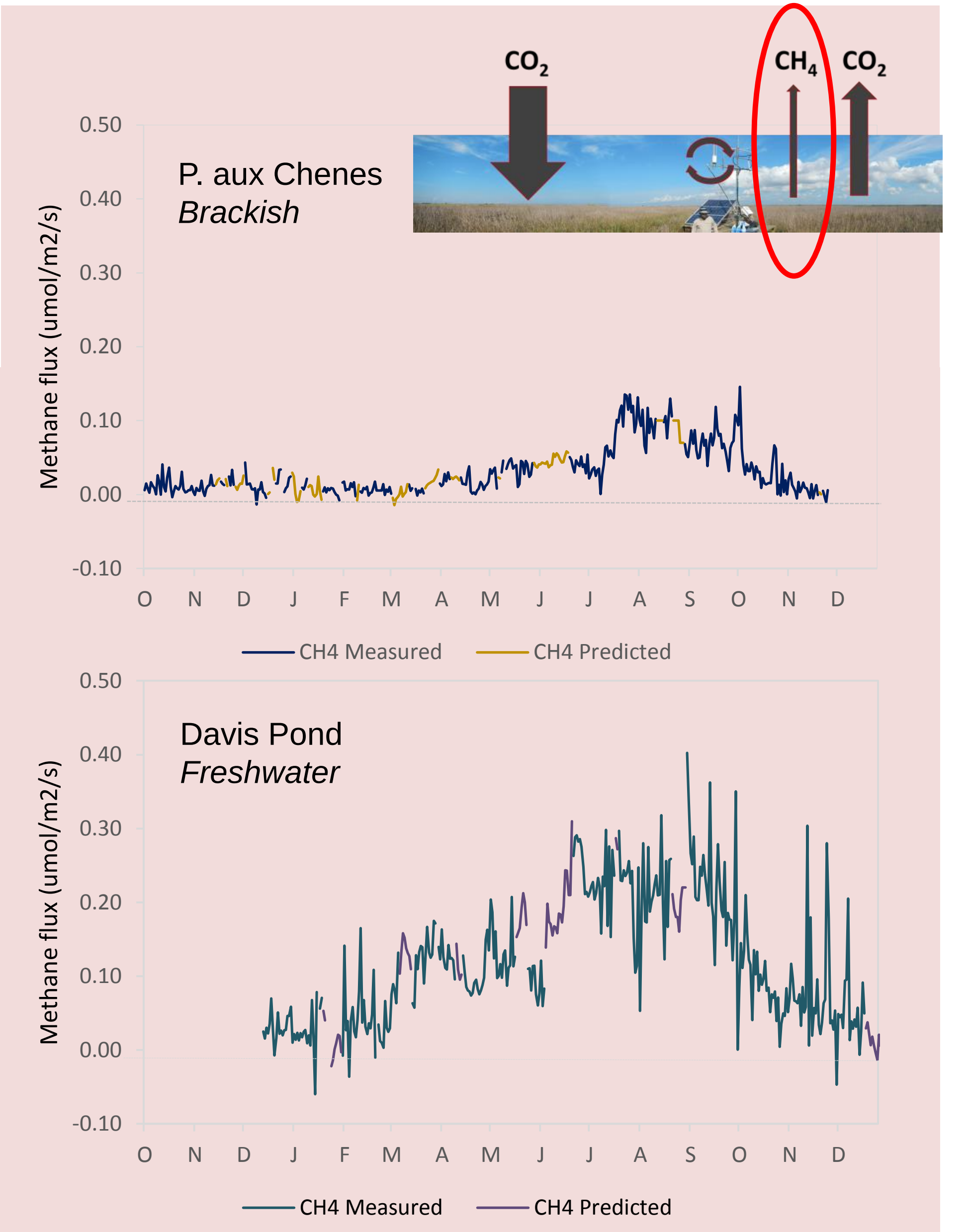


1. comparison ***between*** sites for 1-yr

2. Comparison of Eddy Covariance (EC) fluxes with salinity relationship

CH_4

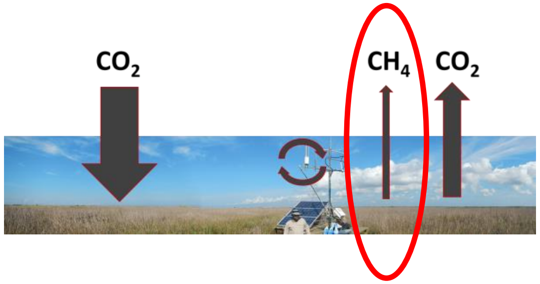
1. Methane comparison *between* sites



- methane flux at the freshwater site was 4X greater than the brackish site
  - brackish = 11 g C/m²/yr
  - freshwater = 47 g C/m²/yr

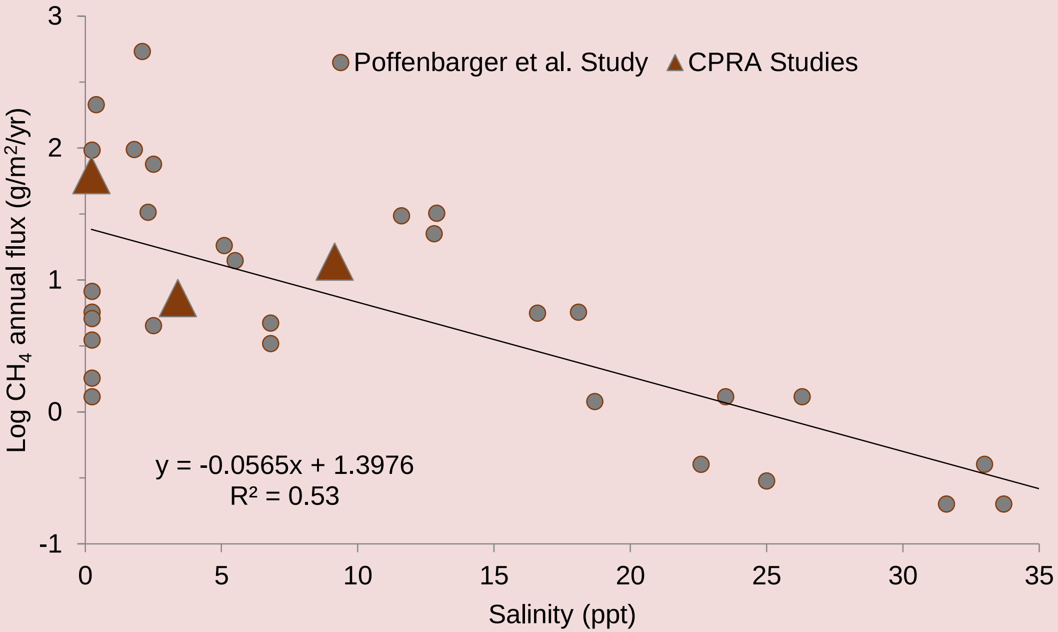
CH_4

2. Comparison of EC fluxes with chamber fluxes across the salinity gradient

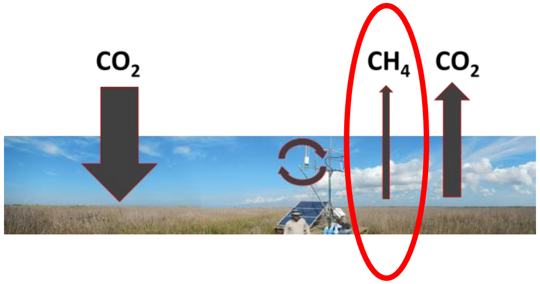


- The EC method produced annual methane budgets of similar magnitude to what has been measured with a broad selection of chamber studies

- Salinity acts as a robust proxy for predicting annual methane emissions



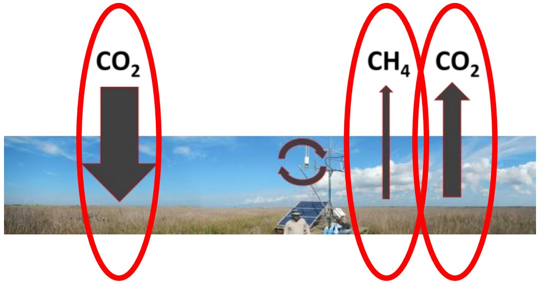
CH_4



Methane budget for both sites

Site	Methane release (g C/m²/yr)
Freshwater	47
Brackish	11

$CO_2 + CH_4$

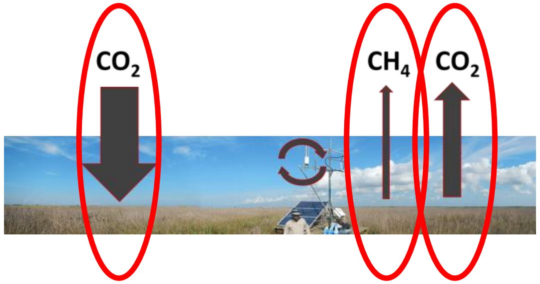


Carbon budget for both sites

Site	Carbon dioxide uptake or release (g C/m²/yr)	Methane release (g C/m²/yr)	Annual uptake or release (g C/m²/yr)
Freshwater	- 337	47	**- 290 (uptake)**
Brackish	171	11	**182 (release)**

$CO_2 + CH_4$

Carbon budget for both sites



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Comparison soil carbon accretion with Eddy Covariance budget

CRMS Site Davis Pond	Mean accretion rate 2009-2014 (cm/yr)	Mean soil carbon density (mg C/cm^3)	Carbon burial (g C/m^2/yr)
3166	1.2	18	220
3169	1.9	19	367
		mean	***294 (uptake)***

***mean carbon burial corroborates what is being measured by ecosystem exchange estimates*

Selected Scientific Contributions

Technical Reports:

Ecosystem Level Methane Fluxes from a Created Marsh in Mississippi River Delta. G.O. Holm Jr., B.C. Perez, D.E. McWhorter, R.C. Raynie, and C.J. Killebrew. 2015.

Soil Development and Carbon Accumulation of Created Wetlands in Coastal Louisiana. Guerry O. Holm Jr., Brian C. Perez and Richard C. Raynie. 2015.

Peer-Reviewed Publications:

Holm, G.O., Jr., B.C. Perez, D.R. McWhorter, K.W. Krauss, D.J. Johnson, R.C. Raynie, and C.J. Killebrew. 2016.
Ecosystem Level Methane Fluxes from Tidal Freshwater and Brackish Marshes of the Mississippi River Delta: Implications for Coastal Wetland Carbon Projects. Wetlands 36(3):401–413. doi:10.1007/s13157-016-0746-7.

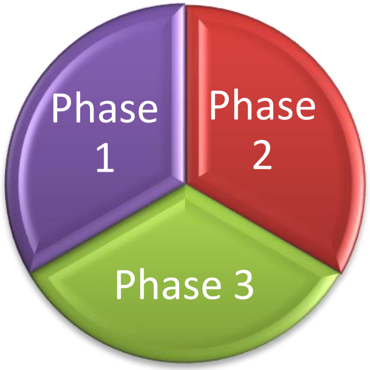
Krauss, K.W., G.O. Holm Jr, B.C. Perez, D.E. McWhorter, N. Cormier, R.F. Moss, D.J. Johnson, S.C. Neubauer, and R.C. Raynie. 2016.
Component greenhouse gas fluxes and radiative balance from two deltaic marshes in Louisiana: Pairing chamber techniques and eddy covariance. J. Geophys. Res. Biogeosci., 121, doi:10.1002/2015JG003224.

Blue Carbon and Louisiana CPRA: Summary

- **CPRA's team developed a nationally viable wetland creation methodology** under VCS with the ability to aggregate projects

- Carbon pricing and monitoring-verification costs remain significant controls on the **return on investment** for marsh creation projects

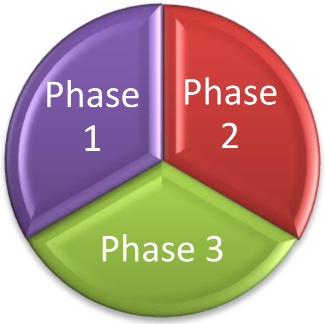
- **Published research can help reduce uncertainty and monitoring costs**
  - *Salinity is a robust predictor of methane release*



Blue Carbon and Louisiana CPRA: Summary

- **Large-scale projects such as river diversions** which have the potential for enhanced productivity/sequestration and avoided loss of existing carbon stocks **may be more likely to provide financially sound investment returns**.

- Nonetheless, there are **policy challenges** that would need to be resolved:
  - *Ownership of Carbon Credits*
  - *Property Owner Rights*
  - *Ability of State entity to sell offsets*
  - *Mechanism for a state entity to sell offsets*



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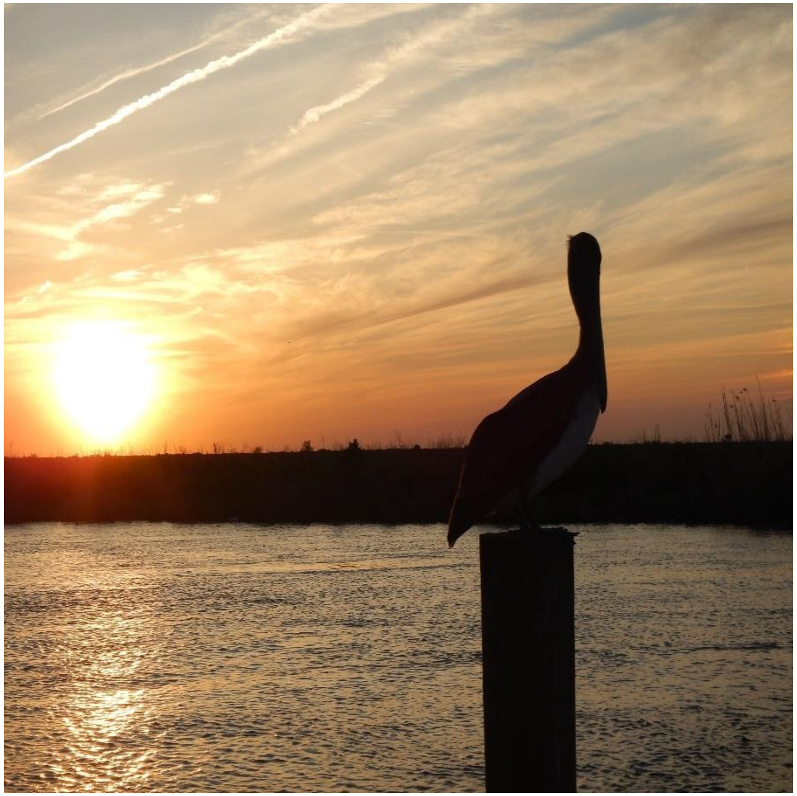
- Coastal Estuary Services
- LDWF
- Apache



Thank You