

Lead Scientist's Report

Summary: This report covers 8 items:

Collaborative Science Activities: (1) California WaterFix Aquatic Science Peer Review; (2) Society for Freshwater Science Annual Meeting; (3) Mercury in the Delta Synthesis Workshop.

Science Communication: (4) Brown Bag Seminar on Everglades restoration science; (5) Journal article on hydropower effects on aquatic insects; (6) Research article from *San Francisco Estuary and Watershed Science (SFEWS)* journal on physical conditions favoring aquatic weed growth; (7) One poster from the 2015 State of the Estuary Conference; and (8) the "By the Numbers" summary.

Collaborative Science Activities

California WaterFix Aquatic Science Peer Review Report

At the request of the National Marine Fisheries Service (NMFS), the U.S. Fish and Wildlife Service (USFWS), and the California Department of Fish and Wildlife (CDFW), select staff from the Council's Delta Science Program convened an independent scientific peer review of analytical approaches for the California WaterFix NMFS and USFWS joint Biological Opinion and CDFW 2081(b) Incidental Take Permit analyses. A public meeting for this review was held April 4-5. This is the first of two phases. The second will review the scientific basis of the draft joint Biological Opinion and the 2081(b) Incidental Take Permit. The independent scientific panel has completed its review, which has been posted online. The report, along with review materials, background information, and presentations may be found at:

http://www.westcoast.fisheries.noaa.gov/central_valley/WaterFix/index.html

Society for Freshwater Science Annual Meeting

The Society for Freshwater Science (SFS) is an international organization whose members study freshwater organisms, biotic communities, physical properties that affect ecosystem function, habitat quality and assessment, and restoration. The SFS annual meeting convened May 21-26th in Sacramento, titled, "Running on Empty: Increasing Demands on Freshwater Resources in the Face of a Changing Climate". The meeting focused on declining freshwater availability, challenges posed by climate change for freshwater ecosystems, and potential solutions.

Mary Power, Peter Moyle, and Peter Gleick provided plenary lectures on the following topics: the importance of scouring winter floods and summer flows to establish the food web needed for salmon and other predators, reconciliation ecology as a framework for conservation of California native species, and the consideration of economic, cultural, and political factors to understand and improve water management. Angus Webb, also a plenary speaker, discussed the innovative responses of Australia to the Millennium Drought inacted through the 2012 Murray-Darling Basin Plan. Cliff Dahm (lead scientist of the Delta Science Program) received the 2016 SFS Award of Excellence to honor his significant contributions to the fields of ecosystem studies and aquatic ecology. The details of the SFS 2016 program may be viewed at:

<http://sfsannualmeeting.org/>

Workshop - Revisiting the 2003 Mercury Strategy

A three-day technical workshop titled, “Revisiting the 2003 Mercury Strategy for the Bay-Delta Ecosystem”, was held in January. A follow-up synthesis workshop will be held June 3, 2016. The purpose of this workshop series is to create a shared understanding of the current knowledge of mercury sources and effects, critical uncertainties, and priorities for research and monitoring to address the challenges of mercury in the Delta ecosystem. The goal is to publish the key findings of this workshop series, focused on research and management needs, in a peer-reviewed journal article. This work is part of implementing the Delta Plan Interagency Implementation Committee-endorsed High Impact Science Actions. Specifically it furthers Action 2C – Synthesize established knowledge about designing effective habitat restoration projects in the Delta.

Science Communication

Brown Bag Seminar - Science in Support of Everglades Restoration

This seminar—one of the Council’s regularly scheduled Delta Science lunchtime seminars—was held May 24, 2016. The Southern Florida Everglades was once a free-flowing river of grass, but like the Bay-Delta ecosystem, flood-control projects and the construction of an extensive water conveyance system has dramatically altered the Everglades landscape and ecosystem. Dr. Nicholas Aumen (the regional Science Advisor for U.S. Geological Survey, South Florida) discussed the agency’s Greater Everglades Priority Ecosystem Sciences (GEPES) program. GEPES is an important source of restoration-related science that informs management and policy decisions. Dr. Aumen described a number of restoration projects currently underway in the Everglades, along with other projects that provide flood control and fresh water supply to millions of residents. He emphasized the importance of high quality, collaborative science to determine restoration targets and performance measures, assist managers with selection of optimum restoration alternatives, and provide data to track restoration progress.

Journal Article - Effects of hydropower operations on aquatic insects

Flow Management for Hydropower Extirpates Aquatic Insects, Undermining River Food Webs. *Theodore A. Kennedy, Jeffrey D. Muehlbauer, Charles B. Yackulic, David A. Lytle, Scott W. Miller, Kimberly L. Dibble, Eric W. Kortenhoeven, Anya N. Metcalfe, and Colden V. Baxter.* Biosciences, 2016.

Aquatic insects are an important food source for fish, birds, and other wildlife. Decreases in the number of aquatic insects directly impact aquatic and riparian food webs. One possible reason for poor insect survival in impounded rivers is the operation of hydroelectric dams. Hydroelectric dams provide around 19 percent of the world’s electric supply, and 6-12 percent of California’s electricity. Hydropower provides the vast majority of the world’s renewable energy. Demand for hydropower is growing in the face of climate change. To generate energy in a cost-effective manner, managers practice hydropeaking. This process involves increasing river flows during the day when demands are high. Hydropeaking increases efficiency, but also creates abrupt changes in river water levels. In this study, researchers determined the ecological impacts of hydropeaking. To accomplish this, scientists recruited river guides, educational groups, and other citizen scientists, who collected over 2,500 insect samples along the Colorado River.

Three important findings were:

1. The majority of aquatic insects lay eggs in habitats that are susceptible to abrupt flow changes.

2. Insect eggs exposed to flow changes are vulnerable to mortality due to eggs drying out before hatching.
 3. There is a strong correlation between hydropeaking practices and insect survival.
- In summary, hydropeaking has a strong negative effect on insect survival. This impairs fish populations that rely on insects as a food source. Flow management involves more than just the volume of water. This paper demonstrates the importance of the rate of change in flow on food webs downstream of hydropower dams.

March 2016 Issue of the SFEWS Journal

The March issue of the SFEWS Journal is currently available online. This open access journal, funded by the Council, is a key venue for publishing the latest research addressing Delta scientific questions. This edition includes one essay and five research papers. One of these articles is highlighted here.

Physical Controls on the Distribution of the Submersed Aquatic Weed *Egeria densa* in the Sacramento–San Joaquin Delta and Implications for Habitat Restoration. *John Durand, William Fleenor, Richard McElreath, Maria J. Santos, and Peter Moyle*

The weed *Egeria densa* is present at sites throughout the Delta, where its tendency to grow in dense mats blocks waterways, interferes with reservoir operations, displaces native vegetation, and favors the success of non-native fish species. Control of *Egeria* has proved challenging, as biological control measures have been mostly ineffective, and repeated applications of herbicides may harm other organisms. In this study, workers from U.C. Davis and Universiteit Utrecht investigated the physical properties of the habitats (water velocity, depth, and turbidity) associated with *Egeria* presence and absence. They fit Generalized Linear Models to the data and found the probability of *Egeria* occurrence over a realistic range of values for each physical property. Their results suggest that water depth and turbidity, more than water velocity, were the best predictors of *Egeria* presence. Specifically, the weed was most likely to occur between 2 meters above and 1 meter below the average low tide depth, *Egeria* presence was also predicted at sites with relatively low turbidity. Although many restoration efforts value shallow water habitat, such a focus may also facilitate growth of aquatic weeds.

Poster summary from the 2015 State of the Estuary Conference

The biennial State of the Estuary Conference is a forum focusing on the management and ecological health of the San Francisco Bay-Delta Estuary. Results from the conference are relevant to the Delta Science Program's mission to provide the best possible, unbiased, science-based information for water and environmental decision-making in the Bay-Delta system. The following poster from the last conference in September 2015 is one of the 161 posters presented at the conference and was selected because of its relevance to recent symposia held by Delta Science Program staff.

Community Involvement in Reducing Human Exposure to Mercury in Delta Fish *Kathryn Kynett, Gabriela Pasat, Alyce Ujihara, Lauren Joe, Alcira Dominguez, Margy Gassel, Shakoora Azimi-Gayon, Laura McLellan, and Janis Cooke*

Delta fish are contaminated with mercury at levels potentially harmful to human consumers. The Delta Mercury Exposure Reduction Program (Delta MERP) is a campaign by the Sacramento-San Joaquin Delta Conservancy, California Department of Public Health, and Central Valley Regional Water Quality Control Board to protect human health and reduce consumer exposure to mercury. The effort targets sensitive

populations including pregnant/nursing mothers, children, and people who regularly eat Delta fish. Working with these groups, the administrators of Delta MERP found community members often have low awareness of mercury risk and they identified the need for educational materials and trainings in the communities' first languages. Delta MERP has provided grants to the Asian Pacific Self-Development and Residential Association, the California Indian Environmental Alliance, and the Lao Khmu Association. Delta MERP will hold community stakeholder meetings and will continue to engage communities to design and implement successful mercury awareness programs.

By the Numbers

Delta Science Program staff will give a summary of current numbers related to Delta water and environmental management. The summary (Attachment 1) will inform the Council of recent counts, measurements, and monitoring figures driving water and environmental management issues.

List of Attachments

Attachment 1: By the Numbers Summary (*report to be provided at the Council Meeting*)

Contact

Dr. Cliff Dahm
Lead Scientist

Phone: (916) 445-0463