

Stage and Water Quality Compartmental Model of an Everglades Wetland

Hamid Bazgirkhoob

June 2012

Prepared as a part of a cooperative research program between

The Center for Louisiana Inland Water Studies, University of Louisiana –
Lafayette

Ehab A. Meselhe – Director and Principle Investigator

The Arthur R. Marshall Loxahatchee National Wildlife Refuge, US Fish and
Wildlife Service

Michael G. Waldon, Technical Cooperator

ABSTRACT : Cluster analysis was applied to objectively determine the number of compartments and to spatially delineate compartments with similar features in the Arthur R. Marshall Loxahatchee National Wildlife Refuge which led to delineate the 9-Compartment Model structure based on the analysis of concentrations of chloride, total phosphorus, sulfate, and calcium. The 39-Compartment Model was built by analyzing the water quality gradient from the calibration and validation of the 9-Compartment Model, and professional judgment by analyzing information such as the vegetation/elevation map of the Refuge.

The 39-Compartment Model results represent spatially aggregated canal and marsh values for all state variables (e.g., volume, stage, and water quality parameters). The 39-Compartment Model predicts water stage very well for canal and marsh. The model also predicts the concentration of three constituents (Cl, SO₄, and TP) reasonably well. It is evinced that in the Refuge, the inflow structures in the north have strong impact to the flows in the canal and the northern marsh. Automated calibration of the seepage coefficients for the marsh and the canal revealed that the seepage loss in canals for the 39-Compartment Model is larger than that for the 9-Compartment Model.

The 39-Compartment Model and the Spatially Explicit Model (Mike Flood) were quantitatively evaluated vs. observed data. Although, the 39-Compartment Model can be used to detect water quality variations along western and eastern gradients as well as north-to-south gradient, due to its spatially aggregated nature, the model was not designed to be used to analyze site specific events. But, the Spatially Explicit Model (Mike Flood) can provide more accurate prediction of the observed data for the Refuge. The Spatially Explicit Model results provide detailed spatial and temporal information of hydrodynamic and water quality state variables. This model can be used to analyze site specific events. Depending on the time scale of input data, Mike Flood can be used for analyzing short term (transient) to long term (daily, monthly or annual) events. In view of its computational cost, it is feasible to run decadal simulation within reasonable amount of time.

Views and opinions expressed in this report are solely those of the author, and do not necessarily represent views or opinions of the US Fish and Wildlife Service. This thesis is copyrighted by the author, Hamid Bazgirkhoob, and is distributed as a research report by permission of the author.

Recommended citation:

Bazgirkhoob, H. (2012). *Stage and Water Quality Compartmental Model of an Everglades Wetland*. (MS), University of Louisiana - Lafayette, Lafayette, LA.