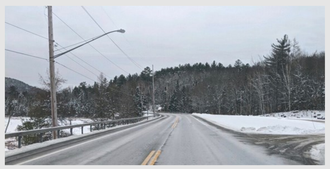
Mortality Rates of Aquatic Macroinvertebrate Populations when Exposed to Conventional and Organic Road Salts

Introduction

- Sodium chloride (NaCl) is the most common road deicer used
- 10 million tons of road salt are being applied annually in North America (Benbow, 2004)
- NYSDOT applies 680,000-860,000 metric tons of road salt each winter
- Road salt washes away into nearby waterways
- Aquatic macroinvertebrates are native to wetlands and vulnerable to this runoff (Sanzo, 2005)
- Macroinvertebrates are key components of wetland and marsh ecosystems and primary consumers of organic material in these environments (Benbow, 2004)
- Chloride anions bring about malformations and alter mortality rates in macroinvertebrate species (Benbow, 2004)



(Lewis, 2019)

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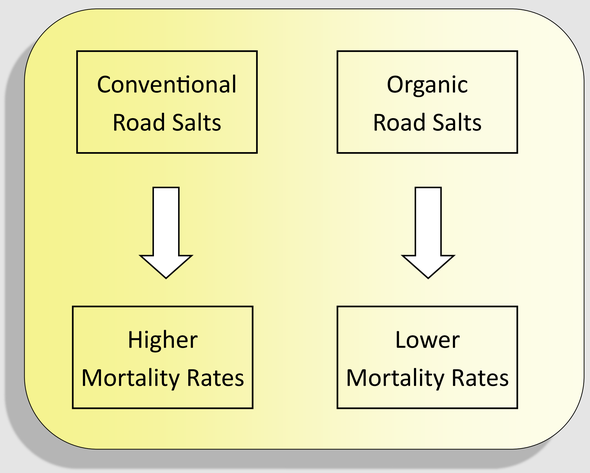
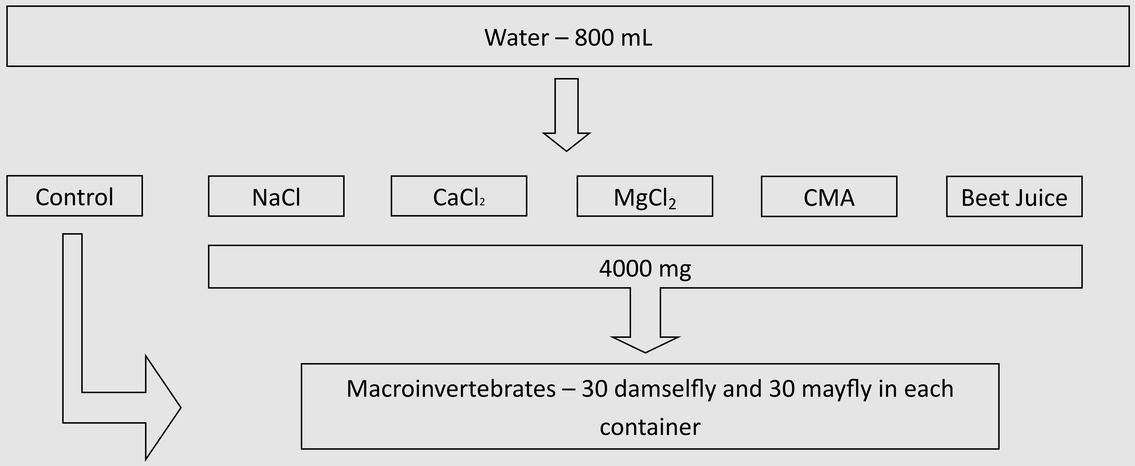
Hypothesis



Methods and Results



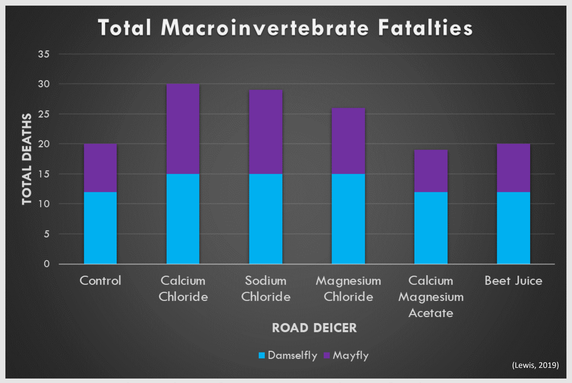


Figure 3: Total number of macroinvertebrate fatalities including mayflies and damselflies.

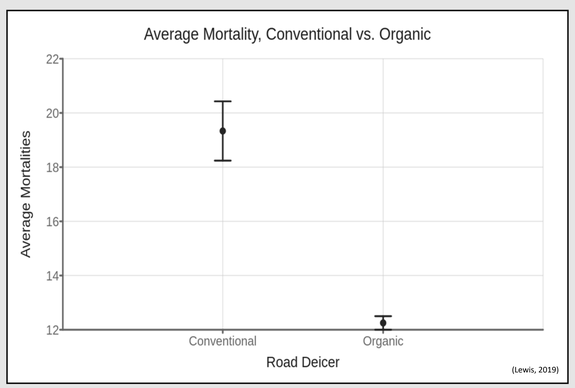


Figure 6: The dots show the mean and the bars represent the standard deviation. Note that the y-axis starts at 12, for appearance purposes.

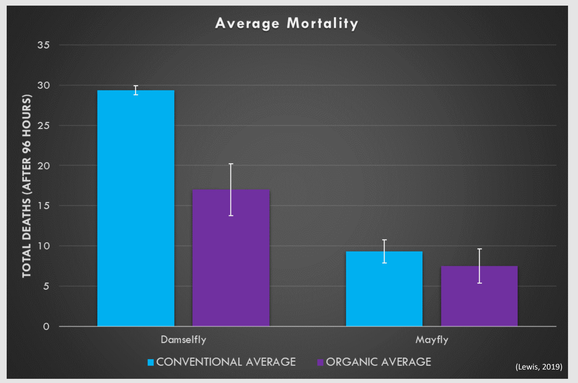


Figure 5: The lines on the bars show standard deviation.

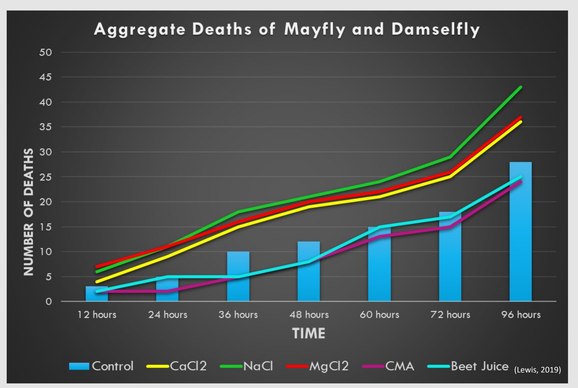


Figure 4: Cumulative mortality of all macroinvertebrates included in this study. The blue bars represent the control data. The colored lines represent the different road salt treatments.

Discussion and Conclusion

- Data for damselflies supports original hypothesis
- P-value for damselflies and mayflies combined while comparing conventional and organic was <.01
- P-value for damselflies was 0.0165
- P-value for mayflies was 0.19777
- Mayflies could possibly be tolerant of road salts at this concentration
- Previous study had similar results while looking at the differences in stoneflies and caddisflies
- Bioaccumulation could occur and effect other organisms in the aquatic ecosystem
- Small sample size of only 360 macroinvertebrates in total
- Stages and sizes of macroinvertebrates were not accounted for
- Organic road salts may provide a safer alternative for macroinvertebrate populations and aquatic ecosystems

Damselfly only

	Conventional Average	Organic Average
Damselfly	29.33	17
Standard Deviation	0.58	3.21
Standard Error	0.33	2.27
n	3	2

t-value	5.369
p-value	0.0165

Mayfly only

	Conventional Average	Organic Average
Mayfly	9.33	7.5
Standard Deviation	1.41	2.12
Standard Error	0.82	1.5
n	3	2

t-value	1.073
p-value	0.19777

Damselfly and Mayfly

	Calculated Mean	Calculated SD	Standard Error
Conventional	19.3	1.89	1.09
Organic	12.3	0.354	0.25

t-value	6.3
p-value	0.0032

Tables 5-7: Paired t-test, comparing mortalities (Lewis, 2019)

References

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