A Synoptic Scale Survey of Campus Creek in Winter

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Abstract:

Interactions between flowing water, surrounding ecology, and the soil substrate of the stream, as well as chemical and physical inputs to the watershed all alter the stream's chemistry as it travels downstream. Here, I use salinity, pH, dissolved oxygen, metal content, and other proxies for water quality to compare an urban environment (the UMD campus) with a rural environment (the UMD golf course) in terms of the impact of human activities (salting and fertilizer application) as well as precipitation events on the water quality of Campus Creek. I have found that road salt application with subsequent precipitation washes Ca, Mg, K, and Na at different rates through the watershed, where Ca and Mg concentrations showed the largest increases. There is a Na signal produced during salting events, but unlike the Ca and Mg signals does not subside within two days, unlike Ca and Mg. The concentration of K does not appreciably change during salting, however. Additionally, salt levels at sites adjacent to impervious surfaces in campus creek display a heightened sensitivity to precipitation events, where salt accumulates on dry days and is washed downstream on wet days.

Figure 1: Map of sampling sites along Campus Creek

Hypothesis:

The application of salt to roads and walkways in the winter impacts the water quality (defined by the conductivity, DO content, and pH) of Campus Creek, increased total impervious surface area of the UMD campus makes variations in water quality due to salt application and precipitation more extreme relative to water in the UMD golf course.

Null Hypothesis:

Salt application has no impact on the salinity, pH, and DO of the stream water, and there is no difference in water quality between the campus and the golf course after salt application and precipitation.

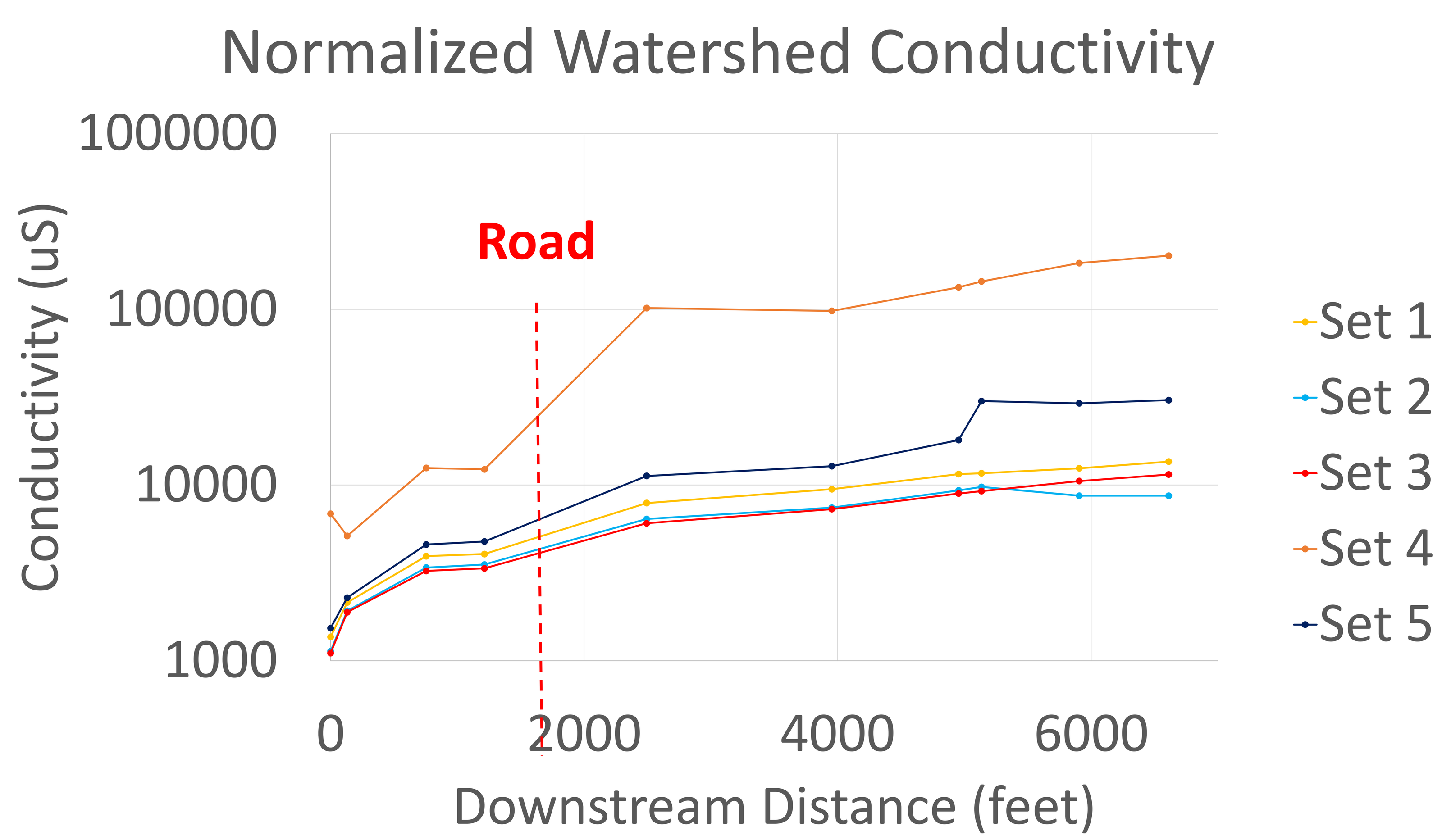

Figure 2: Conductivity down Campus Creek.

Survey #	Date	Weather	Air temp (ºF)	Salt?
Set 1	11/30/2018	Dry	45	No
Set 2	12/20/2018	0.36'' Rain	39	No
Set 3	1/6/2019	Dry	52	No
Set 4	1/14/2019	Dry, approx. 14" of snow on ground	33	1/12/2019 (same day)
Set 5	1/29/2019	Rain (13:00), Sleet (14:00), Snow (14:30)—0.2" total	35	1/29/2019 (2 days prior)

Table 1: Summary of weather conditions during sampling events.

Experimental Procedure:

- Sample (pH, conductivity, temp) at each site, in triplicate, as well as 250ml of water for instrumentation.
- Perform Winkler's titration (to measure DO) then filter sample.
- Perform ICP-OES for base cation abundances, then TOC/L analysis for TIC, TOC, and TDN.

Figure 4: Site 1, taken two days after snowfall and salt application.

Future Work:

- Measure [Fe] and relate it to precipitation history.
- Quantify organic matter present as fraction of TOC.
    - Chain length, functionalization, aromaticity…
- Compare chemistry along riffle pool sequences.