

FACT SHEET

Assessment of baseline conditions in Liberty Cut (14-7)

Deliverables: Deliverables will be quarterly and final report describing the study and results; one presentation at a local or national science conference; and one presentation to SFWCA representatives, designees and staff.	
Status: Flow analysis in progress. Continuous monitoring site installation in progress. Real time data publicly available by end of January, 2014.	
Primary Investigator: Bryan Downing	Recipient Organization: US Geological Survey
Project Cost: \$200,900	SFCWA Funding: \$158,175
Partners: USGS Cooperative Water Program, USGS Bay-Delta Program, USGS Western Region	



Site Map and Station Locations

Introduction

Monitoring habitat quality in the San Francisco Estuary (SFE) and Sacramento-San Joaquin Delta (Delta), in a way that fully characterizes the physical and biogeochemical variability has been limited to mostly monthly discrete measurements of biologically relevant parameters (e.g. phytoplankton, dissolved organic matter (DOM), nutrients). Monthly surveys often miss key events and are biased by the tidal stage under which sample collection occurred. Continuous measurements are needed to characterize complex, tidally dependent variance in food web dynamics that influences the river-estuarine ecosystem and its capacity for productivity. Establishing a continuous monitoring station to measure key habitat-quality characteristics and food-web effects is fundamental to establish relationships to flow, and determining effects of wetland restoration efforts in the Yolo Bypass region of the Delta. Yolo Bypass, situated within the North Delta/Cache Slough/Liberty Island complex, provides natural habitat to fish and wildlife species in the Delta.

Implementation of the Yolo Ranch restoration within the Cache Slough complex, has the potential to change the magnitude of current processes in the region, because it will change the size of the tidal exchange, and thus, alter the timing and rates of nutrient utilization. Given the multiple timescales of the processes that shape the aquatic habitat, a long period of baseline measurements is needed against which to compare conditions following implementation of the wetland restoration project. Establishing a continuous monitoring station to quantify fluxes and characterize conditions in real time to measure key habitat-quality characteristics and food-web effects at Liberty Cut will form the basis of the comparison. This proposed work at Liberty Cut, in Liberty Island, will provide data that captures short and long term variability in habitat quality, helping to identify hydrologic and biogeochemical conditions which drive the environmental health of the estuary, and provide means to assess multiple interacting drivers of habitat quality and ecosystem change.

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Objective

A continuous monitoring station will be established at Liberty Cut and incorporated into the existing enhanced Delta Flow and Turbidity network (<http://www.baydeltalive.com/>). The Liberty Cut station will provide a necessary biogeographic link to existing continuous time-series stations south of the proposed location in the lower Sacramento River Delta at Decker Island (USCG Channel Marker 17,), Cache Slough (at Ryer Island), and the mouth of Liberty Island (Moored Buoy). Measurements will include acoustic velocity, DOM, nutrient, and particle sensors (e.g turbidity and pigment) similar to stations already in operation. All sensors will be calibrated for tracking trends in the integrity of the instrumentation. Standard temperature and optical corrections will be applied and deionized, organic-free water blanks will be subtracted from sensor values where necessary. Servicing and cleaning of equipment will occur on 3 to 4 week timespans to avoid biofouling and maintain data integrity. At the same time, discrete samples for DOM and nutrients (e.g. dissolved organic carbon, nitrate, ammonium and soluble reactive phosphate) will be taken to provide vicarious calibration of the sensors. Sensor data will be transmitted via a cellular modem to Loggernet servers at the USGS California Water Science Center and made publicly available through USGS NWIS servers. Data will be flagged as provisional until data is quality assured by project PI's. Several steps will be programmed into the field data loggers to permit real-time assessment of system performance by the project PIs.

Results

We will provide a report resulting from our analysis of current flow data in Liberty Island/Liberty Cut (tentatively titled: Flow analysis at Liberty Cut) and additionally, quarterly reports describing hydrology, nutrient cycling, turbidity, chlorophyll-*a*, and dissolved organic matter measured continuously at Liberty Cut to the cooperator. Other deliverables for the project include the real-time accessible data via NWIS/NWISweb, CDEC and Bay Delta Live. We anticipate oral and poster presentations on results of water quality monitoring from the work at Liberty Cut nationally as well as presentations at local workshops and regional meetings, such as the Interagency Ecological Program (IEP) workshops, held in Folsom, CA.

Conclusions

High frequency, continuous measurements of nitrate, chlorophyll-*a*, phycocyanin and DOM fluorescence provide an essential database for interpreting environmental change against the background of climate and anthropogenic impacts on the Delta. Further, understanding baseline concentrations and flux monitoring in Liberty Cut will help assess current conditions and evaluate conditions following implementation of wetland restorations in the lower Yolo Bypass area in Liberty Island. Continuous measurements in the Delta have provided important information on the timing, drivers, and mechanisms influencing nutrient cycling, food web dynamics and contaminant transport. Continuous measurements at Liberty Cut will expand our knowledge of important processes as well as provide increased understanding of potential benefits of wetland restoration.

Relevance

The proposed monitoring station at Liberty Cut will provide a necessary biogeographic link to existing continuous time-series stations south of the proposed location in the lower Sacramento River Delta at Decker Island (USCG Channel Marker 17), Cache Slough (at Ryer Island), and the mouth of Liberty Island (Moored Buoy). Measurements will include acoustic velocity, DOM, nutrient, and particle sensors (e.g turbidity and pigment) similar to stations already in operation. This project addresses ecosystem and climate strategic directions in the USGS Science Plan, for example 'Understanding Ecosystems and Predicting Ecosystem Change' as well as 'Climate Variability and Change' (U.S. Geological Survey 2007).

Next Steps

Study results will be used to interpret continuous monitoring data in Delta habitats and guide wetland restoration in the Delta. Future studies will use results to develop quantitative models of wetland support of pelagic habitats. In conjunction with future environmental monitoring data (such as that provided by the SFWCA-supported Liberty Cut monitoring station) these models will be used to monitor and evaluate the efficacy of shallow water tidal wetland restoration on pelagic food supplies and habitat quality.