

Continuous Water Quality Monitoring Report for Water Year 2024

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ENVIRONMENTAL MONITORING PROGRAM

Introduction

The Department of Water Resources (DWR) and the US Bureau of Reclamation (USBR) are required by Water Right Decision 1641 (D-1641) to collect continuous water chemistry data to monitor the water quality at select sites in the upper San Francisco Estuary (Estuary). This report describes the results of these monitoring efforts for water year 2024 (October 1st 2023 through September 30th 2024) which was classified as above normal in the Sacramento and San Joaquin Valleys ([source](#)).

This report includes mandated stations collected by DWR's Continuous Environmental Monitoring Program (CEMP) and Suisun Marsh Water Quality Program (SMWQP) as well as USBR's Delta Water Quality Monitoring Program (USBR). Stations monitored by other programs were not included in this report. Additional information about these programs can be found [here](#).

Methods

Water quality data was continuously monitored at 29 sites throughout the Upper Estuary and were grouped into regions based on their geographic location (Figure 1; Table 1). These sites represent a variety of aquatic habitats, from narrow, freshwater channels to broad, estuarine bays.

Notes:

- The Sherman Island station (SSI), which was called D22A in previous reports, has been changed back to D11A.
- The Cache Slough station (C19) is listed as a monitoring station for D-1641 but has not been in operation since 2015 due to lack of use and safety concerns.

Data were collected for six water quality parameters and stations were divided between programs (Table 2). For CEMP and SMWQP, all water samples were collected 1-meter below the water surface using a float-mounted YSI EXO2 multi-parameter water quality sonde. These parameters are:

- Water Temperature (°C)
- Specific Conductance (S/cm 25°C)
- Dissolved Oxygen (mg/L)
- pH
- Turbidity (FNU)
- Fluorescence (g/L)

For Reclamation, water samples were collected 1-meter below the water surface using float-mounted YSI 6-series and EXO-1 multi-parameter water quality sondes as well as Hydrolab MS5 and HL4 water quality sondes. Parameters collected include:

- Water Temperature (°C)
- Specific Conductance (S/cm 25°C)

Regional facet graphs were created for each parameter. The average, minimum, and maximum values were determined for parameter, both overall and per region. Average summary statistics are reported as the mean () \pm the standard deviation.

For more in-depth methodology, see [here](#).

Results

Water Temperature

The average water temperature value was 17.10 ± 4.66 °C. Values ranged from 7.34 °C to 29.10 °C. Per region average, minimum, and maximum values are shown in Table 3; time series plots are shown in Figure 2.

Specific Conductance

The average specific conductance value was 2990 ± 4790 µS/cm. Values ranged from 50 µS/cm to 28700 µS/cm. Per region average, minimum, and maximum values are shown in Table 4; time series plots are shown in Figure 3.

Dissolved Oxygen

The average dissolved oxygen value was 8.70 ± 1.22 mg/L. Values ranged from 2.67 mg/L to 15.30 mg/L. Per region average, minimum, and maximum values are shown in Table 5; time series plots are shown in Figure 4.

Stockton Station DO Values

C-EMP monitors DO at the Stockton Ship channel to determine if/when it fall below limits established by the CVRWQCB (1998). For the months that coincide with the passage of fall-run Chinook salmon (October, November, and September), values fell below the 6 mg/L limit in September. For all other months, values fell below the 5 mg/L limit in July. A boxplot of the DO values is shown in Figure 5.

pH

The average pH value was 7.68 ± 0.25 . Values ranged from 7.16 to 9.31. Per region average, minimum, and maximum values are shown in Table 6; time series plots are shown in Figure 6.

Turbidity

The average turbidity value was 20.10 ± 18.40 FNU. Values ranged from 0.17 FNU to 178.00 FNU. Per region average, minimum, and maximum values are shown in Table 7; time series plots are shown in Figure 7.

Chlorophyll *a* Fluorescence

The average fluorescence value was 3.72 ± 5.16 $\mu\text{g/L}$. Values ranged from 0.72 $\mu\text{g/L}$ to 87.90 $\mu\text{g/L}$. Per region average, minimum, and maximum values are shown in Table 8; time series plots are shown in Figure 8.

Interpretations

Water Year 2024 started off dry, but a series of storms in February and March brought the water year to be classified as Above Normal. Patterns in water quality generally followed expected seasonal and regional trends. Specific conductivity varied greatly across the stations and throughout the water year, depending on precipitation and Delta outflow. North and South Delta stations remained fresh throughout the year, whereas most Confluence, Suisun Marsh, and Suisun and Grizzly Bay stations had low specific conductivity values from February through early June. The specific conductivity at D6A, the western-most station, started increasing in mid-March, far earlier than the rest of the stations. Decreases in dissolved oxygen and increases in turbidity were observed between February and March, likely associated with increased discharge from storm events. Shallow bays and Suisun Marsh exhibited more persistently high and variable turbidity compared with other stations. Elevated fluorescence, dissolved oxygen, and pH were measured in the South Delta during late June and July associated with a bloom event.

References

[CVRWQCB] Central Valley Regional Water Quality Control Board. (1998). Water Quality Control Plan for the California Regional Water Quality Control Board Central Valley Region, the Sacramento River Basin, and San Joaquin River Basin [Basin Plan] (4th ed.).

[SWRCB] State Water Resources Control Board. (1995). Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Estuary [Bay-Delta Plan] (Adopted May 22, 1995, pursuant to Water Right Order 95-1). Sacramento, CA.

[SWRCB] State Water Resources Control Board. (1999). Water Rights Decision 1641 for the Sacramento-San Joaquin Delta and Suisun Marsh (Adopted December 29, 1999, Revised in Accordance with order WR2000-02 March 15, 2000). Sacramento, CA.

Archived Reports

Old EMP continuous water quality reports can be found [here](#).

Figures

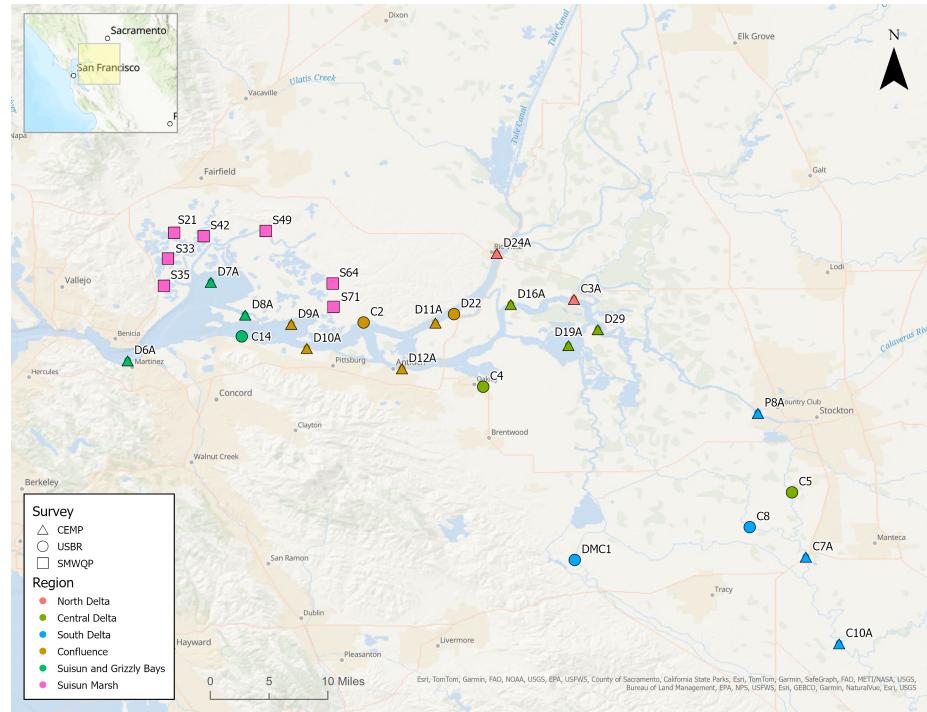


Figure 1: Map of EMP's continuous WQ field sites

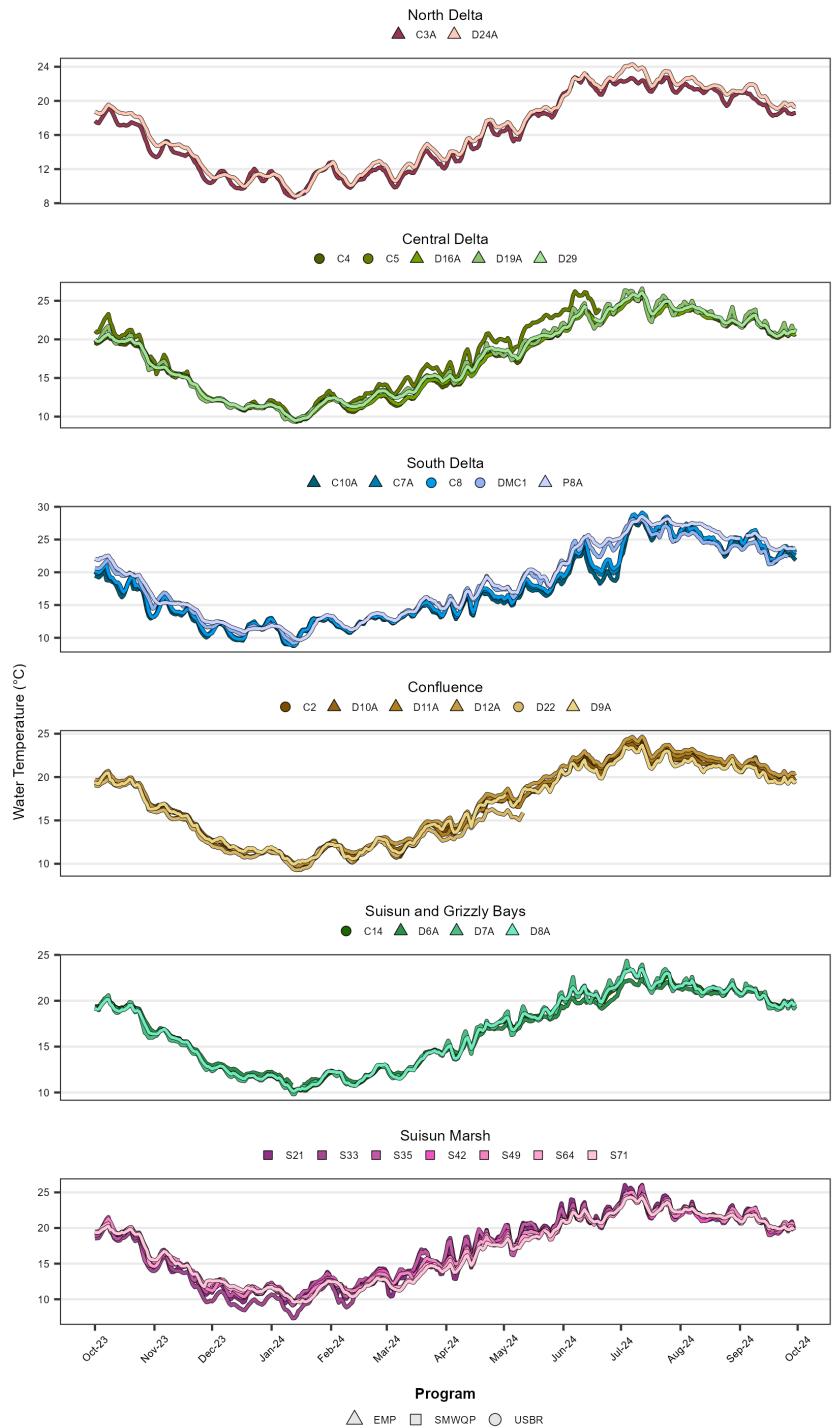


Figure 2: Water temperature by region in the San Francisco Bay-Delta estuary.

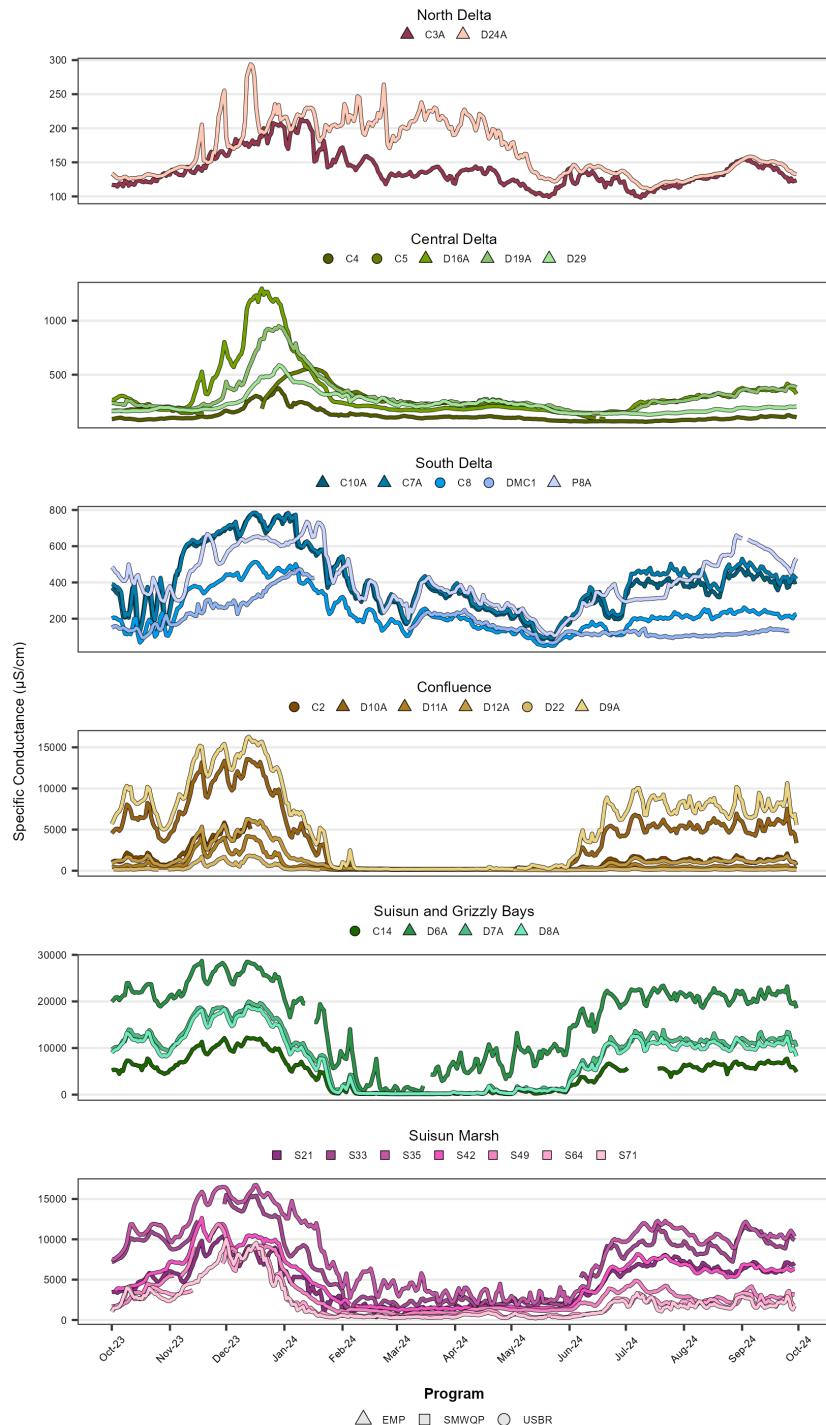


Figure 3: Specific conductance by region in the San Francisco Bay-Delta estuary.

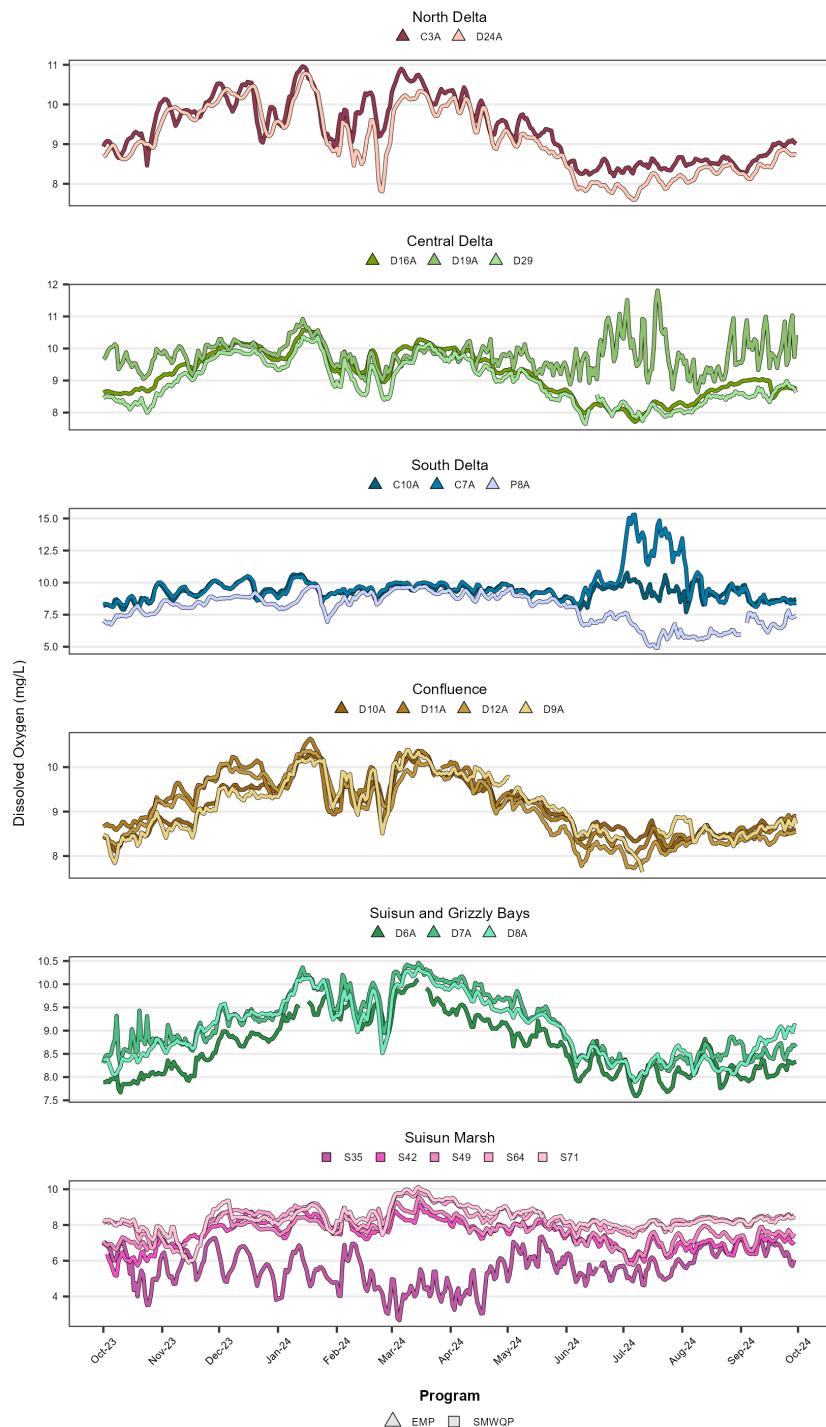


Figure 4: Dissolved oxygen by region in the San Francisco Bay-Delta estuary.

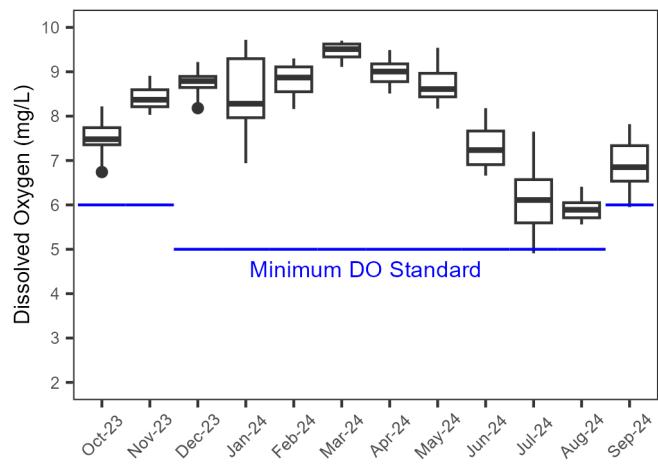


Figure 5: Range of daily dissolved oxygen values at the Stockton Ship Channel (P8).

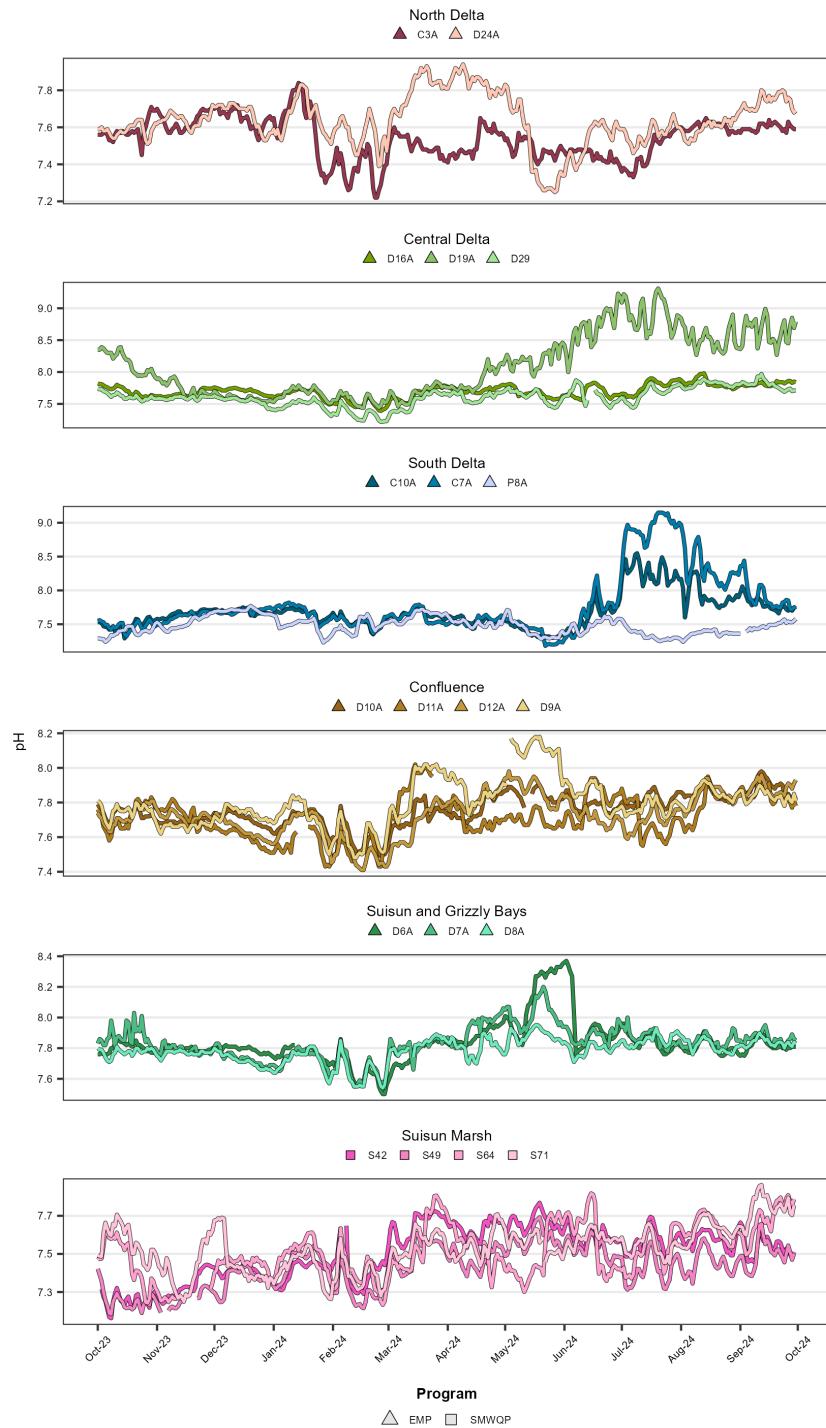


Figure 6: pH by region in the San Francisco Bay-Delta estuary.

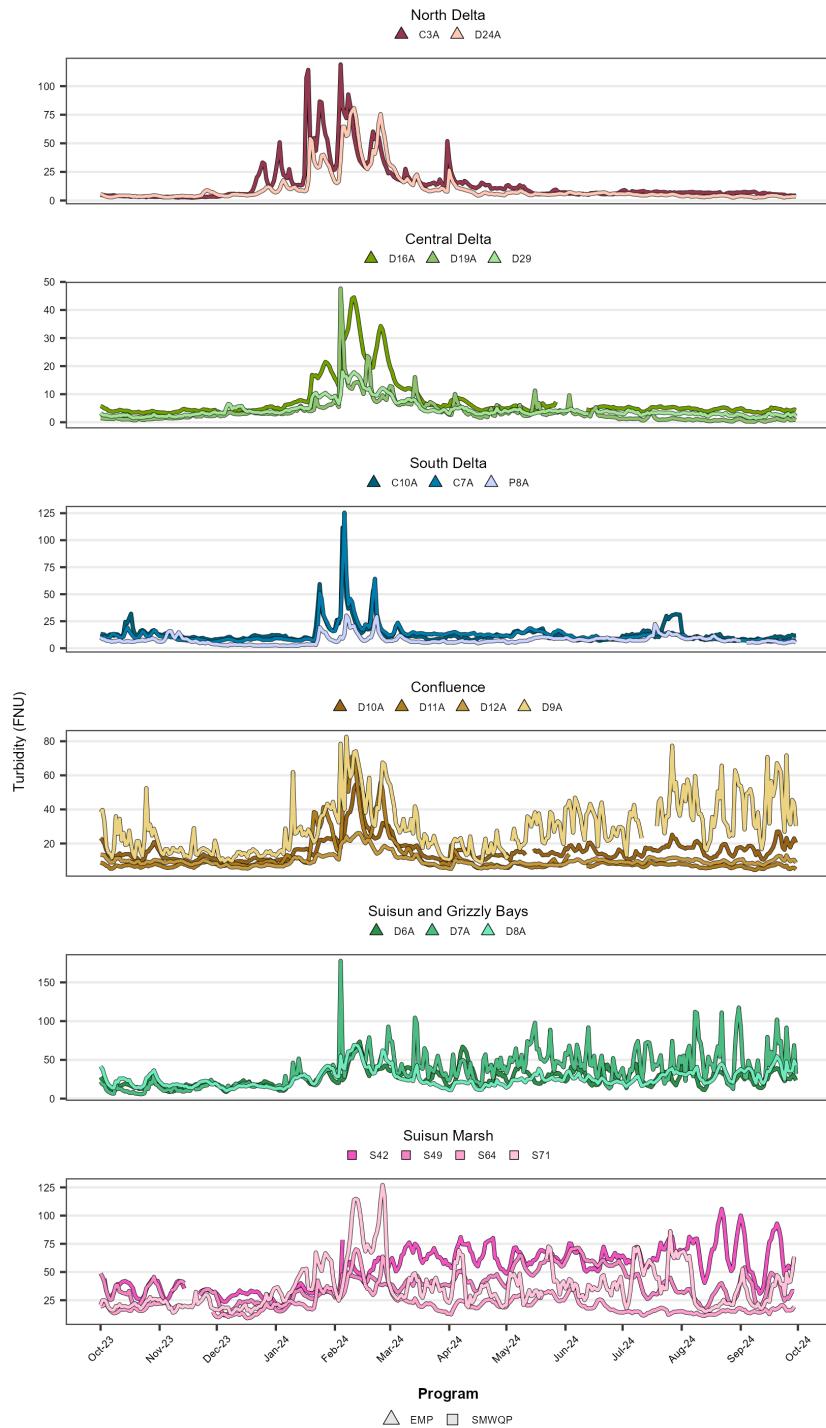


Figure 7: Turbidity by region in the San Francisco Bay-Delta estuary.

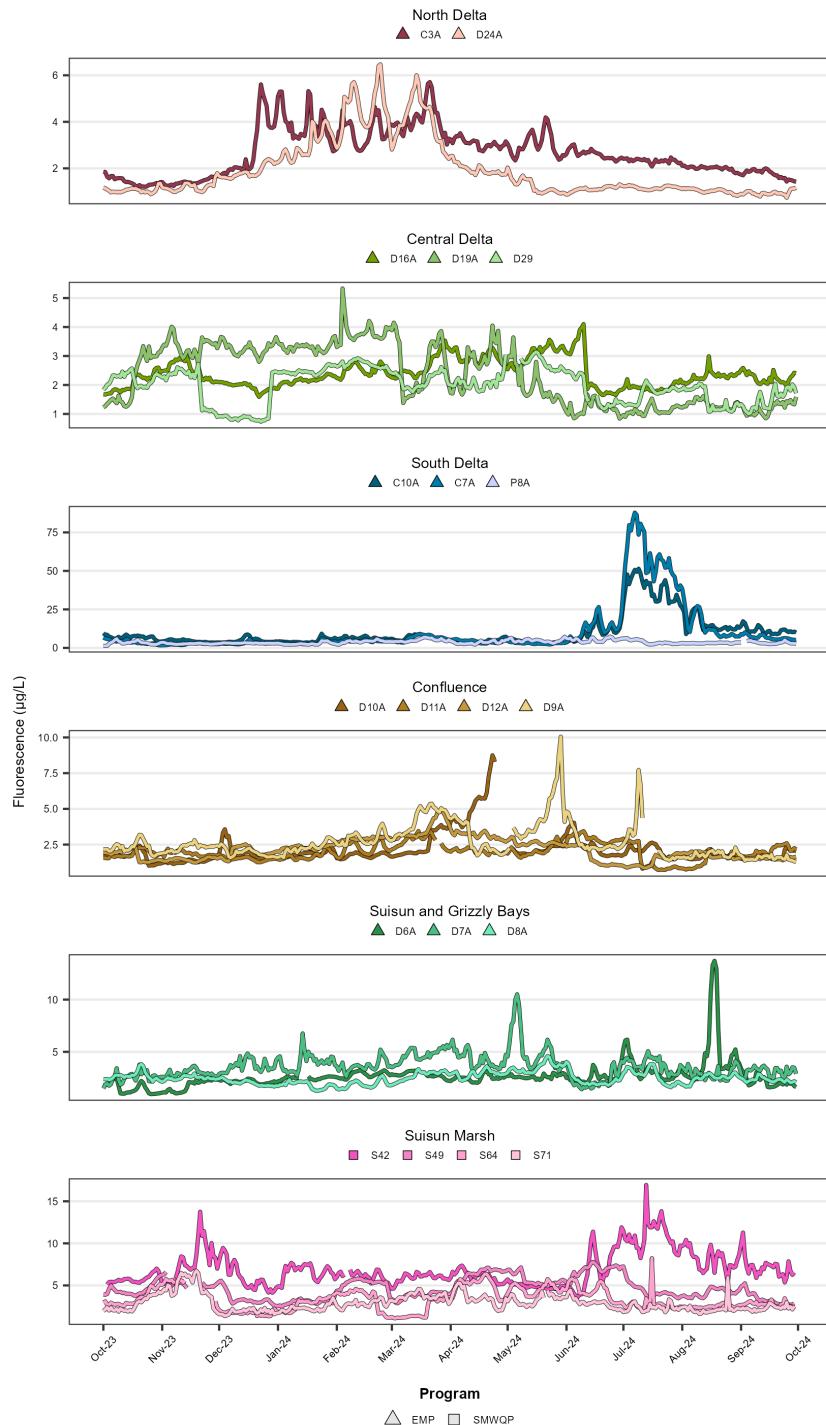


Figure 8: Chlorophyll a fluorescence by region in the San Francisco Bay-Delta estuary.

Table 1: Continuous WQ stations included within each region of the Delta

Region	WY Index	Stations
Central Delta Confluence	San Joaquin	C4, C5, D16A, D19A, D29
	Sacramento	C2, D9A, D11A, D12A, D22
North Delta	Sacramento	C3A, D24A
	South Delta	C7A, C8, C10A, DMC1, P8A
Suisun and Grizzly Bays	Sacramento	C14, D6A, D7A, D8A, D10A
Suisun Marsh	Sacramento	S21, S33, S35, S42, S49, S64, S71

Table 2: List of device types used at continuous WQ stations per program

Program	Stations
DWR-EMP	C2, C3A, C7A, C10A, D6A, D7A, D8A, D9A, D10A, D11A, D12A, D16A, D19A, D24A, D29, P8A
DWR-SMWQP	S21, S33, S35, S42, S49, S64, S71
USBR-DWQMP	C2, C4, C5, C8, C14, D22, DMC1

Tables

Table 3: Summary statistics for water temperature by region in the San Francisco Bay-Delta estuary.

Statistic	Central Delta	Confluence	North Delta	South Delta	Suisun and Grizzly Bays	Suisun Marsh
Average	17.40	16.70	16.30	17.90	16.70	17.10
Min	9.33	9.28	8.65	8.76	9.82	7.34
Max	26.60	24.60	24.30	29.10	24.40	26.00

Table 4: Summary statistics for specific conductance by region in the San Francisco Bay-Delta estuary.

Statistic	Central Delta	Confluence	North Delta	South Delta	Suisun and Grizzly Bays	Suisun Marsh
Average	247	2260	153	330	9110	4630
Min	64	85	98	50	110	213
Max	1300	16300	294	785	28700	16700

Table 5: Summary statistics for dissolved oxygen by region in the San Francisco Bay-Delta estuary.

Statistic	Central Delta	Confluence	North Delta	South Delta	Suisun and Grizzly Bays	Suisun Marsh
Average	9.31	9.10	9.23	8.98	8.95	7.46
Min	7.65	7.64	7.60	4.91	7.59	2.67
Max	11.80	10.60	11.00	15.30	10.50	10.10

Table 6: Summary statistics for pH by region in the San Francisco Bay-Delta estuary.

Statistic	Central Delta	Confluence	North Delta	South Delta	Suisun and Grizzly Bays	Suisun Marsh
Average	7.80	7.75	7.59	7.65	7.82	7.50
Min	7.22	7.41	7.22	7.18	7.50	7.16
Max	9.31	8.18	7.94	9.15	8.37	7.86

Table 7: Summary statistics for turbidity by region in the San Francisco Bay-Delta estuary.

Statistic	Central Delta	Confluence	North Delta	South Delta	Suisun and Grizzly Bays	Suisun Marsh
Average	5.24	16.70	12.80	11.30	30.10	37.40
Min	0.17	4.44	2.47	2.15	5.79	9.01
Max	47.70	82.70	119.00	126.00	178.00	127.00

Table 8: Summary statistics for chlorophyll a fluorescence by region in the San Francisco Bay-Delta estuary.

Statistic	Central Delta	Confluence	North Delta	South Delta	Suisun and Grizzly Bays	Suisun Marsh
Average	2.23	2.24	2.30	8.01	2.90	4.42
Min	0.73	0.72	0.74	1.30	0.95	1.10
Max	5.33	10.00	6.47	87.90	13.70	16.90