

Anke Mueller-Solger, PhD. , [amueller@deltacouncil.ca.gov](mailto:amueller@deltacouncil.ca.gov), Delta Stewardship Council , 980 9th Street, 14th Floor , Sacramento, CA 95814 , (916) 275-8727, Tara Schraga, USGS Menlo Park, Tiffany Brown, DWR. Erwin Van Nieuwenhuysse, Reclamation, Randy Dahlgren, UCD

### **Big surprises come in small packages: 2011 phytoplankton monitoring results.**

**Abstract:** The fall outflow adaptive management plan included several predictions about phytoplankton biomass and species composition in the low salinity zone of the San Francisco estuary for three different fall outflow scenarios. To evaluate if these predictions were met, we compared phytoplankton biomass (chlorophyll *a*) and species composition data collected during IEP and USGS monitoring surveys among four recent years with different fall outflows, 2005, 2006, 2010, and 2011. The highest fall outflow occurred in 2011 while the lowest fall outflow occurred in 2010. 2005 and 2006 had intermediate fall outflows. Phytoplankton biomass was generally highest in the high fall-outflow year 2011, but was also high in the low-outflow year 2010 and lowest in 2005. 2011 also stood out by having an unusual diatom bloom in the Sacramento River between Rio Vista and Antioch in October-November and by more *Aphanizomenon flos-aquae* than *Microcystis aeruginosa*. In addition to the four year comparison, we also evaluated phytoplankton (chlorophyll *a*) monitoring data collected from 1975 to 2011 by three monitoring surveys with respect to geography (river kilometer), salinity, and the position of the low salinity zone as indexed by X2, the distance of the 2‰ isohaline from the Golden Gate. Results showed that phytoplankton concentrations were generally greatest before 1988 and at salinities of 0 to 12 psu. Fall blooms were virtually absent between 1988 and 1998 except in the most upstream (fresh water, San Joaquin River) and downstream (salinity > 20 psu, toward the Golden Gate) regions of the estuary. In the most recent decade fall phytoplankton biomass has somewhat increased, but remains at a much lower magnitude than before 1988. Over the entire data record of more than 25,000 data points, the highest phytoplankton biomass in low and medium salinity regions (1-12 psu) occurred at X2 values between 73 and 82 km, i.e. a fairly westward low salinity zone.

**Statement of Relevance:** This work is part of the evaluation of the effects of fall outflow management on water supplies and delta smelt required by the 2008 FWS Delta Smelt Biological Opinion. Results will be used to adaptively manage fall outflow to better protect delta smelt and water supplies in the future.