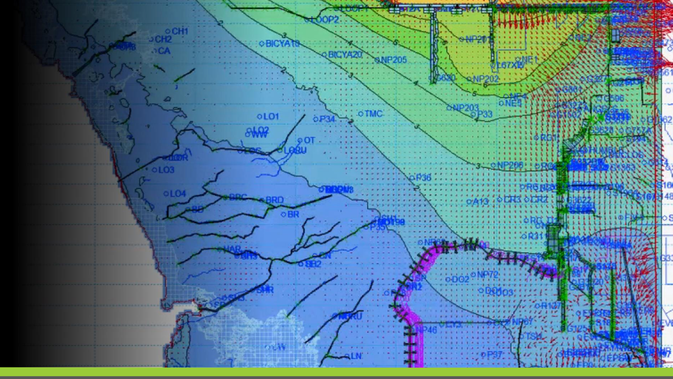
M3ENP-SF an integrated surface and subsurface hydrologic and hydrodynamic model of the Everglades National Park (ENP)



Georgio Tachiev, PE PHD, GIT CONSULTING LLC, Kiren Bahm, NPS and Kevin Kotun, USGS

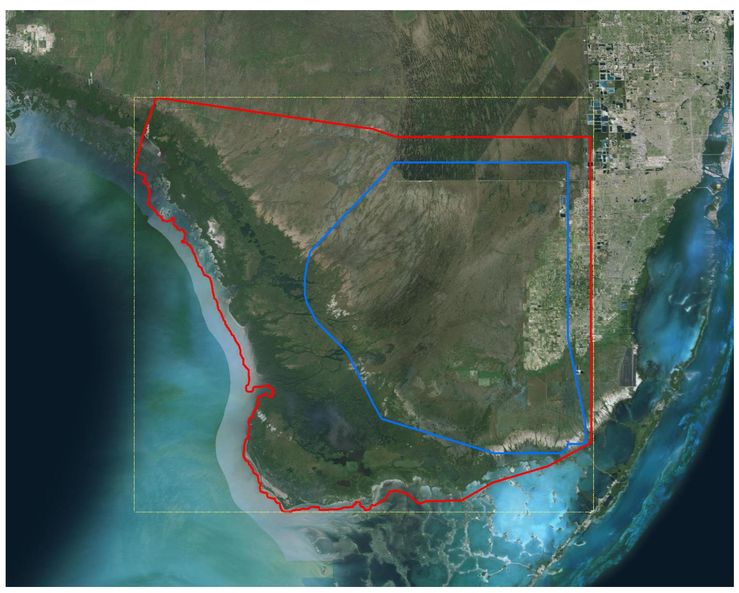
Numerical Model

An integrated surface and groundwater flow model for evaluation of restoration projects that are intended to increase water flow into Northeastern Shark Slough and the Rocky Glades regions of the Everglades National Park (ENP).

Conceptual Model

- Integrated Surface and Groundwater Model discretized at 400 m resolution
- Tidal Boundary conditions (hourly basis)
- Head Boundaries at domain boundaries
- Rainfall and Evapotranspiration on daily basis
- Unsaturated 1D flow (Richard's Equation
- 1D Open Channel and Culvert Flow
- 2D Overland Flow
- 3D Saturated Zone Flow (with 5 subsurface layers)
- Detailed Structure Operations

Model Domain

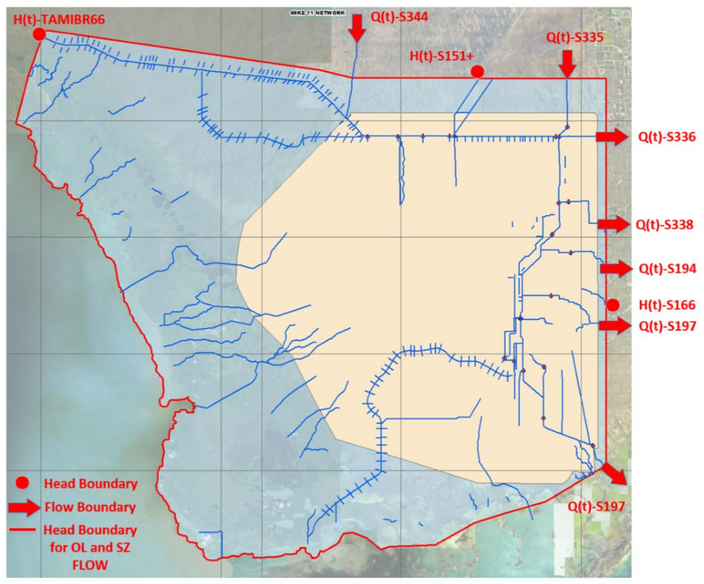


Model Domain M3ENP SF and M3ENP

Model Parameters

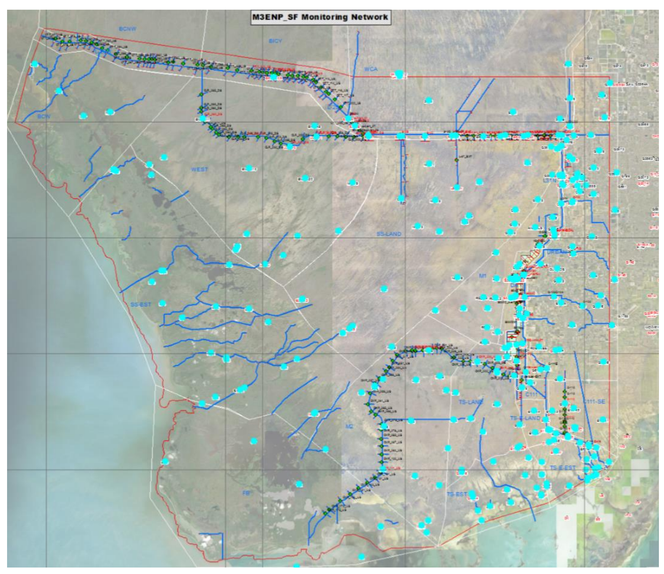
Model Parameters	M3ENP	M3ENP_SF
Dimensions	158x155	248x225
Cells	20124	42192
Layers	3	5 and 9
Area (sq.mi)	1244	2608
Canals	77	335
Canals (mi)	225	680
Culverts	55	327
Weirs	15	19
Structures	70	85
M11 Comp Pts (H+Q)	1310	2912

1D – Hydrodynamic Network



1D Boundary Conditions and Network

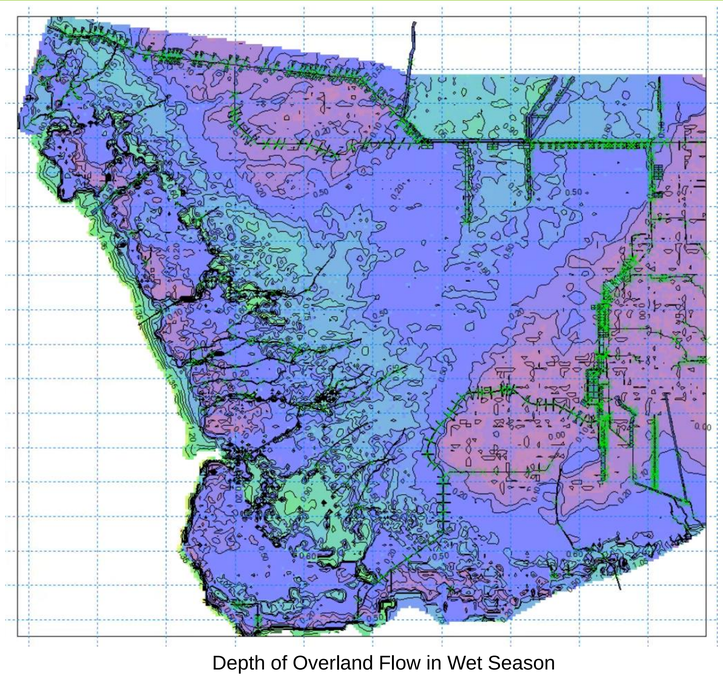
Calibration Targets and Results



Network of Observations used for Calibration Targets

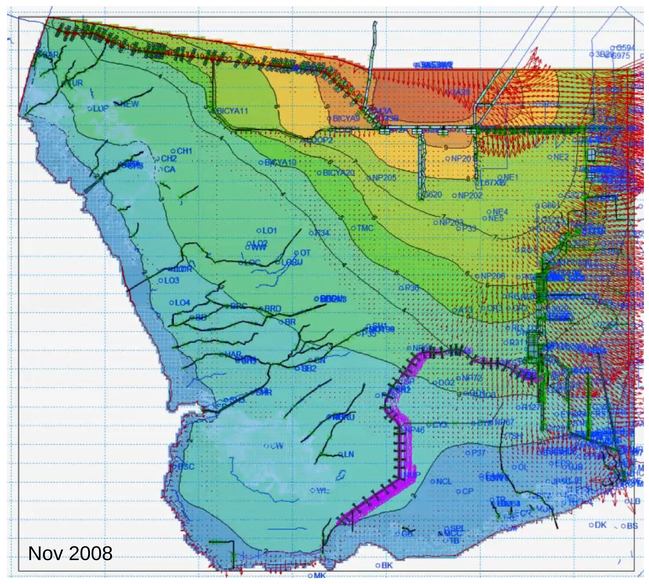
- 388 stage calibration targets within the domain
- Difference between observed and computed probability exceedance (is less than 0.5 ft at median values.
- Average MAE and RMSE has values are less then 0.5 ft

Results Water Depth

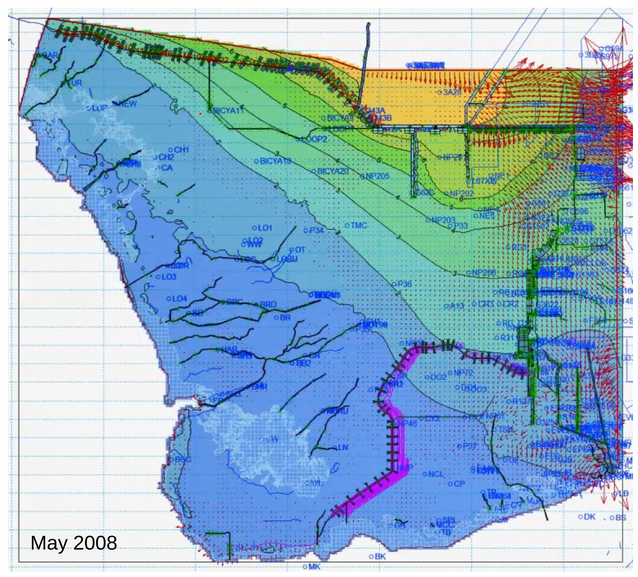


Depth of Overland Flow in Wet Season

Results Groundwater Levels



Computed Groundwater Table in Wet Season



Computed Groundwater Table in Dry Season

Summary

- Provides detailed timeseries of hourly, daily, seasonal and annual discharges and stages in canals,
- Provides exchange between overland, canal and groundwater subdomains, regional and local water budgets, flow in detention areas
- Provides analysis of the changes in hydrological cycle and water balance components for a specified list of operational alternatives of control structures
- Capabilities to modify structure operation using timeseries input file which activates a particular set of control operations based on changing hydrologic conditions and response from the model.
- Capabilities for analysis of local variations of hydrolgeoloty

References

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