South Florida Basins (SFBasins) Implementation

Documentation of Management Features

Office of Modeling
South Florida Water Management District

Randy Van Zee, Chief Hydrologic Modeler

February 21, 2007

Contents

List of Figures

List of Tables

Chapter 1

Introduction

The evaluation of infrastructure changes and operational strategies envisioned by the Comprehensive Everglades Restoration Plan (CERP) and new water supply plans requires a regional simulation model with unprecedented flexibility and extensibility. Applying the RSM at a basin scale is the first step in establishing the RSM as an appropriate model for evaluating these types of regional scenarios. The SFBasins implementation conceptualizes south Florida hydrology in a manner similar to the SFRRM (Figure 1.1).

The SFBasins implementation conceptualizes the south Florida system as an interconnected collection of lakes and basins. The water supply and flood control needs are assessed for each lake and basin. These needs are addressed regionally by water supply and flood control releases through the managed watermovers that connect the associated lakes and basins. The assessor based approach uses WcuAssessors to assess needs for a Water Control Unit (WCU). A WCU can be a lake, basin, canal reach (assembly of canal segments) or mesh (assembly of cells). Managed watermovers are represented by "mseNodes" and are associated with corresponding watermovers in the Hydrologic Simulation Engine (HSE). The WCU's and mseNodes together define an MSE Network.

The assessor based approach is "WCU-centric" in that needs are quantified at the WCU level and operational response releases at the mseNodes are set the WCU level. The SFBasins implementation includes the following lake WCU's:

1. Lake Okeechobee

2. Water Conservation Area 1

3. Water Conservation Area 2a

4. Water Conservation Area 2b

5. Water Conservation Area 3a

6. Water Conservation Area 3b

The SFBasins implementation includes the following basin WCU's:

1. Big Cypress National Preserve
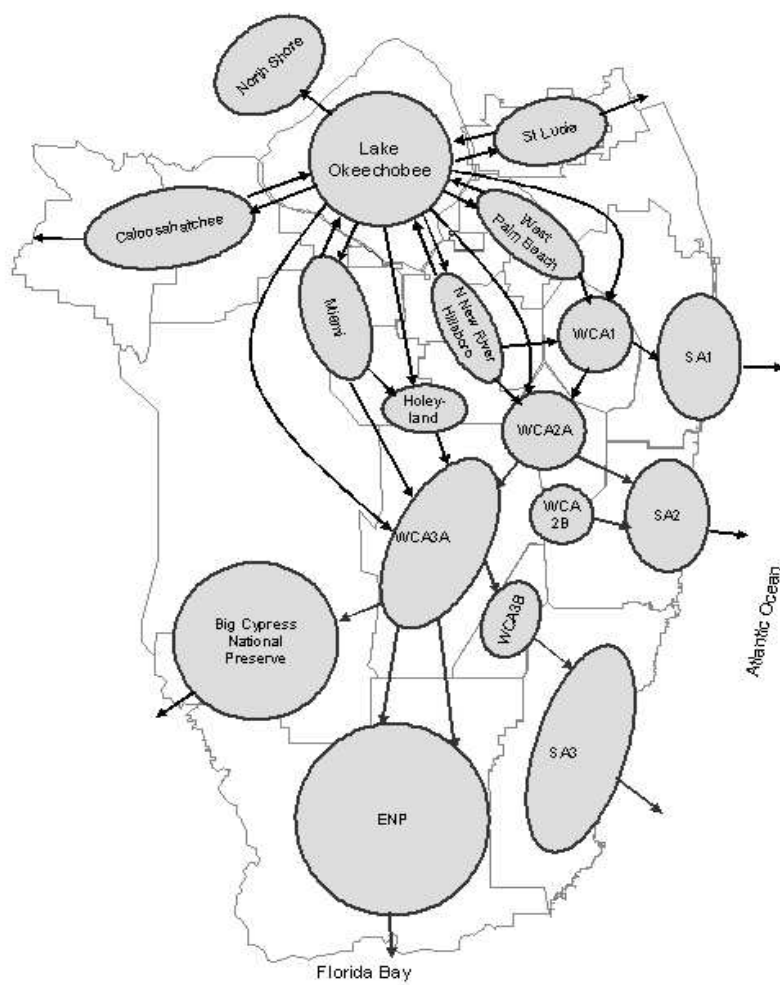
Figure 1.1: SFBasins Implementation.

2. Service Area 3 (Miami-Dade County)

3. Everglades National Park

4. Caloosahatchee River Basin

5. St Lucie River Basin

6. Service Area 1 (Palm Beach County)

7. Service Area 2 (Broward County)

8. Miami (Everglades Agricultural Area)

9. Holeyland

10. Hillsboro - North New River (Everglades Agricultural Area)

11. West Palm Beach (Everglades Agricultural Area)

12. S4 Basin (Everglades Agricultural Area)

13. S236 Basin (Everglades Agricultural Area)

14. 298 Districts (Everglades Agricultural Area)

15. Brighton Reservation

16. Lake Okeechobee Public Water Supply

17. L8 Basin

The regional coordination of operational releases is addressed in two ways. First, a "regional manager" is used to set management constraints for water supply and/or flood control releases at selected mseNodes. To types of regional managers are used in the SFBasins implementation. The Decision Tree Manager is used to implement lake regulation schedules for flood control. Regulation schedules are comprised of management zones that prescribe operational responses for a defined set of hydrologic conditions. The EaaSSM manager is used to implement the Supply Side Management (SSM) Plan for the Lake Okeechobee Service Area (LOSA). LOSA is comprised of 10 basins and their water supply from Lake Okeechobee falls under SSM control during droughts.

Regional coordination is also address through the sequence in which water supply and flood control assessors are processed. Water supply assessors are first processed from downstream to upstream to propagate water supply needs to the most upstream source(s). The water supply assessors are processed a second time in reverse order (upstream to downstream) to impose cutback allocations on water supply releases from a WCU's outlet(s) when supply or flow through capacity is limited. The order in which water supply needs are assessed is depicted graphically in Figure 1.2. The columns are used to indicate the "staging" which must occur, to ensure that all downstream water supply needs have been fully accounted for before moving upstream to the next WCU.

The SFBasins implementation is described by inspecting each lake and basin WCU, and identifying their relevant management specifications. Lakes are described in Chapter 2 and basins are described in Chapter 3.

```
                                                              ┌──────────┐
                                                              │ stlucie  │
                                                              └────┬─────┘
                                                                   ▼
                                                              ┌──────────┐
                                                              │ caloosa  │
                                                              └────┬─────┘
                                                                   ▼
                                                              ┌──────────┐
                                                              │  miami   │
                                                              └────┬─────┘
                                                                   ▼
                                                              ┌──────────┐
                                                              │ hillsnnr │
                                                              └────┬─────┘
                                                                   ▼
                 ┌──────┐                                     ┌──────────┐
                 │ enp  │                                     │   wpb    │
                 └──┬───┘                                     └────┬─────┘
                    ▼                                              ▼
                 ┌──────┐      ┌──────┐      ┌──────┐         ┌──────────┐                 ┌──────┐
                 │ sa3  │      │ sa2  │      │ sa1  │         │ s4basin  │                 │  lo  │
  ┌────────┐     └──┬───┘      └──┬───┘      └──┬───┘         └────┬─────┘                 └──────┘
  │ wca2b  │        ▼             ▼             ▼                  ▼
  └────────┘     ┌──────┐      ┌──────┐      ┌──────┐         ┌──────────┐
                 │wca3b │      │wca2a │      │ wca1 │         │ s236basin│
                 └──┬───┘      └──────┘      └──────┘         └────┬─────┘
                    ▼                                              ▼
                 ┌──────┐                                     ┌──────────┐
                 │wca3a │                                     │ 298dist  │
                 └──────┘                                     └────┬─────┘
                                                                   ▼
                                                              ┌──────────┐
                                                              │ brighton │
                                                              └────┬─────┘
                                                                   ▼
                                                              ┌──────────┐
                                                              │   lops   │
                                                              └────┬─────┘
                                                                   ▼
                                                              ┌──────────┐
                                                              │ holeyland│
                                                              └──────────┘
```

process columns left to right →
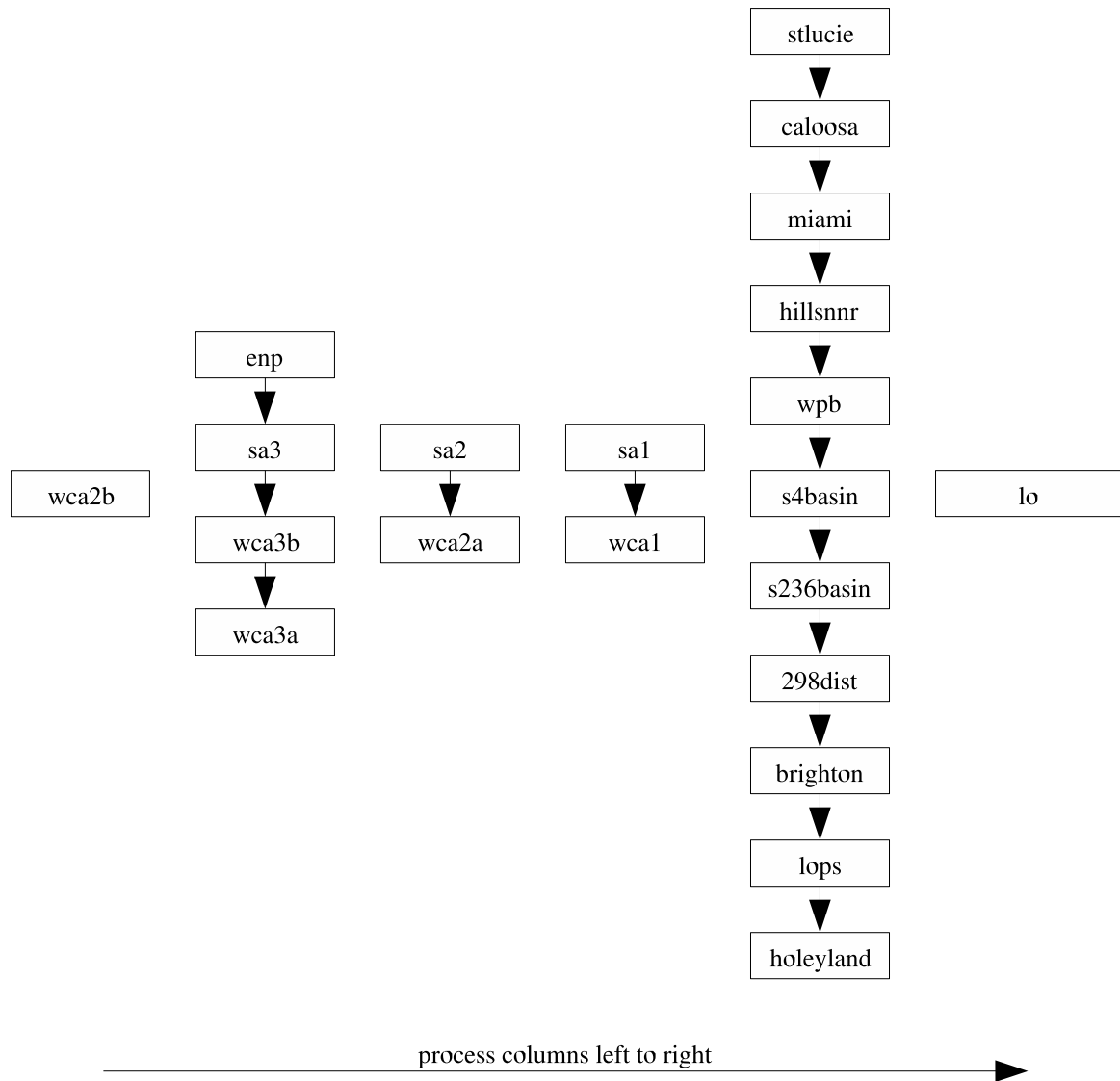
Note: arrows denote order of processing only

Figure 1.2: Process order for water supply assessors.

Likewise, flood control assessors are processed in order, from upstream to downstream to propagate flood waves generated from the most upstream WCU through the network to the most downstream WCU(s). The order in which flood control needs are assessed is depicted graphically in Figure 1.3. Again, the columns are used to indicate the staging which must occur, so all of flood control releases upstream of a WCU have been accounted for before moving downstream to the next WCU. The impact of a flood control release on downstream WCU's can be assessed using the "recursion" option. This feature tests the impact of flood control release on downstream WCU's and reduces the flood control release if needed to avoid adverse impacts.
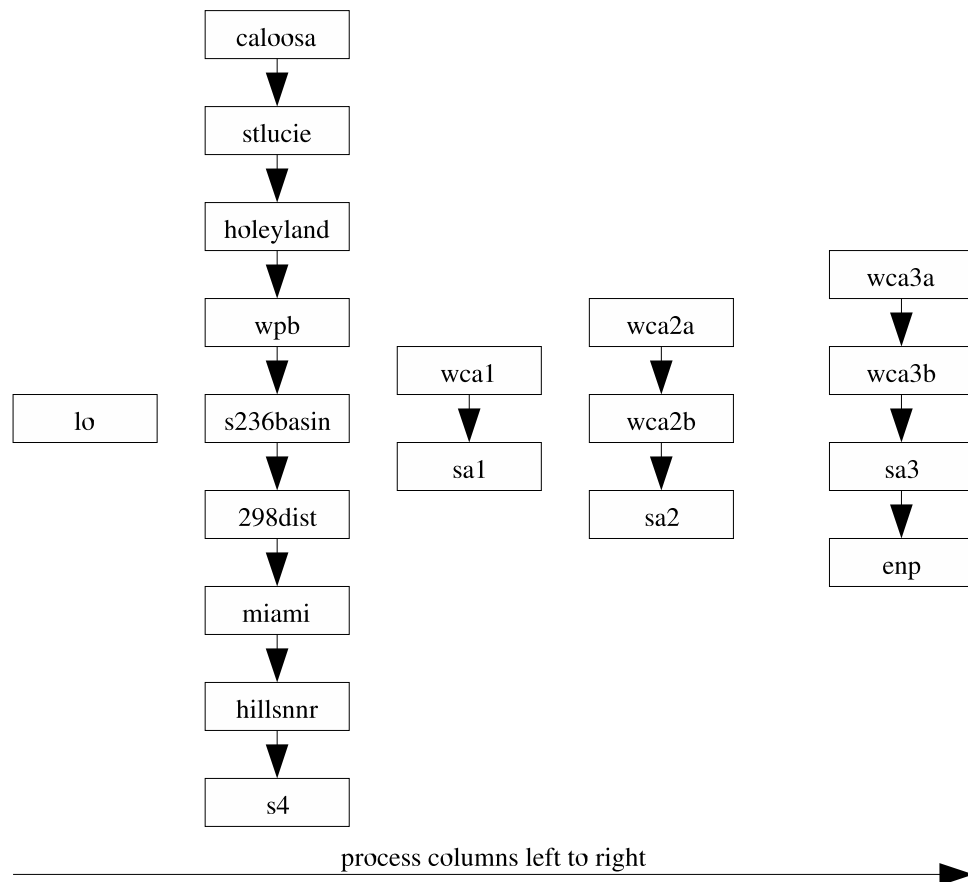
Note: arrows denote order of processing only

Figure 1.3: Process order for flood control assessors.

Chapter 2

Lakes

Lakes are generally viewed as reservoirs and most of the lakes in the SFBasins serve as a source for water supply and a destination for flood control releases. There are limits to how much water can be released downstream for water supply or delivered from upstream for flood control. These limits are specified through regional managers and operational constraints on placed inlets and outlets. The RSM provides a variety of ways to optimize the performance of the system, protect resources and manage risk. Each lake is managed differently in response to different physical characteristics, needs, goals and objectives established for the respective lakes.

2.1   Lake Okeechobee

Lake Okeechobee is managed for water supply and flood control. A summary of Lake Okeechobee management specifications are presented in Figure 2.1.

A standard LakeWS assessor is applied to the lake. There are no water supply inlets defined for the lake, therefore no assessment of water supply need is required (maintLevel and localLevel are not defined). The lake is the primary source of irrigation for the Lake Okeechobee Service Area (LOSA). A regional manager is used to impose the Supply Side Management (SSM) Plan to all of the LOSA subbasins. The SSM manager assesses the total demand on Lake Okeechobee from LOSA, and rations releases at the respective water supply outlets as dictated by the SSM Plan through management constraints. BMP Makeup Water releases from the lake to Wca1, Wca2a and Wca3a are implemented as minimum flow constraints on the lo2wca1, lo2wca2a and lo2wca3a outlets. The regional manager is used to set management constraints on BMP Makeup Water releases if the water level in the downstream water conservation area is above schedule.

The pulse package is included in the LakeFC assessor. This is needed to handle pulse release hydrographs at s308 and s77. The flood control excess in the lake is based the water level relative to fcLevel. Releases at the flood control outlets are subject to management constraints imposed by a regional manager through a collection of decision trees. The decision trees simulate the operational controls specified by the "run25" regulation schedule.

Table 2.1: Lake Okeechobee

WCU Parameter	Specification
type	lake
id	400101
HPM	litZoneET
BC	MDS (lakesource); culvert 10A (lakesource)

WcuAssessor	package	Special Instructions
LakeWS	default	LOSA outlets subject to SSM
LakeFC	pulse	fcLevel set by rule curve (#500); pulse releases at s77 and s308

mseNode	Location	Purpose	Special Instructions	Regional Manager
lo2wca1	outlet	wsfc	minflow (BMP makeup water)	DT(ws); DT(fc)
lo2wca2a	outlet	wsfc	minflow (BMP makeup water)	DT(ws); DT(fc)
lo2wca3a	outlet	wsfc	minflow (BMP makeup water)	DT(ws); DT(fc)
s77	outlet	wsfc	pulse release	SSM(ws); DT(fc)
s308	outlet	wsfc	pulse release	SSM(ws); DT(fc)
s354	outlet	ws		SSM(ws);
s351	outlet	ws		SSM(ws);
s352	outlet	ws		SSM(ws);
s4	outlet	ws		SSM(ws);
s236	outlet	ws		SSM(ws);
298	outlet	ws		SSM(ws);
brightonWS	outlet	ws		SSM(ws);
lopsWS	outlet	ws		SSM(ws);
lo2hl	outlet	ws		

Table 2.2: Water Conservation Area 1

WCU Parameter	Specification
type	lake
id	400102
HPM	litZoneET
BC	MDS (lakesource); s5as (lakesource); L40 (ormLevee)

WcuAssessor	package	Special Instructions
LakeWS	default	localLevel set to constant (14.0 ft)
LakeFC	default	fcLevel set by rule curve (#600); outlets in priority order

mseNode	Location	Purpose	Special Instructions	Regional Manager
lo2wca1	inlet	wsfc	minflow (BMP makeup water)	DT(ws); DT(fc)
s6	inlet	fc		
s5a	inlet	fc		
s10	outlet	fc	tailwater head limited by rule curve (#651); flood control priority 2	DT(fc);
s39	outlet	wsfc	flood control priority 1	DT(fc);

2.2   Water Conservation Area 1

Water Conservation Area 1 (Wca1) is managed for water supply and flood control. A summary of Wca1 management specifications is presented in Table 2.2.

A standard LakeWS assessor is used to set water supply releases at the inlet (lo2wca1) and outlet (s39). If the water level in Wca1 is above the localLevel, demand at s39 is met by local storage in Wca1. If water level is below the localLevel, all s39 demands are passed through to lo2wca1. A minimum flow constraint is placed on lo2wca1 to satisfy "BMP Makeup Water" criteria. A regional manager is used to set a management constraint on this flow if water level in Wcu1 is above schedule.

A standard LakeFC assessor is used to set releases at the flood control outlets (s39 and s10). Flood control excess in Wcu1 is based on the water level relative to fcLevel. Flood control releases to s39 have a higher priority than releases to s10. Releases at s10 are also limited by tailwater constraints. A regional manager is used to set management constraints on s39 flood control releases based on rainfall received in Service Area 1 and on s10 based on water levels in the downstream water conservation areas.

2.3   Water Conservation Area 2a

Water Conservation Area 2a (Wca2a) is managed for water supply and flood control. A summary of Wca2a management specifications is presented in Table 2.3.

A standard LakeWS assessor is used to set water supply releases at the inlet (lo2wca2a) and outlets

Table 2.3: Water Conservation Area 2a

WCU Parameter	Specification
type	lake
id	400103
HPM	litZoneET
BC	MDS (lakesource); L36N (ormLevee); L36S (orm-Levee); L35B (ormLevee)

WcuAssessor	package	Special Instructions
LakeWS	default	
LakeFC	default	fcLevel set by rule curve (#650); outlets in priority order

mseNode	Location	Purpose	Special Instructions	Regional Manager
lo2wca2a	inlet	wsfc	minflow (BMP makeup water)	DT(ws); DT(fc)
s10	inlet	fc	tailwater head limited by rule curve (#651); flood control priority 2	DT(fc);
s11	outlet	wsfc	tailwater head limited by rule curve (#704); flood control priority 2	DT(fc);
s34s38	outlet	wsfc	flood control priority 1	DT(ws); DT(fc);

(s34s38 and s11). Thresholds are not specified for maintLevel or localLevel so no water supply needs are passed to the water supply inlet, i.e., all water needs at the outlets are met by local storage in Wca2a. A minimum flow constraint is placed on lo2wca2a to satisfy "BMP Makeup Water" criteria. A regional manager is used to set a management constraint on this flow if water level in Wcu2a is above schedule. Another management constraint is placed on water supply releases at s34s38 to establish a floor elevation in Wca2a, below which water supply releases are cutoff.

A standard LakeFC assessor is used to set releases at the flood control outlets (s34s38 and s11). Flood control excess in Wcu2a is based on the water level relative to fcLevel. Flood control releases to s34s38 have a higher priority than releases to s11. Releases at s11 are limited by tailwater constraints. A regional manager is used to set management constraints on s34s38 flood control releases based on rainfall received in Service Area 2 and on s11 based on water levels in the downstream water conservation areas.

2.4 Water Conservation Area 2b

Water Conservation Area 2b (Wca2b) is managed for water supply and flood control. A summary of Wca2b management specifications is presented in Table 2.4.

A standard LakeWS assessor is used to set water supply releases at the inlet (wca2b_borrow). A maintainace level is set to a constant 6.9 ft. This LakeWS assessor was added to "solve" an infrequent mass violation error Wca2b. This problem dates back to the SFRRM and is a result of large negative MDS boundary flows when water levels in Wca2b are low. The MDS approach starts to break down when the capacity of the lake is relatively small, and not all the flows are well defined. By adding this water supply

Table 2.4: Water Conservation Area 2b

WCU Parameter	Specification
type	lake
id	400104
HPM	litZoneET
BC	MDS (lakesource); L35A (ormLevee); L35B (ormLevee)

WcuAssessor	package	Special Instructions
LakeWS	default	maintLevel set to constant (6.9 ft)
LakeFC	default	fcLevel set to constant (10.5 ft);

mseNode	Location	Purpose	Special Instructions	Regional Manager
wca2b_borrow	inlet	ws		
s141	outlet	fc		

assessor the volume of water needed to bring the water level up to maintLevel is computed and assigned to a mythical wca2b_borrow inlet. The borrow volumes must be then inspected to determine whether the MDS assumptions for Wca2b need to be revisited.

A standard LakeFC assessor is used to set releases at the flood control outlet (s141). Flood control excess in Wcu2b is based on the water level relative to fcLevel.

2.5 Water Conservation Area 3a

Water Conservation Area 3a (Wca3a) is managed for water supply and flood control. A summary of Wca3a management specifications is presented in Table 2.5.

A standard LakeWS assessor is used to set water supply releases at the inlets (lo2wca3a and s11) and outlets (s12, s333, and s151). If the water level in Wca3a is above the localLevel, demand at the water supply outlets is met by local storage in Wca3a. If water level is below the localLevel, all demands at the water supply are passed through to the inlets. By default, the demand is apportioned between lo2wca3a and s11 based on their relative capacity. A minimum flow constraint is placed on lo2wca3a to satisfy "BMP Makeup Water" criteria. A regional manager is used to set a management constraint on this flow if water level in Wcu3a is above schedule. Another management constraint is placed on water supply releases at s151 to establish a floor elevation in Wca3a, below which water supply releases are cutoff.

The wca3a package is included in the LakeFC assessor. This is needed to implement the Wca3a regulation schedule. Parts of the regulation schedule can be simulated through the regional manager through management constraints applied to flood control outlets. Other parts, such as the coordinated flood control releases to Everglades National Park through s12 and s333 must be handled within the LakeFC assessor itself.

Table 2.5: Water Conservation Area 3a

.

WCU Parameter	Specification
type	lake
id	400105
HPM	litZoneET
BC	MDS (lakesource); L67 (ormLevee); L37 (ormLevee)

.

WcuAssessor	package	Special Instructions
LakeWS	default	localLevel set to constant (7.5 ft)
LakeFC	wca3a	fcLevel by rule curve (#700); s12 and s333 releases set by regulation schedule

.

mseNode	Location	Purpose	Special Instructions	Regional Manager
lo2wca3a	inlet	wsfc	minflow (BMP makeup water)	DT(ws); DT(fc)
s11	inlet	wsfc	tailwater head limited by rule curve (#704); flood control priority 2	DT(fc);
s12	outlet	wsfc		DT(fc)
s151	outlet	wsfc		DT(ws); DT(fc)
s333	outlet	wsfc		DT(fc);
s343	outlet	wsfc		DT(fc);
l67gap	outlet	fc	unmanaged	

Table 2.6: Water Conservation Area 3b

.

WCU Parameter	Specification
type	lake
id	400106
HPM	litZoneET
BC	MDS (lakesource); L30 (ormLevee); L67 (ormLevee); L33 (ormLevee)

.

WcuAssessor	package	Special Instructions
LakeWS	default	localLevel set to constant (99.0 ft)
LakeFC	default	fcLevel by rule curve (#750)

.

mseNode	Location	Purpose	Special Instructions
s151	inlet	wsfc	
l67gap	inlet	fc	unmanaged
s31	outlet	wsfc	

2.6   Water Conservation Area 3b

Water Conservation Area 3b (Wca3b) is managed for water supply and flood control. A summary of Wca3b management specifications is presented in Table 2.6.

A standard LakeWS assessor is used to set water supply releases at the inlet (s151) and outlet (s31). The localLevel is set to a very high level so all demands on s31 are passed through to s151.

A standard LakeFC assessor is used to set releases at the flood control outlet (s31). Flood control excess in Wcu3b is based on the water level relative to fcLevel. A regional manager is used to set management constraints on s31 flood control releases based on rainfall received in Service Area 3.

Chapter 3

Basins

Basins come in all shapes and sizes. The landscapes represented in the SFBasins implementation include agricultural, urban, natural wetlands, and combinations of all of the above. Packages can used to modify the default behavior of the BasinWS assessor to simulate the inherent management and operational control characteristics of the respective basins.

3.1   Big Cypress National Preserve

The Big Cypress National Preserve (bcnp) basin functions as a sink, receiving flood control releases from Wca3a. Management in the basin is not simulated at this time. A summary of the bcnp is presented in Table 3.1.

Table 3.1: Big Cypress National Preserve

WCU Parameter	Specification
type	basin
id	405001
HPM	none specified
BC	

WcuAssessor	package	Special Instructions

mseNode	Location	Purpose	Special Instructions	Regional Manager
s343	inlet	wsfc		DT(fc)

Table 3.2: Service Area 3 (MiamiDade County)
.

WCU Parameter	Specification
type	basin
id	405002
HPM	none specified
BC	L30 (ormLevee)

.

WcuAssessor	package	Special Instructions
BasinWS	sa	demand set by tsNode (#12); maintLevel set to constant (5.5 ft);
BasinFC	default	fcLevel set to constant (6.0 ft)

.

mseNode	Location	Purpose	Special Instructions	Regional Manager
s31	inlet	wsfc		DT(ws); DT(fc)
sa3DemandNode	outlet	ws		
tidalSA3	outlet	fc		

3.2   Service Area 3

Service Area 3 basin (sa3) is managed for water supply and flood control. A summary of sa3 management specifications is presented in Table 3.2.

The sa package is included in the BasinWS assessor. This enables the assessor to simulate a LEC service area using methods developed for the SFRRM. Demand in sa3 were pre-processed, specified as a tsNode and assigned to the sa3DemandNode outlet as a demand. Demand at the inlet (s31) is set to the flow required to maintain the maintLevel and meet the demand at the outlet. A regional manager is used to set management constraints on water supply releases through s31 if water levels in wca3a drop below a specified floor level.

A standard BasinFC assessor is used to set releases at the flood control outlet (sa3Tidal). Flood control excess in sa3 is based on the water level relative to fcLevel. A regional manager is used to set management constraints on the inlet flood control release at s31 based on the depth of rainfall received in sa3.

3.3   Everglades National Park

Everglades National Park basin (enp) is managed for water supply and flood control. A summary of enp management specifications is presented in Table 3.3.

The enp package is included in the BasinWS assessor. This enables the assessor to use of the "Rainfall Formula" to define water supply needs for enp. The Rainfall Formula is pre-processed, specified as a tsNode for the assessor, and used to establish the water supply demand for the enp. This demand is apportioned between the s12 and s333 inlets, based on criteria established by the Wca3a regulation schedule.

A standard BasinFC assessor is used to set releases at the flood control outlet (enpTidal). Flood control

Table 3.3: Everglades National Park

WCU Parameter	Specification
type	basin
id	405003
HPM	none specified
BC	

WcuAssessor	package	Special Instructions
BasinWS	enp	demand set by tsNode (#6); demand split between s12 and s333
BasinFC	default	fcLevel set to constant (6.5 ft)

mseNode	Location	Purpose	Special Instructions	Regional Manager
s12	inlet	wsfc		DT(ws); DT(fc)
s333	outlet	wsfc		
tidalENP	outlet	fc		

excess in enp is based on the water level relative to fcLevel.

This is a very primitive enp implementation. The only purpose for the BasinFC assessor is to remove water delivered by the Rainfall Plan. At the very least, the enp package should be upgraded to handle demand as an outletNode. This implementation is adequate for now, but a more realistic implementation would sure be nice.

3.4   Caloosahatchee

The Caloosahatchee basin (caloosa) is managed for water supply and flood control. A summary of caloosa management specifications is presented in Table 3.4.

A standard BasinWS assessor is used to set water supply releases at the inlet (s77). There are no water supply outlets. Demand and excess in the basin are pre-processed and entered as boundary conditions. The BasinWS assessor computes water supply need based on the position of the water level relative to the maintLevel. All water supply needs are passed on to s77. The caloosa basin is part of LOSA, and water supply releases at the s77 inlet are subject to management constraints set by a regional manager and its implementation of the Supply Side Management Plan.

A standard BasinFC assessor is used to set releases at the flood control outlets (s79 and s77bp). Flood control excess in caloosa is based on the water level relative to fcLevel. Excess is distributed to the outlets based on the relative capacity of the outlets. A regional manager is used to set management constraints on s77bp, stopping backpumping to Lake Okeechobee if lake levels are above a specified level.

Table 3.4: Caloosahatchee Subbasin (EAA)

WCU Parameter	Specification
type	basin
id	405004
HPM	none specified
BC	demand (basinsource); runoff (basinsource)

WcuAssessor	package	Special Instructions
BasinWS	default	maintLevel set to constant (10.5 ft)
BasinFC	default	fcLevel set to constant (11.0 ft)

mseNode	Location	Purpose	Special Instructions	Regional Manager
s77	inlet	wsfc		DT(fc); SSM(ws)
s77bp	outlet	fc		DT(fc)
s79	outlet	fc		

3.5   St Lucie

The St Lucie basin (stlucie) is managed for water supply and flood control. A summary of stlucie management specifications is presented in Table 3.5.

A standard BasinWS assessor is used to set water supply releases at the inlet (s308). There are no water supply outlets. Demand and excess in the basin are pre-processed and entered as boundary conditions. The BasinWS assessor computes water supply need based on the position of the water level relative to the maintLevel. All water supply needs are passed on to s308. The stlucie basin is part of LOSA, and water supply releases at the s308 inlet are subject to management constraints set by a regional manager and its implementation of the Supply Side Management Plan.

A standard BasinFC assessor is used to set releases at the flood control outlets (s80 and s308bp). Flood control excess in stlucie is based on the water level relative to fcLevel. Excess is distributed to the outlets based on the relative capacity of the outlets. A regional manager is used to set management constraints on s308bp, stopping backpumping to Lake Okeechobee if lake levels are above a specified level. Flood control releases from Lake Okeechobee through s308 are limited by the volume of local runoff generated in the basin.

3.6   Service Area 1

Service Area 1 basin (sa1) is managed for water supply and flood control. A summary of sa1 management specifications is presented in Table 3.6.

The sa package is included in the BasinWS assessor. This enables the assessor to simulate a LEC service area using methods developed for the SFRRM. Demand in sa1 were pre-processed, specified as a tsNode and assigned to the sa1DemandNode outlet as a demand. Demand at the inlet (s39) is set to the flow required to maintain the maintLevel and meet the demand at the outlet.

Table 3.5: St Lucie Subbasin (EAA)

WCU Parameter	Specification
type	basin
id	405005
HPM	none specified
BC	demand (basinsource); runoff (basinsource)

WcuAssessor	package	Special Instructions
BasinWS	default	maintLevel set to constant (14.0 ft)
BasinFC	default	fcLevel set to constant (14.5 ft); inletRule set to "LocRunoffLim"

mseNode	Location	Purpose	Special Instructions	Regional Manager
s308	inlet	wsfc		DT(fc); SSM(ws)
s308bp	outlet	fc		DT(fc)
s80	outlet	fc		

Table 3.6: Service Area 1 (Palm Beach County)

WCU Parameter	Specification
type	basin
id	405006
HPM	none specified
BC	L40 (ormLevee); L36N (ormLevee)

WcuAssessor	package	Special Instructions
BasinWS	sa	demand set by tsNode (#10); maintLevel set to constant (13.5 ft);
BasinFC	default	fcLevel set to constant (14.0 ft)

mseNode	Location	Purpose	Special Instructions	Regional Manager
s39	inlet	wsfc	flood control priority 1	DT(fc)
sa1DemandNode	outlet	ws		
tidalSA1	outlet	fc		

Table 3.7: Service Area 2 (Broward County)

WCU Parameter	Specification
type	basin
id	405007
HPM	none specified
BC	L36S (ormLevee); L37 (ormLevee); L33 (ormLevee); L35A (ormLevee)

WcuAssessor	package	Special Instructions
BasinWS	sa	demand set by tsNode (#11); maintLevel set to constant (6.0 ft);
BasinFC	default	fcLevel set to constant (6.5 ft)

mseNode	Location	Purpose	Special Instructions	Regional Manager
s34s38	inlet	wsfc	flood control priority 1	DT(ws); DT(fc)
s141	inlet	fc		
sa2DemandNode	outlet	ws		
tidalSA2	outlet	fc		

A standard BasinFC assessor is used to set releases at the flood control outlet (sa1Tidal). Flood control excess in sa1 is based on the water level relative to fcLevel. A regional manager is used to set management constraints on the inlet flood control release at s39 based on the depth of rainfall received in sa1.

3.7   Service Area 2

Service Area 2 basin (sa2) is managed for water supply and flood control. A summary of sa2 management specifications is presented in Table 3.7.

The sa package is included in the BasinWS assessor. This enables the assessor to simulate a LEC service area using methods developed for the SFRRM. Demand in sa1 were pre-processed, specified as a tsNode and assigned to the sa1DemandNode outlet as a demand. Demand at the inlet (s34s38) is set to the flow required to maintain the maintLevel and meet the demand at the outlet.

A standard BasinFC assessor is used to set releases at the flood control outlet (sa2Tidal). Flood control excess in sa2 is based on the water level relative to fcLevel. A regional manager is used to set management constraints on the inlet flood control release at s34s38 based on the depth of rainfall received in sa2.

3.8   Miami

The Miami subbasin of the EAA (miami) is managed for water supply and flood control. A summary of miami management specifications is presented in Table 3.8.

Table 3.8: Miami Subbasin (EAA)

.

WCU Parameter	Specification
type	basin
id	405008
HPM	layer1nsm
BC	G136 (basinsource); G88 (basinsource); BMP (basinsource)

.

WcuAssessor	package	Special Instructions
BasinWS	eaa	maintLevel set by rule curve (#1001); resLevel set to constant (9.8 ft)
BasinFC	iap	fcLevel set by rule curve (#1000); IAP rule for backpumping at s3

.

mseNode	Location	Purpose	Special Instructions	Regional Manager
s354	inlet	ws		SSM(ws)
hlpump	outlet	ws	water supply priority 1	
s3	outlet	fc		
s8	outlet	fc		

The eaa package is included in the BasinWS assessor. This enables the assessor to simulate demands in the EAA using methods developed for the SFRRM. Demand in miami is based on the position of the water table relative to the maintLevel and the potential evapotranspiration of the HPM. Demand is passed on to s354. Excess in the Miami basin is used to meet water supply demands the Holeyland basin through hlpump. The available excess is based on the resLevel threshold. The miami basin is part of LOSA, and water supply releases at the s354 inlet are subject to management constraints set by a regional manager and its implementation of the Supply Side Management Plan.

The iap package is included in the BasinFC assessor. This enables the assessor to simulate the Interim Action Plan. Flood control excess in miami is based on the water level relative to fcLevel. Excess is distributed to the outlets (s3 and s8) based on guidelines established by the IAP.

3.9 Holeyland

The Holeyland basin (holeyland) is managed for water supply and flood control. A summary of miami management specifications is presented in Table 3.9.

A standard BasinWS assessor is used to set water supply releases at the inlets (hlpump and lo2hl). There are no water supply outlets. Demand in the holeyland are based on the position of the water table relative to the maintLevel.The BasinWS assessor computes water supply need based on the position of the water level relative to the maintLevel. All water supply needs are passed on to the inlets in priority order - hlpump has the highest priority. Both inlets are subject to management constraints set by the regional manager. Water supply deliveries through hlpump are discontinued if the IAP has been abandoned and water supply deliveries through lo2hl are limited to the volume of water required to bring water levels up to

Table 3.9: Holeyland

.

WCU Parameter	Specification
type	basin
id	405009
HPM	layer1nsm
BC	

.

WcuAssessor	package	Special Instructions
BasinWS	default	maintLevel set by rule curve (#1051); inlets in priority order for inlet supply
BasinFC	default	passive flood control

.

mseNode	Location	Purpose	Special Instructions	Regional Manager
hlpump	inlet	ws	water supply priority 1	DT(ws)
lo2hl	inlet	ws	water supply priority 2	DT(ws)
hlcul	outlet	fc	passive flood control	

a specified level.

A standard BasinFC assessor is used to set release at the flood control outlet (hlcul). A passive approach is used where the flood control control release at hlcul is based on its capacity.

3.10   Hillsboro - North New River

The Hillsboro - North New River basin (hillsnnr) is managed for water supply and flood control. A summary of hillsnnr management specifications is presented in Table 3.10.

The eaa package is included in the BasinWS assessor. This enables the assessor to simulate demands in the EAA using methods developed for the SFRRM. Demand in hillsnnr are based on the position of the water table relative to the maintLevel and the potential evapotranspiration of the HPM. Demand is passed on to s351. The hillsnnr basin is part of LOSA, and water supply releases at the s351 inlet are subject to management constraints set by a regional manager and its implementation of the Supply Side Management Plan.

The iap package is included in the BasinFC assessor. This enables the assessor to simulate the Interim Action Plan. Flood control excess in hillsnnr is based on the water level relative to fcLevel. Excess is distributed to the outlets (s2, s6 and s7) based on guidelines established by the IAP.

3.11   West Palm Beach

The West Palm Beach basin (wpb) is managed for water supply and flood control. A summary of wpb management specifications is presented in Table 3.11.

Table 3.10: HillsboroNorth New River Subbasin (EAA)

.

WCU Parameter	Specification
type	basin
id	405010
HPM	layer1nsm
BC	BMP (basinsource)

.

WcuAssessor	package	Special Instructions
BasinWS	eaa	maintLevel set by rule curve (#1001)
BasinFC	iap	fcLevel set by rule curve (#1000); IAP rule for backpumping at s2

.

mseNode	Location	Purpose	Special Instructions	Regional Manager
s351	inlet	ws		SSM(ws)
s2	outlet	fc		
s6	outlet	fc		
s7	outlet	fc		

Table 3.11: West Palm Beach Subbasin (EAA)

.

WCU Parameter	Specification
type	basin
id	405011
HPM	layer1nsm
BC	BMP (basinsource)

.

WcuAssessor	package	Special Instructions
BasinWS	eaa	maintLevel set by rule curve (#1001);
BasinFC	default	fcLevel set by rule curve (#1000)

.

mseNode	Location	Purpose	Special Instructions	Regional Manager
s352	inlet	ws		SSM(ws)
s352bp	outlet	fc		DT(fc)
s5a	outlet	fc		

Table 3.12: S4 Subbasin (EAA)

.

WCU Parameter	Specification
type	basin
id	405012
HPM	layer1nsm
BC	

.

WcuAssessor	package	Special Instructions
BasinWS	eaa	maintLevel set by rule curve (#1001)
BasinFC	iap	fcLevel set by rule curve (#1000); IAP rule for backpumping at s4bp

.

mseNode	Location	Purpose	Special Instructions	Regional Manager
s4	inlet	ws		SSM(ws)
s4bp	outlet	fc		
s235	outlet	fc		

The eaa package is included in the BasinWS assessor. This enables the assessor to simulate demands in the EAA using methods developed for the SFRRM. Demand in wpb are based on the position of the water table relative to the maintLevel and the potential evapotranspiration of the HPM. Demand is passed on to s352. The wbp basin is part of LOSA, and water supply releases at the s352 inlet are subject to management constraints set by a regional manager and its implementation of the Supply Side Management Plan.

A standard BasinFC assessor is used to set releases at the flood control outlets (s5a and s352bp). Flood control excess in wpb is based on the water level relative to fcLevel. Excess is distributed to the outlets based on the relative capacity of the outlets. A regional manager is used to set management constraints on s352bp, stopping backpumping to Lake Okeechobee if lake levels are above a specified level.

3.12   S4

The S4 basin (s4) is managed for water supply and flood control. A summary of s4 management specifications is presented in Table 3.12.

The eaa package is included in the BasinWS assessor. This enables the assessor to simulate demands in the EAA using methods developed for the SFRRM. Demand in the s4 basin are based on the position of the water table relative to the maintLevel and the potential evapotranspiration of the HPM. Demand is passed on to the s4 inlet. The s4 basin is part of LOSA, and water supply releases at the s4 inlet are subject to management constraints set by a regional manager and its implementation of the Supply Side Management Plan.

The iap package is included in the BasinFC assessor. This enables the assessor to simulate the Interim Action Plan. Flood control excess in the s4 basin is based on the water level relative to fcLevel. Excess is distributed to the outlets (s235 and s4bp) based on guidelines established by the IAP.

Table 3.13: S236 Subbasin (EAA)

WCU Parameter	Specification
type	basin
id	405013
HPM	layer1nsm
BC	

WcuAssessor	package	Special Instructions
BasinWS	eaa	maintLevel set by rule curve (#1001)
BasinFC		fcLevel set by rule curve (#1000);

mseNode	Location	Purpose	Special Instructions	Regional Manager
s236	inlet	ws		SSM(ws)
s236bp	outlet	fc		

3.13   S236

The S236 basin (s236) is managed for water supply and flood control. A summary of s236 management specifications is presented in Table 3.13.

The eaa package is included in the BasinWS assessor. This enables the assessor to simulate demands in the EAA using methods developed for the SFRRM. Demand in the s236 basin are based on the position of the water table relative to the maintLevel and the potential evapotranspiration of the HPM. Demand is passed on to the s236 inlet. The s236 basin is part of LOSA, and water supply releases at the s236 inlet are subject to management constraints set by a regional manager and its implementation of the Supply Side Management Plan.

A standard BasinFC assessor is used to set releases at the flood control outlet (s236bp). Flood control excess in the s236 basin is based on the water level relative to fcLevel. Excess is passed directly to the s236bp outlet. The flood control release is limited only by the capacity of the outlet.

3.14   298 Districts

The 298 Districts (298) are combined into a single basin are managed for water supply and flood control. A summary of 298 management specifications is presented in Table 3.14.

The eaa package is included in the BasinWS assessor. This enables the assessor to simulate demands in the EAA using methods developed for the SFRRM. Demand in the 298 districts are based on the position of the water table relative to the maintLevel and the potential evapotranspiration of the HPM. Demand is passed on to the 298 inlet. The 298 districts are part of LOSA, and water supply releases at the 298 inlet are subject to management constraints set by a regional manager and its implementation of the Supply Side Management Plan.

A standard BasinFC assessor is used to set releases at the flood control outlet (298bp). Flood control

Table 3.14: 298 District (EAA)

WCU Parameter	Specification
type	basin
id	405014
HPM	layer1nsm
BC	

WcuAssessor	package	Special Instructions
BasinWS	eaa	maintLevel set by rule curve (#1001)
BasinFC		fcLevel set by rule curve (#1000)

mseNode	Location	Purpose	Special Instructions	Regional Manager
298	inlet	ws		SSM(ws)
298bp	outlet	fc		

excess in the 298 districts are based on the water level relative to fcLevel. Excess is passed directly to the 298bp outlet. The flood control release is limited only by the capacity of the outlet.

3.15 Brighton Reservation

The Brighton Reservation (brighton) is managed for water supply only. A summary of brighton management specifications is presented in Table 3.15.

A standard BasinWS assessor is used to set water supply releases at the inlet (brightonWS). There are no water supply outlets. Demand is pre-processed and entered as minimum flow constraint on the inlet. The BasinWS assessor translates the minimum flow as the demand for the basin. Minimum flow constraints are subject to management constraints imposed by a regional manager. Since brighton is a part of LOSA, management constraints for water supply are set by a regional manager and its implementation of the Supply Side Management Plan. Water levels in brighton are controlled by a head boundary condition that maintains water levels at a constant 20.2 ft.

3.16 Lake Okeechobee Public Water Supply

Lake Okeechobee Public Water Supply (lops) is managed as a basin for water supply only. This basin does not really exist, but its water supply needs do and Lake Okeechobee is their primary source for water supply. This water supply need and its effect on Lake Okeechobee can be simulated using an imaginary basin and setting a minimum flow constraint on the inlet from Lake Okeechobee.

A summary of lops management specifications is presented in Table 3.16.

A standard BasinWS assessor is used to set water supply releases at the inlet (lopsWS). There are no water supply outlets. Demand is pre-processed and entered as minimum flow constraint on the inlet. The

Table 3.15: Brighton Reservation

.

WCU Parameter	Specification
type	basin
id	405015
HPM	none specified
BC	constant head (20.2 ft)

.

WcuAssessor	package	Special Instructions
BasinWS	default	

.

mseNode	Location	Purpose	Special Instructions	Regional Manager
brightonWS	inlet	ws	minflow for water supply	SSM(ws)

Table 3.16: Lake Okeechobee Public Water Supply

.

WCU Parameter	Specification
type	basin
id	405016
HPM	none specified
BC	constant head (17.0 ft)

.

WcuAssessor	package	Special Instructions
BasinWS	default	demand set by tsNode (#6); demand split between s12 and s333

.

mseNode	Location	Purpose	Special Instructions	Regional Manager
lopsWS	inlet	ws	minflow for water supply	SSM(ws)

Table 3.17: L8 basin (EAA)

.

WCU Parameter	Specification
type	basin
id	405017
HPM	none specified
BC	runoff (basinsource)

.

WcuAssessor	package	Special Instructions
BasinFC	default	fcLevel set to constant (10.5 ft)

.

mseNode	Location	Purpose	Special Instructions	Regional Manager
culvert10	outlet	fc	flood control priority 1	DT(fc)
s5as	outlet	fc	flood control priority 2	

BasinWS assessor translates the minimum flow as the demand for the basin. Minimum flow constraints are subject to management constraints imposed by a regional manager. Since lops is a part of LOSA, management constraints for water supply are set by a regional manager and its implementation of the Supply Side Management Plan. It is debatable whether or not lopd should fall under the same management constraints as the other LOSA subbasins, but they are included for now. Water levels in lops are controlled by a head boundary condition that maintains water levels at a constant 17.0 ft.

3.17 L8 Basin

The L8 basin (L8) is managed only for flood control. A summary of L8 management specifications is presented in Table 3.17.

A standard BasinFC assessor is used to set releases at the flood control outlets (culvert10 and s5as). Basin runoff is pre-processed and entered as a boundary condition. The runoff time series is computed using the "rrm_prep" program which uses a water balance approach and observed data to estimate te runoff generated in the basin. Flood control excess in L8 is based on the water level relative to fcLevel. Excess is distributed to the outlets based on priority order. Although releases through culvert10 has the highest priority, the regional manager stops backpuming to Lake Okeechobee if lake levels are above a specified level.