2008 USDA-CSREES National Water Conference
Sparks, NV

Developing nitrogen, phosphorus and sediment reduction efficiencies reflective of operational conditions

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Abstract Text:

Severe Eutrophication in the Chesapeake Bay has lead to degraded water quality and anoxic conditions. A review of BMP definitions and efficiencies used by the Chesapeake Bay Program (CBP) in strategies to reduce nutrient loads was conducted to estimate effectiveness based on operational conditions. Current efficiencies were assigned using limited science and best professional judgment. In the 1990's, CBP began using model estimates of reductions in nutrient loads as surrogates for reporting progress in water quality improvement. Modeled progress overestimated actual progress, conflicting with monitoring data, as BMP efficiencies were based on research scale data and tracking and reporting, implementation, and operation and maintenance were assumed to be accurate or properly done. The inconsistency between modeled progress and actual water quality resulted in negative press which drove federal programmatic reviews that emphasized the need for CBP to revise BMP efficiency estimates. BMPs were evaluated and their effectiveness revised to better reflect current research and knowledge, providing more realistic, science-based estimates of expected pollution reduction levels. Scientific experts were utilized to review literature and develop efficiency estimates. Additional scientists and agency staff reviewed draft efficiencies. Research-scale efficiency values are optimistic when applied to operational conditions at the watershed scale factors such as management, soils, hydrology and climate add variability that result in actual practice effects that are lower than research based estimates. The lower efficiencies, however, was met with resistance as both research and programmatic interests wanted to maintain optimistic efficiencies. A period of debate and negotiation followed between the authors and reviewers. The process to reach final efficiencies, factors that create variability and interests that resisted the use of operational efficiencies will be discussed. Revised definitions and efficiency estimates are closer to actual, but likely remain optimistic.

Impact Statement:

To achieve and maintain the water quality necessary to support the aquatic living resources of the Bay and its tributaries, and to protect human health, watershed plans with BMP efficiencies reflective of actual effectiveness are necessary. Operational effectiveness will allow water resource managers to develop efficient watershed plans that will protect and improve water quality, than plans developed with optimistic efficiencies. The revised BMP definitions and efficiencies will also be available for use in Total Maximum Daily Load (TMDL) implementation plans and nutrient trading programs.