

Application Form
2015-2016 TWRI Mills Scholarship Program

- (1) Extension of Water Availability Modeling for the Rio Grande River using Water Rights Analysis Package. Development short and long-term water reliability and firm yields for Amistad and Falcon reservoir systems using Conditional Reliability Modeling
- (2) Askarali Karimov, Email: akarimov@tamu.edu
- (3) Dr. Ralph Wurbs, Committee Chair, Arthur McFarland Professor Civil Engineering Department 410B CE/TTI, TAMU College Station, TX 77845 Phone: (979) 845-3079 E-mail: r-wurbs@tamu.edu
- (4) The 1997 Senate Bill 1 authorized the Water Availability Modeling (WAM) system and directed the Texas Committee on Environmental Quality (TCEQ) to develop a consistent set of databases and modeling tools for use both in conducting planning studies and in preparing and evaluating water rights permit applications (Sokulsky 1998). The WAM system consists of the Water Rights Analysis Package (WRAP) model along with 21 sets of input files covering the 23 river basins of the state, geographic information system (GIS), and other supporting database (Wurbs 2005). The TCEQ in contract with several engineering firms, universities and research institutes developed complete WAM datasets for each river basin of Texas including the Rio Grande (TCEQ 2015). The Rio Grande WAM was developed by R.J. Brandes Company in contract with TCEQ and completed in 2004. This model is capable of determining water availability in the basin under a range of policy and planning scenarios in accordance with the Prior Appropriation Doctrine and the TCEQ Rio Grande operating rules (Brandes 2004). The main purposes of this research are to extend, synthesize and calibrate the Rio Grande WAM datasets for the 1940-2014 hydrological period-of-record using WRAP modeling tools and assess, assert the impacts of short and long-term water availabilities and allocations for Amistad and Falcon system. This will be accomplished by using conditional reliability modeling within WRAP. The results of this research can be used on future water planning in the region by agricultural water users, cities, TCEQ Watermaster, Texas Water Development Board (TWDB), International Boundary and Water Commission (IBWC), Texas Parks and Wildlife Department (TPWD), irrigation districts, environmental organizations and researchers interested in water conservation in the Rio Grande. The specific objectives of the research includes followings:
 1. Extension of hydrological period-of-analysis from 2001 to 2014 using WRAP-*HYD*, WRAP-*SIM* and TABLES modeling tools.
 2. Calibration and synthesis of extended naturalized flows, net evaporation rates, and spring flows for 1940 – 2014 hydrologic period of analysis.
 3. Develop short-term and long-term water availability scenarios using conditional reliability modeling (CRM) for Falcon-Amistad reservoir system.
 4. Examine effectiveness of the following CRM approaches within WRAP for Objective 3:
 - a. The Equal-Weight option
 - b. Flow-Frequency option
 - c. Storage-Flow-Frequency option
 5. Determine and quantify reliabilities of municipal and irrigation water uses at various storage levels at Falcon and Amistad system

6. Examine impacts of potential reliability changes (decreasing or increasing) in municipal pools of Falcon and Amistad system to future reliabilities of irrigation water rights and regional water supply
7. Develop likelihood of water allocations in the next few months for agricultural users based on reliability analysis and investigate the practicality of this information in water management operations for TCEQ, IBWC and irrigation districts

Additional benefit of this research include drought contingency plans based on likeliness of storage availability in the Amistad-Falcon reservoir system for short-term planning and water conservation. Specifically, the results of research will provide quantitative water allocation analysis for the TCEQ watermaster and potential water availability for irrigation districts ahead of time. In addition, once updated, the Rio Grande WAM system can be used to simulate various reliability scenarios based on future demands that will benefit the Region M planning group in development of future water plans for the region.

- (5) PhD. Water Management & Hydrological Science, May 2016 (expected)
M.S. Environmental Science/Water Resources, May 2005. Indiana University
B.S. Civil Engineering, July 1999. Tashkent Institute of Irrigation & Melioration, Uzbekistan
- (6) Proposed funds will be used towards tuition and fees. This will be the only funding source that will help me to complete my research and PhD degree.
- (7) After obtaining my PhD degree, I am planning to pursue international research and consultancy work on development and application of WRAP modeling system for river basins of Central Asia.

Reference

- Sokulsky, K., Dacus, T., Bookout, L., and Patek, J. (1998). Water availability modeling project concept plan: Overview of the new modeling system and its role in regional water planning. *Proc., 25th Water for Texas Conf., Water Planning Strategies for Senate Bill 1*. TWRI, 17-30
- Wurbs, R.A. (2005). Water availability modeling system. *J Water Resour. Plann. Manage.* 131(2), 270-279.
- TCEQ, (2015). Water Availability Models. Texas Commission on Environmental Quality, https://www.tceq.texas.gov/permitting/water_rights/wam.html, last accessed on January 25, 2015.
- Brandes, R.J. (2004). Water Availability Assessment. Final Report.