

## RESEARCH OUTLINE

My goal is to determine whether salting roads in cities contributes to increased metal concentrations in urban streams. And, if such conditions exist, determine to what extent current water quality measurements we rely upon to set policy can detect when and where such problems occur. Results of this research will serve as the basis for understanding the risk of freshwater salinization in the Midwest, and the perceptions of public works and transportation officials regarding the problem.

Salts applied to winter roads change the chemistry of urban streams. This, in turn, increases the potential for pollutants present in the environment, such as metals, to mobilize in runoff. While human health and safety influence the amount and frequency of maintaining winter roads, the long-term effects to the environment are likely overlooked due to the localized and transient nature of salt-laden runoff.

Using a study area of Cedar Rapids and Coralville, Iowa, statewide monitoring datasets from the US Geological Survey and Iowa Department of Natural Resources, and interviews with Midwestern public works and transportation agency officials, my proposed research is based on the following specific aims:

1. ***Determine the relationship between chloride concentration and metals in urban surface waters.*** Using field data collected 2016-2018 from bi-weekly sampling year-round and event-based sampling during winter months, I will quantify covariance of chloride, copper and zinc at the local scale to establish baseline knowledge of local conditions.
2. ***Quantify covariation of chloride and metals across spatial and temporal scales.*** Long term trends in chloride and metals concentrations will be compared using ten-year state and federal water quality datasets to estimate the extent which local conditions remain undetected by broader measurement scales.
3. ***Determine the state of perceptions and action of managers tasked with local and statewide decision-making related to road salt and freshwater salinization.*** Analysis of in-depth interviews with state and local transportation agency officials will determine to what extent management decisions, attitudes, perceptions and actions align with freshwater salinization concerns and empirical evidence of local impacts.

While studies throughout northern North America have detected trends in increased freshwater salinization for decades, little is known about what *else* is occurring as a result of more salts in our streams. Communities responding only after freshwater sources become salty may have little to no alternatives for drinking water supplies, local fisheries, and recreation areas. The damage may already be done. This dissertation grows knowledge of conditions at the local scale and grows understanding of how decision-makers might respond if conditions are found to be severe enough to take action.

As cities grow and climate change affects the frequency and intensity of unusual weather patterns, more communities are at risk of unintentionally making freshwater systems salty. *Even worse, most are likely unaware the risk even occurs.* This research addresses an important, albeit challenging dialogue which often results in choices between human safety and the environment.