Research Experiences for Urban Science Teachers

Impact of Road Salt Runoff on Soil Plant and Microbial Communities

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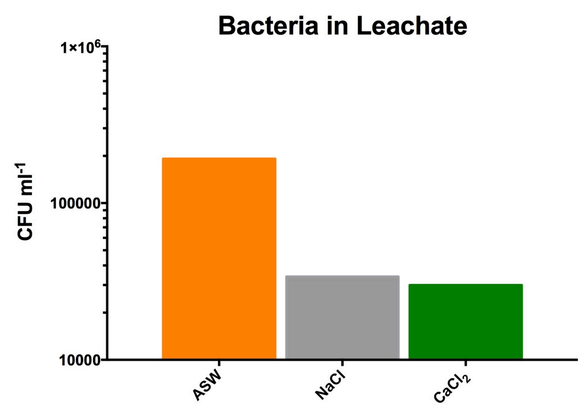
Introduction

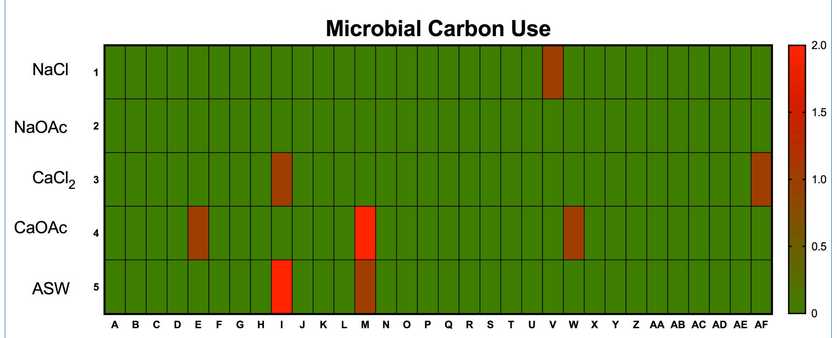
Roads play an important part of our society's infrastructure. Road deicers are heavily used during winter storms and their effect on the environment is now being looked at. Their impact is felt throughout the biosphere through runoff and infiltration into soil and waterways. One immediate impact is the plant life cycle. After decades of using deicers, changing the type of deicer and the amount put onto the roads might adversely affect vegetation as well as the water supply. Plant life stressors are common in high saline environments. One way to detect these changes is to study the effects on plants. Using these deicers, NaCl, $CaCl_2$, $Ca(C_2H_3O_2)_2$ and $Na(C_2H_3O_2)$, and by studying the growth of the plants, the bacterial counts in the leachate and soil and microcosm counts, we will try to determine if these different deicers affect the nutrient levels as well as the microbial levels of the plants that are subjugated through infiltration and runoff.

Methods

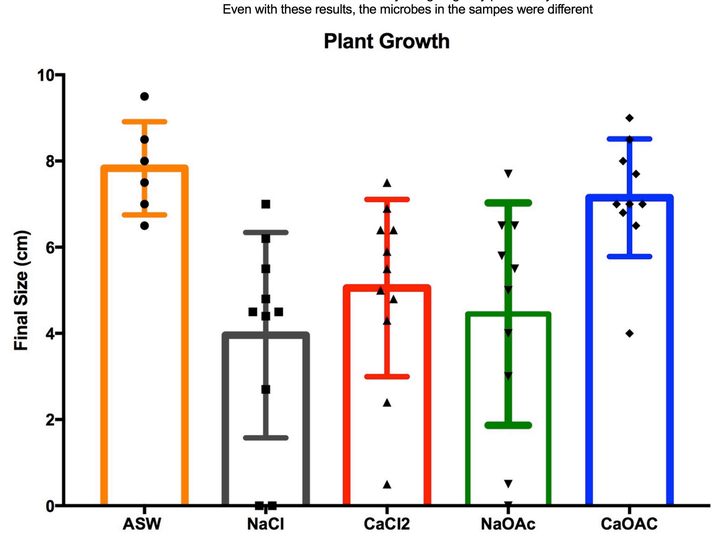
Obtain your soil type for Buchner funnel
Weigh and load the Buchner funnel with soil
Water with tap water 4 to 6X's to find flow rate average time, using 100mL each time
Collect leachate and measure before and after seeds are added and record
Prepare salt solutions of Artificial Storm Water(ASW), NaCl, CaC_{l2}, NaOAc, CaOAc, 100mL per solution/per day
Plant seeds and water daily with prepared salt solutions and ASW, collect leachate for Bio-logs and microcosms
Prepare microcosm using Serial dilution and Vacuum Filtration, incubate 5days @ 27°C
Prepare Bio-log using Serial Dilution
Run nutrient test on leachate daily for nitrate, phosphates, temperature (°C), pH, Salinity, TDS (Total Dissolved Solids), Conductivity, and Flow Rate

Results

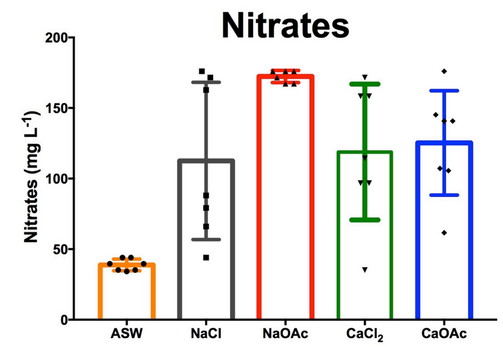


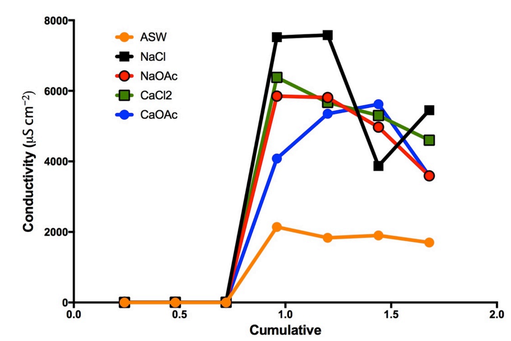


Numbers of microbes were very low giving very preliminary results
Even with these results, the microbes in the sampes were different



Plant growth was significantly lower using NaCl, $CaCl_2$, or NaOAc compared to Artificial Stormwater (ASW). There was no difference between CaOAC and ASW





Conclusion

The results show significant differences in plant growth because of the amounts of nitrates that are found in the tested leachate. The results also pose more questions/hypothesis for future investigations for the students to become involved in. The soil type is more permeable and in the future less porous substances will be added to make more natural soil and tested for changes in flow rate and load amount for certain nutrients as well as bacterial and microbial colonies. Bacterial amounts found on Bio-logs and microcosm shows significant amounts of colonies(cfu's) but does not specify the type of cfu. The results finally show, that pH, temperature, and phosphates show no significant differences.

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