THE PEW CHARITABLE TRUSTS

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January 5, 2022

Dr. Adam Moreno, Lead NWL Climate Scientist
California Air Resources Board
1001 I Street
Sacramento, CA 95814

Dear Dr. Moreno:

RE: Pew Comments on Natural and Working Lands Alternative Scenarios

On behalf of the Pew Charitable Trusts (Pew), thank you for the opportunity to comment on the California Air Resources Board (CARB) 2022 Scoping Plan update, specifically the natural and working lands component of this effort. We commend CARB for its work to ensure that natural and working lands are part of the state's overall strategy to achieve carbon neutrality by the mid-century, which can set a model and standard for other states and the nation to follow.

Pew's interests relative to the 2022 Scoping Plan update, and the focus of our comments, is to advance protection and restoration of California's coastal wetlands, from the inland tidal reach of the Delta to nearshore eelgrass beds, as a key component of the state's climate response policies. This letter will specifically focus on recommendations to improve the greenhouse gas (GHG) inventory for coastal wetlands, integrate best available science into modeling efforts, and refine proposed alternative scenarios (business as usual and scenarios 1 through 4).

GHG Inventory for Coastal Wetlands

Pew is providing comments on the natural and working lands (NWL) inventory, specifically the coastal wetlands section, because the inventory will be critical for CARB to assess business as usual (BAU) as well as other forward-looking scenarios for projected GHG emissions and removals.

California is among the first states to develop a NWL GHG inventory, which in the most recent version available includes a Tier 1 snapshot of coastal wetlands for 2016. Other states are now developing GHG inventories for coastal wetlands, including Oregon, Maine, New Jersey, Maryland, North Carolina, and Louisiana. This momentum provides an opportunity for California to improve its inventory with an eye towards creating a model that other states can follow, as well as contribute refined, California-specific GHG data to the Inventory of U.S. Greenhouse Gas Emissions and Sinks (NGGI).

As noted in discussions with CARB staff and in our previous comment letter, U.S. coastal states (including California, which represents its own climate region in the NGGI) now have access to disaggregated Tier 2 level data from the NGGI for coastal wetlands. Oregon, Maine, Maryland, North Carolina, and Louisiana are using this data as a basis for refinement using state-specific mapping and emissions factors.

CARB can take a similar approach by comparing and refining the California-specific NGGI data with the fine-scale California Aquatic Resource Inventory (CARI) spatial dataset and applying associated emissions factors gleaned from California and region-specific published data. Data sources include the Smithsonian's Coastal Carbon Atlas and the Northeast Pacific Blue Carbon Database, which has extensive coverage from Humboldt Bay to Tijuana Estuary. At a minimum, we recommend greater transparency in CARB's GHG calculations for coastal wetlands.

Modeling

From a greenhouse gas accounting standpoint, coastal wetlands are complicated systems, and we commend CARB for undertaking modeling work specific to these ecosystems. Protecting and restoring these landscapes can enhance the state's carbon sinks and (in the case of Delta wetland restoration) reduce GHG emissions relative to current conditions. Given this climate mitigation potential, we recommend CARB increase its ambition for future Scoping Plan updates from Tier 1 to higher tier estimates for coastal wetlands.

To bring coastal wetland modeling up to higher tier levels, we recommend consideration of models and regionally specific data that are available for California. Several models predicting elevation change, carbon accumulation, and GHG exchange have been developed for the Delta and other coastal wetlands.[1] Recent and ongoing upgrades to these models have improved their usability and expanded their coverage across wetland types and salinity gradients. In the Delta, for example, the process-based accretion and subsidence models SEDCALC[2] and SUBCALC[2,3,4] have been developed and parameterized to evaluate a broad array of possible wetland restoration scenarios. The PEPRMT[5] model, which predicts methane emissions from restored wetlands, has been expanded to include managed and tidal wetlands across the salinity gradient. With limited additional effort, these and other existing models could be applied to future Scoping Plan scenarios.

In terms of coastal carbon data, the Smithsonian Environmental Research Center, which curates the aforementioned Coastal Carbon Atlas (the largest coastal carbon database in the world), rated California in the top percentile of coastal states in a national assessment of blue carbon data quality and availability. The Pacific Northwest Blue Carbon Working Group (PNWBCWG) is compiling the detailed Northeast Pacific Blue Carbon with extensive data across the California

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[1] See: Swanson et al. 2014, Schile et al. 2014, Thorne et al. 2018, Thorne et al. 2021, Buffington et al. 2021.

[2] Deverel, S., Ingrum, T., Lucero, C., Hydrofocus, Inc., Drexler, J., U.S. Geological Survey, 2014. Impounded Marshes on Subsided Islands: Simulated Vertical Accretion, Processes, and Effects, Sacramento-San Joaquin Delta, CA USA. San Franc. Estuary Watershed Sci. 12. https://doi.org/10.15447/sfews.2014v12iss2art5

[3] Deverel, S.J., Ingrum, T., Leighton, D., 2016. Present-day oxidative subsidence of organic soils and mitigation in the Sacramento-San Joaquin Delta, California, USA. Hydrogeol. J. 24, 569–586.

[4] Deverel, S., Leighton, D.A., Hydrofocus, Inc., 2010. Historic, Recent, and Future Subsidence, Sacramento-San Joaquin Delta, California, USA. San Franc. Estuary Watershed Sci. 8. https://doi.org/10.15447/sfews.2010v8iss2art1

[5] Oikawa, P.Y., Jenerette, G.D., Knox, S.H., Sturtevant, C., Verfaillie, J., Dronova, I., Poindexter, C.M., Eichelmann, E., Baldocchi, D.D., 2017. Evaluation of a hierarchy of models reveals importance of substrate limitation for predicting carbon dioxide and methane exchange in restored wetlands. J. Geophys. Res. Biogeosciences 122, 145–167. https://doi.org/10.1002/2016JG003438

coast. Accordingly, we recommend that CARB utilize California-specific information from the Atlas and PNWBCWG to derive regionally specific, Tier 2 level emissions factors.

We understand that CARB is facing considerable time constraints for undertaking this modeling work. Pew and our partners, including San Francisco Estuary Institute and Silvestrum Climate Associates, are happy to provide an overview of data and models to help CARB move to a higher tier approach, should that be of interest. For the current Scoping Plan update, replacing Tier 1 emissions factors with region-specific values offers a straightforward way to better represent coastal wetland restoration in scenario analyses. For future Scoping Plan updates, broader changes such as the inclusion of process-based models would enable more detailed and varied coastal wetland scenarios to be included in their analysis.

Scenarios

Business as usual: For the business as usual (BAU) scenario, we recommend that CARB incorporates the impact of sea level rise, associated projected loss of coastal wetlands (in the absence of management action to allow coastal wetlands to accrete vertically and move inland), and subsequent emissions/loss of future carbon sequestration and storage opportunities.

The impact of sea level rise on coastal wetlands has been well documented, including the Thorne et al (2018) study that projected complete loss of salt marshes by 2110 absent interventions like wetland restoration, protecting buffer areas to allow coastal wetlands to migrate away from rising seas, restoring and enhancing sediment flows, etc.

Scenario 1- Minimize disturbances, prioritize conservation, maximize near-term carbon stocks*:* In addition to CARB's proposed climate actions (conserve wetland soil organic carbon and restore wetlands; increase restoration of riparian, coastal and delta wetlands), we recommend including more specific actions addressing the impacts of sea level rise, including sediment application to support vertical accretion of coastal wetlands, removal/replacement of barriers like culverts that impede water and sediment flows, re-establishing tidal connections, and creation of landward migration zones to allow for inland movement of coastal habitats away from rising seas.

Scenario 2 - Prioritize restoration and climate resilience**:** As above, we recommend including (in addition to CARB's proposed actions) more specific actions addressing the impacts of sea level rise and subsidence, including sediment application to support vertical accretion of coastal wetlands, removal/replacement of barriers like culverts and dikes that impede water and sediment flows, re-establishing tidal connections, and creation of landward migration zones to allow for inland movement away from rising seas.

Management actions to restore saline and brackish tidal waters to impounded wetlands that were historically saline can reduce methane emissions, and targeted construction of managed wetlands in low-elevation agricultural lands (e.g., areas in the central Delta where subsidence generates high CO_2 emissions and threatens future arability) would restart carbon burial and reduce overall GHG emissions. We recommend CARB incorporate these emission reduction strategies and benefits in its modeling.[6] We also note that these management strategies are well established in the coastal adaptation and resilience arena, creating an opportunity for the state to take a holistic approach to climate mitigation and adaptation.

***Scenario 3 - Model mix of strategies from current commitments and plans**:* For this scenario, Pew recommends CARB include specific strategies and targets that include wetlands (please see following table, beginning on page 5). Recent examples include: the 30 by 30 pathways document released by the California Natural Resources Agency (CNRA) that prioritizes conservation of lands and coastal waters with high carbon sequestration and storage values, such as wetlands, peatlands, and eelgrass; the CNRA Natural and Working Lands Climate Smart Strategy that details specific "climate smart" actions for coastal and Delta wetlands, as well as seagrasses and seaweeds; and the Ocean Protection Council (OPC)'s Strategic Plan, which includes quantitative targets for conserving and restoring coastal habitats.

Scenario 4 - Prioritize wildfire reduction with additional complementary policies: Our recommendations are the same for scenarios 1 and 2.

Scenario 5 - Focus on resource utilization: We note that a focus on resource utilization will not be the same as business as usual with respect to wetlands. Upland increases in timber harvest could lead to degradation of downstream wetland habitats; marine renewable energy and aquaculture expansion could also negatively impact coastal wetlands. We urge CARB to recognize the impacts to coastal wetlands that would extend beyond BAU in this scenario.

[6] See "Restoring tides to reduce methane emissions in impounded wetlands: A new and potent Blue Carbon climate change intervention" https://www.nature.com/articles/s41598-017-12138-4. James Holmquist of the Smithsonian Environmental Research Center is collaborating with Kevin Kroeger and others at the USGS (Woods Hole Coastal and Marine Science Center) on spatial products to identify and map impounded tidal wetlands and assess their potential for restoration that generate greenhouse gas benefits, which should be available in early to mid 2022. The work builds on other spatial products J. Holmquist has developed such as a probabilistic coastal lands map and a CONUS-wide relative tidal elevation map.

Scenario Name	Business as Usual (BAU)	Alt SP NWL Scenario 1	Alt SP NWL Scenario 2	Alt SP NWL Scenario 3	Alt SP NWL Scenario 4	Alt SP NWL Scenario 5
CARB proposed over-arching objectives	*No new climate action*	*Minimize disturbances, prioritize conservation, maximize carbon stock at 2045.*	*Prioritize restoration and climate resilience*	*Model mix of strategies from current commitments/plans*	*Prioritize wildfire reduction, with additional complimentary policies*	*Focused on resource utilization*
Objective/climate action for wetlands	Include sea level rise impacts when assessing BAU	CARB - *Conserve wetland soil organic carbon and restore wetlands. Increase restoration of riparian, coastal, and delta wetlands* Preserve buffer areas to allow for inland migration Beneficial re-use of dredge material to support vertical accretion of wetlands Restore tidal connections	CARB - *Conserve wetland soil organic carbon and restore wetlands. Increase restoration of riparian, coastal, and delta wetlands* Preserve buffer areas to allow for inland migration Beneficial re-use of dredge materials to support vertical accretion of wetlands Restore tidal connections Remove upland barriers that restrict	*CARB - Conserve wetland soil organic carbon and restore wetlands. Increase restoration of riparian, coastal, and delta wetlands* **2019 NWL draft implementation plan targets**: Avoided conversion across landscapes - 50-75% reduction in annual rate of conversion by 2030; Coastal wetland restoration - 5,100-5,500 acres/ year; Delta wetland restoration 2,500-2,800 acres/ year;	*CARB - Conserve wetland soil organic carbon and restore wetlands. Increase restoration of riparian, coastal, and delta wetlands* Identify and fill data gaps on wildfire impacts to wetlands ecosystem services.	CARB – *Same as BAU* Prioritize avoidance of impacts over mitigation. Account for possible impacts of expansion of marine renewable energy and aquaculture.

		Remove upland barriers that restrict water and sediment flows Restore wetlands in degraded low elevation agricultural lands Prioritize avoidance over mitigation in project permitting	water and sediment flows Restore wetlands in degraded low elevation agricultural lands Prioritize avoidance over mitigation in project permitting	Seagrass restoration 500-600 acres/ year **Baylands goals** (just for lower SF Estuary): 100,000 acres **OPC strategic plan goals and targets**: Protect, restore or create 10,000 acres of additional coastal wetlands by 2025. Increase total acres of coastal wetlands by 20% by 2030 and 50% by 2050. Preserve known 15,000 acres of seagrass beds and create an additional 1,000 acres by 2025 **National Marine Fisheries Service** policy goal of no net loss of eelgrass function in California waters **DSC Delta Plan targets** (including		

				draft ecosystem amendment to chapter 4): 30,000 acres of wetland restoration for subsidence reversal and carbon sequestration (PM 5.2) with 3,500 acres for tidal reconnection (PM 4.12); and 32,500 acres of tidal marsh and 19,000 acres of nontidal wetlands, seasonal wetlands, or wet meadow (PM 4.16)		

Co-benefits

Pew supports CARB's commitment to assess co-benefits associated with the scenarios noted above. We encourage CARB to factor in the significant ecosystem services provided by California's coastal wetlands, from nearshore eelgrass beds to the tidal reaches of the Delta. Examples of these co-benefits include:

- Improving water quality by trapping and processing nutrients and pollutants and stabilizing sediments.
- Providing localized amelioration of ocean acidification in coastal waters (an ecosystem service associated with eelgrass beds).[7]
- Supporting commercially important fish populations including salmon, Dungeness crab, California halibut, rockfish, and Pacific herring.
- Providing storm damage services valued at over $23 billion annual dollars, and providing coastal protection that reduces the magnitude of levees and other flood protection that will need to be built for sea level rise.
- Supporting other wildlife, including threatened and endangered endemic species and migratory birds.
- Providing access to nature and recreation, with the ensuing mental and physical benefits, for nearby communities, including many disadvantaged communities.

CARB should also assess negative impacts related to BAU and other scenarios that may lead to the destruction of coastal wetlands. In the case of the Delta, which provides fresh water to two-thirds of the state's population, rising sea levels, floods, and aging levees threaten the long-term sustainability of this region. California has a window of time over the next decade or so to undertake ambitious action to conserve and restore wetland habitats in the Delta, San Francisco Bay, and other regions. Delay and inaction will lead to the loss of these ecosystems and the wide array of benefits they provide to people and nature, including blue carbon.

Conclusion

Thank you for the opportunity to comment on this important work to leverage California's natural and working lands in support of climate mitigation. Pew and our partners welcome the opportunity to provide further information and assistance in support of our recommendations.

Sincerely,

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[7] Ricart et al (2021) https://doi.org/10.1111/gcb.15594