

Water-surface Elevation and Water Depth Analyses Using a GIS Application

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A geographical information system (GIS) is being used to produce grids of water-surface elevations and water depths for a 25-square kilometer area encompassing the Taylor Slough wetland in the southern Florida Everglades. The low topographic relief results in shallow water-surface gradients and large fluctuations in the spatial extent of inundation. Numerous ongoing multi-disciplinary projects are investigating the complex hydrologic processes, anthropogenic influences, and ecological habitat of this unique ecosystem. The ability to identify changes in water-surface elevations and hence water depths, in both space and time, is fundamental to evaluating the hydrology of this ecosystem. A GIS program has been developed to produce a daily time series of water depths for use in the regional analysis of seasonal changes in inundation patterns and for the delineation of the time-varying wetland boundaries.

The GIS program subtracts a topographic grid of the study area from a water-surface elevation grid generated from daily water-level records to produce water-depth grids at a 50-meter spatial resolution with a vertical accuracy of approximately +/- 10 cm. Topographic data collected by the U. S. Geological Survey (USGS) were used to generate the land-surface elevation grid. Water-level records are obtained from the South Florida Water Management District, the National Park Service, and from within the USGS. Data are generally available from approximately thirty stations on any given day for the working period of record, which is 1994 to present.

The daily time slices of water depths are concatenated for visualization and qualitative analysis. The resulting graphics sequence is used to delineate historical inundation depths, and thus, is useful to discern seasonal flow patterns, particularly as these may have been affected by anthropogenic influences. Historical hydroperiods can be computed from the generated water-depth maps to provide a quantitative description for correlation to gaged inflows.