

Description and Photo-Documentation of Field Work Activities

Report 4.2.1

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List of Acronyms

DO	dissolved oxygen
DWSC	deep water shipping channel
ID	irrigation district
MID	Modesto Irrigation District
RM	river mile
sonde	YSI 600XL waterquality sonde
TMDL	total maximum daily load
UOP	University of the Pacific

Introduction

The Ecological Engineering Research Program (EERP) at the University of the Pacific (UOP) was the lead scientific agency on the San Joaquin River Dissolved Oxygen Total Maximum Daily Load (DO TMDL) project (ERP-08D-SO3; E0883006). The purpose of this project was to collect and analyze data on the sources of oxygen-consuming materials in the San Joaquin River (SJR) and estuary in order to support the development of an estuary model.

In accordance with the DO TMDL project, EERP collected water quality data from numerous locations throughout the SJR watershed. Water quality data was obtained through on site measurements using a YSI water quality data sonde and through water quality grab samples which were analyzed at the EERP lab at UOP. Collecting grab samples and on-site water quality measurements was the responsibility of the EERP field research team. The major objective of the field research team was to collect water quality data in support of modeling efforts while maintaining a high level of quality control, as well as to organize collected data for scientific and engineering analysis. The purpose of this report is to document EERP field research activities for the San Joaquin River DO TMDL project.

Methods

EERP collected samples from the San Joaquin River and estuary at 39 different locations during the years 2011 and 2012 (Figure 1). Sample locations were broken up into three groups based on site access and location. Table 1 lists each site along with its DO TMDL Project site number and group assignment. Paradise Marina, Bear Creek, Mosher Slough, 5 Mile Slough, Calaveras River, Smith Canal, Turning Basin, French Camp, SJR at DosReis, and SJR at Mossdale are all located in or near the City of Stockton and are accessible by land, whether by dock, bridge, or shore, and are referred to as “Estuary Truck” sites. Brant Bridge, Louis Park, Light 38, Light 18, Turner Cut, Acker Island, 14 Mile Slough, Disappointment Slough, Columbia Cut, and Little Venice Isl. are also located in the Stockton area but can only be accessed by boat; therefore, these sites are referred to as “Estuary Boat” sites. The remaining sites are located upstream of the SJR and are referred to as “Upstream” sites. The Estuary Boat and Estuary Truck sites were sampled on a biweekly or monthly basis from April to December. Selections of upstream sites were sampled, based on specific scientific objectives related to the SJR model, on a monthly basis from May through September to coincide with the irrigation season.

A typical sampling event included visiting seven to ten sampling sites. Prior to deployment, field trip plans were prepared and distributed to field and laboratory staff. A field trip plan included a basic itinerary of where and when sampling would occur and acted as a check sheet and sample chain of custody. At each site, grab samples were collected and a sonde was used to take on-site water quality measurements. Upon return to the EERP lab, the field notes and check sheet were scanned to .pdf and filed, data was downloaded from the sonde, and grab samples were compared against the chain of custody, inspected, and stored for processing. Field notebooks and a camera were used to document all field activities.

In addition to the above mentioned sampling events, the EERP field research team also

conducted six special studies under the adaptive management plan during the year 2012. The objective of the special studies was to investigate high conductivity plumes that were observed by the Department of Water Resources in the San Joaquin River Deep Water Ship Channel (DWSC) and to investigate the extent of stratification in the waterbody. Each special study included the collection of water quality measurements with the use of multiparameter water quality data sondes. A typical special study lasted six to eight hours and included collection of as many as 10,000 data points from the ship channel turning basin to navigation light 41.

The field activity summaries included in this report document activities by sampling trip for the 2011 and 2012 sampling seasons. Depending on the specific trip objectives, each field activity summary was given an categorical heading of either “Truck Sampling”, “Boat Sampling”, “Upstream Sampling”, or “Special Study”. Below the heading is a brief description of the objectives and work performed along with any complications that were encountered during the sampling trip. Photographs are also included to provide further documentation.

Water Quality Measurements

During each sampling event, sonde measurements were collected for each sample site (Spier et al., 2011). Sonde measurements were attained using a YSI 6600 multi-parameter sonde connected to a YSI 650 MDS handset (YSI Inc., Yellow Springs, CO). The sonde was programmed to log a reading for every parameter every four seconds and was deployed for a minimum of five minutes. This ensures a statistically significant sample size ($n > 30$) even after outliers are removed from the dataset (Graham and Hanlon, 2008). The parameters measured by the sonde include time, temperature ($^{\circ}\text{C}$), specific conductivity (mS/cm), total dissolved solids (g/L), dissolved oxygen (DO) percent, DO concentration (mg/L), depth (ft), pH, turbidity (NTU), chlorophyll a content ($\mu\text{g/L}$), fluorescence, barometric pressure (mmHg), and battery level (V).

Grab Sampling

Nine to 12 grab samples were collected at each sample site per sampling event. Grab samples were collected in four different types of sample bottles [glass 1 liter bottles (Wheaton Science Products, Millville, NJ), 1 liter Trace-Clean plastic bottles (VWR International, West Chester, PA), 250 milliliter Trace-Clean plastic bottles (VWR International), and 250 milliliter Nalgene amber plastic bottles (Thermo Scientific, Rochester, NY)]. Bottle type was selected in accordance with requirements for different lab analyses (Borglin et al., 2008).

There were two ways in which depth integrated water samples were collected. The first was by submerging the bottles in the water by moving them up and down within the water column using a telescoping pole. This method was used whenever the site could be accessed by boat, shore, or dock. For sites which could only be accessed by bridge, a bucket which was connected to a rope and weighted with site water was dropped in the water mid-channel. The bucket of water was then pulled up to the bridge and evenly distributed between sample bottles by means of a funnel. Regardless of sampling method, all bottles and equipment were rinsed with site water before samples were collected.

One concentrated sample was also collected at each site. Twenty-seven liters to twenty-eight liters of water was collected and filtered using a sixty-three μm plankton net (Wildlife Supply Company, Yulee, FL). Concentrated samples were immediately split for microcystin analysis and the remainder preserved with Lugol's solution, M-3 fixative, or formalin sucrose (SM 10200) for plankton enumeration.

Once all grab samples were collected for a site, they were stored in the dark on ice at or below 4°C. Upon completion of the sampling event, all samples were immediately transported to the EERP lab for processing.

Special Studies

Each special study consisted of collecting data from a boat with multiparameter water quality sondes using two different sampling methods. The first method was in the form of a low speed troll, starting at the turning basin and ending downstream of Rough and Ready Island at navigation light 41. During each troll, one or more sondes were deployed from the bow of the boat and alternately raised and lowered from river bottom to surface. The second method of data collection was obtained in the form of vertical profiles. Vertical profiles were performed by fixing the location of the boat while gathering high resolution data from the river bottom to the surface. Vertical profiles were conducted at several points along the length of the DWSC with particular detail gathered near the Rough and Ready Island monitoring station.

All sonde measurements were attained using YSI 6600 multi-parameter data sondes connected to YSI 650 MDS handsets (YSI Inc., Yellow Springs, CO). The sondes were programmed to log a measurement for every parameter every four seconds. The parameters measured by the sondes included time, temperature (°C), specific conductivity (mS/cm), total dissolved solids (g/L), dissolved oxygen (DO) percent, DO concentration (mg/L), depth (ft), pH, turbidity (NTU), chlorophyll a content (ug/L), fluorescence, barometric pressure (mmHg), and battery level (V). The MDS handsets were also configured to concurrently record GPS coordinate locations from a Garmin eTrex Legend global positioning system (Garmin International, Inc., Olathe, KS).

Results

During the 2011 field season, the field research team completed a total of 27 sampling events. Of these events, eleven were truck sampling events, ten were boat sampling events, four were upstream sampling events, and two were practice sampling events. During the 2012 field season, the field research team completed a total of 30 sampling events. Of these events, eleven were truck sampling events, seven were boat sampling events, six were upstream sampling events, and six were special studies. Occasionally problems were encountered in the field which prevented the collection of specific samples. Those events are described in detail below.

2011 Sampling Season

No grab samples were collected and no sonde data were obtained for DO-21-092911, DO-11-100611, DO-2-111011, and DO-127-120811. On September 29th, it was discovered that there was no flow at Site 21. On October 6th, there was a heavy rain the night before sampling; this caused the steep slope which is used to access Site 11 to become very muddy, making conditions too dangerous to access the sampling site. On November 10th, one of the field research team members became ill and so a team of two people instead of three completed the sampling event. This resulted in longer sampling times and Site 2 had to be removed from the field trip plan due to time constraints. On December 8th, the boat battery died before Site 127 could be reached. The outboard motor was used to safely return the boat to dock; however, no samples were collected at Site 127.

Grab samples were collected, but there are no sonde measurements for DO-433-080411, DO-10-092911, DO-4-111011, DO-421-111011, DO-428-111711, and DO-421-120111. On August 4th, the sonde froze during operation. Upon discovery, the batteries were replaced and the sonde continued to function normally, however, all data was lost for Site 433. The sonde requires a minimum depth in order to take accurate and reliable measurements. On September 29th, this minimum depth was not met for Site 10, nor was it met for Site 421 on November 10th and December 1st. An operator error caused sonde data to be lost for Site 4 on November 10th. Lastly, sonde data was recorded for Site 428 on November 17th, but upon further inspection the data was found to be unreliable and was thrown out.

During the year 2011, a total collection of 205 samples were attempted. Of the 205 attempts, 201 grab samples and 195 continuous measurement datasets were obtained.

2012 Sampling Season

On June 28th, there was so much trash and debris along the shore of Smith Canal that the field research team was unable to collect a microcystin sample. On August 23rd, the field crew was unable to take a representative sample at SJR at Patterson because the Patterson Irrigation District Pump Diversion Platform was discharging water into the river just upstream of the sample site. The erosion of the levee at French Camp coupled with winter rains made this site too dangerous to access during the months of October, November, and December.

On three occasions, Orestimba Creek was found to be completely dry. A minimum water depth of one foot (approximately the height of a one liter sample bottle or the height of the sonde cage) is required in order to collect a representative grab sample or take reliable measurements with a sonde. That minimum depth was not met for DO-10-071912, DO-421-120612, or DO-421-121312 and therefore no samples were collected for these sites. A minimum water depth of approximately 18 inches (a little more than the diameter of a sample collection bucket) is required to collect a microcystin sample. SJR at Lander Avenue never reached this minimum depth, in addition, the minimum depth was not met for DO-7-071912, DO-21-082312, or DO-11-083012 and therefore no microcystin samples were collected at these sites.

During the year 2012, a total collection of 207 unique samples were attempted. Of the 207 attempts, unconcentrated grab samples and sonde measurements were successfully obtained for 200. Concentrated grab samples were obtained for 193.

Discussion

This report includes field activity summaries for all 27 sampling events which were completed in 2011 and all 30 sampling events which were completed in 2012. These summaries include both written and photo documentation. The field sampling program lasted a total of 67 weeks. Truck sites were sampled at least once a month from April to December, boat sites were sampled at least once a month from May to November, and upstream sites were sampled at the same frequency from May to September. In addition, special studies were conducted at least once a month from May to September in 2012.

A total of 412 unique samples were attempted. Due to unforeseen circumstances, such as low or no flow or dangerous conditions, some samples were attempted, but not collected. Ninety-seven percent of all sample collection attempts resulted in the successful acquisition of unconcentrated grab samples, and 96% resulted in successful collection of sonde measurements and concentrated samples. All samples were collected and processed in accordance with EERP Field Operating Procedures (Graham and Hanlon, 2008), EERP Standard Laboratory Operating Procedures (Borglin et al., 2008), and in accordance with the EERP Quality Assurance Project Plan (Spier et al., 2011).

Acknowledgements

We gratefully acknowledge the Ecosystem Restoration Program and its implementing agencies (California Department of Fish and Wildlife, U.S. Fish and Wildlife Service, and the National Marine Fisheries Service) for supporting this project (E0883006, ERP-08D-SO3).

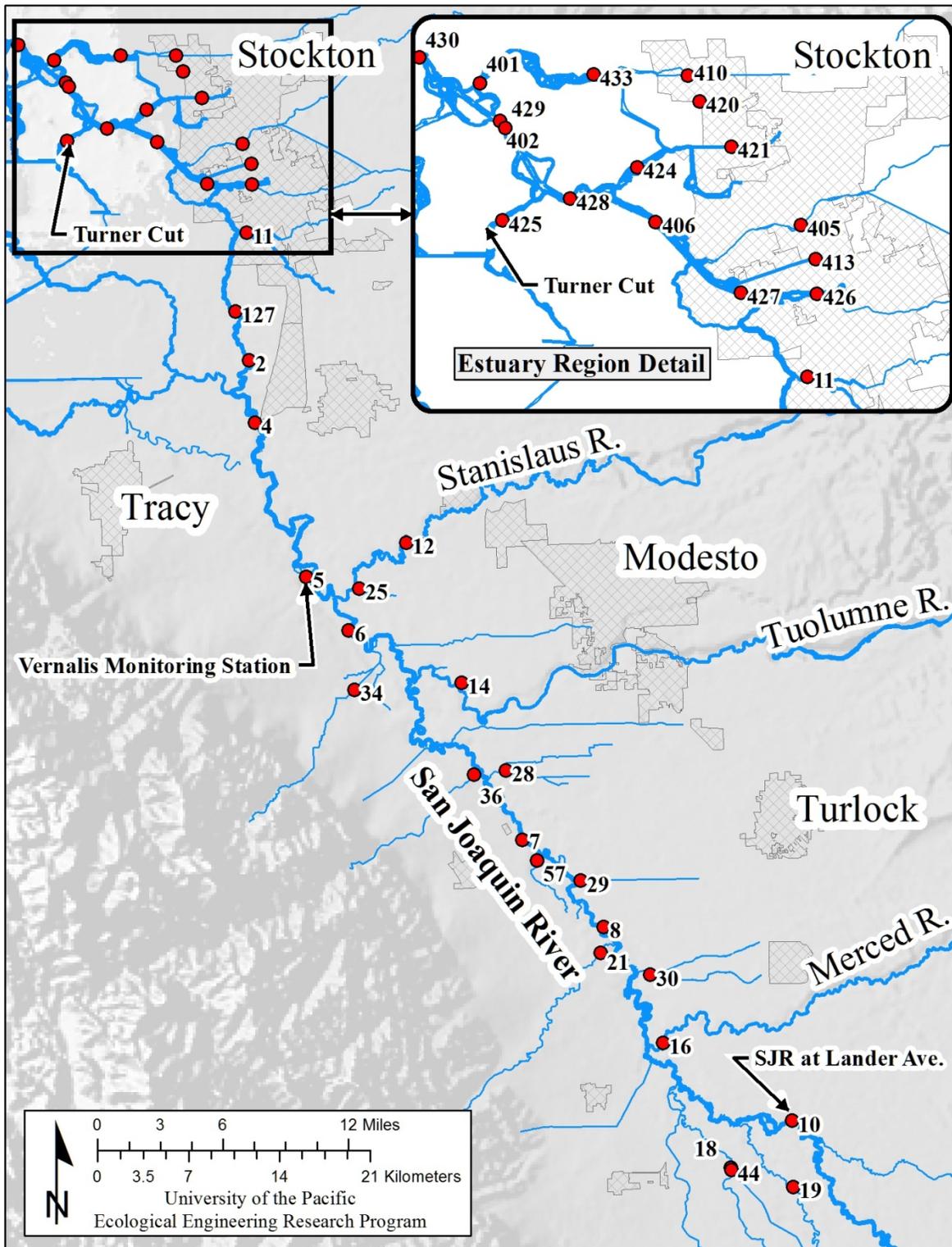
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- Graham, J., Hanlon, J., 2008. EERP Field Standard Operating Procedures Protocol Book. Environmental Engineering Research Program, Stockton, CA.
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Table 1. DO TMDL study site list.

Site Number	Site Name	Sample Group
2	SJR at Dos Reis Park (Lathrop)	Truck
4	SJR at Mossdale	Truck
5	SJR at Vernalis	Upstream
6	SJR at Maze	Upstream
7	SJR at Patterson	Upstream
8	SJR at Crows Landing	Upstream
10	SJR at Lander Avenue	Upstream
11	French Camp Slough	Truck
12	Stanislaus River at Caswell Park	Upstream
14	Tuolumne River at Shiloh Bridge	Upstream
16	Merced River at River Road	Upstream
18	Mud Slough near Gustine	Upstream
19	Salt Slough at Lander Avenue	Upstream
21	Orestimba Creek at River Road	Upstream
25	MID Main Drain to Stan. R. via Miller Lake	Upstream
28	Turlock ID Westport Drain Flow station	Upstream
29	Harding Drain at Carpenter Rd.	Upstream
30	Turlock ID Lateral 6 & 7 at Levee	Upstream
34	Ingram Creek	Upstream
36	Del Puerto Creek Flow Station	Upstream
44	San Luis Drain End	Upstream
57	Ramona Lake Drain at Levee	Upstream
127	SJR at Brant Bridge	Boat
401	Disappointment Slough	Boat
402	Light 18 (Node 96) DWSC	Boat
405	Calaveras River at UOP	Truck
406	Light 38 DWSC	Boat
410	Bear Creek at Trinity Bridge	Truck
413	Smith Canal at Yosemite Lake	Truck
420	Mosher Slough at Mariners Dr.	Truck
421	5 Mile Slough at Hazelwood Ave	Truck
424	14 Mile Slough	Boat
425	Turner Cut	Boat
426	Turning Basin at Morelli Park Launch	Truck
427	RM 39 Near Louis Park	Boat
428	RM 33.2 Upstream of Acker Isl. (Light 28)	Boat
429	Columbia Cut	Boat
430	RM 27.3 Near Little Venice Isl.	Boat
433	Paradise Marina	Truck

Figure 1. Map of DO TMDL Project sampling locations in 2011-2012.



April 7, 2011

DO-Estuary Practice Sampling

Jeremy Hanlon, Chelsea Spier, and Michael Jue practice sampling for the DO-Estuary Project.



DO-410 Bear Creek at Trinity Bridge
Chelsea labeling a sample bottle as Michael gathers sampling equipment



DO-410 Bear Creek at Trinity Bridge
Michael and Chelsea deploying the sonde



DO-405 Calaveras River at UOP
Michael gathering a bucket sample as Chelsea takes a light measurement



DO-405 Calaveras River at UOP
Michael and Chelsea rinsing the sample bottles

May 5, 2011

DO-Estuary Truck Sampling Event
Jeremy Hanlon, Will Stringfellow, and Michael Jue sampling for the DO-Estuary Project



DO-420 Mosher Slough at Mariners Dr.
Jeremy collecting microcystins at Mosher Slough



DO-421 5 Mile Slough at Hazelwood Ave
Jeremy deploying the sonde at 5 Mile Slough



DO-11 French Camp Slough
Will collecting grab samples at French Camp Slough



DO-11 French Camp Slough
Jeremy packing up the equipment at French Camp Slough

May 19, 2011

DO-Estuary Truck Sampling Event

Jeremy Hanlon, Justin Graham, and Michael Jue sampling for the DO-Estuary Project



DO-413 Smith Canal at Yosemite Lake
Jeremy deploying the sonde at Smith Canal



DO-413 Smith Canal at Yosemite Lake
Justin collecting grab samples at Smith Canal



DO-426 Turning Basin at Morelli Park
Michael collecting microcystins at Turning Basin



DO-426 Turning Basin at Morelli Park
The view from the Morelli Park Launch at Turning Basin

June 2, 2011

DO-Estuary Truck Sampling Event
Jeremy Hanlon, Ashley Stubblefield, and Michael Jue sampling for the DO-Estuary Project



DO-410 Bear Creek at Trinity Bridge
Michael and Ashley collecting bucket samples at Bear Creek



DO-410 Bear Creek at Trinity Bridge
Michael processing phosphate samples



DO-2 SJR at Dos Reis Park
San Joaquin River at Dos Reis Park



DO-11 French Camp Slough
The view at French Camp Slough

June 9, 2011

DO-Estuary Boat Sampling Event
Jeremy Hanlon, Ashley Stubblefield, and Michael Jue sampling for the DO-Estuary Project



DO-428 RM 33.2 Upstream of Acker Isl.
Ashley collecting sonde readings



DO-406 RM 35.8 Light 38 DWSC
Jeremy controlling the outboard in order to minimize boat drift during sample collection



DO-428 RM 33.2 Upstream of Acker Isl.
Michael collecting a phytoplankton sample

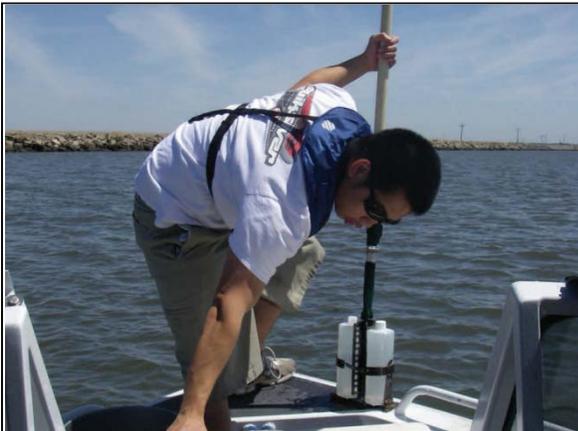


DO-427 RM 39 Near Louis Park
A view from across the Port of Stockton

June 16, 2011

DO-Estuary Boat Sampling Event

Jeremy Hanlon, Ashley Stubblefield, and Michael Jue sampling for the DO-Estuary Project



DO-424 14 Mile Slough
Michael collecting grab samples



DO-428 RM 33.2 Upstream of Acker Isl.
Jeremy controlling the outboard



DO-425 Turner Cut
Ashley going through the checklist in order to account for all the samples collected and processed at the sampling site



DO-402 Light 18 (Node 96)
A view of Light 18

June 23, 2011

DO-Estuary Upstream Sampling Event

Jeremy Hanlon, Ashley Stubblefield, and Michael Jue sampling for the DO-Estuary Project



DO-21 Orestimba Creek at River Road
A view of Orestimba Creek



DO-29 Turlock ID Harding Drain
A view from the bridge at Harding Drain



DO-36 Del Puerto Creek Flow Station
The staff gauge at Del Puerto Creek



DO-34 Ingram Creek
Strong flow at Ingram Creek

June 30, 2011

DO-Estuary Truck Sampling Event

Jeremy Hanlon, Ashley Stubblefield, and Michael Jue sampling for DO-Estuary Project



DO-433 Paradise Marina

Paradise Marina is added to the Truck Sampling site list for the first time in 2011 on June 30th



DO-420 Mosher Slough at Mariners Dr.

A view from the bridge at Mosher Slough - bucket samples must be carefully collected over the drain pipe that runs along the bridge



DO-421 5 Mile Slough at Hazelwood Ave

Ashley taking sonde measurements and Michael taking grab samples



DO-2 SJR at Dos Reis Park

The dock at Dos Reis Park

July 7, 2011

DO-Estuary Boat Sampling Event
Jeremy Hanlon, Ashley Stubblefield, and Michael Jue sampling for the DO-Estuary Project



DO-427 RM 39 Near Louis Park
Ashley going through the sample check-sheet



DO-425 Turner Cut
Samples are collected in front of the Turner Cut Resort.



DO-406 RM 35.8 Light 38 DWSC
A view of Light 38



DO-424 14 Mile Slough
The view at 14 Mile Slough

July 14, 2011

DO-Estuary Truck Sampling Event

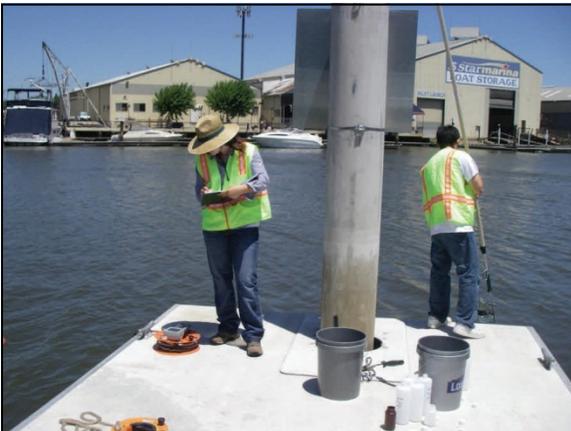
Jeremy Domen, Ashley Stubblefield, and Michael Jue sampling for the DO-Estuary Project



DO-410 Bear Creek at Trinity Bridge
Jeremy and Michael collecting water over Trinity Bridge using ropes and buckets



DO-421 5 Mile Slough at Hazelwood Ave
Jeremy and Ashley processing phosphate and inorganic carbon samples



DO-426 Turning Basin at Morelli Park
Ashley reading sonde values and Jeremy taking grab samples



DO-11 French Camp Slough
The sonde deployed at French Camp and Jeremy rinsing the sample bottles in the background

July 21, 2011

DO-Estuary Upstream Sampling Event

Jeremy Domen, Jeremy Hanlon, and Michael Jue sampling for the DO-Estuary Project



DO-19 Salt Slough at Lander Avenue
Jeremy D. putting the samples on ice



DO-29 Turlock ID Harding Drain
Jeremy D. collecting a grab sample



DO-29 Turlock ID Harding Drain
Jeremy D. and Michael collecting grab samples



DO-21 Orestimba Creek at River Road
Michael collecting a microcystin sample

July 28, 2011

DO-Estuary Boat Sampling Event

Ashley Stubblefield, Jeremy Hanlon, and Michael Jue sampling for the DO-Estuary Project



DO-427 RM39 Near Louis Park
The Port of Stockton



DO-406 RM 35.8 Light 38 DWSC
A view of Light 38



DO-428 RM 33.2 Upstream of Acker Isl.
Jeremy collecting a microcystin sample



DO-425 Turner Cut
The view at Turner Cut

August 04, 2011

DO-Estuary Truck Sampling Event

Ashley Stubblefield, Jeremy Domen, and Michael Jue sampling for the DO-Estuary Project



DO-433 Paradise Marina (Node 70)
Jeremy collecting grab samples



DO-426 Turning Basin at Morelli Park
Ashley collecting a microcystin sample



DO-433 Paradise Marina (Node 70)
Jeremy and Ashley processing phosphate and inorganic carbon samples



DO-421 5 Mile Slough at Hazelwood Ave
Ashley deploying the sonde

August 11, 2011

DO-Estuary Boat Sampling Event
Ashley Stubblefield, Jeremy Hanlon, and Michael Jue sampling for the DO-Estuary Project



DO-428 RM 33.2 Upstream of Acker Isl.
Michael collecting a grab sample



DO-425 Turner Cut
The view at Turner Cut



DO-424 14 Mile Slough
Jeremy processing a microcystin sample



DO-424 14 Mile Slough
Michael preparing to take a grab sample

August 18, 2011

DO-Estuary Upstream Sampling Event
Ashley Stubblefield, Jeremy Hanlon, and Michael Jue sampling for the DO-Estuary Project



DO-29 Turlock ID Harding Drain
The bridge which spans across Harding Drain. Michael and Ashley prepare for sampling in the background



DO-7 SJR at Patterson
Michael collecting a water sample while Ashley records sonde measurements - hundreds of small fish can be seen at the end of the boat dock



DO-25 Modesto ID Main Drain to Stan. R
Miller Lake is covered in duckweed



DO-5 SJR at Vernalis
Jeremy collecting a microcystin sample - water is pumped to the top of McCune station making sampling simple

August 25, 2011

DO-Estuary Boat Sampling Event
Ashley Stubblefield, Jeremy Hanlon, and Michael Jue sampling for the DO-Estuary Project



DO-428 RM 33.2 Upstream of Acker Isl.
Jeremy collecting a microcystin sample



DO-425 Turner Cut
A view from Turner Cut



DO-402 Light 18 (Node 96)
A view of Light 18



DO-427 RM 39 Near Louis Park
The Port of Stockton

September 1, 2011

DO-Estuary Boat Sampling Trip Ashley Stubblefield, Jeremy Hanlon, and Michael Jue sampling for the DO-Estuary Project



DO-428 RM 33.2 Upstream of Acker Isl.
Ashley processing a sample to measure for phosphate concentration



DO-406 RM 35.8 Light 38 DWSC
Samples being iced after they have been collected



DO-127 SJR at Brant Bridge
Michael collecting a grab sample



DO-428 RM 33.2 Upstream of Acker Isl.
Ashley filling out the checklist after all samples have been collected and processed

September 22, 2011

DO-Estuary Truck Sampling Event

Ashley Stubblefield, Chelsea Spier, Jeremy Doman, and Michael Jue sampling for the DO-Estuary Project



DO-410 Bear Creek at Trinity Bridge
Ashley rinsing a syringe before collecting a sample for phosphate analysis



DO-420 Mosher Slough at Mariners Dr.
The water level is unusually low, exposing trash and debris that has collected at the bottom of Mosher Slough



DO-413 Smith Canal at Yosemite Lake
The sonde deployed at Smith Canal



DO-4 SJR at Mossdale
Mike rinsing the microcystins from the sock and into the collection cup

September 29, 2011

DO-Estuary Upstream Sampling Event

Ashley Stubblefield, Jeremy Hanlon, and Michael Jue sampling for the DO-Estuary Project. No samples were taken at Orestimba Creek due to no flow. Grab samples were collected, but no sonde measurements or microcystin samples were taken at SJR at Lander Ave because the water level was too low to take accurate readings.



DO-10 SJR at Lander Ave

Ashley processing a sample to measure for phosphate concentration



DO-21 Orestimba Creek at River Road

No flow at Orestimba Creek; we are unable to take a sample at this site



DO-34 Ingram Creek

Michael collecting a water sample and Jeremy collecting a microcystin sample



DO-34 Ingram Creek

Jeremy processing a microcystin sample

October 6, 2011

DO-Estuary Truck Sampling Event

Ashley Stubblefield, Jeremy Hanlon, and Michael Jue sampling for the DO-Estuary Project. There was a heavy rain the night before this sampling trip. No samples were taken at French Camp Slough because the mud and sharp slope leading to the site made the sampling area too dangerous to access.



DO-433 Paradise Marina (Node 70)

There is a light rain during this sampling trip



DO-410 Bear Creek at Trinity Bridge

Ashley and Michael gathering equipment in order to take samples



DO-421 5 Mile Slough at Hazelwood Ave

The water level at 5 Mile Slough is unusually high



DO-413 Smith Canal at Yosemite Lake

A view of Smith Canal

October 13, 2011

DO-Estuary Boat Sampling Event

Will Stringfellow, Ashley Stubblefield, Jeremy Hanlon, and Michael Jue sampling for the DO-Estuary Project



DO-425 Turner Cut
Will processing a phosphate sample



DO-428 RM 33.2 Upstream of Acker Isl.
Will recording data from the sonde measurements



DO-406 RM 35.8 Light 38 DWSC
Michael icing the grab samples after they have been collected



DO-427 RM 39 Near Louis Park
Ashley processing an inorganic carbon sample

October 20, 2011

DO-Estuary Truck Sampling Event

Ashley Stubblefield, Jeremy Hanlon, and Michael Jue sampling for the DO-Estuary Project



DO-410 Bear Creek at Trinity Bridge
Michael collecting a grab sample



DO-421 5 Mile Slough at Hazelwood Ave
Ashley collecting a microcystin sample



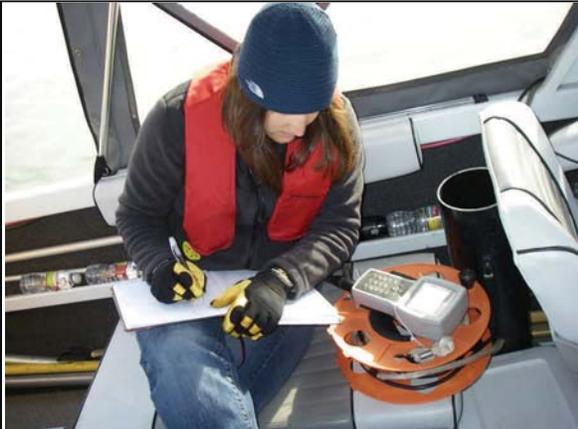
DO-11 French Camp Slough
Ashley collecting water for the microcystin sample



DO-413 Smith Canal at Yosemite Lake
Water hyacinth prevented sampling at the usual site, samples were taken at another nearby site instead

November 3, 2011

DO-Estuary Boat Sampling Event
Ashley Stubblefield, Jeremy Hanlon, and Michael Jue sampling for the DO-Estuary Project



DO-428 RM 33.2 Upstream of Acker Isl.
Ashley recording the sonde measurements



DO-428 RM 33.2 Upstream of Acker Isl.
Ashley collecting a phosphate sample



DO-428 RM 33.2 Upstream of Acker Isl.
Jeremy collecting a microcystin sample



DO-427 RM 39 Near Louis Park
Dredging was being conducted near the sample site which resulted in unusually high turbidity readings

November 10, 2011

DO-Estuary Truck Sampling Event

Ashley Stubblefield and Michael Jue sampling for the DO-Estuary Project. This sampling trip took an unusually long time because there were only two people instead of three. DO-2 had to be removed from the trip plan due to time constraints. Also, the water level was too low at DO-421 in order to take accurate samples.



DO-410 Bear Creek at Trinity Bridge
Ashley collecting the microcystin sample at Bear Creek at Trinity Bridge



DO-405 Calaveras River at UOP
Michael collecting grab samples at Calaveras River



DO-405 Calaveras River
Ashley deploying the sonde at Calaveras River



DO-421 5 Mile Slough at Hazelwood Ave
The water level is unusually low, exposing the side of the bank; it is too shallow to collect samples

November 17, 2011

DO-Estuary Boat Sampling Event

Ashley Stubblefield, Chelsea Spier, and Michael Jue sampling for the DO-Estuary Project



DO-406 RM 35.8 Light 38 DWSC
Michael collecting a microcystin sample



DO-424 14 Mile Slough
Chelsea moving the grab samples to the ice chest after being collected



DO-424 14 Mile Slough
Ashley deploying the sonde



DO-424 14 Mile Slough
Chelsea collecting a grab sample

December 01, 2011

DO-Estuary Truck Sampling Event

Ashley Stubblefield and Michael Jue sampling for the DO-Estuary Project. There is an unusually high wind during this sampling trip. The water level was too low at DO-421 to take an accurate sample.



DO-433 Paradise Marina (Node 70)

Ashley collecting a microcystin sample, there is a high wind during this sampling trip



DO-405 Calaveras River at UOP

DO-405 Calaveras River



DO-11 French Camp Slough

A view of the deployed sonde from the top of the levee



DO-2 SJR at Dos Reis Park

Ashley retrieving the sonde after taking measurements

December 08, 2011

DO-Estuary Boat Sampling Event

Jeremy Hanlon, Ashley Stubblefield, and Michael Jue sampling for the DO-Estuary Project. The boat battery died before DO-127 could be reached so no samples were collected there. The outboard motor was used to return the boat safely to dock.



DO-428 RM 33.2 Upstream of Acker Isl.
Jeremy collecting a grab sample



DO-424 14 Mile Slough
Ashley processing the phosphate sample



DO-425 Turner Cut
Ashley deploying the sonde



DO-406 RM 35.8 Light 38 DWSC
Ashley collecting the sample for inorganic carbon

April 19, 2012

DO-Estuary Truck Sampling Event

Michael Jue, Ashley Stubblefield, and Jeremy Domen sample for the DO-Estuary Project.



DO-405 Calaveras River at UOP

The flow is unusually low.



DO-405 Calaveras River at UOP

Care is taken not to stir up waterway bottoms despite unusually low water levels.



DO-433 Paradise Marina (Node 70)

Ashley records sonde measurements in the field notebook.



DO-413 Smith Canal at Yosemite Lake

Due to the amount of debris along the Smith Canal bank, the microcystin sample is taken at a more accessible location.

April 26, 2012

DO-Estuary Truck Sampling Event

Michael Jue, Ashley Stubblefield, Jeremy Domen, and Jason Jung sample for the DO-Estuary Project.



DO-410 Bear Creek at Trinity Bridge
Jason Jung, a student lab assistant, joins the sampling team to get an understanding of where samples come from.



DO-421 5 Mile Slough at Hazelwood
Jeremy takes grab samples at 5 Mile Slough.



DO-433 Paradise Marina (Node 70)
Mike processes the microcystin sample.



DO-433 Paradise Marina (Node 70)
Jeremy processes the inorganic carbon sample. Behind him the weather becomes gloomy.

May 3, 2012

DO-Estuary Truck Sampling Event
Jeremy Hanlon and Michael Jue perform a special study for the DO-Estuary Project.



Turning Basin
Jeremy takes a microcystin sample.



Turning Basin
Jeremy attaches a fin to the sonde in order to maintain the desired measurement depth while trolling.



Turning Basin
GPS coordinates and channel depth are recorded using a Garmin 188C GPS system



Port of Stockton
A vertical profile is performed near the DO sensor at the Port of Stockton

May 10, 2012

DO-Estuary Truck Sampling Event

Michael Jue, Ashley Stubblefield, Jeremy Domen, and Annelea Vuontela sample for the DO-Estuary Project. No samples are collected at Orestimba Creek as there is no flow and SJR at Lander Ave is too shallow to take a microcystin sample.



DO-7 SJR at Patterson

Jeremy teaches Annelea how to collect grab samples. Annelea joins the field team as a visiting student from Finland.



DO-21 Orestimba Creek at River Road

There is no flow at Orestimba Creek.



DO-19 Salt Slough at Lander Ave

Mike and Jeremy make their way down the rocky slope at Salt Slough.



DO-19 Salt Slough at Lander Ave

Mike processes a phosphate sample.

May 17, 2012

DO-Estuary Truck Sampling Event

Michael Jue, Ashley Stubblefield, and Annelea Vuontela sample for the DO-Estuary Project.



DO-425 Turner Cut

Mike teaches Annelea how to process a phosphate sample.



DO-402 Light 18 (Node 96)

Light 18, the first site of the day.



DO-127 SJR at Brant Bridge

The team encounters another research group collecting sonde data at Brant Bridge.



DO-425 Turner Cut

Ashley collects grab samples.

May 24, 2012

DO-Estuary Truck Sampling Event

Michael Jue, Ashley Stubblefield, and Annelea Vuontela sample for the DO-Estuary Project. No samples are collected at Orestimba Creek as there is no flow and SJR at Lander Ave is too shallow to take a microcystin sample.



DO-10 SJR at Lander Ave

Mike collects grab samples while Annelea records sonde measurements in the field notebook.



DO-7 SJR at Patterson

The water level is unusually low making it difficult to collect samples.



DO-10 SJR at Lander Ave

Ashley shows Annelea how to use the sonde float to take measurements in shallow water.



DO-16 Merced River at River Road

Ashley rinses the sock before collecting the microcystin sample from the cup below.

May 31, 2012

DO-Estuary Truck Sampling Event

Michael Jue, Ashley Stubblefield, and Annelea Vuontela sample for the DO-Estuary Project.



DO-410 Bear Creek at Trinity Bridge
Mike collects grab samples at Bear Creek.



DO-421 5 Mile Slough at Hazelwood
Mike and Ashley discuss whether it is possible to take representative samples in such shallow water at 5 Mile Slough.



DO-410 Bear Creek at Trinity Bridge
Mike and Ashley put sample water into bottles at Bear Creek.



DO-413 Smith Canal at Yosemite Lake
Due to the amount of debris on the shore, the microcystin sample is taken at a more accessible site at Smith Canal.

June 7, 2012

DO-Estuary Truck Sampling Event

Jeremy Hanlon and Chelsea Spier perform a special study for the DO-Estuary Project.



Outer Boundary

Trolls are performed at Weber Lake and the Outer Boundary (Node 96).



Weber Lake

Chelsea performs a vertical profile at the Weber Lake area dock. Four vertical profiles are taken during this trip at the Weber Lake area dock, Weber Lake North Fork, Turning Basin, and Node 96.

June 14, 2012

DO-Estuary Truck Sampling Event

Michael Jue, Ashley Stubblefield, and Annelea Vuontela sample for the DO-Estuary Project.



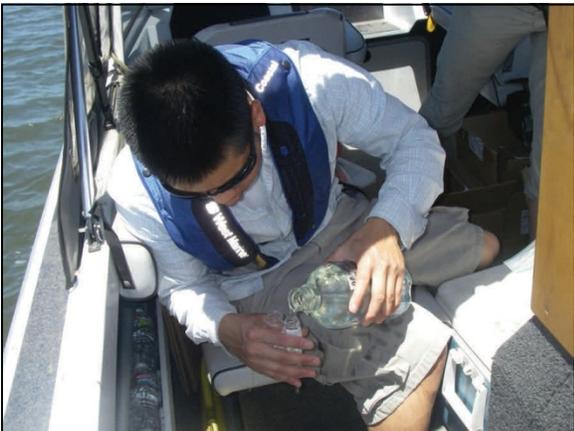
DO-402 Light 18 (Node 96)

Mike records sonde data in the field notebook.



DO-427 RM 39 Near Louis Park

Ashley transfers the microcystin sample from the collection cup to a bottle.



DO-127 SJR at Brant Bridge

Mike processes an inorganic carbon sample.



DO-427 RM 39 Near Louis Park

Annelea collects grab samples.

June 21, 2012

DO-Estuary Truck Sampling Event

Michael Jue, Ashley Stubblefield, and Annelea Vuontela sample for the DO-Estuary Project. SJR at Lander Ave is too shallow to take a microcystin sample.



DO-16 Merced River at River Road
Ashley processes a microcystin sample.



DO-10 SJR at Lander Avenue
Mike demonstrates why a microcystin sample cannot be taken at Lander Ave; when sampling in shallow waters, the bucket drags along the river bed and picks up dirt.



DO-21 Orestimba Creek at River Road
Annelea collects sonde data. This is the first sampling trip of the year in which Orestimba is flowing.



DO-34 Ingram Creek
The flow at Ingram Creek is turbulent, making it difficult to take readings with the optical sensors of the sonde.

June 39 2012

DO-Estuary Truck Sampling Event

Ashley Stubblefield, Jeremy Domen, and Annelea Vuontela sample for the DO-Estuary Project. No microcystin sample is taken at Smith Canal due to debris at the shore and drain discharge into the lake.



DO-11 French Camp Slough

Ashley and Jeremy work together to take a microcystin sample on the slope leading to French Camp Slough.



DO-413 Smith Canal at Yosemite Lake

Cloudy water discharges from a drain in Smith Canal. Because of this and the amount of debris along the shore, no microcystin sample is taken.



DO-420 Mosher Slough at Mariners Dr

The field team sets out cones and wear reflective vests when sampling from busy streets.



DO-2 SJR at Dos Reis Park

There is a lot of boat traffic on the Delta, particularly at the boat ramps.

June 40 2012

DO-Estuary Truck Sampling Event

Jeremy Hanlon and Annelea Vuontela perform a special study for the DO-Estuary Project.



Port of Stockton

Multiple trolls and vertical profiles are performed in the Turning Basin and near the Port of Stockton. Ships are scheduled to load cargo and may therefore be discharging ballast water from the San Francisco Bay area.



Port of Stockton

Jeremy looks for changes in electrical conductivity near docked cargo ships.

July 5, 2012

DO-Estuary Truck Sampling Event

Jeremy Hanlon, Dr. William Stringfellow, and Dr. Mary Kay Camarillo perform a longitudinal water quality study in the deep water shipping channel.



Port of Stockton

Trolls were performed in the deep water ship channel in order to locate high conductivity plumes due to the release of ballast water from cargo ships like the one pictured above.



Port of Stockton

Will uses the sonde in an attempt to characterize the large algal flakes which were observed in the water during the troll.

July 12, 2012

DO-Estuary Truck Sampling Event

Michael Jue, Annelea Vuontela, and Maya Estrada sample for the DO-Estuary Project.



DO-427 RM 39 Near Louis Park
Maya, a visiting undergraduate student from UC Davis, joins the sampling team this week.



DO-428 RM 33.2 Upstream of Acker Isl.
Mike takes a look under the hood when the boat engine becomes blocked.



DO-427 RM 39 Near Louis Park
Large green algae flakes were observed floating in the water at all sampling sites.



DO-427 RM 39 Near Louis Park
The flakes were so abundant that the water seemed green in color.

July 19, 2012

DO-Estuary Truck Sampling Event

Michael Jue, Ashley Stubblefield, and Annelea Vuontela sample for the DO-Estuary Project. SJR at Lander Ave is too shallow to sample and SJR at Patterson is too shallow to take a microcystin sample.



DO-19 Salt Slough at Lander Ave

Mike balances on a rocky slope while taking samples at Salt Slough.



DO-7 SJR at Patterson

A bucket sample cannot be collected at Patterson without dragging the bucket along the river bed.



DO-10 SJR at Lander Ave

The SJR at Lander Ave is too shallow to take samples with the sonde.



DO-34 Ingram Creek

Annelea tries to position the sonde in a way that will allow for readings with the optical sensors despite turbulent waters.

July 26, 2012

DO-Estuary Truck Sampling Event

Michael Jue, Ashley Stubblefield, and Annelea Vuontela sample for the DO-Estuary Project.



DO-410 Bear Creek at Trinity Bridge

Annelea records values from the sonde display.



DO-410 Bear Creek at Trinity Bridge

The team tries out a new technique for characterizing the density of algal flakes with limited success.



DO-420 Mosher Slough at Mariners Dr

Mosher Slough shows an unusual amount of aquatic plant life.



DO-405 Calaveras River at UOP

Annelea processes an inorganic carbon sample while Ashley processes a microcystin sample.

August 9, 2012

DO-Estuary Truck Sampling Event

Michael Jue, Ashley Stubblefield, and Zehra Avdan sample for the DO-Estuary Project.



DO-406 Light 38 DWSC

Zehra, a visiting doctoral student from Turkey, joins the sampling team this week.



DO-424 14mi Slough

Zehra takes a microcystin sample.



DO-425 Turner Cut

Zehra puts the samples on ice.



DO-424 14mi Slough

Zehra adds preservative to a microcystin sample.

August 16, 2012

DO-Estuary Truck Sampling Event

Michael Jue and Ashley Stubblefield perform a longitudinal water quality study in the deep water shipping channel.



Port of Stockton

More than a dozen vertical profiles are performed during the study, including one in front of the aeration facility at the Port of Stockton.



Port of Stockton

Ashley operates two sondes at once. During the troll, the sondes slowly oscillate opposite of each other between the channel bed and the river's surface.

August 23, 2012

DO-Estuary Truck Sampling Event

Michael Jue, Ashley Stubblefield, and Jeff Rubino sample for the DO-Estuary Project. Orestimba is too shallow to take a microcystin sample and no samples are collected at SJR at Patterson due to an unusual discharge upstream of the sample site.



DO-18 Mud Slough near Gustine

Our Program Coordinator Jeff Rubino joins the sampling team this week.



DO-10 SJR at Lander Avenue

The water is so shallow that flow has been cut off from the usual sample site. Jeff and Mike cross the newly formed peninsula in search for a better place to take samples.



DO-21 Orestimba Creek at River Road

The water level at Orestimba is not high enough to submerge the sample bucket; no microcystin sample is taken here.



DO-7 SJR at Patterson

Overflow is being discharged into the SJR creating a large discolored plume along the area where samples are usually taken.

August 30, 2012

DO-Estuary Truck Sampling Event

Michael Jue and Ashley Stubblefield sample for the DO-Estuary Project.



DO-413 Smith Canal at Yosemite Lake
Smith Canal is unusually shallow; typically the rocks that Mike is standing on are completely submerged in water.



DO-426 Turning Basin
Mike checks the inorganic carbon samples for air bubbles.



DO-433 Paradise Marina (Node 70)
Ashley prepares the field notebook for sampling.



DO-413 Smith Canal at Yosemite Lake
The sample site at Smith Canal is becoming overgrown.

September 6, 2012

DO-Estuary Truck Sampling Event

Michael Jue, Ashley Stubblefield, and Maya Estrada perform a longitudinal water quality study in the deep water shipping channel.



Port of Stockton

For five hours, the field team moves along the deep water ship channel at a snail's pace while collecting water quality information using two multiparameter sondes.



EERP Water Quality Lab

Back in the lab after the special study is completed, a comparative study is performed on the sondes in order to account for drift during the sampling day.

September 13, 2012

DO-Estuary Truck Sampling Event

Michael Jue, Ashley Stubblefield, and Jeff Rubino sample for the DO-Estuary Project.



DO-406 Light 38 DWSC

Jeff deploys the sonde. Weights are added to the sonde to reduce drift due to flow.



DO-428 RM 33.2 Upstream of Acker Isl.

Mike adds a new formalin based preservative to a microcystin sample.



DO-406 Light 38 DWSC

Mike navigates the San Joaquin River.



DO-127 SJR at Brant Bridge

Ashley collects a microcystin sample.

September 20, 2012

DO-Estuary Truck Sampling Event

Michael Jue, Ashley Stubblefield, and Jeff Rubino sample for the DO-Estuary Project.



DO-34 Ingram Creek

This week, the sites are sampled opposite of the usual order, as a result, Ingram Creek is less turbulent, making it easier to take sonde samples with optical sensors.



DO-7 SJR at Patterson

DO-7 is often difficult to sample due to the gradual slope of the bank. This week, Ashley and Mike waded into the river to get more representative samples.



DO-10 SJR at Lander Ave

Mike wades into the SJR at Lander Ave and is able to collect grab samples just downstream of the sonde.



DO-21 Orestimba Creek at River Road

There is no flow at Orestimba Creek; no samples are taken here.

September 27, 2012

DO-Estuary Truck Sampling Event

Michael Jue, Ashley Stubblefield, and Chelsea Spier sample for the DO-Estuary Project.



DO-413 Smith Canal at Yosemite Lake

The usual sample site at Smith Canal has become too dangerous to use. A new, safer site, not far from the old site, has been selected.



DO-426 Turning Basin

Mike processes a phosphate sample.



DO-4 SJR at Mossdale

Mike collects water for a microcystin sample while Chelsea prepares bottles for grab samples.



DO-410 Bear Creek at Trinity Bridge

Abundant aquatic plant life makes it difficult to collect sonde data.

October 11, 2012

DO-Estuary Truck Sampling Event

Michael Jue, Ashley Stubblefield, Jeremy Domen, and Jason Jung sample for the DO-Estuary Project.



DO-402 Light 18 (Node 96)

Jason, an EERP undergraduate, joins the field team to learn how to take grab samples from the boat.



DO-427 RM39 Near Louis Park

Jeremy, an EERP graduate assistant, joins the field team to learn about grab sampling from the boat.



Ladd's Marina

Mike transports the field equipment to the boat. Behind him it can be seen that the marina is full of hyacinth.



DO-127 SJR at Brant Bridge

Mike fills out the sampling checksheet in order to ensure all necessary information is collected before departing the site.

October 25, 2012

DO-Estuary Truck Sampling Event

Michael Jue and Ashley Stubblefield sample for the DO-Estuary Project. French Camp Slough is inaccessible.



DO-413 Smith Canal at Yosemite Lake
Ashley records sonde measurements in the field notebook.



DO-433 Paradise Marina (Node 70)
Ashley deploys the sonde mid-depth at Paradise Marina.



DO-2 SJR at Dos Reis Park
Grab samples are collected from the end of the boat dock at Dos Reis Park.

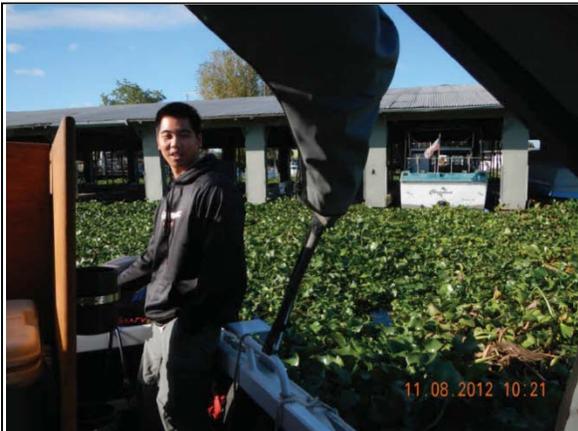


DO-410 Bear Creek at Trinity Bridge
Grab samples are collected from Trinity Bridge, near the Trinity Park shopping center, at Bear Creek.

November 8, 2012

DO-Estuary Truck Sampling Event

Michael Jue, Ashley Stubblefield, and Jason Jung sample for the DO-Estuary Project.



Ladds Marina

Mike uses the outboard to navigate the boat through the hyacinth in the marina.



Ladds Marina

Jeremy meets the field team at the marina to help remove hyacinth from the jet engine after the boat stalls mid sampling trip.



DO-427 RM 39 Near Louis Park

Ashley takes a microcystin sample in the pouring rain.



DO-428 RM33.2 Upstream of Acker Isl.

Jason demonstrates how the bottle cradle can be changed out to accommodate different bottle types.

November 29, 2012

DO-Estuary Truck Sampling Event

Michael Jue and Ashley Stubblefield sample for the DO-Estuary Project. French Camp Slough is inaccessible.



DO-433 Paradise Marina (Node 70)

Ashley prepares the sonde for deployment by double checking the programming on the handheld as well as the connections to the sonde.



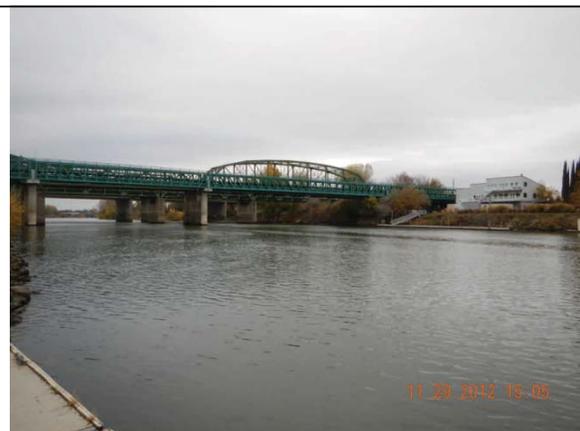
DO-405 Calaveras River at UOP

The microcystin sample is filtered on the opposite side of the bridge from where the sample is collected so that the filtrate drains downstream.



DO-2 SJR at Dos Reis Park

Ashley carries the equipment to the end of the dock. The SJR at Dos Reis is unusually shallow today.



DO-4 SJR at Mossdale

The SJR at Mossdale is unusually shallow today, as can be seen from the water rings around the bridge.

December 6, 2012

DO-Estuary Truck Sampling Event

Michael Jue and Ashley Stubblefield sample for the DO-Estuary Project. 5 Mile Slough is too shallow to sample. The flow at Mosher Slough is moving upstream. French Camp Slough is inaccessible.



DO-420 Mosher Slough at Mariners Dr.
The flow is moving upstream today at Mosher Slough.



DO-4 SJR at Mossdale
Ashley uses a graduated cylinder to measure the volume of the microcystin sample. This measurement is necessary to calculate concentration.



DO-2 SJR at Dos Reis Park
Ashley casts out a bucket in order to collect a microcystin sample at Dos Reis Park.

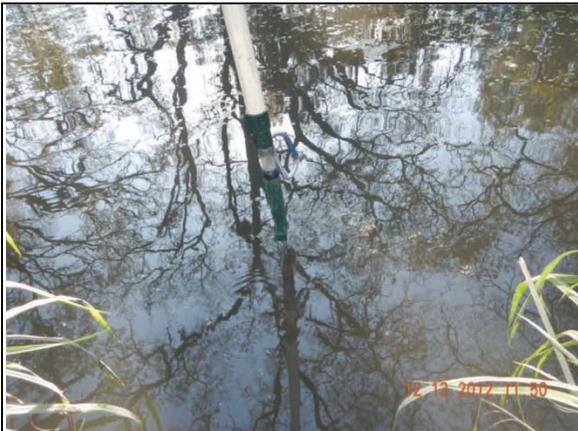


DO-421 5 Mile Slough at Hazelwood Ave
5 Mile Slough is too shallow to sample. The mud on the plants along the bank indicates the usual water level.

December 13, 2012

DO-Estuary Truck Sampling Event

Michael Jue and Ashley Stubblefield sample for the DO-Estuary Project. 5 Mile Slough is too shallow to sample. French camp is inaccessible.



DO-421 5 Mile Slough at Hazelwood Ave
Mike demonstrates that the water level is too low to take a grab sample at 5 Mile Slough.



DO-405 Calaveras River at UOP
The water level at the Calaveras River is unusually low, but the field team is still able to take an accurate sample.



DO-426 Turning Basin at Morelli Park
Downtown Stockton can be seen from the boat launch at Morelli Park.



DO-2 SJR at Dos Reis Park
The field team takes complete and accurate notes at all sampling sites.