Climate Sensitivity Runs (DRAFT)

South Florida Water Management Model

SOUTH FLORIDA WATER MANAGEMENT DISTRICT

February 13, 2013

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Introduction

In view of the current projections of climate change and sea level rise, the concept of "stationarity" that the traditional planning efforts have used in the past is no longer appropriate. Current literature is abundant with projections of temperature and precipitation for the 21st century at the global scale but such information is not readily available or has been evaluated adequately for regional scales such as the Everglades. SFWMD has conducted some initial work on the evaluation of downscaled climate model projections of rainfall and temperature for the Everglades region (Obeysekera et al. 2011). A preliminary conclusion of this analysis was that the accuracy of the downscaled information may not be adequate for use in impact assessments. The present study was undertaken to provide a set of scenario runs that would be the basis for conversations among scientists and decision makers in order to identify the future work necessary to understand the implications of potential changes in the climate and sea level on Everglades Restoration. The results of this analysis should not be viewed as definite projections of what will occur but as bounds on what could happen in the greater Everglades region. The results should not be used beyond the Ecological Workshop that has been scheduled through the Center for Environmental Studies at the Florida Atlantic University.

The South Florida Water Management Model (SFWMM a.k.a 2x2), the premier regional-scale model being used for Everglades Restoration, was used to analyze the response of the south Florida system to changing climate conditions. As described later in this document, a baseline run and six scenarios have been run, each with varying rainfall and/or evapotranspiration (ET). The SFWMM estimates the response of the south Florida region (Figure 1) to these changing climate conditions. The model outputs were analyzed to produce standard Performance Measure (PM) sets that are traditionally used for the evaluation of regional hydrologic simulation of the 2x2 model. The performance measures include a myriad of metrics which are typically grouped by geographical areas.

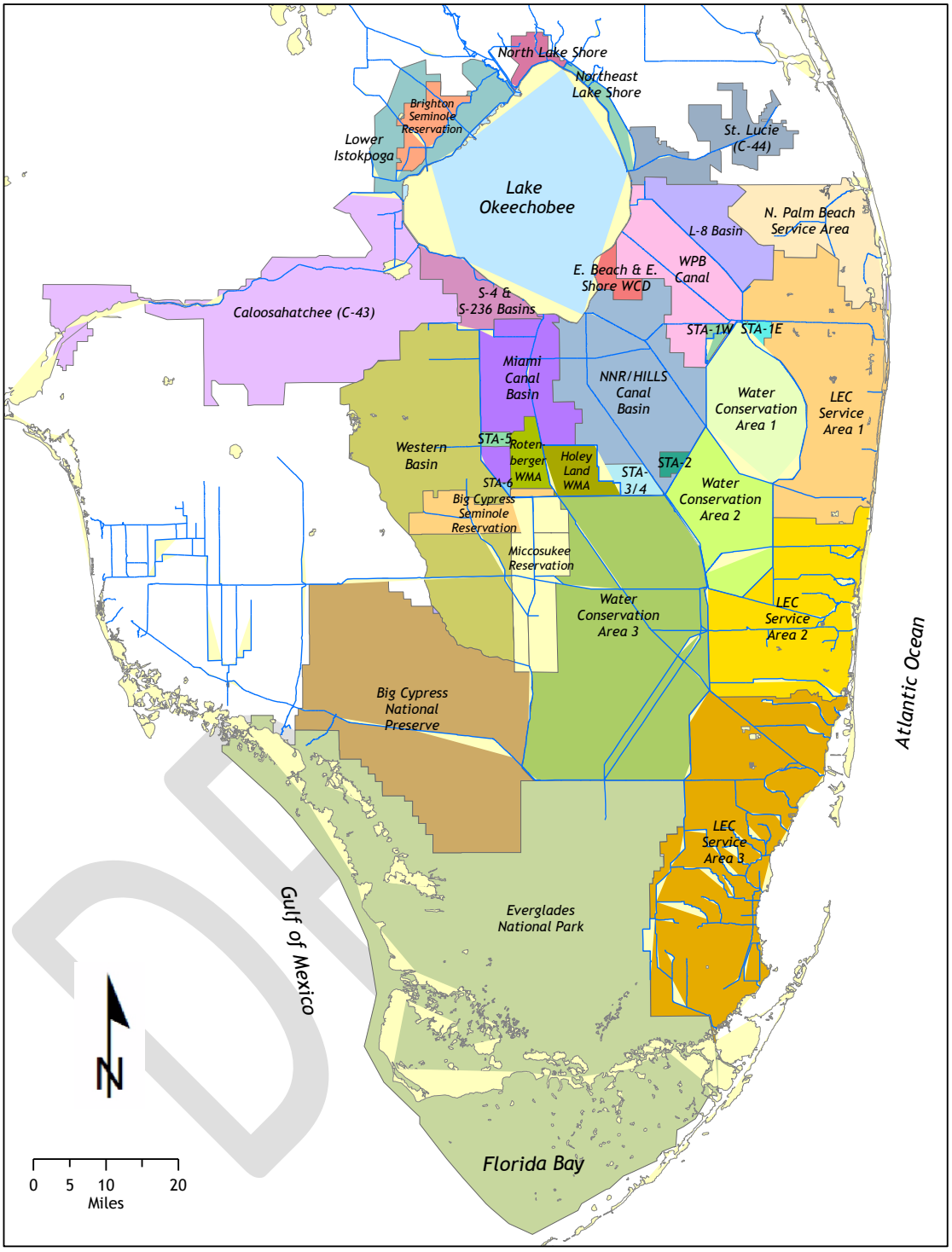

Figure 1. Regions within the Domain of the SFWMM

Rationale

Temperature and precipitation projections are based on the previous work reported in Obeysekera et al. (2011). This report is available from www.sfwmd.gov (->Scientists & Engineers->Technical Report and Publications-> Climate Change in South Florida). A summary of expected changes by circa 2050 is reproduced in Table 1. The sea level rise estimate is based on the SE Climate Compact report available from http://southeastfloridaclimatecompact.org/. Some of the relevant figures from these reports are reproduced in Figure 2.

Table 1. Summary of Median Climate Change for Circa 2050

Variable	GCM	Statistically Downscaled Data	Dynamically Downscaled Data
Average Temperature	1 to 1.5°C	1 to 2°C	1.8 to 2.1°C
Precipitation	-10% to +10%	-5% to +5%	-3 to 2 inches
Reference Crop Evapotranspiration			3 to 6 inches

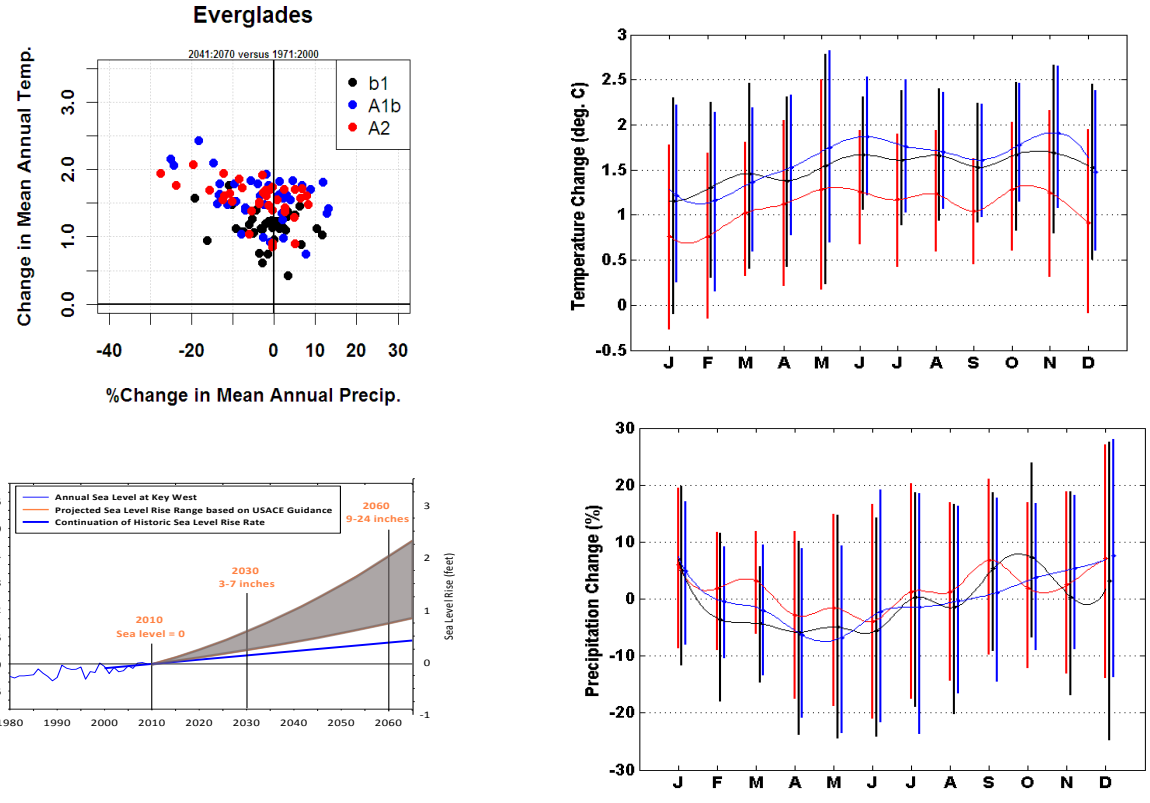

Figure 2. Projections of precipitation, temperature, and sea level rise for the 2050-2060 time frame from (a) analysis of statistically downscaled data (upper left panel); (b) GCM data for the SE region (two right panels); and (c) unified sea level rise projections of the SE Climate Compact (lower left panel).

Scenario Details

Seven scenarios have been run to look at the system response to the following combinations of climate variations:

1. 2010 Baseline (demands and land use corresponding to 2010 simulated with the 1965-2005 rainfall & ET)
2. 2010 Baseline with 10% decrease in rainfall (decRF)
3. 2010 Baseline with 10% increase in rainfall (incRF)
4. 2010 Baseline with 1.5° Celsius increase and 1.5 foot sea level rise with increased coastal canal levels (incET)
5. 2010 Baseline with 10% decrease in rainfall, 1.5° Celsius increase and 1.5 foot sea level rise with increased coastal canal levels (decRFincET)
6. 2010 Baseline with 10% decrease in rainfall, 1.5° Celsius increase and 1.5 foot sea level rise with no increased coastal canal levels (decRFincETnoC)
7. 2010 Baseline with 10% increase in rainfall, 1.5° Celsius increase and 1.5 foot sea level rise with increased coastal canal levels (incRFincET)

Temperature increase is incorporated by estimating the increased evapotranspiration (ET) using the temperature-based method for computing solar radiation. Rainfall data was uniformly increased or decreased by 10% (the "delta method"). Once this updated rainfall and ET data was created it was then used to model demands and runoff for areas around Lake Okeechobee and the Lower East Coast. These updated datasets were then used as input to the SFWMM. It should be noted that, depending on the scenario, boundary inflows to the systems have been altered.

Most of the model runs with increased ET include a 1.5 foot sea level rise. In order to maximize the protection for the freshwater interface and as a buffer for sea level rise, coastal canal levels were increased to the maximum flood control levels. The canals which were modified include: Hillsboro Canal, C-11 Canal, C-13 Canal, LWDD, C-6 Canal, C-7 Canal, S-148U, C-102, C-103S, C-111E, C-9, C-12, C-4, C-51, C-51S, C-14E and the Pompano Canal. Scenario 6 (decRFincETnoC) includes sea level rise but does not include the increase of the maintenance levels of coastal canals.

The input files which were updated to include new climate data are:

- dmdro.dss
- ETp_1965-2005_17stn_plsLOK.dat (ET scenarios only)
- rain_v3.0_beta_tin_14_05_nsm_wmm.bin (rainfall scenarios only)
- flow.dss
- daily_et_input.bin
- daily_nirrdmd.bin
- monthly_lok_et_rf_1965-2005.dat
- pdsi_14_05.dat (rainfall scenarios only)
- weekly_excess_pdsi_lonin.prn

These scenarios were modeled with updated inflows and outflows based on potential climate regimes but, other than canal level increase, no operational differences exist between runs. It would be likely that, in the future, operations of the flood control system would be modified to adapt to changing climatic conditions. Lake Okeechobee follows a regulation schedule which may be modified to allow for less stringent regulatory releases if inflows to the lake were to be reduced. The LOOPS model would be ideal to test modified operations for Lake Okeechobee. The iModel

may be used to assist with modifying structure operations south of Lake Okeechobee. Both are tools available at SFWMD.

Links to Performance Measure Sets

ftp://ftp.sfwmd.gov/pub/jabarne/climate/

ftp://ftp.sfwmd.gov/pub/jabarne/climate/PM_Base_decRF_incET_decRFincET_decRFincETnoC

ftp://ftp.sfwmd.gov/pub/jabarne/climate/PM_Base_incRF_incET_incRFincET

ftp://ftp.sfwmd.gov/pub/jabarne/climate/PM_Base_incRFincET_decRFincET_decRFincETnoC

Summary of Results

SFWMM results will be described in this section relative the 2010 Baseline. Only relative differences are noted here and alternate climate scenarios will not be compared to each other. This is high level summary and does not contain explanations for all differences.

Lake Okeechobee

Lake Okeechobee is the main driver of the south Florida regional water supply. The official Lake Okeechobee Minimum Flow & Level (MFL) is defined as "an event is when the stage falls below 11 feet NGVD for more than 80 consecutive or non-consecutive days during an 18-month period that does not include more than one wet season (May 31- Oct 31)."

decRF

- stage decreases up to 1.7 feet
- +11 Minimum Flow & Level exceedances
- -2 high stage exceedances (above 17 ft. NGVD)
- +11 low stage exceedances (below 11 ft. NGVD)

incRF

- stage increases up to 1.5 feet
- -5 Minimum Flow & Level exceedances
- +6 high stage exceedances (above 17 ft. NGVD)
- -6 low stage exceedances (below 11 ft. NGVD)

incET

- stage decreases up to 1.7 feet
- +10 Minimum Flow & Level exceedances
- -2 high stage exceedances (above 17 ft. NGVD)
- +14 low stage exceedances (below 11 ft. NGVD)

decRFincET

- stage decreases up to 6.0 feet
- +23 Minimum Flow & Level exceedances

- 0 high stage exceedances (above 17 ft. NGVD)
- +7 stage exceedances (below 11 ft. NGVD)

decRFincETnoC

- stage decreases up to 6.0 feet
- +23 Minimum Flow & Level exceedances
- 0 high stage exceedances (above 17 ft. NGVD)
- +8 stage exceedances (below 11 ft. NGVD)

incRFincET

- stage is almost identical to the Base
- +1 Minimum Flow & Level exceedance
- no change in high stage exceedances (above 17 ft. NGVD)
- +1 low stage exceedances (below 11 ft. NGVD)

Caloosahatchee & St. Lucie Estuaries

The MFL for the Caloosahatchee is as follows "suggested flow criteria for the Caloosahatchee Estuary MFL average monthly flow of greater than or equal to 300 cfs at S-79". There is not an MFL for the St. Lucie Estuary but there is a target to decrease high regulatory flows to the Estuary.

decRF

- -295,000 acre-feet/year to Caloosahatchee Estuary
- +72 MFL exceedances for Caloosahatchee Estuary
- -116,000 acre-feet/year to St. Lucie Estuary
- -3 times mean monthly flow between 2000 & 3000 cfs to St. Lucie Estuary
- -24 times mean monthly flow greater than 3000 cfs to St. Lucie Estuary

incRF

- +368,000 acre-feet/year to Caloosahatchee Estuary
- -41 MFL exceedances for Caloosahatchee Estuary
- +175,000 acre-feet/year to St. Lucie Estuary
- +16 times mean monthly flow between 2000 & 3000 cfs to St. Lucie Estuary
- +21 times mean monthly flow greater than 3000 cfs to St. Lucie Estuary

incET

- -271,000 acre-feet/year to Caloosahatchee Estuary
- +54 MFL exceedances for Caloosahatchee Estuary
- -108,000 acre-feet/year to St. Lucie Estuary
- +2 times mean monthly flow between 2000 & 3000 cfs to St. Lucie Estuary
- -23 times mean monthly flow greater than 3000 cfs to St. Lucie Estuary

decRFincET

- -442,000 acre-feet/year to Caloosahatchee Estuary
- +180 MFL exceedances for Caloosahatchee Estuary
- -160,000 acre-feet/year to St. Lucie Estuary
- -9 times mean monthly flow between 2000 & 3000 cfs to St. Lucie Estuary
- -33 times mean monthly flow greater than 3000 cfs to St. Lucie Estuary

decRFincETnoC

- -440,000 acre-feet/year to Caloosahatchee Estuary
- +180 MFL exceedances for Caloosahatchee Estuary
- -159,000 acre-feet/year to St. Lucie Estuary
- -8 times mean monthly flow between 2000 & 3000 cfs to St. Lucie Estuary
- -33 times mean monthly flow greater than 3000 cfs to St. Lucie Estuary

incRFincET

- +9,000 acre-feet/year to Caloosahatchee Estuary
- -1 MFL exceedances for Caloosahatchee Estuary
- +11,000 acre-feet/year to St. Lucie Estuary
- No change to mean monthly flow between 2000 & 3000 cfs to St. Lucie Estuary
- +2 times mean monthly flow greater than 3000 cfs to St. Lucie Estuary

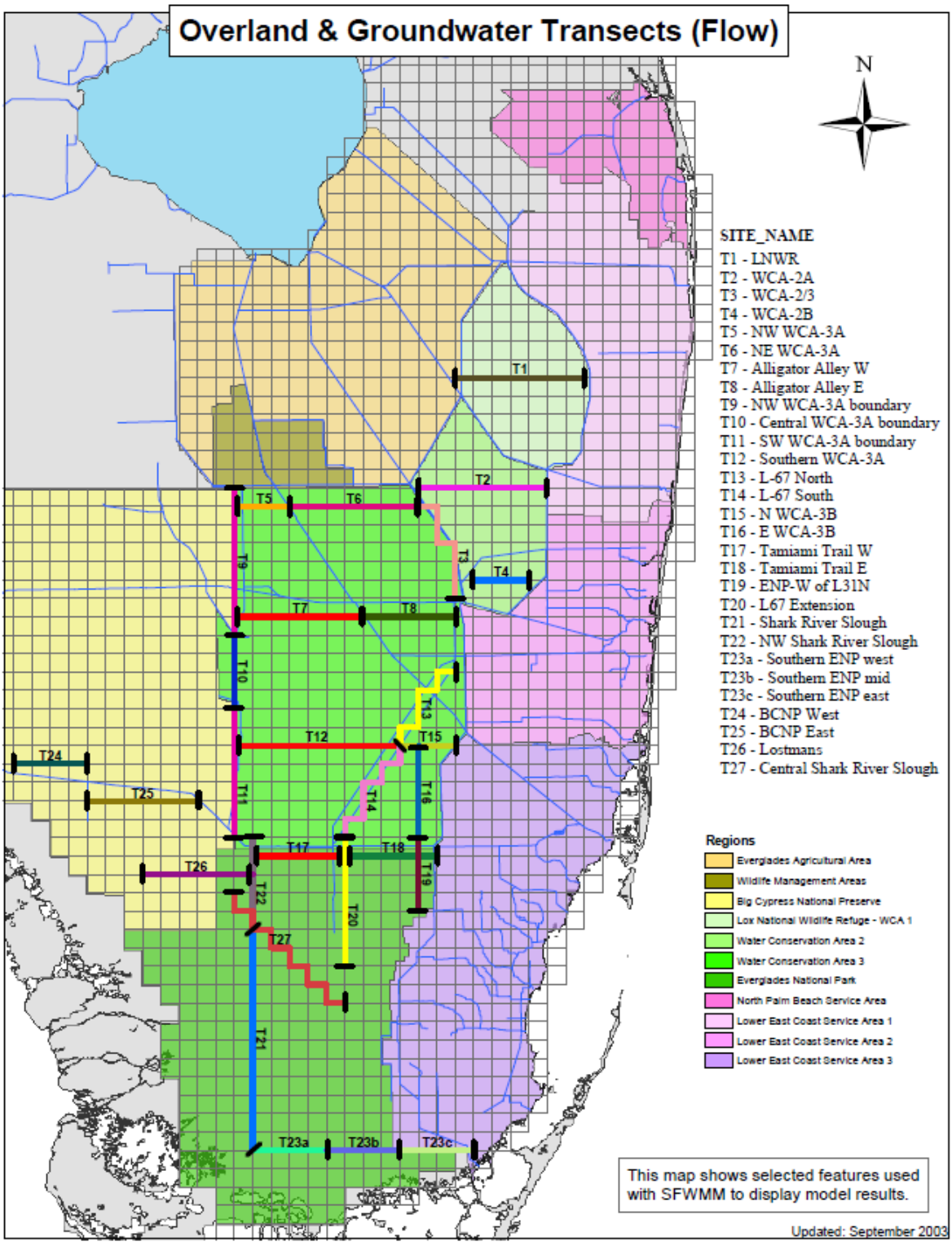

Figure 3. Overland Flow Transects with SFWMM Regions

Water Conservation Areas

The water conservation areas consist of WCA-1, WCA-2 (WCA-2A and WCA-2B). WCA-3 (WCA-3A and WCA-3B), see Figure 6. Each conservation area is managed between the minimum operating level as designated by their floor elevations and the top of their respective regulation schedules. This floor elevation is the lowest level at which no water from the perimeter or internal canals will intrude into the marsh. For each drop of water supply the WCAs deliver to the LECSAs beyond their floor elevation a drop of water is delivered to the WCAs from Lake Okeechobee. The floor elevation for WCA-1 is 14.0 feet NGVD 1929, the floor elevation for WCA-2 is 10.5 feet NGVD 1929 and the floor elevation for WCA-3 is 7.5 feet NGVD 1929. The WCAs receive water from rainfall and ideally only receive treated water from the Stormwater Treatment Areas (STAs) upstream.

Table 2. Base Condition Overland Flow Transect Volumes with Differences from the Base Condition

1,000 ac-ft/yr	1	2	4	5	6	7	8	10	12	15	16
Base (total)	74	299	92	245	68	477	507	77	824	168	-153
decRF (delta)	-13	-111	-24	-66	-26	-171	-142	-27	-327	-91	+42
incRF (delta)	+11	+119	+9	+62	+29	+173	+71	+4	+244	+25	-29
incET (delta)	-7	-58	-11	-41	-15	-103	-78	-10	-182	-45	+20
decRFincET (delta)	-23	-167	-45	-107	-39	-269	-285	-39	-550	-139	+85
decRFincETnoC (delta)	-23	-166	-45	-107	-39	-266	-273	-39	-535	-136	+85
incRFincET (delta)	+3	+58	+4	+28	+13	+80	+29	+8	+111	+20	-13

decRF

- Water Conservation Area 1 water levels decrease up to 0.40 feet
- Water Conservation Area 2A water levels decrease up to 0.40 feet
- Water Conservation Area 2B water levels decrease up to 3.0 feet
- Water Conservation Area 3A north end water levels decrease up to 0.20 feet
- Water Conservation Area 3A south end water levels decrease up to 0.70 feet
- Water Conservation Area 3B north end water levels decrease up to 1.0 feet
- Water Conservation Area 3B west central end water levels decrease up to 0.70 feet
- Water Conservation Area 3B east central end water levels decrease up to 1.5 feet
- Water Conservation Area 3B south end water levels decrease up to 0.9 feet

incRF

- Water Conservation Area 1 water levels increase up to 0.25 feet
- Water Conservation Area 2A water levels increase up to 0.25 feet
- Water Conservation Area 2B water levels increase up to 1.5 feet
- Water Conservation Area 3A north end water levels increase up to 0.50 feet
- Water Conservation Area 3A south end water levels increase up to 0.75 feet
- Water Conservation Area 3B north end water levels increase up to 0.80 feet
- Water Conservation Area 3B west central end water levels increase up to 0.50 feet
- Water Conservation Area 3B east central end water levels increase up to 1.10 feet
- Water Conservation Area 3B south end water levels increase up to 0.70 feet

incET

- Water Conservation Area 1 water levels decrease up to 0.10 feet
- Water Conservation Area 2A water levels decrease up to 0.10 feet
- Water Conservation Area 2B water levels decrease up to 1.5 feet
- Water Conservation Area 3A north end water levels decrease up to 0.10 feet
- Water Conservation Area 3A south end water levels decrease up to 0.30 feet
- Water Conservation Area 3B north end water levels decrease up to 1.0 feet
- Water Conservation Area 3B west central end water levels decrease up to 0.75 feet
- Water Conservation Area 3B east central end water levels decrease up to 0.8 feet
- Water Conservation Area 3B south end water levels decrease up to 0.6 feet

decRFincET

- Water Conservation Area 1 water levels decrease up to 0.8 feet
- Water Conservation Area 2A water levels decrease up to 0.7 feet
- Water Conservation Area 2B water levels decrease up to 4.0 feet
- Water Conservation Area 3A north end water levels decrease up to 0.5 feet
- Water Conservation Area 3A south end water levels decrease up to 1.5 feet
- Water Conservation Area 3B north end water levels decrease up to 1.5 feet
- Water Conservation Area 3B west central end water levels decrease up to 1.0 feet
- Water Conservation Area 3B east central end water levels decrease up to 2.2 feet
- Water Conservation Area 3B south end water levels decrease up to 1.5 feet

decRFincETnoC

- Water Conservation Area 1 water levels decrease up to 0.8 feet
- Water Conservation Area 2A water levels decrease up to 0.7 feet
- Water Conservation Area 2B water levels decrease up to 4.0 feet
- Water Conservation Area 3A north end water levels decrease up to 0.5 feet
- Water Conservation Area 3A south end water levels decrease up to 1.5 feet
- Water Conservation Area 3B north end water levels decrease up to 1.5 feet
- Water Conservation Area 3B west central end water levels decrease up to 1.0 feet
- Water Conservation Area 3B east central end water levels decrease up to 2.3 feet
- Water Conservation Area 3B south end water levels decrease up to 1.5 feet

incRFincET

- Water Conservation Area 1 water levels increase by 0.10 feet
- Water Conservation Area 2A water levels increase by 0.10 feet
- Water Conservation Area 2B water levels increase by 0.25 to 0.50 feet
- Water Conservation Area 3A north end water levels increase up to 0.10 feet
- Water Conservation Area 3A south end water levels increase up to 0.25 feet
- Water Conservation Area 3B north end water levels increase up to 0.40 feet

- Water Conservation Area 3B west central end water levels increase up to 0.20 feet
- Water Conservation Area 3B east central end water levels increase up to 0.40 feet
- Water Conservation Area 3B south end water levels increase up to 0.15 feet

Everglades National Park

Below is a summary of the results for Everglades National Park.

Table 3. Base Condition Overland Flow Transect Volumes with Differences from the Base Condition

1,000 ac-ft/yr	17	18	19	20	21	22	23	23a	23b	23c	27
Base (total)	692	131	-117	7	675	133	154	19	67	68	730
decRF (delta)	-381	-9	+28	+23	-347	-84	-68	-8	-31	-29	-384
incRF (delta)	+502	-9	-22	-36	+419	+128	+79	+11	+37	+31	+476
incET (delta)	-230	-10	+17	+13	-188	-52	-33	-22	-11	0	-234
decRFincET (delta)	-513	-82	+50	+17	-468	-109	-99	-27	-41	-31	-486
decRFincETnoC (delta)	-506	-30	+47	+20	-461	-107	-103	-27	-41	-35	-523
incRFincET (delta)	+216	-9	-9	-9	+205	+53	+39	-17	+25	+30	+200

decRF

- 8.5 square mile area water levels decrease up to 0.5 feet
- Pennsuco Wetlands water levels decrease up to 1.0 feet
- C-111 Basin water levels decrease up to 0.5 feet
- Rocky Glades water levels decrease up to 0.7 feet
- N.W. Shark River Slough water levels decrease up to 0.7 feet
- N.E. Shark River Slough water levels decrease up to 0.7 feet
- Central Shark River Slough water levels decrease up to 0.5 feet
- NP-205 water levels decrease up to 0.7 feet
- NP-206 water levels decrease up to 1.0 feet
- NP-33 water levels decrease up to 0.5 feet
- Taylor Slough water levels decrease up to 0.4 feet

incRF

- 8.5 square mile area water levels increase up to 0.75 feet
- Pennsuco Wetlands water levels increase up to 0.9 feet
- C-111 Basin water levels increase up to 0.3 feet
- Rocky Glades water levels increase up to 0.7 feet
- N.W. Shark River Slough water levels increase up to 0.7 feet
- N.E. Shark River Slough water levels increase up to 0.3 feet
- Central Shark River Slough water levels increase up to 0.3 feet
- NP-205 water levels increase up to 0.7 feet

- NP-206 water levels increase up to 0.8 feet
- NP-33 water levels increase up to 0.4 feet
- Taylor Slough water levels increase up to 0.3 feet

incET

- 8.5 square mile area water levels decrease up to 0.2 feet
- Pennsuco Wetlands water levels decrease up to 0.7 feet
- C-111 Basin water levels slight decrease and increase up to 0.7 feet
- Rocky Glades water levels decrease up to 0.5 feet
- N.W. Shark River Slough water levels decrease up to 0.5 feet
- N.E. Shark River Slough water levels decrease up to 0.5 feet
- Central Shark River Slough water levels decrease up to 0.25 feet
- NP-33 water levels decrease up to 0.25 feet
- NP-205 water levels decrease up to 0.5 feet
- NP-206 water levels decrease up to 0.7 feet
- Taylor Slough water levels increase up to 0.7 feet

decRFincET

- 8.5 square mile area water levels decrease up to 0.75 feet
- Pennsuco Wetlands water levels decrease up to 1.8 feet
- C-111 Basin water levels decrease up to 0.3 feet and increase up to 0.3 feet
- Rocky Glades water levels decrease up to 1.1 feet
- N.W. Shark River Slough water levels decrease up to 1.4 feet
- N.E. Shark River Slough water levels decrease up to 1.1 feet
- Central Shark River Slough water levels decrease up to 1.0 feet
- NP-33 water levels decrease up to 0.7 feet
- NP-205 water levels decrease up to 1.3 feet
- NP-206 water levels decrease up to 1.6 feet
- Taylor Slough water levels increase up to 0.5 feet

decRFincETnoC

- 8.5 square mile area water levels decrease up to 0.75 feet
- Pennsuco Wetlands water levels decrease up to 2.0 feet
- C-111 Basin water levels decrease up to 0.3 feet and increase up to 0.3 feet
- Rocky Glades water levels decrease up to 1.1 feet
- N.W. Shark River Slough water levels decrease up to 1.4 feet
- N.E. Shark River Slough water levels decrease up to 1.1 feet
- Central Shark River Slough water levels decrease up to 1.0 feet
- NP-33 water levels decrease up to 0.7 feet

- NP-205 water levels decrease up to 1.3 feet
- NP-206 water levels decrease up to 1.6 feet
- Taylor Slough water levels increase up to 0.5 feet

incRFincET

- 8.5 square mile area water levels increase up to 0.4 feet
- Pennsuco Wetlands water levels increase up to 0.25 feet
- C-111 Basin water levels increase up to 0.7 feet
- Rocky Glades water levels increase up to 0.4 feet
- N.W. Shark River Slough water levels increase up to 0.25 feet
- N.E. Shark River Slough water levels increase up to 0.3 feet
- Central Shark River Slough water levels increase up to 0.15 feet
- NP-33 water levels increase up to 0.2 feet
- NP-205 water levels increase up to 0.3 feet
- NP-206 water levels increase up to 0.5 feet
- Taylor Slough water levels increase up to 0.8 feet

Lower East Coast Service Area

The Lower East Coast Service Area (LECSA) contains multiple canals which are maintained at designated levels when possible. Some are maintained for water supply purposes while others are not allowed to go above their flood control levels. The SFWMM results show that the LECSA canals are well maintained even under the most extreme condition. The increased ET runs include 1.5 foot sea level rise, this has the effect of raising the tidal boundary along the eastern and southern boundaries but does not explicitly model the freshwater/saltwater interface. Increased water levels near the coast may be have increased salinity levels. The SFWMM does a good job of providing the flood protection needed within the canals toward the southern end of the LECSA. In some scenarios where there is increased rainfall and also increased ET there are flood control discharges made from the LECSA to the WCA's. Water levels increase where they are able to so the results show higher water levels toward the north and almost no change in the south where there are flood control restraints.

decRF

- Slightly lower water levels within the regional canal system
- Decreased regulatory flows to tide
- Decreased water levels within the West Palm Beach Catchment Area up to 1.0 foot
- Decreased water levels at Taylor trigger cell by 1.0 foot

incRF

- Slightly higher water levels within the regional canal system
- Increased water levels at Deerfield trigger cell by .5 foot
- Increased regulatory flows to tide

- Increased water levels within the West Palm Beach Catchment Area

incET

- Increased water levels at Highland Beach trigger cell by 1.5 feet
- Increased water levels at Boca Raton trigger cell by 1.5 feet
- Increased water levels at Ft. Lauderdale Airport trigger cell by 1.5 feet
- Increased water levels at Hollywood trigger cell by 1.5 feet
- Increased water levels at Miami trigger cell by 1.0 foot
- Increased water levels at Homestead trigger cell by 1.0 foot
- Increased water levels at Model Lands by 1.0 foot
- C-9 canal increases up to .6 foot

decRFincET

- Increased water levels at Highland Beach trigger cell by 1.5 feet
- Increased water levels at Boca Raton trigger cell by 1.5 feet
- Increased water levels at Ft. Lauderdale Airport trigger cell by 1.5 feet
- Increased water levels at Hollywood trigger cell by 1.5 feet
- Increased water levels at Miami trigger cell by 1.0 foot
- Increased water levels at Homestead trigger cell by 1.0 foot
- Increased water levels at Model Lands by 1.0 foot
- C-9 canal increases up to .6 foot

decRFincETnoC

- Increased water levels at Highland Beach trigger cell by 1.5 feet
- Increased water levels at Boca Raton trigger cell by 1.5 feet
- Increased water levels at Ft. Lauderdale Airport trigger cell by 1.5 feet
- Increased water levels at Hollywood trigger cell by 1.5 feet
- Increased water levels at Miami trigger cell by 1.0 foot
- Increased water levels at Homestead trigger cell by 1.0 foot
- Increased water levels at Model Lands by 1.0 foot
- C-9 canal increases up to .6 foot

incRFincET

- Increased water levels at Highland Beach trigger cell by 1.5 feet
- Increased water levels at Boca Raton trigger cell by 1.5 feet
- Increased water levels at Ft. Lauderdale Airport trigger cell by 1.5 feet
- Increased water levels at Hollywood trigger cell by 1.5 feet
- Increased water levels at Miami trigger cell by 1.0 foot
- Increased water levels at Homestead trigger cell by 1.0 foot
- Increased water levels at Model Lands by 1.0 foot
- C-9 canal increases up to .6 foot

Water Supply

The demands within the SFWMM differ as follows:

Table 4. Summary of the Demand and Runoff Changes for the Climate Sensitivity Scenarios

1,000 ac-ft/yr	BASE	decRF	incRF	incET	decRFincET	decRFincETnoC	incRFincET
Palm Beach County Irrigation	208.8	214.9	196.4	205.0	210.6	210.6	191.6
Broward County Irrigation	160.6	165.2	150.5	163.9	168.3	168.3	152.8
Miami-Dade County Irrigation	230.7	240.5	220.0	241.3	251.1	251.1	229.2
EAA	308.7	371.0	276.4	385.6	497.6	495.3	328.3
C-43 Demand	107.4	123.4	92.5	122.2	140.2	140.2	106.3
C-43 Runoff	712.6	520.4	914.5	636.4	452.8	452.8	831.6
C-44 Demand	24.3	29.3	20.5	29.4	35.6	35.6	24.8
C-44 Runoff	166.4	122.6	213.1	147.2	106.5	106.5	191.9
Istokpoga-AB Demand	2.5	2.8	2.5	2.9	3.1	3.1	2.7
Istokpoga-AB Runoff	2.0	1.6	2.0	1.8	1.4	1.4	2.3
Istokpoga-BB Demand	3.5	3.8	3.2	4.0	4.3	4.3	3.7
Istokpoga-BB Runoff	2.3	1.8	2.9	2.1	1.6	1.6	2.6
North Lake Shore Demand	0.5	0.5	0.4	0.6	0.6	0.6	0.5
North Lake Shore Runoff	0.4	0.3	0.6	0.4	0.3	0.3	0.5
Northeast Lake Shore Demand	5.3	6.0	4.7	6.2	7.0	7.0	5.5
Northeast Lake Shore Runoff	5.2	3.8	6.8	4.6	3.2	3.2	6.1
S4 Disston Demand	22.6	25.0	20.6	25.9	28.6	28.6	23.6
S4 Disston Runoff	16.9	12.6	21.7	15.2	11.1	11.1	19.7
S4 Other Demand	11.9	13.5	10.6	13.7	15.4	15.4	12.2
S4 Other Runoff	29.2	22.0	37.0	26.5	19.7	19.7	33.9

A summary of the water supply results is presented here:

decRF

- C-43 demands increase by 16,000 acre-feet/year, demand not met increases by 14.2%
- C-44 demands increase by 4,900 acre-feet/year, demand not met increases by 15.9%
- North Palm Beach Service Area local trigger cutbacks increase by 2 months
- Lower East Coast Service Area 1 local trigger cutbacks increase by 21 months
- Lower East Coast Service Area 2 local trigger cutbacks increase by 4 months
- Lake Okeechobee in Supply Side Management 34 more months
- Local and SSM cutback dry season carryover increase of up to 88 months

incRF

- C-43 demands decrease by 14,500 acre-feet/year, demand not met decreases by 4.4%
- C-44 demands decrease by 3,900 acre-feet/year, demand not met decreases by 4.8%
- Lower East Coast Service Area 2 local trigger cutbacks decrease by 4 months
- Lake Okeechobee in Supply Side Management up to 5 less months
- Local and SSM cutback dry season carryover decrease of up to 19 months

incET

- C-43 demands increase by 15,000 acre-feet/year, demand not met increases by 14.4%
- C-44 demands increase by 5,000 acre-feet/year, demand not met increases by 16.0%
- Lake Okeechobee in Supply Side Management 33 more months
- SSM cutback dry season carryover increase of 47 months

decRFincET

- C-43 demands increase by 33,000 acre-feet/year, demand not met increases by 33.7%
- C-44 demands increase by 11,200 acre-feet/year, demand not met increases by 36.3%
- Lake Okeechobee in Supply Side Management 81 more months
- SSM cutback dry season carryover increase of 110 months

decRFincETnoC

- C-43 demands increase by 33,000 acre-feet/year, demand not met increases by 33.3%
- C-44 demands increase by 11,200 acre-feet/year, demand not met increases by 35.9%
- Lake Okeechobee in Supply Side Management 80 more months
- SSM cutback dry season carryover increase of 110 months

incRFincET

- C-43 demands decrease by 1,000 acre-feet/year, demand not met increases by 0.8%
- C-44 demands increase by 400 acre-feet/year, demand not met increases by 0.9%
- Lower East Coast Service Area 2 local trigger cutbacks decrease by 19 months
- Lake Okeechobee in Supply Side Management up to 2 more months
- SSM cutback dry season carryover decrease of up to 29 months

Summary

The SFWMM scenarios show a wide variety of results for climate sensitivity. Scenarios with increased ET have increased sea level as well. These scenarios have unique results wherein the LECSA has a surplus of water in most cases while the natural areas may be in need of water. Increased ET along with a decrease in rainfall creates the most dramatic effect on the natural system and the ability to provide water supply for human and environmental needs. Further analysis is required to provide any detailed conclusions from these model runs.

References

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