American Water Resources Association
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GIS & Water Resources VI
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Orlando, FL

Tuesday, March 30
10:30 AM – 12:00 Noon
SESSION 14: Water Quality I

Tritium Spill Modeling in the Savannah River using BASINS 4.0 – Amber Ignatius, The University of Georgia, Watkinsville, GA (co-author: Todd Rasmussen)

Between December 22-25, 1991, approximately 210 TBq (5700 Ci) of tritiated cooling water was accidentally released from the K-Reactor at the Savannah River Site, a federal nuclear production facility located near Aiken, SC. The release occurred when a small leak developed in the heat exchanger between the primary and secondary coolant. A massive monitoring program was initiated that mapped the progress of the spill as it moved through Pen Branch (a small, onsite stream), the Savannah River Swamp (a large, onsite wetland), and down the Savannah River to the estuary and then out into the Atlantic Ocean. One goal of the monitoring program was to estimate the potential maximum dose from consuming contaminated food and water. This paper examines the ability of BASINS 4.0 to predict the movement from the site to the tidal mixing zone. The BASINS platform provides an integrated framework for GIS representation of spatially explicit data using MapWindow, modeling of watershed hydrologic behavior and contaminant transport using HSPF, and automated model calibration of parameter estimates using HSPEXP and PEST. Existing topographic, land use, ground-based meteorology, and MERRA (remotely sensed re-analysis) data were used to assess the ability to blindly forecast spill behavior. LIDAR data was used to improve topographic detail within the Savannah River Swamp. Upstream reservoir operation on the Savannah River dominated flow conditions within the Savannah River, while onsite flow was dominated by reactor cooling water releases. Estimating flow and contaminant dispersion through the Savannah River Swamp was more difficult than in Pen Branch or the Savannah River.

Cities as Forces for Good in the Environment: Scientific Visualization and Stakeholder Dialogue - Ibrahim Demir, University of Georgia, Athens, GA (co-authors: Amanda K. Parker, M. Bruce Beck)

GIS technology has been used widely by scientists and environmental managers for measuring changes in the environment, managing geographic data, assessing relationships between environmental variables, modeling environmental events and visualization of findings for managers and other stakeholders. Web-based information systems made advanced mapping and scientific visualization tools easy to use and available to all with the latest advancements in internet technologies. This paper addresses the challenge of engaging stakeholder dialogue and the role of information systems with advanced GIS and scientific visualization tools under the networked research program, Cities as Forces for Good (CFG) in the environment. The paper outlines the Georgia Watershed Information System (GWIS), a comprehensive environmental information platform, and use of its scientific visualization tools for supporting two-way communication across the science-society interface. GWIS is a prototype of a web-based Information System for Georgia watersheds with several data management, modeling, visualization, mapping and digital resource management tools for watersheds, as well as interfaces for integration across distributed data sources. GWIS aims to provide a platform to help integration of state-wide efforts for an effective watershed management to all potential stakeholders by visualizing complex science in an easily understood format useful for managers, decision-makers and the general public. Scientific visualization interfaces in GWIS provide interactive tools to evaluate different scenarios and visualize changes in the environment to bring a better understanding of environmental research and demonstrate effects of management options. The results show that the scientific visualization interfaces can help increase social legitimacy of environmental research and support the prospective role of information systems with advanced mapping capabilities in trying to achieve stakeholder dialogue with respect to re-engineering the city's infrastructure.

Using Storm Event Samplers to Calibrate the Watershed Loading Model for use in the Development of the Lake Jesup TMDL - Joe Walter, PBSJ, Orlando, FL

Beginning in year 2000 Seminole County began the Lake Jesup Stormwater Sampling and Water Quality Analysis Project. The purpose of this project, funded in part by NOAA, was to quantify flows and water quality of runoff conveyed by tributaries to Lake Jesup. The project originally included the collecting and analyzing storm event sampling data at four tributaries of Lake Jesup including Soldier Creek, Howell Creek, Solary Canal, and Six Mile Creek. The program has hence been expanded to include Gee Creek and in total includes at least 15 characteristic storm events in each tributary between years 2000 and 2008. The data collected included flow composite samples of a range of water quality parameters including nutrient concentrations and corresponding flow volumes for each storm event. The data from each sampling event was evaluated for applicability in the calibration of surface runoff and concentrations produced by the PBS&J pollutant loading model. The using each characteristic storm event, surface flows then EMC values were calibrated. This presentation describes the data QC, evaluation methodology, and calibration results. The five tributaries samples cover watersheds on the north, south and west sides of the lakes, including contributing basins that are largely undeveloped to highly urbanized and agriculture watershed. The event sampling calibration process involved the evaluation of storm event samples, to determine its applicability to the analysis; correlate the measured flow data to generate runoff coefficient inputs to the pollutant loading model and the resulting predicted flows and concentrations are compared to the measured values, with modifications made as appropriate. The resulting calibration has brought the reality of measured data into the often numerical and academic process of watershed pollutant load modeling. Specific results indicated the following: * Watershed with significant storage needs to be divided into segments * Runoff curve number for wetlands needs to be reduced to account for wetlands during drought conditions * Agricultural basins did not calibrate well for nutrients, suggesting that other legacy factors are in place. * Not all watersheds in the Jesup basin act alike. Future evaluation would call for subbasin specific land uses tributary characterization.

A Decision Support System for Preharvest Planning in North Carolina - David Jones, North Carolina Division of Forest Resources, Raleigh, NC (co-authors: D.G. Jones, A.D. Bailey, T.B. Allen, D.K. O'Loughlin, J.L. Boggs)

Pre-harvest planning can enhance recognition of environmentally-sensitive areas in advance of forest harvesting, including soil and water resources. While pre-harvest planning is often a standard component of many forest harvesting operations, either explicitly with paper-based checklists or implicitly with best professional judgment, the use of GIS-based and GPS-supported tools has only recently been made economically and functionally available for some foresters, loggers, and landowners. According to the Final Report for the North Carolina Forestry BMP Implementation Survey 2000-2003, pre-harvest planning resulted in higher implementation of BMPs for water quality. However, information about the availability of state-of-the-art GIS technology, publically available GIS data, and open source software is often not well disseminated to forest managers, consultants, owners, and loggers for use in pre-harvest planning. In association with a paired watershed study - designed to evaluate the effectiveness of forestry best management practices (BMPs) - a trial version of a decision support system (DSS) for forest harvest planning in North Carolina will be developed. The goal of the DSS will be to generate a brief report with supporting mapping that identifies general site considerations, potential hazards, and potential site rehabilitation needs associated with site characteristics such as highly erosive soils, steep slopes, streams, wetlands, protected species, conserved land, and historical and cultural sites. This information can assist with the identification of suitable locations for forest harvesting operational areas, including stream crossings, hauling roads, loading decks, and skid trails and will also highlight areas of special concern. Based on feedback from end users (e.g., forest managers, consultants, landowners, and loggers), opportunities will be pursued to expand the trial version of the DSS to a web-based user-friendly interface available to natural resource managers and citizens throughout the state. Through the use of current GIS technology and data, a DSS for forest harvest planning in North Carolina can offer additional information to support the protection of water quality and soil resources, and further support the implementation of forestry BMPs for water quality.