

Stream Water Data Summary

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Location A data, from each of the four sites, was collected on July 20th, 2017, followed by Locations B on July 21st, 2017, Locations C on July 24th, 2017, and lastly, Locations D on July 25th, 2017. All data for each of the factors was t-tested for any statistical difference between the locations sampled.

One anomaly observed in the data trends this years was the relationship between oxygen and temperature in the water. The normal inverse relationship was not observed, with large fluctuations of temperature in the stream while dissolved oxygen remained consistent. When the raw data was t-tested for both dissolved oxygen and temperature, temperature had significant p-values (values below 0.2) of 0.047 between Locations 1 and 2, 0.042 between Locations 2 and 4, and lastly, 0.178 between Locations 3 and 4. Dissolved oxygen, however, had none, which contradicts the expected trend. An important factor when it comes to dissolved oxygen is the amount of sunlight the water is exposed to at any given time, because the process of photosynthesis releases that form of oxygen. In Location 2, it is noted that there is plenty sunlight because there is a lack of tree cover, but low dissolved oxygen. In addition to this, after a weekend of thunderstorms, the day 3 piece of data is unexpected because dissolved oxygen tends to decrease after it rains. The organic matter and pollution is expected to be washed into the water, lowering the dissolved oxygen. However, day 3 in Location 1 has the highest recorded dissolved oxygen over those four days.

Another interesting trend was the calcium carbonate levels and the pattern that they followed. There were significant differences in the amount of this chemical: $p=0.057$ between Locations 1 and 2, $p=0.047$ between Locations 1 and 3, $p=0.089$ between Locations 2 and 4, and $p=0.061$ between locations 3 and 4. The calcium carbonate levels slightly dropped after the water entering the locations travelled downstream, but then began to rise once the stream flowed through the Location 4. The large deposits of calcium carbonate in the water at Location 1 is most likely due to the large amounts of limestone that the water flows over to travel down its path. However, the reason as to why it drops and then returns to a higher level is undetermined. Upon further speculation and examining of the stream, the water begins to flow over exposed limestone once again in Location 4, so this would be a possible explanation as to why the calcium levels rise once again toward the end of the stream's path.

The trend in coliform counts were unpredictable due to the circumstances of the data collecting. The first 2 days of research were done on Thursday and Friday, July 20th and 21st, which was then followed by a weekend with scattered thunderstorms before we returned to data collecting on Monday, July 24th. As a result, the coliform data for Day 3 had a different trend when we graphed it in comparison with the other days. The significant p-values for coliform were 0.046 between Locations 3 and 4 and 0.096 between Locations 1 and 4. While it is not entirely knowable yet to know if the rain was the cause of the change in data, it is very probable and likely for it to be an important factor. The average daily data count for coliform per 1 ml is as follows: 494 counts/ml in Location 1, 118 counts/ml in Location 2, 209 counts/ml in Location

3, and 317 counts/ml in Location 4. The EPA has set the guideline for coliform counts in swimming water not to exceed 200 counts of coliform/100 ml of water, so, simply stated, the water currently greatly surpasses the allowed amount for swimming.

The nitrate-nitrogen and phosphorous also had different trends with one significant value each: $p=0.178$ between locations 3 and 4 for nitrate and $p=0.130$ between Locations 2 and 3 for phosphorous. It is important to note these calculated values, but the differences in these data sets do not have strong implications for the state of the stream for 2017.

Starting water testing for the first time this year proved to be a promising form of research for future teaching assistants. Depending on the trends of the data in later years, the stream could be an interesting research topic to discover and solve certain anomalies that appear as the years pass.