



# Effects of Salt Runoff on Surrounding Ecosystems

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## Environmental Science: Hydrology and Limnology

### Introduction:

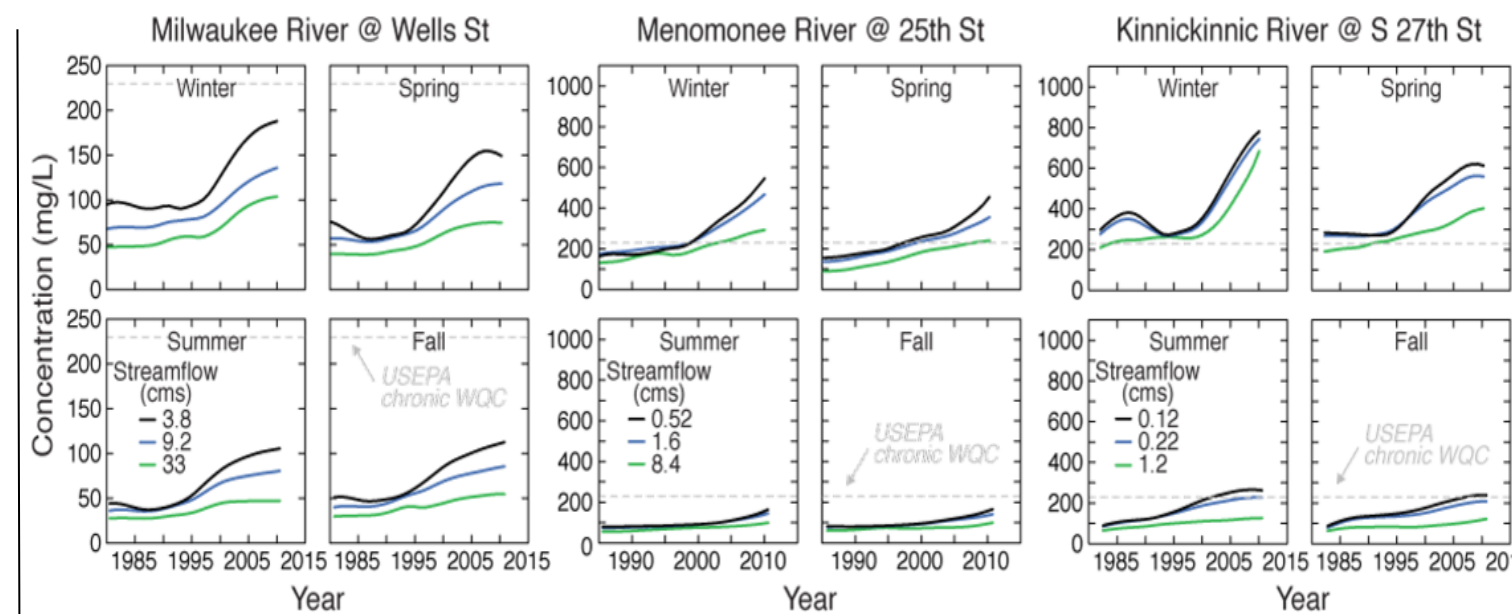
Winter road maintenance is an important part of keeping a community safe. Sodium chloride (NaCl) is commonly spread on the roadways to melt the snow and ice. America on average uses approximately 24 million tons of salt per year. Salt is an effective road treatment due to its freezing point depression capabilities. However, the sodium chloride causes ecological harm to the surrounding ecosystems. With the increasing amounts of impervious surfaces being built, this increases the amount of sodium chloride that is being transferred to the streams through runoff. In this research the effects of the sodium chloride on the surrounding ecosystems were examined.

### Methods:

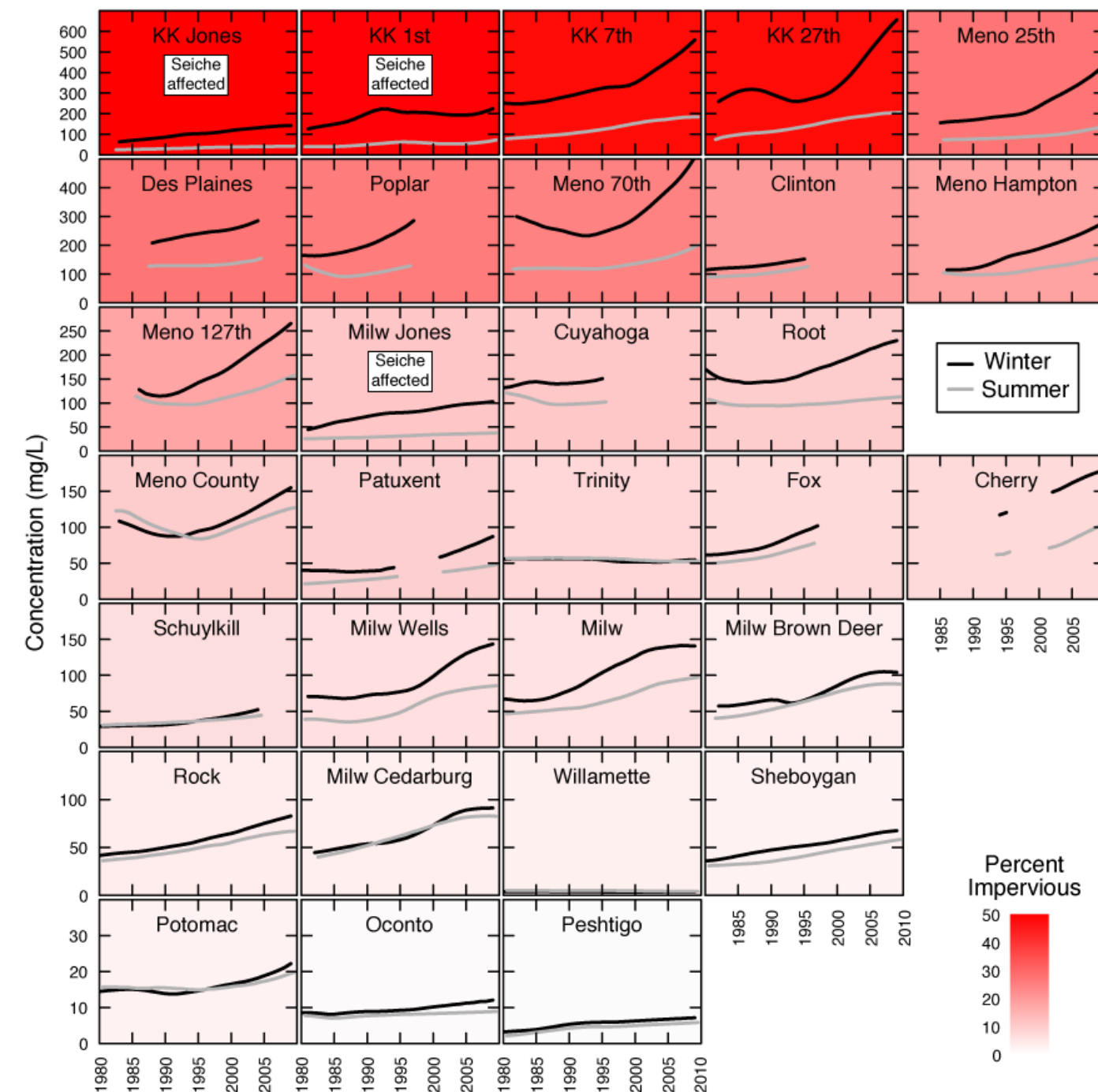
For this research I examined previous research of waterways that were near major highways that were treated with sodium chloride. Sodium concentrations in (mg/L) were obtained in a number of waterways from 1985 to 2015 (Evaluating chloride trends n.d). The data was collected for winter, spring, summer, and fall. The data for the first graph was collected on the Milwaukee River in Wisconsin. The data collection site was at the site where the roadway is bridged over the river. The second graphs' data was collected where the 25<sup>th</sup> street crosses over the Menominee river in Menominee Michigan. For the third graph the data was collected in Milwaukee Wisconsin where south 27<sup>th</sup> street is bridged over the Kinnickinnic River.

### Results:

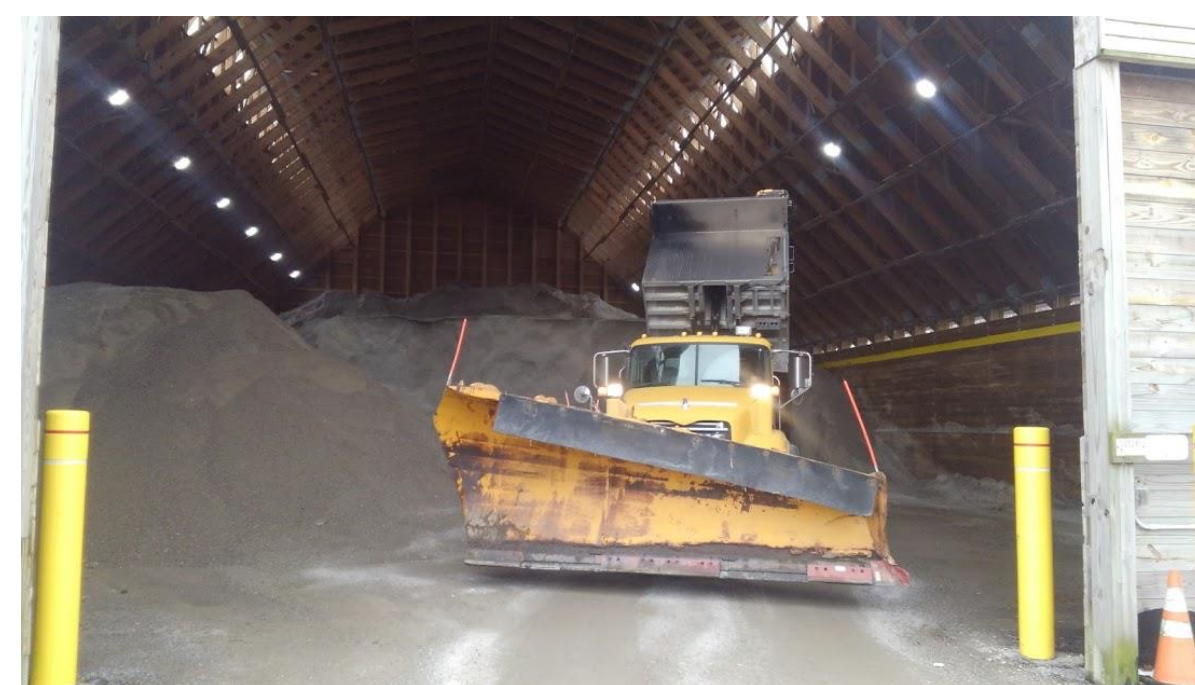
The graphs show that the amount of salt in the waterways has increased significantly from 1985 to 2015. The concentration also has increased during the summer months when there is no salt being applied to the roadways.



**Figure 1.** This graph shows the concentration (mg/L) of salt in Milwaukee river (WI), Menomonee river (MI), and Kinnickinnic River (MI) during winter, spring, summer, and fall. Data taken from USGS website.



**Figure 2:** This figure shows the concentration of chloride in relation to the flow of various waterways across the United States. The background color of the individual graphs represents the percent of impervious surfaces in the watershed. Data taken from USGS website.



### Discussion:

With the increase of impervious surfaces, there is a need for a larger amount of sodium chloride to be used to ensure public safety. The data suggests that the concentration of sodium in the waterways is not only increasing in the winter months when it is being applied but it is also increasing in the summer months. This could suggest that the sodium could be being stored in the soils and then slowly released into the surrounding waterways. The increased concentration in the summer months could also mean that the sodium is being stored in the sediments of the rivers. The higher sodium concentration would also affect the stratification of lakes. The increased sodium concentration would increase the density of the lower layer of lake when it stratifies. This can make it less likely to mix, which could affect the function of the lake ecosystem. The increased chloride in the soil could also have negative effects on the surrounding plant life. The sodium can cause stunted plant growth along with yellow leaves and could cause death in certain plants.

### Conclusion:

In conclusion, the use of sodium chloride is essential to the safety of the public, it has increasingly negative effects on surrounding ecosystems. There are methods that are begging to be practiced, that allow for less salt to be placed on the roadways. Within the next 10 years there will hopefully be a decrease in the amount of sodium chloride that is needed to be placed on the roadways to ensure public safety. In the end the safety of the public is always the main concern of the states and municipalities.

### Sources:

Contributors, H. (2021, February 02). Why is salt used to melt ice on the roads in winter? Retrieved April 22, 2021, from <https://science.howstuffworks.com/nature/climate-weather/atmospheric/road-salt.htm#:~:text=Road%20salt%20works%20by%20lowering,difficult%20for%20water%20to%20freeze>.

Tiwari, Athena, and Joseph W. Rachlin. "A Review of Road Salt Ecological Impacts." *Northeastern Naturalist*, vol. 25, no. 1, Mar. 2018, pp. 123–142. EBSCOhost, doi:10.1656/045.025.0110.

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