

Linkage of Ecological Algorithms with a Transport and Reaction Simulation Engine (TaRSE:ECO) for implementation with the regional-scale water simulation model, RSM.

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Current water models have a limited ability to portray the effect that various water management decisions have on the local ecology. Instead, often model output data is passed to separate ecological models such as ATLSS (Across Trophic Level System Simulation) or ELM (Everglades Landscape Model) for post-processing. The objective of this project is to effectively model cattail migration through the WCA2a test site in South Florida. TaRSE (Transport and Reaction Simulation Engine) is a new generic library that can be coupled with a variety of spatially-distributed hydrodynamic models. Building on the TaRSE library, an HSI (Habitat Suitability Index) algorithm for cattails is created and included in the TaRSE:ECO module. This is then implemented with the Regional Simulation Model (RSM) as the hydrodynamic driver, and verified on a theoretical 10*10 test grid. Validation is then performed over the actual test site, with global sensitivity analysis being incorporated as part of the model development. A lot of attention is focused on reviewing the fundamental design of the various models involved, as well as their code layout, and input/output structures, along with the reviewing of various ecological algorithms and models. Building on the foundation of the cattail HSI component, more advanced algorithms focusing on meta-populations could be added to TaRSE:ECO for simulating the distribution of flocks of birds for example. The TaRSE:ECO module will then be applicable not only in south Florida, but anywhere where there is uncertainty of the effect of water management decisions on the surrounding ecology.

Key words: Ecology; Hydrology; Modeling; TaRSE; RSM

Challenges: Public health, wildlife health, ecosystem health and water resource sustainability

Issues: Water availability and allocation