American Water Resources Association
2009 SPRING SPECIALTY CONFERENCE
Managing Water Resources Development in a Changing Climate
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Tuesday, May 5
3:30 PM – 5:00 PM
Session 23: Changing Drought Conditions?

1. Price and Rate-Structure Modifications as Drought and Climate Variability Management Tools for an Urban Water Utility - David Rosenberg, USU Dept. of Civil and Environmental Engineering and Utah Water Research, Logan, UT

Water utility managers and economists have long been interested in the effect of price on household water use as a tool to manage demand. This non-structural, economic approach to promote use within existing supplies may flexibly respond to supply changes associated with droughts or climate variability. Yet disaggregating through econometric study the intertwined effects on water use of (i) prices and (ii) the rate (tariff) structure in which price signals are embedded has proved tricky for numerous reasons. These reasons include endogenous pricing, price specification, confounding flat charges, lack of household knowledge of rate structures and prices, low water prices, sample selection bias, and a limited number of empirical studies with conflicting results, among others. This paper applies an existing deductive model of residential water use in Amman, Jordan and simulates demand responses across a cross-section of households over a variety of uniform, increasing and declining block, and quadratic rate structures at low historical and significantly higher prices. Results show how price- and rate-structure driven reductions in water use both can and cannot accommodate supply variations associated with droughts and changing climate. For example, we see small decreases in water use for all rate structures at low historical prices. These inelastic price responses are similar to results from a prior econometric study conducted in Amman. However, when prices increase 2- to 4- fold, we observe significant reductions in water use. Uniform, quadratic, and increasing block rates show, respectively, the greater reductions in use. We further discuss how to set prices, impacts of price and rate structure modifications on utility revenues, and cost allocation among users are discussed. Results also highlight several complications and limitations to determine and interpret demand responses under different price schedules and rate structures.

2. Drought Management Implications for Irrigated Agriculture in Georgia - Mark Masters, Flint River Water Policy Center - Albany State University, Albany, GA

The Lower Flint River Basin in Southwest Georgia produces roughly $6 billion annually in agricultural and related output relying heavily on a high concentration of irrigated row crop and vegetable production. Below average rainfall in six of the last nine years, including a “100-year drought” during 2007, has elevated concerns over the amount agricultural pumping and the subsequent effects to the surface and ground water resources in the Basin. Maintaining adequate streamflow for several species of endangered mussels coupled with interstate water allocation disputes prompted the Georgia Environmental Protection Division (GEPD) to formulate and adopt the Flint River Regional Water Development and Conservation Plan (Plan) in 2006. The Plan sets forth a number of drought management strategies including conservation measures, altered permitting regulations, and most notably, a revised version of the Flint River Drought Protection Act, an irrigation suspension program (auction) operated by the state in times of drought. The two most critical areas of the Lower Flint as identified in the Plan are the Ichaway (HUC 03130008) and Spring Creek (HUC 031300010) watersheds. Economic impacts were calculated for a 20%, 30% and 40% reduction in irrigated acreage for each of the above mentioned watersheds. Watershed modelers from GEPD suggest these scenarios may prevent streamflows from dropping below critical levels identified using guidance from the US Fish and Wildlife Service. Depending on the scenario, direct and indirect impact from a one-year irrigation suspension would be a loss of $59 – $182 million and 700 – 2,290 jobs. A break-even analysis was also performed to estimate participation should an irrigation suspension auction take place in the near future. It is questionable, if not highly unlikely given current commodity pricing, a $200 per acre “buyout” from the state, which is the largest amount paid in past auctions, would solicit enough participation to meet the reductions required to support critical habitat. Faced with such a dilemma, it is unclear whether the state would then enact involuntary suspension of irrigation in an effort to maintain minimum flows.

3. Monitoring the Effects of Climate Change on Springs, Seeps and Other Water Resources in the Mojave National Preserve - Boris Poff, National Park Service, Nipton, CA (co-author: Debra Hughson)

Even though the Mojave National Preserve is located in one of the driest parts of the nation, with an annual precipitation ranging from two to six inches, it has more than 200 natural water sources that sustain wildlife and often endemic biota. Long periods of drought combined with infrequent and sometimes severe storms characterize the Mojave Desert. However, severity, frequency and timing of droughts as well as precipitation events are shifting. The two driest years on record (2002 and 2007) and the wettest year on record (2005) have already caused significant impacts, including the largest wildfire in the park's history. Understanding and maintaining resources through these changes is one of the great challenges facing resource managers. Monitoring efforts, preliminary results from the past four years, as well as management options and implications are presented.

4. Development of a Climate Forecast Decision Support Tool Using Stakeholder Involvement for Assessing and Examining Drought Risks and Water Management Strategies for the Upper Rio Hondo Basin, NM - Thomas Lowry, Sandia National Laboratories, Albuquerque, NM (co-authors: Jesse D Roach, Vincent C Tidwell, Elizabeth H Richards)

Lincoln County is located in south/central New Mexico and includes the towns of Ruidoso, Carrizozo, Alto, Ruidoso Downs, and Capitan. At an increasing rate, the area is enjoying vibrant growth and development (8% average increase in the tax base for the 10 years ending in 2007) that has begun to put stress on the area's water resources. During drought years, constrictive emergency water management options have been implemented that have had a negative impact on development and growth. Concern that predicted changes in local weather patterns due to climate change could result in further restrictions have arisen to the point where the community has become active in addressing this problem. Through the State of New Mexico Small Business Assistance program, Sandia has been constructing a decision support model for water planning in the region. The model is being transparently developed through a Shared Vision Planning process, with the stakeholders actively guiding and informing the model building process. The model simulates the gross water balance within the legal framework of current water allocations and water rights to examine and analyze various conservation measures and management strategies within the municipal, agricultural, and commercial sectors. Currently we are expanding the model to include drought forecasts, seasonal climate predictions, and the primary and secondary socio-economic impacts due to drought. This is being accomplished by hindcasting local conditions to various types of agency forecasting data and global climate indices to establish both short-term (1 to 6 months) and long-term (5 to 50 years) correlations from which future predictions can be made and management scenarios can be simulated. This talk will present the completed water balance decision support system and the SVP methodology used to create it, as well as the hindcasting methods that are being used to develop the climate forecasting portion of the model.