



COORDINATING NUTRIENT SCIENCE IN SUISUN BAY

What is it?

The Suisun Bay Workgroup was formed under the umbrella of the San Francisco Bay Nutrient Management Strategy to coordinate nutrient science in Suisun Bay. The workgroup, which is an outgrowth of the SWAMP [2010-2012 studies in Suisun Bay](#), is made up of Water Board staff from the SF Bay and Central Valley Regions, Bay Area Clean Water Agency (BACWA), Central Contra Costa Sanitary District (Central San), Delta Diablo, City of Benicia, State and Federal Contractor Water Agencies (SFCWA), San Francisco Estuary Institute (SFEI), and regional scientists. Since 2011, this workgroup has been used to coordinate nutrient studies in Suisun Bay that have been funded by SWAMP, SFCWA, BACWA, and Central San. The next step is to develop a collaborative



Suisun Nutrient Science Plan to develop the scientific information necessary for the Water Board to make sound management decisions that ensure the protection of the Suisun Bay ecosystem. This is important since currently there is disagreement among the scientific community on some of the ecosystem impacts associated with nutrients.

Suisun Bay is part of the Bay-Delta Estuary. It is located below the confluence of the Sacramento and San Joaquin rivers and drains to the upper San Francisco Bay via the Carquinez Strait. Suisun Marsh, just north of Suisun Bay, is the largest contiguous brackish marsh on the West Coast. Suisun Bay and Marsh provide habitat for many fish and other wildlife species, including the state endangered delta smelt.

In Suisun Bay, a considerable decline in phytoplankton has been observed since the late 1980s. There has also been a shift in species composition from diatoms to other, less nutritious algae species (green algae, blue-green algae, and miscellaneous flagellate species). These changes cause

concern because they can affect food quality and availability for fish and other organisms. There is some evidence that the Pelagic Organism Decline (POD) in the Delta may be, at least partially, caused by a declining food supply for native pelagic (open water) fish.

Although phytoplankton biomass has been greatly affected by the 1987 invasion of *Potamocorbula* (Asian clam), which is a voracious grazer on phytoplankton, there is some concern that low phytoplankton biomass, as well as the shift in species composition, may be associated with high ammonium (NH_4) levels. The SWAMP studies were initiated to address this issue. The source of ammonium is primarily from wastewater treatment plants in the Sacramento River and Suisun.

Why is this important?

The Bay-Delta Estuary is the largest estuary on the Pacific Coast. It provides habitat for 750 species of plants, fish, and other wildlife; water for cities and agriculture; and many recreational opportunities. Declines in phytoplankton, populations of certain fish species, and other changes in Suisun Bay and the rest of the Bay-Delta Estuary are indicative of a stressed ecosystem. Steps must be taken to protect the beneficial uses of this ecosystem. Beginning in 2002, scientists began to observe a rapid decline in four pelagic fish species in the upper San Francisco Estuary (the Delta and Suisun Bay): delta smelt, longfin smelt, juvenile striped bass, and threadfin shad. Since then, the POD has become an issue of concern for state environmental agencies and others. The reasons for the POD are not fully understood, but the decline in phytoplankton has been identified as a potential factor.

The control of loadings and concentrations of nutrients is important to a healthy ecosystem. San Francisco Bay, including Suisun Bay, has long been recognized as an estuary where nutrients are high but phytoplankton biomass is low. Phytoplankton has not been able to access enough light to grow high levels of biomass due to the high turbidity in the Bay. Now, however, there is scientific evidence that Bay water, including Suisun, is becoming clearer, allowing more light to penetrate the water column. Although currently phytoplankton biomass is low in Suisun Bay, there is a danger that increasing light availability and increasing temperatures (due to climate change) could increase primary production to levels that could cause a steep decline in oxygen levels, harming fish and other aquatic life. It is also possible that the population of clams feeding on phytoplankton may diminish, increasing this risk. These conditions could lead to levels

of phytoplankton biomass that may harm, rather than support, the ecosystem. As part of the Region's Nutrient Management Strategy, a model is being developed to control nutrients under these changing environmental conditions.

How will this information be used?

The SF Bay Region's Nutrient Management Strategy is a joint fact-finding collaborative approach to develop the science necessary to support decision making. The Regional Water Board is working with SFEI, the Southern California Coastal Water Research Project (SCCWRP), and regional stakeholders to implement this regional strategy. The important elements of the strategy include developing a nutrient assessment framework to help interpret the impact of nutrients on the Bay ecosystem, establishing a monitoring program, and building a model to help determine the role of controllable factors, such as nutrient loading from permitted discharges, on beneficial uses. Another element of the strategy is to conduct special studies, like the SWAMP study, to increase the Regional Water Board's understanding of the role of nutrients in phytoplankton production in Suisun Bay. The information collected from the SWAMP studies and any future coordinated science studies, including those with the Interagency Ecological Program (IEP), will support these efforts so that the Regional Water Board may be able to make decisions based on sound science for the protection of the Suisun Bay ecosystem.

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