North Delta Flow Action 2019: Continuous Water Quality Monitoring in the Yolo Bypass

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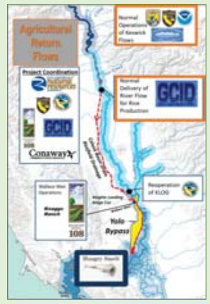
Background

- The Yolo Bypass floodplain has shown evidence of being a productive lower trophic habitat (1,2,3) and can transport these food resources to the lower estuary during winter and spring (3,4). Typically during summer and fall, low flows and local consumptive use trap this productive water in upper channels (5).
- In 2011 and 2012, above average fall agricultural return flows in the Yolo Bypass contributed to an observed increase in phytoplankton biomass in downstream regions (5).
- Additional summer and fall monitoring provided evidence of increased phytoplankton and subsequent zooplankton abundance in response to increased flows.
- The North Delta Flow Action (NDFA) has been identified as a critical part of the 2016 Delta Smelt Resiliency Strategy to improve Delta Smelt (*Hypomesus transpacificus)* habitat.
- With support from interagency stakeholders and landowners, a managed NDFA and Food Web Study took place in 2016, 2018, and 2019.



Study Questions

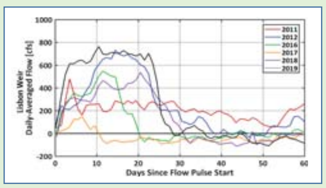
1. How do levels of chlorophyll, pH, and dissolved oxygen (DO) change along the axis of the Toe Drain before, during, and after a fall agricultural flow pulse?
2. Do managed flow actions in the Yolo Bypass stimulate increased primary productivity rates locally and downstream?
3. How does continuous WQ data illustrate changes in the aquatic environment throughout the managed flow action?

Managed fall flows increases food production, availability, and habitat quality beneficial to Delta Smelt

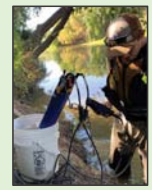
Higher: Chlorophyll fluorescence & Specific conductivity

Lower: DO & Temperature

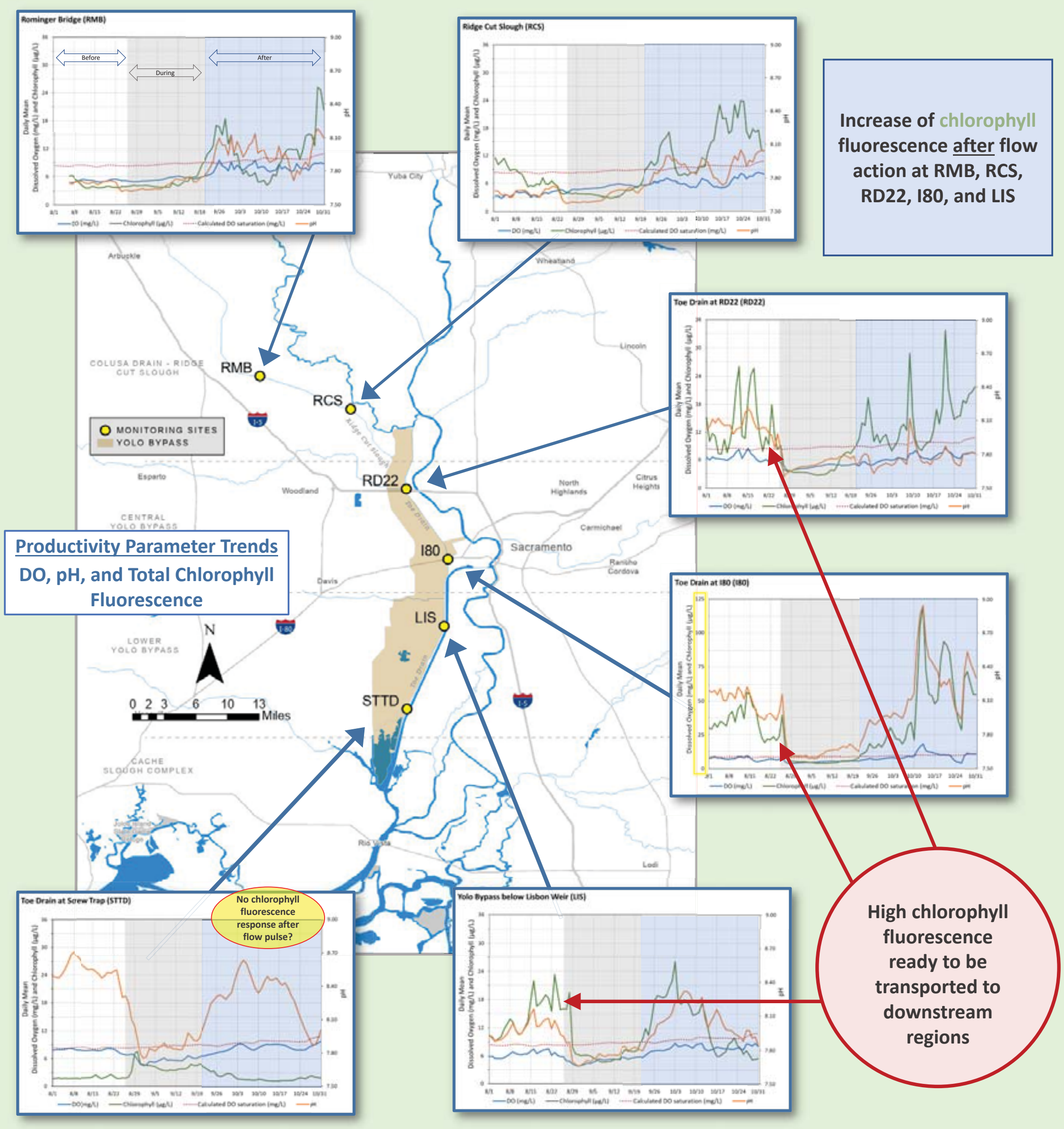
Methods



- Agricultural drainage water was used to generate a flow pulse from August 26 – September 21 at 31,000 AF and 750 cfs.
- Continuous, 15-minute interval water quality data was collected during late summer and early fall at six stations along the Yolo Bypass Toe Drain using YSI EXO2 multiparameter water quality sondes.
- Sondes were calibrated for deployment every 3-4 weeks in DWR's water quality lab adhering to NCRO and DWR's Quality Assurance group supported methods.
- QA/QC procedures were used to identify outliers, validate datasets, and archive files for analysis and reporting through KISTERS Hydstra time series database.



Results



Summary

- The flow action resulted in chlorophyll transport out of upstream sites to the Lower Yolo Bypass where the chlorophyll signal was detected at STTD.
- Higher chlorophyll fluorescence after the flow action indicate that a flushing and mixing mechanism has the potential to restore phytoplankton production and improve habitat conditions.
- Continuous WQ monitoring of biotic and abiotic parameters using YSI EXO2 technology provides high-resolution data on the aquatic environment, critical to informing management decisions.

Next Steps

- fDOM data can provide additional information for phytoplankton and zooplankton productivity during low concentrations of chlorophyll fluorescence.
- WQ data along with hydrodynamics, nutrients, contaminants and plankton taxa (phytoplankton and zooplankton) are essential to understanding the impacts of the flow action on the regional food web for Delta Smelt and other fishes.
- The Department of Water Resources is implementing a 2020 no action year to collect additional baseline WQ data. A managed flow pulse using Sacramento river water is planned for 2021.

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Acknowledgements

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