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Development of an Interface Between the South Florida Water Management Model and a Fine-Resolution Hydrology Model of Everglades National Park

Kiren Bahm, Vincent DiFrenna (NPS)
Eric Swain and Melinda Lohmann (USGS)
Mike Kohler (SFWMD)

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South Florida Water Management Model (SFWMM)

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South Florida Water Management Model (SFWMM)

Fine-Resolution Hydrology Model of Everglades National Park (TIME)

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South Florida Water Management Model
(SFWMM)

Interface
(sfwmm2time)

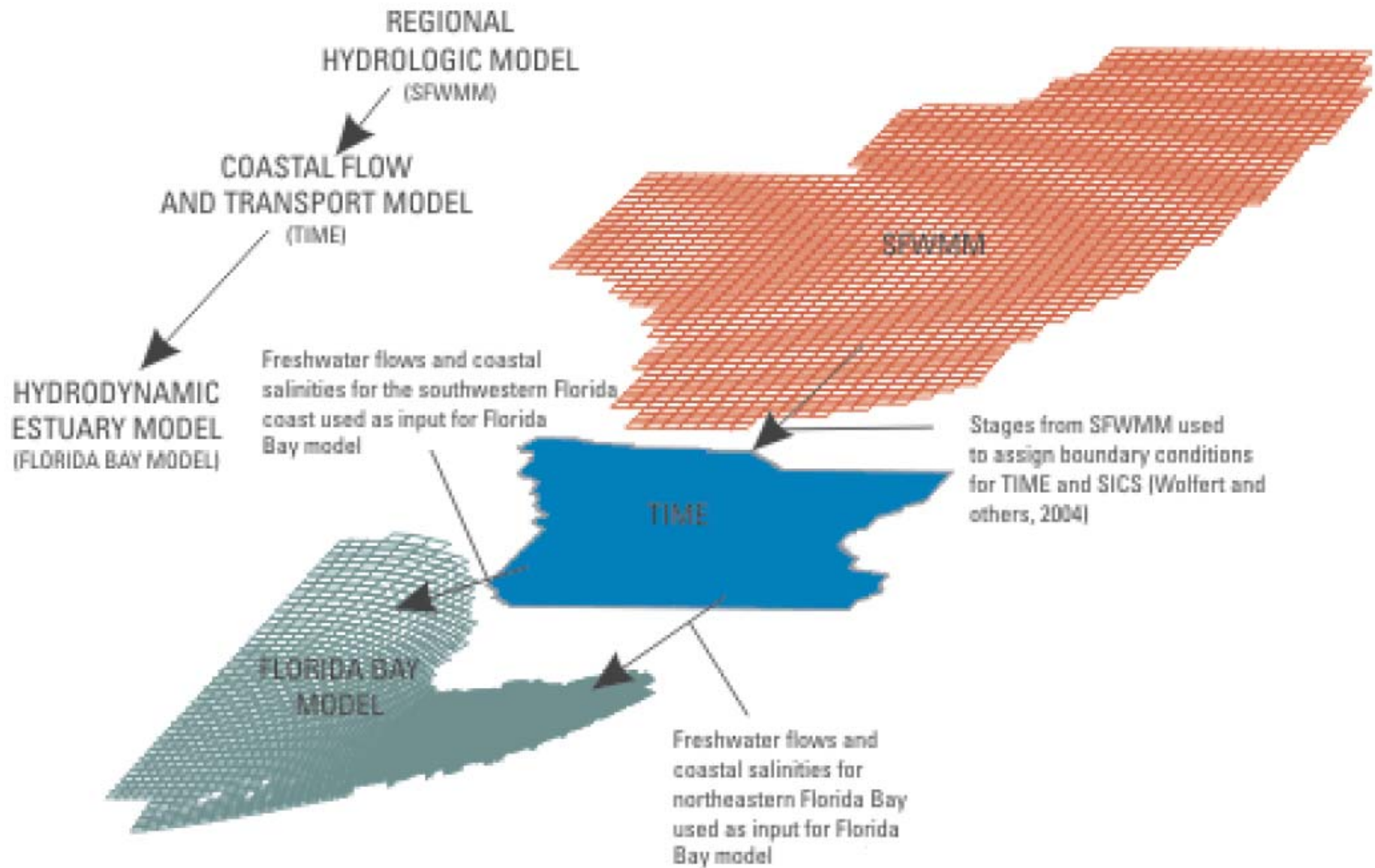
Fine-Resolution Hydrology Model of
Everglades National Park (TIME)

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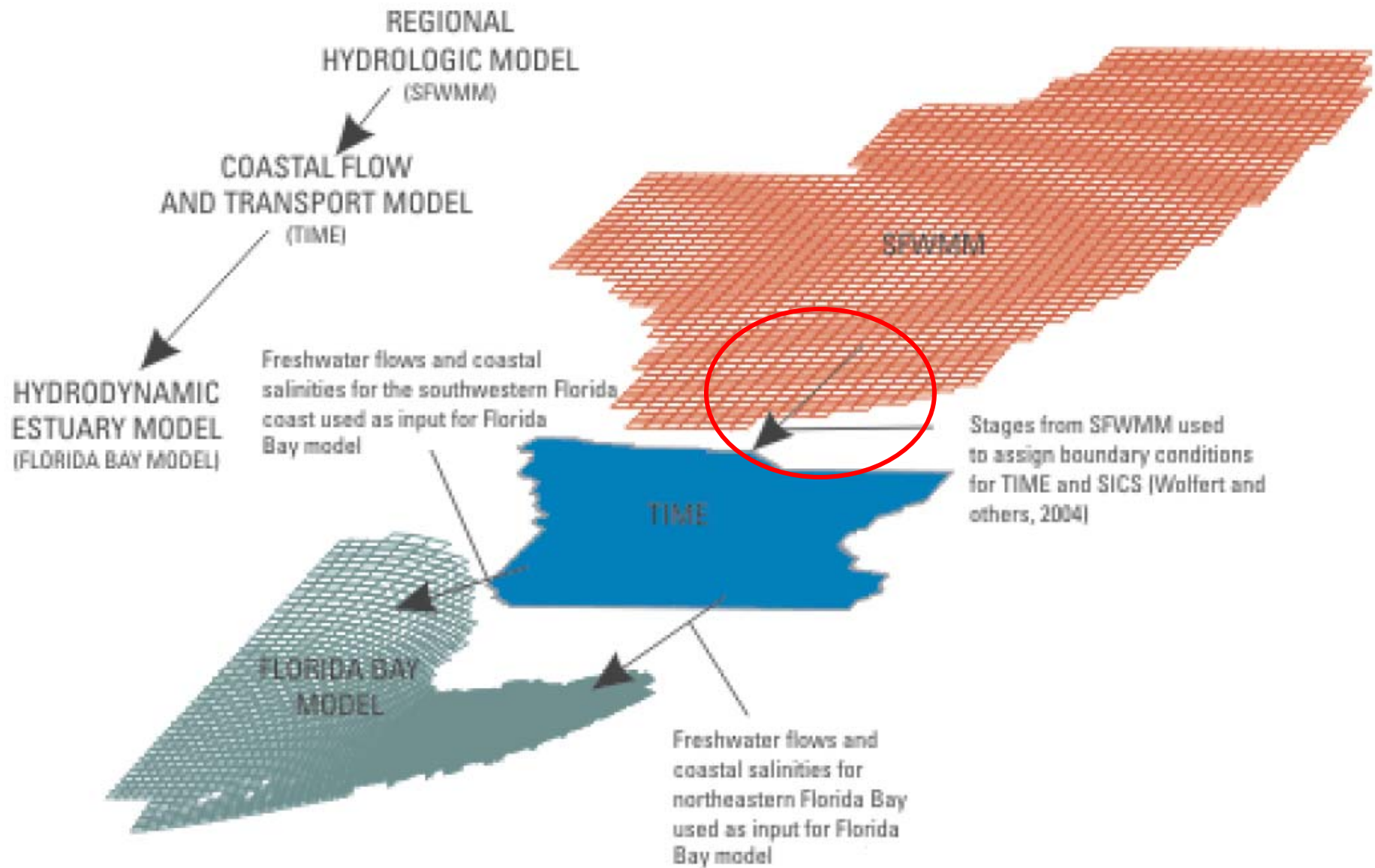
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South Florida Water Management Model
(SFWMM)

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South Florida Water Management Model
(SFWMM) **Has water control structures**

Interface
(sfwmm2time)

Fine-Resolution Hydrology Model of
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South Florida Water Management Model
(SFWMM) **Has water control structures**

Interface
(sfwmm2time)

Fine-Resolution Hydrology Model of
Everglades National Park (TIME)
Has no water control structures

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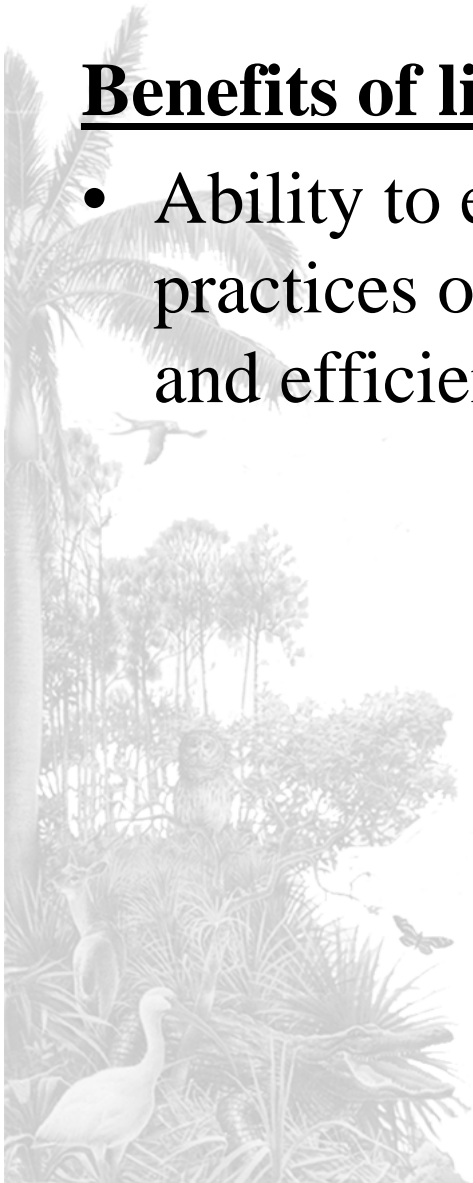
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Benefits of linking SFWMM and TIME:

- Ability to evaluate effects of water management practices on ENP by making new scenarios quickly and efficiently



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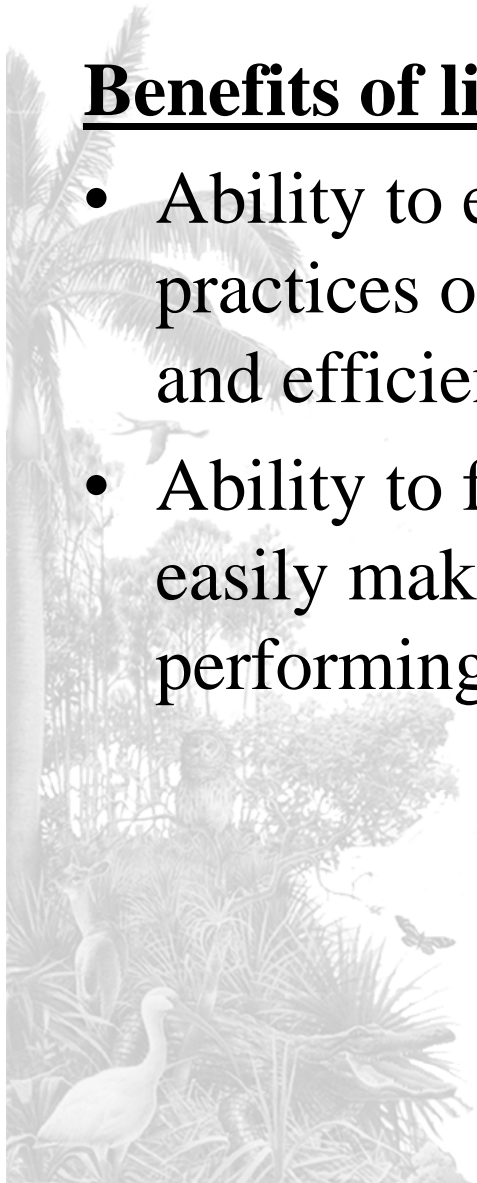
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Benefits of linking SFWMM and TIME:

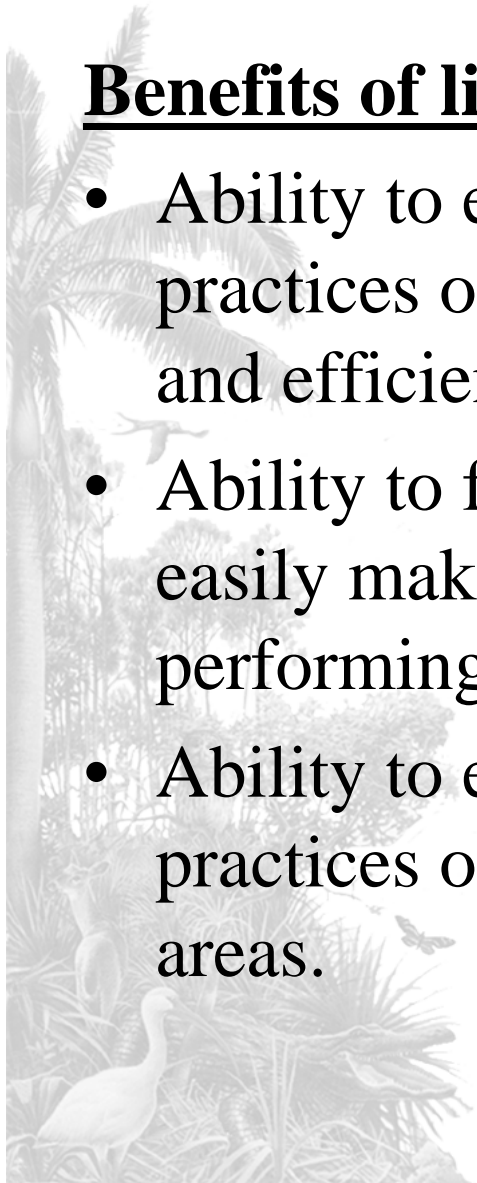
- Ability to evaluate effects of water management practices on ENP by making new scenarios quickly and efficiently
- Ability to fine-tune water management practices by easily making small changes in inputs and performing multiple sensitivity runs





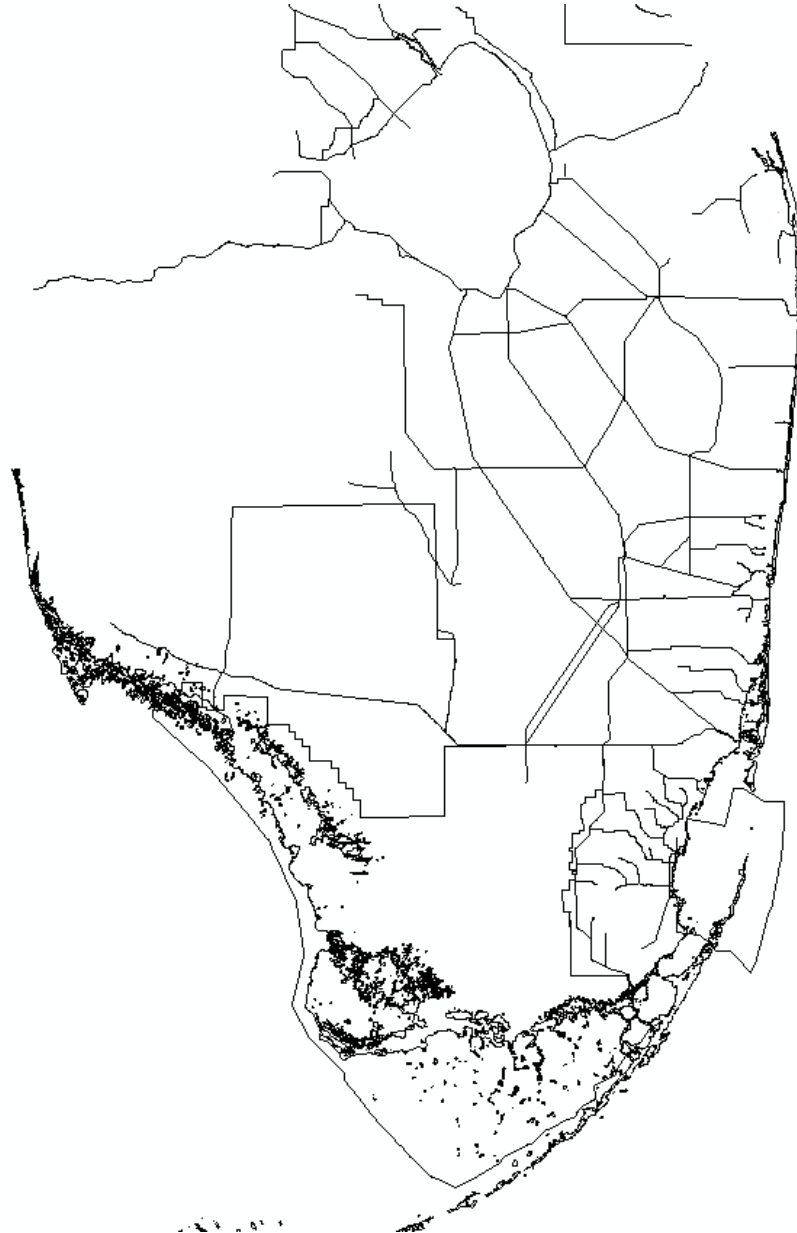
Benefits of linking SFWMM and TIME:

- Ability to evaluate effects of water management practices on ENP by making new scenarios quickly and efficiently
- Ability to fine-tune water management practices by easily making small changes in inputs and performing multiple sensitivity runs
- Ability to evaluate the effects of water management practices on flows to Florida Bay and other coastal areas.



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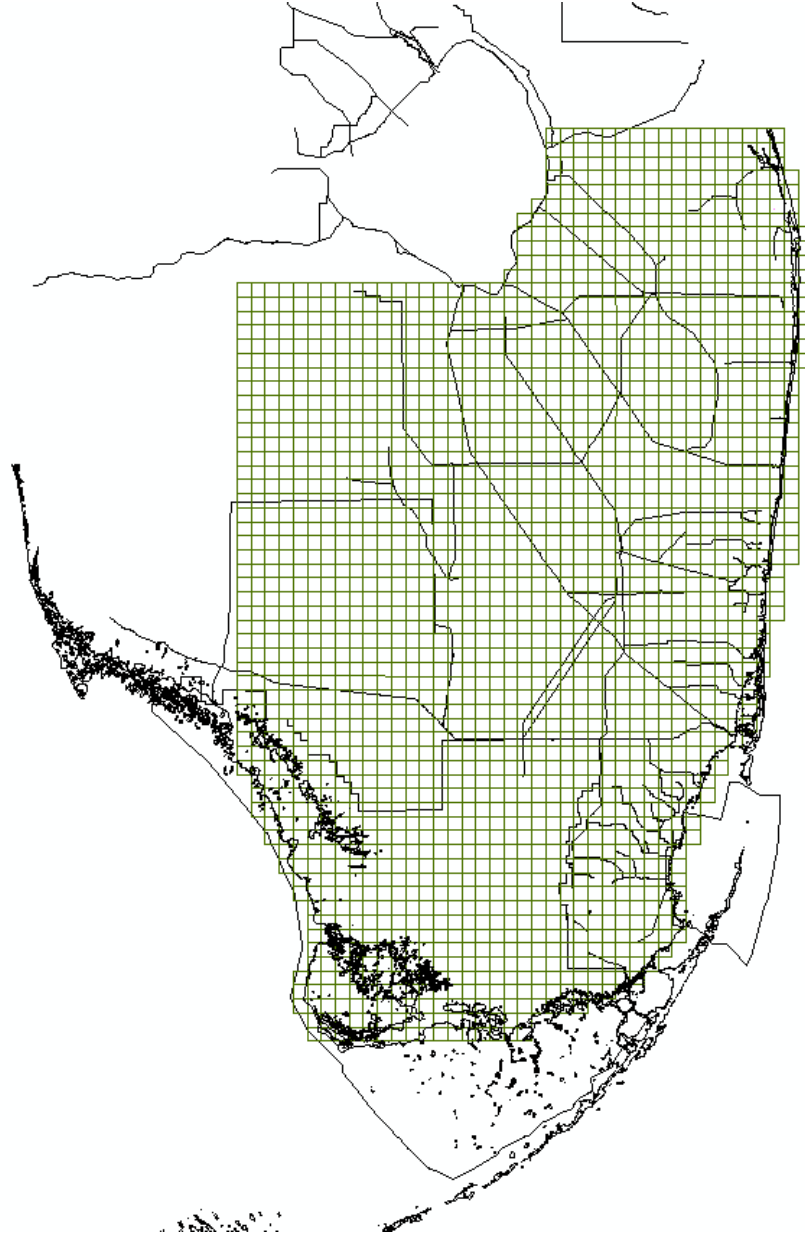
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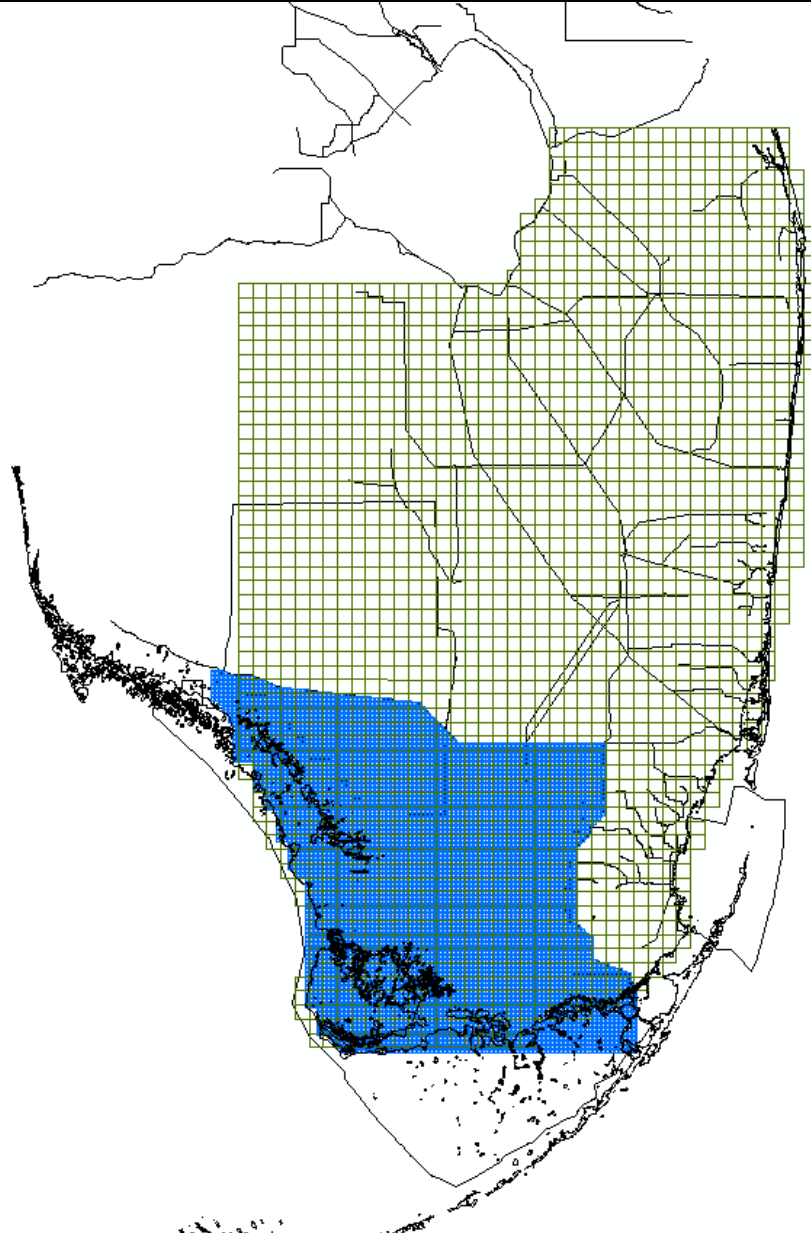
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SFWMM is used to evaluate water management decisions – hundreds of scenarios have been run

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SFWMM is used to evaluate water management decisions – hundreds of scenarios have been run

TIME by itself does not have the ability to evaluate water management decisions

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SFWMM is used to evaluate water management decisions – hundreds of scenarios have been run

TIME by itself does not have the ability to evaluate water management decisions

SFWMM2TIME allows us to evaluate predicted effects of water management decisions on Everglades National Park at a very high resolution, and predict freshwater flows to Florida Bay

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SFWMM to TIME

SFWMM

- **Has water Control Structures**
- UNIX platform
- NGVD 29
- 2mi cells
- Jan 1965 - Dec 2000
- vertical in feet
- daily timestep

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SFWMM to TIME

SFWMM

- **Has water Control Structures**
- UNIX platform
- NGVD 29
- 2mi cells
- Jan 1965 - Dec 2000
- vertical in feet
- daily timestep

TIME

- **Has no water control structures**
- PC platform
- NAVD 88
- 400 m cells
- Jan 1990 – Dec 2000
- vertical in meters
- daily timestep (groundwater)
- 10-min timestep (surface water)



SFWMM to TIME

Previous linkage between the SFWMM and TIME was done by manipulating data acquired from the IMC using Fortran programs, Excel spreadsheets, and utilities for manual extraction of SFWMM data.



Types of data used

- Cell-to-cell flow data (BC)
- Structure flow data (BC)
- Cell stage data (IC and BC)
- Reservoir leakage for S332 detention areas (BC)

BC = Boundary Conditions

IC = Initial Conditions



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SFWMM to TIME

‘SFWMM2TIME’ automates the process and consolidates it into one routine that is much easier for a user to understand and correctly implement.



SFWMM to TIME

‘SFWMM2TIME’:

- Written in Python using Fortran and DSSutl
- Can be used in PC or UNIX environment
- Converts straight from SFWMM binary and ascii output files to TIME input files
- Simple, user-friendly setup files
- Packaged with Python and DSSutl install files



SFWMM to TIME

SFWMM files needed:

- daily_str_flw.dss
- daily_stg_minus_lsel.bin
- daily_surface_flow.bin
- daily_gw_flw.bin
- daily_levee_spg.dat
- daily_r85sta_budg.dat
- daily_r332b_bud.dat
- daily_r332c_bud.dat
- daily_r332dn_bud.dat
- daily_r332ds_bud.dat

SFWMM must be run with certain flags set to make it output daily data.



SFWMM to TIME

TIME files generated:

inputflows.dat:

point/structure flows at model boundary
andsurface-water cell flows at model boundary

time.ghb: cell stages at model boundary

time.wel: groundwater leakage for reservoirs
and L31W canal

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SFWMM

daily_stage_minus_lsel.bin

daily_surface_flow.bin
daily_str_flw.dss

mthly_tot_seep_to_canal.bin
daily_x_budg.dat

where x is each reservoir in reservoirfile (excluding L31Ws)

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SFWMM

daily_stage_minus_lsel.bin

daily_surface_flow.bin
daily_str_flw.dss

mtlhy_tot_seep_to_canal.bin
daily_x_budg.dat

where x is each reservoir in reservoirfile (excluding L31Ws)

sfwmm2ghb.py

sfwmm2inputflows.py

sfwmm2wel.py

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SFWMM

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sfwmm2ghb.py

sfwmm2inputflows.py

sfwmm2wel.py

time.ghb

inputflows.dat

time.wel

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SFWMM

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Summary

- A procedure has been developed to produce TIME model input and boundary conditions directly from SFWMM output.



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- The procedure has been automated and can be applied to virtually any SFWMM scenario.



Summary

- A procedure has been developed to produce TIME model input and boundary conditions directly from SFWMM output.
- The procedure has been automated and can be applied to virtually any SFWMM scenario.
- Linking these models allows for fine-resolution analysis of effects of water management decisions on the hydrology of Everglades National Park and Florida Bay.

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