Abstracts

Thursday, May 1

Session L1: The Big Picture: Holistic Approaches to Water Quality Assessments

1:30 – 3:00 pm | Room 263

Determining How Much Algae is too Much Algae in West Virginia Streams

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Abstract
While there is much discussion on the impacts of increased nutrients on the aquatic community, there is little information available on the impacts to recreational uses. In West Virginia, there are numerous large rivers impacted by filamentous algae during the summer recreational season, which are often attributed to excessive nutrients. Biological data on these rivers is not showing significant impacts to the aquatic community that would warrant listing as impaired, and many of these rivers contain some of the best recreational fishing in the state. Conversely, WV DEP has received many complaints from citizens that recreational uses are being impacted by the excessive algae. In 2007, DEP initiated efforts to better understand and address excessive algae in the state. Part of that effort identified the need to better understand what levels of algae are deemed excessive and would impact recreational activities. In 2011, DEP initiated a statewide public opinion survey to determine what levels of filamentous algae would impact recreation in state rivers. The firm Responsive Management was contracted to develop and implement the survey and working with DEP, was able to get responses from over a thousand state residents. The results of the survey showed that levels of filamentous algae cover greater than 25-30% impacted recreational uses. DEP was able to get a significant amount of demographic information concerning recreational stream use in the state which will be discussed in detail. The presentation will also discuss how the findings will be utilized in the nutrient criteria development process.

Projected Economic Benefits Associated with the Removal of Excess Nitrogen and Phosphorous from Utah's Lakes and Streams

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Abstract
The Utah Division of Water Quality (DWQ) recently completed a study to quantify the projected economic benefits and costs associated with implementation of nutrient criteria and associated efforts to remove excess N and P from Utah's surface waters. This presentation will focuses on the methods and results of the economic benefit investigations, specifically: total economic value, water-based and near shore recreational use value, non-use existence value, property values adjacent to waterbodies, and reduced drinking water treatment costs. We evaluated the benefits in couple of ways. First, a state-wide survey was used to estimate willingness to pay (WTP) for both participants and nonparticipants of water-based recreation. These WTP estimates were subsequently adjusted to account for the propensity of these methods to overestimate economic value. We also used econometric models to evaluate the benefits of water recreation by coupling results of a second state-wide recreation use survey with ambient water quality and nutrient response (*i.e.*, chlorophyll concentrations, TSI values) data. Together, these methods essentially allowed us to compare stated preferences (valuations) against actual preferences – the relative nutrient status of where people chose to recreate. Utah households report that they are willing to pay from $70 million to $271 million a year to protect and improve from the deleterious effects of excess nutrients. Households who visit lakes, rivers and streams in Utah stated, and showed through their trip choices, a clear preference for recreating at cleaner waterbodies. The study also found, from current recreation choices, that improving water quality would enhance recreation resulting in approximately $48 million of the total

economic value annually. Overall, these economic benefits are fairly balanced with projected costs associated with nutrient removal from Utah's wastewater treatment plants.

Collaborative Science and Monitoring to Support Integrated Watershed Planning

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Abstract
We will present the foundation for an Exeter-Squamscott Watershed Integrated Plan for three communities in southern New Hampshire. This research project engages the end users from the initial stages to identify research priorities that will directly support the municipality's ability to make science-based decisions about the value and impact of specific monitoring, planning and implementation actions. Of particular importance is the development of information to inform strategies to deal with uncertainty of ecosystem response in relation to adaptive management actions. The communities have regulatory requirements to meet strict nutrient criteria associated with impairment in the Great Bay estuary; a highly valued resource which hosts a National Estuarine Research Reserve and is a National Estuaries Program Estuary of National Significance. Long term monitoring under these federal programs is augmented by municipalities to meet specific regulatory needs. This project explores a multi-town subwatershed application of integrated planning across jurisdictional boundaries that will address some of today's highest priority water quality issues: wastewater treatment plant upgrades for nutrient removal; improved stormwater management for developing and re-developing areas; and regional monitoring of ecosystem indicators in support of adaptive management to achieve nutrient reduction and other water quality goals in local and downstream waters. The project outcome will be a collaboratively-developed inter-municipal integrated plan, and a monitoring framework to support cross jurisdictional planning, and adaptive management for water quality goals.

Next-Generation of Urban Water Systems

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Abstract
To address the complexities associated with municipal water issues there is a need to change from our traditional "siloed" (drinking water, wastewater, stormwater, etc.) management approach. In a water-connected world, sustainable solutions require a system-based approach, in which water services (traditionally within wastewater, stormwater, and drinking water) are integrated with options to maximize the recovery of resources (energy, nutrients, materials, and water). Water system managers require science-based assessment of the broader system to aid in such decision-making. One system-based approach is emergy synthesis, a process previously used for various systems at multiple scales to incorporate environmental, social, and economic aspects into a common unit of nonmonetary measure (solar energy equivalents). Further, an emergy approach may provide an objective metric to assess the sustainability of systems, when compared with other metrics. It not only quantitatively assesses the direct and indirect energy required to produce goods and services but also provides managers a decision criterion (metric) to evaluate the efficacy of alternatives that specifically includes ecosystem services.

Here we present an emergy analysis that provides a system-wide evaluation, including water resource, drinking water treatment, wastewater treatment, and stormwater management, as well as the distribution and collection systems. The traditional centralized services (including drinking water supply and wastewater) are compared against alternative systems that include wetland treatment and urine-diversion toilets, so as to specifically address coastal eutrophication issues. As a preliminary study we aim to 1) provide a decision-support framework that employs emergy analysis to support integrated water system management; 2) pinpoint the major emergy expenditures for each system; 3) compare water balances; and 4) identify total emergy embedded in the systems examined.