2009 CSREES National Water Conference; St. Louis, MO

Impact of sampling frequency on annual load estimation of total phosphorus and total suspended solids

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Abstract:
Water quality regulations for nutrients and sediment are typically based on loading estimates determined by the collection and analysis of infrequent grab samples. These data generally are not collected with enough frequency or regularity to provide an accurate representation of the constituent loading, yet regulatory decisions and the investment of significant resources are based upon these loading numbers. In the Little Bear River watershed in northern Utah, USA, continuous, in-situ measurements of turbidity were used to generate continuous estimates of instream total phosphorus and total suspended solids concentrations through surrogate relationships. These high frequency concentration estimates were paired with continuous discharge data to estimate total phosphorus and total suspended solids loading. The continuous records were then artificially decimated to create subsets representing varying sampling frequencies, including hourly, daily, weekly, and monthly subsets. Additionally, subsets were created to examine the effects of randomizing sampling days and times. The resulting annual load estimates of each dataset were compared to the loads estimated from the continuous data. Results show that continuous sampling of a surrogate, even with a less than ideal surrogate regression relationship, generally provides a more accurate estimate of total phosphorus and total suspended solids load than does grab sampling. Overall, higher frequency sampling resulted in load estimates that better approximated the reference loads. Additionally, the hour of the day and the day of the week in which sampling is conducted can have an impact on load estimation, depending on sampling location and hydrologic conditions.

Impact Statement:
* Implementation of high frequency monitoring network for CEAP river system

* Unique cooperation with local producers and regulators in assessment of viability of conservation projects

* Leverage funding with U.S. EPA, NSF, States of Utah, Idaho, and Wyoming

Category: Watershed Assessment and Restoration
Type of Presentation: Poster Presentation