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APPLICATION OF THE KISSIMMEE RIVER HYDRAULIC MODEL AND FLOODPLAIN SPATIAL ANALYSIS TOOL TO THE DEVELOPMENT OF FLOODPLAIN INUNDATION TARGETS FOR THE KISSIMMEE RIVER RESTORATION PROJECT

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The South Florida Water Management District has embarked on the Kissimmee Basin Modeling and Operations Study (KBMOS) to modify water control structure operating criteria for the Kissimmee Basin. These modified operating criteria are one element of the Kissimmee River Restoration Project, whose goal is to restore ecological integrity to the Kissimmee River floodplain ecosystem by reestablishing a more natural flow regime in the river.

This paper describes the analyses performed to validate hydrologic performance targets for broadleaf marsh communities in the Kissimmee River floodplain, a key success indicator for Kissimmee River restoration. A search of the literature by Anderson et al (2008) established the hydrologic requirements for broadleaf marsh communities. To estimate expected water levels within the restored floodplain, a hydraulic model of the restored Kissimmee River was developed and simulations were run using pre-channelization inflow and outflow data (AECOM, 2008a). The model was calibrated using historic observed gradients through the floodplain over the 29-year pre-regulation period from 1933 to 1961. This model generated daily estimates of stage at cross-sections extending the length of the restored river. Modeled stage data were interpolated into a time-series of daily stage and water depth grids using the Floodplain Spatial Analysis Tool (AECOM, 2008b). Water depths were relative to the topography of the full restored Kissimmee River floodplain. The Floodplain Spatial Analysis Tool was programmed in Python and run on the ArcGIS 9.2 platform. Water depth time-series at each cell were then assessed for annual hydrological suitability for broadleaf marsh. Statistics on suitability were developed along with a family of suitability maps for dry/wet/normal/composite conditions. The statistical analysis is written in Fortran90.

Model results were verified by comparing simulated hydrologic suitability maps against historic vegetation maps. Historic vegetation was quantified by examining a 1954 pre-channelization vegetation map for 1951-1954, a normal-to-wet period. Seven Kissimmee River cross-sections were selected and superimposed on the maps and the extent of historic broadleaf

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marsh along each cross-section quantified (Anderson et al, 2008). Modeled vegetation was quantified using the Floodplain Spatial Analysis Tool.

During this process, the hydrologic suitability criteria for broadleaf marsh found in the literature were evaluated, refined, and compared to the location and extent of broadleaf marsh shown in the 1954 pre-channelization vegetation map. The final performance target for broadleaf marsh is "*Seventy-five percent of water years (May 1- April 30) in the 41-year simulation where floodplain inundation is greater than or equal to 1.0 ft for 210 or more days at cross-sections XS-5 and XS-9"* (AECOM, 2008c). Using these criteria, the modeled extent of land with hydrologic suitability for broadleaf marsh is consistent with the historic extent of broadleaf marsh.

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