Environmental Assessment Of River And Estuary Ecosystems

Marquette Patterson[1], Melanie J. Kadake[1], Moses Nix[1], Andrew Kashevarof[1], Wendy F. Smythe[1] (smythew@ebs.ogi.edu), Sean McAllister[2], Anthony Christianson[3], & Antonio Baptista[1]

[1]OHSU-CMOP, [2]Western Washington University, [3]Hydaburg Cooperative Association

Introduction

The rivers & estuaries in & around Hydaburg, Alaska serve an important function as both a valuable community resource & as an indicator of environmental health. Rivers provide water resources to the community, and deliver nutrients to the estuaries into which they flow. The health of these ecosystems directly impacts the health of the community relying on these water & fishery resources. This study focuses on answering the question of "What is the health of these ecosystems?" by conducting field assessments examining the ecological, chemical, & microbial characteristics of these environments. Environmental assessments were conducted along three rivers: Natzuni, Hydaburg, and Saltery. Ecological bioassessment was conducted by collection identification and characterization of macroinvertebrates; this information can be used as an indicator of water quality within these ecosystems. Microbiology assessments were conducted by plating water samples onto eosine & methylene blue (EMB) plates, which are selective for *E. coli* & other harmful microorganism. Chemistry assessments were conducted using both Vernier data loggers and colorimetric assays. Results suggest that overall these ecosystems are healthy. Even so, there are some indications that local logging activities are negatively impacting the river & estuary ecosystems that have the potential to have significant negative consequences for the health of the local fisheries and subsequently the community.

Southeast Alaska

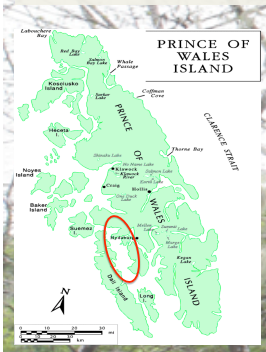


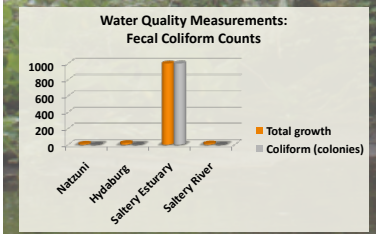
Figure 1: Left figure is a map of Prince of Wales Island, the red circle shows where Hydaburg is located. Right figure is a Google map of Hydaburg Each marker on the map indicates sampling locations.

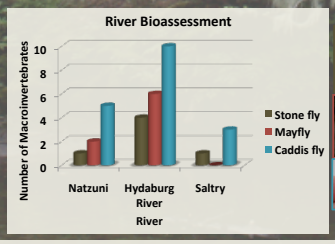
Methods

Bioassessment

- Along the river macroinvertebrates were collected and characterized.
- At each collection site pH, temperature, flow rate, turbidity and conductivity were measured.
- Colorimetric chemical assays were conducted as well.
- Water from each site was streaked onto a EMB plate to determine the absence or presence of fecal coliform bacteria.

Results: Biological Characteristics





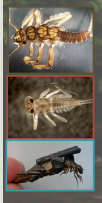
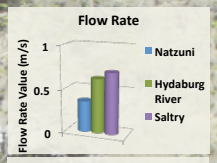
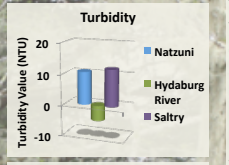
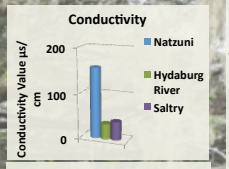


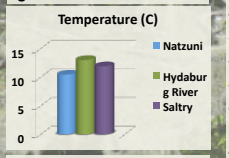
Table: A) Illustrates fecal coliform counts of colonies from river and estuary waters. The elevated colony counts at Saltery Estuary indicates the potential for contamination from anthropogenic activity. B) River Bioassessment counts of macroinvertebrates. The presence of stone flies and mayflies indicates that the rivers are well oxygenated, cold and low in harmful pollutants.

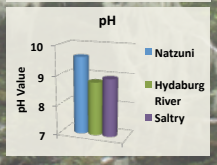
Results: Physical Characteristics











Tables indicate physical characterizations of the three rivers studied. Flow rate is a measure of how fast the river water is moving downstream. Flow rate indicates how rapidly water moves at or near the surface. It influences bank erosion and water turbidity, as river flow increases more sediment is transported into the water. This is reflected in the turbidity measurements collected from Saltery and Natzhuini both of which have sandy banks and riverbed. Hydaburg River has less turbidity due to its solid bedrock shore and bank, resulting in less sediment particulates.

Water conductivity measures water's ability to conduct an electric current and is directly related to the total dissolved salts in the water. Groundwater carries salts into the river, increasing conductivity. Large fluctuations in conductivity can occur after periods of rainfall or snowmelt, additional water entering the river after a rainfall or snowmelt dilutes the salt content decreasing conductivity of the river water. The data indicates that the rivers with elevated flow rates have decreased conductivity. The temperature between the three rivers shows little variability ranging between 10°C and 13°C.

Temperature has a slight but measurable effect on the pH of water. As the temperature of water increases, pH decreases. The opposite is also true, in that cooler water has a higher pH value.

Discussion

Findings from this study indicate that the three rivers examined host a diverse community of macroinvertebrates. Macroinvertebrates serve as indicators of environmental health of the river ecosystem. Some species such as mayfly and stonefly are slightly to moderately sensitive to pollution; the presence of these organisms indicates that the rivers are well-oxygenated, cold clear waters. Assessment of fecal coliform in the rivers again indicates a health ecosystem, however the high number of colonies grown from Saltery Estuary raise some concern as the health of the estuary, which is a key area for harvesting shellfish. Physical characteristics of the rivers indicates that although there is some slight variability overall the rivers are health stable ecosystems .

References

Lenat, D.R. (1988) Water quality assessment of streams using a qualitative collection method fro benthic macroinvertebrates. J.N.Am. Benthol. Soc 7(3): 222-223.

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