A Comparison of Total Suspended Solids in Agricultural and Urban Streams within the Winooski Watershed

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Context of Study

- Saint Michael's College Water Quality Laboratory
  - Problem Researched
  - Insight Found

Research Team

Outline

- Background
- Hypothesis
- Methods
- Results
- Summary and Future Studies

Background

- Total suspended solids (TSS)

- High TSS levels threaten the biodiversity of streams (Murphy 2007).

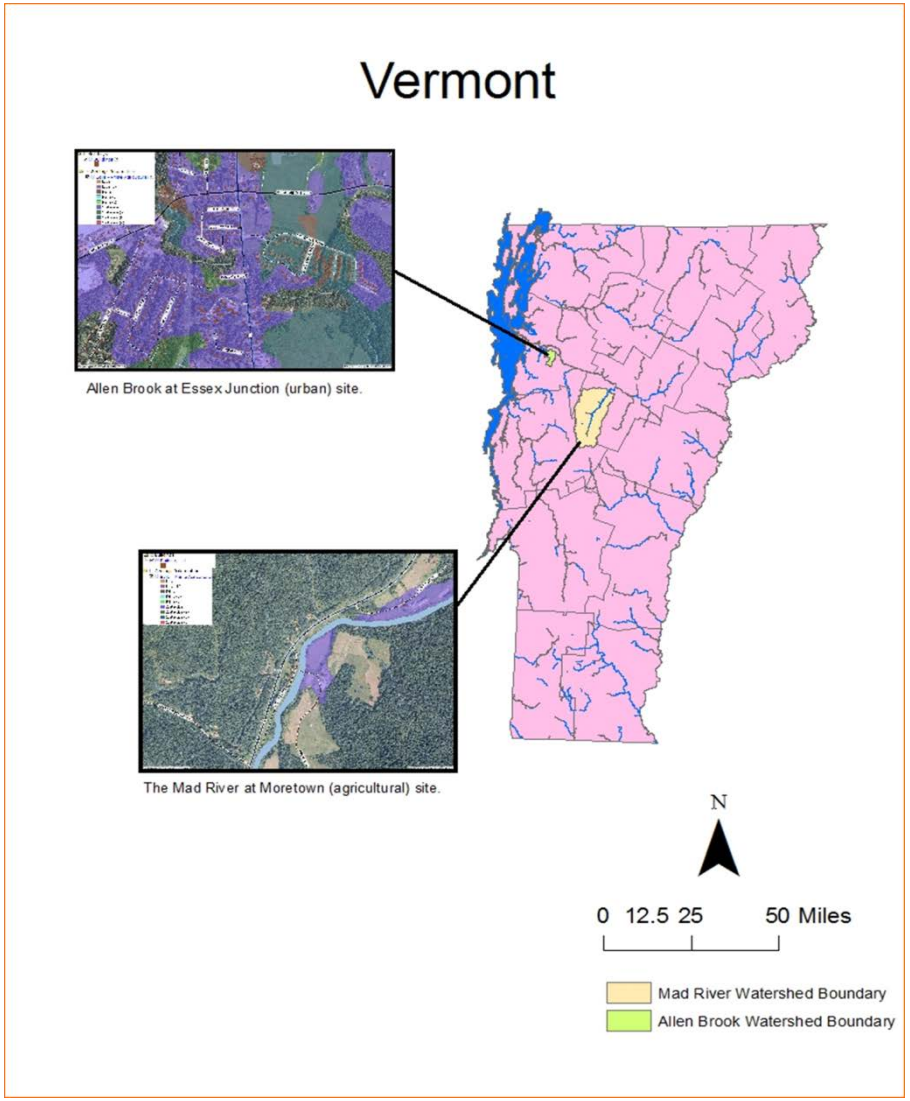
- Global climate change is predicted to increase the frequency of severe precipitation events in Vermont (Betts 2011).

The Question:

- Do land uses- specifically, agricultural and urban development- affect TSS levels in streams both at baseline and following storm events?

Materials and Methods

- Defining sites:
  - ARC GIS- mapped the watersheds
  - Agency of Natural Resources Environmental Interest Locator determined land use around potential sites.
  - Both sites within the Winooski watershed



Materials and Methods

- Sample collection:
  - hand grabs during baseline and post precipitation events.
- Sample storage:
  - refrigerated within 24 hours of being collected.

Materials and Methods

- TSS analysis
  - Samples filtered using a 3-Place Stainless Steel Filter Holder Manifold, 47mm Glass Microfiber Filters and tin pans.
  - Standard procedures for drying and filtration were used to determine TSS/sample (mg/L).

Results

- Two-way ANOVA :
  - Significant increase between baseline and post-precipitation TSS levels in both the Mad River and Allen Brook ($p = 0.00062$)
  - No significant difference between the TSS levels of the two streams ($p = 0.43$)
  - No significant difference between the TSS increase experienced by Allen Brook and by the Mad River after precipitation events ($p = 0.35$)

Results

	BASELINE	
	Urban	Agricultural
R^2	0.908	0.7315
Slope	-11.842	31.574

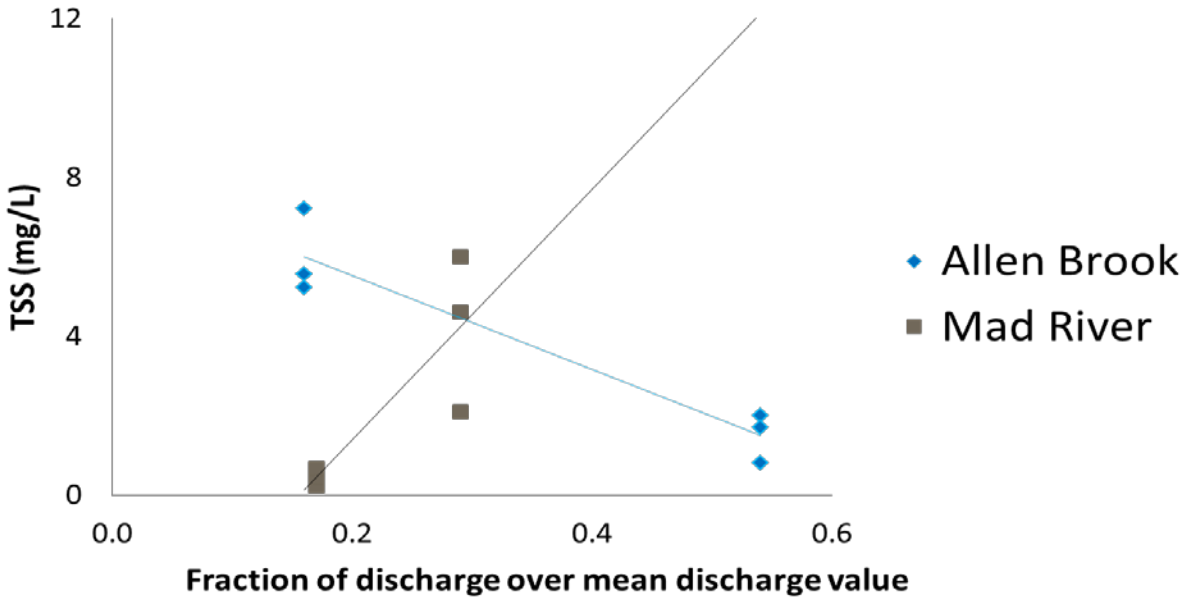


Fig 1. Baseline TSS graphed versus the fraction of the mean discharge for Allen Brook and Mad River at the time of sampling for dates from June 19th through July 23rd

Results

	POST-PRECIPITATION EVENT	
	Urban	Agricultural
R^2	0.9902	0.843
Slope	88.095	18.08

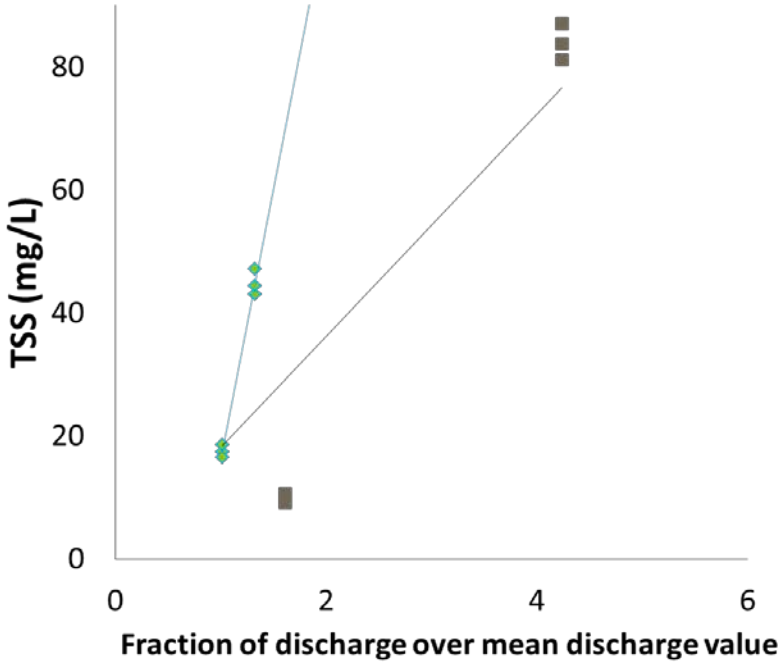


Fig 2. Post-Precipitation Event TSS graphed versus fraction of mean discharge for Allen Brook and Mad River at time of sampling for July 18th and July 24th

Summary

- TSS increases significantly between baseline and precipitation events at both sites
- With further study a significant difference in the TSS increase experienced by the respective streams may be found.

Future Studies

- Longer study period- more data points
- Streams of comparable size
- More thorough land use evaluation process.

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Literature Cited

- Betts, Alan. 2011. Climate Change in Vermont. Adaptation White Papers. Available from http://www.anr.state.vt.us/anr/climatechange/Pubs/VTCCAdaptClimateChangeVTBetts.pdf.
- Meals, D, Dressing S (2006) Lag time in water quality response to land treatment. NWQEP Notes Number 122. N.C. State University Cooperative Extension Raleigh, N.C
- Sheila Murphy. [Internet] 2007. [cited 2012 July 11] General Information on Solids. Available from http://bcn.boulder.co.us/basin/data/NEW/info/TSS.html
- Vermont Agency of Natural Resources. [Internet]. [cited 2012 August 1] Agency of Natural Resources Environmental Interest Locator. Available from http://maps.vermont.gov/imf/sites/ANR_NATRESViewer/jsp/launch.jsp?popup_blocked=true
- Watershed delineations were obtained from USGS StreamStats. Other GIS data were obtained from the Vermont Center for Geographic Information's Data Warehouse.