COUPLED WATERSHED WATER QUALITY MODEL AS A DECISION SUPPORT TOOL FOR WATER RESOURCES PROTECTION

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This study introduces an integrated modeling system applied in coastal watersheds, focusing on utilizing hydrology and watershed models as decision support tools to implement alternative management strategies for water resources allocation, Minimum Flow Level (MFL) maintenance, and estuary ecosystem restoration.

The intricate interplay among climate change, sea level rise, and watershed hydrology and water quality presents significant challenges for managing water resources and protecting the environment. This study presents a comprehensive coupled watershed water quality model, designed as a decision support tool to assess the impacts of sea level rise scenarios and climate change on water quality in coastal watersheds. To address this information gap, we have developed a comprehensive watershed water quality model, WaSh. The WaSh model is a time-dependent, coupled hydrologic and hydraulic simulation model. It includes representation of basic surface hydrology, groundwater flow, surface water flow, and water quality fate and transport. The model is capable of simulating hydrology in watersheds with high groundwater tables and dense drainage canal networks, which is typical in South Florida.

The model integrates hydrological, hydraulic, and water quality components, enabling a holistic assessment of how shifting climate patterns and rising sea levels affect watershed hydrology and water quality. Additionally, the model helps identify vulnerable areas within the watershed that may face heightened water quality challenges due to sea level rise and changing climate conditions.

The study underscores the importance of incorporating advanced modeling techniques and integrating interdisciplinary data to improve the accuracy and applicability of watershed hydrology and water quality predictions in evolving environmental conditions. The results emphasize the potential of the coupled watershed water quality model as a valuable tool for adaptive water resources management, ensuring the resilience and sustainability of freshwater ecosystems amidst a changing climate and rising sea levels.

PRESENTER BIO: Dr. Shimelis Setegn holds a PhD in Land and Water Resources Engineering and MS & BS in Agricultural Engineering. He completed postdoctoral research in Earth & Environment. Dr. Setegn joined the SFWMD in April 2017 and currently serves as the Lead Scientist at the Applied Science Bureau. Prior to joining SFWMD, he was Assistant Professor and led geospatial modeling and water resources programs at the Department of Environmental Health Sciences & the Global Water for Sustainability Program at FIU