The Effects of Seasonal and Geographical Variations on the Physical and Chemical Properties of Wastewater in Oregon

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BACKGROUND

- A near-neutral pH (7.0-7.4) is favorable for biological activity and crucial to wastewater treatment.
- Variable pH and conductivity levels induce stress in microbial communities. [1]
- Chemical Oxygen Demand (COD) measurements indicate the amount of consumable oxygen used in the reaction of organic carbon with bacteria or chemicals. [1]
- High levels of ammonia in water can harm aquatic organisms through toxic buildup. [2]

RESEARCH OBJECTIVES

- Investigate geographical and seasonal impacts on the physical/chemical parameters of 17 wastewater treatment plants (WWTPs) across Oregon.
- Determine impacts of temperature and precipitation on physical/chemical properties of wastewater.

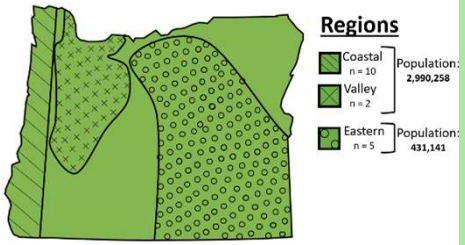

Figure 1: Map of Oregon showing the number of participating WWTPs, division of regions, and region serving populations.

METHODS

- Measure **physical/chemical** properties of wastewater (pH, conductivity, ammonia, COD, and solids).
- Collect average **temperature and precipitation** data for regions of participating WWTPS.

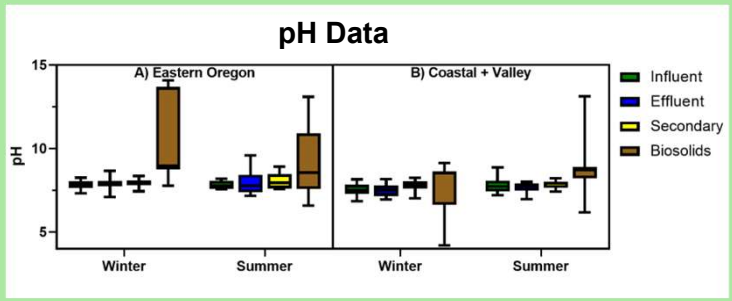

Figure 2: Average measured pH in WWTP samples for each region and season

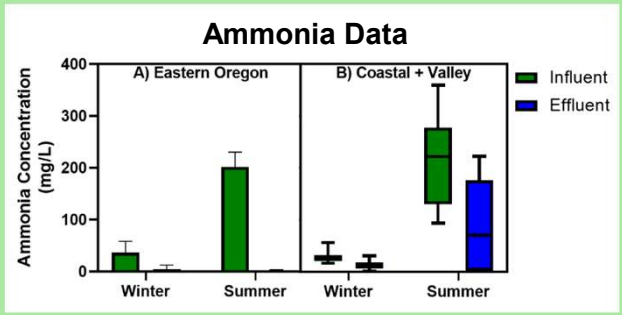

Figure 3: Average measured ammonia in WWTP samples for each region and season

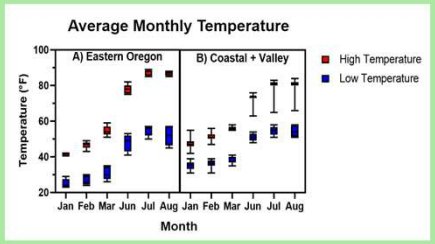

Figure 4: Average monthly high and low temperatures in Eastern Oregon (A) and Coastal and Valley Region (B)

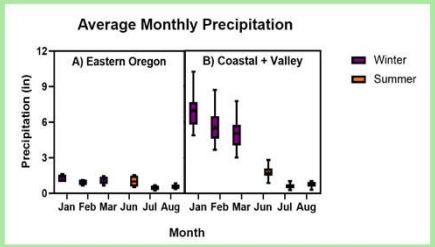

Figure 5: Average monthly high and low precipitation in Eastern Oregon (A) and Coastal and Valley Region (B)

Figure 6: Flow chart of wastewater treatment processes

CONCLUSIONS

- **pH of influent, effluent, and secondary** may not be affected by temperature and precipitation due to consistency of data in all regions and seasons
- **pH of biosolids** are more affected by treatment process (ex: lime stabilization) than by temperature and precipitation
- Lower precipitation rates in the summer may lead to higher **ammonia** concentration in influent (less dilution)

FUTURE WORK

- Complete one more sampling season (summer 2020)
- Determine impact of unique physical/chemical parameters and seasonal/geographical variations on the prevalence of antibiotic resistance of *E. coli*. in wastewater
- Assist in collecting and performing antibiotic susceptibility tests on 900 E.coli isolates

REFERENCES

1. Manaia, C. M., et al. (2018). Antibiotic resistance in wastewater treatment plants: Tackling the black box. *Environment International*, *115*, 312-324.
2. "Aquatic Life Criteria - Ammonia." *EPA*,Environmental Protection Agency, 13 Mar. 2019, www.epa.gov/wqc/aquatic-life-criteria-ammonia.

ACKNOWLEDGEMENTS

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