

Memorandum –

To: URGWOM Technical Team Members
Date: July 17, 2017
Subject: Notes of July 11, 2017 URGWOM Technical Team Meeting

These notes summarize the salient matters discussed at the July 11, 2017 Upper Rio Grande Water Operations Model (URGWOM) Technical Team meeting. The meeting began at 9:00 am in the NM Interstate Stream Commission Office in Albuquerque, NM. An attendance list is included on page four.

The meeting Agenda was limited to the discussion of evapotranspiration (ET) in URGWOM and topics include the ET Toolbox, ET calculations in URGWOM, effective precipitation computations, ET use in URGWOM, weather stations in the Middle Valley and ET weather data requirements, new MRGCD stations in the Middle Valley, the NMOSE 2013 remote sensing crop coefficient study, and necessary improvements to ET calculations in URGWOM.

Al Brower continued his ET Toolbox presentation from last month's meeting. He reported that the Toolbox used the modified Penman Montith reference equation and NMSU growing degree day crop coefficients until 2012. Since that time the Hargreaves Samani reference equation and the FAO-56 crop coefficients have been used in the Toolbox. The Team discussed the reliability of climate data from stations in the Middle Valley and the shortcomings of existing data for use in computing reference ET. Al reported that the Toolbox uses annual irrigated acreage data supplied by the MRGCD in the form of GIS polygons for direct application in the Toolbox for the computation of crop consumptive use. These data may not include irrigated lands within the middle Rio Grande Pueblos. Riparian acreage data are based on the 2000 IKONOS survey and effective precipitation is determined using Bureau of Reclamation procedures. Effective precipitation is calculated for display based on the BoR method, but it is not used in CIR calculations. In the CIR calculations all precipitation is assumed effective. Al concluded his discussion of the structure of the Toolbox by stating that more reliable climate data are needed and the riparian acreage survey should be updated.

Al demonstrated the functionality of the Toolbox and explained that the source of the seven day weather forecast parameters is the National Digital Forecast Database (NDFD). Open water surface and wetted sands areas are based on a lookup table derived with FLO2D model run results. He demonstrated all of the Toolbox products, described the model documentation and the log of model enhancements.

Miller presented a summary of the methods used to compute crop ET in URGWOM. He reported that the crop ET computation is based on the Hargreaves Samani reference equation

using data from four weather stations in the middle valley. The growing season is fixed each year based on the MRGCD operating season (March 1 – October 31). Individual crop coefficients are computed for 18 crop types based on the data and methods contained in FAO-56. Effective precipitation is based on the TR-21 method distributed during the month using the Keller Bliesner application. Crop CIR was computed for each crop each day, and a weighted CIR is computed for use in the URGWOM model. Miller also presented data on growing season lengths (based on a growing season between spring and fall dates of 25 °F) for each of the weather stations. The trends over the 40 year period of study were variable at each station, but each station demonstrated an increasing length of the growing season over the study period.

Brian led a discussion on the various methods of computing effective precipitation and described the history of development of the SCS TR-21 method. He described the procedures used to distribute the monthly effective precipitation computed using TR-21 to daily values using the Keller Bliesner application. Brian suggested a number of enhancements to this method including distributing the rainfall using the relative amount of actual rainfall falling on different dates through the month, implementing a different water storage depth for each crop type and developing a means to compute effective precipitation for use in forecast applications.

Nabil reported that ET computations are used in URGWOM in the Middle Valley and the Lower Valley. He suggested that ET computations should be applied in URGWOM for the lower Chama and Velarde reaches, as is currently done in the Toolbox. ET computations are used to determine crop and riparian vegetation loss, which accounts for about 70% of total Middle Valley depletions. Nabil demonstrated how URGWOM simulates ET stresses (crop, riparian vegetation and evaporation) in the Central to Isleta reach. Future URGWOM development efforts include development of ET rates (based on air temperature and precipitation) for use in planning applications and development of a linkage between the real-time URGWOM model and the forecast capability of the Toolbox.

Molly led a discussion about weather station requirements for computing reference ET. Weather data integrity and station location are important considerations in the review of existing records or the siting of new stations. Collected climate data must also be subject to rigorous QA/QC procedures. Molly reviewed the networks of existing weather stations in the Middle Valley expressly noting the loss of operating weather stations.

David Gensler reported that most of the MRGCD remote weather stations (of a total of sixteen or seventeen) have been taken out of service due to vandalism, or hardware, telemetry and data interface difficulties. He said the MRGCD plans on installing up to ten new stations with the ultimate goal of twenty operating weather stations. These stations will collect all data required for computing ET using a Penman reference equation. The stations would transmit hourly data using FM transmitter. Ultimately the MRGCD data collection system should be made available via the NMSU Climate Center.

Molly summarized the study undertaken by NMOSE and NMSU to develop crop coefficients using weather stations and eddy covariance tower data and the REEM model. The study also included crop surveys and field monitoring of Middle Rio Grande farms greater than five acres located between Bernalillo County and Socorro County. Three monitoring trips were made to each field to observe crop stage, field and crop conditions and patterns. Landsat 2011 and 2013 data were applied to the REEM model. No final conclusion was developed from this investigation due to problems relating to calibration of Landsat image data with data collected from the field weather stations. The Team thought that it might be possible to review the data with the intent of developing a crop coefficient for alfalfa.

At the conclusion of the meeting, the Team developed the following recommendations:

- Review the alfalfa crop coefficient used in the Toolbox and focus on development of a reliable crop coefficient for alfalfa, grass and hay, as these crops make up a great percentage of the total;
- Develop a plan to use the Toolbox to compute crop ET instead of using a spreadsheet computations outside of URGWOM;
- Compare reference ET and crop coefficients used in URGWOM and the Toolbox;
- Obtain MRGCD crop polygon data and compare these data with data in the URGWOM database; address Pueblo irrigated land data;
- Update the 2000 IKONOS survey of riparian vegetation in the Middle Valley; and
- Develop the Toolbox application in the lower Rio Grande.

The next meeting of the Team has been tentatively scheduled for August 29, 2017 to coincide with the planned URGWOM training seminar.

The meeting adjourned at about 12:15 pm.

ATTENDANCE LIST
URGWOM TECHNICAL TEAM MEETING
July 11, 2017

<u>NAME</u>	<u>REPRESENTING</u>
Marc Sidlow	USACE
Jesse Roach	Tetra Tech / USACE Contractor
Brian McCutcheon	USGS
Kyle Douglas-Mankin	USGS
William Miller	WJM Engineers/USACE Contractor
David Gensler	MRGCD
Lucas Barrett	USBR
Ken Richards	USBR
Molly Magnussen	NMOSE
Al Brower	USBR Contractor
Brian Westfall	Keller Bliesner / BIA Contractor
Cindy Stokes	NMISC
Andrew Lieuwen	Albuquerque Water Utility
Tony Zimmerman	BIA
Nabil Shafike	USACE

Those participating via telephone conference:

John Craven	Hydros Consulting
Conrad Keyes Jr.	Paso del Norte WC / USACE Contractor
Jerry Melendez	USBR
David Neumann	CADSWES