

Effect of Road Salt on Local Water Quality

Hayley Jonkman, Emily Brice, Amanda Rodabaugh
Jefferson High School



Abstract

Road salt is used every year to make snowy commutes safer. However, it is a major component of winter runoff into bodies of water. This experiment concludes the effects of road salt on local water quality. The measurements taken were pH, phosphate concentration, water temperature, and salinity in the Wabash River (by the overlook), West Lafayette, IN and Burnett Creek Battleground, IN. Experimental design consisted of taking these measurements before and after snowfall, where road salt was inevitably used somewhere upstream of the Wabash and Burnett testing locations. The data shows there was a noticeable difference in salinity in the water before and after snowfall. Moving forward, the effect of road salt on water quality should be tested more directly, rather than being based off of the assumption that road salt was used after snowfall, and included a more consistent testing timetable.

Hypothesis

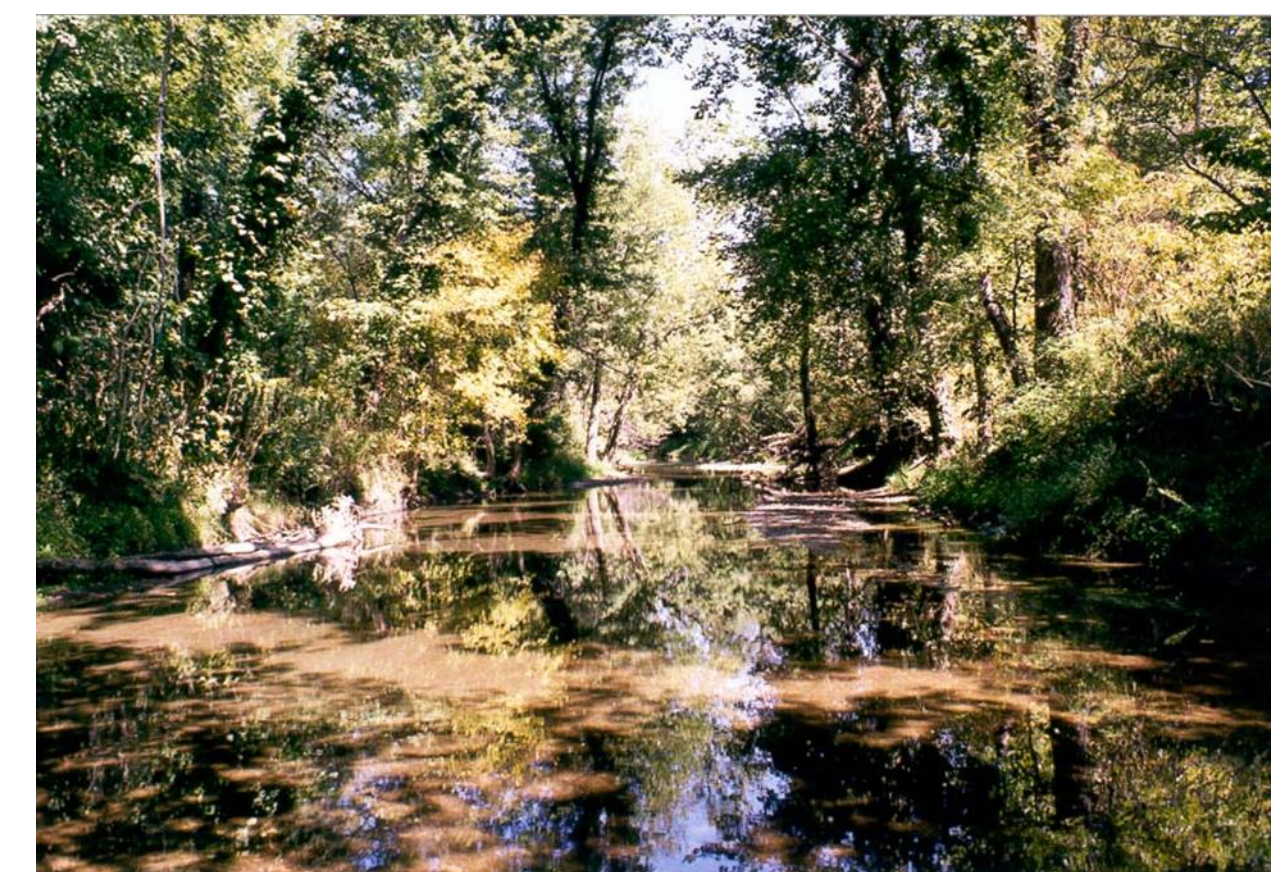
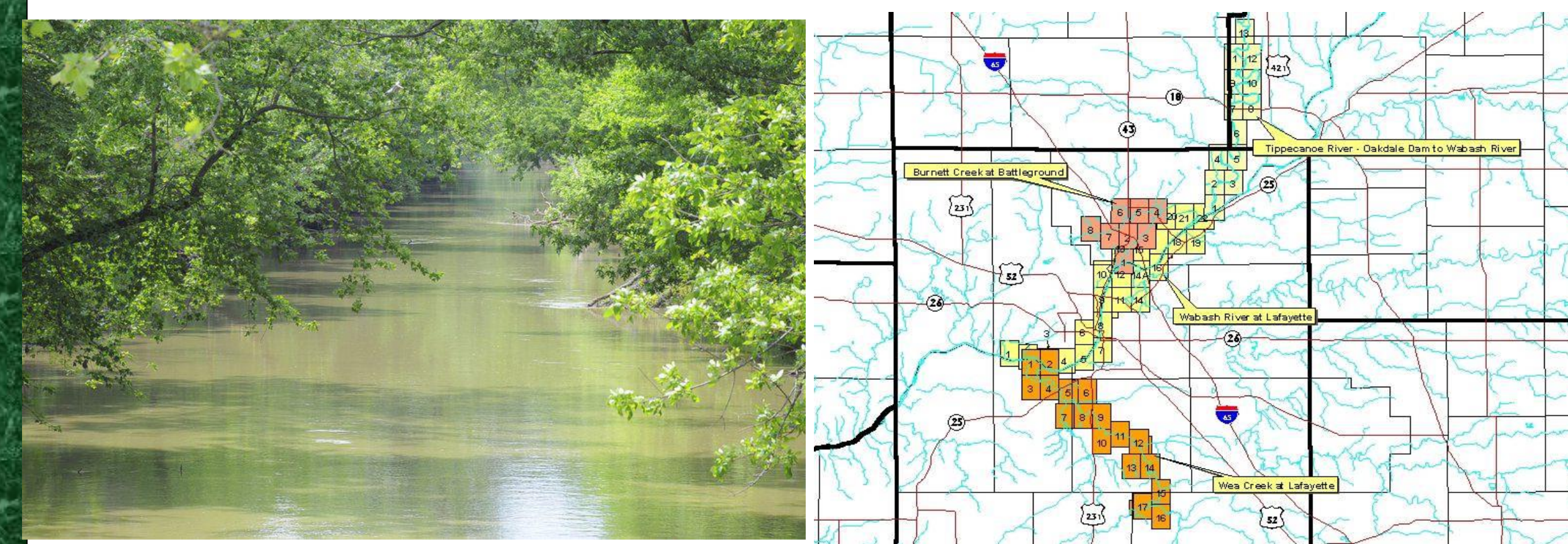
Our hypothesis is that the salinity of the Wabash River and Burnett Creek will decrease as the time since snow increases.

Research Methods

LaMotte water quality testing kits
HACH water quality testing kits

1. Site definitions were taken for the Wabash River and Burnets creek
2. Steps of these kits were fully completed and measurements recorded for pH, temperature, DO, phosphates and salinity of the Wabash River and Burnets Creek.

Field Photos and Site Map



GLOBE BADGES

- Collaboration**
Amanda: Analyzed and interpreted the data to draw conclusions..
Hayley: Put together the poster from the sets of information provided by the data collector.
Emily: Collected data from sites and compiled report.
- Community Impact**
The Wabash River and Burnett creek have experienced decreased water quality for years, this experiment explores one of the ways this is happening, and its impact.
- Exploring STEM Careers**
The scientific method was used to perform an experiment that explored natural processes.

Results

Wabash River Data

| Wabash River | Average, 8/31/18 | |
|--------------|------------------|------------|
| Phosphates | 10 | |
| pH | 6.8 | |
| Temperature | 24.9° C | |
| Salinity | 0.29 ppt | |
| Coordinates | 40.41936N | -86.89722W |

| Wabash River | Trial 1 3/15/19 Recent Snow | Trial 2 3/26/19 After Snow | Trial 3 3/28/19 After Snow |
|-------------------|--------------------------------------|-------------------------------------|-------------------------------------|
| Salinity | 0.31 ppt | 0.33 ppt | 0.32 ppt |
| Water Temperature | 7° C | 11.7° C | 14.2° C |

Burnett Creek Data

| Burnett Creek | Average, 9/13/18 | |
|---------------|------------------|-----------|
| Phosphates | 9 | |
| pH | 7.585 | |
| Temperature | 16.6° C | |
| Salinity | 0.275 ppt | |
| Coordinates | 40.5066N | -86.8458W |

| Burnett Creek | Trial 1 3/15/19 Recent Snow | Trial 2 3/26/19 After Snow | Trial 3 3/28/19 After Snow |
|-------------------|--------------------------------------|-------------------------------------|-------------------------------------|
| Salinity | 0.28 ppt | 0.30 ppt | 0.31 ppt |
| Water Temperature | 5 C | 14.8 C | 16.7 C |

Discussion

Wabash and Burnett show differences in water quality that demonstrate effects of road salt on water quality. Two brands of water quality testing kits were used. Differences between them could have led to possible errors. Another source of error could be the inconsistency in the dates that the data was collected. Effects of salt on water have been tested before, but this experiment draws conclusions from testing and comparing two different locations. The results do not support our hypothesis. The salinity of the testing locations increased as time since winter increased. One possible explanation is that it could've taken longer for the road salt to run off into the bodies of water than expected.

Research Question

What is the effect of road salt on local water quality? The use of road salts can alter many different factors of an aquatic ecosystem; including salinity, phosphate concentration, and pH. These factors can affect the quality of drinking water being consumed and the health of aquatic habitats. Actions taken by cities close to bodies of water should be carefully monitored to ensure the well-being of both the terrestrial (including humans) and aquatic organisms occupying the area.

Introduction

Water quality is the chemical, physical, and biological characteristics of water that determine the health of the environment. It is important to be aware of the water quality of an area because it affects local drinking water, health of aquatic species, and the overall wellness of an ecosystem. Some aspects of water quality include salinity, dissolved oxygen, phosphates, nitrates, pH, and temperature. These factors can dictate population size and diversity of aquatic organisms, potability (drinkability), and suitability for industrial and domestic purposes. When determining potability, contaminants and turbidity, as well as odor and taste are assessed.

Conclusions

Road salt does affect the salinity of local bodies of water. The direct relationship between road salt and the different aspects of water quality is unclear. Our results show that the salinity of local bodies of water increases as the time since snowfall increases. Distance from roadways and amount of buffer zone may account for the difference between the two sites. Burnett Creek has more buffer zone for more distance from the creek's edge than the Wabash River at the overlook site. The Wabash site is also very close to roadways and is in between two bridges.

References

- Knauth LP (1998) *Salinity history of the Earth's early ocean* [letter]. *Nature* 395(6702):554–555
- Krumgalz B, Millero F (1982) *Physico-chemical study of Dead Sea waters*. *Mar Chem* 11(5):477–492
- Nilsson J, Langen PL, Ferreira D, Marshall J (2013) *Ocean basin geometry and the salinification of the Atlantic Ocean*. *J Clim* 26(16):6163–6184