INTEGRATED MODELING FOR ENVIRONMENTAL EVALUATION USING ICPR VERSION 4

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Monitoring of the St. Johns Marsh Conservation Area (SJMCA) in recent years has shown serious issues with overdrainage by existing canals that is impacting the ecosystem and exposing the heavily organic soils to oxidation. Solutions that retain surface water in the marsh are constrained by USACE flood control flows that must be passed without reducing structure capacity or negatively impacting adjacent privately-owned land. The system's combination of deep canals, a fluctuating water table, spatial variability in inundation patterns, and flood control structures that control a large fraction of the inflows meant that a simple surface water hydrology model would not suffice to accurately determine hydroperiod, while a groundwater model would not suffice to accurately predict the adequacy of conveyance of flood flows.

Therefore, the St. Johns River Water Management District (SJRWMD) used ICPR version 4 to develop a detailed hydraulic model of the structures and canals linked to a two-dimensional (2D) integrated surface and groundwater model of the impacted portion of the marsh. The model facilitated evaluation of structural alternatives for protecting soils and providing a hydrologic regime suitable for maintaining the ecosystem, while allowing existing flood control releases to pass through the area. This model addresses surface and groundwater systems, including 2D overland flow, structure operations, infiltration, evapotranspiration, soil moisture, runoff, surficial aquifer recharge, and water table dynamics above and below ground.

A number of scenarios were evaluated over three phases of the project. The primary optimization maximizes the area where organic soils are protected by sufficient hydroperiod and the area of desirable wetland vegetation types. The preferred restoration scenario was predicted to protect an additional 1700 acres (12% of the total area) from oxidation compared to the initial proposal, and resulted in an additional 1800 acres (13% of the total) with predicted vegetation in the most desired categories.

PRESENTER BIO: Tom Jobes is a Senior Engineer Scientist at the St. Johns River Water Management District. He has 28 years of watershed modeling experience, including software development and model applications in hydrology, hydraulics, and water quality, and participated in the development and testing of the Integrated Hydrologic Model (IHM).