2012-2015 EMP Discrete Water Quality Summary Report

Introduction:

To analyze discrete water quality parameters trends from 2012 through 2015, data from the EMP stations were grouped and averaged into six regions: San Pablo Bay, Grizzly and Suisun Bay, Confluence, Central Delta, Southern Interior Delta, and Northern Interior Delta. A summary of station groupings and associated parameters is described in Table 1. The entrapment zones stations are not included in these analyses.

Specific Conductance (Figure 1):

Salinity (measured as specific conductance) varied greatly across EMP sampling with the highest levels in the western regions (San Pablo Bay, Suisun Bay and Grizzly Bay and Confluence) where water from the Pacific Ocean has the strongest influence. Salinity ranged from 500 to 41,000 μS/cm in the western regions and 100 to 1,200 μS/cm in the interior and central Delta.

From 2012 through 2015, California experienced one of the worst consecutive droughts in the state's history. The effects of the drought are most apparent in the western regions with salinity increasing over the time period as a result of decreased freshwater flow and increased salt water intrusion.

From May until October of 2015, the CA Department of Water Resources installed an Emergency Drought Barrier at False River near EMP station D19 (Central Delta Region). The effectiveness of the Emergency Drought Barrier at preventing salinity intrusion into the Central and Southern Delta is observed in EMP data. Salinity increased in the Central Delta region during the Spring of 2015, but decreased after the installation of barrier (May 2015). When the barrier was removed in October of 2015, salinity increased in the region.

Turbidity (Figure 2):

From 2012 through 2015, the highest levels of turbidity occurred in the late fall (November) through the winter (March), when high flow, rain and elevated winds occurred most frequently. Regions most strongly influenced by the Sacramento River (Northern Interior Delta and Confluence) had the highest peaks of turbidity, likely due to increased runoff and flow through the watershed. High levels of turbidity were also recorded in the San Pablo Region, where winds are typically higher than other regions in the Delta. The Northern Interior Delta experienced the most variability with turbidity values ranging from 2 NTU (October) to 129 NTU (December) between 2012-2015.

Chlorophyll *a* (Figure 3):

The highest levels of chlorophyll *a* were consistently observed in the Southern Interior Delta region during spring and summer months of 2012-2015. In July of 2013, average chlorophyll *a* levels in the Southern Interior Delta peaked at 65.2 μg/L. High nutrient levels (Figures 5, 6) and low flow create conditions suitable for phytoplankton blooms in the Delta. A description of phytoplankton genera is described in the phytoplankton section. With exception of the Southern Interior Delta region, chlorophyll *a* levels averaged less than 10μg/L, a general threshold for food limitation in the Bay-Delta. The confluence region experienced the lowest average chlorophyll *a* levels (0.45 μg/L, January 2015) during 2012 through 2015 time period.

Ammonia (Figure 4):

Dissolved ammonia levels were highest (0.94 mg/L, May 2014) in the Northern Interior Delta, which is located downstream of the effluent discharge from Sacramento Regional Sanitation District. Ammonia levels are lower throughout the Delta and Bays, likely as a result of dilution and nitrification. In the confluence region, average ammonia levels were frequently below the detection limits (e.g. August 2014, September 2015). Decreased levels of ammonia in the Northern Interior Delta occurred during periods of higher flow (late Fall-Winter). During this time, ammonia levels in other regions of the Bay-Delta were elevated, indicating that ammonia was flushed downstream prior to nitrification.

Nitrate + nitrite (Figure 5):

Nitrate and nitrite levels were highest in the Southern Interior Delta region of the Bay-Delta likely as a result from runoff from nearby agriculture land-use. Levels throughout the Bay-Delta region ranged from 0.04 to 2.36 mg/L, but average levels, outside of the Southern Interior Delta, were 0.39 mg/L. Nitrate and nitrite levels fluctuated with the seasons, with highest levels of nitrate and nitrite in the Late Fall and Winter and lowest levels during the Summer, presumably caused by increased nitrogen uptake by the phytoplankton and aquatic vegetation communities during the Summer.

Total phosphorus (Figure 6):

Total phosphorus levels ranged on average between 0.05 and 0.2 mg/L during 2012-2015. The highest levels of total phosphorus were record in the Southern Interior Delta region, with maximum levels reaching 0.37 mg/L in December 2014, nearly double the amount of other regions in the Bay-Delta. Levels of total phosphorus increased overall across the Bay-Delta from 2013 through 2015, likely as a result of drought.

Tables and Figures:

Table 1: Station grouping of the six regions and metadata.

	Lab Data	Field Data
Discrete Water Quality Stations	**Dissolved Ammonia, Total Phosphorus, Dissolved Nitrate+ Nitrite**	**Specific Conductance, Turbidity, Chlorophyll *a***
Grizzly Bay/Suisun Bay		
D7	Yes	Yes
NZ032	No	Yes
NZS42	No	Yes
D8	Yes	Yes
Confluence		
D10	No	Yes
D4	Yes	Yes
D12	No	Yes
D22	No	Yes
Central Delta		
D28A	Yes	Yes
D19	Yes	Yes
D16	No	Yes
D26	Yes	Yes
San Pablo Bay		
D41	Yes	Yes
D41A	Yes	Yes
D6	Yes	Yes
NZ002	No	Yes
NZ004	No	Yes
NZ325	No	Yes
Southern Interior Delta		
P8	Yes	Yes
MD10A	Yes	Yes
C10A	Yes	Yes
Northern Interior Delta		
C3A	Yes	Yes

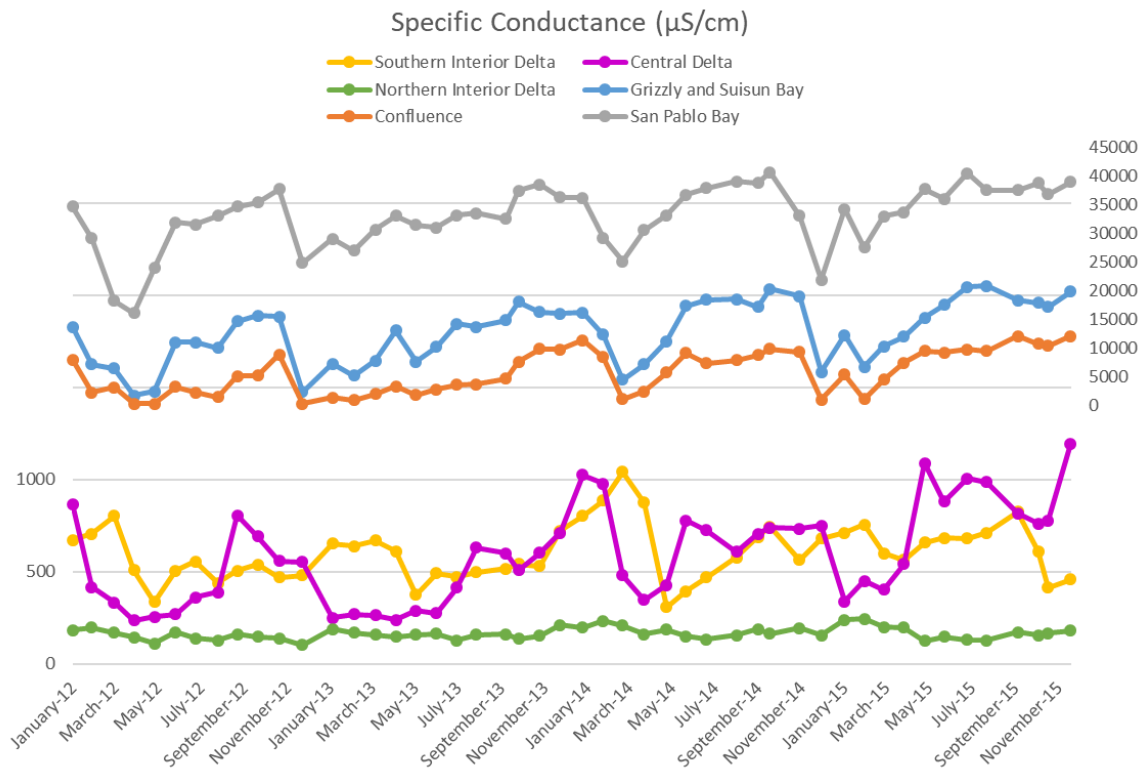

Figure 1: Average specific conductance at six regions during 2012-2015.

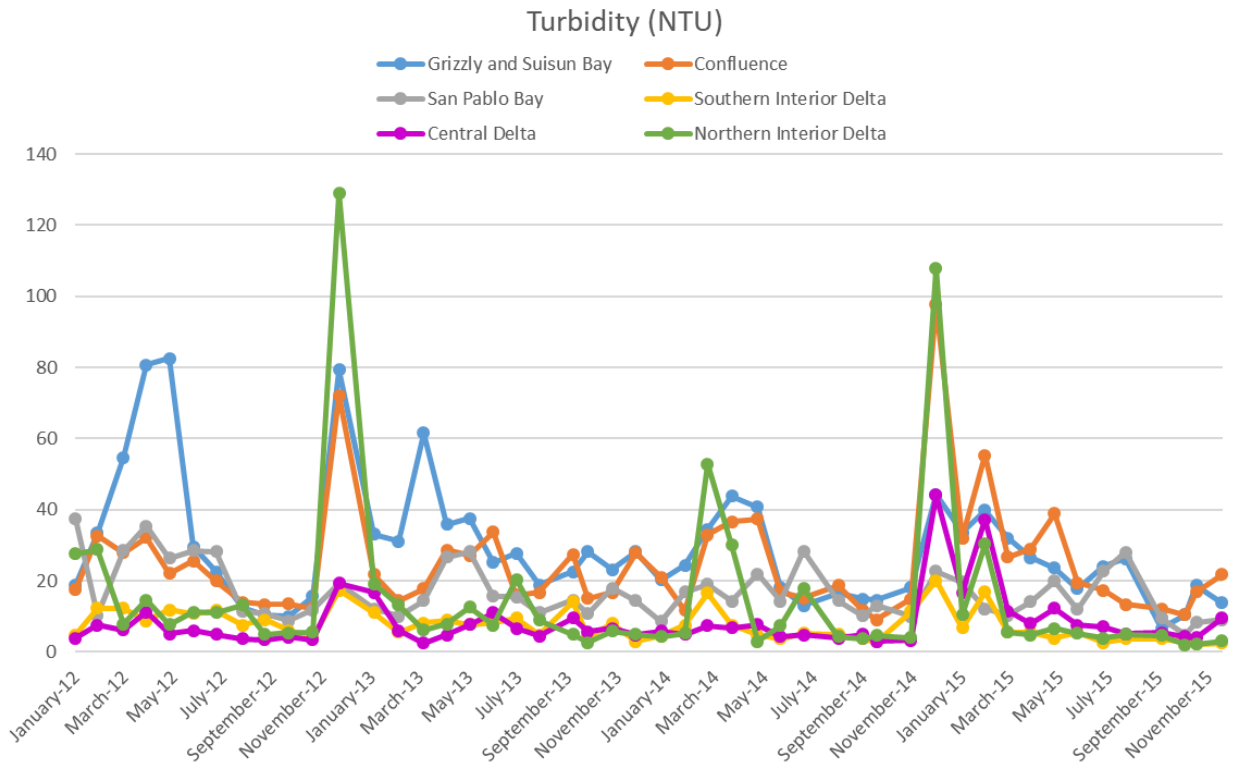

Figure 2: Average turbidity at six regions during 2012-2015.

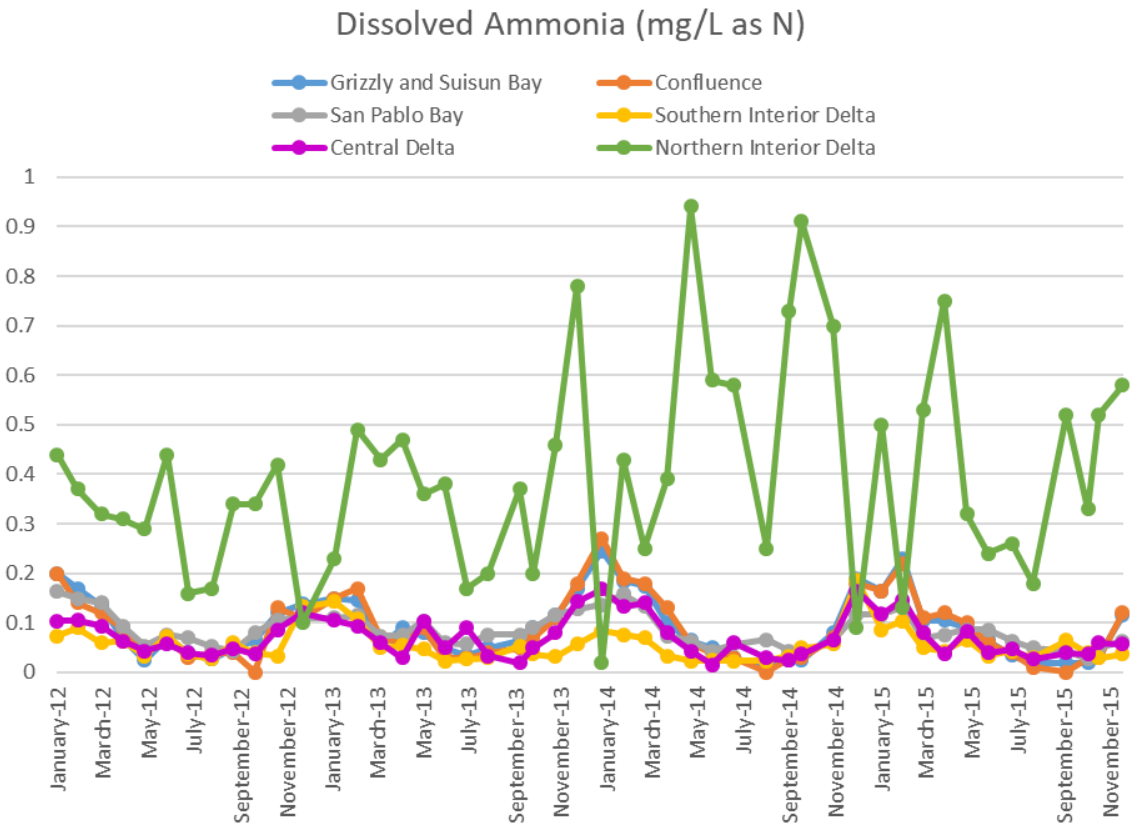

Figure 3: Average dissolved ammonia concentrations at six regions during 2012-2015.

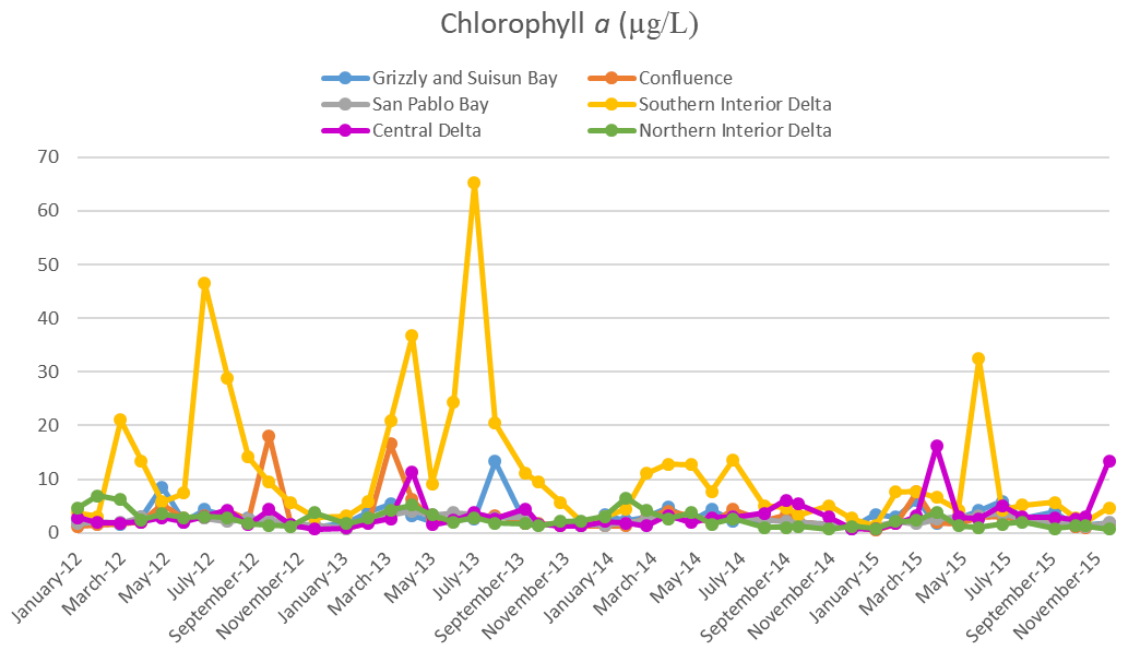

Figure 4: Average chlorophyll *a* concentrations at six regions during 2012-2015.

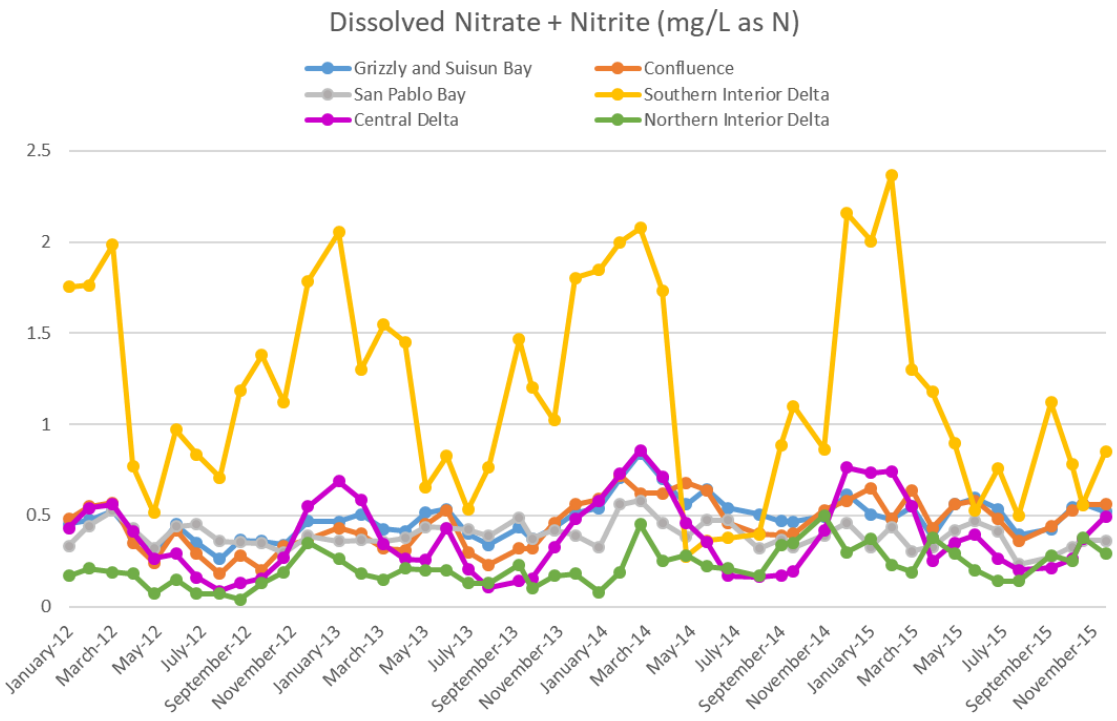

Figure 5: Average dissolved nitrate and nitrite concentrations at six regions during 2012-2015.

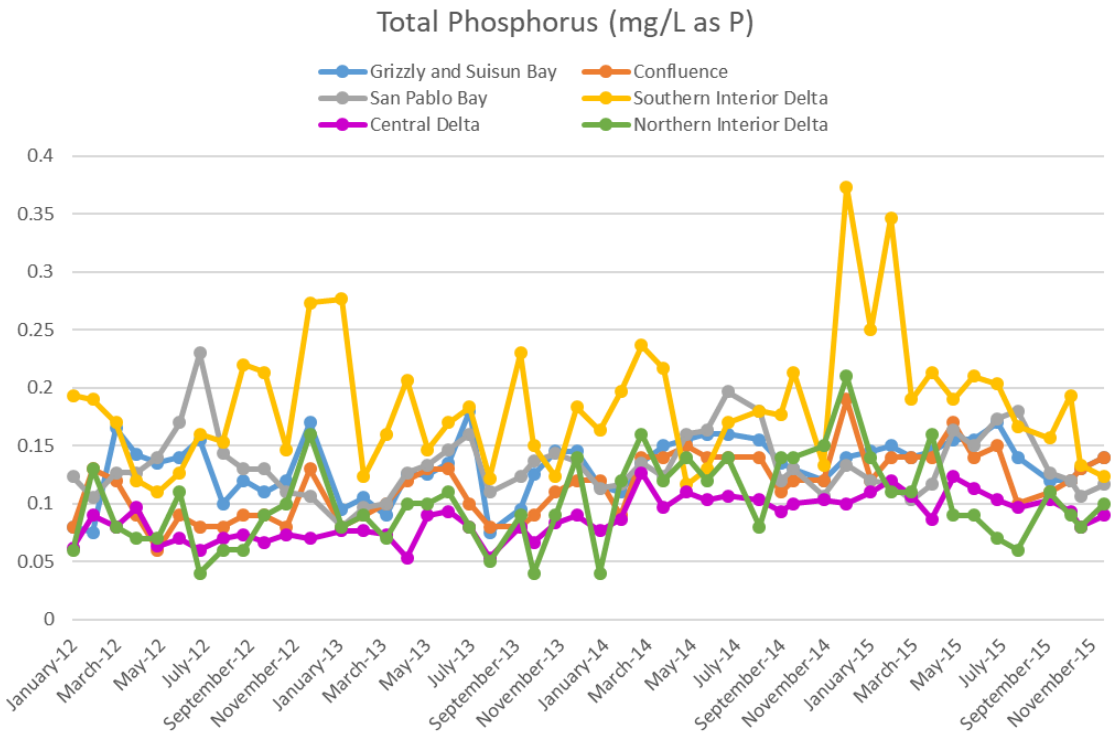

Figure 6: Average total phosphorous concentrations at six regions during 2012-2015.