

COASTAL CONSERVANCY

Staff Recommendation

October 1, 2015

**ASSESSING SEDIMENT DYNAMICS AND SALT MARSH SUSTAINABILITY
IN HUMBOLDT BAY**

15-016-01

Project Manager: Joel Gerwein

RECOMMENDED ACTION: Authorization to accept \$372,984 in federal grant funds from the U.S. Environmental Protection Agency, and to contract with the U.S. Geological Survey, the University of California at Los Angeles, and the University of California Sea Grant Extension to assess sediment supply, sediment contaminants, water quality, and salt marsh sustainability in Humboldt Bay in Humboldt County.

LOCATION: Humboldt Bay, Humboldt County

PROGRAM CATEGORY: Climate Change, Coastal and Marine Resource Protection

EXHIBITS

Exhibit 1: [Project Location](#)

Exhibit 2: [Project Letters](#)

RESOLUTION AND FINDINGS:

Staff recommends that the State Coastal Conservancy adopt the following resolution pursuant to Chapter 5.5 and Section 31113 of the Public Resources Code:

“The State Coastal Conservancy hereby authorizes the acceptance of \$372,984 (three hundred seventy-two thousand nine hundred and eighty-four dollars) in federal grant funds from the U.S. Environmental Protection Agency (EPA) to assess sediment supply, sediment contaminants, water quality, and salt marsh sustainability in Humboldt Bay. The Conservancy further authorizes the disbursement of this amount for contracts with the U.S. Geological Survey (USGS), the University of California at Los Angeles (UCLA), and the University of California Sea Grant Extension (UC Sea Grant) to accomplish the assessment.

Prior to the Conservancy’s disbursement of funds, the respective contractors shall submit for the approval of the Conservancy’s Executive Officer the names and qualifications of any subcontractors to be employed; and evidence that all permits, approvals, and any access agreements necessary for the work have been obtained.”

Staff further recommends that the Conservancy adopt the following findings:

“Based on the accompanying staff report and attached exhibits, the State Coastal Conservancy hereby finds that:

1. The proposed authorization is consistent with Chapter 5.5 (Coastal and Marine Resource Protection) and Section 31113 (climate change) of Division 21 of the Public Resources Code.
 2. The proposed project is consistent with the current Conservancy Project Selection Criteria and Guidelines.”
-

PROJECT SUMMARY:

Under the proposed authorization, the Conservancy would contract with the USGS, UCLA, and UC Sea Grant to conduct research regarding sediment dynamics in Humboldt Bay to help assess the sustainability of tidal marsh and other tidal habitats in the face of anticipated sea level rise (SLR) caused by climate change, and to communicate research findings to resource managers in the region. Funding would be provided by a \$372,984 EPA Wetland Program Development Grant to the Conservancy, of which \$357,037 would pay for contracted work by USGS, UCLA, and UC Sea Grant. The remaining grant funds (\$15,947) would pay for the Conservancy’s project management costs.

Humboldt Bay’s tidal wetlands are a key part of an important estuarine ecosystem, providing rearing habitat for threatened salmonids and nurseries for a diversity of fish and wildlife that feed the Bay with their high productivity. Management planning for existing tidal marshes and wetland restoration prioritization and design in Humboldt Bay are hampered because key information about sediment dynamics in the estuary is lacking. Sediment dynamics are critical to understanding the resiliency of existing wetlands and potential restored wetlands to SLR. Because certain sites in the Bay are accreting while others are eroding, information on sediment dynamics is important to determine where sediment can be beneficially reused to enhance or restore wetlands.

Our current understanding of sedimentary processes in the upper intertidal zone is extremely limited. A climate change workshop held by the USGS in October, 2014 for the Humboldt Bay estuary identified sediment information as a key science need for managers to plan and implement climate change adaptation measures. Critical data are lacking in Humboldt Bay regarding sediment supply, turbidity, vertical marsh accretion, and impacts related to climate change, although such measurements are necessary for assessing marsh health and sustainability. These data are needed to determine the resiliency of existing wetlands and planned wetland restorations to SLR.

Marsh resilience to sea level rise is governed by sediment accretion. If sediment accretes on marshes at the same rate as SLR, marshes can remain in place, at least until sea level overtops shoreline protection structures that may be present on their landward side. Sediment accretion is dominated by inorganic sedimentation, which is the deposition of inorganic sediment transported by the bay and its tributaries. An additional factor in sediment accretion is organic matter accumulation that results primarily from the growth of marsh plants.

The assessment will include baseline data collection, monitoring protocols, and watershed modeling to guide resource management decisions relevant to salt marsh sustainability under current and future climate conditions. Specific work products will include: 1) vertical marsh accretion rates under pre-historic, historic and current conditions and continuous water quality data (turbidity, salinity, water temperature) within reference Humboldt Bay marshes; 2) projections of precipitation, air temperature, and suspended sediment supply from watershed sources under future climate conditions; 3) physical data and monitoring protocols to guide salt marsh management and prioritization of conservation and restoration efforts; and 4) a white paper presenting the management implications of project findings. The project will prioritize interpretation and dissemination of research results to land managers and resource agencies, to ensure that research findings will be applied to wetland management. Results will be disseminated through 1) in-person presentations at one or more local workshops to disseminate findings to stakeholders and managers and at a national conference to place the findings in a larger regional picture, 2) publicly available physical data relevant to sustainable salt marsh management in Humboldt Bay, 3) a USGS interpretive report, and 4) a white paper prepared by UC Sea Grant, with assistance from USGS and the Conservancy, describing the management implications and summary of findings.

Project outcomes are expected to include: 1) improved understanding of the current health and condition of Humboldt Bay salt marshes in terms of organic matter accumulation and inorganic sedimentation, which are the two main components of vertical marsh accretion; 2) improved prioritization of marsh restoration and protection in light of SLR impacts; and 3) increased understanding of how climate change and SLR will affect Humboldt Bay marsh sustainability. This project will directly inform the design of restoration and adaptation projects currently in the planning process, such as Arcata's Living Shoreline Project, funded through a Conservancy Climate Ready grant, and Eureka's proposed restoration of the Elk River Estuary.

Four reference salt marsh sites will be monitored during the 2-year data collection period (Exhibit 1). Two existing sites are located in the western region of Arcata Bay and two sites will be selected in the eastern region of the South Bay with input from local land managers. The USGS established the two Arcata Bay sites in 2008 and 2010 and there are three potential South Bay sites established by the USGS in 2010 and 2011. This proposal will support on-going work at the Arcata Bay sites and at two South Bay sites. Elevation and vegetation surveys and continuous monitoring of water levels, salinity and water temperature are available for all of the sites, and preliminary marsh accretion data are available at the Arcata Bay sites. Pre-historic, historic and current accretion rates (organic matter and sediment) will be estimated at each of the four reference salt marshes. Water levels, salinity and water temperatures will continue to be collected at all four sites. Due to the large expense of collecting and calibrating continuous turbidity data, one Arcata Bay site and one South Bay site will be selected by USGS for this effort.

In addition to the monitoring and data analysis at four Humboldt Bay sites, modeling will be undertaken to predict future climate (temperature and precipitation) and sediment supply for the Humboldt Bay region. An existing water balance model will be calibrated to represent local hydrologic conditions and a time series of daily streamflow will be developed for all watersheds contributing suspended sediment to Humboldt Bay, including the Eel River. The model will be developed using available high-resolution geospatial and historic climate data. Model inputs include precipitation, air temperature, and potential evapotranspiration calculated using solar

radiation, topographic shading, and cloudiness. Watershed parameters include soil properties and shallow bedrock permeability. Suspended-sediment concentrations and streamflow data are available from USGS gauges within the Eel River watershed and non-USGS stations within the Humboldt Bay watershed. The water balance model will be calibrated to available streamflow data and a mathematical relationship between streamflow and suspended-sediment concentrations will be defined for each source watershed, producing an estimate of sediment supply for current conditions. The water balance model will be used to estimate streamflow and sediment supply to Humboldt Bay for a suite of future climate conditions.

Scientists from UCLA, two USGS offices (California Water Science Center and Western Ecological Research Center), and UC Sea Grant will undertake the main work. The Conservancy will provide project oversight and contract administration. UCLA will estimate long term marsh accretion rates. USGS will collect and analyze continuous water quality data, monitor marsh accretion under current conditions, model watershed sediment supply under current and future conditions and will prepare a project report for the Conservancy, UC Sea Grant, and the Water Board. The Conservancy will work with UC Sea Grant to ensure local stakeholder input in project design, and to facilitate distribution of project results to the local community, agencies and managers. The Conservancy and UC Sea Grant will work together to produce a white paper describing management implications and a summary of findings. Conservancy staff expect to distribute project results to agencies and managers statewide. The Conservancy and UC Sea Grant are working together currently to prepare a SLR Adaptation Plan for the Humboldt Bay region. Other agencies performing related work include the North Coast Regional Water Quality Control Board (NCWQCB) and the Department of Water Resources, which maintain gaging and Total Suspended Sediment (TSS) data collection stations on the Elk River and Eel River. The NCWQCB is also calculating a storm-based TSS regression.

The UC Sea Grant Extension Specialist in Eureka, Mr. Joe Tyburczy, will help to coordinate the work of the various contractors. Mr. Tyburczy is a marine ecologist, and has been coordinating meetings of the Humboldt Bay Initiative, bringing together federal, state and local agencies with scientists and non-governmental organizations to advance ecosystem-based management of the Humboldt Bay region. As such, Mr. Tyburczy and UC Sea Grant are highly qualified to help the Conservancy communicate the results of this project to resource managers in the region.

Site Description: Humboldt Bay is located approximately 265 miles north of San Francisco, California, and approximately 250 miles south of Coos Bay, Oregon, in the heartland of California's majestic Redwood forest region (Exhibit 1). The Humboldt Bay watershed includes rolling farmlands, scenic beaches and dunes, creeks, lush woodlands, and diverse wetlands.

Humboldt Bay has numerous ecosystems that are home to many plant and animal species, including several classified as endangered or threatened under federal or state law. The biota associated with Humboldt Bay is diverse and ecologically significant at scales ranging from a local focus on fisheries and algal uses by local residents to a participation in hemispheric ecological patterns such as shorebird and waterfowl migration. The Bay hosts over 100 plant species, 300 invertebrate species, 100 fish species, and 200 bird species, including those that rely on the bay as they travel the Pacific Flyway. Recent studies indicate the importance of the Bay in the life cycles of commercially and recreationally important fish species, and the general level of biological vitality in the Bay has been identified as an important aesthetic and quality-of-life variable for both residents and visitors to the area. During the late-nineteenth and early twentieth

centuries, diking and filling reduced Bay salt marshes from an estimated 9,000 acres to only 900 acres today. Bay habitat has been further disturbed by discharges of agricultural and urban runoff, industrial and recreational uses, and colonization by invasive cordgrass.

Humboldt Bay's bountiful aquatic organisms support commercial and sport finfishing and shellfishing, and the Bay supports many other water-dependent and water-related activities. Tourism and recreation are central to Humboldt County's local economy, including businesses such as restaurants and marinas that cater to recreational fishermen, birders, boaters, bathers, hunters, and nature enthusiasts. Both residents and visitors enjoy the numerous ecological, cultural, and economic assets of Humboldt Bay. The population of Humboldt Bay is approximately 80,000, divided between Eureka, in the central portion of the Bay, Arcata, located on Humboldt Bay's northern section, and several unincorporated communities around the Bay.

Project History: The Conservancy has engaged multiple partners to plan for habitat protection and restoration and climate change adaptation in Humboldt Bay. In 2012, the Conservancy granted \$250,000 to UC Sea Grant to collaborate with the County of Humboldt, the Cities of Eureka and Arcata, and land management agencies on a regional SLR Adaptation Plan. In January 2012, the Conservancy granted \$85,000 to the Humboldt Bay Harbor District to evaluate the feasibility of using dredged materials for tidal marsh restoration and climate change adaptation projects. In 2010, the Conservancy contracted with Trinity Associates to map shoreline protection around Humboldt Bay to inform climate change adaptation planning. In 2006, the Conservancy made two grants to California Sea Grant for natural resource management planning: \$75,000 to support the development of a Humboldt Bay Ecosystem Based Management (EBM) Program, and \$115,000 to prepare a Subtidal and Intertidal Habitat Goals Project.

In addition, the Conservancy has made numerous grants to support the planning and implementation of tidal marsh restoration projects in Humboldt Bay and the Eel River Delta, including most recently grants in 2015 to support the White Slough Restoration Project, in 2013 to support the Eel River Estuary Preserve Restoration, in 2012 to support the McDaniel Slough Restoration, in 2011 to support the Salt River Restoration, and in 2006 to support the Arcata Baylands Restoration.

Conservancy staff has been working with USGS since Winter 2014 to develop the project.

PROJECT FINANCING

U.S. EPA	\$372,984
Project Total	\$372,984

The EPA will contribute up to \$372,984 towards the project, including up to \$15,947 to cover Conservancy costs for project management. In addition, UCLA is contributing \$8,790 in staff time, the Department of Water Resources will operate, maintain, and collect and analyze data from its gauges in the Eel River over the two years of the project, an in-kind contribution valued at \$54,800. The North Coast Regional Water Quality Control Board (NWQCB) will make a similar in-kind contribution, operating, maintaining, collecting and analyzing data from its gauges

on the Elk River over the life of the project. The NCWQCB's contribution is valued at \$54,000. The Conservancy is contributing its indirect costs of approximately \$7,176 towards the project.

CONSISTENCY WITH CONSERVANCY'S ENABLING LEGISLATION:

This project would be undertaken pursuant to Chapter 3 (Section 31113) of the Conservancy's enabling legislation, Division 21 of the Public Resources Code, regarding climate change. Consistent with Section 31113(a), this project would address potential impacts of sea level rise on tidal marshes within the Conservancy's jurisdiction.

Uncodified Section 1 of Chapter 611, Stats. 2012 (S.B. 1066 Lieu) provides additional information regarding the intent of Section 31113 discussed above. Section 1(k) states that the projects that protect coastal resources from climate change impacts can provide additional valuable public benefits, including, but not limited to, flood protection, improved water quality, and increases in fish and wildlife for food and recreation. Section 1(q) notes that the Conservancy's participation in addressing climate change can contribute to the resiliency of natural and built environments. Section 1(r) states that, "To the extent that this act assists the Conservancy in obtaining federal and other funds, it may help reduce demand on the General Fund for coastal improvement and resilience activities." Consistent with Section 1, the project involves the acceptance of federal funds for a project that will enable resource managers to increase the resiliency of coastal wetlands through an improved understanding of sediment dynamics.

This project also would be undertaken pursuant to Chapter 5.5 (Section 31220) of the Conservancy's enabling legislation, Division 21 of the Public Resources Code, regarding integrated coastal and marine resources protection. Section 31220 authorizes the Conservancy to undertake and award grants for projects that meet one or more criteria of Section 31220(b). Consistent with Section 31220(b)(3), the proposed project aims to reduce threats to coastal and marine fish and wildlife by assessing risks and vulnerability from impacts of projected sea level rise on the natural and manmade assets of Humboldt Bay and identify adaptation strategies to address these threats. Consistent with Section 31220(b)(6), the proposed project will facilitate restoration of coastal wetlands by providing critical information regarding the resiliency of tidal marshes to SLR.

Section 31220(c) requires that projects funded under Section 31220 be consistent with the Integrated Watershed Management Program established under Public Resources Code Section 30947, local watershed management plans, if available, and water quality control plans adopted by the State Water Resources Control Board and regional water quality control boards; and include a monitoring and evaluation component. As discussed in detail below under "Consistency with Local Watershed Management Plan/State Water Quality Control Plan," the proposed project is consistent with local and state watershed plans. In addition, the project includes a monitoring and evaluation component. Consistent with Section 31220(a), which requires consultation with the State Water Resources Control Board (SWRCB) to ensure consistency with Chapter 3 (commencing with Section 30915) of Division 20.4 of the Public Resources Code, staff has notified the SWRCB of the nature of the project and provided the opportunity for comment, input and review.

Section 31104 authorizes the Conservancy to apply for and accept federal grants. Consistent with this Section, the Conservancy would accept a grant from the US EPA to fund the project.

CONSISTENCY WITH GOALS & OBJECTIVES OF THE CONSERVANCY'S 2013 STRATEGIC PLAN, AS REVISED JUNE 25, 2015:

Consistent with **Goal 7, Objective 7A** of the Conservancy's 2013-2018 Strategic Plan, the proposed project involves working with public agencies and universities to identify and clarify significant climate-related threats, management challenges and priority technical assistance needed to maintain resilient natural resources, and the coastal community which depends on them.

CONSISTENCY WITH CONSERVANCY'S PROJECT SELECTION CRITERIA & GUIDELINES:

The proposed project is consistent with the Conservancy's Project Selection Criteria and Guidelines, last updated on October 2, 2014, in the following respects:

Required Criteria

1. **Promotion of the Conservancy's statutory programs and purposes:** See the "Consistency with Conservancy's Enabling Legislation" section above.
2. **Consistency with purposes of the funding source:** See the "Project Financing" section above.
3. **Promotion and implementation of state plans and policies:** The Project will help implement two priority actions identified in the 2014 *California Water Action Plan* (CWAP):

Action 4: Protect and Restore Important Ecosystems. The Project will implement this action by assessing SLR threats to tidal marshes in an estuary that provides valuable fish and wildlife habitat, and recommending management actions to address the threat.

Action 8: Increase Flood Protection. The CWAP calls for action to address flooding threats due to aging levee infrastructure and sea level rise due to climate change. The Project will further this action by informing the design of living shoreline projects to increase flood protection that depends on sediment accretion to keep pace with SLR.

The Project will help implement Priority Action 3 in the 2015 *Safeguarding California Implementation Plan for Ocean and Coastal Ecosystems and Resources*. Action 3 calls for an improved understanding of climate impacts on ocean and coastal ecosystems and resources. The project will improve understanding of the threat from SLR to tidal marshes.
4. **Support of the public:** The project enjoys broad public support (Exhibit 2), and addresses a priority data gap that has been identified by land managers in the Humboldt Bay region. (The attached support letters are addressed to the US EPA in support of the Conservancy's grant proposal for the project.)
5. **Location:** The proposed project would be located within the coastal zone of Humboldt County.
6. **Need:** The project could not occur without the Conservancy's role as a state agency sponsor to work with the EPA Wetland Program Development Initiative.

7. **Greater-than-local interest:** The proposed project will enable improved management and SLR adaptation of tidal marsh in Humboldt Bay, which provides plant and wildlife habitat of regional and statewide importance for resident and migratory species.
8. **Sea level rise vulnerability:** The project will enable increased resiliency to SLR by providing critical information and analysis to clarify the sustainability of tidal marsh in Humboldt Bay in the face of SLR.

Additional Criteria

9. **Urgency:** Planned tidal marsh restoration projects involving large public investments will benefit significantly from prompt implementation of this project, allowing its guidance to be incorporated into restoration plans.
10. **Leverage:** See the “Project Financing” section above.
11. **Readiness:** Project partners are prepared to begin implementation in October 2015.
12. **Realization of prior Conservancy goals:** See “Project History” above.
13. **Cooperation:** Nonprofit groups, state and federal agencies are providing significant contributions to the project, as discussed in “Project Financing” above.
14. **Vulnerability from climate change impacts other than sea level rise:** The project will account for projected changes in temperature and precipitation in modeling changes to sediment supply.

CONSISTENCY WITH LOCAL COASTAL PROGRAM POLICIES:

The proposed project area falls within the jurisdiction of the Local Coastal Programs (LCP) of the City of Eureka, County of Humboldt, and the City of Arcata. Consistency with the LCP for each of these jurisdictions is discussed below. The Humboldt Bay Area Plan (HBAP) of the Humboldt County Local Coastal Program (LCP), certified by the California Coastal Commission in 1982, supports planning to protect environmentally sensitive habitats, such as coastal marshes at risk from sea level rise, and to protect property and residents. The HBAP cites Section 30240(a) of the California Coastal Act, stating that “environmentally sensitive habitat areas shall be protected against any significant disruption of habitat values” (HBAP Section 3.30, p. 38). In addition, the HBAP stresses the tremendous value of salt marsh, brackish marsh, and other natural habitats for fish and wildlife in Humboldt Bay (HBAP, Section 3.30(A), pp.39-40). The County’s updated Draft General Plan includes the following policy:

S-P27. Pre-disaster Planning and Mitigation. The County shall proactively reduce known hazards through pre-disaster planning and mitigation efforts. (ibid, pg 14-18)

The proposed project is also consistent with resource protection and hazard mitigation policies in the City of Arcata’s certified LCP and the City of Eureka’s certified LCP. Section D of the City of Arcata’s LCP, regarding wetlands and riparian resources, provides for the establishment of Wetland Buffer Areas to protect sensitive wetlands. The City of Arcata’s General Plan contains the following policy:

RC-1a Maintain Biological and Ecological Integrity. Maintaining ecological balance, system function, biological integrity, and natural diversity is the

primary focus of the Resource Conservation and Management Element. Protecting ecological functions of natural habitats, and natural drainage and infiltration processes, will enhance natural ecosystems in the Planning Area....An "adaptive management" approach shall be utilized to maintain ecological and biological integrity, including monitoring the status of ecological systems in the City and adjusting City implementation of this Plan, in order to more closely approximate the conditions provided in the Planning Area's least-disturbed natural ecosystems. (Arcata General Plan 2008, pg. 4-24)

The City of Eureka's 1997 General Plan Policy Document (GPPD), which was certified by the Coastal Commission as an update to the City of Eureka's LCP in 1999, contains several policies consistent with the project. The GPPD designates wetlands as environmentally sensitive habitat areas (GPPD Section 6.A.6, pg. B-15) and states that the City of Eureka "shall ensure that environmentally sensitive habitat areas are protected against any significant disruption of habitat values, and that only uses dependent on such resources shall be allowed within such areas"

(GPPD Section 6.A.7, pg. B-15). The GPPD also states that the City of Eureka "shall maintain and, where feasible, restore biological productivity and the quality of coastal waters, streams, wetlands, and estuaries" (GPPD Section 6.A.1, pg. B-14).

**CONSISTENCY WITH LOCAL WATERSHED MANAGEMENT PLAN/
STATE WATER QUALITY CONTROL PLAN:**

Projects undertaken pursuant to Chapter 5.5 of Public Resources Code Division 21 (Section 31220) must be consistent with local watershed management plans, if available, and with water quality control plans, adopted by the state and regional water boards. The proposed project is consistent with the Water Quality Control Plan for the North Coast (adopted by the Regional Water Quality Control Board North Coast Region in 1988 and last updated in 2007) in that it constitutes an important step towards the protection and enhancement of wildlife habitat, habitat for rare, threatened and endangered species, and estuarine habitat in Humboldt Bay. The Water Quality Control Plan for the North Coast designates wildlife habitat, rare, threatened, and endangered species habitat, and estuarine habitat as beneficial uses of Humboldt Bay (Water Quality Control Plan for the North Coast, Table 2-1, pp. 2-8 to 2-12).

The proposed project is also consistent with the North Coast Integrated Regional Water Management Plan, Phase I (NCIRWMP) (2007). Objective 1 of the NCIRWMP is to "conserve and enhance native salmonid populations by protecting and restoring required habitats, water quality and watershed processes." Consistent with Objective 1, the project will facilitate planning for the protection of tidal marshes and other habitats in Humboldt Bay that provide valuable habitat for salmonids.

The Harbor District adopted the Humboldt Bay Management Plan (HBMP) in 2007, which includes the following policy related to planning to accommodate sea level rise.

HSM-7: Identify needs for potential shoreline improvements necessary to accommodate bay water surface elevation changes, including potential effects of climate change

Policy: The District shall consult with the County of Humboldt, the City of Arcata, the City of Eureka, other affected local agencies, relevant state and federal agencies, and affected local parties to identify the potential effects on the Humboldt Bay shoreline and nearby areas that may occur because of meteorological or climate-related water surface-level fluctuations in the bay prior to the year 2050. Based upon these consultations, the District and other affected parties shall develop a plan that identifies any necessary shoreline alterations or maintenance programs needed to accommodate the water-level fluctuations. The District shall adopt findings with respect to the contents and recommendations of this plan when approving District operational programs or when approving any application for project approval submitted to the District. (HBMP 2007, pg. 169)

COMPLIANCE WITH CEQA: The proposed project is categorically exempt from the California Environmental Quality Act (CEQA), pursuant to 14 California Code of Regulations Section 15306. Consistent with Section 15306, the project will only involve basic data collection, research, and resource evaluation activities that will not result in a serious or major disturbance to an environmental resource. Project activities are part of a study that may lead to future actions which a public agency has not yet approved, adopted, or funded. Upon approval, staff will file a Notice of Exemption for this project.