LAKE OKEECHOBEE WATER QUALITY MODEL PROJECT

Mandate:

Comprehensive Everglades Restoration Plan (CERP),
Lake Okeechobee Protection Program (LOPP)

Background:

The South Florida Water Management District has developed and applied water quality models of Lake Okeechobee since 1981 to determine loading goals of phosphorus, guide lake research, and help predict impacts of management actions. The 1989 Surface Water Improvement and Management Plan applied the first of these models, the modified Vollenweider model, to set target phosphorus loads to the lake. Subsequently, District Staff developed a more complex model, the Lake Okeechobee Water Quality Model (LOWQM) to investigate the impact of phosphorus and water management on water-column nutrient concentrations and algal blooms in Lake Okeechobee.

Project Overview:

The LOWQM uses the U.S. Environmental Protection Agency's Water Quality Analysis Simulation Program (WASP) to simulate nutrient and algal dynamics in both the water column and underlying sediments. The WASP was updated to include three algal groups; resuspended sediments and the associated processes, the silica cycle, nitrogen fixation, and an improved representation of the phosphorus cycle. External forces that drive the model include sunlight, temperature, wind induced sediment resuspension, surface inflows and outflows, rainfall, evaporation, and nutrient loads. The LOWQM treats the lake as a single box. Although the model is calibrated to monthly averaged observations of nutrients and chlorophyll a, it does not accurately predict the two-fold increase in phosphorus from 50 ppb in 1973 to over 100 ppb in 1981. A spatial scale model that more accurately represents the lake is being developed (See the project summary page for the Lake Okeechobee Environment Model, LOEM).

Application of Results:

The LOWQM was used in the Central and South Florida Restudy to determine impacts of various management plans on the water quality of Lake Okeechobee. It also was used to assist the U. S. Environmental Protection Agency and the Florida Department of Environmental Protection to develop a Total Maximum Daily Load (TMDL) of phosphorus to the lake. The LOWQM has been used to predict the impact of reduced phosphorus loads to the lake and is currently being used in a study to investigate various methods of sediment management. An uncertainty analysis of the model determined the range of outcomes from various management scenarios. Until the LOEM is operational the LOWQM can be used by the Restoration

Coordination and Verification project of the Consolidated Everglades Restoration Plan to evaluate impacts of management plans on water quality.