IMPLEMENTING PINE PLANTATION SILVICULTURAL PRODUCTION AND MANAGEMENT PRACTICES INTO THE SOIL AND WATER ASSESSMENT TOOL (SWAT)

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Pine plantation silviculture has a significant economic and landscape footprint within the southeastern United States. With approximately 32 million planted acres in the region, pine plantations are a substantial fraction of the land area in many watersheds. It is well understood that the land use and land management practices within a watershed can have significant impacts on its water quality and quantity, such as the net recharge and nitrate loading to groundwater. Some plantation management practices, such as lower density planting or heavy thinning, have been shown to increase net recharge to groundwater. While these effects have been demonstrated at the plot scale, it is desirable to quantify the potential impacts of widespread adoption of similar management practices at the watershed scale. To that aim, a watershed scale model such as the Soil and Water Assessment Tool (SWAT) can be employed. SWAT is a biophysical model that can directly simulate the effects of land management practices on water quantity and quality. Within SWAT, we implement the current range of management practices for loblolly, slash, and longleaf pine in Florida and Georgia to quantify their relative differences in net recharge and nitrate loading to groundwater. SWAT was initially designed for annual crops, and therefore the standard SWAT management operations have inherent limitations in simulating the multi-decadal rotations and management practices required for pine plantations. To circumvent some of these limitations, we make use of the dynamic land use update feature to simulate two different vegetation types (i.e. pine plantation and understory) fractionally within each Hydrologic Response Unit. This allows us to simulate the effects of plantation management practices known to impact net recharge and nitrate loading (e.g. thinning), which SWAT would otherwise be unable to do. Current work is utilizing these pine plantation implementations within regional SWAT-MODFLOW models to investigate basin-scale impacts of land management practices.

PRESENTER BIO: Dr. Reaver is a Post-Doctoral Associate with the UF Water Institute. He earned his Ph.D. in Environmental Engineering Sciences from UF in 2018. At the Water Institute, he applies his multi-disciplinary experience to the understanding of hydrological, ecological, and social dynamics in karst watersheds.