AFFORESTATION AND ITS IMPACTS ON GROUNDWATER RESOURCE AVAILABILITY IN A MISSISSIPPI WATERSHED

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Groundwater resource depletion, resulted from agricultural, industrial and domestic usages, is an issue of increasing water resource concern. Many parts of USA, especially in Mississippi Delta, are now experiencing an overdraft of groundwater resources. Afforestation has been applied to sustain water quantity, improve water quality, and mitigate river flooding. However, knowledge of afforestation's impacts on groundwater resource availability is currently fragmented. In this study, we applied the USGS's MERAS (Mississippi Embayment Regional Aquifer Study) model in conjunction with ModelMuse to estimate the impacts of afforestation on groundwater resource availability at the Upper Yazoo River Watershed (UYRW) in Mississippi. This watershed consists of 49% crop land and 46% forest land. Two simulation scenarios were developed in this study. The first scenario was a base scenario for the agricultural pumping conditions commonly used as well as for the natural forest conditions normally existed in the UYRW. The second scenario was the same as the first scenario except that the crop lands were converted to the forest lands as a result of afforestation. During the afforestation, all of the agricultural pumping wells have been "removed" because no groundwater irrigation is needed for tree growth in this humid subtropical region. Simulations showed that the average groundwater level at the UYRW had declined 1.2 m without afforestation over a 20-year period from 1987 to 2007, whereas the average groundwater level at the UYRW had declined only 0.13 m with afforestation for the same simulation period. The latter occurred due to the "removal" of agricultural pumping wells. Results suggested that afforestation had mitigated the groundwater resource depletion at the UYRW. This approach (afforestation) could be applied to marginal (low productivity) crop lands for groundwater conservation.

PRESENTER BIO: Dr. Ouyang is a research hydrologist with USDA Forest Service, Southern Research Station. He has extensive experience in hydrology and water quality modeling and measurement.