

Nooksack River Water Chemistry Composition over the length of the Main Leg



Geology 100: Intro to Earth Sciences

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Abstract

The Nooksack River watershed comprises most of the Water Resources in Whatcom county and is also the primary source of freshwater for Portage Bay. From its headwaters in the northwestern Cascade Mountains, the Nooksack River (N. River) drains approximately 809 square miles, comprising most of western Whatcom County, including agricultural areas and the developed lowlands surrounding the towns of Deming, Everson, Lynden, and Ferndale. The N. River enters the Lummi Indian Reservation at its eastern extent, which contains most of the river delta before it discharges into the marine waters of Bellingham Bay. (Washington Water Center, 2021)

Question

With the differences in surroundings, is there also a difference in chemical composition of the water of the main N. River leg?

To evaluate this, we will choose three different locations (Figure 1) and collect data on the nitrate levels, pH, and dissolved oxygen (DO) at each location. The chemical composition of the N. River can likely be affected by a lot of surrounding influences. The environment doesn't just affect the river composition, but also the surrounding watershed.

Locations



Figure 1. The three forks and the mainstream of the N. River. The three white circles indicate the three testing locations for this project. (Klienkecht, 2018)

Procedure

At each of the three locations, three sample jars of water were collected, associated pH strips (Figure 2) or tablets were done at each location. Additionally associated probe testing for all nine collected water jars were conducted at the N. River Mouth.



Figure 2. Dylan briefly inserts the pH strip into the sample of river water from the fork junction near Deming.

Materials Used

DO Tablets
DO Probe
Nitrate Probe
pH Strips
pH Probe



Figure 3. Karley and Kasia collect river water using a water collecting device created by Kris Harrell

We looked for 3 things:

1. Dissolved Oxygen

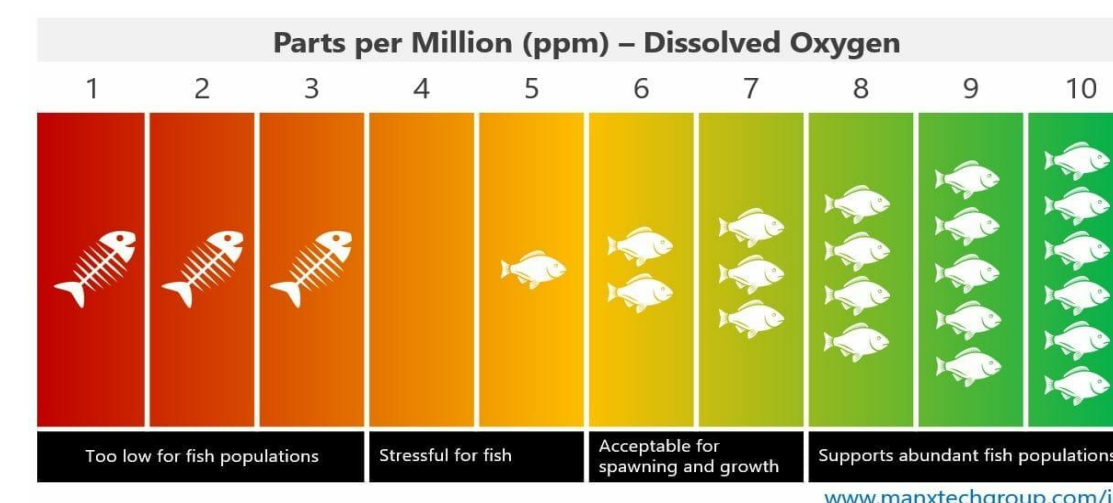


Figure 4. Dissolved oxygen (DO) is a measure of how much oxygen is dissolved in the water - the amount of oxygen available to living aquatic organisms. The amount of DO in a stream or lake can tell us a lot about its water quality. This DO is breathed by fish and zooplankton and is needed by them to survive. Figure 4 shows the relationship between DO and abundant fish populations. (Water Science School 2018)

2. Nitrates

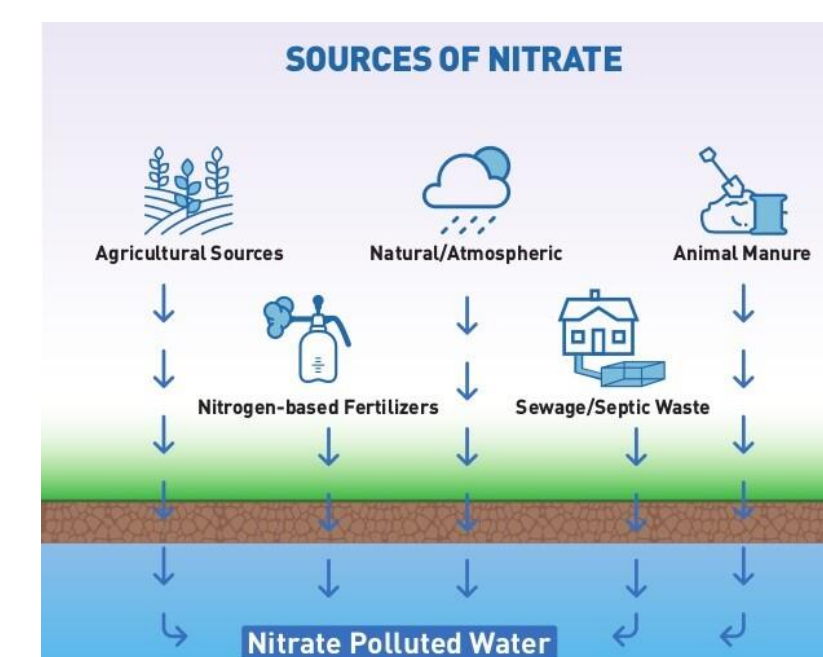
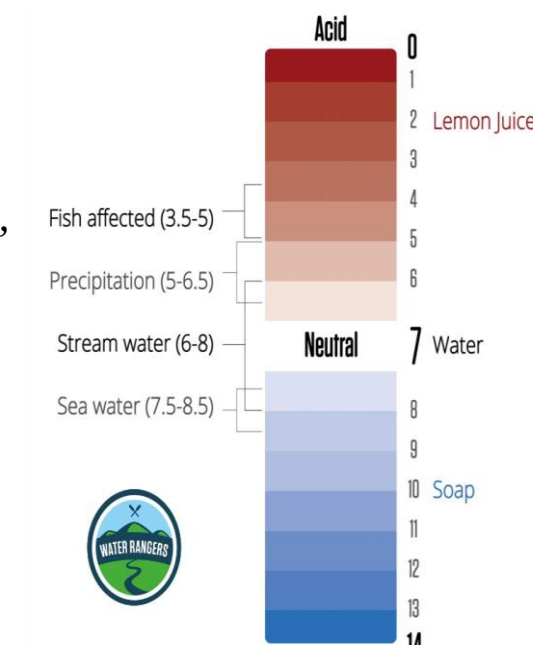


Figure 5. Nitrate is a form of nitrogen naturally occurring in the environment, and it is regularly associated with algae abundance. Please refer to Figure 5 on what contributes to nitrate polluted waters. (Water Management District, S.R. 2024)

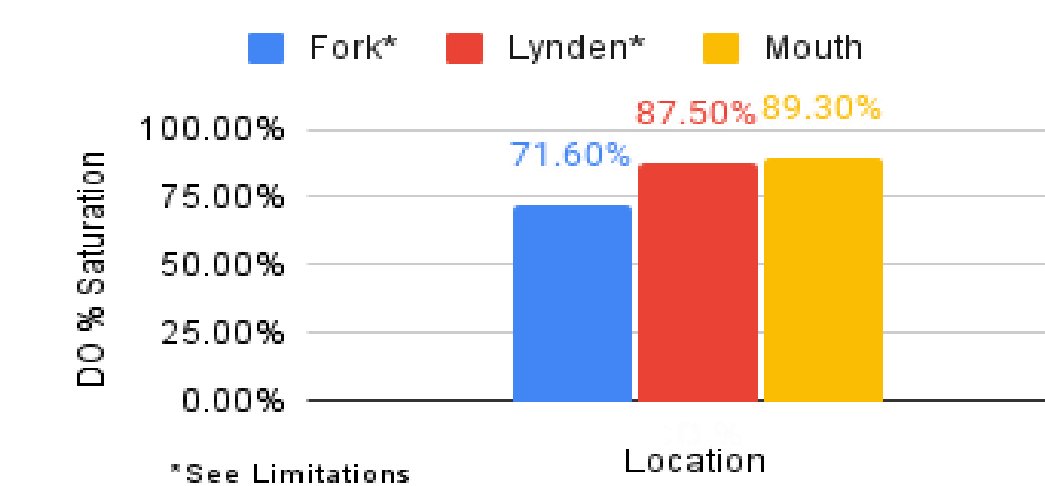
3. Potential of Hydrogen (pH)

Figure 6. In freshwater, pH influences the availability of nutrients and how easily heavy metals, which are toxic to aquatic life, can dissolve in the water. If the pH falls below 5 or over 10, like you see in Figure 6 you will start to see how fish life spans and reproduction affected. Low pH can reduce the number of fish eggs that successfully hatch and make life difficult for fish and macroinvertebrates (Water Rangers, 2024)



Results

1a N. River Dissolved Oxygen % Saturation



*See Limitations

1b N. River Nitrate Parts Per Million

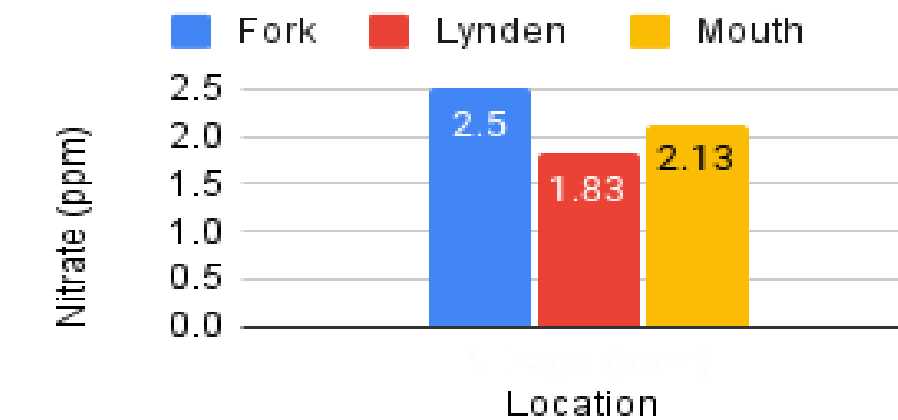
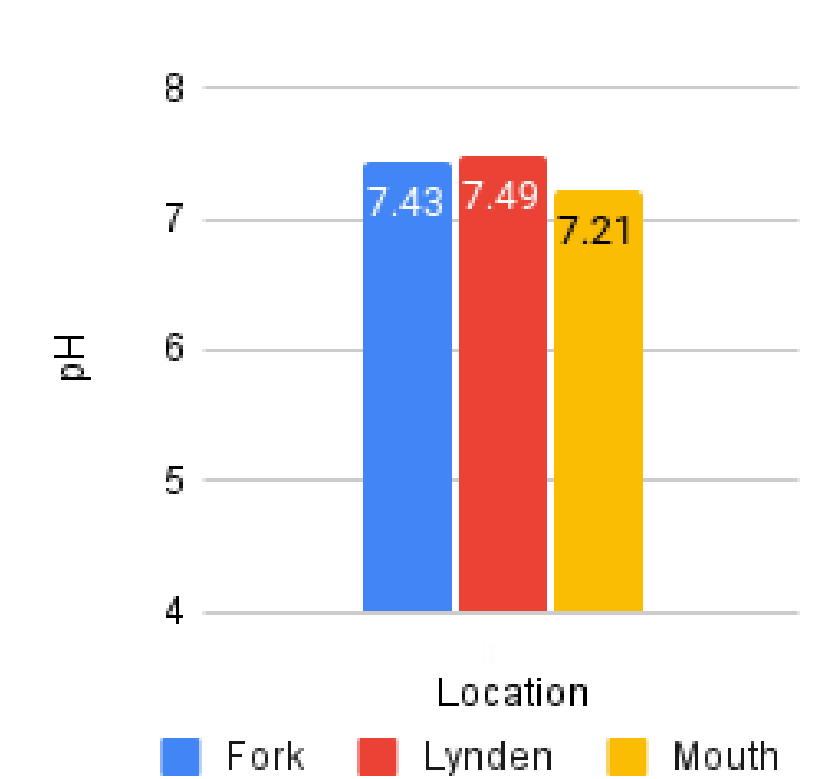


Chart 1a-c: Data results of three different geochemical analyses for the Nooksack River.

N. River pH Level



Discussion

- Nitrate levels are optimal below 30-40 ppm and are heavily affected by agriculture
- pH levels are ideal between 6.5-8.5 (Kidd, 2011) and can be affected by temperature as well as acid runoff from farming lands
- Dissolved oxygen levels are ideal >80% and can change by turbidity of water as well as aquatic vegetation
- All measurements taken from the water samples of the N. River fall within the ideal range for each metric with the exception of the DO levels shown in the graph for Lynden
- The Deming and Lynden results could be misleading as the data from those locations was measured by the probe several days after the samples had been collected. DO is a time-sensitive metric, due to it deteriorating quickly. Even so, the Lynden location maintained healthy oxygen levels for supporting salmonids even days after the sample had been collected from the river.

After evaluating the results, we can conclude that Lynden and the Mouth of the Nooksack river are in good condition for supporting salmonids. More investigation is needed for the Deming location.

Acknowledgements

We would like to extend our gratitude to Dr. Kaatje Kraft for her support throughout this project and her willingness to help us collect data. Our sincere thanks go to the Geology Lab Technician, Kris Harrell, for his help in providing the necessary materials for data collection and for creating a special tool that ensured our safety during our data collection process. We also wish to extend our appreciation to our peers for their thoughtful feedback during this project. Finally, we extend gratitude to the original stewards of the land, the Nooksack and Lummi people, for being caretakers of the land and for their past and present efforts in restoring and maintaining the health of the Nooksack river.

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