Application of Riparian Evapotranspiration Package in MODFLOW for Riparian Vegetation Restoration

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Quantifying spatial and temporal variability of riparian evapotranspiration (ET) is essential in water resources management especially in management and restoration of riparian ecosystems where multiple agricultural, industrial, and domestic users may exist. To enhance riparian evapotranspiration estimation in a MODFLOW groundwater model, RIPGIS-NET, an ArcGIS custom application, was developed to derive parameters and visualize results of spatially explicit riparian evapotranspiration in groundwater flow models for ecohydrology, riparian ecosystem management, stream restoration and water resources applications. RIPGIS-NET works with RIP-ET, a modeling package for MODFLOW. RIP-ET improves riparian ET simulations by using a set of eco-physiologically based ET curves for plant functional subgroups (PFSG), and is able to separate ground evaporation and plant transpiration processes.

To evaluate impact of riparian restoration scenarios on groundwater resources, the above packages were applied to MODFLOW model of hypothetical Dry Alkaline Valley area. Using riparian ET curve files which show the relation between the groundwater level and ET, aerial extent of riparian vegetation in each season and a digital elevation map, RIPGIS-NET derived RIP-ET model parameters for each season. After running MODFLOW, groundwater head dynamics and spatial variability of riparian ET were visualized in GIS environment for each restoration scenario. This study provided useful information for riparian restoration planning in this area. It further highlighted the advantage of using spatially explicit models and datasets for riparian restoration planning.