American Water Resources Association
2009 ANNUAL WATER RESOURCES CONFERENCE
November 9-12, 2009
Seattle, WA

Tuesday, Nov. 10
8:30 AM – 10:00 AM
SESSION 20: Information Management

Multi-Criteria Decision Analysis (MCDA) to Prioritize Watershed Improvement Projects - Sandra Slayton, ENTRIX, Inc, Hood River, OR (co-authors: Douglas MacNair, Jefferson Keaton)

The North Carolina Ecosystem Enhancement Program (EEP) is developing a Local Watershed Plan (LWP) for the Indian and Howard's Creeks hydrologic units of the in the Catawba River Basin of North Carolina. To support this effort, ENTRIX, Inc. conducted a Phase II watershed assessment to evaluate watershed conditions and identify and prioritize stream and wetland mitigation and stormwater BMP projects. An important component of the project is developing a systematic, transparent process for prioritizing potential projects that considers the disparate objectives of stakeholders. This presentation will describe how we used a quantitative approach, Multi-Criteria Decision Analysis (MCDA), to achieve stakeholder consensus and to prioritize and rank projects. The watershed planning process lead by EEP included a substantial stakeholder involvement component. The stakeholder group, comprised of state and local agency representatives and natural resources professionals, met regularly during the project and outlined objectives for the plan. A common challenge for these groups is prioritizing watershed improvement projects with consideration of the disparate purposes of providing ecological improvement, meeting programmatic needs, and complying with stakeholder concerns. We developed a project-ranking tool using MCDA, a quantitative, systematic, and transparent process that identifies the values and costs of alternative management options using stakeholder goals and objectives. We have routinely applied MCDA in natural resources valuations, but it has not been used for watershed planning before. The project-ranking process began with a stakeholder "framing session" to identify criteria for selecting projects, or ranking criteria, and reach a consensus on the importance, or weight, of each. These criteria included need for restoration or preservation, pollutant load reduction benefits, programmatic considerations, and stakeholder interests. A spreadsheet-based statistical model estimated the project rankings based on stakeholder-approved criteria and weights. The model output consisted of a prioritized list of projects that should be pursued to best meet the needs of the mitigation program and stakeholder goals. The MCDA framework provided a straightforward and defensible approach to help the EEP maximize the value of the mitigation funds.

A Decision Support System for Optimizing Reservoir Operations Using Ensemble Streamflow Predictions (ESP) - Austin Polebitski, Department of Civil and Environmental Engineering, University of, Amherst, MA (co-authors: Eset T. Alemu, Richard N. Palmer, Bruce Meeker)

ABSTRACT: This research investigates the value of Ensemble Streamflow Predictions (ESP) streamflow and energy price forecasts in the operation of a hydropower system. Forecasts of streamflow and energy prices are used to schedule the quantity and timing of reservoir releases for daily, weekly, and seasonal operations while meeting regulatory constraints. A decision support system is described that incorporates two integrated operating models: a simulation model that replicates general operating rules for the hydropower system and an optimization model that refines operations based upon forecasts of state variables. The decision support system provides a series of recommendations for the quantity and timing of reservoir releases to optimize the economic value of the electrical energy produced, while balancing requirements and concerns related to flood control, and environmental flows. The decision support system generates a range of optimal reservoir releases though the use of an ensemble streamflow forecast and identifies robust operational solutions. The results from the investigation of the value of forecasts show how the decision support system can be used to improve skills in operating the reservoir system.

Web-based Low Impact Development Decision Support and Planning Tool - James Hunter, Purdue University, West Lafayette, IN (co-authors: Bernard A. Engel, Joseph E. Quansah)

Low Impact Development (LID) practices helps to reduce pollution and hydrologic instability from stormwater arising from increases in impervious surfaces and land development practices. However, significant obstacles to the adoption of LID practices by federal, state, and local agencies may stem from the lack of tools to quickly and easily predict the impact of LID practices within an area. The use of currently available LID models for stormwater management and preliminary assessments precludes the use by a greater audience due to needed expertise. In response to increasing demands for information about LID and tools for comparing LID practices to conventional development practices, an easy to use web-based LID decision support and planning tool, L-THIA/LID, has been developed as a simple to use screening tool to evaluate the benefits of LID practices. The Long-Term Hydrologic Impact Assessment (L-THIA) tool is a web-based spatial decision support system that provides support for decision makers who need information regarding the hydrologic impacts of water quantity and quality resulting from land use change. The L-THIA enhanced L-THIA/LID tool will enable various stakeholders to quickly and easily evaluate development within a watershed based on historic climate, soils, and land use data for an area. L-THIA/LID will provide: (1) the impact of urban development on average annual runoff volume; and (2) the potential stormwater and pollutant reduction of proposed LID practices. Runoff quantity and water quality impact of proposed land use change are displayed in tables, bar charts, and pie charts. A case study will be used to demonstrate the model's ability to assess the impact of LID practices within a watershed. The aim of the model is to enable decision makers to formulate effective watershed management plans to achieve desired stormwater management and water quality goals.

The Role of Field Operations in an Urban Watershed - Edward Speer, CDM, Seattle, WA (co-author: George Collier)

The Philadelphia (Pennsylvania) Water Department operates all storm and sanitary sewers within the city of Philadelphia. Its 142-square-mile service area encompasses 3,000 miles of publicly owned drains, sanitary sewers, and combined sewers. The service area includes the highly impervious areas of Center City Philadelphia, as well as the Fairmount Park waterway along the Schuylkill River. Regulatory changes and an increased awareness of water quality issues in the region have prompted the department to partner with neighboring jurisdictions in developing integrated watershed management plans covering their service area. Combined sewer overflow (CSO) control efforts have been developed in this context and a capital program of infrastructure improvements—as well as land-based stormwater management techniques—are currently being implemented. To successfully transition from planning to operations, tools and techniques have been developed to ensure that results match the intended targets. Several component systems provide real-time and historical information on critical structures within the sewage collection system, including sewer levels, flow rates, gate positions, pumping rates, rainfall, and discrete alarms. Real-time control of select facilities modulates sluice gates and modifies pump settings to best utilize existing storage within the piping network to achieve overall system objectives. Operations data is disseminated through desktop browser applications available over a wide-area network. This information supports the effective operation, tactical oversight, and proper deployment of resources at critical times. Proper coordination of facilities, as well as integration of the support functions required to properly operate and maintain the facilities, is essential to achieving the system performance expected by the public and the regulatory community.