SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Evaluation of Alternatives for Water Conservation Area-3 Decompartmentalization and Sheet Flow Enhancement Project Implementation Report 1

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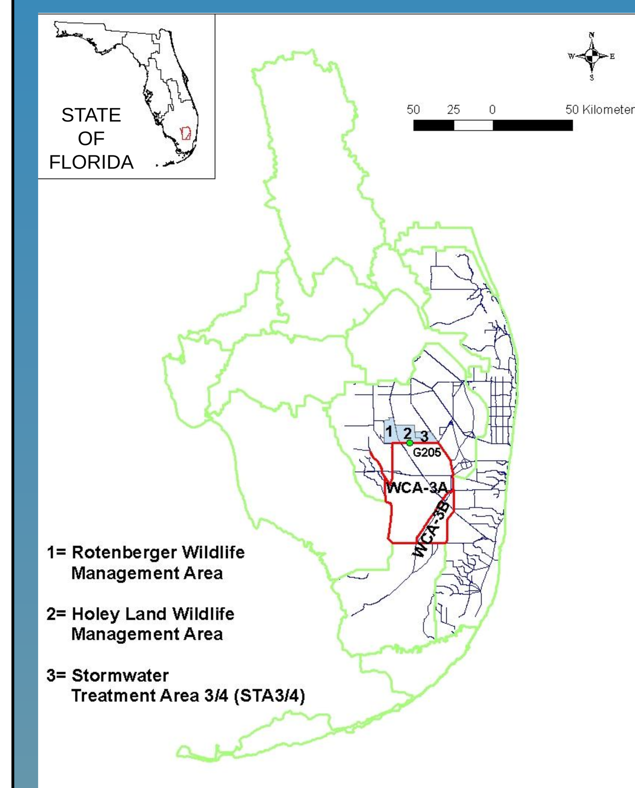
ABSTRACT

Water Conservation Area-3 (WCA-3) Decompartmentalization (DECOMP) and Sheet Flow Enhancement Project Implementation Report (PIR)1 is part of the Comprehensive Everglades Restoration Plan (CERP) where the goal is to restore the natural patterns of flow distribution, timing, continuity and volume of sheetflow in this area. The ecological target for restoration is the recovery of pre-drainage hydrologic patterns of hydroperiods. This study explores a proposed improvement to sheetflow that can be achieved by backfilling/plugging the Miami canal which is currently acting as a barrier to sheetflow. Further improvements to sheetflow can be achieved by redistributing flows southward along the northern boundary of WCA-3A. Seven alternative scenarios were evaluated using the Glades-LECSA Regional Simulation Model (RSM[1]) to understand the effect on stage and flow-dynamics within WCA-3.

The intent of each evaluation was to simulate future conditions in the year 2015 that will exist in south Florida prior to the implementation of the DECOMP CERP project plus the specific alternative features. All non-CERP projects that are anticipated to be in place by that time were also modeled. With these conditions, modeling was conducted in between the period from 1/1/1965 to 12/31/2000, using historical rainfall and reference evapotranspiration (RET) data for this period. Each of the alternatives included backfill or plugging of the Miami Canal and either the full length Hydropattern Restoration Feature (HRF) or the West of G-205 HRF. Full length HRF spanned the entire northern boundary of WCA-3A and included east, central and south components. The east HRF was located directly south of STA-3/4, the central HRF directly south of Holey Land Wildlife Management Area (HLWMA) and the west HRF directly south of Rotenberger Wildlife Management Area (RWMA). The boundary conditions along the northern boundary of WCA-3A were provided from the South Florida Water Management Model (SFWMM). Evaluations of the alternatives presented in this paper were based on the relative comparisons of average annual water budgets, flow transects, stage hydrographs and duration curves, ponding depths, hydroperiods and surface water vectors.

[1]In RSM, Hydrologic Simulation Engine (HSE) is used to simulate the flow-dynamics in the southern Everglades. The implicit, finite-volume, rainfall-runoff model, HSE is capable of simulating two-dimensional flow in arbitrarily shaped areas by using a variable triangular mesh structure. HSE is written in C++ by using object oriented methods. The diffusion wave simplification of the Saint-Venant equation is used to simulate ground-water and overland flows. Manning and Darcy equations are used for the definition of friction-losses in these formulations. Governing equations are solved by using a high performance external sparse solver. HSE uses a mass-balance approach to redistribute the water in the vertical soil-profile. It loosely couples this solution with the horizontal solution at the beginning of each time-step. In addition to key hydrologic processes, HSE also models levee seepage and canal structure flow.

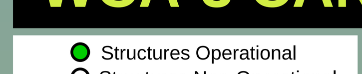
LOCATION OF PROJECT DOMAIN

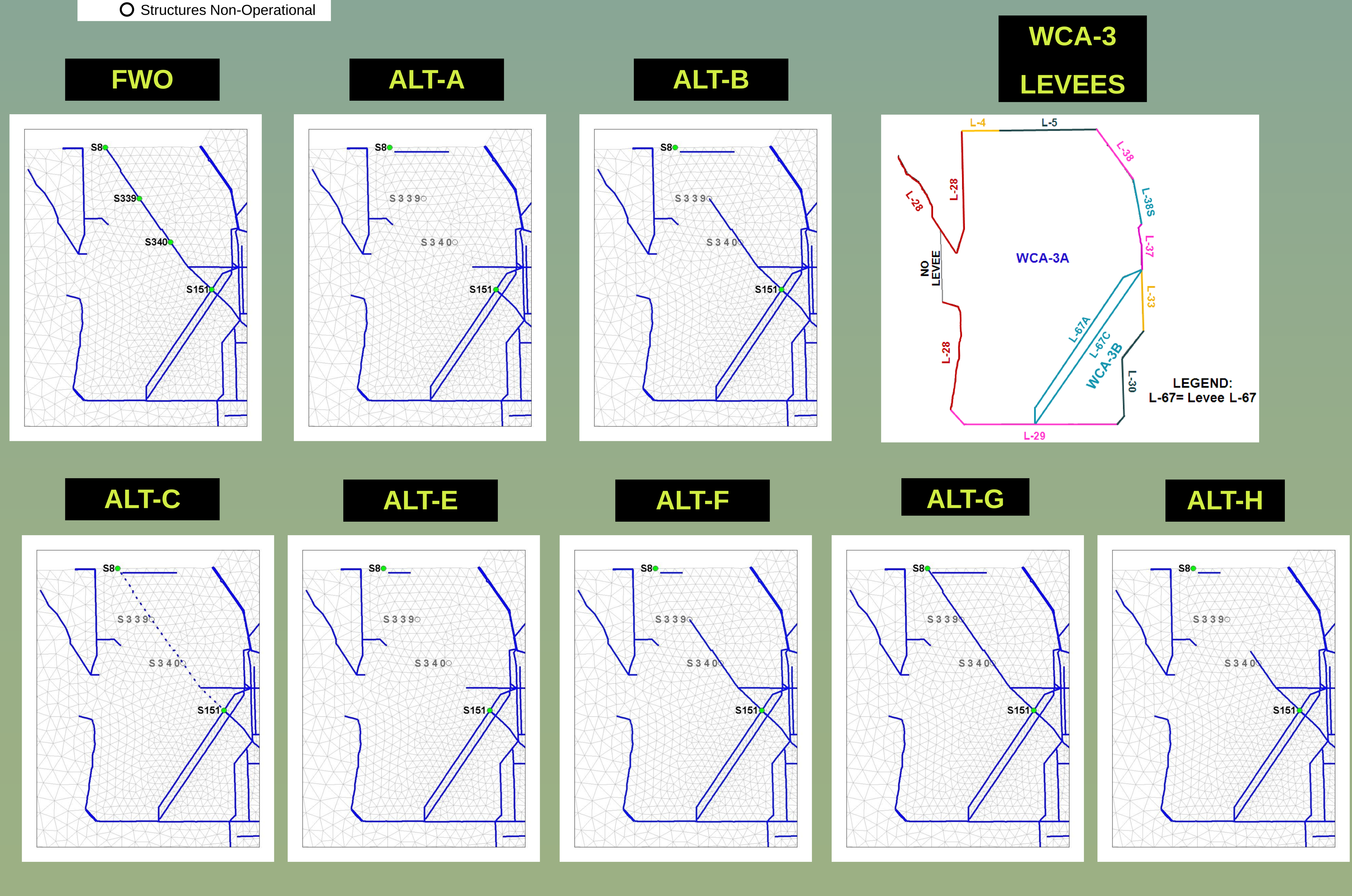


FWO: The FWO (future without project) condition represents the predicted conditions that will exist in south Florida prior to the implementation of the DECOMP CERP project. In general, assumptions in the FWO represent structures, operations, and land use projected to be in place in the year 2015.

ALT: FWO plus the specific alternative condition considered for evaluation.

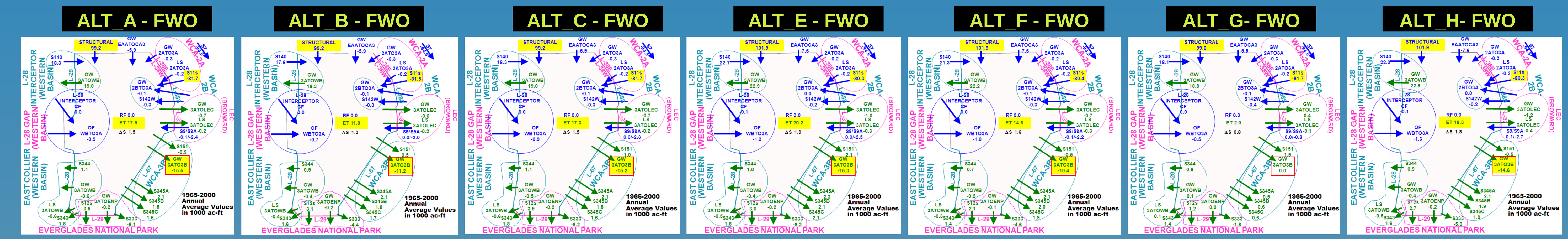
WCA-3 CANAL CONFIGURATION IN EACH SIMULATION





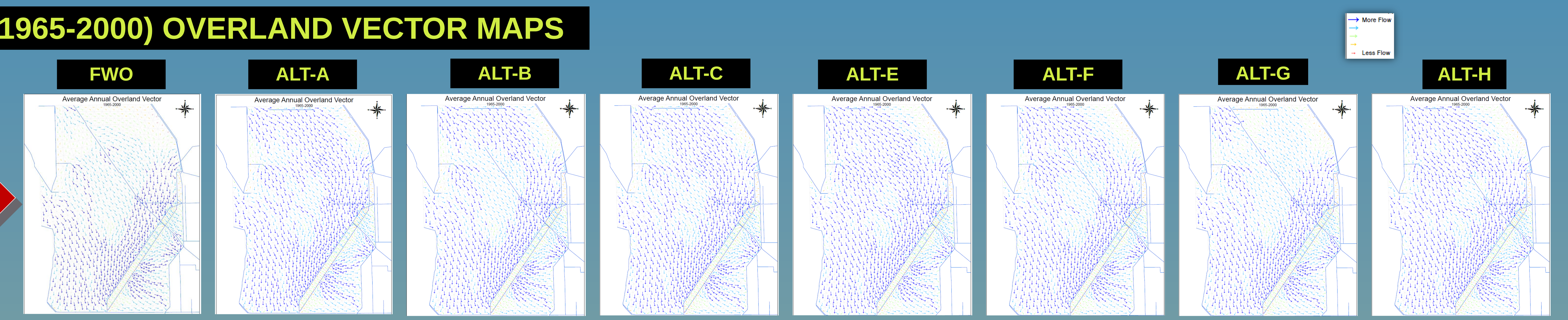
WCA-3A AVERAGE ANNUAL (1965-2000) WATER BUDGET COMPARISON WITH FWO SIMULATION

- The decrease in discharges from the S11 gravity structures in the ALTs as compared to FWO is due to the increase in northern imposed structural flows in ALTs, as compared to FWO.
- The Ground Water (GW) outflows from WCA-3A to WCA-3B are lower in the ALTs (except ALT-G), as compared to FWO could be partly because of the absence of the complete Miami Canal in all other ALTs except ALT-G.
- The ET is more in the ALTs (except ALT-G) as compared to FWO because there is more water spread out in the marsh as compared to FWO, where this water could be in the complete Miami Canal in FWO and ALT-G.



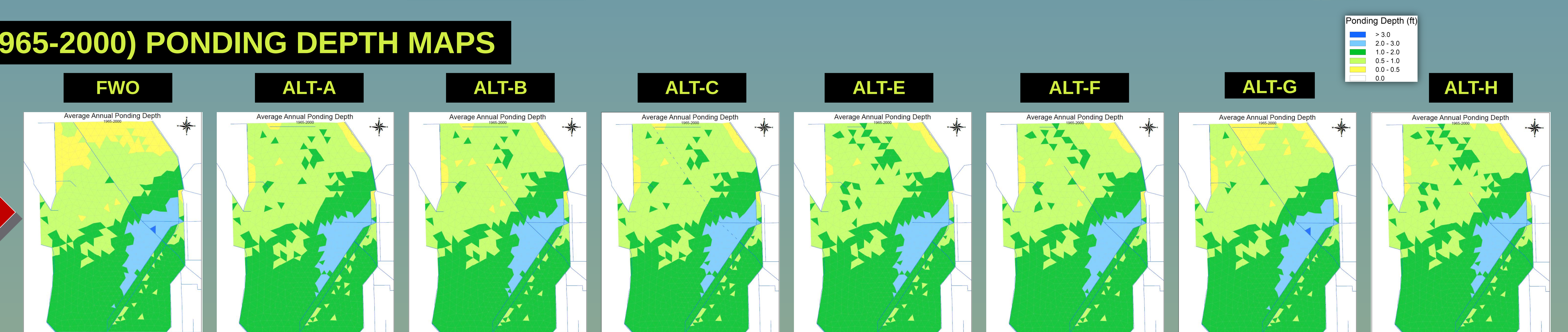
AVERAGE ANNUAL (1965-2000) OVERLAND VECTOR MAPS

- There is more overland flow in marsh areas wherever there is back filling of the Miami Canal as in ALTs-A, B, C, E, F & H.
- The northern areas of WCA-3A show more overland flow in the ALTs, as compared to FWO due to the presence of the central Hydropattern Restoration Feature (HRF) and higher northern boundary inflows in the ALTs as compared to FWO.



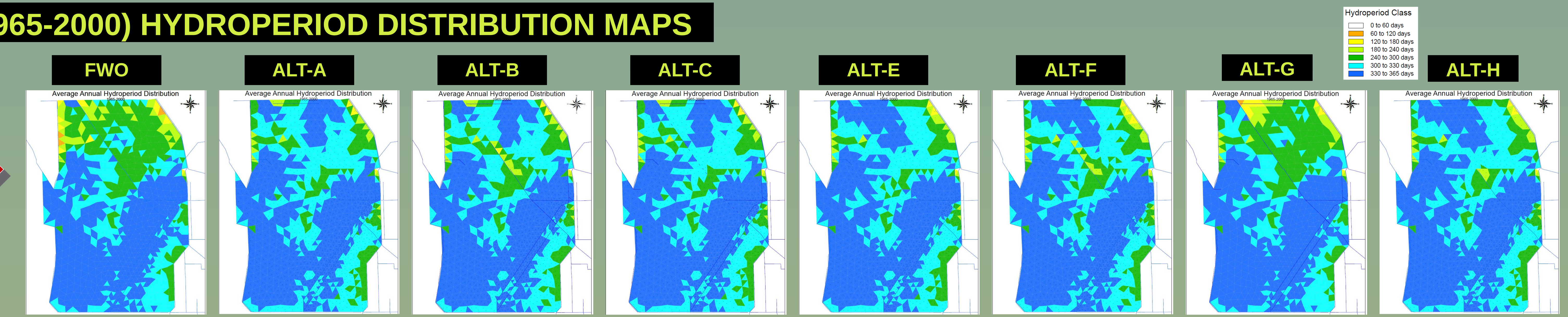
AVERAGE ANNUAL (1965-2000) PONDING DEPTH MAPS

- The ALTs (except ALT-G) appear to have higher ponding depth along the northern areas of WCA-3A compared to FWO due to the presence of the central Hydropattern Restoration Feature (HRF), higher northern boundary inflows in the ALTs as compared to FWO and the backfill of the Miami canal for ALTs (except ALT-G), as compared to FWO.



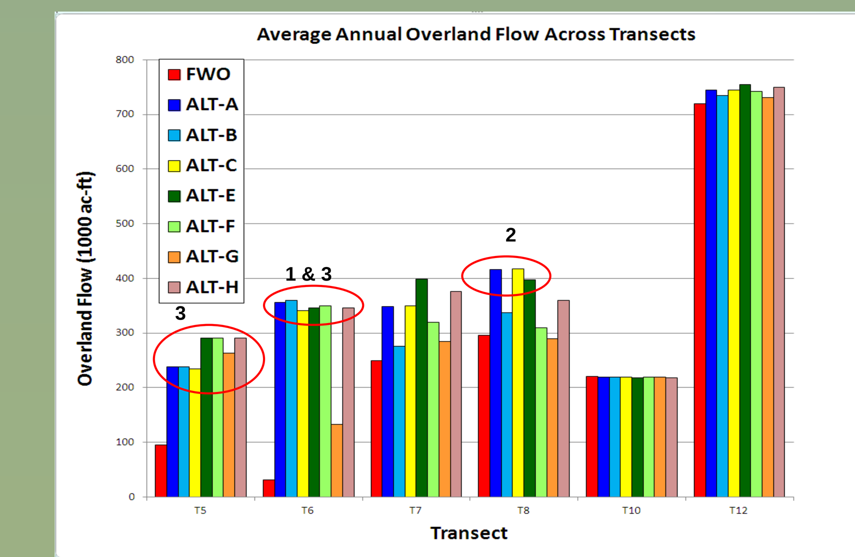
AVERAGE ANNUAL (1965-2000) HYDROPERIOD DISTRIBUTION MAPS

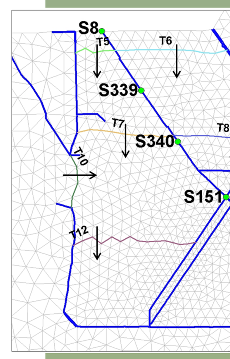
- ALT-A and ALT-B scenarios show longer hydroperiods in northern WCA-3A as compared to ALT-G for the same imposed northern boundary flows. This is due to the backfill of the Miami canal for ALT-A and ALT-B.
- FWO shows the shortest hydroperiods in the northern WCA-3A area due to the lower northern WCA-3A boundary inflows and the presence of the Miami canal, which tends to drain the areas adjacent to the canal.



AVERAGE ANNUAL (1965-2000) FLOW ACROSS TRANSECTS

- Flows across the WCA-3A north-eastern transect T6 are higher in ALTs-A, B, C, E, F & H as compared to FWO & ALT-G due to backfill of the Miami Canal north of the structure S339.
- Flows across the WCA-3A north-eastern transect T8 are higher in ALTs-A , C, E as compared to FWO & ALT-G due to backfill of the Miami Canal north of the structure S340.
- Flows across the WCA-3A northern transects T5 & T6 are higher in ALTs (compared to FWO) due to the presence of central Hydropattern Restoration Feature (HRF) and higher northern boundary inflows in the ALTs as compared to FWO.





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