Understanding Sources of Zinc Contamination in Eugene-Springfield, OR

Charlotte Klein[1], Matthew Polizzotto[1,2]

[1]University of Oregon, [2] Department of Earth Sciences

Objectives

The goals of this work are to identify sources of zinc pollution in the Eugene-Springfield Metro Area and develop regulatory guidance for minimizing zinc loading to the environment.

Zinc contamination in Eugene

- Data collected by the City of Eugene show zinc concentrations within waterways in the Amazon and Willamette basins have been trending upward since reporting started in 1997.

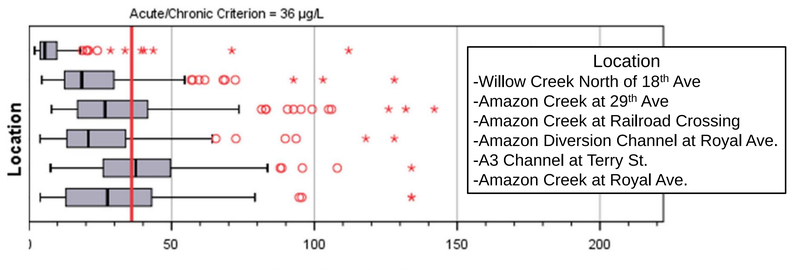

Figure 1. Amazon Basin Ambient Water Quality (City of Eugene 2020)

- In 2019/2020 reporting period show zinc concentrations within waterways in the Amazon basin often exceed acute and chronic zinc standards (36.2 μg/L, 37 μg/L).
- Exceedances also recorded in Willamette basin.

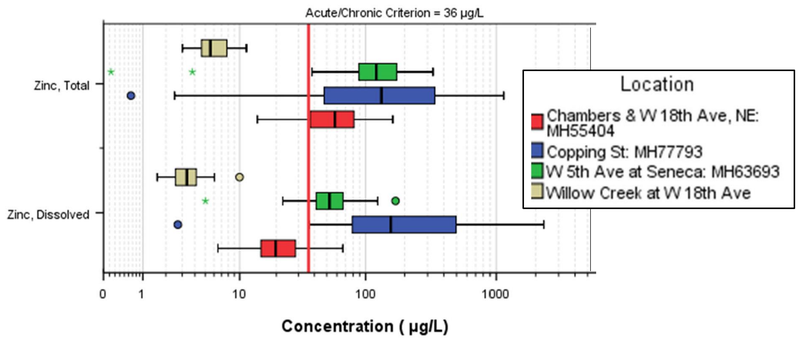

Figure 2. Zinc in Storm Event Runoff (City of Eugene 2020)

- Elevated levels of zinc in stormwater samples indicate stormwater runoff and anthropogenic sources are causing zinc contamination.

Methods

1. Identify potential and likeliest sources of zinc contamination through literature review and analysis of catchment characteristics.
2. Locate zinc within Eugene-Springfield
   a. Create temporal and spatial maps of zinc concentration data.
   b. Analyze hypothesized drivers of zinc pollution using parametric distance weighting

Results and Interpretations

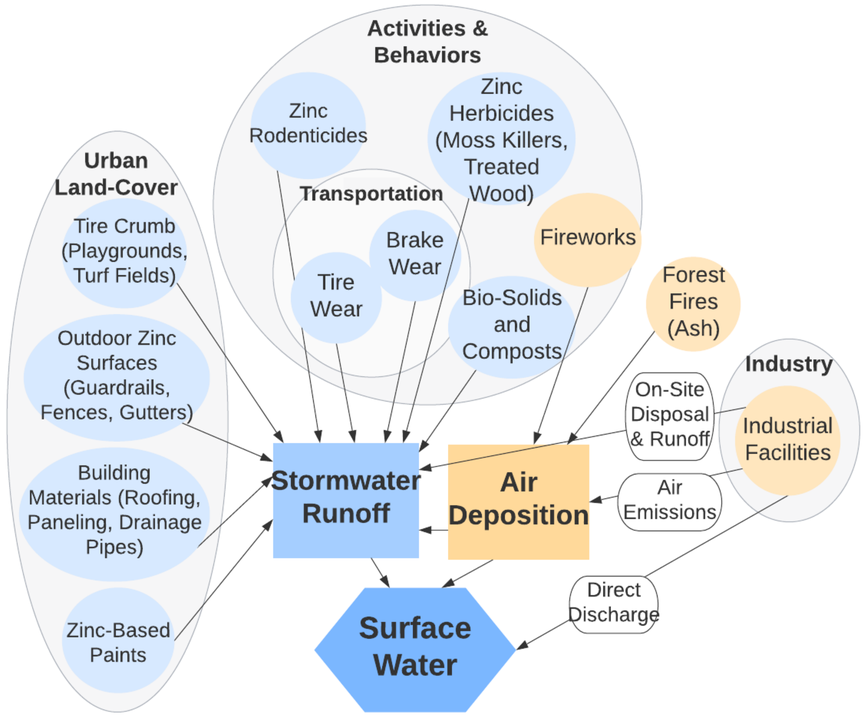

Figure 3. Potential Sources of Zinc Contamination. Sources are grouped into categories and colored by entrance path into surface waters.

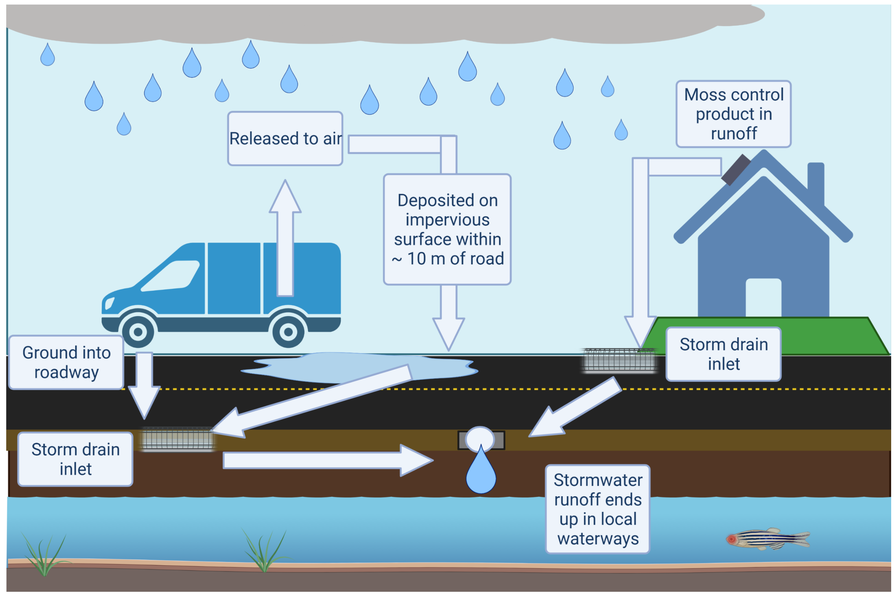

Figure 4. Nonpoint Chronic Sources of Zinc Contamination

- Vehicle derived zinc and zinc herbicides for moss control both have the potential to be drivers of zinc pollution which, in aggregate, could be causing increasing zinc concentration trends seen by the City of Eugene.

Ongoing Work

1. Temporal and spatial visualization of zinc.

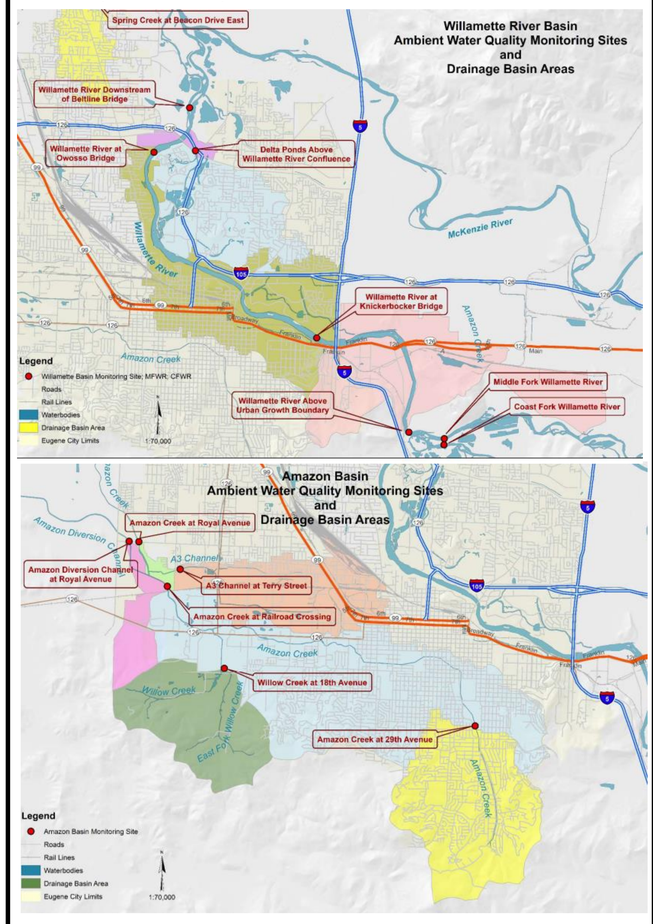

Figure 5. Map of sampling locations within Eugene. Willamette basin (upper) and Amazon Basin (lower). (City of Eugene 2020)

2. Parametric distance weighting to examine correlation between transportation, zinc herbicide, and industrial sources with high zinc concentrations using method of Watson and Chang (2018).

References

Brix, K. v., Keithly, J., Santore, R. C., DeForest, D. K., & Tobiason, S. (2010). Ecological risk assessment of zinc from stormwater runoff to an aquatic ecosystem. *Science of the Total Environment*, *408*(8), 1824–1832. https://doi.org/10.1016/j.scitotenv.2009.12.004

City of Eugene (2018). *City of Eugene Year 2018 Stormwater Annual Report*. December 2018. Submitted in Accordance with the Requirements of National Pollutant Discharge Elimination System (NPDES) Permit Number 101244, File Number 107989.

Watson, E. C., & Chang, H. (2018). *Relation Between Stream Temperature and Landscape Characteristics Using Distance Weighted Metrics*. https://doi.org/10.1007/s11269-017-1861-9\

Acknowledgments

This research was performed in partnership with the Metro Clean Water Partners. Additional thanks to the Soil and Water Lab. Research supported by the Presidential Undergraduate Research Scholars program.