

# **A DYNAMIC STATEWIDE WATER BUDGET FOR NEW MEXICO: June 30, 2016 Model Version**

Ken Peterson, Water Resources Research Institute  
Jesse Roach, Tetra Tech Inc., Bruce Thomson, University of New Mexico

New Mexico Water Resources Research Institute In cooperation with  
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## **The Driving Question and What We Did**

The New Mexico Dynamic Statewide Water Budget (NMDSWB) is an effort to account for the origin and fate of New Mexico's water resources through time. As is common in formalized accounting methods, the NMDSWB uses stocks to define how much water of a given type is present at a given location over a specified time period, and uses fluxes to quantify how water moves from one stock to another, or into or out of the area of interest. The NMDSWB features four levels of mass balance accounting units (MBAU); counties, water planning regions (WPRs), river basins, and statewide. These four scales define the spatial boundaries over which stocks and fluxes are aggregated. Mass balance terms can be calculated for any sequence of months from January 1975 through December 2010. In addition to a best estimate, the NMDSWB interface includes a 95% confidence interval, to help visually represent uncertainty in the calculations and data (Figure 1).

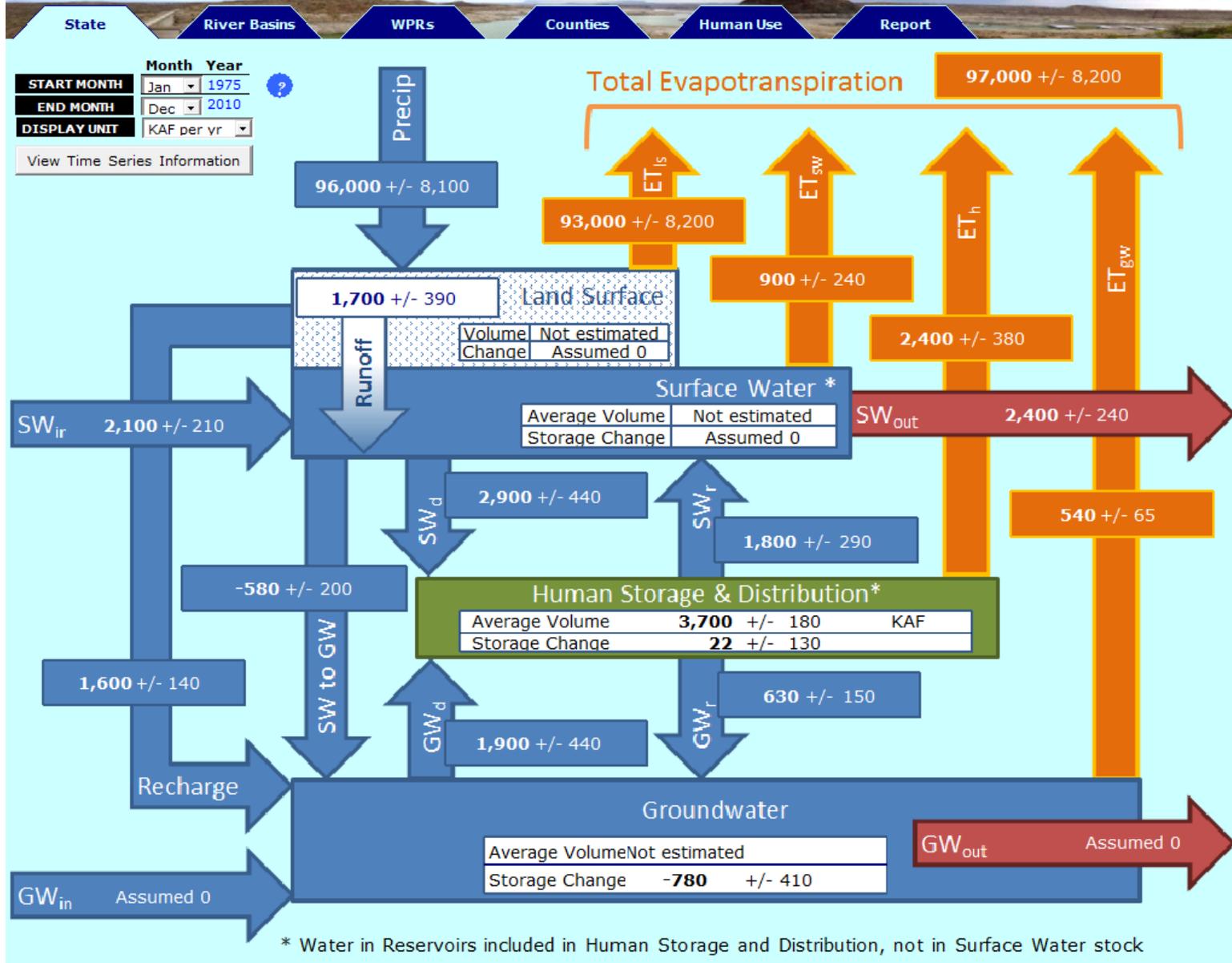
## **How We Did It**

In the NMDSWB water storage is tracked in four separate stocks; the land surface, surface water, human storage and distribution, and groundwater. The land surface stock conceptually represents moisture stored in non-saturated soils or geologic formations (the vadose zone), in vegetation, or any other surface water source that cannot be practicably diverted for human use. The surface water stock represents the total amount of water in rivers and other natural water ways at any time. The human storage and distribution system (HSDS) stock represents water at any given time residing in manmade storage impoundments or distribution systems, such as public water supplies, irrigation canals, and reservoirs. The groundwater system conceptually represents all sub-surface water that is below the water table (saturated soil and rock). There are 16 fluxes representing water movement between stocks within or in and out of a given MBAU. Of these 16 fluxes, 9 have direct modeled estimates, and 7 are closure terms or assumed negligible.

## **What We Found and Why It's Important**

The New Mexico Dynamic Statewide Water Budget is a novel effort to aggregate a variety of water related observations and calculations into a single framework to account for water movement through the state from 1975 through 2011 and into the future. By compiling existing relevant information into a single mass balance constrained framework, an overall picture of water resources, movement and use at a variety of spatial scales has emerged. Closing the mass balance around this data has resulted in mass balance based or influenced estimates of certain terms such as surface water evaporation, plant evapotranspiration, and recharge which are difficult or impossible to measure. This has also enabled quantitative estimates of other parameters such as runoff, recharge, and changes in storage for which measurements are non-available or sparse. The NMDSWB effort has shown that precipitation data and surface water records are relatively robust, and estimates of human use, though temporally coarse are also extensive. Understanding of recharge, surface water groundwater interactions, and regional groundwater movement on the other hand is less developed, and the NMDSWB effort has brought these data gaps to the forefront and is helping to direct and quantitatively constrain other research efforts. As parallel work by other researchers in the Statewide Water Assessment begins to fill in data gaps, the uncertainty of fluxes and stocks calculated by the Dynamic Statewide Water Budget will decrease, and the utility of the model for providing a high level view of New Mexico's water resources for planning purposes will increase. Future work will focus on (1) incorporation of new information from this parallel research, and (2) turning the focus of the model from visualization of the past towards future time period scenario analysis.

# New Mexico's Dynamic Statewide Water Budget



**Figure 1:** Statewide water budget 1975 – 2010 calculated by the New Mexico Dynamic Statewide Water Budget Model