Blue Carbon in Our Backyard

Hotel 1620 | *September 10, 2019*

Mapping Wetland Restoration as a Natural Climate Solution

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Aknowledgements

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Overview

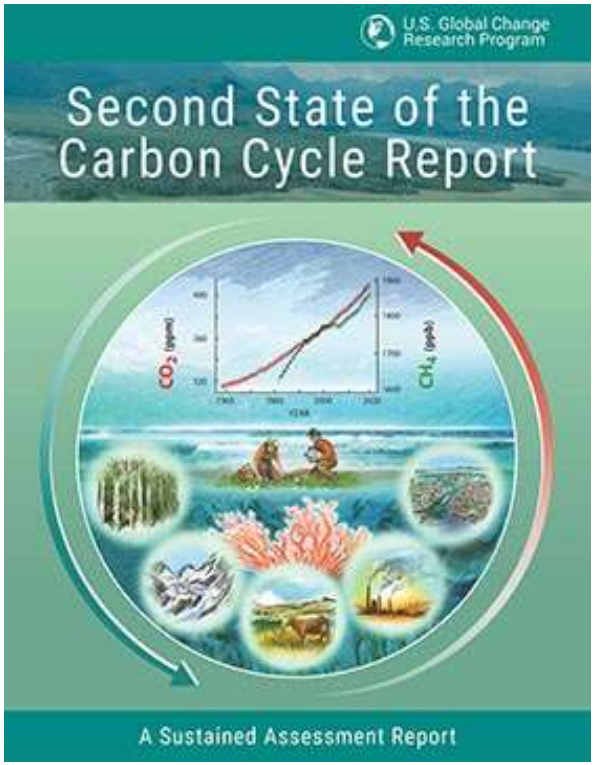
Aggregation & Reporting

Decision Support, Planning & Efficacy

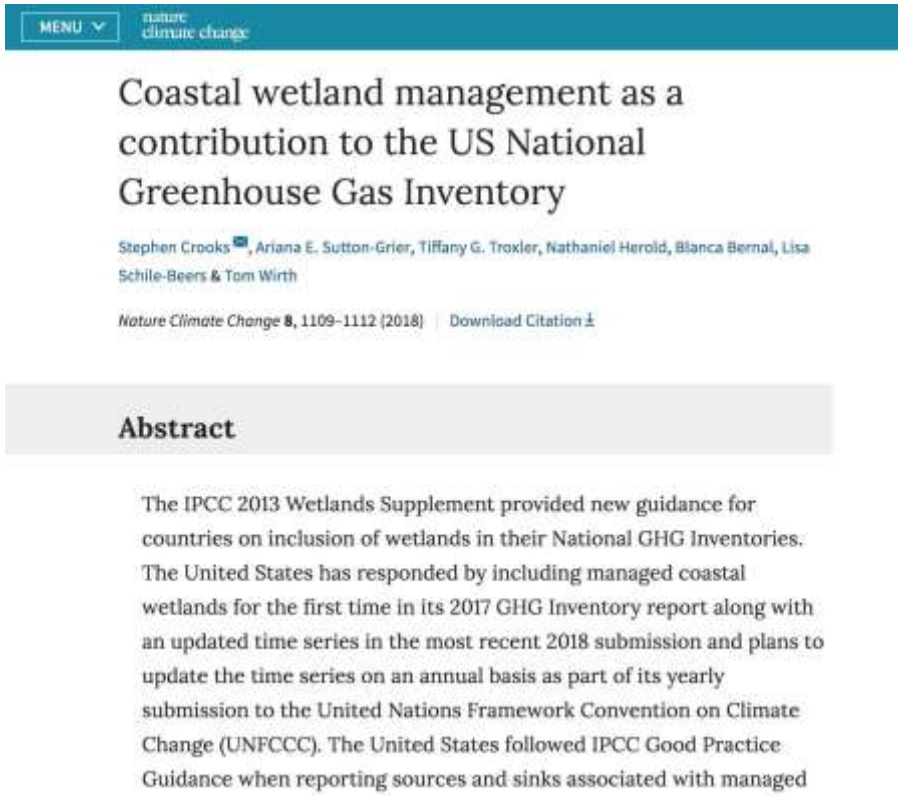
Credit: Beth Huning

- The Last Few Years of Mapping Blue Carbon
- The Coastal Carbon Research Coordination Network
- Mapping State to Local Level Greenhouse Gas Reduction Opportunities

Continental and National-Scale Coastal Carbon Inventorying



Windham-Myers and Cai eds. (2018). Ch 12. *SOCCR-2.*



MENU nature climate change

Coastal wetland management as a contribution to the US National Greenhouse Gas Inventory

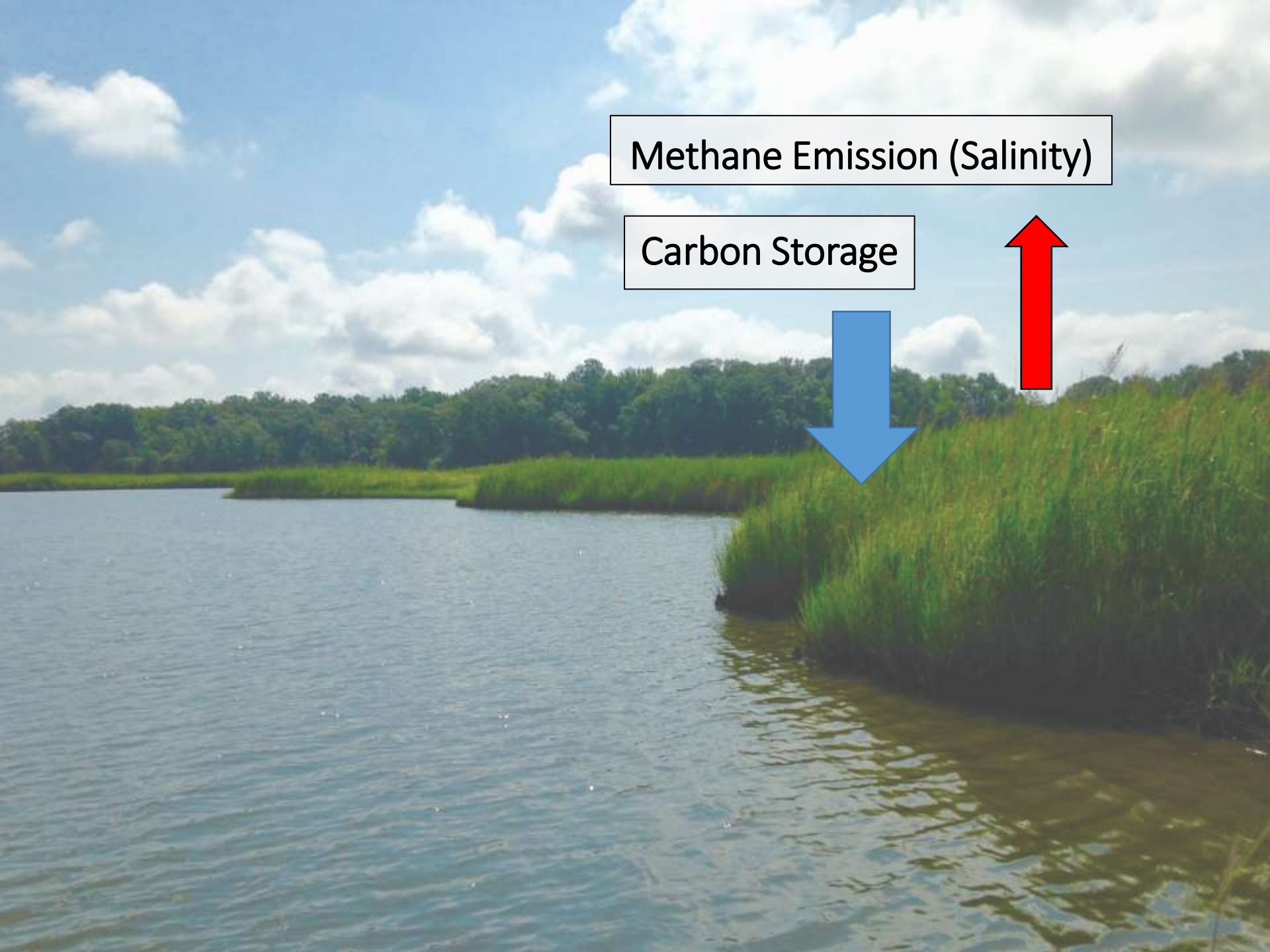
Stephen Crooks, Ariana E. Sutton-Grier, Tiffany G. Troxler, Nathaniel Herold, Blanca Bernal, Lisa Schile-Beers & Tom Wirth

Nature Climate Change **8**, 1109–1112 (2018) | Download Citation

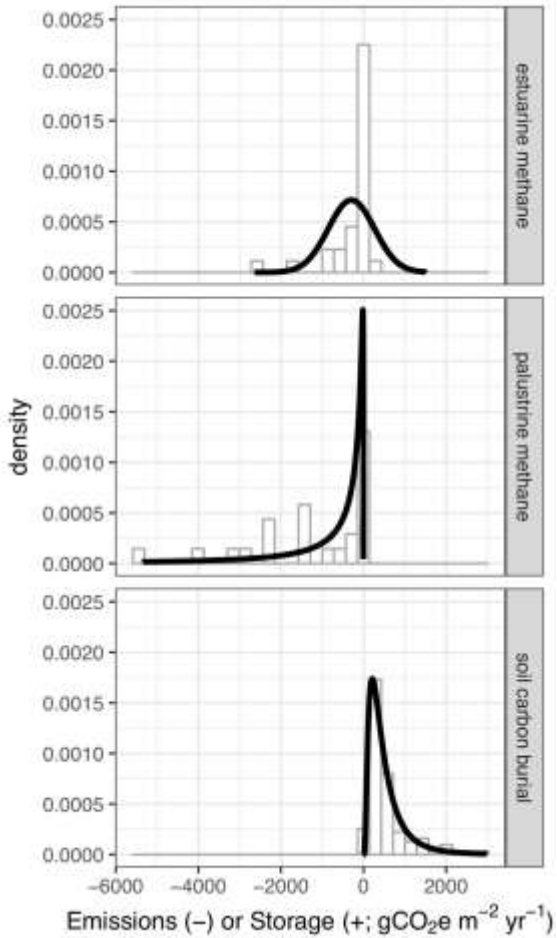
Abstract

The IPCC 2013 Wetlands Supplement provided new guidance for countries on inclusion of wetlands in their National GHG Inventories. The United States has responded by including managed coastal wetlands for the first time in its 2017 GHG Inventory report along with an updated time series in the most recent 2018 submission and plans to update the time series on an annual basis as part of its yearly submission to the United Nations Framework Convention on Climate Change (UNFCCC). The United States followed IPCC Good Practice Guidance when reporting sources and sinks associated with managed

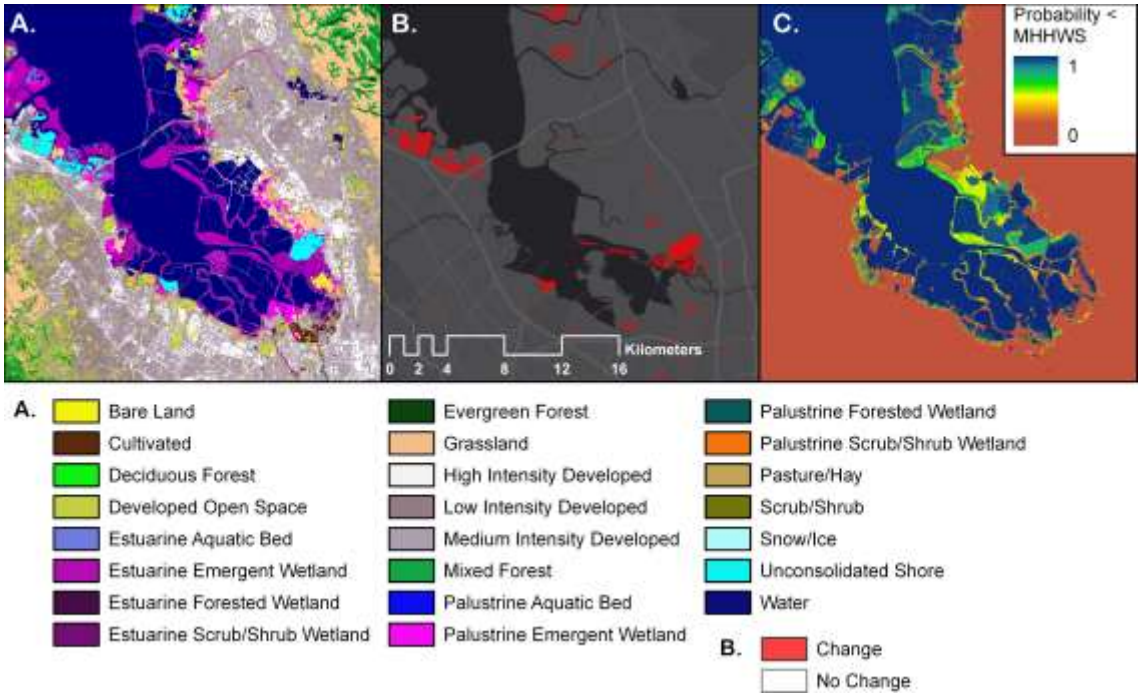
Crooks et al (2018) *Nature Climate Change.*


Methane Emission (Salinity)
Carbon Storage

What Kind of Data Go Into The Accounting?

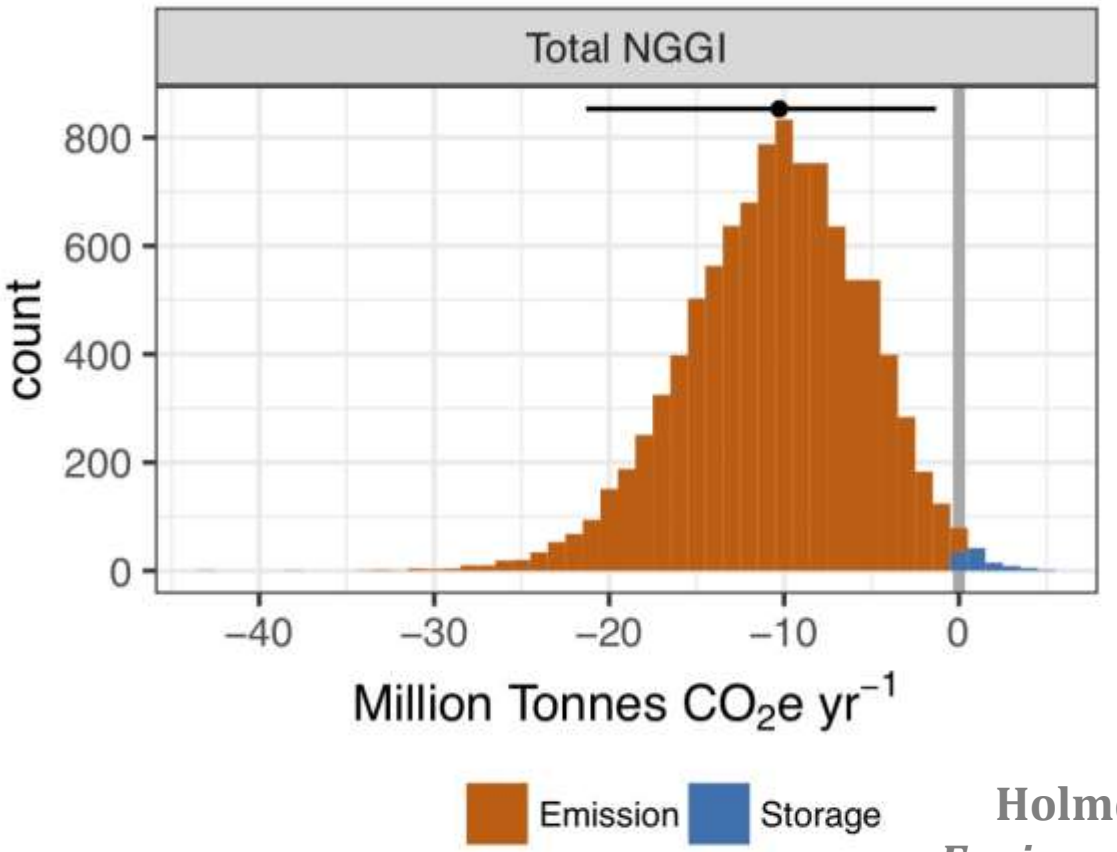


Total Emissions or Removals = Emissions Factor x Activities



Holmquist et al. 2018
Environmental Research Letters

How much uncertainty is there in the total inventory?



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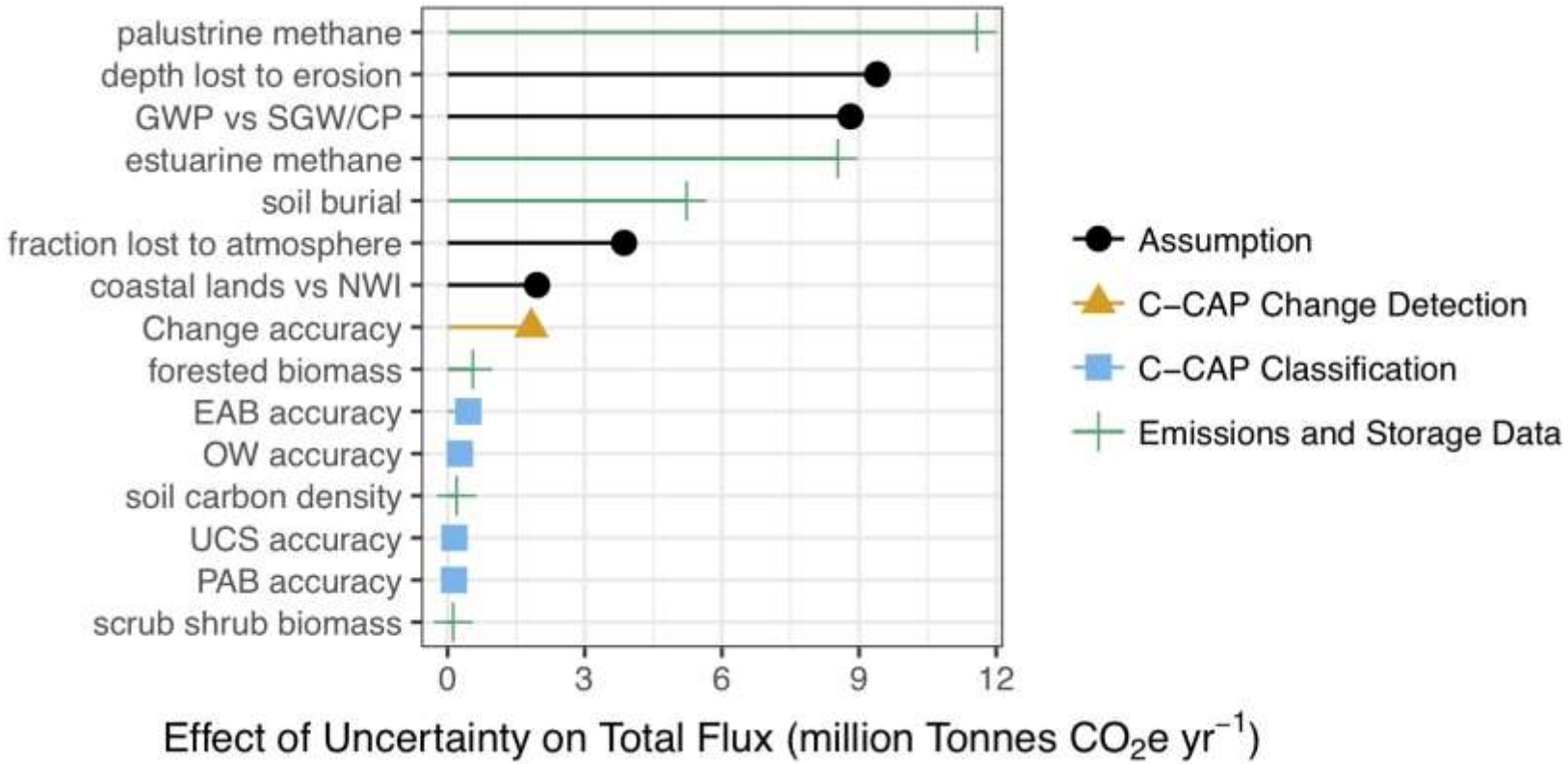
Where does uncertainty come from?



Holmquist et al. 2018
Environmental Research Letters

Section #2

THE COASTAL CARBON RESEARCH COORDINATION NETWORK

Our goal is to accelerate the pace of discovery in coastal carbon science by serving a community of researchers and practitioners with data, tools and synthesis opportunities.

Coastal Carbon

Research Coordination Network

@CoastalCarbon

That U.S. Inventory seemed like a lot of work.
Can you save other people some time?

ccrcn.shinyapps.io/CoastalCarbonAtlas

Soil Carbon Working Group

Dec 8th & 9th 2018

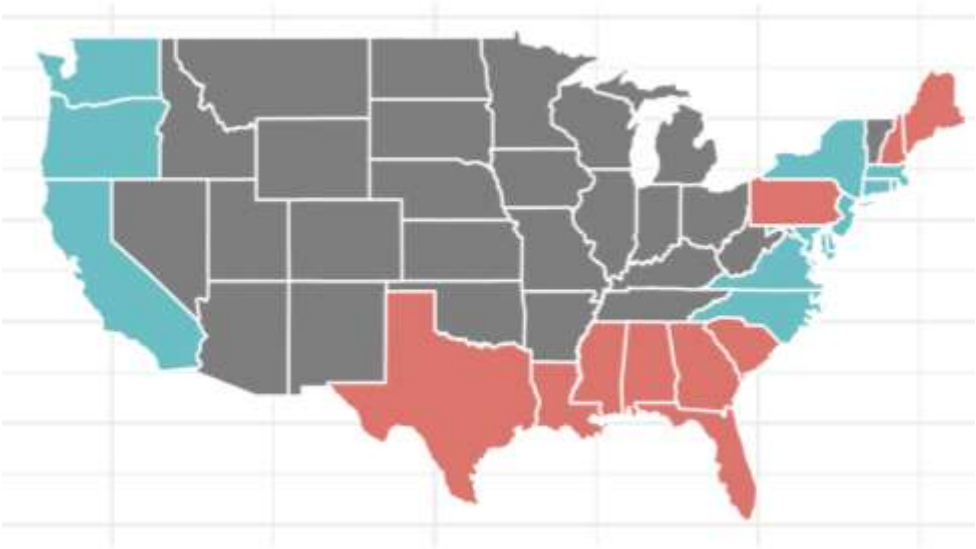
From left to right: Dr. Patrick Megonigal, Dr. Samantha Chapman, Dr. James Holmquist, Dr. James Morris, Lauren Brown, Dr. Gregory Noe, Dr. Jonathan Sanderman, Dr. Brandon Boyd, Dr. Meagan Gonneea, Dr. Amanda Spivak, Michael Lonneman, Dr. Christopher Janousek, Dr. Fay Belshe, David Klinges, Dr. Ron Corstanje, Dr. Andre Rovai, Dr. Katherine Todd-Brown, and Megan Vahsen

Section #3

ENGAGING PARTNERS TO CREATE STAKEHOLDER RELEVANT ANALYTICS

New stakeholders for Coastal Carbon Data

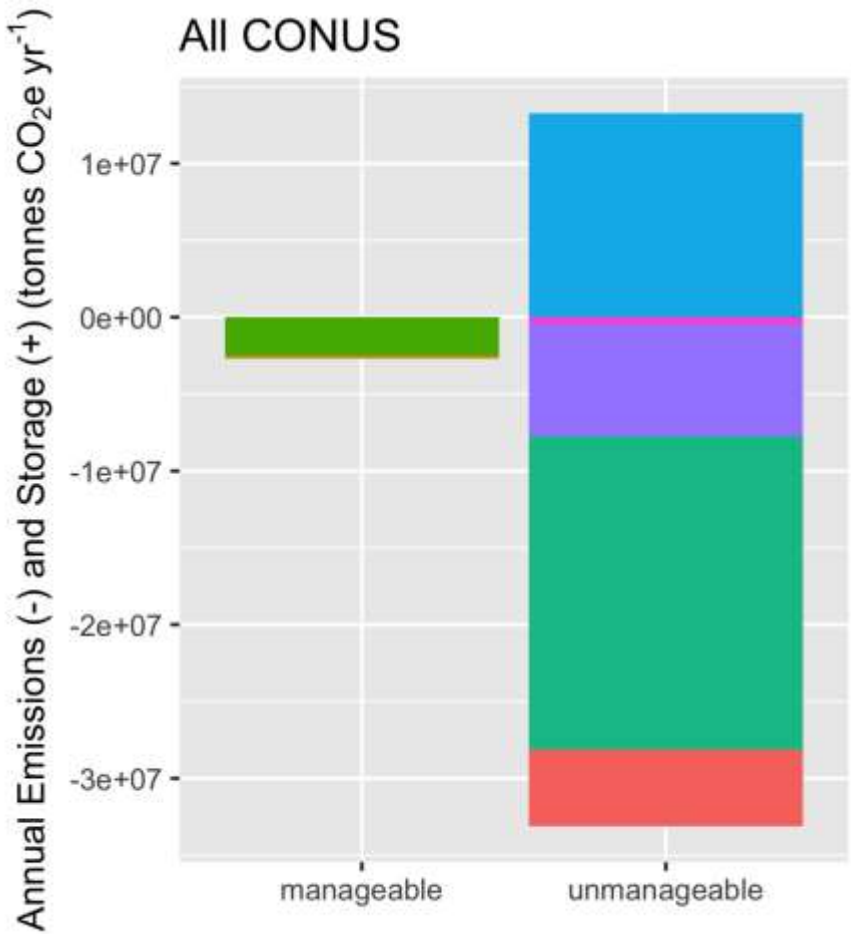
The United States Climate Alliance was formed by Governors Andrew Cuomo, Jay Inslee, and Jerry Brown in response to the U.S. federal government's decision to withdraw the United States from the Paris Agreement on climate change. The bipartisan coalition of governors is committed to reducing greenhouse gas emissions consistent with the goals of the Paris Agreement.



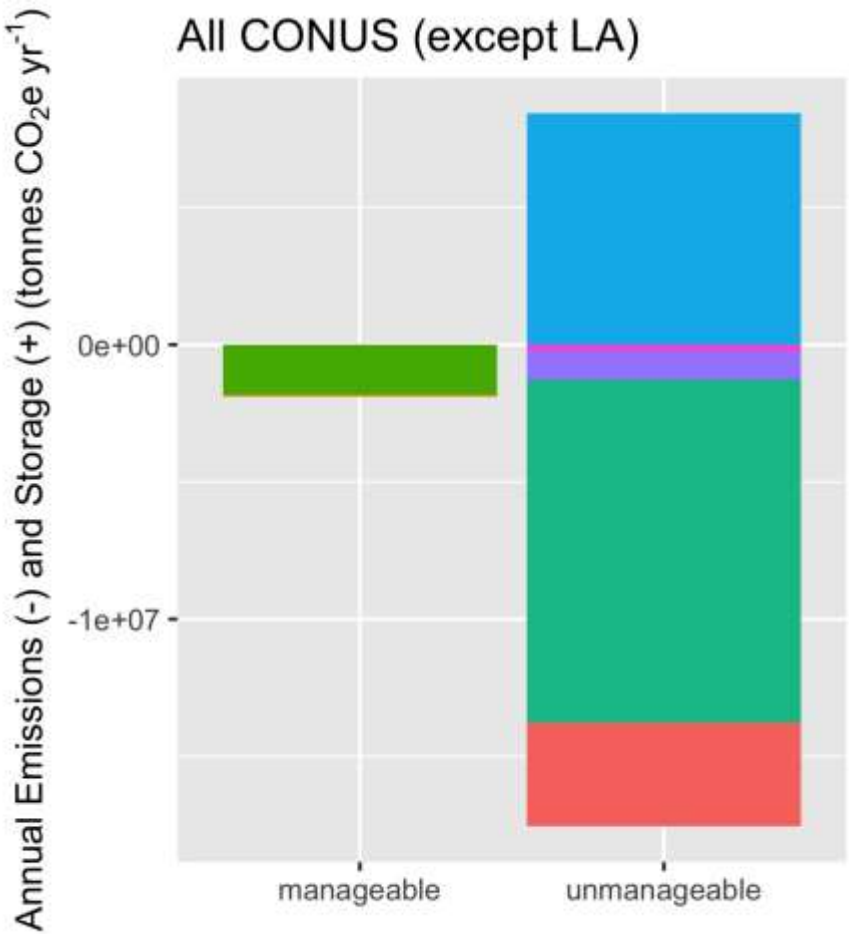
Can we focus on a subset of emissions and removals relevant to on the ground managers?

- *Manageable* Emissions
  - Some methane emissions from freshwater impounded wetlands
  - Missed opportunity for carbon burial on drained wetlands.
- *Unmanageable* Emissions
  - Carbon burial and methane emissions in natural and undisturbed wetlands
  - Catastrophic soil and biomass losses

Credit: Kevin Kroeger



- change in biomass
- manageable methane emissions from impoundments
- missed soil carbon burial
- natural methane
- soil carbon burial
- soil loss events
- unmanageable methane emissions from impoundments



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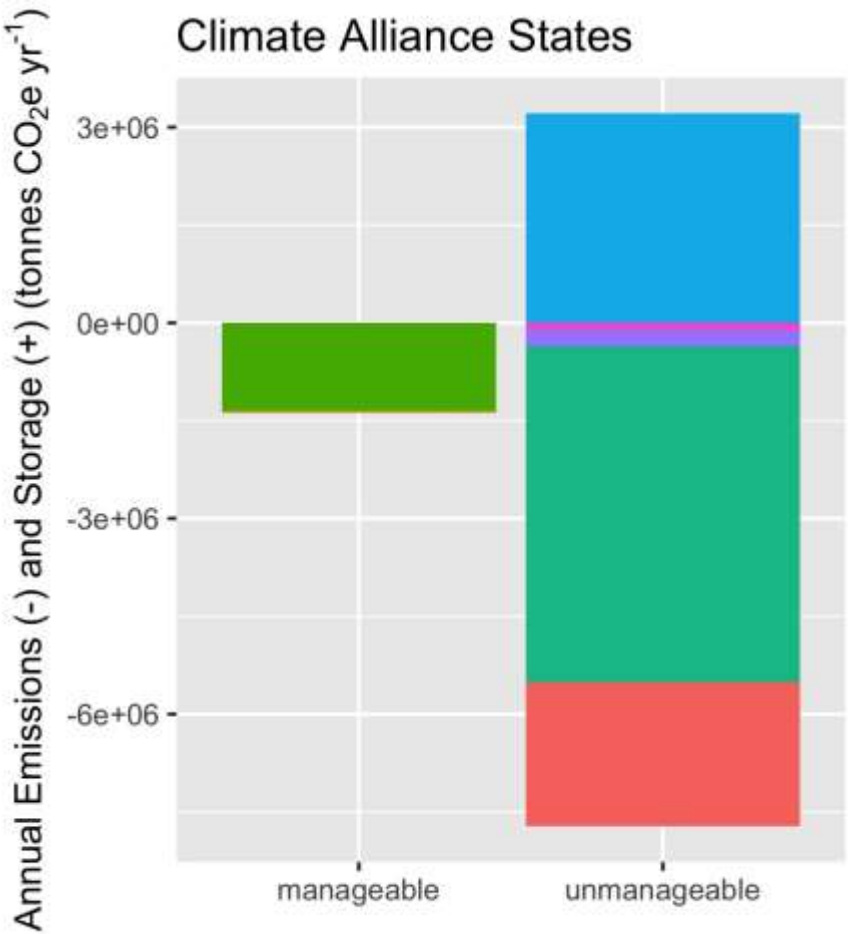
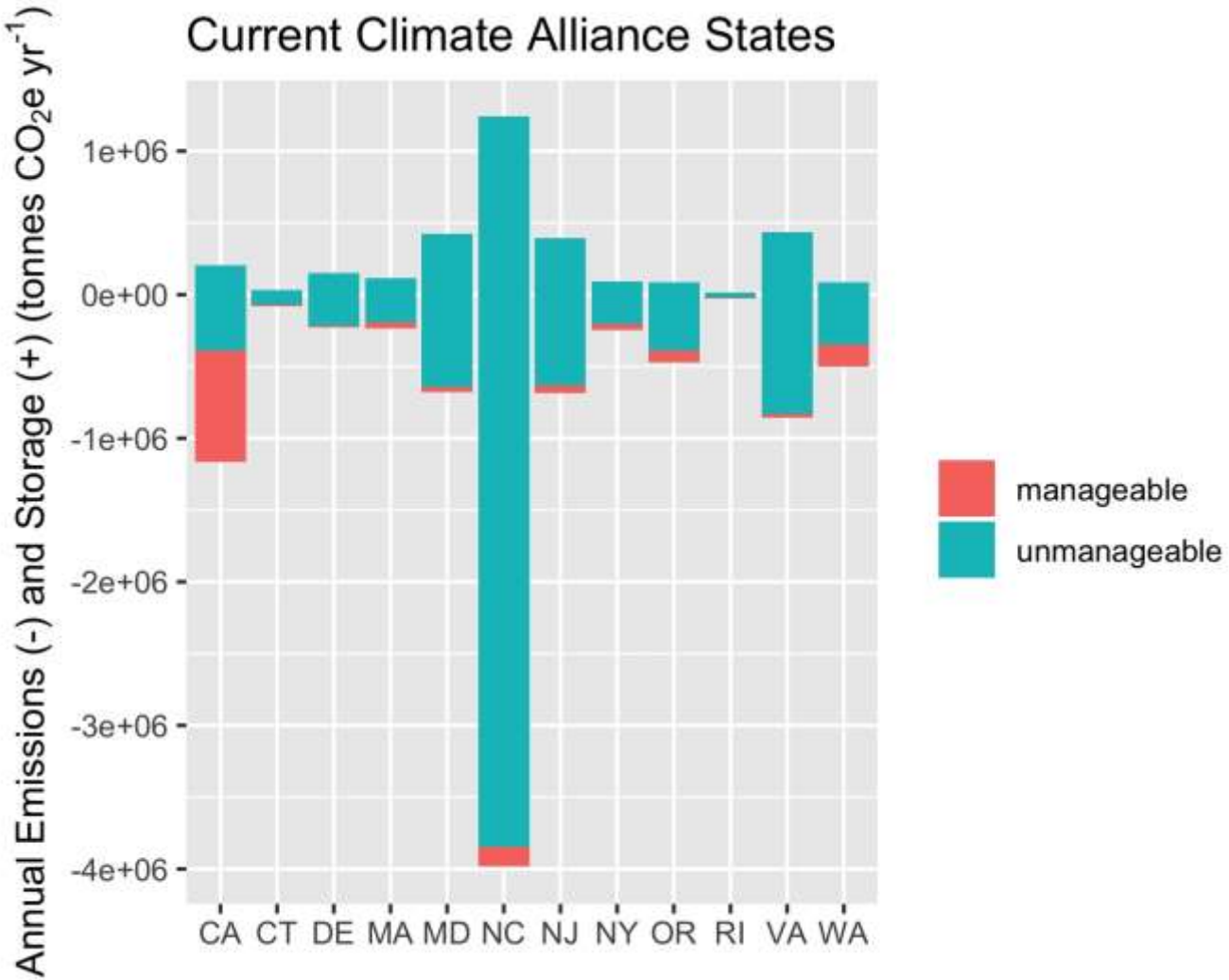


- change in biomass
- manageable methane emissions from impoundments
- missed soil carbon burial
- natural methane
- soil carbon burial
- soil loss events
- unmanageable methane emissions from impoundments

- Missed carbon burial is by far the largest manageable emission.
- California has a very high proportion of missed carbon burial opportunity because of the Sacramento Delta
- Oregon has a high proportion of tidally impounded wetlands



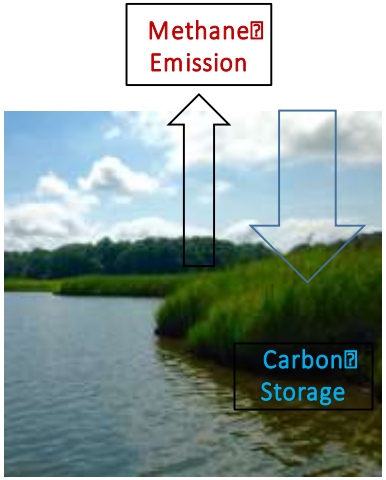
How do we communicate and learn from each other?

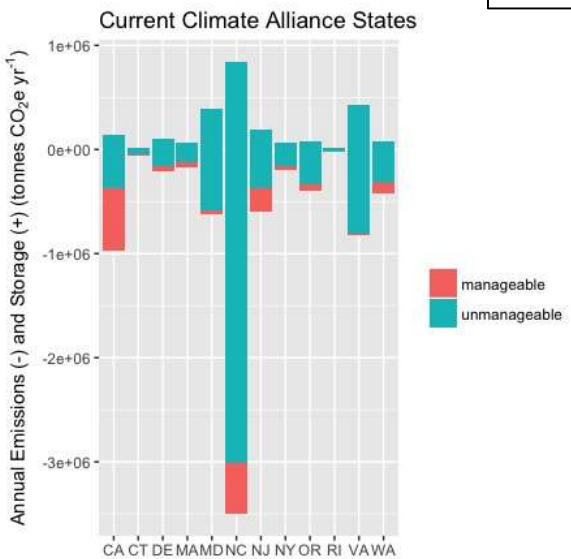
Blue Carbon Management Opportunities for DE Greenhouse Gas Reduction Goals

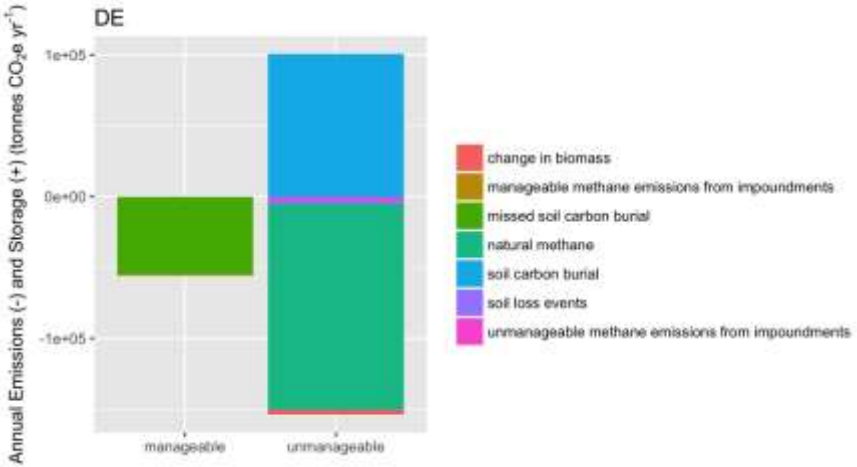
James R Holmquist and Kevin Kroeger

Background: Tidal wetlands play an outsized role in the carbon cycle. They can store carbon long term in their soils as a dynamic response to sea-level rise. They can emit methane; emissions vary by salinity with saltier wetlands emitting less methane and fresher wetlands emitting more. They can loose soil carbon catastrophically during erosion events.

DE coastal wetlands have **55,715 tones per year** of total manageable CO_2e with **54,824 coming from lost potential soil carbon burial** in drained, farmed, and impounded wetlands, and **891 from the potential to reduce methane emissions** from artificially freshened, tidally restricted, impounded wetlands.







The upshot: many tidal restoration projects are completed, underway, or planned, typically under the guise of habitat restoration. You may be able to take GHG credit for work your state has already funded and implemented.

Where management comes in: the vast majority of emissions and removals from tidal wetlands are unmanageable from a practical standpoint. However there are special cases in which management can reduce GHG emissions. For wetland that were historically drained, there are potential soil carbon burial benefits not currently being accrued. For wetlands that are impounded -- isolated from tidal exchange – added freshwater input can increase methane emissions. Both of these situations can benefit from **tidal reintroduction**.

Results are pending. if you are interested in discussing further please contact:
James Holmquist | HolmquistJ@si.edu |
@CoastalCarbon | serc.si.edu/CoastalCarbon

How do we communicate and learn from each other?

Roving Experts

State	Wetland Type	Area (Acres)	Soil Stock (1m; Million Tons C)
CA	Natural wetland	92,925	11
CA	Impounded wetland	61,018	
CA	Drained, farmed or extracted	416,239	

Developing new outreach materials on the fly.

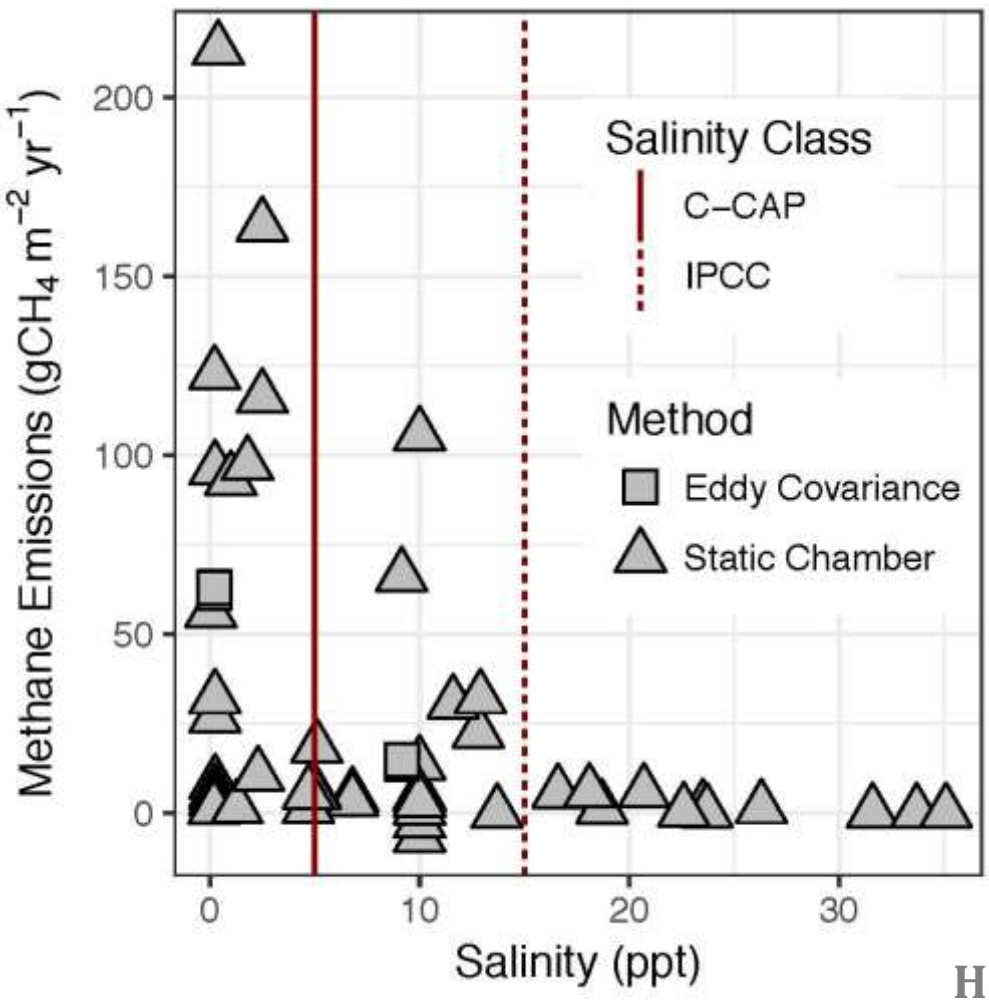
What's needed to improve further?

- **National Wetlands Inventory** does not consistently map impoundments.
- **C-CAP's salinity classifications** do not lend themselves to clean differentiation between high and low methane emitting wetlands.
- We could likely, with some more work, put better bounds on the potential for restoration to reduce methane emissions. .
- Still need to calculate **marginal abatement costs**.

Summary

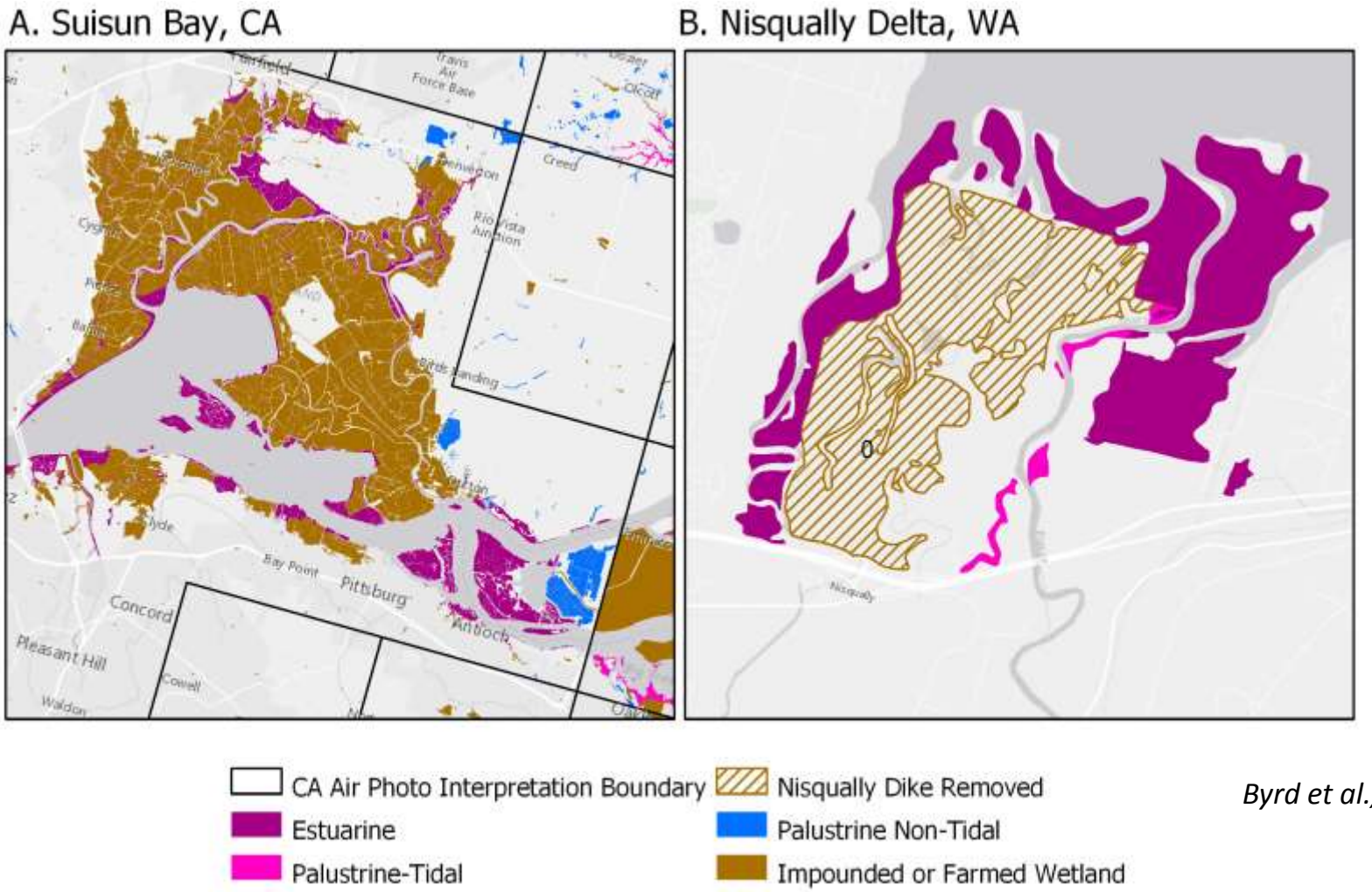
- We've made progress in top-down inventorying relying on available maps and emissions factors. This has also revealed the scale, shape, and sources of uncertainty
- CCRCN is moving the science forward by fusing data and models, but we need support from partners and end users.
- Need key improvements to salinity maps, spatial and temporal data on impoundment, drainage, and restoration if we are going to scale up manageable emissions and offer on the ground support.

C-CAP's salinity classifications do not lend themselves to clean differentiation between high and low methane emitting wetlands.



Holmquist et al. 2018
Environmental Research Letters

National Wetlands Inventory Could Map too Many or Not Enough Tidal Wetlands



Byrd et al., 2018.

Natural Climate Solutions for the U.S.

National | State

26
Mitigation Potential
(Million tons CO_2e per year)

428
2014 net emissions
Million tons CO_2e per year

0 — 26 (Max NCS potential)
California's Selected NCS Potential

Mitigation Pathways

Marginal Abatement Cost
$ per ton of CO_2e

Reforestation	Off	$10	$50	$100	Max
Avoided Forest Conversion	Off	$10	$50	$100	Max
Fire Management	Off	$10	$50	$100	Max
Urban Reforestation	Off	$10	$50	$100	Max
Avoided Grassland Conversion	Off	$10	$50	$100	Max
Grassland Restoration	Off	$10	$50	$100	Max
Alley Cropping	Off	$10	$50	$100	Max
Cover Crops	Off	$10	$50	$100	Max
Cropland Nutrient Management	Off	$10	$50	$100	Max
Improved Manure Management	Off	$10	$50	$100	Max
Improved Rice Cultivation	Off	$10	$50	$100	Max

California

Full Extent

Click map to select state

Pathway	NCS Mitigation (Mt CO_2 per year)	Area Available (million acres)
Reforestation	5.54	8.24
Fire Management	5.11	20.09
Improved Manure Management	4.77	N/A
Cropland Nutrient Management	2.39	N/A
Avoided Grassland Conversion	2.35	0.05
Urban Reforestation	1.81	0.45
Avoided Forest Conversion	1.6	0.22
Cover Crops	1.02	2.14
Alley Cropping	0.8	0.37
Improved Rice Cultivation	0.64	0.47
Grassland Restoration	0.19	0.15

Tidal Wetland Restoration
0.77 Mt CO_2e yr^{-1}