Wetland/Rice Greenhouse Gas Methodology Development

Sacramento-San Joaquin Delta, San Francisco Estuary

Steve Deverel, HydroFocus, Inc., Davis, CA
sdeverel@hydrofocus.com

Stakeholder Meeting
Sacramento-San Joaquin Delta Conservancy
May 28, 2015

Thanks to:

- Funding from
  - California Department of Water Resources
  - Coastal Conservancy
  - Metropolitan Water District
  - Sacramento Municipal Utilities District
- The Writing team
  - Kyle Hemes (ACR)
  - Stuart McMorrow (ACR)
  - Sara Mack (Tierra Resources)
  - Patty Oikawa (UC Berkeley)
  - Jessica Orrego (ACR)
  - Lucas Silva (UC Davis)
- The Technical working group
  - Evyan Borgnis (CCC)
  - Bryan Brock (DWR)
  - John Callaway (USF)
  - Judy Drexler (USGS)
  - Matt Gerhart (CCC)
  - Campbell Ingram (DC)
  - Sara Kroopf (EDF)
  - Michelle Passero (TNC)
  - Russ Ryan (MWD)
  - Lisamarie Windham Myers (USGS)

Overview

- Background – mission and direction
- Methodology
  - Modular Framework
  - Modules
- Example Project
- Next Steps

Mission

To develop a GHG methodology for wetlands and rice in California based on sound science and the best available information and…

that provides a practical mechanism for producers to participate in the carbon market in an environmentally sound and economically viable way

Parallel processes

- Methodology development
  - Modular approach modeled after Mississippi Delta wetland restoration protocol
  - 3 primary geographic areas:
    - Sacramento –San Joaquin Delta
    - Suisun Marsh
    - San Francisco Bay
- Technical underpinnings
  - Baseline emissions
  - Refinement of project GHG emissions and benefit
  - Modeling
  - Implementation of pilot projects
  - Best management practices

Methodology

- Modular framework

Basic Modular Structure

Wetland – Rice Cultivation Methodology Framework Describes structure and function of modules, applicability, activities requirements
Defines geography:
Sacramento-San Joaquin Delta and San Francisco Estuary

3 Baseline Modules for estimation of GHG loss: agricultural, seasonal wetlands, open water

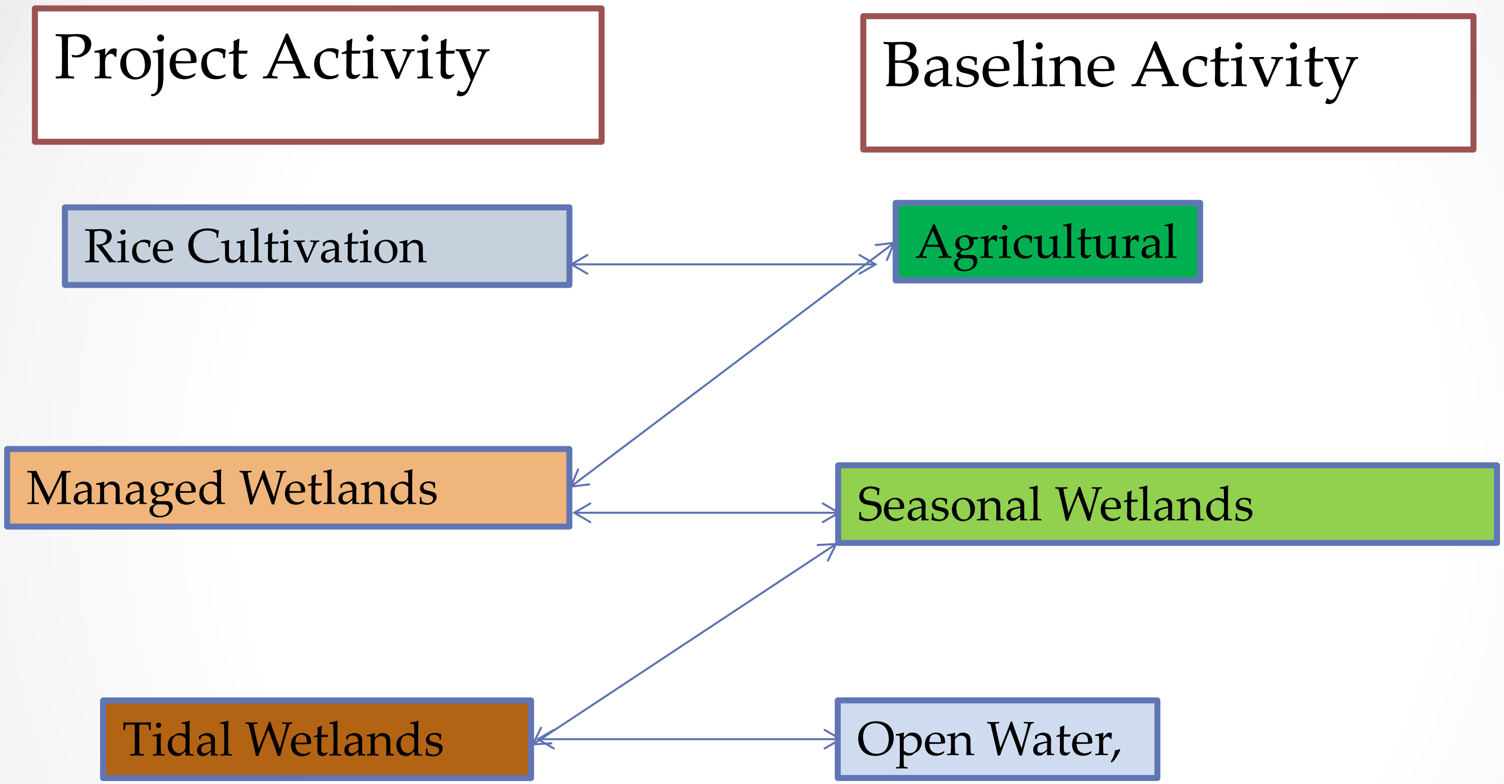
3 Project Modules for estimation of GHG benefit for tidal wetlands, managed non-tidal wetlands and rice

Leakage analysis

Uncertainty Module
UC W/RC

Methods module
Estimation of carbon stock changes and emissions

Tools (including models)


Project Activity
Baseline Activity
Rice Cultivation
Agricultural
Managed Wetlands
Seasonal Wetlands
Tidal Wetlands
Open Water,

Relevant land use examples and GHG relevancy.

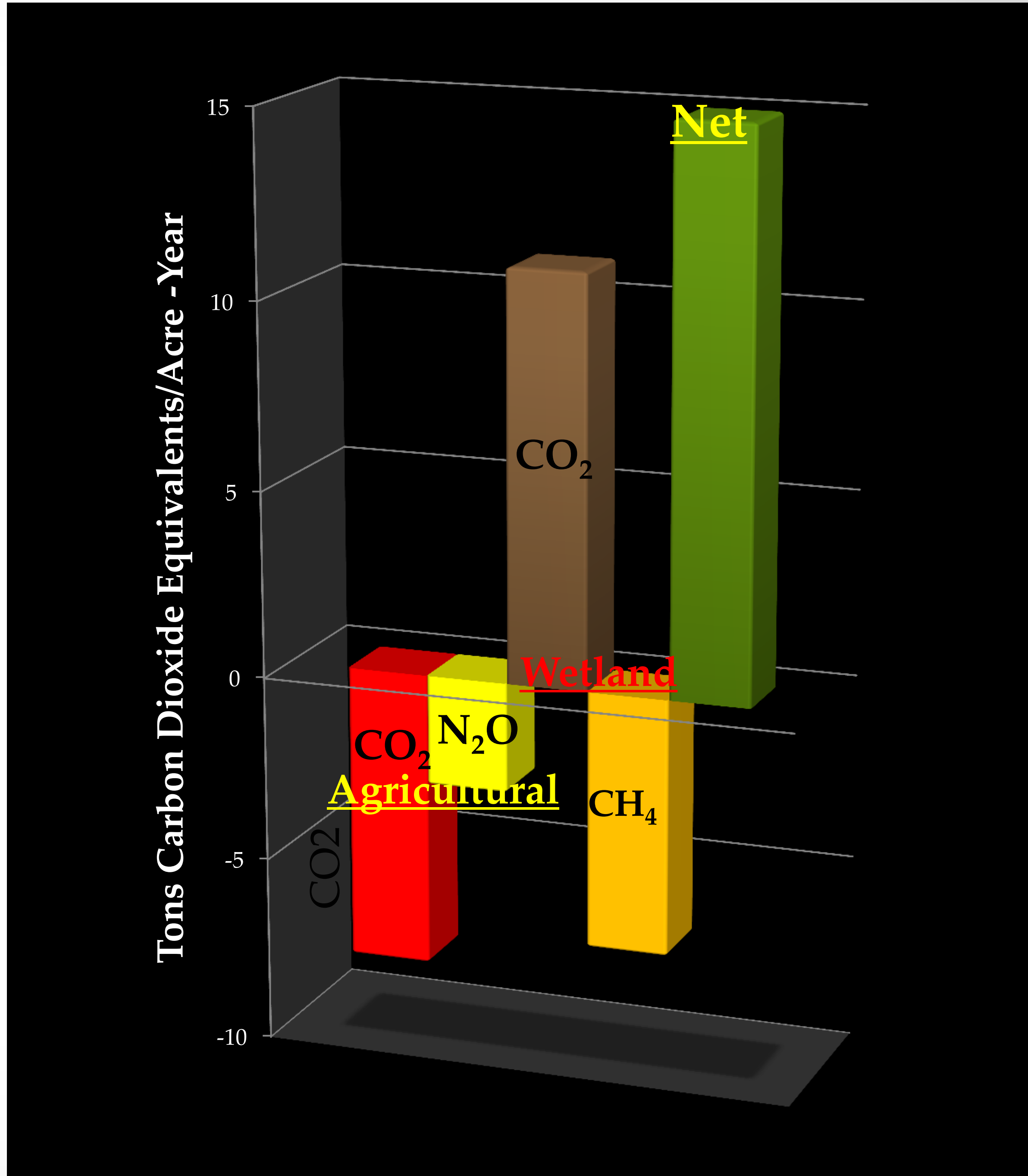
	Land Use	Examples	GHG relevancy
Baseline	Agricultural	Farmed organic soils on Delta islands	Baseline GHG emissions due to oxidation of organic soils
	Agricultural/fallow/ seasonal wetlands	Fallow areas or areas that have become impractical to farm due to excessive wetness	Baseline GHG emissions due to oxidation of organic soils
	Seasonal Wetlands	Seasonally flooded hunting clubs in Suisun Marsh	Baseline GHG emissions due to oxidation of organic soils
	Open water	Subsided salt ponds in the South Bay, Franks Wetland in the Delta	Likely net GHG emissions but no data

	Land Use	Examples	GHG relevancy
Project	Managed non-tidal wetlands on organic soils	Twitchell and Sherman islands	Net GHG benefit, methane emissions, carbon sequestration, stops baseline emissions
	Saline/brackish tidal wetlands	Rush Ranch, Suisun Marsh	Net GHG removal where there is minimal methane emitted
	Rice	Twitchell Island, Wright Elmwood Tract, Brack Tract, Rindge Tract, Canal Ranch Tract, Delta	Greatly reduces organic soil GHG emissions and provides net GHG removal on organic soils.

Agricultural Baseline to Wetland Conversion Example

Net carbon benefit results from stopping current baseline carbon dioxide and nitrous oxide loss and sequestering carbon dioxide in wetlands.

Wetland carbon dioxide sequestered	11
Wetland methane emitted	-7
Baseline carbon dioxide emitted	-8
Baseline nitrous oxide emitted	-3
Net benefit (11-7+8+3)	**15**



Example Implementation of Methodology, Non-tidal Wetlands on Agricultural Lands, Sacramento-San Joaquin Delta

Steps

<u>Before project start</u>

1. Identification of the project activity baseline
2. Definition of project boundaries
3. Legal requirement test and performance standard evaluation
4. Development of monitoring plan
5. Estimation of baseline GHG emissions
6. Estimation of project GHG emissions and reductions
7. Estimation of total net GHG emission reductions (project minus baseline and leakage)
8. Calculation of uncertainty
9. Assessment of reversal and termination risk
10. Calculation of ERTs

Steps, continued

After project start

6. Estimation of project carbon stock changes and GHG emissions
7. Estimation of total net GHG emission reductions (project minus baseline and leakage)
8. Calculation of uncertainty
9. Assessment of reversal and termination risk
10. Calculation of emission reduction tons (ERTs)

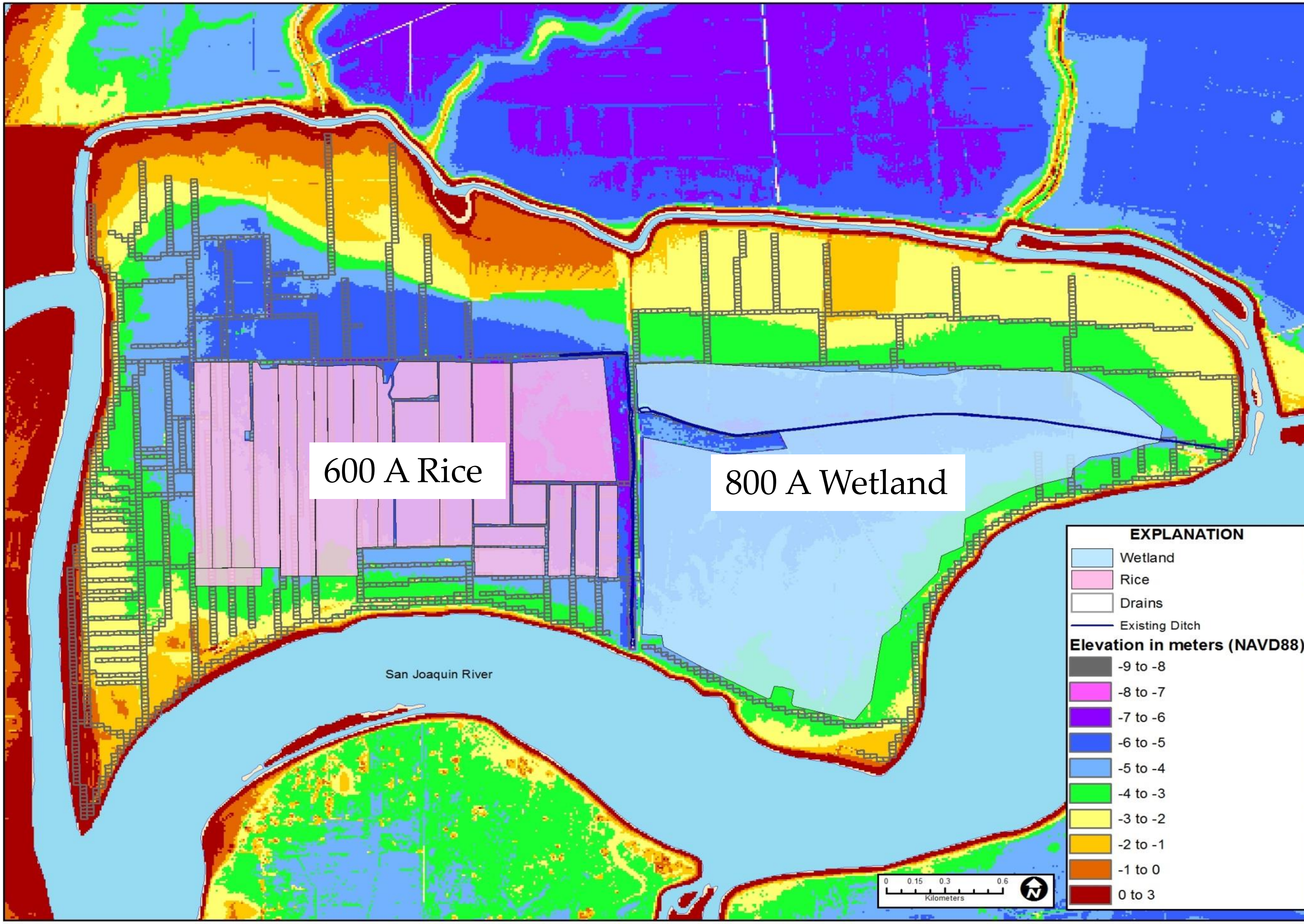
Step 1 - Baseline Activity Identification

Twitchell Island example – Project proponent demonstrates that project area has been used for agriculture for at least 10 years using aerial photos or equivalent

Step 2. Project boundaries

- Geographic boundaries – define using GIS, provide shapefile
- Carbon pools for carbon stocks and greenhouse gas emissions (Tables 4 and 5 in Framework Module)
  - Soil organic matter
  - CO2 and CH4
- Stratification
  - Vegetated areas
    - Areas with varying depth of water
    - Areas with varying soil carbon content
  - Non-vegetated areas
- Leakage

Twitchell Wetland "Project Boundary"



Step 3. Evaluation for Additionality

What is Additionality?

- *Emission reductions achieved by a Rice Cultivation or Wetland project must be additional in that they must be demonstrated to exceed those likely to occur in a conservative business-as-usual scenario.*
- Additionality attempts to answer the question: Would the activity have occurred, holding all else constant, if it were not implemented as an offset project? Or : Would the project have happened anyway? If the answer to that question is yes, the project is not additional.

Step 3. Performance Standard Evaluation for Additionality

Practice-based Performance Standard

- Managed, permanently flooded, non-tidal wetlands on lands which were formally in agriculture represent less than 2 percent of area where organic and highly organic mineral soils are present in the Sacramento-San Joaquin Delta.
- Because wetland restoration is not a common practice among Delta landowners, Managed Non-Tidal Wetland projects using this methodology are deemed "beyond business as usual" and therefore additional.

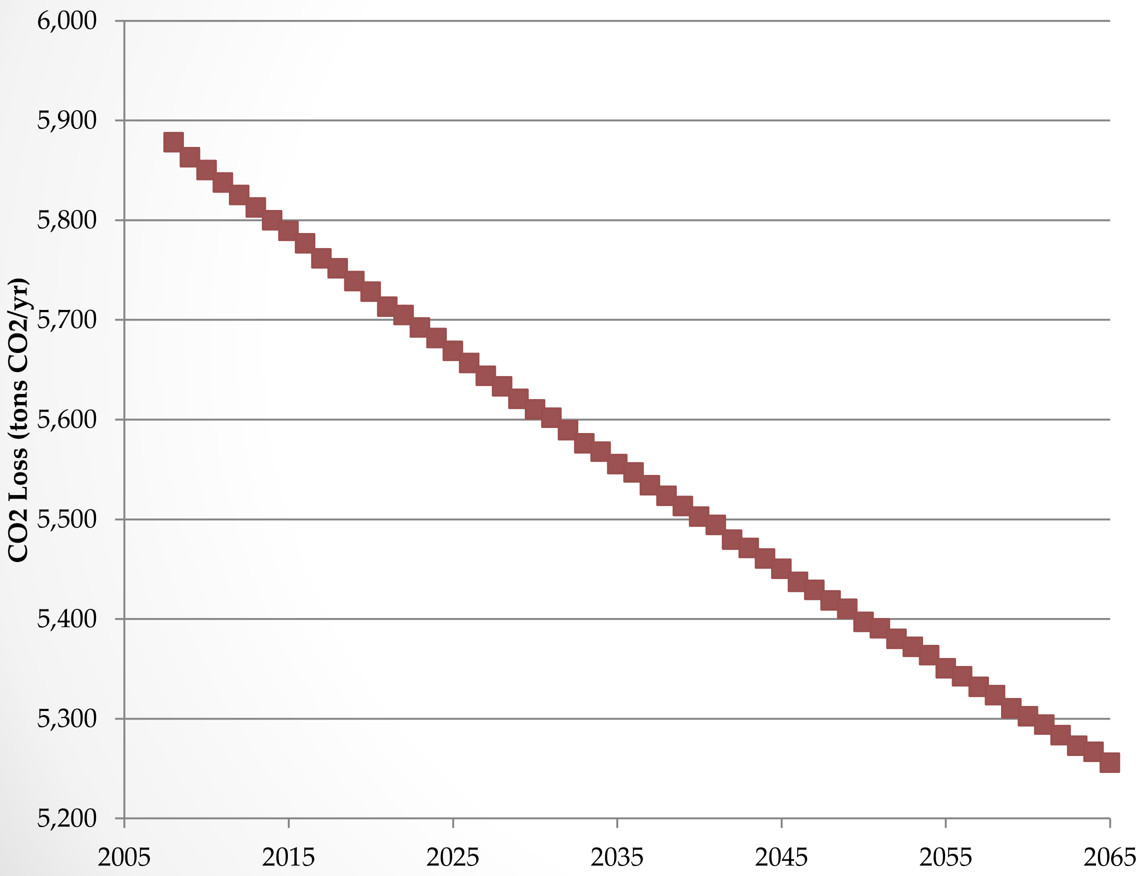
Step 4. Monitoring Plan

- Specify methods for monitoring of carbon stocks
  - Micrometeorological
  - Measurement of soil organic carbon changes
  - Modeling
- Include
  - Description of monitoring tasks
  - Data to be collected
  - Model documentation (peer reviewed publication required)
  - QA/QC
  - Data storage protocol
  - Organization chart and parties responsible

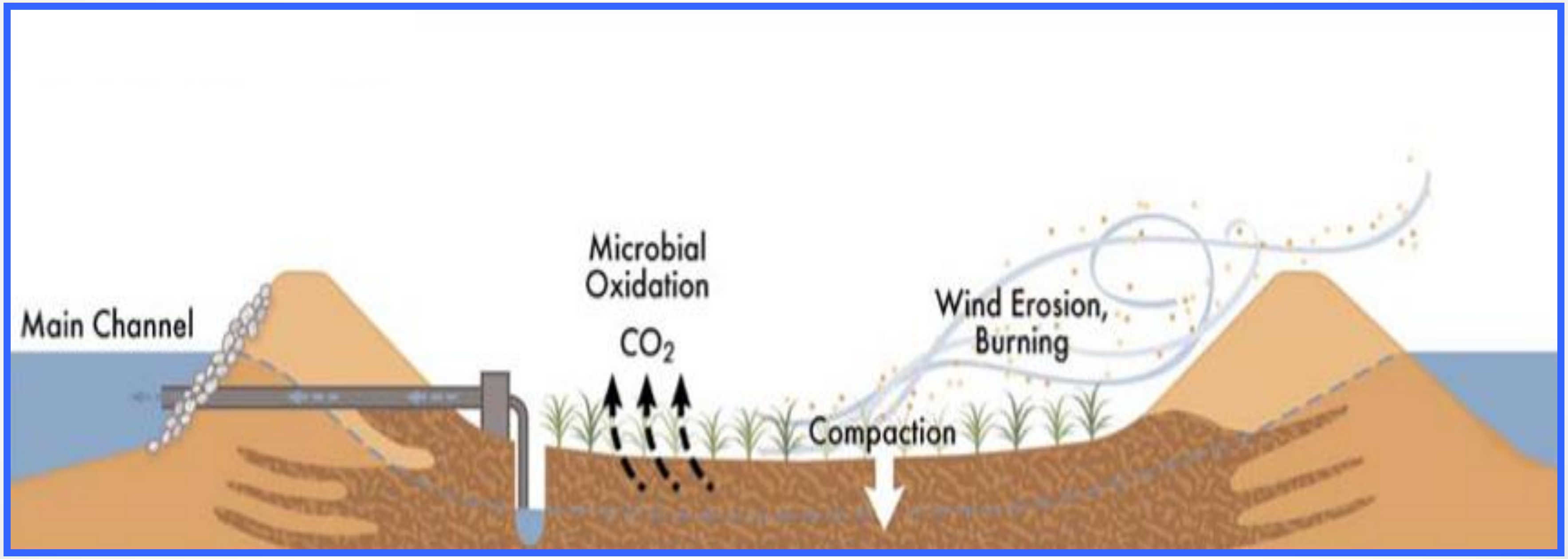
Step 5. Estimation of baseline carbon stock changes and GHG emissions

- Per the ACR Standard, the GHG project baseline is a forecast of the likely stream of emissions or removals to occur if the Project Proponent does not implement the project, i.e., the "business as usual" case.

Step 5. Likely stream of Baseline GHG emissions



Ongoing CO2 emissions slow with time as land subsides and soil organic carbon decreases



Step 6. Estimation of project carbon stock changes and greenhouse gas emissions

- Determination of carbon accumulation
- Determination of methane emissions

Step 7. Estimation of total net greenhouse gas emissions reductions or net benefit

The total net greenhouse gas project benefit is calculated as follows (expressed in tons of CO2 equivalents):

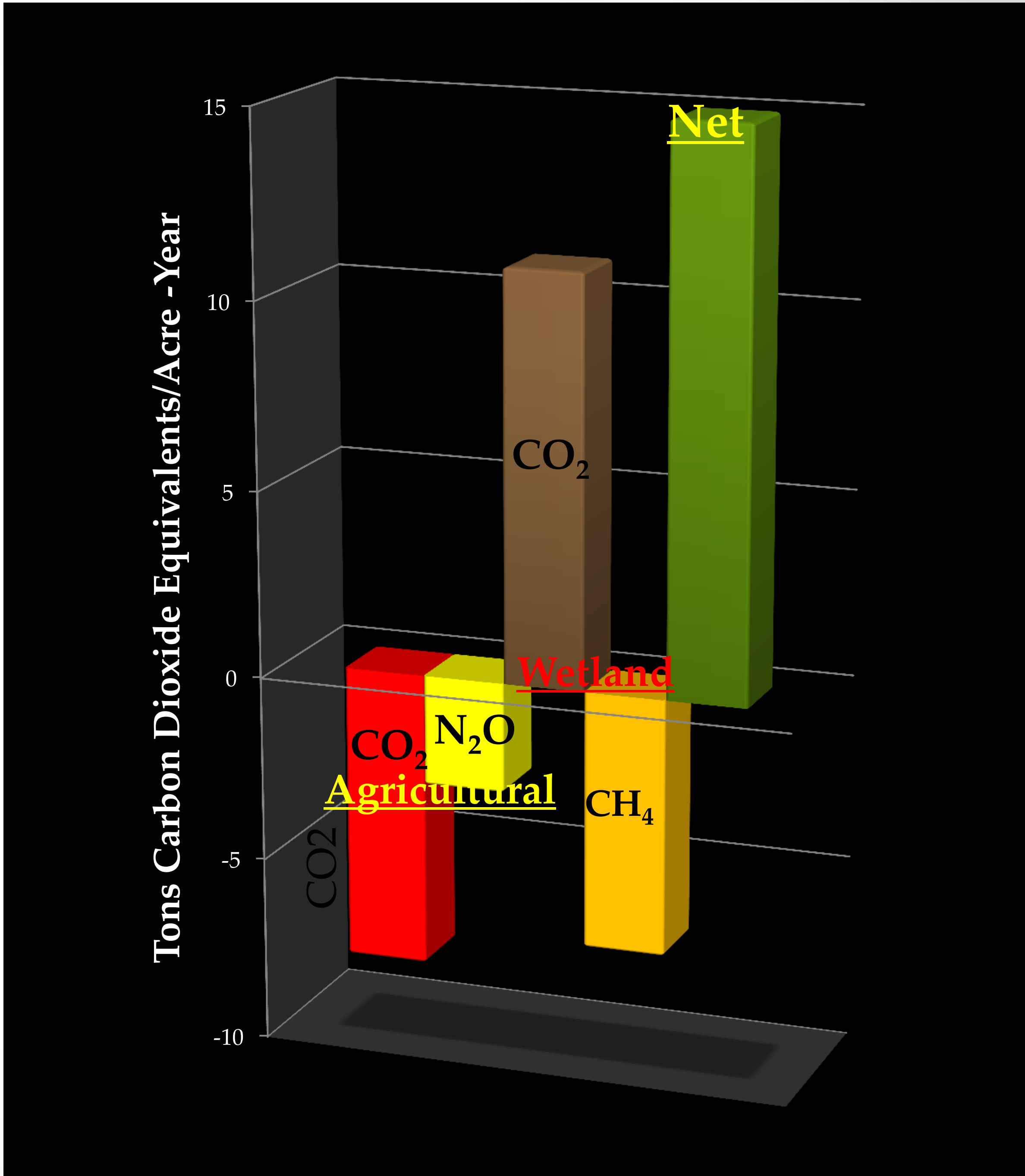
Net GHG benefit =

[(project carbon accumulation – methane emissions) + baseline GHG emissions] X *(1-leakage discount fraction)*

Agricultural Baseline to Wetland Conversion Example

Net greenhouse gas benefit results from stopping current baseline carbon dioxide and nitrous oxide loss and sequestering carbon dioxide in wetlands minus methane emissions.

Wetland carbon dioxide sequestered	11
Wetland methane emitted	-7
Baseline carbon dioxide emitted	-8
Baseline nitrous oxide emitted	-3
Net benefit (11-7+8+3)	**15**



Leakage

Leakage is an increase in GHG emissions or decrease in GHG removal or carbon sequestration outside the project boundaries that occurs because of the project action.

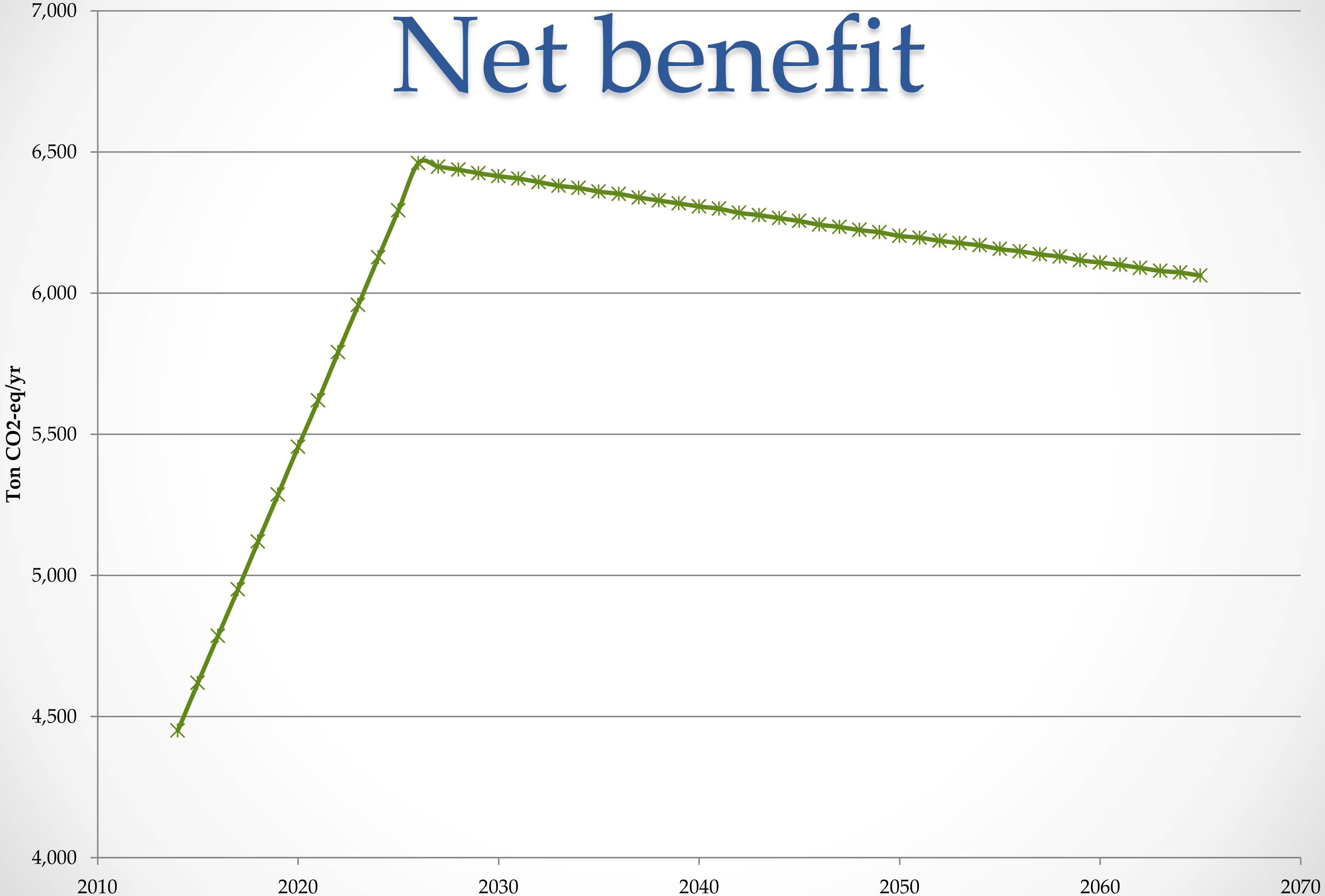
- Must be calculated and deducted from GHG benefit, if above de minimis level of 3%
- For example, *if wetlands displace agricultural crops from the Delta to other places, this may in turn result in a net increase in GHG emissions.*
- *This is defined as market-effects leakage and is transmitted through market forces;*
  - *a supply reduction can result in an upward pressure on price that may incentivize increased production and shifts in cropping patterns elsewhere.*

Leakage Assessment

- Used economic model and statewide GHG emissions data to assess GHG leakage effects of land-use change from current agricultural practices to rice and wetlands in the Delta.

- Steps:
  - Determined likely scenarios for land use change within Delta during next 30 years;
  - Simulated consequence of change – will crop move elsewhere? If so, where?
  - Estimated GHG consequence
- Result
  - *For managed wetlands and rice projects implemented on Delta agricultural lands that include less than 35,000 acres of crop land or 10,000 acres of pasture, no leakage deduction is required.*

Net benefit



7,000
6,500
6,000
5,500
5,000
4,500
4,000
Ton CO2-eq/yr
2010
2020
2030
2040
2050
2060
2070

Step 8. Determine and account for uncertainty

- *Net benefit must be adjusted if uncertainty in the net benefit estimate exceeds a threshold of 10% of the mean at the 90 % confidence level*

Step 9. Risk Assessment

- Wetland projects in the Delta and San Francisco Estuary have the potential for termination or GHG reductions and removals to be reversed or when:
  - a project is subject to flooding, damage from wildlife, erosion or;
  - intentional reversals or termination, such as landowners choosing to discontinue project activities before the project minimum term has ended.

Step 9. Risk Assessment

- Project proponents shall conduct a risk assessment
  - Addresses internal, external and natural risks using guidance provided in the most recently ACR approved risk assessment tool.
    - Internal risk factors include project management, financial viability, opportunity costs and project longevity.
    - External risk factors include factors related to land tenure, community engagement and political forces.
  - The primary natural termination risk to wetlands is flooding due to sea level rise and/or levee failure
  - Currently minimum of 10 % mitigation for risk to be contributed to buffer pool.

Step 10. Calculation of Emission Reduction Tons (ERTs)

- ERT = Net GHG benefit expressed in metric tons CO_2-e during the reporting period * (1-fraction allocated to buffer account)

- E.g. if risk analysis indicates a buffer of 10%
  - For maximum estimated benefit of ~6,500 tons CO2-e, discount 10% for buffer pool or:
  - ERT = 6500*0.90 = 5,850 tons CO2-e

Next Steps

- Submit to ACR for public comment, internal and peer review
- Respond to public comment
- Respond to peer review
- Publish within ACR
- Ongoing discussions with ARB for eventual inclusion in the compliance market

Questions or comments?

Twitchell example[1]

- *Data from 1997 – 2006 for Twitchell results (west pond) in an uncertainty in the mean of about 10% at the 90% confidence level following guidelines in Uncertainty module*

- *According to equation 2 in the Framework, this would result in no discount of the cumulative total net GHG emission reduction.*
- *West pond probably would represent the variability in a typical stratum with similar water management.*

- *The east pond was more variable with an uncertainty of about 25% which results in a discount*
  - *The east pond had deeper water levels and a mixture of open water and vegetated areas and therefore could have likely represented multiple strata.*

[1] data from Miller, R.L., Fram, M.S., Wheeler, G., Fujii, R., 2008. Subsidence reversal in a re-established wetland in the Sacramento-San Joaquin Delta, California, USA. *San Francisco Estuary and Watershed Science*, 6(3): 1-24