Benefits of Continuous Monitoring for Fluorescence in the Upper San Francisco Estuary

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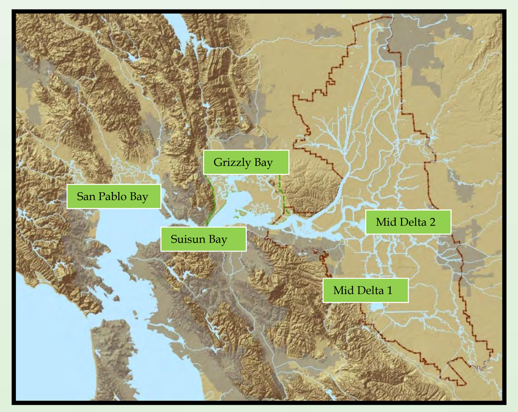
Introduction

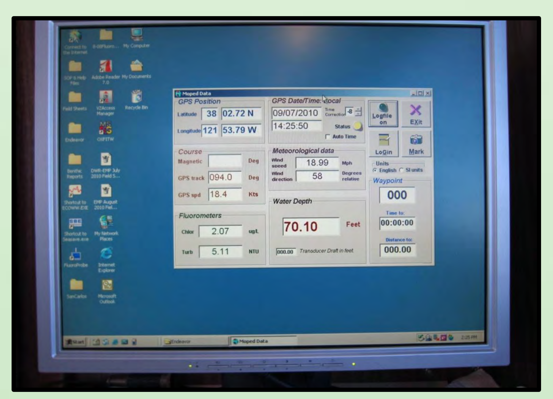
Since 1999, the Environmental Monitoring Program (EMP) has been collecting continuous longitudinal water quality profiles in the upper San Francisco Estuary as part of their monthly water quality monitoring program. This data supplements the discrete water quality samples collected at twenty-two fixed stations throughout the region.

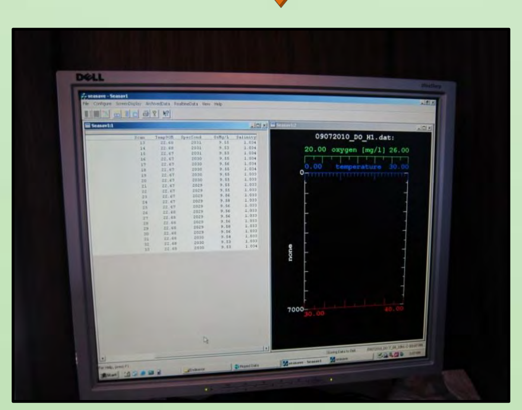
Both discrete and continuous data collected are used to improve our understanding of estuarine ecology. The continuous data may provide scientists with a better idea of the spatial and temporal distribution of water quality parameters. In May 2010, a diatom bloom occurred in the Estuary. The bloom's distribution could be tracked more effectively using continuous fluorescence data.

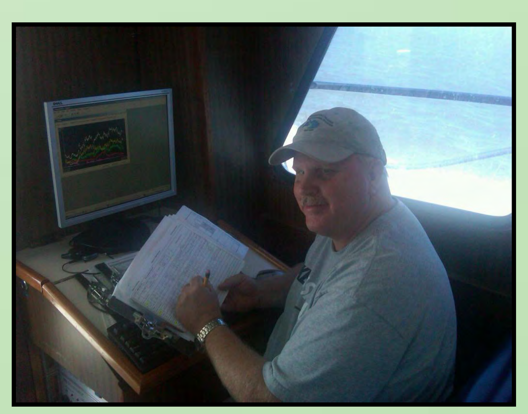
This poster provides an in-depth look at the benefits of using continuous longitudinal water quality profiles compared to fixed discrete data by observing fluorescence trends in the upper San Francisco Estuary from the winter (January 2010) to the spring (May 2010).

Methods









The research vessel lab is equipped with a flow-through system and a computer to collect geographically referenced in-situ water quality data. A SEA-BIRD Electronic 9/11 instrument electronically records values for water temperature, dissolved oxygen concentration and specific conductance. On the other hand, chlorophyll fluorescence (an indicator of algal growth) and turbidity are determined using two separate Turner 10-AU instruments.

Results

Figure 1: Continuous Fluorescence Data in the SF Estuary During a May 2010 Field Run

From May 5th to 11th, the Autohelm GPS unit recorded latitudinal and longitudinal units as the vessel traveled through the Estuary. Continuous longitudinal water quality profiles helped illustrate spatial change better than discrete data alone during this sampling period:

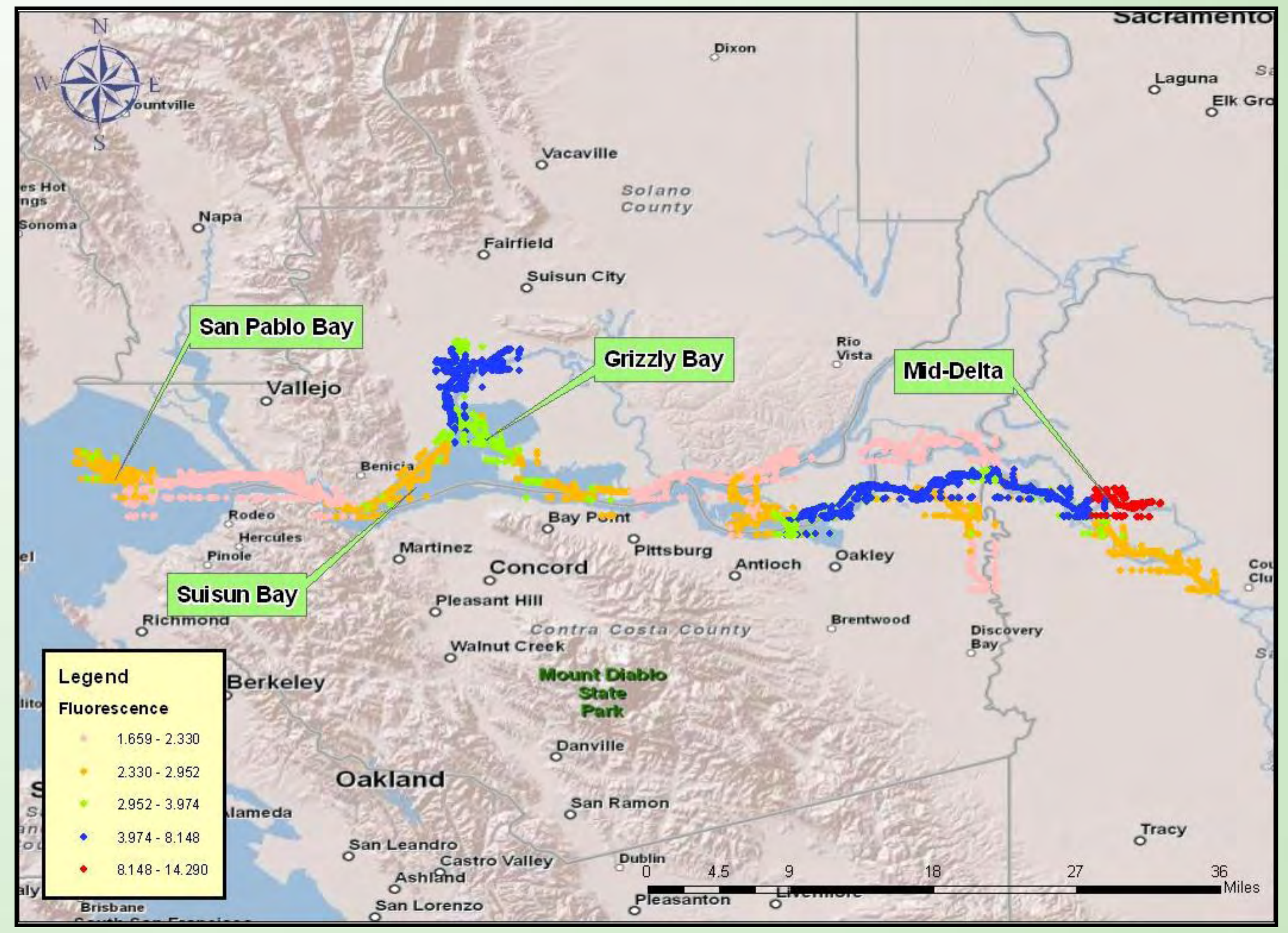
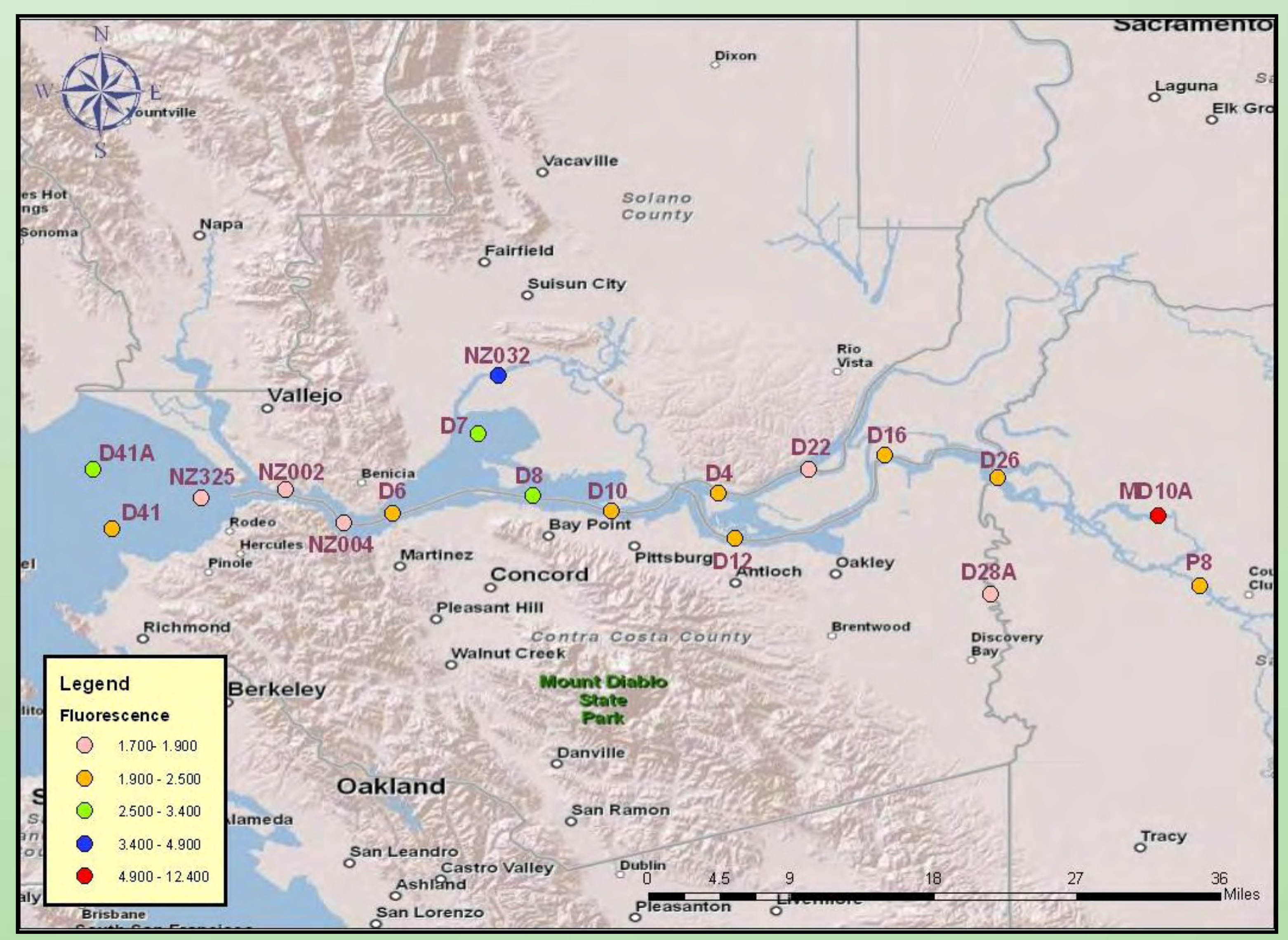


Figure 2: Discrete Fluorescence Data in the SF Estuary From May 2010

Discrete data analytical maps are not as comprehensive since discrete samples are chosen to represent conditions in a given watershed at a specific location and depth.

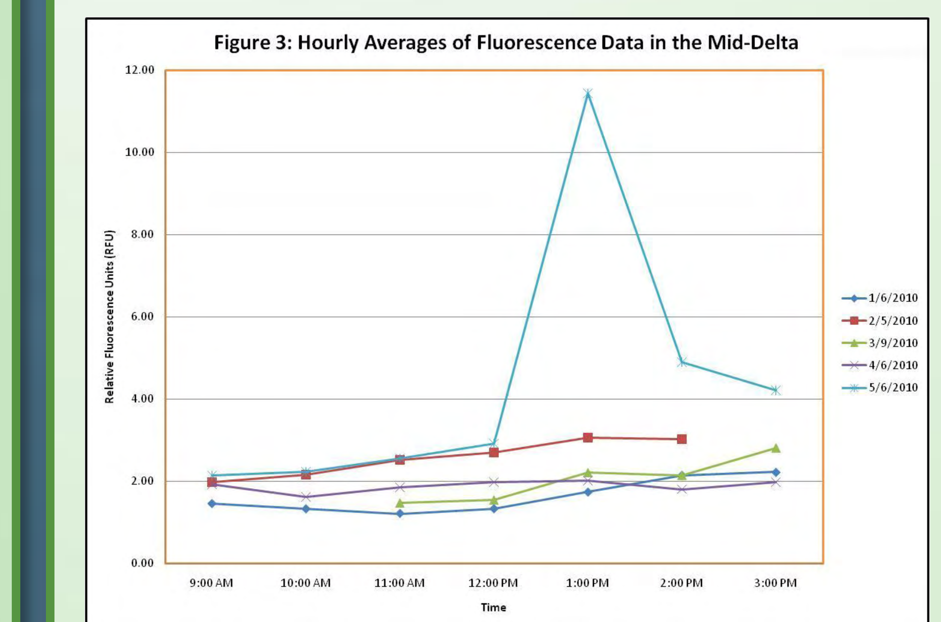


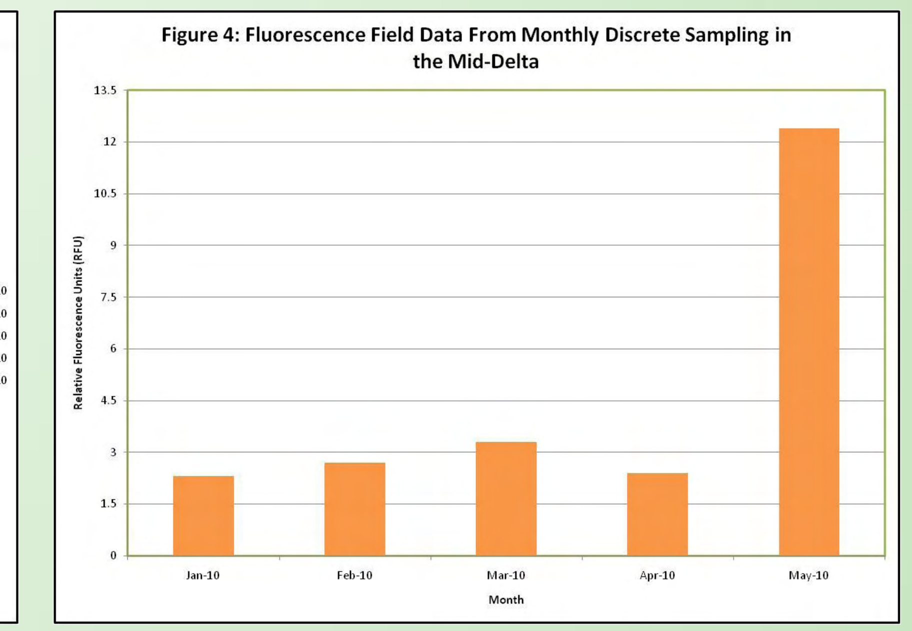
Analysis

Maps generated from continuous data (Figure 1) allowed for improved analysis of spatial distributions of fluorescence when being compared to those generated from discrete data alone (Figure 2). Analyzing maps of continuous data enable us to:

1. Observe changes in the transect where discrete samples are not being collected.
2. Target specific locations based on fluorescence trends.
3. Find potential correlations between local land and water-use practices that influence the water quality in the Estuary.

Both continuous and discrete data showed a significant increase in fluorescence in the Mid-Delta between April and May, 2010 (Figure 3 and 4). However, continuous data documented temporal variability over the course of each monthly field run. This data was later combined into hourly averages by offsite staff members (Figure 3).





Continuous fluorescence data can also be useful for analyzing chlorophyll temporal variability. Analyzing temporal fluorescence trends and patterns is important because variations are often driven by short-term physiological responses as well as long-term changes in plankton biomass. The continuous fluorescence data set is also more helpful to scientists in designing special studies in response to bloom events or to better quantify temporal variation of phytoplankton with regard to each other and to water quality conditions.

Conclusions

How Can Continuous Data be Used?

The data collected during continuous monitoring may provide new insights into system mechanics, including: 1) quantification of unknown point discharges, 2) identification of key in-stream sources, and 3) the extent to which biological activity (phytoplankton growth) affects water quality. Continuous data is extremely useful when observing annual and seasonal trends of fluorescence. Comparing figures 1 and 2 shows continuous data giving a much clearer picture of temporal and spatial fluorescence trends.

Acknowledgments

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