WATER MANAGEMENT BENEFITS OF FULLY INTEGRATED HYDROLOGIC MODELS

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The nexus of increasing water supply demand, environmental sustainability concerns, and regulation complexity requires water managers to consider application of hydrologic models with greater accuracy, flexibility, and capabilities. Environmental and water supply sustainability concerns in Florida have been increasing over the past three decades. These concerns have led the five water management districts in Florida to designate more than half of the state as a Water Resource Caution Area and to assign a Minimum Flow or Level to an increasing number of water bodies each year. Growing sustainability concerns for Florida's water resources should motivate water managers to consider application of advanced modeling technology which better captures the interdependent relationships among rainfall, landuse, pumping, and hydrologic responses.

A fully-integrated surface water / ground water model can be used to partition the influences of rainfall, landuse change, and well pumping on flows and levels and to dynamic define changes to recharge, surface runoff, baseflow, and evapotranspiration. The benefits of using a fully-integrated model increase where near-surface water table conditions are prevalent.

For changes to well pumping rates, a calibrated groundwater model can estimate changes in aquifer water levels, baseflow to a stream, and evapotranspiration (ET) from the groundwater system but it cannot estimate changes in recharge to groundwater, surface runoff to a stream, and ET from the vadose zone. Since a groundwater model does not dynamically redefine recharge during a simulation scenario that includes modified pumping rates, the model biases the magnitude and variability of changes to aquifer water levels and baseflow. An integrated model overcomes these limitations.

Uncertainty of future flows and levels due to known historical rainfall variability and projections of climate change is a missing element in historical assessments. Fully-integrated models provide capability to assess uncertainty of flows and levels through a Monte-Carlo framework.

PRESENTER BIO: Jeff Geurink is a lead water resources system engineer with Tampa Bay Water, a wholesale regional water supply utility. He has over 30 years of water resources experience and 25 years of experience in fully-integrated hydrologic modeling including development of simulation code, user training, and water resources and sustainability applications.