LONG TERM WATER YIELD IMPACTS FROM PINE PLANTATION MANAGEMENT STRATEGIES IN THE SOUTHEAST

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In the American Southeast, novel changes in global biofuel consumption have catalyzed pine plantations as a supplied energy source alternative to fossil fuels. Such evolving energy interests congruently alter landscapes and embedded ecosystem services that cooperate to satisfy those demands. However, the suite of possible pine plantation management scenarios and their relative impacts on long term mean annual (1961-2015) water yield (Q) has yet to be simultaneously examined. Here, we theoretically and empirically addressed how thinning, clear-cut, and short rotation influenced Q at site and watershed scales (watershed area ranging 695,953 – 7,374,414 km^2) in northern Florida, southern Georgia, and southern Alabama through statistical and process-based methods, including the Water Supply Stress Index (WaSSI) model. We additionally evaluated climate impacts by simulating changes in precipitation (P) and temperature. Our two theoretical pine plantations provided differently modeled Q results from the empirically-based WaSSI model, which is likely primarily due to spatial scale variability between the two frameworks. For the theoretical pine plantations and for the simulated WaSSI watersheds, clear-cut yielded the greatest management-induced increase in Q (changes of up to approximately 47% and 25% for each framework), while the 10% reduction in annual P yielded the greatest overall Q change in WaSSI watersheds, decreasing Q by approximately 20-30%. In one theoretical pine plantation, the 10- and 18-year short rotation simulations yielded less of a Q increase than the 50% thinning but more than the 10% thinning. In the second theoretical pine plantation, both short rotation scenarios yielded the least Q increase, compared to thinning and clear-cut. Under drought circumstances, landowners can mitigate local water supply shortages by changing agricultural management strategies. Our results can help inform predicted Q changes under pine management scenarios, which landowners can then use to choose which strategy to employ to optimize both profit and desired ecosystem services.

PRESENTER BIO: Dr. Pisarello is an early-career research scientist at USDA-Agricultural Research Service, where she is the unit's lead agroecosystems modeler and supervisor of an extensive database management endeavor. Her experience and trajectory are multi-disciplinary and include landscape hydrology and ecology, as well as human dimensions within an agroecosystems context.