

## MEMORANDUM

**TO:** SINTANA VERGARA  
**FROM:** CHRYSTIAN MEDINA, PAKUNIHANICH MARTIN, BEN DULLUM, ETHAN THOMPSON  
**SUBJECT:** WATER QUALITY LAB  
**DATE:** 9/21/18  
**CC:**

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### Introduction

By Humboldt State University, there is a lake called Fern Lake that flows upstream into the community forest down near the Jolly Green Giant Dorming Building. Our group consists of 4 undergraduate engineers that went into the community forest to collect water samples to analyze the water quality of Fern lake. The goal of analyzing the quality of the water of Fern lake is to relate what the results of the water sample test show how humans impact the quality near HSU. The tests we took was pH, turbidity, dissolved oxygen, and temperature. We took samples from an upstream inlet, at Fern Lake, an outlet near Jolly Giant, and an outlet at College Creek near a fishery. As a group, our goal was to hypothesize what parts of the lake would have either high, average, or low pH, turbidity, dissolved oxygen, and temperature and why. Ultimately, we try to relate our hypothesis reasoning our results to human interactions or minimal human interactions to Fern Lake.

### Material & Method

The data was collected using a number of different instruments to measure turbidity, pH, temperature and dissolved oxygen. For turbidity a HI93703 turbidity meter was used. The device measures the amount of light that shines through both sides of the sample, effectively measuring the turbidity in Nephelometric Turbidity units (NTUs). The sample was collected in a cuvette and measurements were observed three times at each of the four sites. To measure dissolved oxygen (DO), a YSI model 55 dissolved oxygen (DO) meter was used. The DO meter is an instrument with a screen for observing readings and a probe. The DO sensor also measured temperature. The probe was inserted below the water line in order to get a reading. Measurements for both dissolved oxygen and temperature were taken only once at each location. To measure pH, a pH meter was used. The pH meter measures electric potential across an electrode when inserted in a water sample, using a probe. This probe was submerged about an inch and a half below the water line and was agitated to allow the electrode to stabilize in order to get a proper reading. Temperature was measured as well as pH. One sample was taken at each location.

### Results

Location	DO (mg/L)	Temperature (Celcius)	pH	Turbidity Reading with 10 NTU Sample	Turbidity from site (NTU)
College Creak	9.40	16.6	6.62	4.10	6.75 NTU
Upstream of Fern Lake	10.98	12.4	6.48	4.00	8.44 NTU
In Fern Lake (near the outlet)	7.34	14	6.80	4.12	7.80 NTU
In Jolly Giant Creek upstream of the dorms	11.35	11.8	7.83	4.20	8.42 NTU

### Discussion

When comparing our groups water quality hypothesis for the four locations with the actual measurement results we noticed most of our group had the same hypothesis, with the exception of temperature and dissolved oxygen due to their correlation. If the temperature of the water is cooler than average the total amount possible of Dissolved Oxygen is increased. Though a few of these hypothesis were proven to be wrong we were able to discuss the outcomes for a better understanding of how some elements of campus are impacting the quality of the creek water and further discuss why it is the way it is. I am going to describe the samples in the order as they appear on the chart in the Appendices paragraph. To start, the levels of Dissolved Oxygen fluctuated at the different locations. Dissolved Oxygen was slightly under 10 NTUs (amount of NTUs the equipment calibrates initially) in the first location and slightly over 10 NTUs in the second location. Most of our group guessed the Dissolved Oxygen to be the below 10 NTUs and under 10 NTUs (in that order) based on the temperatures at these two locations. One group member guessed the opposite of everyone else due to not understanding the correlation very well. The temperatures of water at the locations were all warmer than we expected. The discussion of temperature as a group got confusing due to some temperatures having a higher Dissolved Oxygen along with a higher temperature. Our pH hypothesis were all proven to be the exact opposite of the results. We supposed the pH in College Creek to be lower due to a higher exposure of CO<sub>2</sub> from cars. The pH at this location was more acidic than neutral. We all came to the conclusion of it being higher due to the Fisheries building's byproducts and other human related activities. The turbidity samples were all somewhat inaccurate due to stirring up particles while taking the sample. We agreed the most accurate turbidity level was Fern Lake, because we were able to take the sample correctly by submerging the instrument reader and not stirring up particles in the process. While taking water quality samples of creeks

that are located within Humboldt State University's Campus, the group had a difficult time getting high quality water samples and one of our sample instruments had a malfunction. At our first location, College Creek, we noticed an error when calibrating the Turbidity meter. Before testing the turbidity level of the water one of our group members turned on the Turbidity meter and let it calibrate to 10 NTUs. It was to his surprise that the calibration was only able to reach 4 NTUs. When he informed the rest of the group of this instrumental error we all agreed to inform our supervisor/instructor to ask how we should continue the lab. The only option given was to continue to work with the instrument and add the difference of what the calibration was suppose to be and what our reading was once our samples were taken. At our first and last locations (College Creek and Jolly Giant Creek upstream of the dorms) it was difficult to get close to the water, because the creek beds had high levels of erosion. Another natural occurring issue was the depth of water. In some locations it was difficult to take Turbidity and Dissolved Oxygen samples, because the water was shallow and the instruments would either stir up particles in the water, or not fully submerge underneath the water. Both of these obstacles made our group have to work a little harder to get water samples that would give us the best results. Together our group still managed to all get an opportunity to work with the different pieces of equipment.

### **Conclusion**

Our data shows that the closer you get to the Jolly Giant dorming, dissolved oxygen, pH, turbidity go up while temperature goes down. This shows that the closer the lake gets to human activity, the more disruption is caused to the lake. The fisheries that is on the College Creak location of the lake causes less dissolved oxygen in the water due to the fish that live near it. One unit that may be off in our lab is the turbidity because the equipment to test turbidity was not functioning properly. We took different steps to add on to our results to get turbidity. Through this lab, my group and I learned that different disruptions to a lake such as animal life or human activity causes different measurements to either be raised or be lower.

**Appendices**

<b>Location</b>	<b>DO (mg/L)</b>	<b>Temperature (Celcius)</b>	<b>pH</b>	<b>Turbidity Reading with 10 NTU Sample</b>	<b>Turbidity from site (NTU)</b>
<b>College Creek</b>	9.40	16.6	6.62	4.10	0.41
					1.83
					0.33
<b>Upstream of Fern Lake</b>	7.34	14	6.80	4.12	2.99
					1.53
					1.17
<b>In Fern Lake (near the outlet)</b>	10.98	12.3	6.48	4.00	2.42
					2.57
					2.63
<b>In Jolly Giant Creek upstream of the dorms</b>	11.35	11.8	7.83	4.20	1.62
					2.43
					3.51

Amounts of dissolved oxygen at 100% saturation at sea level at 20° C is 9.03 mg/L.

(Table that shows correct Turbidity readings)

Location	DO (mg/L)	Temperature (Celcius)	pH	Turbidity Reading with 10 NTU Sample	Turbidity from site (NTU)
College Creek	9.40	16.6	6.62	4.10 + 5.9 = 10	6.31
					7.73
					6.23
Upstream of Fern Lake	7.34	14	6.80	4.12 + 5.88 = 10	8.87
					7.41
					7.05
In Fern Lake (near the outlet)	10.98	12.3	6.48	4.00 + 6.00 = 10	8.42
					8.57
					8.63
In Jolly Giant Creek upstream of the dorms	11.35	11.8	7.83	4.20 + 5.80 = 10	7.42
					8.23
					9.31

### Field Notes

- A lot of twigs near College creek
- Leaves and twigs were in the water of Fern Lake
- Grimmy near Fern Lake
- Lots of tree logs near Fern Lake
- Upstream of Fern Lake: cold, shallow, not fast flowing, and lots of dead matter
- The water near Jolly Giant Creek dorms was muddy and leafy, with fast flowing water