In meeting its hydrologic forecast responsibilities, the National Weather Service (NWS) Missouri Basin River Forecast Center (MBRFC) simulates soil moisture across the Missouri River basin in real-time. The Modeled Saturation Index (MSI) quantifies the relative degree of tension water saturation present within the soil column, and is calculated on a sub-basin level. The above graphic displays the MSI across the Missouri River basin. *“Click here to read more….”*

(The following info would be what the user would see if they clicked on the “read more” button.)

**EXPLANATION OF THE MSI GRAPHIC**

The National Weather Service River Forecast System (NWSRFS) river forecast model is the primary tool used by MBRFC to produce river stage and river flow forecasts. The precipitation-runoff component of the river forecast model is the Sacramento Soil Moisture Accounting Model (SAC-SMA). The SAC-SMA conceptually simulates the physical mechanisms driving water movement through the soil column. The ability of the soil to absorb and hold water is one such physical mechanism. “Tension water” is that volume of water which is absorbed and held by the soil column. Tension water is not available to produce immediate runoff from a precipitation event, or to produce longer-term base flow from water which has percolated downward in the soil column. Tension water deficits within the soil column are replenished by free water, such as is made available during precipitation events. The larger the tension water deficit, the greater the reduction of free water available for runoff or base flow. The modeled tension water within the soil column is represented by two portions, an upper portion which represents the amount of precipitation which has been absorbed and held (not available for runoff), and a lower portion which represents the amount of percolated water which has been absorbed and held (not available for base flow). The MSI is a mathematical representation of the degree to which tension water is present in the entire soil column, and is calculated by the following equation:

MSI = TWupper + TWlower

TWup cap + TWlow cap

where: TWupper is the volume of upper portion tension water

TWlower  is the volume of lower portion tension water

TWup cap is the capacity available for upper portion tension water

TWlow cap is the capacity available for lower portion tension water

The 530,000 square mile Missouri River basin has been subdivided into approximately 1200 watersheds. These 1200 watersheds vary in size from about 30 square miles to over 8500 square miles, with the majority of basins being a few hundred square miles in size. The above computation is performed on an individual watershed basis to produce the MSI graphic. The MSI graphic is a geographic display of the individual MSI’s as viewed across the Missouri River basin. The MBRFC updates the MSI daily.

Tension water is only one of the several soil moisture types which the SAC-SMA models in simulating the natural precipitation-runoff process. These various soil moisture types and the mechanisms which determine their quantities interrelate and influence one another in a very complex manner. Viewed alone, the degree to which tension water is present in the soil column (the “MSI”) does not give the complete picture of the hydrologic state of a watershed. While not conclusive, the MSI can give the user a sound indication of the potential hydrologic response of a watershed to a precipitation event, or its ability to sustain current streamflow conditions.