Salts at the 9th Street Outfall

Abby Chen, Shelby Galinat, Abby Robison, Quinn White
UMaine Stormwater Research Program

- Professor Wilhelm
- UMaine Stormwater Management and Research Team Program
- Returning to Boise
  - Pasco Sensors to monitor the Boise River Watershed
    - Temperature, pH, and conductivity data
  - Maintaining contact with SMART advisors in Maine
Beginning Education of Elementary Students in Stormwater Research

Summary
Students demonstrate how everyone contributes to the pollution of a river as it flows through a watershed and recognize that everyone’s “contribution” can be reduced.

Objectives
Students will:
• distinguish between point and non-point source pollution.
• recognize that everyone contributes to and is responsible for a river or lake’s water quality.
• identify Best Management Practices to reduce pollution.

- Kelly Brown, Mountain View Elementary
- Lesson plan:
  ○ Stormwater pollution
  ○ Walking tour
  ○ Technology (probes)
  ○ SMART research
  ○ Research questions
- River trip in early May
- Future prospects: continuing with new highschool students and reaching out to teachers at other schools
The 9th Street Outfall

- Stormwater drain
  - Drainage area of 220 acres downtown Boise
- Union Block Association Building
  - Discharges water used for temperature regulation
Data

Temperature Before, At, and After 9th Street Outfall Over Time

Conductivity Before, At, and After 9th Street Outfall Over Time
Comparison to Water Quality Standards

Tested Concentration (µg/L) and IDEQ Standard (CMC) (µg/L)
# Calcium and Magnesium

<table>
<thead>
<tr>
<th>Element</th>
<th>Concentration</th>
<th>EPA Standard (CMC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium</td>
<td>273,000 µg/L</td>
<td>N/A</td>
</tr>
<tr>
<td>Magnesium</td>
<td>37,700 µg/L</td>
<td>N/A</td>
</tr>
<tr>
<td>Est. Chloride</td>
<td>592,925.2 µg/L</td>
<td>860,000 µg/L</td>
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</table>
Effects of Road Salt on Aquatic Life

- High concentrations of road salts may cause:
  - Zooplankton death
    - Algal blooms
    - Effects on food chain
  - Unnatural ratios of male to female frogs
  - Saline layers on bottom of lakes
    - Oxygen transfer
  - Frog larvae abnormalities
  - Stunted rainbow trout growth
Effects of Road Salt on Aquatic Life (continued)

- Increased concentrations of salt lead to a decrease in function of periphyton
- Embryonic and larval survival of two common kinds of amphibians were reduced when conductivity increased (graph)
- Equilibrium of the ecosystem may be shifted
Investigating Effects of Road Salts on Bacteria

- Sample was taken from river upstream of 9th Street Outfall
- Counted E. Coli and total coliforms in both control and salt prior to adding salt
- Added relative amounts of road salt chemicals to salt sample
- Counted E. Coli and total coliforms 48 hours after adding salt of both control and salt samples

Data:

<table>
<thead>
<tr>
<th>Sample</th>
<th>E.Coli Before Salt</th>
<th>E. Coli 24 Hours After Salt</th>
<th>E. Coli 48 Hours After Salt</th>
<th>Total Coliforms Before Salt</th>
<th>Total Coliforms 24 Hours After Salt</th>
<th>Total Coliforms 48 Hours After Salt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>42.0 MPN/100 mLs</td>
<td>27.2 MPN/100 mLs</td>
<td>28.1 MPN/100 mLs</td>
<td>1553.1 MPN/100 mLs</td>
<td>1986.3 MPN/100 mLs</td>
<td>1413.6 MPN/100 mLs</td>
</tr>
<tr>
<td>Salt</td>
<td>34.1 MPN/100 mLs</td>
<td>32.3 MPN/100 mLs</td>
<td>23.8 MPN/100 mLs</td>
<td>1119.9 MPN/100 mLs</td>
<td>1732.9 MPN/100 mLs</td>
<td>2419.6 MPN/100 mLs</td>
</tr>
</tbody>
</table>
Conclusions/Next Steps

- Road Salt
  - EPA guidelines applicable to Boise area
  - Acute or chronic
  - Effects on other organisms, not just E. Coli
  - If a problem: possible solutions
- Other pollutants
  - Zinc was higher than acceptable acute levels
    - Possible sources
    - Effects on ecosystem
  - Nutrients (phosphates and nitrates)
  - Other contaminants from Union Block Association Building
Works Cited


“Cut the Salt: Green Deicers for Snowy Roads.” The Science Teacher, vol. 82, no. 1, 2015. Questia School,


“Zooplankton Evolve to Tolerate Road Salt.” Science and Children, vol. 54, no. 7, 2017. Questia School,
Thank you for your support and help!

- Janet Finegan-Kelly - helping with metals analysis and answering practically all of our questions
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- Monica Lowe - helping with understanding the 9th Street Outfall and visiting Boise High to answer our questions and work with Chloe Woodall on her project
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- Andrew Taruscio - traveling to Maine with us and advising our team through the whole process
- Micah Lauer - participating in the SMART summer institute with our team
- Kelly Brown - participating in the SMART summer institute with our team and working with Abby Robison to educate elementary school students about stormwater