American Water Resources Association
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Wednesday, March 31
8:30 AM – 10:00 AM
SESSION 26: Decision Support Systems

Using LDCurve to Support Watershed Management Decisions - Stephanie Johnson, Houston Engineering, Inc, Maple Grove, MN

Load duration curves are a commonly used tool in the field of water resource management. These curves are developed at a single point on a stream by combining historic flow and water quality information to compute the pollutant load experienced at that point under different flow regimes. LDCurve is an Excel-based tool that automates the creation of load duration curves, using web services to retrieve flow and water quality data over an internet connection, combine the data, and create the desired curves. The entire process is typically completed in less than three minutes. Using LDCurve in combination with geographic information systems allows the user to quickly view spatial differences in pollutant loading, by creating curves for various points across a study area. Curves can also be created for different periods of time, revealing temporal trends in loading as circumstances within the study area have evolved. The combined use of LDCurve and GIS, therefore, provides a quick approach to viewing spatial and temporal trends in pollutant loading across a study area, revealing trends over the entire hydrologic regime. In this paper we will apply LDCurve and GIS to show how development in a Texas watershed has impacted pollutant loadings over time. We will discuss how the information from these tools can be used to quantify the increased loadings, to communicate this information to stakeholders and/or decision-makers, and to support management decisions within the study area.

North Slope Decision Support System: Water Resources Management in Support of Oil and Gas Exploration in Alaska - Kelly Brumbelow, Texas A & M University, College Station, TX (co-authors: Amy C. Tidwell, Stephen F. Bourne, William F. Schnabel, James Haleblian, Arun K. Aryasomayajula)

The North Slope Decision Support System (NSDSS) is currently under development as a technology in support of oil and gas exploration and development on Alaska's North Slope. Major modules of the DSS include information systems, natural system models, and planning/management functions. Development of the DSS is a collaborative effort of academic and industry personnel with significant stakeholder involvement from local, state, and federal government, private energy companies, and non-governmental organizations. Ice roads and pads provide a cost-effective means of oil and gas exploration with minimal impact to the sensitive underlying tundra. Consequently, these ice structures have become integral to oil and gas exploration activities on the North Slope. Their widespread use represents a challenge to water resource managers, however, due to the large volume of water required to construct and maintain them. Crucial questions on water balance and ecosystem impact must be considered in the state regulatory process that permits construction of these ice structures. The NSDSS will consist of 1) a service oriented architecture (SOA) based cyberinfrastructure composed of a node-link network of distributed databases, 2) a desktop-based workbench tool, and 3) a web browser tool. The cyberinfrastructure will contain databases of GIS data, time series of meteorological and hydrological data at points and as gridded products, and papers describing scientific findings relevant to the North Slope. Using the workbench, users will be able to assess the impact of proposed management alternatives vis-□-vis important stakeholder criteria by simulating the implemented alternative in an integrated model of the physical systems on the North Slope. The web browser will provide an intuitive view of the North Slope, the data available, and indeed the data gaps to be filled. One important workbench application is multi-objective planning for ice road routes. Pareto-optimal route alternatives are determined for cost, travel time, completion date, and other objectives. Spatial search domains are built using GIS layers for water availability, vegetation and wildlife sensitivity, topography, etc., and heuristic optimization is utilized with novel algorithms for graph pre- and post-processing to improve solution efficiency. Outputs from the planning routines allow decision makers to understand tradeoff relationships among objectives.

Linking Modeling and and Data Visualization to Create a Cliamte Change Adpatation Deicison Support Tool for a California Water District - David Purkey, Stockholm Environment Institute, Davis, CA (co-authors: David Yates, Elizabeth Mansfield, Jack Sieber, Vishal Mehta)

Climate change poses a chellenge to water management planners as they seek to idendify infrastructure investments and policy reforms that will contribute to achieving a balance between supply and demand in an uncertain future. This challenge is particularly acute in systems where snow accumulation and melt consitute an improtant component of the hydrology of source water regions. This presentation will intorduce some innovative modeling work done in collaboraiton with the El Dorado Irrigation District located in the South Fork of the American River Watershed in the western Sierra Nevada. This modeling captures potential climate change impacts on both water supply and water demand and provides and analytical tool to evaluate adaptive management responses. One feature of the modeling system that will be featured during the presentation is a linkage with an econometric model of water user behaviour with include climate, water price, and a set of socio-economic variables as independent variables. Another unique feature of this work is the creation of a dynamic link between model output and the Google Earth platform, which provides a rich visualization environment for presenting information to managers and policy makers to support decision making. The presentation will include some reaction of decision-makers to the utility of the Goolge Earth visualization approach.

Designing Decision Support Systems for Water Resources: Making the Tool Fit the Needs - Daniel Sheer, HydroLogics Inc., Columbia, MD

Effective water resources decision support systems (WRDSS) are very different depending on the application, as they should be. To be useful, a WRDSS must be designed around the decisions it is intended to support on both spatial and temporal scales. Even if the underlying system and system model are the same, different data and different human interfaces are likely to be required to provide full support for different kinds of decisions. In the simplest case, a WRDSS is used simply to allow the evaluation of user created alternatives. In the most complex cases, the WRDSS will both determine and implement a course of action that optimally meets pre-defined goals. Regardless, in all cases, the critical first step in the design of the system is to determine the objectives which drive the decisions to be supported. How those objectives will be evaluated and displayed is the single most important design decision. The second step is to determine the speed with which the decisions must be made. The third step is to design an interface that is easy and convenient for the intended users, while allowing the flexibility needed to deal with all foreseeable events. With three items, the design of the remainder of the WRDSS is considerably better specified and, in most cases, simplified. This presentation will illustrate how this approach to DSS design has played out (or is playing out) in the development in several of HydroLogics projects. Outputs, interfaces, data maps and information flow diagrams for each project will be presented.