

TO: Judy Heath, CALFED

FROM: Douglas Morrison, USFWS, Sacramento Field Office

SUBJECT: Additions to CALFED Water Quality Program Parameters of Concern

DATE: 1 December 1997

In previous comments on the CALFED Water Quality Program Component Report (August 1997 draft), USFWS recommended that nutrients (nitrogen and phosphorous) and light attenuation or availability be added to the environmental parameters of concern. Our scientific basis for these recommendations follows.

Nutrients (nitrogen, phosphorous) should be included as an environmental parameter(s) of concern:

- Nutrient loading is discussed throughout the report as a water quality issue and concern. For example, high nutrient levels are listed under water quality issues and concerns on page 2-2. Nutrient loading is discussed in the section on environmental water quality issues and concerns (p. 2-4).
- Nutrients are listed as a parameter of concern for Suisun marsh wetlands, a Clean Water Act Section 303(d) listed impaired waterbodies in the CALFED problem area (Appendix D, CALFED Water Quality Component Report). Anthropogenic sources supply about 90% of nutrient inputs to north San Francisco Bay, which includes Suisun Bay, during times of low river flow; 70% of nutrient inputs form wastewater treatment plants, 20% from agricultural drains (Hager and Schemel 1992, Estuaries 15: 40-52)
- Nutrients are listed as a parameter of concern for several Clean Water Act Section 303(d) listed impaired waterbodies that may affect the CALFED problem area (Appendix D, CALFED Water Quality Component Report).
- Nutrient loading, primarily from wastewater treatment plants, is a water quality concern in south San Francisco Bay (Hager and Schemel 1996, pp. 189-215 in San Francisco Bay: The Ecosystem). Nutrient levels affect phytoplankton production in south San Francisco Bay. South San Francisco Bay is also a Clean Water Act Section 303(d) listed impaired waterbody that may affect the CALFED problem area.
- Nutrients, along with salinity and light, are important factors determining nuisance macroalgal blooms in San Francisco and San Pablo Bays (Josselyn and West 1985, Hydrobiologia 129: 139-152). A major unanswered question is the source of nutrients for benthic macroalgal blooms in San Pablo Bay. Josselyn and West (1985) speculate that anthropogenic sources (primarily from wastewater effluent) and nutrient loading from upstream may be important.

- Delta outflow affects nutrient levels in north and south San Francisco Bay estuary (Hager and Schemel 1992, 1996).
- The CALFED Ecosystem Restoration Program Plan (ERPP) states that nutrient processes (e.g., nutrient cycling, primary productivity) are important elements in ecosystem management and restoration. Nutrient processes are an important component of the following ecosystem elements discussed in ERPP: bay-delta aquatic foodweb, natural sediment supply, all of the aquatic and wetland habitats, herbivorous waterfowl (indirectly), invasive aquatic plants, and contaminants.
- Nutrient dynamics are an important ecological process in all aquatic ecosystems, especially estuaries. Nutrient dynamics in the bay-delta ecosystem need to be understood and monitored to facilitate successful ecosystem restoration and protection.

Light attenuation or availability should be listed (with turbidity or separately) as an environmental parameter of concern:

- Light attenuation is discussed as a parameter of concern on p. 3-11.
- Light availability is a major factor affecting phytoplankton abundance and productivity in much of the Bay-Delta estuary (Cole and Cloern 1984, Mar. Ecol. Prog. Ser. 17: 15-24; Jassby et al 1996, pp. 325-349 in San Francisco Bay: The Ecosystem). Phytoplankton production is significantly correlated with light levels in the water column (Cole and Cloern 1984). Most of the temporal and spatial variability in phytoplankton productivity in the estuary can be explained by variations in light availability (specifically the parameter daily surface irradiance/attenuation coefficient) and phytoplankton biomass (Cole and Cloern 1984).
- Light availability is an important factor affecting benthic macroalgal and seagrass spatial and temporal dynamics (abundance, species composition, distribution) in the San Francisco Bay estuary (Josselyn and West 1985, Hydrobiologia 129: 139-152; Kitting 1993, Investigation of San Francisco Bay Shallow Water Habitats, NOAA/NMFS Report).
- Because light availability is a major controlling factor of phytoplankton and benthic plant productivity, it is therefore a key control on food-web dynamics in much of the Bay-Delta estuary (IEP 1995, Tech. Rept. 42, Working Conceptual Model for the Food Web of San Francisco Bay / Delta Estuary).
- Turbidity is not a sufficient surrogate measure for in situ irradiance or light availability.