ESTIMATING TRIBUTARY PHOSPHORUS LOADS USING FLOW-WEIGHTED COMPOSITE STORM SAMPLING

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ABSTRACT

Quantification of total phosphorus (TP) loads entering a lake or reservoir is important because phosphorus is most often the limiting nutrient in terms of algae growth, thus phosphorus can control the extent of eutrophication. Four methods for assessing the annual tributary phosphorus loads to two different Virginia reservoirs were analyzed, three methods that use tributary monitoring program data and one that uses land-use and rainfall data. In this project, one tributary has been extensively monitored for many years and served as a control on which the other methods were tested. The key difference between this research and previous studies is the inclusion of flow-weighted composite storm sampling instead of simple grab sample analyses of storm flow. Three of the methods employed flow stratification, and the impact of the base flow separation point was examined. It was found that the Regression Method developed in this research was the least sensitive to the base flow separation point, which is a valuable attribute because a wrong choice will not significantly affect the estimate. The Monte Carlo Method was found to underestimate the TP loads. The amount of rainfall impacted the accuracy of the methods, with more error occurring in a year with lower precipitation.

Keywords: Nonpoint source pollution, water quality, tributary load estimation, flow stratification, total phosphorus, regression, Monte Carlo, Schueler's Simple Method, and ratio estimator

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