An Application of the Regional Simulation Model to the Everglades and Lower East Coast for the Modified Water Deliveries and C-111 South Dade Projects

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Historic VS Current System

Kissimmee
LOK
Florida Bay
Managed system
Roads, Levees, Canals
Compartmentalized
Control structures
Remnants Everglades
Water Conservation Areas 1, 2, 3A and 3B
Everglades National Park: Shark River Slough

Historic Flow
Gulf of Mexico
Everglades
Current Flow
Florida Bay
ENP
Modified Water Deliveries or Modwaters (MWD)

- Restore more natural flows into Everglades National Park
- Part of South Florida Ecosystem Restoration Project

MWD is a multi-agency effort

Model Results

Before MWD

West ~ 80%

East ~ 20%

After MWD

West ~ 55%

East ~ 45%
MWD and C-111 South Dade Projects

Includes three incremental efforts

- **Increment 1 Field Test:**
  - Initiated on October 15, 2015
  - A planned deviation to the 2012 Water Control Plan
  - Deliver more water from WCA-3A to NESRS
  - Return Seepage from L-31N Canal to L-29 using S-356 pump
  - Collect and analyze hydrologic, water quality, and ecological data

- **Increment 2 Field Test:**
  - Allow L-29 canal maximum stage at 8.5 ft

- **Increment 3 or Combined Operating Plan (COP)**

The modeling effort will help to evaluate a range of potential options.
Modeling Tool: RSM

- Developed by the South Florida Water Management District with South Florida’s unique hydrology in mind
- Simulates canal, overland & groundwater flows and all major water budget components
- Has features to handle local scale hydrology and water management operations

Model Application: RSMGL

- A regional scale implementation of the mesh version of RSM to the Everglades and Lower East Coast Service Areas.
- Previously applied for the CERP WCA-3A DECOMP and the Central Everglades Planning projects (CEPP)
**Mesh Information:**
- Finite element mesh
- Number of cells: 5,794
- Average size: $\sim$ 1 sq. mile

**Canal Information:**
- Total length: $\sim$ 1,000 miles
- Number of segments: $\sim$ 1,000
- Average length: $\sim$ 1 mile

**Run Time:** $\sim$ 1 day

**Calibration/Validation:**
- Calibrated for 336 gages to match historical data dating from 1/1/1984 to 12/31/1995.

**Model Domain:**
- Everglades and Lower East Coast service areas
- Domain size: 5,825 sq. miles
Modeling Approach using RSMGL

Model Input

- Climatic Input
  - Rainfall
  - ET
- Boundary Conditions
- Land Use/Land Cover
- Water Demands
- Project Features
- Operating Criteria

Model Output

- Daily time series of water levels, flows
- Demands not met

Evaluation
(Environmental, Flood Control, Water Supply, etc…)

Climatic Simulation Period of record: 1965-2005
Scenarios (Base VS Increment 1)

**Base (ECBRW)**
- Everglades Restoration Transition Plan (ERTP) conditions with 2015 project features.
- Revised to reflect Real-World operations (within the operational flexibility)

**Increment 1**
= Base +
- Part of MWD projects
  - Allow more flows to NESRS (via S-333) without constraining for 8.5 SMA
  - Return seepage from L31N to NESRS via S-356 pump
- Part of South Dade Projects
  - Revised operations to SDCS based on WCA-3A stages, and available capacity at SDCS
  - Additional conditional operation for S-197
Water Budgets for Everglades National Park (ENP)

Average Annual water budget in K-AC-FT (1965-2005)
Duration Curves

Duration Curves for L-29 at S334
Elev: 5.47 ft, NGVD29; Segment ID: 309197

Normalized Duration Curves for G3273
Elev: 6.65 ft, NGVD29; Cell ID: 2364

Base
Increment1
Duration Curves at Key Slough Gages

Normalized Duration Curves for ENP NESR51
Elev: 5.86 ft, NGVD29; Cell ID: 1917

Normalized Duration Curves for ENP NESR52
Elev: 5.75 ft, NGVD29; Cell ID: 2373

Normalized Duration Curves for ENP NESR53
Elev: 5.96 ft, NGVD29; Cell ID: 7540

Normalized Duration Curves for ENP NP-TSB
Elev: 3.74 ft, NGVD29; Cell ID: 3808

Base
Increment1
Additional flows into NESRS could help a variety of habitats:
- plants like sawgrass,
- wildlife like fishes, alligators, otters, wading birds and endangered snail kites & wood storks
Transects: Taylor Slough and Eastern Panhandle

Average Annual Overland Flow across Transect 23B
Southward flow in Southern ENP (Taylor Slough)

- **T23B**
  - Taylor Slough
  - **Base**: 87
  - **Increment1**: 86
  - **23**
  - **64**

Average Annual Overland Flow across Transect 23C
Southward flow in Southern ENP (Eastern Panhandle)

- **T23C**
  - Eastern Panhandle
  - **149**
  - **140**
  - **43**
  - **38**

Overland Flow in K-AC-FT

- **Dry Season**
- **Wet Season**
Higher Ponding depth helps a variety of habitats

Stage difference: (Increment 1 - Base)

Ponding Depth: Base

Ponding Depth: Increment 1

Stage Difference (ft)

- >1.0 higher
- 0.5-1.0 higher
- 0.25-0.5 higher
- 0.10-0.25 higher
- +0.10
- 0.10-0.25 lower
- 0.25-0.5 lower
- 0.5-1.0 lower
- >1.0 lower

Ponding Depth (ft)

- >3.0
- 2.0-3.0
- 1.0-2.0
- 0.5-2.0
- 0.0-0.5
- 0.0
Hydroperiod means the length of time that water is present over the surface of a wetland. Longer hydroperiods help a variety of habitats.
Cape Sable Seaside Sparrow (CSSS) Populations

- ENP is a home of Cape Sable Seaside Sparrows
- A non-migratory endangered sparrow species.
- Marl prairies
- Sparrows are distributed in 6 areas: A-F.
- Nest on the ground
- Short-hydroperiod
Benefits of Increment 1

Increment 1 produce small but important benefits:

- **Hydrologic benefit** → increased flow through NESRS
- **Water quality benefit** → will be maintained
- **Ecological benefit** → Improve
  - habitat function
  - species composition
  - abundance
- **Geological benefit** →
  - promoting the build-up of soil
  - inhibiting soil loss
Current Status of Increment 1

- Increment 1 planned for
  - minimum of one year
  - maximum of two years
- **El Niño** year with extremely wet “dry season”
- Florida’s Governor declared **WCA-3 High Water Emergency Condition**

- USACE approved a deviation on Feb. 15, 2016 which allows L-29 canal stage to rise 8.5 feet maximum instead of current limit at 7.5 feet
Path Forward

- **Increment 2 (2017-2019):**
  - Officially allowing the L-29 canal to reach a maximum stage of 8.5 ft
  - Benefits: provide additional hydrologic and ecological benefits to NESRS

**Other MWD projects:**
- Tamiami Trail Bridge: 1 mile bridge completed in 2012;
  - 2.6 mile bridge will be constructed soon

**Other South Dade projects:**
- Contract 8 and 8A: Full build out of Northern Detention Areas (NDA) and hydraulic connection from 8.5 SMA to NDA – currently under construction

**Other projects:**
- Rock Miner’s Seepage Barrier at L31N canal: 2 mile completed in 2012, additional 3 mile is almost complete

- **Increment 3 (2018-2021):**
  - Combined Operating Plan will guide operation of the MWD and C-111 South Dade project features.
Questions and Answers

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