American Water Resources Association
2010 SUMMER SPECIALTY CONFERENCE
GIS & Water Resources VI
March 29 – 31, 2010
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Monday, March 29
1:30 PM – 3:00 PM
SESSION 4: Hydrologic Modeling I

Using GIS to Assess Climate Change Impacts on the Rio Grande and its Riparian Forest - Julie Coonrod, Department of Civil Engineering, Albuquerque, NM (co-authors: Kelly Isaacson, Venkatesh Merwade)

River restoration projects in the vicinity of Albuquerque, New Mexico are often focused on the riparian forest. Exotic species are removed, while native cottonwood trees are planted. The cottonwood trees are 'pole planted' such that their roots tap into the groundwater table adjacent to the river. Such projects are located anywhere current cottonwood trees exist and not necessarily where groundwater depths have been estimated to determine likelihood of species survival. This work is aimed at utilizing Geographic Information Systems (GIS) along with the Hydrologic Engineering Center River Analysis System (RAS) to determine depth to groundwater as a function of river flow rate. The RAS model utilizes a terrain model developed by various data sets including point data from Light Detection and Ranging, surveyed cross-section points, and aerial photographs. The RAS model is calibrated with readily available flow gage data. In-channel water surfaces from RAS are combined with well data in GIS to create groundwater surfaces. The groundwater surfaces are thus created as a function of flow rate. Doing so allows for simulation of groundwater surfaces for average years, dry years, and wet years. Furthermore, climate change scenarios (that employed GIS methods) can be used to estimate changes in stream flow. These changes show the groundwater surface can drop below the depth that the cottonwood trees can reach. By subtracting the groundwater surface from the digital terrain, the depth to groundwater is determined. Locations where riparian vegetation will be most stressed can be identified.

Assessment of Water Availability in the Mountainous Watersheds of Idaho - Venkataramana Sridhar, Boise State University, Boise, ID

It is both complex and challenging to model the hydrologic water balance in mountain watersheds due to the lack of observations from high elevations at a resolution that is critical to accurately understand and partition precipitation into streamflow, evapotranspiration, drainage and ground water recharge. This study will involve hydrological modeling of two basins namely the Treasure Valley and Rathdrum Prairie and Palouse Basin located in different parts of Idaho which are also the priority watersheds under the Comprehensive Aquifer Management Plan of the Idaho Department of Water Resources. Using the spatially distributed watershed model, Soil Water Assessment Tool (SWAT), we plan to quantify current and future water availability under climate change conditions by providing GIS information including landuse, vegetation, soil and weather conditions at a high resolution to the model. SWAT-predicted streamflow and ET at some selected sites will be validated using the available data. The insights gained from this project will directly benefit in quantifying the spatial distribution and heterogeneity in ET, streamflow and groundwater over a large area on a continuous time scale.

Predicting Pre- and Post-Wildfire Runoff using ArcGIS 9.4 - Lorri Peltz-Lewis, U.S. Bureau of Reclamation, Sacramento, CA (co-author: Richard Easterbrook)

The Department of the Interior's National Interagency Burned Area Emergency Response (BAER) teams conduct analysis of fire effects using aerial and ground reconnaissance methods within the fire areas with the goal of stabilizing the fragile condition of the land to protect life, property, water quality, and ecosystems. Vegetation loss exposes soil to erosion, which could increase runoff and causing flooding. Previous tools developed for the BAER Team hydrologists automated the process of predicting post-wildfire watershed runoff using ArcGIS ModelBuilder utilizing tools within the ArcToolbox. The tools created predict pre- and post-wildfire watershed runoff for a selected rain event are being updated using ArcGIS 9.4 capabilities and updated algorithms.

An Assessment of Climate Change Impact on Water Resources in Spain - Javier Alvarez-Rodriguez, Centre for Hydrographical Studies of Cedex, Madrid, NA, Spain (co-authors: Barranco Sanz, Luis.,Potenciano de las Heras, Angela, Quintas Ripoll, Luis)

Some results are shown of work carried out in CEDEX to assess the climate change impact on water resources in natural regime. The work is developed under the coordination of the Spanish General Directorate of Waters. 12 climate regionalized projections were provided by the Spanish Office of Climate Change (OECC) and the Spanish Meteorological Agency (AEMET). They give estimates of precipitation and maximum and minimum daily temperatures during the control period (1961-1990) and three future periods (2011-2040, 2041-2070 and 2071-2100) in which the impact was evaluated. A preliminary comparison of climate projections and observed data was done for the control period. It was followed by an interpolation of the atmospheric forcing variables. Also potential evapotranspiration was estimated. Finally, atmospheric forcing variables were implemented in a semidistributed version of T□mez model to obtain maps of actual evapotranspiration, soil moisture, groundwater recharge and runoff. The model is integrated into SIMPA (An Integrated System for Rainfall Runoff Modelling) system, a GRASS based GIS tool, developed by CEDEX since the 90's. Atmospheric and hydrological variables are distributed with the exception of groundwater discharge, which is simulated using a tank model in defined hydrogeological units. More than 200,000 maps of 1 km2 resolution have been generated covering the whole of Spain in a monthly basis. The impact of climate change on water resources is presented as percentage deviations of runoff in each future period of the XXIth century with respect to the control period.