



## Lead Scientist's Report

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**Summary:** Delta Lead Scientist Dr. John Callaway will discuss an article from *Science* on river dynamics and restoration; summarize conferences, workshops, and symposia; discuss the 2019 State of the Estuary Report; cover announcements; and provide the By the Numbers Report.

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### **Linkages between flow regime, biota, and ecosystem processes: Implications for river restoration. Palmer, M., and A. Ruhi. *Science*. September 2019.**

Rivers are diverse ecosystems that support many species and important processes, but they have been altered by dams, channelization, and other impacts. Changes to the flow of water within a river affect what species are present and alter ecosystem processes, such as nutrient dynamics and primary productivity. The connections between these three components (flow regimes, organisms or biota, and ecosystem processes) are poorly understood. Improving understanding of these linkages will provide insight into how we manage and restore rivers to maximize the wide range of benefits that these ecosystems provide.

This paper reviewed past research across these three components from a wide range of rivers around the globe. Flow regimes (i.e., the timing, magnitude, and duration of flows) impact biota by altering the physical conditions for species within a river and also by affecting species movement and dispersal. This, in turn, determines how species interact and where dynamics like competition from invasive species or predation may be important. Flow regimes also impact ecosystem processes by delivering nutrients, affecting organic matter accumulation and decomposition, and influencing where organic matter accumulates. All of these factors combine to impact the river food web, another critical ecosystem process. The authors highlight how insights from these dynamics inform the importance of “process-based restoration” that incorporates physical and biological dynamics into restoration design. The authors also identify gaps in research to date, suggesting opportunities to advance the state of knowledge for the field of river restoration, including the use of new sensors and analyses that could improve future understanding and management.

Given the importance of restoration issues to the Delta ecosystem and its watershed, the research within this article is directly relevant to local management concerns. The current amendment to the Ecosystem Chapter of the Delta Plan promotes the use of process-based restoration that is a direct focus of this article. In addition, the knowledge gaps identified by the authors provide insight for future research throughout the Delta and its watersheds.

## **Conferences, Workshops, and Symposia**

### ***Coastal and Estuarine Research Federation Conference.***

The 25<sup>th</sup> Biennial Conference of the Coastal and Estuarine Research Federation took place in Mobile, Alabama from November 3 - 7, 2019. The conference is one of the largest international meetings that focus on coastal and estuarine science and management issues, and this year's meeting included topics ranging from seagrass, oyster reef, and wetland restoration, to food webs, invasive species, and hydrology with perspectives from across the country and many international participants. Other notable themes throughout the conference included understanding how social and natural sciences are integrated into environmental decision-making, the importance of outreach and communication, and effectively planning restoration under future climate change scenarios, all topics of interest for the Delta as well as for similar systems across the globe.

### ***Zooplankton Identification Workshop (Zoopfest).***

This workshop was held on November 13, 2019, at the California Department of Fish and Wildlife Bay-Delta office in Stockton to promote improved and coordinated methods for zooplankton identification across all Delta monitoring and research projects. The workshop was attended by scientists from several agencies throughout the Delta and focused on proper techniques for identifying both common and rare species of zooplankton. Many programs throughout the Delta include zooplankton monitoring due to their critical role as a food source for Delta fish, including both resident and migratory species. Proper identification of zooplankton is essential to monitoring trends in population and food web dynamics for these programs.

### ***Thresholds and Restoration Symposium.***

This symposium, hosted in conjunction by the Delta Science Program and the Coastal and Marine Sciences Institute of University of California, Davis, was held November 19, 2019. The aim of the symposium was to bring together scientists and managers to gain a common understanding of the processes affecting the development of restored ecosystems. Many factors, such as shifts in hydrology, temperature, or nutrient conditions, can push ecosystems over thresholds, which can lead to substantial and sometimes unexpected shifts in the ecosystem that may not be easily reverted. Understanding these thresholds and dynamics is critical in order to determine when we should push to direct change within an ecosystem through management or restoration and when further change may not be possible.

Examples from the Everglades, South San Francisco Bay Salt Ponds, and other projects highlighted how adaptive management, including targeted research to address key uncertainties, can provide insight for restoration in the Delta and elsewhere. Talks and posters revolved around key restoration questions, such as, how gradual change and thresholds affect existing and restored ecosystems, how and when to restore ecosystems, and at what timescale these processes are important to evaluate. A panel

discussion featuring Delta Lead Scientist John Callaway and Senior Environmental Scientist Dr. Dylan Chapple concluded the symposium, discussing a path forward for science to better address management needs.

### **2019 State of the Estuary Report**

The 2019 State of the Estuary Report (Report) was released at the recent State of the Estuary Conference. This interim Report is a follow up to the 2015 State of the Estuary Report and continues the effort to integrate reporting across the Bay and Delta. Two issues that are highlighted throughout the Report are the linkage between the health of the Estuary and the health of the community that lives around the Estuary, and the importance of resilience in the face of coming changes that will affect the Estuary. The interim 2019 Report covers five indicators from the 2015 Report, including freshwater flows, tidal marsh acreage, fish communities, beneficial floods, and urban water use. Three “emerging” indicators also are included in the Report: subsided lands, shoreline resilience, and urban green space. The report was developed for the San Francisco Estuary Partnership (SFEP) by staff from the San Francisco Estuary Institute, with financial support and involvement from the Delta Stewardship Council. Caitlin Sweeney, Director of SFEP, will provide an overview of the Report to the Council. Delta Lead Scientist John Callaway and Program Manager Martina Koller served on the steering committee for the Report, and numerous Council staff provided input throughout its development and review.

### **On your radar**

- Environmental DNA (eDNA) Symposium. January 29, 2020. This symposium will focus on techniques and technology that are used to assess eDNA, or genetic material found in environmental samples that has not come directly from organisms. A registration link is now available at:  
<https://marinescience.ucdavis.edu/events/upcoming-events/edna>

### **By the Numbers**

Delta Science Program staff will provide 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 (provided at the Council Meeting).

Attachment 2: Visual abstract for Linked River Processes tied to Restoration Approaches.

**Contact**

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