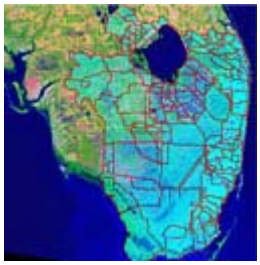
RSM Overview

The advent of software packages for computational and numerical simulation has produced a profound impact on the ability of scientists and engineers to model a wide variety of physical phenomena across a broad spectrum of disciplines. The Regional Simulation Model (**RSM**) is a concentrated effort by the SFWMD to enhance its current regional modeling capability with the latest coding methods.

South Florida faces complex problems related to water supply deliveries, flood control, and water quality management. While tools exist to address individual water resource management needs, the complexity of South Florida requires a comprehensive modeling tool with greater flexibility for simulating various planning and management options, and the ability to integrate multiple disciplines into one model (*e.g., hydrology, hydraulics, ecology, and water quality*).



SFRSM Mesh map

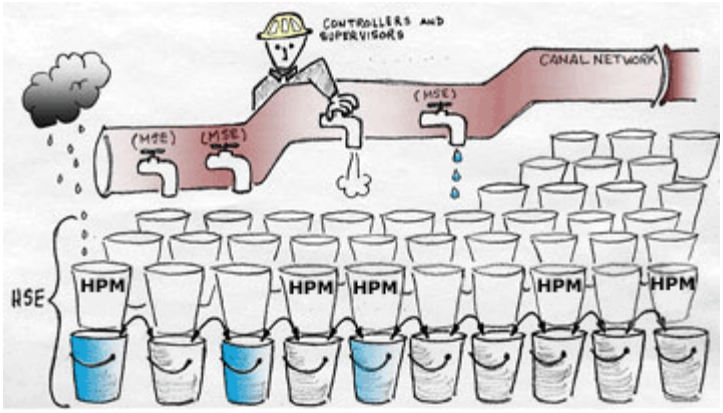
Numerous simulation models have been developed to provide a predictive application which included both groundwater and surface water components. Some of these models were mainly developed as groundwater models, and then added surface water components to the original model (*e.g., Modflow*), while others were developed as surface water models, and then a groundwater component was added (*e.g., WASH123, MikeSHE,*). The limitation of such an approach is that more attention is given to one component over the other (*i.e., groundwater vs. surface water*), with more details included in one component while little or minimal mathematical representation is included in the other. The code structure of the RSM overcomes these limitations and allows concurrent model development and integration of both surface water and ground water.

In South Florida, both groundwater and surface water components need to be equally represented to address this unique region. In addition, a comprehensive hydraulic component must be provided to simulate and manage numerous and various types of man-made structures and canals in South Florida. The hydraulic component must be capable of responding to

preset rules and operations as well as to extreme weather patterns (*wet/dry*) that affect competing urban, environmental and agricultural demands.

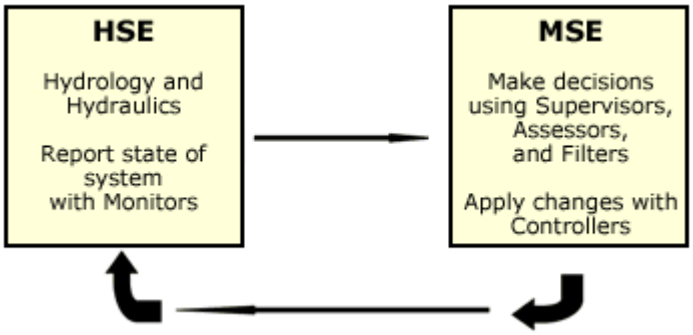
To address these needs, the South Florida Water Management District (SFWMD) is developing the Regional Simulation Model (RSM). While this regional hydrologic model is developed on a sound conceptual and mathematical framework, simulating a wide range of hydrologic conditions, RSM has been developed principally for application in South Florida, and accounts for interactions among surface water and groundwater hydrology, structure and canal hydraulics, and management of these hydraulic components.

The RSM simulates the coupled movement and distribution of groundwater and surface water in conjunction with the coordinated operation of canals and structures in South Florida. The RSM has two principal components, the Hydrologic Simulation Engine (HSE) and the Management Simulation Engine (MSE). The HSE simulates natural hydrology, water control features, water conveyance systems and water control bodies. The HSE component solves the governing equations of water flow through both the natural hydrologic system and the man-made structures. *Future versions of RSM will include water quality and system ecology*.



The two components of the RSM are HSE and MSE.

The MSE component provides a wide range of operational and management capabilities to the RSM by implementing water control structure rules, canal stage maintenance levels and reservoir operating guidelines. Since there is not a single unique way that operations can be executed, the MSE is designed to provide a flexible, extensible expression of management simulation and optimization targets employing a suite (toolbox) of modern control algorithms.



RSM state and management information flow