Hydrometeorological Data Analysis and Processing for the Arkansas-Red Basin

U.S. NATIONAL WEATHER SERVICE

PROJECT SUMMARY

The National Weather Service needed to accurately predict streamflow resulting from rainfall, snowmelt, and reservoir releases. Riverside Technology, inc. created mean areal temperature and mean areal precipitation for over 300 basins, and provided reservoir models for seven reservoirs tributary to the Verdigris River, upstream of Tulsa, Oklahoma.

LOCATION
Arkansas,Colorado, Kansas, Missouri, New Mexico, Oklahoma, Texas U.S.A.

PERIOD
2002 – 2008

PROJECT DETAILS

Mean areal temperature (MAT) and mean areal precipitation (MAP) time series are required as inputs for modeling snow accumulation and ablation, and the runoff response in a given basin. A number of analyses are required to produce accurate and representative time series for use in the National Weather Service River Forecast System (NWSRFS). Working with the Arkansas-Red Basin River Forecast Center (ABRFC) on four separate projects, Riverside Technology, inc. (Riverside) performed data analysis and developed MAT and MAP time series data for over 300 river basins in Colorado, New Mexico, Texas, Oklahoma, Kansas, Arkansas, and Missouri. The river basins included the Arkansas, the Canadian, the Verdigris, the Neosho, the Grand, the Washita, and the Red. The four projects were conducted as part of the Advanced Hydrologic Prediction Services (AHPS) program being implemented at regional NWS river forecast centers.

ABRFC Area of Responsibility

Riverside Technology, inc. (Riverside) collected all the digital information necessary to perform the work, including data for over 1,000 temperature and 1,500 precipitation stations, basin boundaries, isohyetal maps, and copies of the ABRFC forecast system files and database. Through the use of NWS software, in-house data analysis tools, and Geographic Information System (GIS) capabilities, Riverside reviewed data quality and consistency and adjusted precipitation and temperature data as appropriate. Using these data, Riverside generated MAPs using a modified Thiessen Polygon procedure in which station weights are adjusted to represent more accurately the spatial distribution of precipitation over a basin based on an isohyetal map. Riverside generated MAT time series using an areal grid point weighting scheme or an elevation-distance based weighting scheme, depending on the relief of each basin. Time series for both data types were delivered to ABRFC for use in NWSRFS calibration activities.

Verdigris River Basin, Wichita, Kansas

To correctly model streamflow downstream of a reservoir, the reservoir's operation must be represented to one of the reservoir models inside NWSRFS. Riverside modeled the operation of seven reservoirs on the Verdigris using the Joint Reservoir Regulation Operation (RES-J) within NWSRFS. All seven reservoirs are operated as flood control reservoirs by the United States Army Corps of Engineers (USACE). USACE operations manuals and data from ABRFC were used to determine operating rules, spillway capacity, and outlet capacity for each reservoir.

During the calibration process, historical reservoir operation was evaluated to determine which reservoirs were candidates for joint operations. Two joint operations models were defined, combining the effects of five out of the original seven reservoirs. The resulting decks predict the reservoir releases when downstream capacity limits the total release of all the reservoirs.

RELATED PROJECTS

Watershed and Reservoir Model Calibrations for the Ohio River Basin

Watershed and Reservoir Model Calibrations for Locations in the Northeast United States

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