ENGINEERING_115 MEMORANDUM

TO: PROFESSOR SINTANA VERGARA

FROM: MICHAEL CASTELLINO

SUBJECT: WATER QUALITY ANALYSIS OF JANES CREEK, ARCATA CA.

DATE: 9/22/2020

Introduction

The purpose of this lab was to try and find a correlation between human proximity and water quality of Janes Creek near Arcata Ridge trail in northern Arcata. Water quality test kits received by Professor Vergara were used to test temperature, dissolved oxygen, pH, and turbidity. Two different sites where chosen along Janes Creek. The first site known as Site A was at the beginning of the Arcata Ridge trail while Site B was approximately a mile upstream and on the backside of the Arcata Ridge trail (see Appendix A). These sites were specifically chosen due to the difference in foot traffic the two receive. What we are looking for is if the human foot traffic has an effect on the water quality and out of the four categories, which might it have impacted the most.

Materials and Methods

Two sites where tested at Janes Creek on September 19, 2020 at approximately 2:30pm. Tests for temperature, dissolved oxygen, pH, and turbidity were done using a low-cost water quality monitoring kit provided to us by Professor Vergara. Temperature was tested utilizing a strip on the bottom of our provided water container and holding it under at least four inches of water for one minute. Three different temperature measurements were taken at each site. For dissolved oxygen and pH, test tubes from the kit were utilized. Prior to each test, test tubes were conditioned with the site water 3 times. Both dissolved oxygen and pH were tested two times each. Turbidity was tested with the Secchi disk method and the sticker was adhered to the bottom of the container approximately 24 hours before testing was conducted. Three separate containers of water at each site were tested.

Results

Results for temperature, dissolved oxygen, pH, and turbidity are referenced in Table 1 below. Site A is considered downstream from Site B. These numbers represent the average values from the raw data (see Appendix B).

Table 1. Average values of data sets in appendix B

	Temperature (C°)	Dissolved Oxygen (ppm)	pH	Turbidity (JTU)	% Saturation
Site A	17	6	7	40	63
Site B	16	8	7	30	81

Discussion

All of the following numbers are rounded due to the precision of the process we used. The "Low Cost Water Monitoring Kit" provided only allowed us to make determinations to at most (2) significant figures. These figures were subject to human error because it is all relative to the individual on how they interpret their color to the given identification card within the kit. Variations in the data were expected based off of the general amount of people that pass by the site on a regular basis. It was assumed that more foot traffic and exposure to humans would have a negative impact on the creek. Variations among temperature were expected based off of the size of the creek at the particular location of testing. Site A moved a little bit slower than Site B and was also shallower. The fact that Site A was shallower led me to think that the water would be a bit warmer which was apparent with it testing 1° C higher at 17° C. Because Site A was at the head of the trail, lower dissolved oxygen was expected due to more waste being left behind by people adding to the organic and inorganic matter taking up the dissolved oxygen in the water body. Upon arrival at Site A, trash was visually apparent along the banks and in the creek (see Appendix A). This did seem to have an effect on our dissolved oxygen concentration coming in at 6ppm which was a 2ppm difference from the 8ppm tested at Site B. Due to the lush vegetation in the area of Site A providing much needed oxygen through the atmosphere, it seems that the human impact has been partially mitigated because 6ppm is still within the range for some aquatic life to thrive. Site A had a slightly slower current, but I don't think the amount of aeration from the current was any less here than at Site B and so it would seem that the local vegetation has helped the dissolved oxygen level despite the human waste. Site B came in at 8ppm and according to the book *Principles of Environmental Engineering and Science* by Davis and Masten, Site B falls under the "clean zone" classification while Site A falls under a "recovery zone" designation, which both still support aquatic life (Davis and Masten, 2014). There is a logging business next to the opening of the trail where heavy machinery often operates and parks. My initial thought was that there could be chemical runoff leaking into the creek at Site A, effecting the pH of the water. According to the results which had both sites test at a pH level of 7, this appeared to have no effect on Site A since both tested the same. This runoff was also suspected to effect turbidity, however upon visual inspection of the site, no chemical effects could be seen in the water. The fact that the turbidity was slightly dirtier at Site A was probably due to the fact that the water was shallower and therefore more sediment was inside the sample.

Conclusion

Human foot traffic did seem to have a slight correlation with water quality in this case. Dissolved oxygen levels dipped below ideal conditions to 6ppm where human foot traffic was higher at Site A, but from Site B where the creek was further from the main trail, 8ppm was the measurement. Temperature fluctuated slightly by 1°C, while pH levels stayed the same. Turbidity also slightly differed by 10 BTU from 40 BTU to 30 BTU between Site A and B respectively.

References

Davis, M. L., Masten, S. J. (2014). *Principles of environmental engineering and science*. New York, NY: McGraw-Hill.

Google Maps. “Janes Creek Arcata, CA.” Accessed September 25, 2020. https://goo.gl/maps/dEBTAupHQZFCq2Pt6

Appendix A (Pictures)

Figure 1. Google Maps image of Janes Creek

Figure 2. Site A

Figure 3. Trash at Site A

Figure 4. Site B

Appendix B (Raw Data)

	Temp	DO	pH	Turbidity
Site A	17, 17, 18	5, 7	7, 7	40, 40, 40
Site B	17, 16, 16	8, 8	7, 6.5	30, 30, 30

* **Temp Averages**

Site A $\frac{17+17+18}{3} = 17.3 \rightarrow \boxed{17}$ (2 sig figs)

Site B $\frac{17+16+16}{3} = 16.3 \rightarrow \boxed{16}$

* **DO. Avg.**

"A" $\frac{5+7}{2} = 6$

"B" $\frac{8+8}{2} = 8$

* **pH**

"A" $\frac{7+7}{2} = 7$

"B" $\frac{7+6.5}{2} = 6.75$

* **Turbidity**

"A" 40

"B" 30