Session J4: Nonpoint Source Monitoring for TMDL Implementation

Room A107-109
1:00 – 2:30 pm

0399
J4-1

Impaired Waters Within or Near US Forest Service Properties: A National Geospatial Assessment

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A national assessment was carried out by the US Environmental Protection Agency (EPA) at the request of the US Forest Service (FS) to help the FS better address risks involving impaired waters and the federal lands they manage. The existence of EPA's nationally consistent geospatial data on impaired waters enabled mapping where such waters occur within as well as near the over 193 million acres of National Forests and Grasslands. "Near" waters within catchments adjacent to the FS boundary were included to help the FS identify potential external sources or recipients of impairment that may share a stake in restoration, and their upstream/downstream relationships. In assessing impaired waters co-occurrence, we found 4,212 different impaired waterbody segments within or near 114 FS administrative units in 42 states. These waters included 58,180 km of rivers and streams, and 4,644 sq km of lakes, ponds, reservoirs and estuaries. Attributes for each water included waterbody name and ID, pollutant type, length or area, forest name, and other information. Temperature, mercury, habitat alteration, sediment and metals were among the top 5 impairments. Additionally, we found that 43% of the within-FS and near-FS impaired waters have been the subject of 2,530 finalized Total Maximum Daily Loads (TMDLs) that provide initial plans and details about needed pollutant reductions. Of the roughly 17,000 HUC12s with any FS property, 70% had no reported impaired waters and 1.5% had 5 or more impaired waters. The geospatial approach generated findings in numerous formats to maximize utility at local to national scales for users with varying skills across FS and EPA. Products included the GIS database; a browsable ArcReader version for broader audiences; national spreadsheets on impaired waters statistics, HUC12s, and TMDLs; regionalized data summaries; pattern analyses for each pollutant, and an assessment report.

0398
J4-2

Estimation of Total Maximum Daily Load (TMDL) in Agricultural Watersheds Using a Combined Continuous and Periodic Sampling Approach

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Water quality monitoring of electrical conductivity (surrogate for total dissolved solids, TDS) was conducted in four watersheds in Central Valley California (Del Puerto Creek, Hospital Creek, Ingram Creek, and Marshall Road Drain) during the irrigation year from April 1 to Sept 30. The four watersheds provide diverse model systems for assessing the viability and accuracy of the different load estimation methods as they have widely varying concentration and flow distributions from one another and are all non-Normal. Streams in this region experience diurnal fluctuations in flow due to local irrigation practices and as a result have poor correlation between TDS concentration and flow. Hence, a regression based method such as LOADEST cannot be used to compute TDS loads.

In this work, we developed alternate methods of computing loads using periodic grab samples of TDS concentration and various flow rate estimates from in situ continuous monitoring data (mean flow over sampling period, median flow over sampling period, instantaneous flow at time of sampling, and mean of flow on sampling day) and determined their accuracy in comparison with the 'true' load computed using in situ real-time monitoring measurements of both TDS concentration and flow rate. Results show that estimations of load from grab sampling measurements are most accurate when combined with robust statistical measures of central tendency of flow (i.e., median of flow) over the sampling interval; this method estimated all loads with less than 6% error. Additionally, since it is typically not known in advance what type of flow and TDS distribution is to be expected in a watershed and may range from Normal distribution to highly-skewed or other non-Normal distributions, utilizing the median of flow for load estimation is the best choice for load estimation.

0428
J4-3

From Control Site to Treated Site: The Challenge of Quantifying Improvements at Walters Creek

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The EPA's National Monitoring Program researched and evaluated NPS pollution sources and BMP treatments throughout the Morro Bay watershed from 1992-2002. During the study, the Walters Creek subwatershed served as the 'control' site for a paired watershed study examining the effects of rangeland BMPs on reducing sediment loading. At the conclusion of the study in 2002, restoration of the Walters watershed began in earnest.

From 2003 to 2005 an extensive array of improvements and BMPs were implemented across the control watershed. In 2008, the Estuary Program revived the monitoring station that had collected data throughout the National Monitoring Program to evaluate the post-installation success of restoration efforts. Resurrecting the suspended sediment concentration (SSC) data stream and drawing pre and post project comparisons has proven highly challenging.

Despite intensive restoration work, changes in land management and overall improvements in the condition of the watershed, preliminary data do not indicate distinguishable reductions in suspended sediment load. A formal test to compare the pre and post project data models indicates there is only weak evidence for a difference between the two conditions ($P = 0.077$) While additional data collection may strengthen the evidence of an improvement in conditions, SSC data may prove insufficient as the primary indicator of changing conditions of in watershed.

0520
J4-4

Ecological Function Approach to TMDL Prioritization and Implementation

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The TMDL process provides a framework for identifying actions needed to reach water quality standards, and is most efficient when dealing with point source pollution. The TMDL process of determination of a problem, load allocation and implementation is less efficient and cost effective when dealing with non-point source pollution. States and tribes struggle to meet the provisions called for by the Clean Water Act (CWA) due to the overwhelming resource demands of the program, which involve complex assessment of point and nonpoint sources to ascribe and quantify environmental effects. Most states and Tribes prioritize TMDLs using a statewide scheduling process by reviewing water quality problems listed on the most recent 303(d) list of impaired water bodies as a starting point. The greatest weight in determining priorities is given to primary factors of vulnerability (*e.g.*,further degradation, risk to public health, aquatic life, and threatened and endangered species). Unfortunately, this method does not distinguish those parameters essential to determining the assimilative capacity of a waterbody to pollution. Most of the assimilative capacity of a stream and wetland is in the riparian vegetation. Recent resource assessment studies conducted as part of USEPA Region IX Tribal program has shown ecological function condition as the primary driver to non-point source water quality attainment. The objective of this study is to utilize the concepts of ecosystem functions and services to more fully address the complexity and dynamism of ecological and societal factors involved in the TMDL process. The concepts of ecological functions and services provide decision makers with the connections between form, function, management, and monitoring allowing them to better address the underlying causative factors behind ecosystem degradation and loss of biological value, goods, and services. A "services based" determination of ecological condition, and associated management recommendations, can be developed and implemented by better understanding of upland and riparian area functionality and services they provide to society. Qualitative assessments of stream function and biophysical alterations at a local scale can be used to empower resource managers in adaptive management alternatives, prioritize resource allocations, and identify parameters to be monitored.