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**EVAPOTRANSPIRATION AND ITS AFFECT ON GROUNDWATER  
RECHARGE IN NORTH CENTRAL TEXAS**

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**ABSTRACT:** Estimates of groundwater recharge are needed for groundwater modeling across 50,000 square miles of north Central Texas in Texas Groundwater Management Area 8 (GMA8). MODIS data were converted to ETa using the Remotely-sensed Dual Coefficient (RDC) method that employs NDVI\*, a stretched form of the Normalized Difference Vegetation Index as a scalar of ETo, the ASCE Penman-Monteith grass reference. Landsat TM5 and AmeriFlux data were paired to calibrate three natural ET classes. A two step process was used to calibrate RDC to be an unbiased estimator of measured ET: (1) plotting and regressing a first order estimate of ET, the product of NDVI\* and ETo, against measured Ameriflux values; and (2) fitting a correction function,  $f(K)$  to yield a statistically balanced, 1:1 calibration. MODIS data (231 m) were calibrated to yield equivalency with TM5 data (30m) to apply these functions according to reclassified GAP data. GMA8 ETa was estimated with multiple dates of MODIS during unusually dry (2005) and unusually wet (2007) years. Even though there was significantly more rainfall in 2007, as an overall spatial average across GMA8, ETa was higher in the dry year, 2005. This resulted from (1) ETo being significantly reduced during 2007 from cloudy and cool weather accompanying the high rainfall, (2) sufficient soil water storage capacity in the region's clayey soils, and (3) nearly sufficient rainfall to supply ETa in relatively dry year, 2005. This analysis reveals an important climatic feedback mechanism for GMA8 groundwater recharge: less ETa during a wet year enhances groundwater recharge, while the higher ETa during a dry year diminishes groundwater recharge. All data were averaged to a 1-mile grid. The linear relationship between wet- and dry-year total ETa and annual rainfall were calculated for each cell and stored for model retrieval as rasters of slopes and intercepts that yield calibrated, spatially-discrete ETa when fed rasters of annual rainfall.

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