pH, Dissolved Oxygen, and Nitrates Related to Salmon Health

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Research Question & Background

We were wondering what the relationship was between pH, Dissolved Oxygen, and Nitrate levels and how this relationship can affect the health of a watershed, and subsequently whether salmon can sustainably live and breed within the watersheds based on these variables.

With the salmon numbers dwindling each year (The Wall Street Journal, 2021) we wanted to test a local watershed, Squalicum Creek, which is known to be a water source that salmon use here in the PNW to travel upstream and then use as a breeding ground, to see if the levels of these variables had anything to do with this reduction. We also wanted to test one of the largest sources of fresh water in this region which feeds into many watersheds in the area, Lake Whatcom (Lake Whatcom Management Program, 2021), to see whether it was healthy or not.

Methods

Materials & Location

We used Dissolved Oxygen (DO) tablets, pH tablets, and a Nitrate test strip. We collected data from Squalicum Creek and Lake Whatcom. We took two samples at Squalicum Creek, one downstream, and one upstream on 11/10/21 at 12:00 AM. We took one sample at the North end of Lake Whatcom on 11/17/21 at 9:00 AM.

Procedure

For taking a Nitrate sample, we immersed the strip in water for 2 seconds, then waited 60 seconds and did a color comparison. We then did a pH test, we collected 10 ml of water in a falcon tube and added 1 pH test tablet. Lastly, we did a dissolved oxygen test and did a color comparison with our chart.

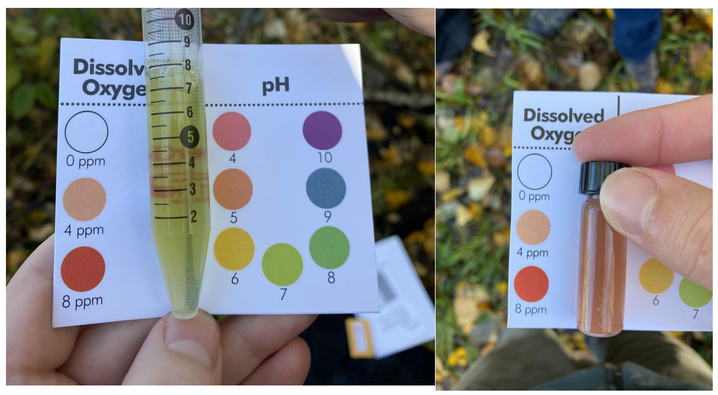


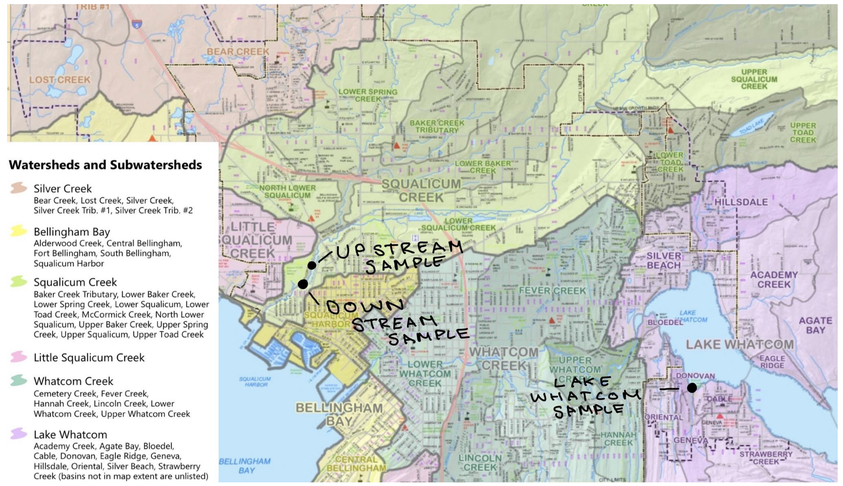
Figure 1. On the left is an example of a pH test taken downstream at Squalicum Creek and on the right is a DO test taken at the same location.

pH, DO, and Nitrate Sample Levels

	pH	Dissolved Oxygen (ppm)	Nitrates (mg/L)
Squalicum Creek (Upstream)	6.5	7	0.5
Squalicum Creek (Downstream)	6.5	7	0.5
Lake Whatcom	6	6	0.25

Table 1. The results from the three samples we took are shown in this table.

Watersheds & Sample Locations



Sample Locations

Figure 2. The photo on the left was taken downstream at Squalicum Creek. The photo on the right was taken on the North end of Lake Whatcom.

Discussion:

From the data we have gathered, both Squalicum Creek and Lake Whatcom provided sample results which show that they are ideal habitats for the Salmon population.

Based on the methods manual published by the United States Environmental Protection agency, we hypothesized that the ideal concentration of pH for Salmon would be between 6.0—9.0, the ideal concentration of nitrate below 10 mg/L, and the ideal level of DO would be at or above 6 mg/L (United States Environmental Protection Agency Office of Water (EPA, 1997). Since for both locations the level of pH, nitrates, and DO is within this range, it shows that both Lake Whatcom and Squalicum Creek are ideal habitats for Salmon spawning.

In conclusion, we have discovered that the current levels of Dissolved Oxygen, Nitrate, and pH of these two watersheds are not the main factors for the decline in the Salmon population. This discovery has led us to believe that there might be other factors that are causing the decrease in the Salmonoid population. In the long term, it would be good if we could gather data on other factors such as temperature, turbidity, alkalinity, etc. It would also be favorable if we could gather data from a wider range of sites and locations.

Lastly, we would like to encourage people to do further research on other factors affecting Salmon health that we did not cover in this research.

Acknowledgements

We would like to acknowledge Professor K for bringing to our attention the importance that the local watersheds here in the PNW have on the health of salmon and for allowing us to get first-hand experience with testing these valuable natural resources.

Work Cited

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