Project Final Report – Nutrient Monitoring Project
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Project Summary

The primary goal of this project is to quantify the water quality parameters (DO, temperature, salinity, chl, and pH), and concentration and loading of nutrients flowing into Moss Landing Harbor (and then into Elkhorn Slough) from the Moro Cojo Slough. Nutrient concentrations are highly variable in time due to tides and discharge plumes moving down stream, but higher concentrations are often found towards the mouth of the Moro Cojo.

Deliverables:

Monitoring System:

1. Development of sensor system at Highway 1, at the mouth of the basin
2. Open source documentation, including write-up on maintenance cycle and protocol so that others can replicate experimental setup
3. Open access data
4. Quarterly and annual progress reports
5. End of project workshop to highlight ongoing monitoring efforts and data collection in Moro Cojo and Elkhorn Slough

Progress on Moro Cojo Monitoring Station (numbered according to deliverable listed above):

1. We have successfully established the multi-sensor monitoring station at Hwy 1 called the Moro Cojo Slough Quality Under Intense Real Time Sampling (MCSQUIRTS; Figures 1-2). The station includes a platform that holds the YSI EXO sonde (purchased with AI funds), the SUNA nitrate sensor (also purchased with AI funds), an osmotic pump that continuously samples surface water for nutrient samples, an Acoustic Doppler Current Profiler to measure flow (from Elkhorn Slough National Estuarine Research Reserve), and an additional hydrolab sensor that hangs at depth (from Elkhorn Slough National Estuarine Research Reserve). We initiated the YSI EXO sonde deployment beginning on 4/19/2017 and conducted multiple trial deployments. The next step was to construct a platform with sufficient battery to power the YSI sonde and SUNA sensor for 30 days. The “permanent” platform was constructed and deployed in October 2017. It has taken multiple adjustments in order to acquire quality data and maintain power of the system since solar panels cannot be installed due to potential theft and vandalism. Deployment and data collection has been successful since the first deployment date. Between April and October 2017 data collection was intermittent while we conducted troubleshooting of the system. Since November 2017, we have collected data consistently with very limited data gaps. Currently, every 25

days the sonde is recovered to check biofouling, conduct any maintenance (calibration, firmware and software updates), and download data from the SUNA, YSI, and ADCP. The batteries are exchanged for fully charged batteries every 25 days.

2. We are finalizing the documents regarding the construction, maintenance cycle, and other protocols of the MCSQUIRTS system to make available to other researchers. The documentation will be available on the MLML and CCWG websites once we have the telemetry and final adjustments of the system completed.
3. Data from the ADCP, YSI sonde, and SUNA are included in this report (Figures 3-10). Data includes flow (m^3 s^{-1}) from the ADCP, local rainfall (inches), salinity, chlorophyll *a* (μg L^{-1}), nitrate (μM), pH, water temperature (Celsius), and total dissolved solids. This data demonstrates the variability of physical parameters on short time scales due to tidal fluctuations and seasonal changes that MCSQUIRTS is able document. As more data is collected, data analysis efforts will continue that will quantify nitrate loading from the Moro Cojo and identify patterns in physical and chemical parameters of surface water. These efforts will provide results to improve our understanding of nutrient dynamics in this watershed. Furthermore, this data will be used in the nutrient transport model and other ongoing modeling efforts in the Moro Cojo. The data will also be used for the ongoing deliberation of Moro Cojo tide gate management by the Moro Cojo Technical Advisory Committee. Communication equipment has been purchased for the monitoring station telemetry system. We have currently presented this project to the SJSU IT department to acquire an interested student to work on the final development of the telemetry system and open access of data. We thought it would provide a wonderful opportunity to another student to work on this project. If a student has not joined the group as of February 10, we will move forward as planned and complete the telemetry and open access. Otherwise the data is currently available as a CSV files.
4. Quarterly reports and this final report have been completed.
5. We will be presenting details of this monitoring system at the Elkhorn Slough Scientific Workshop being held on Feb. 27, 2018. We will also be participating in the upcoming Salinas Watershed Monitoring Coordination Meeting to discuss these monitoring efforts. Since two monitoring workshops are currently being held early this year, we will be hosting a monitoring station development workshop towards the end of summer/fall after we have the telemetry protocol established. The workshop will be held at MLML and targeted to bring technicians and scientists into the same room as we discuss ways to move forward with long term water quality monitoring efforts.

In summary, the following tasks will continue in 2018:

1. Attend Elkhorn Slough Scientific Workshop and the Salinas Watershed Monitoring Coordination Meeting to discuss this monitoring project (February 2018)
2. Complete telemetry and open access, hopefully involving an SJSU IT student (February 2018)
3. Finalize technical documents including components, construction, maintenance, and telemetry (June 2018)
4. System maintenance and data acquisition (ongoing)
5. Monitoring station development workshop (~August 2018)

Figure 1a and 1b. (1a) John Haskins (ESNERR) and Jason Adelaars (MLML) are working on the MCSQUIRTS system at Highway 1. (1b) The box contains batteries and computer system that store data and power the YSI EXO sonde, SUNA nitrate sensors, and ADCP.

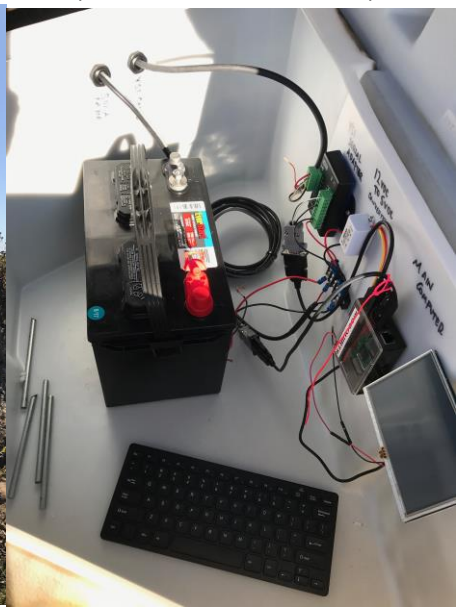
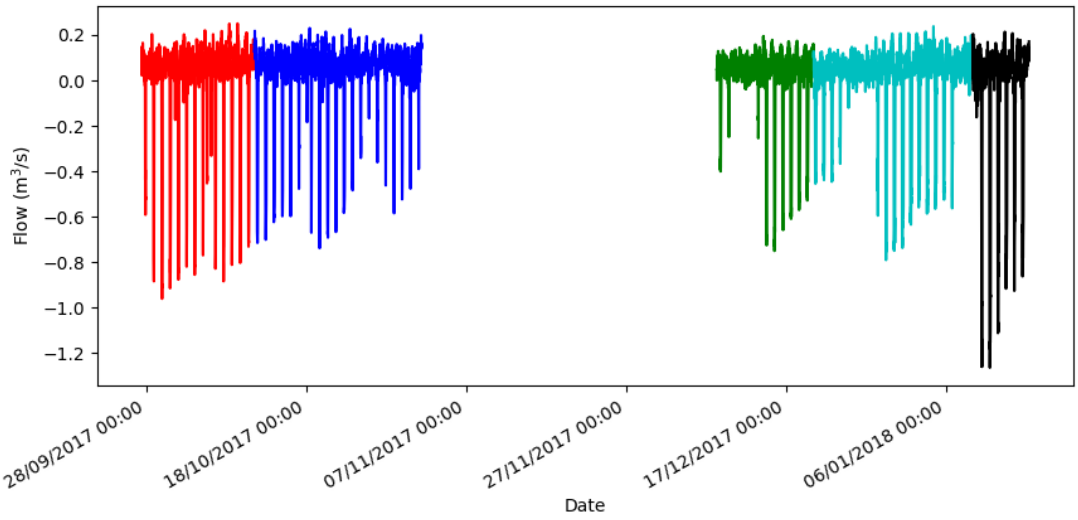
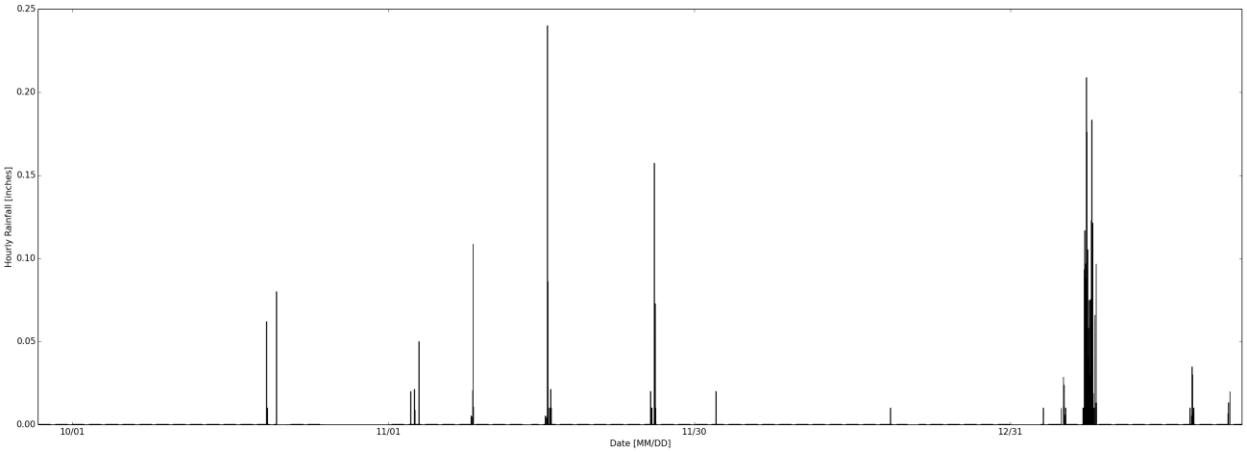
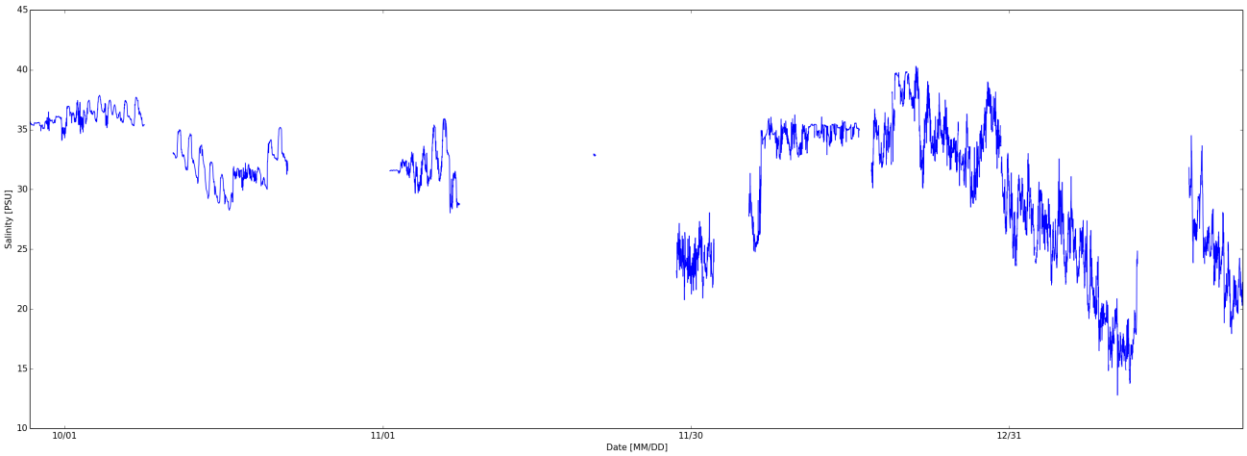


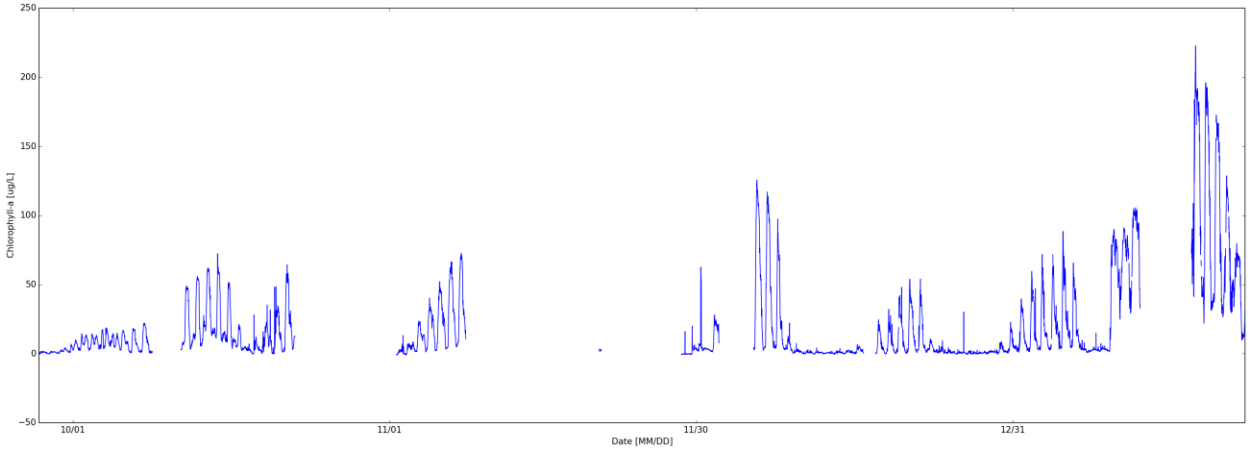
Figure 2a and 2b. (2a) Graduate student, Maureen Wise, works on installing and calibrating the MCSQUIRTS system. (2b) View of MCSQUIRTS platform in Moro Cojo Slough from Hwy 1.

Preliminary data Figures 3-10 collected from MCSQUIRTS. Data gaps are due to platform construction and maintenance.





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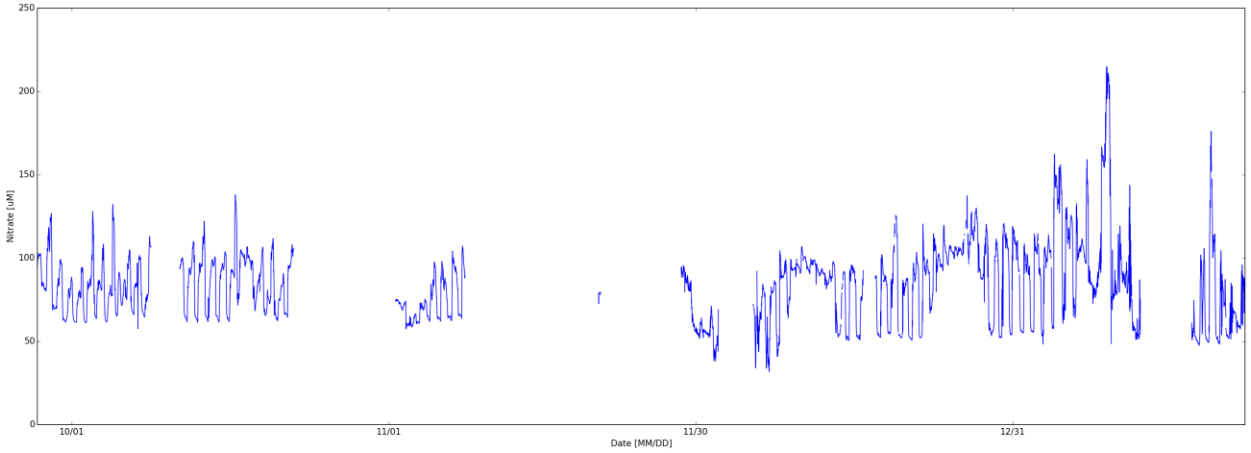
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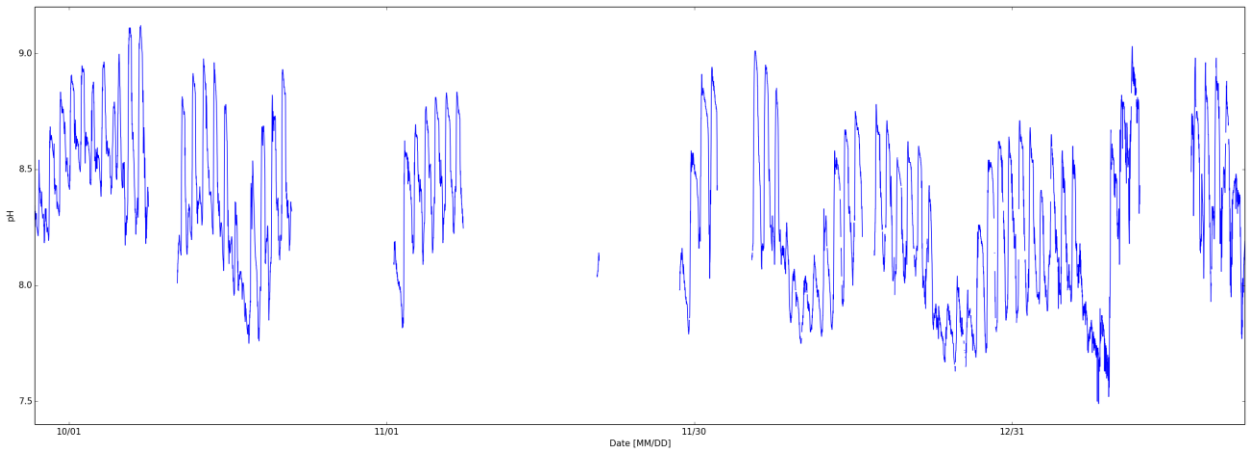
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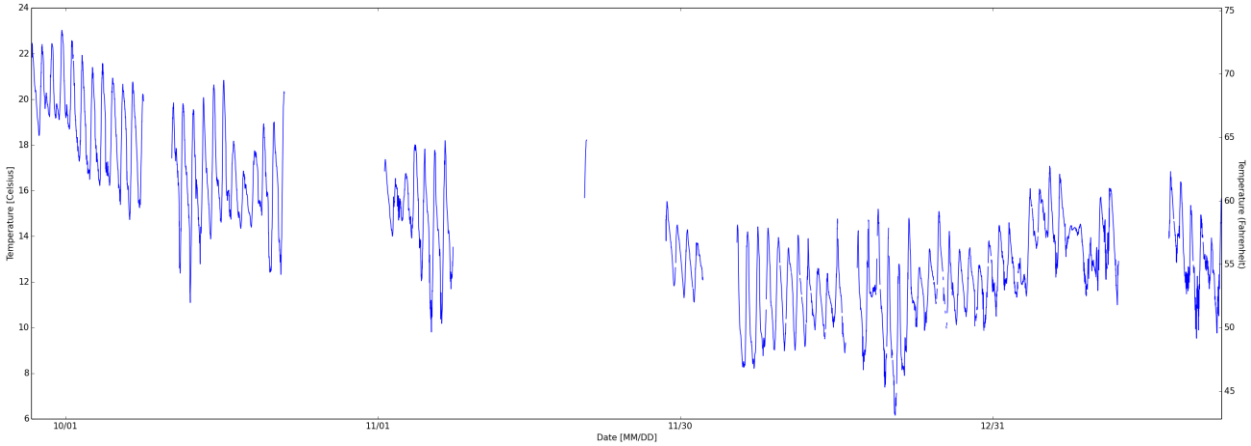
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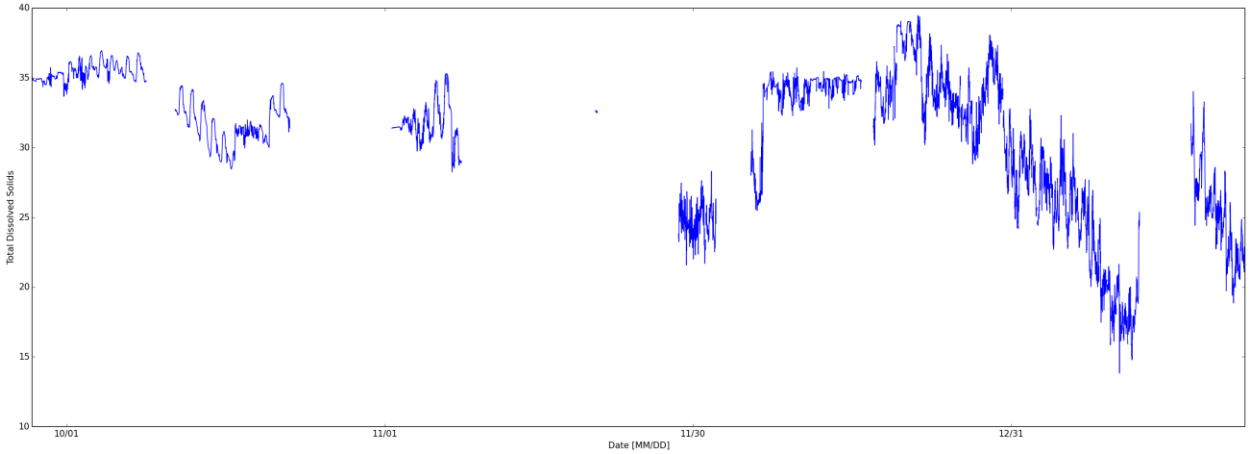
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