



A Quality Control Assessment of ISCO Portable Samplers within the Winooski Watershed

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Abstract:

Total Suspended Solids (TSS) and nutrient loads are indicators of nonpoint source pollution from natural and human-induced causes. High amounts of TSS inhibit photosynthesis to submergent vegetation while phosphorus and nitrogen overload can produce toxic algal blooms. ISCO portable samplers were installed at four stream sites within the Winooski watershed. An Independent t-test compared TSS and an analysis of variance compared nutrient data to find potential differences between hand grab samples and ISCO grab samples. The difference of TSS and nutrient loads between sample methodologies at all four sites were found to be statistically insignificant.

Introduction:

- TSS and nutrient data are indicators of pollution from either industrial and agricultural sites or natural climatic patterns such as storm events or erosion (MWRA, 2012).
- Frequency of storm events have been steadily increasing due to the threat of climate change (Betts, 2011). Storm events promote erosion and runoff pollution into stream habitat, lowering diversity and water clarity.
- To improve sampling efficiency and timing, ISCO portable samplers were installed in and near USGS Gaging stations located within the Winooski River watershed.
- Before this study, it was assumed that there is no statistical difference of TSS between hand grab and ISCO grab samples.
- Difference in TSS is used to determine if ISCO sampling yields data statistically equivalent to data obtained by hand grab sampling.

Methods:

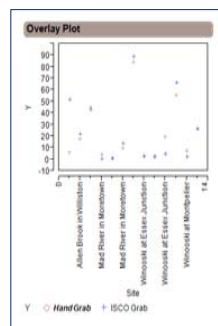
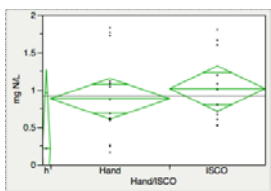
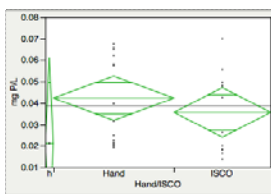
- Samples were taken within the Winooski Watershed at four USGS Gaging station sites.
- Three hand grab samples and three ISCO grab samples were taken at each site visited.
- Each site was visited on four occasions; two times for baseline data and two times within 24 hours of a storm event.
- Samples were filtered with a 3-Place PVC Manifold, dried and weighted.
- Calculations equate to subtracting the pre weight from the post weight.
- Volume of the sample is later incorporated to convert data into grams per Liter.

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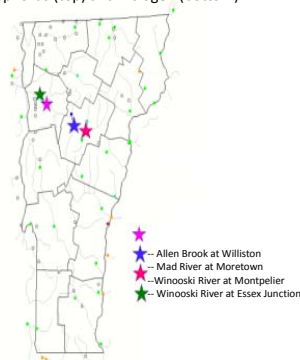
Results:

- An independent t-test did not indicate a significant difference between hand grab and ISCO grab samples ($t_{(24)}=0.78$, $p > 0.05$)
- Phosphorus and nitrogen values were also insignificant with an analysis of variance test ($F_{(2,25)}=.807$, $P > 0.05$ and $F_{(2,25)}= 1.201$, $P > .05$ respectively)



Above: An Overlay Plot that demonstrates difference of TSS between hand grab and ISCO grab samples at each site.

To the left: Results from the analysis of variance of phosphorus (top) and nitrogen (bottom).



Discussion:

- ISCO portable samplers improve sampling accuracy with appropriate timing and abridged human involvement. When installed, assumptions were made regarding quality of samples from the stream.
- ISCO samplers have been programmed to collect 800mL of stream water to test multiple parameters including TSS and nutrient data.
- As expected, statistical analysis showed that there was no significant difference between samples taken by hand and samples taken through the ISCO.
- Occasionally, the ISCO probe was adjusted to reach the low water levels. This promoted a stir up of sediment from the stream bed and instilled an obvious increase of TSS in a few samples, particularly at Allen Brook on July 23rd (52.05, 11.95 and 90.29).
- All samples were taken in the midst of ISCO installment and adjustments, leading to inconsistencies in sample volume and frequency of samples. The ISCO programs were finalized a week before a sequence of many storms, increasing the confidence and consistency of the data set.

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