

## **Section 5: Project Description**

### **1. Project Objectives:**

We propose to construct up to 1,000 acres of managed wetland habitat thereby (a) reducing greenhouse gas emissions and sequestering carbon in the soil organic carbon pool (b) stopping and reversing the effects of land subsidence, thus reducing levee failure risks and the associated threats to California water supply, and (c) employing the capacity of wetlands to improve water quality. The focus area of this project will be private agricultural land in the Delta on peat soils where there is active subsidence. We have identified three project partners who will work with the Conservancy to convert land from current agricultural practices to managed wetlands and/or rice cultivation. The Delta Wetlands Properties is interested in contributing land currently in agricultural production on Bouldin Island for the purposes of wetland management. The Nature Conservancy (TNC) is interested in converting several hundred acres currently in corn production to managed wetlands and/or rice. Ducks Unlimited has identified four producers interested in participating in the project.

We also propose to facilitate advancement of significant greenhouse gas reductions across the Sacramento-San Joaquin Delta while also promoting other public and environmental benefits. Our proposed project will do this by developing a region-wide GHG accounting framework and tool to estimate and monitor GHG reductions at the regional and “nested activity” scale, based on alternative land and water-management practices or wetland restoration, as well as other related conservation values across the Delta.

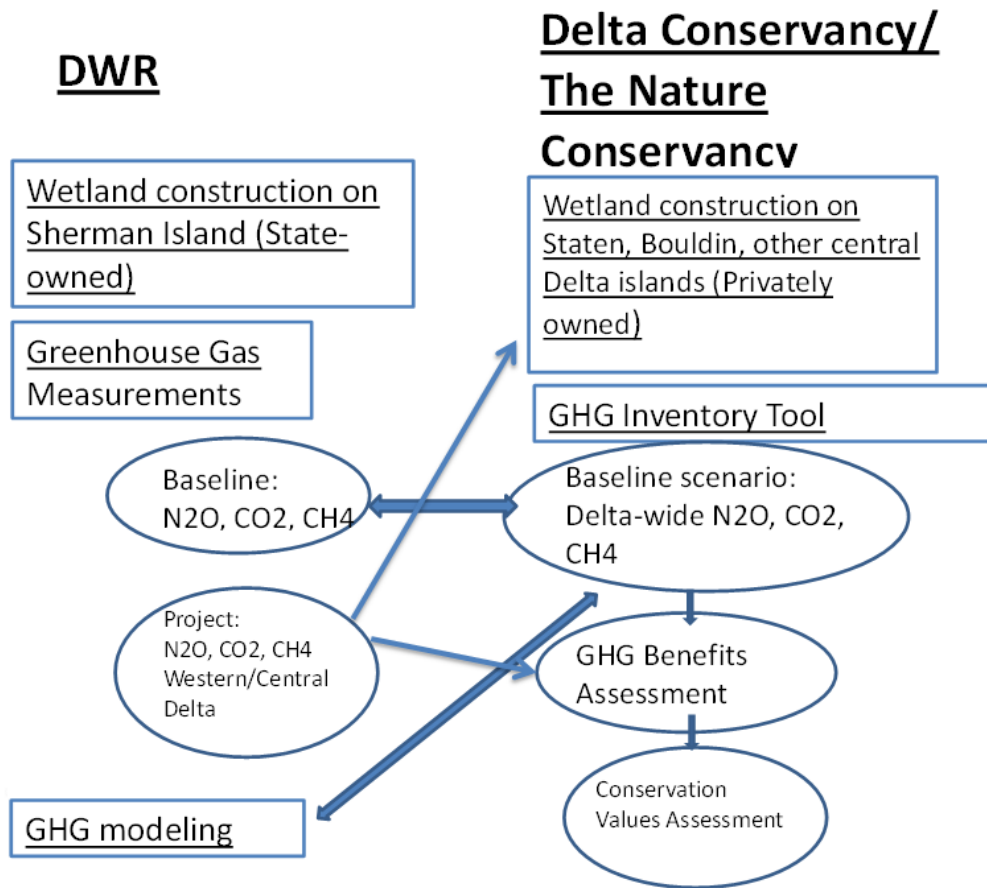
We propose to coordinate closely with California Department of Water Resources who is proposing to construct wetlands on Sherman Island and measure current baseline GHG emissions project emissions reductions. UC Berkeley personnel will lead the effort in GHG measurements for wetland projects on State-owned land and private lands included in this proposal. They will also work on developing models for GHG emissions and emission reduction calculations. Figure 1 shows the interaction between the two proposed projects (DWR and Delta Conservancy).

*Objective 1:* Create up to 1,000 acres of managed wetlands over a 5-year period. This acreage will provide valuable forage, cover and water for numerous species wildlife species, including garter snakes, waterfowl, wading birds, shorebirds, and semi-aquatic mammals, which have evolved with tule wetlands. Special-status species primarily associated with freshwater emergent wetland that may benefit from this project include the giant garter snake, western pond turtle, tule greater white-fronted goose, northern harrier, greater and lesser sandhill

crane, tricolored blackbird, and yellow-headed blackbird. This project will focus on private agricultural land in the Delta on peat soils where there is active subsidence. We have identified three project partners who will convert land from current agricultural practices to managed wetlands and/or rice cultivation. The Delta Wetlands Properties is interested in contributing land currently in agricultural production on Bouldin Island for the purposes of wetland management. The Nature Conservancy is interested in converting several hundred acres currently in corn production to managed wetlands and/or rice. Ducks Unlimited has identified four producers interested in participating in the project

*Objective 2:* Reduce greenhouse gas emissions and sequester carbon in the soil organic carbon pool. Current estimates from research and pilot scale projects indicate that managed wetlands on Delta islands can stop current emissions of about 7 tons of CO<sub>2</sub> per acre per year, and result in a net carbon sequestration of 10 to 14 tons of CO<sub>2</sub> per acre per year. Deeply subsided islands could continue sequestering new carbon at these rates for over 150 years until their elevations are restored to sea level (Deverel and others, 2014). Based on these estimates, about 7,000 metric tons of CO<sub>2</sub> emissions would be avoided and a net of 10,000 to 14,000 metric tons of CO<sub>2</sub> could be sequestered each year after the construction of 1,500 acres of managed wetlands is complete until the land elevation reached sea level (100-200 years for deeply subsided islands) (Deverel and others, 2014). Emission reductions and carbon sequestration will be measured using micrometeorological methods and collection of elevation and soils data. We propose to work closely with California Department of Water Resources (DWR) and UC Berkeley in the collection of these data as per their proposal for this solicitation.

The Nature Conservancy will be the lead to use this data and develop a Delta-wide GHG accounting framework to account for and enable GHG reductions and associated co-benefits across the Delta. Moreover, we propose to promote, prioritize and leverage greater GHG reductions across the region in the future, beyond those achieved on properties included in this proposal through the use of the GHG accounting tool and ongoing policy efforts to link incentives under state climate policy with GHG reductions in the Delta.



**Figure 1. Relation between DWR and Delta Conservancy/The Nature Conservancy proposals. We propose to interact with UC Berkeley (UCB) in the prioritization of areas for current GHG emissions measurements and modeling of GHG emissions and emission reductions. UCB will measure carbon sequestration on lands proposed for this project.**

*Objective 3:* Stop and reverse the effects of land subsidence, thus reducing levee failure risks and the associated threats to the California water supply. Studies on Twitchell Island by the U.S. Geological Survey and HydroFocus have found that inundating Delta peat soils prevents a 3 to 5 cm loss of elevation and the average accretion achieved by managed wetlands to be about 3 cm per year on average and as much as 9 cm per year (Deverel and others, 2014; Miller and others, 2008). This co-benefit will be evaluated by collecting and analyzing data for elevation changes for selected locations.

*Objective 4:* Realize water quality benefits. The available published data (e.g. Fleck and others, 2007; Deverel and others, 2007a) and data collected by DWR and Moss Landing Marine Laboratories on Sherman Island demonstrate that wetlands with appropriate hydrologic management result in lower drainage water loads for key constituents of concern (dissolved organic carbon and methyl mercury) relative to traditional agriculture. While DWR is working with researchers from the Moss Landing Laboratory and the Central Valley Regional Water Board to monitor Methyl Mercury levels and test BMPs to control MeHg in a permanently flooded and managed wetland, the available information demonstrates the benefits of restricting drainage outflow from wetlands. These practices will be implemented and monitored as part of this project. In addition, drainage loads of dissolved organic carbon methylmercury and other constituents of concern, such as salinity, increase with ongoing

subsidence (Deverel and others, 2007b and Heim and others), Water quality benefits will be evaluated by collecting and analyzing water quality monitoring data, measuring drain flow and calculating loads

*Objective 5:* Quantify co-benefits associated with GHG reductions across the Delta. We propose to coordinate with the Department of Fish and Wildlife, DWR and other stakeholders, to develop a geo-spatial conservation values assessment that will identify opportunities across the region that not only reduce GHG emissions but also enhance other resource benefits (e.g. wildlife habitat, water supplies) that also support State efforts as described in the Bay Delta Conservation Plan, Delta Vision and Delta Risk Management Strategy documents. [

*Objective 6: Determine mosquito abatement required for carbon sequestration wetlands.* Densely vegetated wetlands could potentially also produce mosquitoes that can carry diseases and cause pest problems for humans, livestock and wildlife and there is therefore concern by the vector control community about large acreages of carbon sequestration wetlands in the Delta. There are examples of heavily vegetated wetlands that support numerous mosquitoes because they provide nutrients and protection from predators. To understand the potential for carbon restoration wetlands to produce mosquitoes, UC Davis Entomology Professor Sharon Lawler will conduct research in mature and recently established wetlands.

## **2. Background and Conceptual Models:**

This effort is consistent with recommendations in the plans described below:

*The Delta Plan:* The Delta Stewardship Council lays out a long-term vision for the Delta and Delta science in the Delta Plan and the Delta Science Plan. This project will contribute to implementing strategies and actions recommended in the Delta Plan and goals laid out in the Delta Science Plan.

This project aligns with the objectives and strategies identified in The Delta Plan to address habitat degradation, improving water quality, reverse subsidence and act on climate change. The Delta Plan identifies addressing these issues as essential for achieving the coequal goals of providing a more reliable water supply for California and protecting, restoring, and enhancing the Delta ecosystem in a manner that protects and enhances the unique cultural, recreational, natural resource, and agricultural values of the Delta as an evolving place.

*Delta Science Plan:* This project will contribute to transparent and collaborative science in the Delta envisioned by the Delta Science Program.

*The Governor's California Water Plan Update 2013 Public Review Draft (Water Plan Update):* The California Water Plan is the State's long-term strategic plan for guiding the management and development of water resources. The Draft Update identifies piloting carbon capture farming in the Delta as an example of an on-the-ground effort that would advance the objectives stated in the Water Plan and identifies securing funding for a farm-scale demonstration as a key next step.

*President Obama's Climate Action Plan:* This plan supports the goal of reducing carbon emissions in to 17 percent below 2005 levels by 2020 stated in President Obama's Climate

Action Plan. As an important strategy for achieving emission reduction goals, the President Obama's Climate Action Plan calls for identifying approaches to protect and restore wetlands and other diminishing, yet critical landscapes which sequester carbon. In this plan, the Administration recommends strategies which pair conserving land and water resources, protecting biodiversity and promoting ecosystem resilience with ameliorating climate change.

California Executive Order S-3-05: This order calls for the State to reduce greenhouse gas emissions to 1990 levels by 2020 and to reduce greenhouse gas emissions to 80 percent below 1990 levels by 2050. Additionally, this order established the Climate Action Team (CAT) for State agencies. The CAT is chaired by the Secretary of the California Environmental Protection Agency. This project contributes to the emission reduction goals in this order and the Delta Conservancy will coordinate with CAT on this effort as regular participants of CAT meetings.

California Assembly Bill 32 (2006): The California Global Warming Solutions Act of 2006 (AB 32) set the 2020 greenhouse gas emission reduction goal of to reduce greenhouse gas emissions to 1990 levels by 2020 into law. This project contributes to this emission reductions goal. AB 32 directed the Air Resource Board (ARB) to develop a scoping plan to identify how to best reach the 2020 limit and the ARB has since adopted the final cap-and-trade regulation. This project will utilize Auction Revenue Proceeds as in-kind cash donations to support this project and will allow producers and landowners to economically benefit from acting to arrest climate change through obtaining carbon credits from ARB cap-and-trade program. This project will pilot landowners and producers participating in the carbon market through creating managed wetlands in California.

2009 California Climate Adaptation Plan: This plan summarizes the best known science on climate change impacts to California and outlines strategies to increase California's resiliency from the impacts from climate change. Carbon sequestration projects through restoring wetlands is recommended in this plan as an opportunity to provide significant reduction of emissions, capture and sequestration of greenhouse gases while simultaneously providing habitats necessary for the long-term conservation of California's biodiversity. This plan also recommends prioritizing and expanding Delta island subsidence reversal and land accretion projects to create equilibrium between land and estuary elevations along select Delta fringes and islands, and identifies further degradation of water quality and the Delta ecosystem as significant impacts of climate change. This project also is in accordance with California Executive Order S-13-05 which required this plan and was created by CAT, of which the Delta Conservancy is an active participant.

Sacramento-San Joaquin Delta Conservancy Strategic Plan: This project is consistent with the Delta Conservancy's strategic plan. The strategic plan directs the Conservancy to aid in protecting, enhancing and celebrating Delta agriculture and the special character of its working landscape in new ways that are synergistic with improving water quality and habitat conservation and with adaptation to climate change, sea level rise, and subsidence. Working with Delta growers and landowners to identify areas for subsidence reversal and carbon sequestration on wetlands is explicitly stated as a strategy for the Delta Conservancy to achieve its goals and legislative mandates. The strategic plan also directs the Delta Conservancy to investigate development of a carbon market with ARB and appropriate registries, whereby Delta farmers could receive credit for emissions reductions and carbon sequestration from growing managed wetlands or through rice cultivation.

The Delta Risk Management Strategy: In the Phase II documents, implementation of carbon sequestration wetlands is called for to mitigate subsidence.

**3. Detailed project description, including all tasks to be performed:**

This project realizes the potential to restore wetlands in the Sacramento-San Joaquin Delta (Delta), reduce greenhouse gas emissions and sequester carbon, while offering a unique opportunity to increase elevation on subsided lands, improve water quality. The overall project will be to develop up to 1,000 acres of wetlands that will reduce greenhouse gas (GHG) emissions by switching from traditional agricultural crops to wetlands. These projects will serve to demonstrate concept for reducing emissions through changes in management and showcase how GHG reductions and associated co-benefits can be estimated and monitored using the regional GHG accounting framework and conservation values assessment. We will also seek to road test the accounting framework using other wetland management and restoration projects in the Delta, including those proposed by the Department of Water Resources (DWR) in response to this solicitation.

The following are the project tasks:

**Landowner Outreach and Agreements:** Project proponents have been working with producers to develop project concepts and willingness to be recognized as project partners. Producers are committed to providing access as necessary to conduct necessary project development/planning. Formal access agreements will be established if funding is available and projects are moving forward.

**Planning and Design:** Northwest Hydraulic Consultants (NHC) will provide engineering support related to the water distributing system and grading for the carbon sequestration wetland creation. NHC will work with Hydrofocus who has developed preliminary conceptual designs for the carbon sequestration pads locations based on existing infrastructure and land availability. Existing siphons, supply infrastructure and of drainage ditches will be utilized or retrofit where possible and fish screens will be installed. The water distribution system would be gravity driven using siphons from the adjacent Delta channels. The elevation difference between the Delta channels and the subsided islands would provide the necessary head to drive the system. The design system will enable water-level control wetland water levels wetlands accrete and rise in elevation. The berm elevations will be sized to provide control for at least 20 years of accretion. Flashboard risers will be used to control water movement through berms and surface drainage water.

Specific Planning and Design Tasks:

1. Grading Plan: NHC will oversee development of a grading plan based on each islands' topography, including existing site grade and characteristics of existing drainage systems. The land will be surveyed using all-terrain vehicle mounted Global Position System relative to a stable benchmark and accuracy will be within 0.10 foot spaced 100 to 200 feet apart. Using the elevation measurements, generate maps and estimate cut and fill volumes and locations of checks. The grading plan will include wetland berm crest elevations, typical cross sections, and location of construction access ramps and pads if necessary. Irrigation pipe layout and locations of gate or valve structures will be identified on the grading plan, as

determined from the hydraulic design completed in Task 1. The grading plan will seek to optimize the cut and fill quantities and minimize impacts to any existing infrastructure. The deliverable for this task includes a stamped construction plans showing the grading plan and irrigation system layout to be put out to bid. An engineer's cost estimate and specifications would be part of this bid document.

2. Perform earth moving and build berms: Based on surveying and cut and fill calculations, we will work with local contractors and land owners to construct the wetland.
3. Construction Oversight: NHC will provide periodic oversight during construction for clarification of construction plans and review of any modification or adjustment of the plans that arise during construction and water delivery. Plan and install water supply and drainage infrastructure planning and installation.
4. Hydraulic Distribution System Design: NHC will develop the hydraulic design of the irrigation water supply system for the wetland pads. Hydraulic design features such as gates, control systems, and pipe sizing and layout will be determined. The water delivery system will be sized to provide variable flows dependent on seasonal plant water requirements.
5. Install Water Control Structures: We propose to install inlet and outlet control structures, and to refine field configurations and layout water delivery and outflow restriction. Water will enter at the highest elevation and flow to the lowest. As precisely as possible, surface water will be delivered to match plant demand. We propose to install appropriate water supply and outflow control structures to and between wetland cells. Weirs will be used to manage inflow and outflow from wetland and rice fields. Weirs with height adjustments similar to those developed for rice water-quality investigations on Bouldin Island and Wright-Elmwood Tract will be used to allow for precise water elevation control and water-discharge management (Bachand and Associates and others, 2006). We propose to simplify the water supply and drainage network where possible to facilitate water delivery and minimize drainage.

**Environmental Review and Permitting:** Constructing and operating the project will require compliance with State and federal environmental laws and regulations. An efficient environmental review and permitting strategy will be implemented that will utilize and update existing environmental documentation that is available for the sites at Bouldin and Staten islands and other potential sites. Delta Wetland Properties have commissioned detailed environmental analyses for Bouldin Island, including habitat and wetland delineations, cultural resource surveys and reports and other data required for an Environmental Impact Report (EIR) under the California Environmental Quality Act (CEQA), an Environmental Impact Study (EIS) under the National Environmental Policy Act (NEPA) and a range of environmental permits.

Extensive recent environmental documentation for the Delta is also available from the Delta Plan EIR, and the Bay Delta Conservation Plan EIR/EIS, which include documentation of the resources on Bouldin and Staten Islands. This existing documentation will be updated as needed with by field surveys as documentation for an Initial Study/Mitigated Negative Declaration (IS/MND) for the project to comply with CEQA.

Construction and operation of the project is expected to require several environmental permit applications. Early in the permit application preparation process a pre-application meeting will be held with key representatives of the regulatory agencies. The applications would be prepared using funding from the grant with only limited agency negotiation as described under "Assumptions" below. The following permit applications will be prepared.

*Federal Endangered Species Act* - Biological Opinions from the National Oceanic and Atmospheric Administration (NOAA) Fisheries and the U.S. Fish and Wildlife Service allowing incidental take under the Federal Endangered Species Act, requiring preparation of a Biological Assessment and Section 7 Consultation. Potentially affected species could include giant garter snake, valley elderberry longhorn beetle, delta smelt, spring-run and winter-run Chinook salmon, Central Valley steelhead, and green sturgeon, and potentially other species. Any effects on habitat for federally managed fish species (i.e., "Essential Fish Habitat") as regulated by the Magnuson-Stevens Act would also be included in this analysis. Although, no in-channel construction is planned for the project, the Biological Assessment will analyze the water quality effects of potential discharges from the managed wetlands on fish species.

*California Endangered Species Act* - An Incidental Take Permit under Section 2081 of the California Endangered Species Act may be required for authorization of take of state-listed species that could potentially include longfin smelt, greater sandhill crane, Swainson's hawk, and several of the federally listed species identified above that are also state-listed. *Clean Water Act/Rivers and Harbors Act/National Historic Preservation Act* - A permit for fill of waters of the United State, including wetlands, under Section 404 of the Clean Water Act (CWA) from the U.S. Army Corps of Engineers (Corps) would likely be required, which includes obtaining a Preliminary Jurisdictional Determination form the Corps. This would also include obtaining a Section 10 permit under the Rivers and Harbors Act. As part of this application process a review of historical resources under Section 106 of the National Historic Preservation Act will be required (requiring documentation of cultural resources and consultation with tribes), and obtaining CWA Water Quality Certification from the Regional Water Quality Control Board (RWQCB). Given the size of the project, it is likely that the Corps would require an individual permit, which requires a Section 404(b)(1) alternatives analysis, assessment of values and services of affected and created wetlands, demonstration that the project is "water dependent". An application for a Section 401 Certification from the Central Valley Regional Water Quality Control Board (including a substantial application fee) will also be prepared.

*Porter-Cologne Water Quality Control Act* - For compliance with the state Porter-Cologne Water Quality Control Act, an application would be prepared for a conditional waiver of Waste Discharge Requirements from the RWQCB for irrigated agricultural lands (including managed wetlands).

*California Fish and Game Code* - If a river, stream, or lake will be substantially modified by the project, the California Department of Fish and Wildlife (CDFW) will need to be notified as required under Section 1600 et seq. of the California Fish and Game Code. The project applicant may enter into a Lake and Streambed Alteration Agreement with CDFW, which may require mitigation for impacts to Waters of the State and associated riparian habitat. *Delta Reform Act* - Lastly, Certification of Consistency of the project with the Delta Plan needs to be obtained from the Delta Stewardship Council.



**Site Operation and Maintenance:** For all sites, water management will be the key operational and maintenance element, and key tasks include adjusting inflows and outflows among wetland cells and into and out of the wetland. Operation and maintenance tasks include:

- Managing water levels and flashboard riser boards
- Maintaining siphon pumps
- Maintaining clear access on boardwalks and surrounding access roads
- Repairing pipes and levees
- Communicating with researchers
- Maintaining monitoring equipment
- Maintaining vehicles
- Controlling mosquitoes and other vectors
- Collecting and preserving operation and maintenance data (critical for documenting management practices)

**Adaptive Management:** Adaptive management will be used throughout the project to modify operation of the wetland based on water quality and GHG data collection efforts.

**Develop a regional GHG accounting framework and tool for the Delta:** As part of this project, we will develop a regional GHG accounting framework and tool for the Delta that will estimate and monitor GHG reductions for this project, as well as other activities across the Delta. This framework will enable additional GHG emissions and reductions to be estimated and monitored over time at the regional and nested activity scale (see figure 5). This task will enable GHG reductions from these activities and others across the Delta to be estimated and monitored in a standardized way into the future. The development of this framework will be a collaboration between The Nature Conservancy, Hydrofocus, UC Berkeley, Delta Conservancy, the Department of Water Resources and the Climate Action Reserve.

GHG emissions and reductions monitoring will be conducted to update the GHG inventory for the Delta. We propose to work with DWR and UC Berkeley to employ methods already proven in the Delta; micrometeorological techniques and traditional soil coring and sedimentation-erosion table measurements (Figure 1). UC Berkeley and the Department of Water Resources propose under this solicitation to:

1. Measure carbon dioxide, nitrous oxide and methane emissions at strategic locations for representative crops and for varying soil organic matter contents in the Delta using eddy covariance methods (Department of Water Resources, UC Berkeley proposal under this solicitation) and for present-day baseline emissions where we propose to construct wetlands.
2. Measure nitrous oxide emissions for representative crops and for varying soil organic matter contents in the Delta using chambers
3. Measure GHG sequestration at sites proposed for wetland construction under this proposal.

To develop the GHG accounting framework we propose the following tasks.

- 1) Assemble a technical advisory committee for development of the overall framework and tool. This task will be performed by The Nature Conservancy.
- 2) Develop an initial GHG inventory for the Delta based on best available science. These tasks will be performed by a consultant, HydroFocus, in coordination with UC Berkeley..
  - a) During the first year, HydroFocus personnel under the direction of Steve Deverel will use existing and best available data to inform SUBCALC to estimate current Delta-wide carbon dioxide emissions and subsidence and identify data gaps and key areas for data collection. This will include processing and analysis of remote sensing data for land-surface elevation changes (Jones and others, 2011).
  - b) During the years 3 and 4, HydroFocus personnel under the direction of Steve Deverel will coordinate with UC Berkeley research staff (under the direction of Professor Dennis Baldocchi and Whendee Silver). Using updated models informed with data collected by UC Berkeley, HydroFocus will refine will refine estimates of current Delta-wide carbon dioxide, methane and nitrous oxide emissions.
- 3) Develop and establish a GHG baseline scenario to 2030 and 2050 for the Delta. These activities will be led by consultant, Hydrofocus, in collaboration with TNC, the Climate Action Reserve, DWR, UC Berkeley and the Delta Conservancy. Baseline carbon dioxide emissions will be initially estimated using the SUBCALC model for development of the regional accounting framework and tool. Specifically, HydroFocus will refine and recalibrate SUBCALC based on recent GHG emissions data (e.g. Hatala and others, 2012; Knox and others, 2014; Anderson, 2014) and remotely sensed elevation change data (Jones and others, 2011). Elevation change on organic soils is proportional to carbon dioxide emissions for drained agricultural conditions (Deverel and Leighton, 2010; Deverel and Rojstaczer, 1996). The improved SUBCALC model will be used to develop initial estimates of annual baseline carbon dioxide emissions from Delta organic soils through 2030 and 2050. (As demonstrated in Deverel and Leighton (2010), carbon dioxide emissions decrease with time due to loss of soil organic matter.
- 4) These activities will be led by consultant, HydroFocus, in collaboration with TNC, the Climate Action Reserve, DWR, UC Berkeley and the Delta Conservancy as follows.
  - a. Baseline carbon dioxide emissions through 2030 and 2050 will be initially estimated using the SUBCALC model during year 1. Specifically, HydroFocus will refine and recalibrate SUBCALC based on recent GHG emissions data (e.g. Hatala and others, 2012; Knox and others, 2014; Anderson, 2014) and remotely sensed elevation change data (Jones and others, 2011). Elevation change on organic soils is proportional to carbon dioxide emissions for drained agricultural conditions (Deverel and Leighton, 2010; Deverel and Rojstaczer, 1996). The improved SUBCALC model will be used to develop initial estimates of annual baseline carbon dioxide emissions from Delta organic soils through 2030 and 2050. (As demonstrated in Deverel and Leighton (2010), carbon dioxide emissions decrease with time due to loss of soil organic matter.

- i. SUBCALC calculated carbon dioxide losses through the simulation of biogeochemical processes that result in oxidation of soil carbon and subsidence. As oxidation and subsidence ensues, soil organic carbon decreases which in turn results in reduced oxidation rates. This leads to changing GHG emissions with time. These changing GHG emissions will be simulated through 2030 and 2050.
  - b. During the course of the project and in coordination with DWR and UC Berkeley, HydroFocus will refine and develop improved models and cooperate in the development of a model that will estimate nitrous oxide losses in addition to carbon dioxide losses for baseline conditions. These models will be used to refine and forecast the baseline GHG emissions to 2030 and 2050, commensurate with GHG reduction goals envisioned under state climate policy.
- 5) Estimate GHG reduction potential for the Delta based on alternative management, restoration, and conservation scenarios. We propose to:
  - a. Using models, delineate areas of high, low and intermediate current and future baseline GHG emissions.
  - b. Determine where alternative GHG-reducing land uses (wetlands and rice) can be implemented based on land ownership, owner willingness and infrastructure;
  - c. Iteratively develop different GHG-reduction implementation scenarios and determine GHG benefits using available data for GHG benefits for wetlands and rice and estimated baseline emissions;
  - d. Develop scenarios that will minimize delta GHG emissions and prioritize areas for GHG reduction and carbon sequestration projects
  - e. Quantify the range of benefits based in multiple scenarios.

We propose to perform the above tasks during the first year of the project with the SUBCALC model. During years 3 and 4, we will propose to use newly collected data and refined models to refined estimates of the GHG reduction potential.

- 6) Using the underpinnings and results discussed above, we propose to develop a web-based tool for estimating, monitoring and reporting GHG emissions/reductions at regional and nested activity scales. Also, this tool will provide, the potential co-benefits from the conservation values assessment (see below). This GHG accounting framework tool will allow public access to users that include landowners, land managers and state agency personnel. Specific tasks follow.
  - a. Development of interactive maps the provide estimates of annual GHG emissions at regional and nested activity scale;
  - b. Development of interactive maps that include ongoing project information and documented GHG reductions;
  - c. Development of interactive maps that provide ratings for potential GHG reductions and habitat benefit.

- 7) Road test accounting framework with Staten and potentially other projects in Delta. We propose to road test the GHG accounting framework by including the proposed acreages in this project as well as the conversion of agricultural land to wetlands on Sherman and Twitchell islands. Specifically, the GHG data for DWR-owned islands where conversion is taking place will be made readily available.
- 8) Leveraging Additional Reductions through outreach and incentive development: The Nature Conservancy, in collaboration with project partners, will seek to leverage Delta-wide actions to reduce GHG emissions through an active outreach effort to experts, stakeholders and policy-makers. The goals will include the solicitation of input on the accounting framework and tools and design of the project, education on use of the tool and linking the overall GHG accounting framework and performance with climate policy incentives, including auction proceeds. It will also include the production of outreach materials and a guide for use of the tool. All of these activities will take place throughout the first four years of the project.
- 9) Synthesize and report accounting methodology and use of tool. A report describing the accounting framework and tool, including the methodology, scientific support and process will be developed and combined with the final report to be submitted to the Department of Fish and Wildlife.
- 10) Conservation Values Assessment. We will develop a Delta-wide Conservation Values Assessment (“assessment”) focused on integrating greenhouse gas mitigation goals with achieving other environmental and public benefits across the Delta. The goal of the assessment will be to develop an integrated approach to characterizing the relative conservation value of different land uses (e.g. different forms of agriculture, tidal restoration, wetland creation) that can be combined with the GHG accounting framework to evaluate the overall conservation outcomes of alternative land use and management scenarios in the Delta. Different stakeholders in the region have different priorities so it is only through an integrated approach that conservation and GHG reduction goals can be aligned with other co-benefits. We will develop this assessment through the following tasks:
  - a. Develop draft vision statement for conservation values assessment and develop general work plan for assessment
  - b. Refine work plan and develop more detailed plan with timelines, roles and responsibilities, budget, and deliverables after meeting with key stakeholders in the region
  - c. Identify technical advisory committee and determine structure and purpose; identify databases of existing research, data and expertise
  - d. Assemble spatial data to represent fish and migratory bird habitat, agricultural, and water supply values across the Delta and Suisun Marsh. Develop proposed analytical framework for which impacts and benefits to conservation values can be quantified under alternative land use and conservation management scenarios, that also reduce GHG emissions in the Delta.
  - e. Run initial prioritizations, draft results for broader review and feedback, incorporate input and review data, analysis and interpretation, and develop revised output.
  - f. Finalize assessment finalized by advisory committee and staff for integration with

inventory and accounting framework

- g. Develop integrated analysis and demonstration of the uses of the assessment and accounting framework and inventory, gather feedback, revise assessment as needed

This proposed approach will complement, and not replace, finer scale conservation planning for specific projects. It will provide an accounting of the potential to align GHG reductions with habitat conservation goals and critical information about how to meet multiple resource benefits in the Delta. This information can then be used to inform finer-scale implementation of specific projects and policies. This analysis will be combined with the GHG accounting tool.

**4. Timeline:**

		Year 2				Year 3				Year 4				Year 5			
		Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
<b>Task</b>		6/1 - 8/31		12/1 - 2/28	3/1 - 5/30	6/1 - 8/31	9/1 - 11/30	12/1 - 2/28	3/1 - 5/30	6/1 - 8/31	9/1 - 11/30	12/1 - 2/28	3/1 - 5/30	6/1 - 8/31	9/1 - 11/30	12/1 - 3/31	
Preparation, Planning & Design	Outreach																
	Planning & Design																
	Environmental Review & Permitting																
Monitoring	Baseline & Efficacy Monitoring																
Construction	Site Preparation and Construction of Infrastructure																
	Wetland Restoration																
Site Maintenance & Site Management	Site Management																
	Site Maintenance																
Administration	Coordination																
	Reporting																
GHG Framework																	

▲ Quarterly Report  
▲ Final Report

**5. Deliverables:** Project deliverables include the following

- Permits for carbon sequestration wetlands
- Construction design documents for of carbon sequestration wetlands
- Upto 1,000 acres of carbon sequestration wetlands and/or rice on private lands.
- Demonstrated GHG emssions reductions and carbon sequestraiton.
- Definition of mosquito mitigation practices
- Baseline GHG emissions estimates through 2030 and 2050
- Delineation of ways to reduce GHG emissions and sequester carbon
- Regional GHG accounting framework and tool
- Regional conversation values assessment (for GHG reduction co-benefits), including GIS data
- Presentations describing results
- Project summary reports
- Final report

6. **Expected quantitative results (project summary):** As a result of this project, we expect to quantify:

- 1) Present-day and future baseline GHG emissions throughout the Delta
- 2) GHG reduction benefits for wetland and/or rice projects
- 3) We also expect to provide a qualitative explanation of leveraging additional reductions with the Delta-wide framework and link to climate policy/auction proceeds; we can note that the Delta-wide framework, once finished, would serve as the long term monitoring and reporting framework. Interesting thing here is that permanence at the Delta-wide scale can provide more flexibility at the “nested project/activity” scale.

7. **Protocols:**

To estimate and monitor greenhouse gas emissions and reductions from the demonstration site(s), we will initially use a combination of measured GHG emissions measurements conducted by UC Berkeley and DWR and modeling described above.

A draft GHG offset project protocol applicable for quantification of GHG removals and emission reductions for restoration of tidal wetlands; implementation of managed, permanently flooded non-tidal wetlands; and rice cultivation in the San Francisco Estuary and Sacramento-San Joaquin Delta has been developed by HydroFocus, UC Berkeley, Tierra Resources and others and its publication by the American Carbon Registry is anticipated in 2015. Ultimately, the GHG benefit for application of the protocol will equal the difference between project and baseline emissions. We intend to use this protocol to initially estimate GHG reductions from the planned activities.

Ultimately, we intend to transition the GHG accounting of these efforts to the regional/nested activity accounting framework to estimate, monitor and report GHG reductions and intend for the state and other users to access this framework to estimate and monitor reductions that result from investments from auction proceeds and other policies. This framework is intended to complement and not supplant any project scale offset protocols that are being developed for the state’s cap and trade program. Rather, this framework is focused on tracking and advancing GHG reductions (not offsets per se) at a larger scale.

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