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3:30 PM – 5:00 PM

SESSION 15: Salinity and Other Water Quality Targets

Assessment of the Economic Impacts of Rio Grande Salinity - Zhuping Sheng, Texas A&M, El Paso, TX (co-authors: Ari Michelsen, Thomas McGuckin, Bobby Creel, Ron Lacewell)

The Rio Grande Compact Commission, in collaboration with local water management entities, initiated a multi-state effort to create a Rio Grande salinity management program administratively patterned after the Colorado River Salinity Control Forum. In January of 2008, the Rio Grande Project Salinity Management Coalition was formed and is composed of the Rio Grande Compact Commissioners from Colorado, New Mexico and Texas, state water management agencies, local water utilities and irrigation districts, and University research organizations. The overall objectives of the Rio Grande Project Salinity Management Program are to reduce salinity concentrations, loading, and impacts in the Rio Grande basin from San Acacia, New Mexico to Fort Quitman, Texas to increase usable water supplies for agricultural, urban, and environmental purposes. The focus of Phase I of the program is the development of baseline salinity and hydrologic information and a preliminary assessment of the economic impacts of salinity. The USGS New Mexico and Texas state offices are working together to document dissolved solids conditions in the study area, identify salinity sources and loading rates, evaluate the temporal and spatial variability in salinity loading rates and analyze the factors that affect salinity conditions. An assessment of the economic impacts of salinity in the study region, the subject of this paper, was conducted by scientists at Texas A&M University's AgriLife Research Center at El Paso and New Mexico State University. Economic damages attributable to high salinity of Rio Grande water were estimated for residential, agricultural, municipal, and industrial uses within the study area. The major impact issues addressed were who is being affected and the types of economic impacts, the magnitude of economic damages overall and by user category, and identification of threshold-effect levels for different types of water use. Salinity concentrations in this 270 mile reach of the river typically range from 480 ppm to 1,200 ppm, but can exceed 3,000 ppm in the lower section of this reach. Economic impacts include reductions in agricultural yields, reduced appliance life, equipment replacement costs, and increased water supply costs. Results of the economic analysis will determine what salinity reduction control measures will be pursued.

Characterization of Salinity Sources in Desert Lake Complex - Said Ghabayen, Logan, UT (co-authors: lizzette Oman, Mac McKee)

Salinity in Colorado River water causes \$300 million in damages each year. The continuous increase in salinity could affect nearly 30 million people who depend on Colorado river water. Salinity control measures implemented by USDA and USBR are targeted to control 800,000 ton of salt each year. Maintaining the required levels of total dissolved solids in the Colorado River through 2020 requires an additional 1,000,000 ton of salt reduction each year. Identification of the main contributors to salinity so that salinity management measures can be more precisely identified may save millions of dollars in salinity control measures. In this research, a Bayesian Belief Network (BBN) model was developed to quantify the uncertainties in identifying the sources of salinity in the Desert Lake complex. The model utilizes information about the main anions and cations in water and in soil samples from 21 water quality shallow monitoring wells to pinpoint the main origin of salinity in the tested location. The BBN model compares ionic ratios such as Na/Cl, SO₄/Cl, B/Cl, Br/Cl, Ca/(HCO₃+SO₄) and Mg/Ca with the base concentration of the different sources. Backward propagation of the BBN model can be utilized to quantify the value of monitoring program and identify ways to optimize the monitoring process in this regard. The initial investigation results shows that the main sources of salinity could be 1) the rock-water interaction; 2) return flows from irrigation practices; 3) evaporates of CaSO₄

Setting Water Quality Targets with Historical Data: Approaches, Problems, and Limitations - Donald Duke, Florida Gulf Coast University, Ft Myers, FL

Waterbody-specific water quality targets are currently being developed, reviewed, and re-evaluated for many U.S. waterbodies in support of TMDL requirements, intended to accommodate local and regional variation in conditions that can be tolerated by local biota and ecosystems. In a large number of waterbodies, numeric targets have been based on simple statistical analyses of existing water quality data, rather than purpose-specific sampling and analysis, under the assumption that uses that have been supported in the past with a selected proportion of exceedences may continue to be supported in the future. Targets set using historical proportions and exceedences are subject to uncertainties and imprecisions in predicting future conditions, for example due to: parametric uncertainty through lack of site-specific information; parametric uncertainty through temporal variation; incompleteness of available data for relevant hydrologic and physical compartments; data that are not representative in space and time regarding loadings, hydrologic conditions, and environmental conditions; and inability to accurately predict critical conditions. When those targets are the basis for discharge restrictions under TMDL controls, uncertainties can lead to either controls that fail to attain water quality standards or costly overly restrictive controls. This research tested and applied a number of statistical and sampling-analysis procedures can be undertaken to characterize and reduce uncertainties, targeting several selected waterbodies on the southwestern Florida coast that have been subjects of recent TMDLs. The research applied three main approaches: conditioned existing data to be representative of temporal and spatial variations in the selected watersheds, using pending or recent TMDL assessment documents as well as monitoring data from other sources; evaluated effects of non-site-specific parameters in assumptions about water quality conditions supportive of existing biota and ecosystems; and quantified the range of possible solutions using the conditioned and evaluated data. The research considers the kinds of waterbodies, substances, extent of monitoring data, and other conditions where these methods are likely improve current methods, and makes recommendations for ways in which state and local agencies could implement these methods.