

## **Sacramento District Regulatory in the Sacramento San Joaquin Delta**

Kahtleen Dadey, USACE, kathleen.a.dadey@usace.army.mil

The Regulatory Division of the Sacramento Corps of Engineers evaluates permit applications under Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act. The former is intended primarily to ensure navigability; the purpose of the latter is to “restore and maintain the chemical, physical and biological integrity” of waters of the United States. Section 10 authority extends to all tidal waters, thus includes the entire Sacramento-San Joaquin Delta – and all navigable waters are waters of the U.S. All work in navigable waters is regulated under Section 10, whereas Section 404 regulates discharges into waters.

In the past five years, the Sacramento District has issued over 300 authorizations, permit modifications and extensions in the Delta. Moreover, the District has investigated numerous un-permitted activities and compliance issues throughout our area of responsibility in the Delta. Authorized projects have included roads and bridges, residential development, dredging of ports and marinas, mitigation and conservation banks, pipelines, bank stabilization, maintenance activities, monitoring and geotechnical surveys, scientific research, emergency work and restoration activities. Currently under evaluation by the District are substantial and controversial proposals such as the Bay Delta Conservation Plan Delta barriers, as are relatively minor activities like private recreational docks and bank stabilization.

The Corps has two different types of permit authorizations – individual (standard and “letters of permission”) and general (nationwide and regional) permits. The Corps Regulatory’s goal is protect the Nation’s aquatic resources, while allowing reasonable development, through fair, flexible and balanced permit decisions. We look forward to working with applicants, the fish resources agencies (USFWS and NMFS), the State Historic Preservation Office and Regional Water Quality Control Boards to ensure sustainable projects. Talk with us.

**Keywords:** Regulatory, Clean Water Act, Wetlands

**Poster topic:** Human Consequences

## Improving Communication of Fish Consumption Advisories in the Bay Delta System

Matt Douraghi, CSU East Bay, matt.douraghi@cdph.ca.gov

Lauren Joe, California Department of Public Health, lauren.joe@cdph.ca.gov

Nancy Lopez, Sequoia Foundation, nancy.lopez@cdph.ca.gov

Duyen Kauffman, Sequoia Foundation, duyen.kauffman@cdph.ca.gov

Alcira Dominguez, California Department of Public Health,  
alcira.dominguez@cdph.ca.gov

Huyen Tran Pham, OEHHA, huyen.tran.pham@oehha.ca.gov

Margy Gassel, OEHHA, margy.gassel@oehha.ca.gov

Robert Brodberg, OEHHA, robert.brodberg@oehha.ca.gov

Alyce Ujihara, California Department of Public Health, alyce.ujihara@cdph.ca.gov

Human exposure to mercury from consumption of contaminated fish is a significant problem in the Bay-Delta system. Due to historic mercury and gold mining, some fish contain high levels of mercury, a neurodevelopmental toxin. Yet fishing for consumption is popular throughout the watershed. The fishing populations are highly diverse and include immigrants and non-English speakers. Fish consumption advisories have been issued for many water bodies in the watershed. While the advisories provide important information on the species and quantities that are safe to eat, the information is often complex and difficult for some fish consumers to understand. As a result, they may lack the information they need to follow the advisories and protect their health.

The goal of this project is to improve comprehension of advisories by designing and testing educational materials that can be understood by low-literacy audiences. Our approach is to conduct in-depth interviews in English as well as other languages with ethnically diverse fish consumers with recruitment assistance from community-based organizations in the Bay-Delta region. Using qualitative analysis of interview responses, we are identifying common themes among responses and developing recommendations for improving the effectiveness of the materials. Preliminary results show that fish consumers have difficulty identifying the correct advice for their own population group (advisories for children and women 18-45 are more restrictive than advisories for men and older women). New formats are being tested to help fish consumers identify their population group.

Our findings aim to improve comprehension of advisories by low-literacy fish consumers in order to reduce their exposure to contaminants from Bay-Delta fish. The new formats will be used by state agencies and other organizations to improve communication of fish consumption advisories in the Bay-Delta system to affected populations.

**Keywords:** Fish Advisories, Mercury, Communication

**Poster topic:** Human Consequences

## Local Ballot Measures Provide Opportunities for Funding Multiple Stressors Management

Emma Freeman, PPIC, [freeman@ppic.org](mailto:freeman@ppic.org)

Caitrin Chappelle, PPIC, [chappelle@ppic.org](mailto:chappelle@ppic.org)

The Bay-Delta ecosystem is in a state of serious decline due to multiple stressors such as flow regime change, physical alterations, invasive species, poor fish management, and pollutant discharges. Effective, integrated, and sustainable management of these stressors is costly and will require funding from diverse sources beyond state and federal dollars. Local ballot measures provide an opportunity to raise funds that address these challenges, but they often face significant hurdles in obtaining voter approval. A recent PPIC report, “Paying for Water in California”, found that 84% of funding for the water system (including water supply, wastewater, flood protection, stormwater management, and aquatic ecosystem management) comes from local entities. State law requires that local funding in some of these areas (floods, stormwater, and most ecosystem spending) be submitted to voters for approval. We analyzed measure content, geographical and temporal patterns, type of funding mechanisms, and passage rates for local water-related ballot measures from 1995 to today. Measures that combined funding for issues like street maintenance or police services, in addition to water, have a higher passage rate (89%) than those focused more narrowly on water issues only (65%). These multi-issue measures have increased in recent years, which has improved chances of passage, but perhaps with less money designated specifically for water needs. The Bay-Delta region had a higher number of measures proposed and a higher passage rate (82%) relative to the state as a whole (72%). Our findings suggest that obtaining local or regional funds for stressor management in the Bay-Delta – especially stormwater and habitat restoration – remains challenging.

**Keywords:** stressors, funding, ballot, local management, water finance, Bay-Delta, stormwater, habitat

**Poster topic:** Human Consequences

## **Fishing for the Right Message: Community Involvement in Reducing Human Exposure to Mercury in Delta fish**

Lauren Joe, California Department of Public Health, [lauren.joe@cdph.ca.gov](mailto:lauren.joe@cdph.ca.gov)

Alcira Dominguez, California Department of Public Health,  
[alcira.dominguez@cdph.ca.gov](mailto:alcira.dominguez@cdph.ca.gov)

Maha Abdelaziz, California Department of Public Health, [maha.abdelaziz@cdph.ca.gov](mailto:maha.abdelaziz@cdph.ca.gov)

Kathryn Kynett, Sacramento - San Joaquin Delta Conservancy,  
[Kathryn.Kynett@deltaconservancy.ca.gov](mailto:Kathryn.Kynett@deltaconservancy.ca.gov)

Shakoora Azimi-Gaylon, Sacramento - San Joaquin Delta Conservancy, [Shakoora.Azimi-Gaylon@deltaconservancy.ca](mailto:Shakoora.Azimi-Gaylon@deltaconservancy.ca)

Janis Cooke, California Water Resources Control Board, [Janis.Cooke@waterboards.ca.gov](mailto:Janis.Cooke@waterboards.ca.gov)

Alyce Ujihara, California Department of Public Health, [alyce.ujihara@cdph.ca.gov](mailto:alyce.ujihara@cdph.ca.gov)

Due to historic mercury and gold-mining activities, elevated levels of mercury in fish are present throughout the Sacramento-San Joaquin Delta, where fishing is common. Delta fish consumers are a diverse multilingual population that may be exposed to harmful levels of mercury by consuming contaminated catch. Fish consumption advisories detailing the specific types and amounts of Delta fish that can be safely eaten have been issued, but disseminating the advice so that it is understandable by the diverse communities in the Delta requires focused efforts.

Because it will take many years to reach the mercury clean-up goals, the Central Valley Regional Water Quality Control Board is initiating the Delta Mercury Exposure Reduction Program (Delta MERP), a multi-agency effort over several years to reduce human exposure to mercury from eating fish caught in this area. The Delta MERP will raise awareness about fish contamination in the Delta and encourage actions that will reduce mercury exposure in affected communities.

For 2014-15, Delta MERP activities will include convening a stakeholder advisory group to solicit input on project activities; implementing a small grants program to fund community-based education projects aimed at reaching affected populations; developing and distributing multilingual educational materials; conducting training to raise awareness and understanding of fish contamination issues in the Delta to local groups; and promoting collaboration with local programs to include messages and activities on fish contamination.

Exposure reduction activities that are guided and carried out by local groups in the Delta are integral in the overall picture of Bay-Delta management. These activities, in addition to the mercury clean-up efforts, create a well-rounded approach for protecting public health immediately and in the future. Challenges and successes experienced in the Delta MERP activities will provide guidance to future exposure reduction efforts.

**Keywords:** Mercury, Fish, consumers, Community involvement, Public health, Delta, MERP

**Poster topic:** Human Consequences

## Novel Technique for Assessing Ammonium Utilization by Phytoplankton in the San Francisco Bay-Delta Estuary

Calla Schmidt, University of San Francisco, cischmidt@usfca.edu

Carol Kendall, US Geological Survey, ckendall@usgs.gov

Megan Young, US Geological Survey, mbyoung@usgs.gov

Steve Silva, US Geological Survey, srsilva@usgs.gov

High concentrations of  $\text{NH}_4^+$  in the San Francisco Bay-Delta Estuary (SFE) have been hypothesized to inhibit the growth of phytoplankton, which are an important food source to zooplankton at the base of the pelagic food web. The primary goal of this research is to use stable isotope approaches to distinguish  $\text{NH}_4^+$  and  $\text{NO}_3^-$  assimilation at the base of the food web in a portion of the Sacramento River where  $\text{NH}_4^+$  concentration is elevated downstream of the Sacramento Regional Wastewater Treatment Plant (SRWTP). To examine the form of nitrogen assimilated by phytoplankton *in situ*, a novel method has been developed to isolate algae from bulk particulate organic matter using flow cytometry prior to isotopic analysis. Modifications were made to a Carlo Erba 1108 Elemental analyzer to allow measurement of  $\delta^{15}\text{N}$  of samples containing as little as 0.5  $\mu\text{g N}$  with an analytical precision of 0.2 ‰ (determined from replicate analysis of standards). Using this new method requires sorting approximately ten million phytoplankton cells from one to two liters of river water. Replicate analysis of  $\delta^{15}\text{N}$  of sorted phytoplankton samples indicates that analytical precision for the entire protocol is 0.3 ‰ for samples with a final N content between 0.5 -1.0  $\mu\text{g N}$ . Preliminary results suggest that the  $\delta^{15}\text{N}$  of isolated phytoplankton differs by 1-3 ‰ from the detrital fraction of bulk POM. Work is ongoing to establish a relationship between  $\delta^{15}\text{N}$ -  $\text{POM}_{\text{bulk}}$  and  $\delta^{15}\text{N}$  of isolated algal samples. A better understanding of this relationship will potentially allow use of a bulk POM isotope record (collected over the past 10 years in the SFE) to understand potential links between historical changes in phytoplankton nutrient utilization and Delta POD.

**Keywords:** nutrients, ammonium, nitrate, phytoplankton, stable isotopes

**Poster topic:** Human Consequences

## Effects of Nitrogen Fertilization and Soil Carbon Variables on CH<sub>4</sub> and N<sub>2</sub>O Emissions from Rice Fields

Rongzhong Ye, Dept. of Land, Air, and Water Resources, UC Davis, rzye@ucdavis.edu  
Jennifer Morris, Dept. of Land, Air, and Water Resources, UC Davis, jmorris@ucdavis.edu  
Timothy Doane, Dept. of Land, Air, and Water Resources, UC Davis, tadoane@ucdavis.edu  
William Horwath, Dept. of Land, Air, and Water Resources, UC Davis, wrhorwath@ucdavis.edu

Reclamation of the Sacramento-San Joaquin Delta's peatlands provided fertile soils for agriculture, but resulted in the oxidation of peat soils, large greenhouse gas (GHG) emissions, and subsidence. Rice cultivation has been proposed as a regional solution to mitigate ongoing agricultural impacts. In the present study, we investigate the influence of nutrient management and soil carbon (C) content on methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O) emissions from peat soils under rice cultivation. The experiment was conducted in rice fields at Twitchell Island, California including 4 soil C contents (5%, 10%, 20%, and 25%) in combination with 2 nitrogen (N) fertilization rates (0 and 80 kg N ha<sup>-1</sup> as urea). We determined CH<sub>4</sub> and N<sub>2</sub>O emissions with a typical closed chamber method during the growing season of 2013. In general, CH<sub>4</sub> emissions varied considerably across the soil C gradient, but were not affected by N fertilization. Methane emissions peaked during the drainage event, averaging 48.3, 17.2, 5.2, and 11.4 mg CH<sub>4</sub> hr<sup>-1</sup> m<sup>-2</sup> for 5%, 10%, 20%, and 25% C fields, respectively. Total CH<sub>4</sub> emissions decreased gradually as soil C increased from 5% to 25%, suggesting higher C turnover in the lower soil C fields. N fertilization influenced N<sub>2</sub>O emissions rates, however, the effects depended on soil C and crop growth. N<sub>2</sub>O emissions were low during the flooding period and negative emissions (sink) were frequently observed in all fields. The highest emissions were observed in all fields right after the drainage, except for the 25% C field where the emission was largely negative. Our results suggest that, in addition to C quantity, soil C quality is likely controlling GHGs emissions. Furthermore, N management is not as effective as water management to mitigate GHGs emissions from the rice fields with high organic matter soils.

**Keywords:** Greenhouse gas, Nitrogen fertilization, soil carbon content, rice field

**Poster topic:** Human Consequences