Lake Okeechobee System Operating Manual

POST Iteration 2 Modeling Evaluation

Sanibel-Captiva Conservation Foundation

Conservancy of Southwest Florida

DRAFT - August 23, 2021
(Updated: August 26, 2021)

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Use cursor keys for navigation, press "O" for a slide Overview

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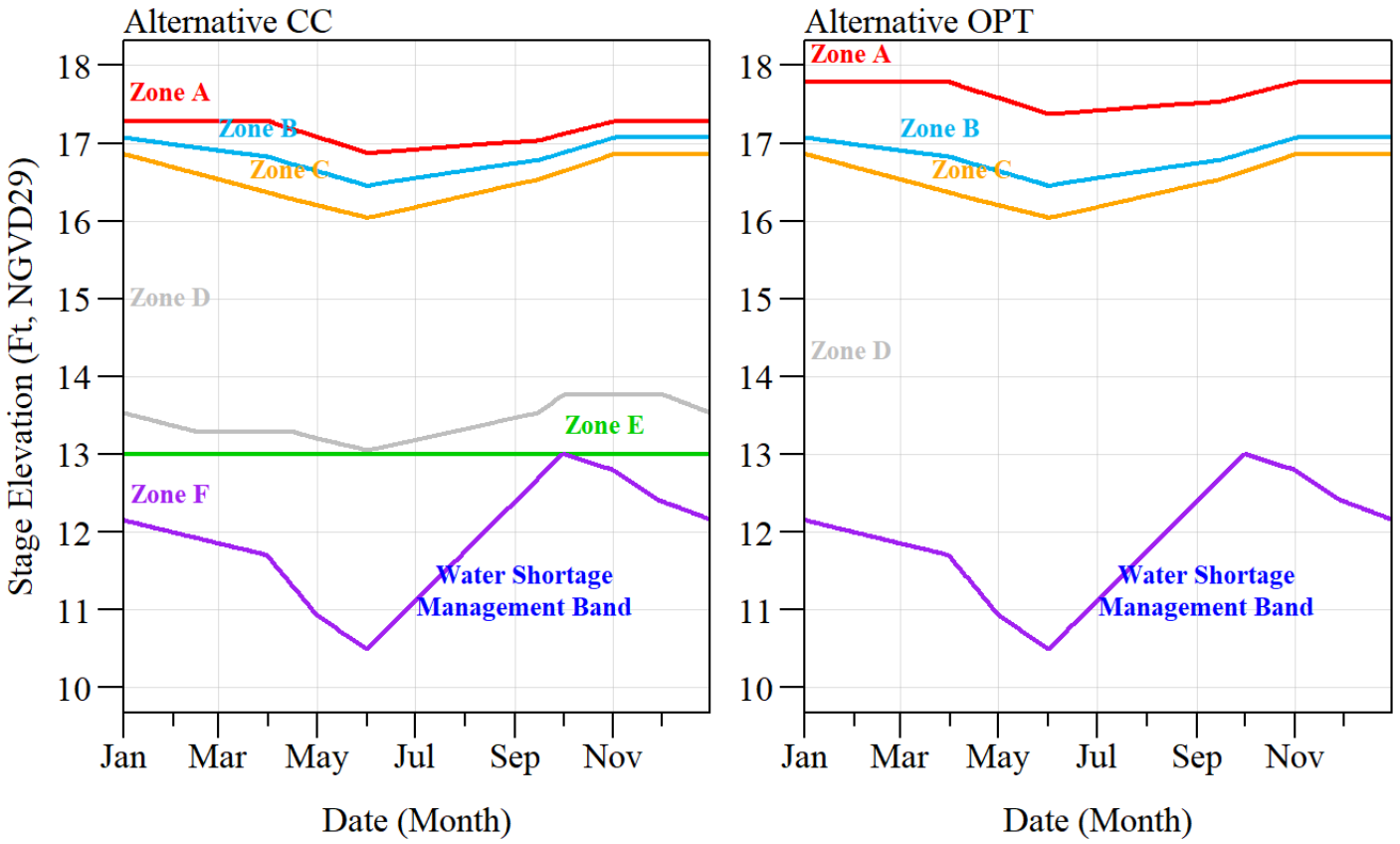
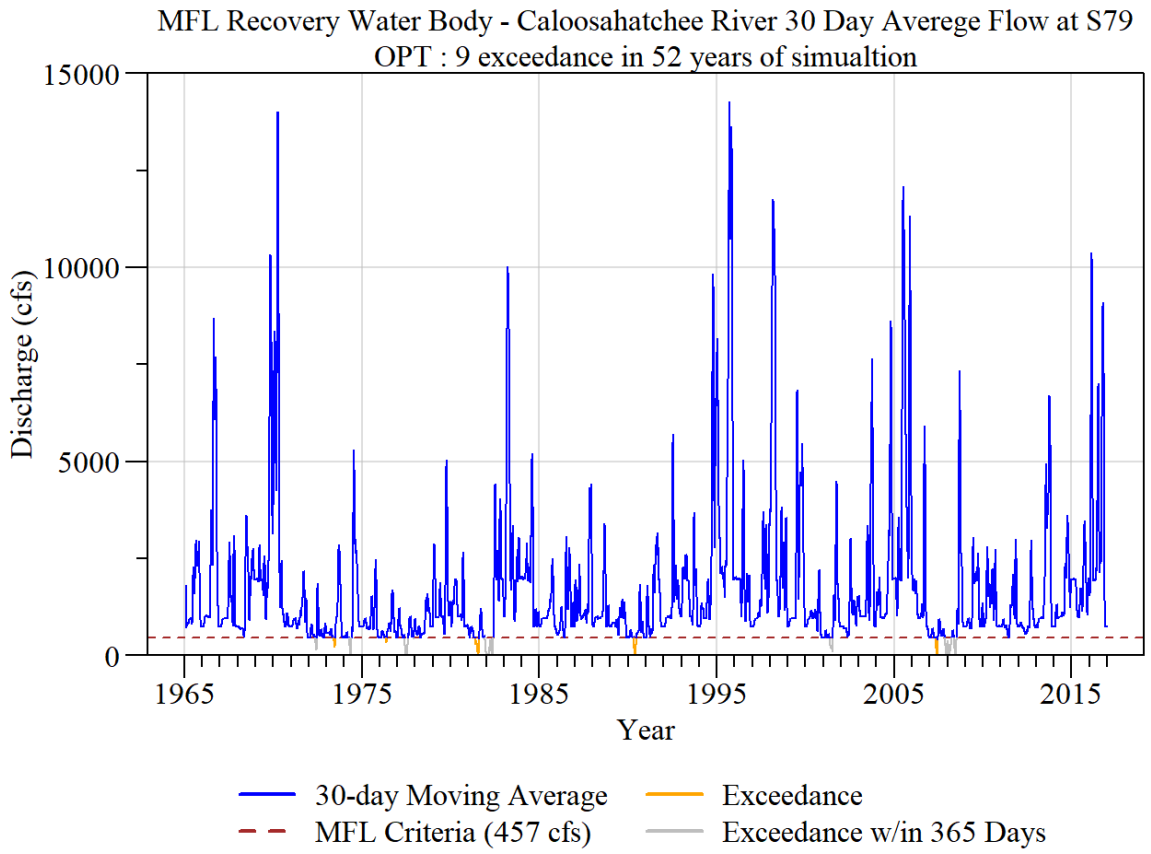
Regulation Schedule



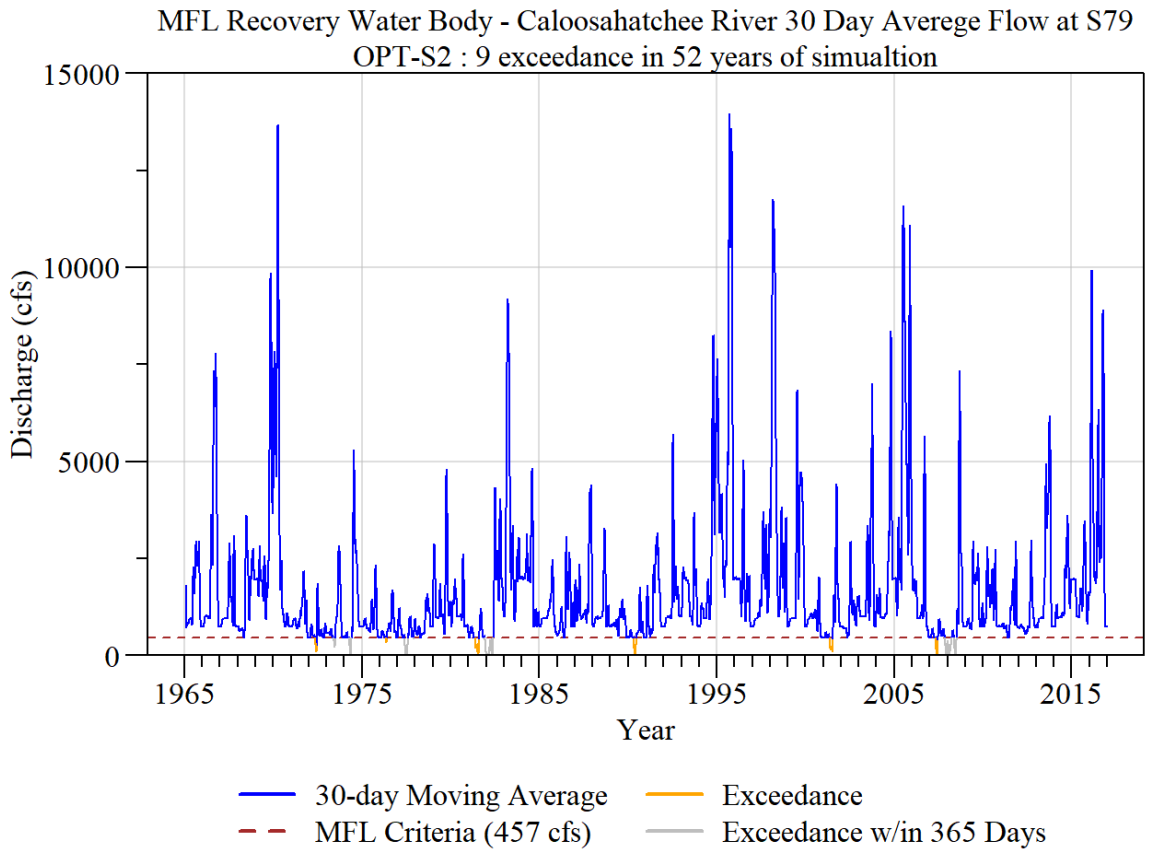
Regulation Schedule with zones identified for CC and OPT

Caloosahatchee MFL



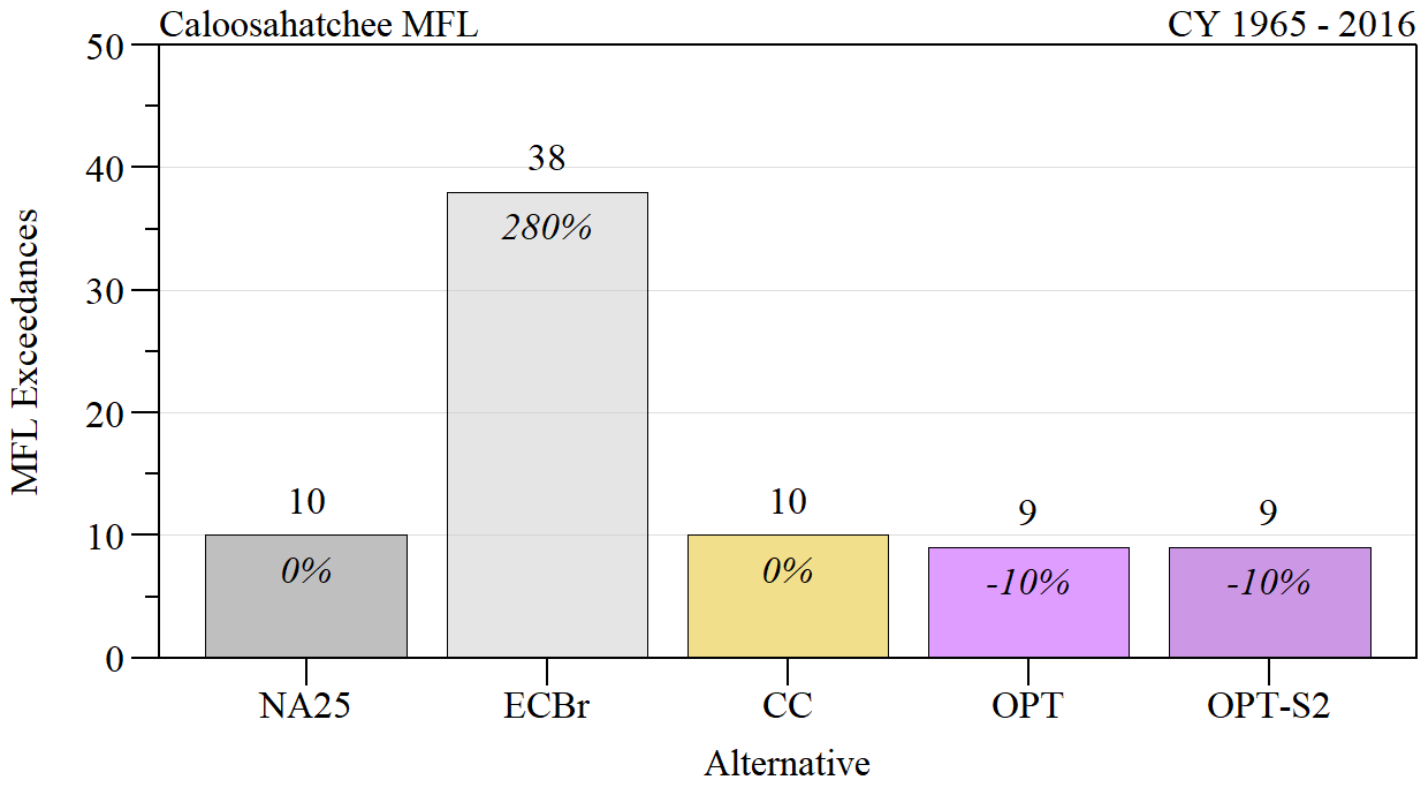
Minimum flow and levels evaluation for the Caloosahatchee River Estuary for alternative 'OPT' during the simulated period of record.

Caloosahatchee MFL



Minimum flow and levels evaluation for the Caloosahatchee River Estuary for alternative 'OPT-S2' during the simulated period of record.

Caloosahatchee MFL



Comparison of MFL exceedances across FWO, ECB, CC and OPT during the simulated period of record. Percentage within bar represents percent difference relative to FWO.

Average annual regulatory flows (QFC flow tag; CRE: S77; SLE: S308) and stress and damaging events based on RECOVER salinity envelope 14-day event counts for Caloosatchee and St Lucie estuaries.

		Summarized Data					Percent Different from FWO				
Estuary	Alt	Regulatory Flows (kacft/yr)	Stress Events From LOK	Stress Events From Basin	Damaging Events From LOK	Damaging Events From Basin	Regulatory Flows (kacft/yr)	Stress Events From LOK	Stress Events From Basin	Damaging Events From LOK	Damaging Events From Basin
CRE [1]	NA25 [2]	528	183	118	186	173					
	ECBr	515	190	153	205	225	**-2.5**	**3.8**	**29.7**	**10.2**	**30.1**
	CC	578	289	89	156	174	**9.5**	**57.9**	**-24.6**	**-16.1**	**0.6**
	OPT	487	65	144	72	187	**-7.8**	**-64.5**	**22.0**	**-61.3**	**8.1**
	OPT-S2	473	57	144	84	185	**-10.4**	**-68.9**	**22.0**	**-54.8**	**6.9**
SLE [1]	NA25 [2]	187	148	210	142	428					
	ECBr	231	162	186	160	432	**23.0**	**9.5**	**-11.4**	**12.7**	**0.9**
	CC	72	13	308	17	469	**-61.7**	**-91.2**	**46.7**	**-88.0**	**9.6**
	OPT	109	23	288	28	467	**-41.8**	**-84.5**	**37.1**	**-80.3**	**9.1**
	OPT-S2	104	18	296	25	471	**-44.3**	**-87.8**	**41.0**	**-82.4**	**10.0**

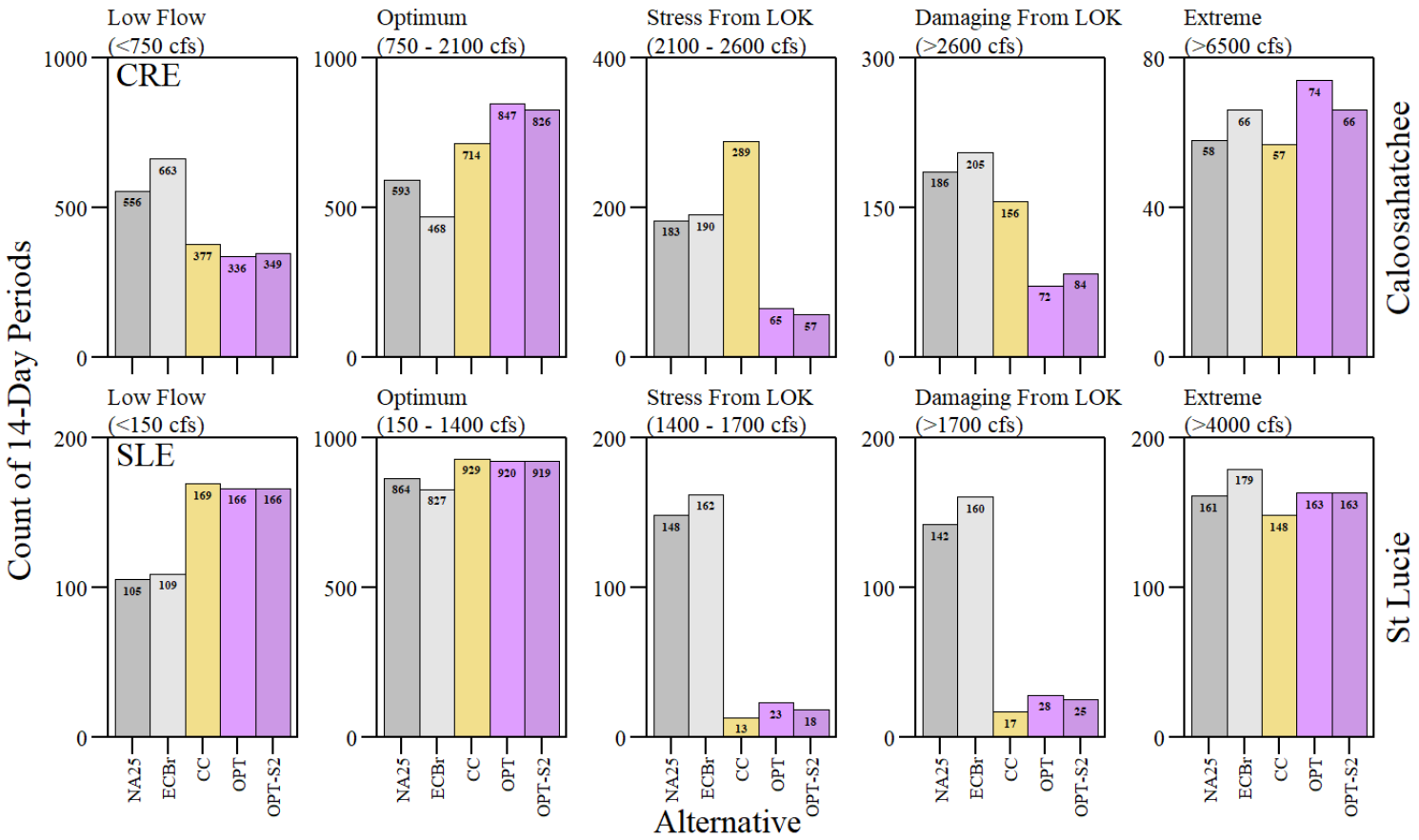
[1] CRE: Caloosahatchee Estuary; SLE: St Lucie Estuary; [2] NA25 = Future without project (FWO)

Stressful Flows CRE: ≥ 2100 cfs & < 2600 cfs; SLE: ≥ 1400 cfs & < 1700 cfs

Damaging Flows CRE: > 2600 cfs; SLE:> 1700 cfs

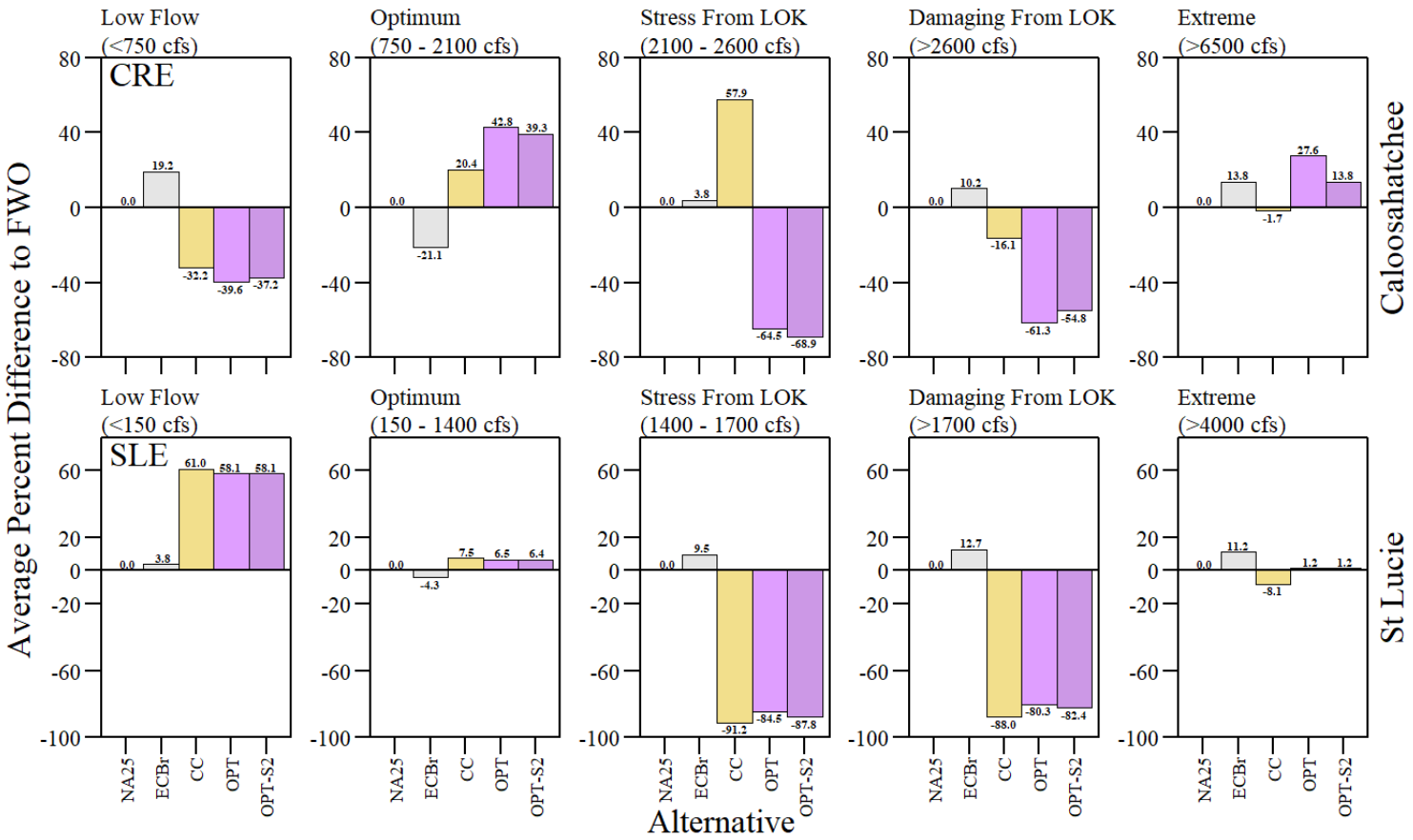
Data Source: USACE and SFWMD Interagency Modeling Center. ***OPT*** and ***OPT-S2*** Alternative provided by Everglades Foundation

RECOVER Metric



RECOVER salinity envelope evaluation during the simulation period of record for Caloosahatchee (top) and St Lucie (bottom) estuaries.

RECOVER Metric



RECOVER salinity envelope evaluation relative to FWO (NA25) during the simulation period of record for Caloosahatchee (top) and St Lucie (bottom) estuaries.

Daily count of low, optimum, stress and damaging flow events for Caloosatchee and St Lucie estuaries.

		Summarized Data						Percent Different from FWO					
Estuary	Alt	Low Events	Optimum Events	Stress Events From LOK	Stress Events From Basin	Damaging Events From LOK	Damaging Events From Basin	Low Events	Optimum Events	Stress Events From LOK	Stress Events From Basin	Damaging Events From LOK	Damaging Events From Basin
CRE [1]	NA25 [2]	7743	6344	261	488	1988	2169	---	---	---	---	---	---
	ECBr	9354	3769	246	706	2015	2903	20.8	-40.6	-5.7	44.7	1.4	33.8
	CC	5058	8420	450	519	2199	2347	-34.7	32.7	72.4	6.4	10.6	8.2
	OPT	4558	10993	101	642	407	2292	-41.1	73.3	-61.3	31.6	-79.5	5.7
	OPT-S2	4720	10658	76	611	653	2275	-39.0	68.0	-70.9	25.2	-67.2	4.9
SLE [1]	NA25 [2]	1943	10112	388	593	1444	4513	---	---	---	---	---	---
	ECBr	2045	9725	405	516	1567	4735	5.2	-3.8	4.4	-13.0	8.5	4.9
	CC	3110	10433	0	759	201	4490	60.1	3.2	-100.0	28.0	-86.1	-0.5
	OPT	3039	10374	0	716	360	4504	56.4	2.6	-100.0	20.7	-75.1	-0.2
	OPT-S2	3055	10345	0	719	370	4504	57.2	2.3	-100.0	21.2	-74.4	-0.2

[1] CRE: Caloosahatchee Estuary; SLE: St Lucie Estuary; [2] NA25 = Future without project (FWO)

Low Flows CRE: < 750 cfs; SLE: < 150 cfs

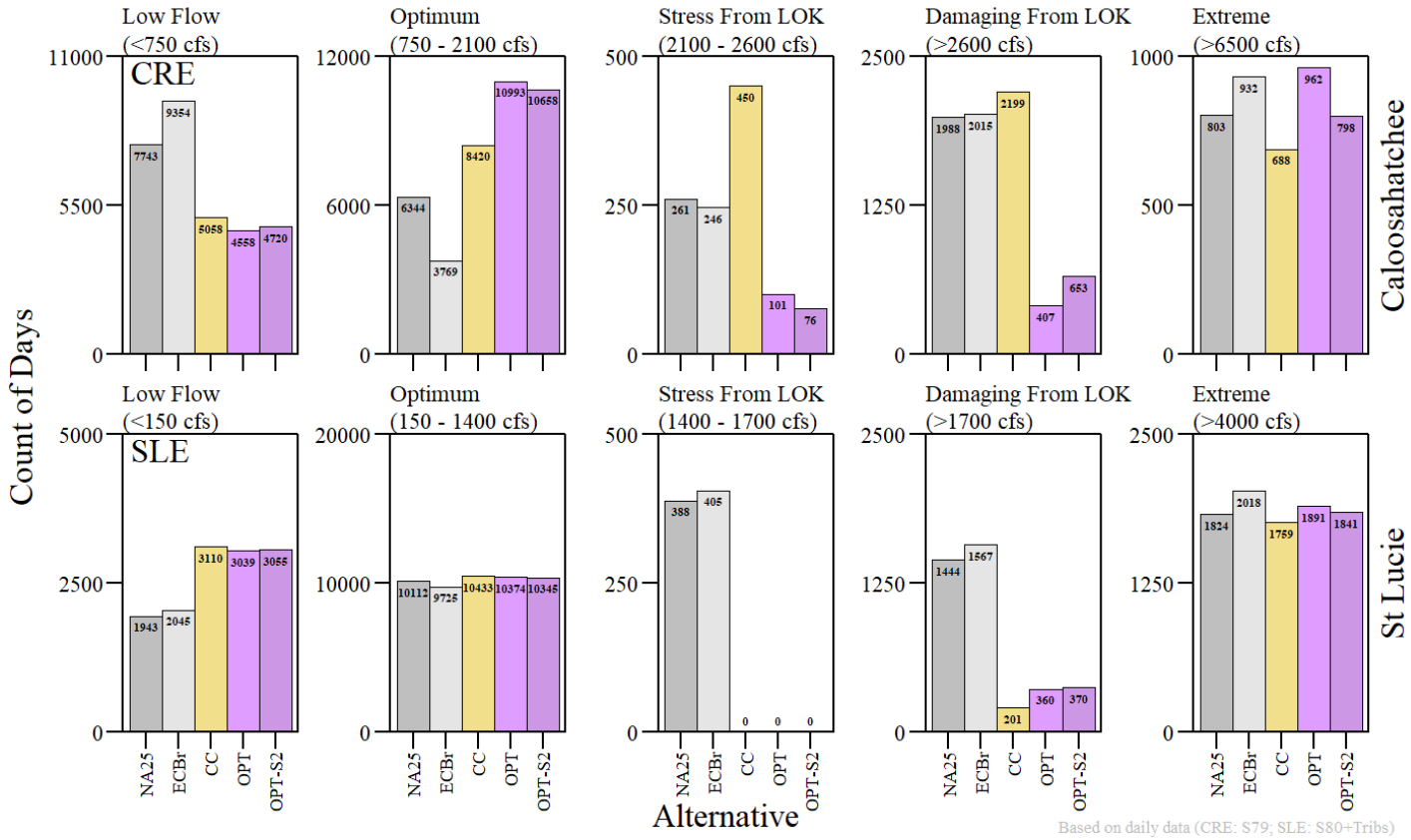
Optimum Flows CRE: ≥ 750 cfs & < 2100 cfs; SLE: ≥ 150 cfs & < 1400 cfs cfs

Stressful Flows CRE: ≥ 2100 cfs & < 2600 cfs; SLE: ≥ 1400 cfs & < 1700 cfs

Damaging Flows CRE: > 2600 cfs; SLE:> 1700 cfs

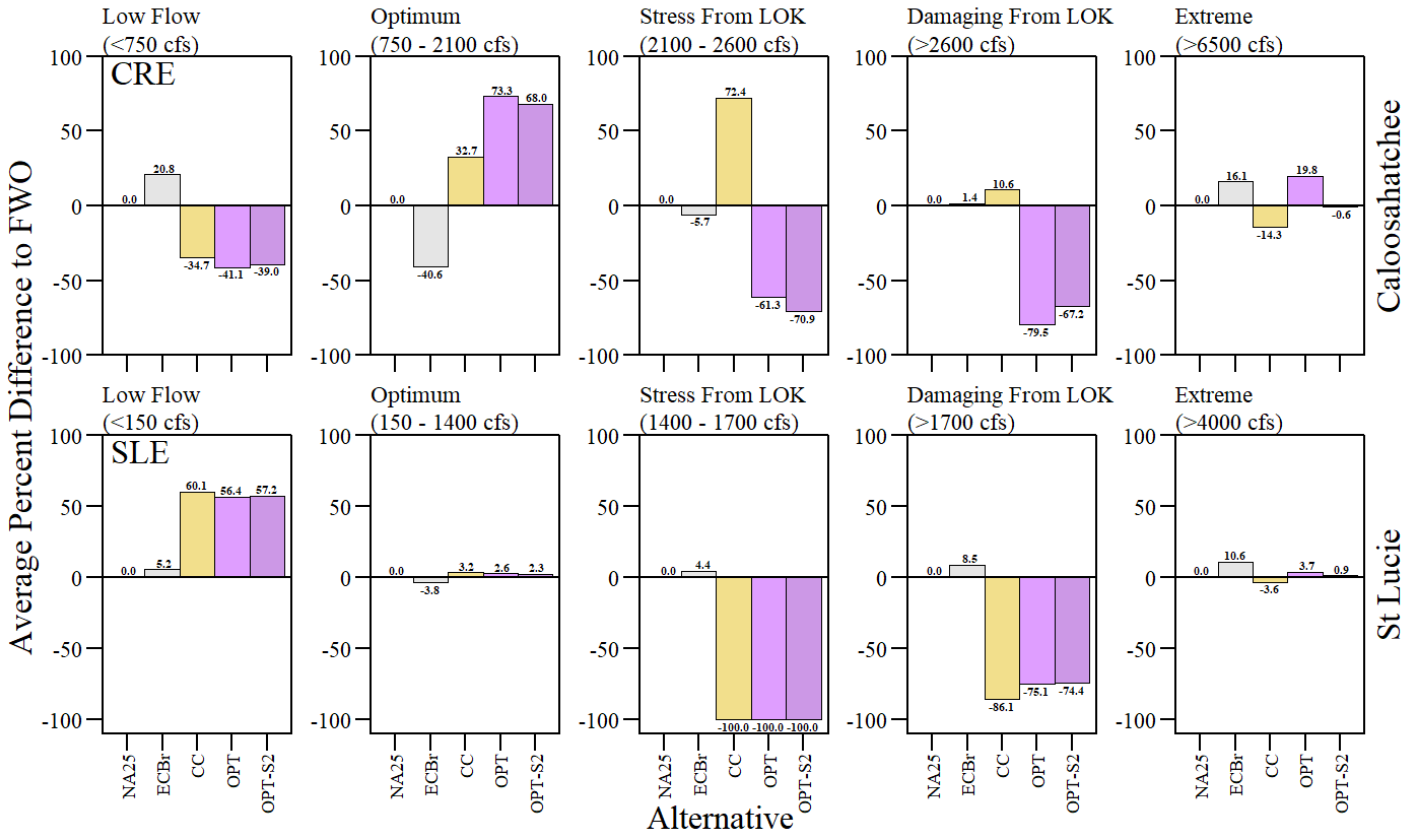
Data Source: USACE and SFWMD Interagency Modeling Center. ***OPT*** and ***OPT-S2*** Alternative provided by Everglades Foundation

Daily Metric



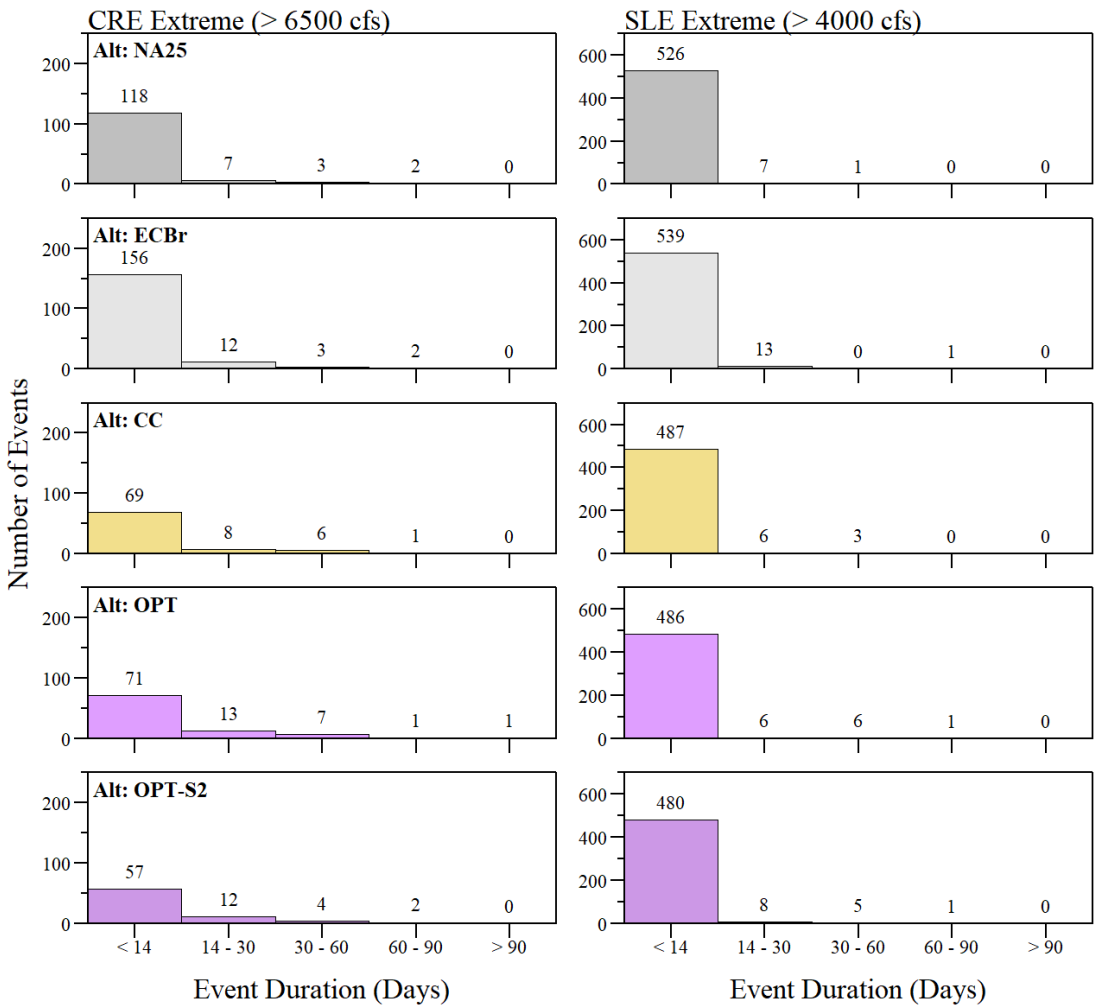
Daily salinity envelope evaluation during the simulation period of record for Caloosahatchee (top) and St Lucie (bottom) estuaries. Low, Optimum and Extreme events are from all sources.

Daily Metric



Daily salinity envelope evaluation relative to FWO (NA25) during the simulation period of record for Caloosahatchee (top) and St Lucie (bottom) estuaries. Low, Optimum and Extreme events are from all sources.

Daily Metric - Extreme Events



Monthly count of low, optimum, stress and damaging flow events for Caloosatchee and St Lucie estuaries based on monthly mean discharge data.

		Summarized Data						Percent Different from FWO					
Estuary	Alt	Low Events	Optimum Events	Stress Events From LOK	Stress Events From Basin	Damaging Events From LOK	Damaging Events From Basin	Low Events	Optimum Events	Stress Events From LOK	Stress Events From Basin	Damaging Events From LOK	Damaging Events From Basin
CRE [1]	NA25 [2]	212	225	37	19	70	61	---	---	---	---	---	---
	ECBr	253	153	33	25	76	84	19.3	-32.0	-10.8	31.6	8.6	37.7
	CC	149	243	96	15	54	67	-29.7	8.0	159.5	-21.1	-22.9	9.8
	OPT	137	353	17	24	27	66	-35.4	56.9	-54.1	26.3	-61.4	8.2
	OPT-S2	142	349	11	23	33	66	-33.0	55.1	-70.3	21.1	-52.9	8.2
SLE [1]	NA25 [2]	23	314	31	35	46	175	---	---	---	---	---	---
	ECBr	23	308	30	26	47	190	0.0	-1.9	-3.2	-25.7	2.2	8.6
	CC	30	363	0	47	8	176	30.4	15.6	-100.0	34.3	-82.6	0.6
	OPT	29	359	1	45	13	177	26.1	14.3	-96.8	28.6	-71.7	1.1
	OPT-S2	30	357	2	47	12	176	30.4	13.7	-93.5	34.3	-73.9	0.6

[1] CRE: Caloosahatchee Estuary; SLE: St Lucie Estuary; [2] NA25 = Future without project (FWO)

Low Flows CRE: < 750 cfs; SLE: < 150 cfs

Optimum Flows CRE: ≥ 750 cfs & < 2100 cfs; SLE: ≥ 150 cfs & < 1400 cfs cfs

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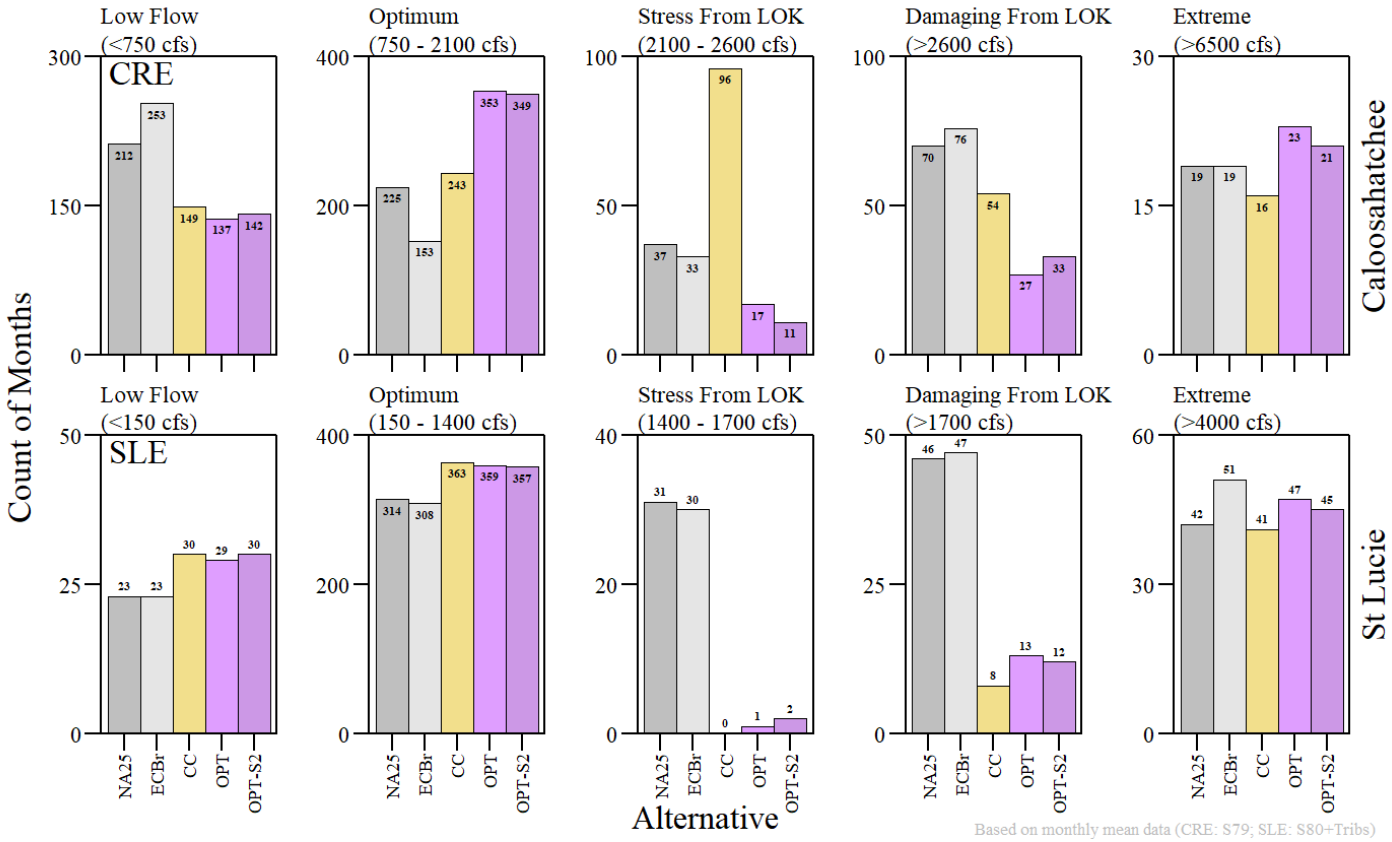
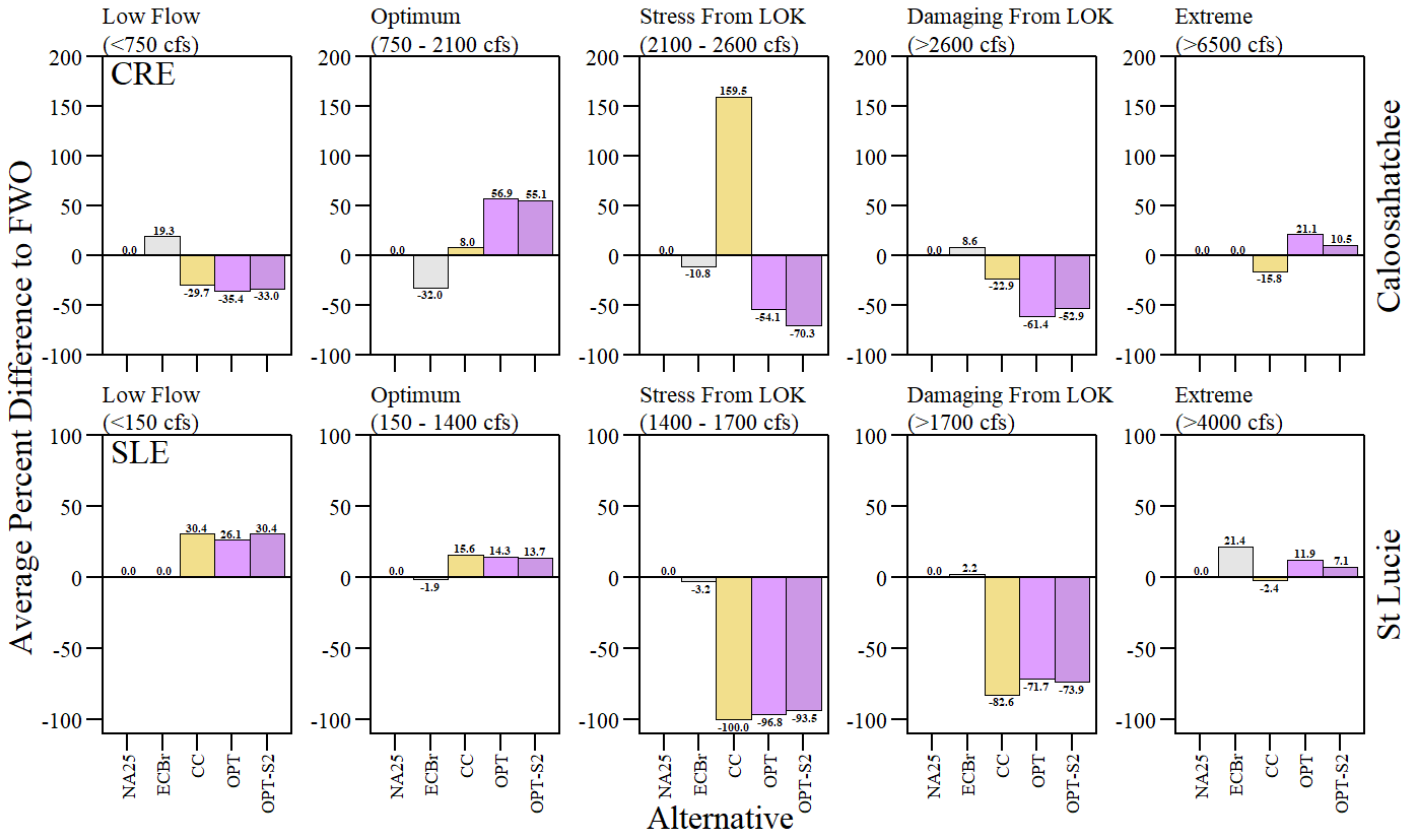
Monthly Metric



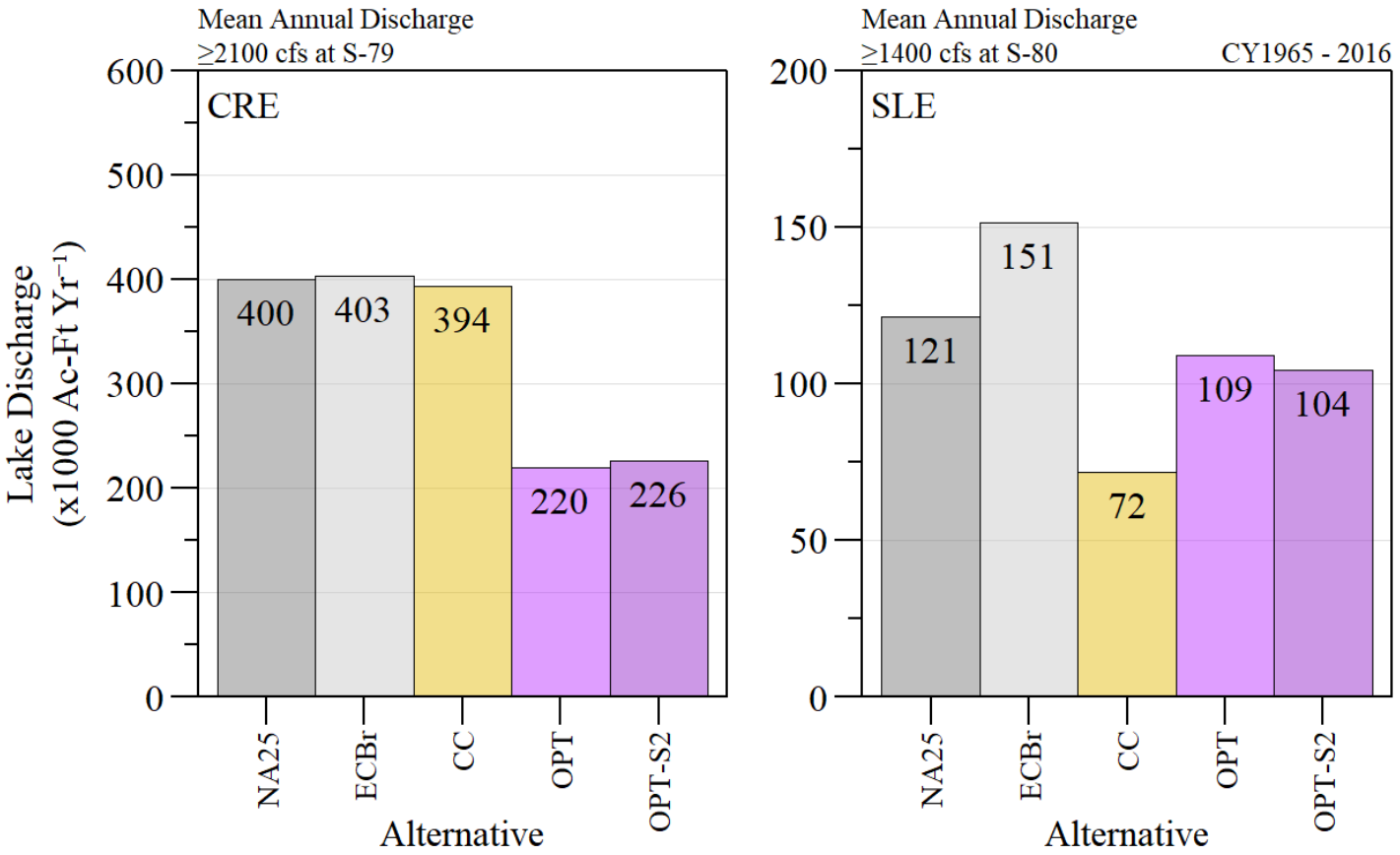
Monthly salinity envelope evaluation during the simulation period of record for Caloosahatchee (top) and St Lucie (bottom) estuaries. Low, Optimum and Extreme events are from all sources.

Monthly Metric



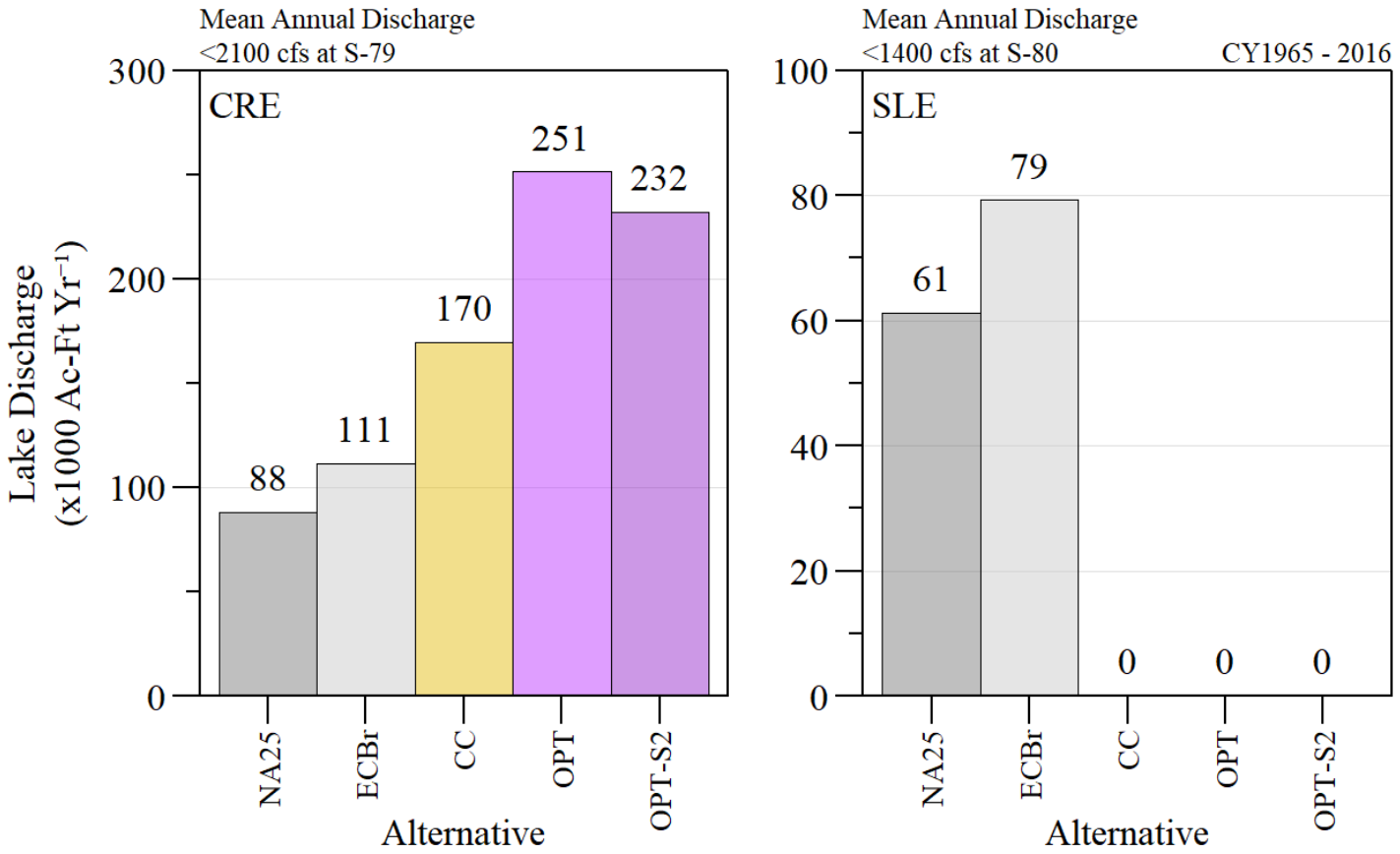
Monthly salinity envelope evaluation relative to FWO (NA25) during the simulation period of record for Caloosahatchee (top) and St Lucie (bottom) estuaries. Low, Optimum and Extreme events are from all sources.

Lake Discharges



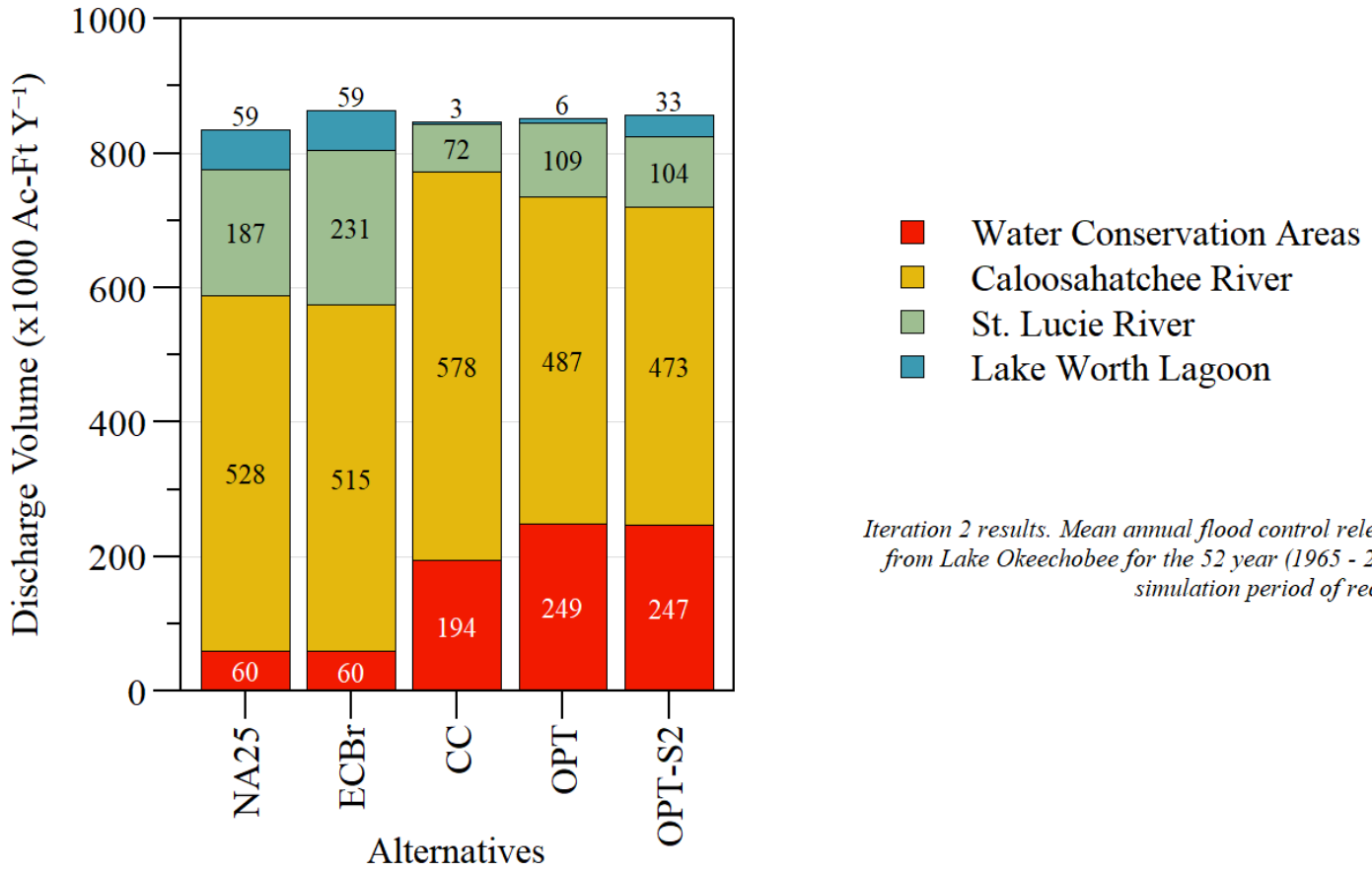
Average annual lake discharge volume over the simulation period of record when stress and damaging discharge at S79 and S80, respectively.

Lake Discharges



Average annual lake discharge volume over the simulation period of record when low and optimum discharge at S79 and S80, respectively.

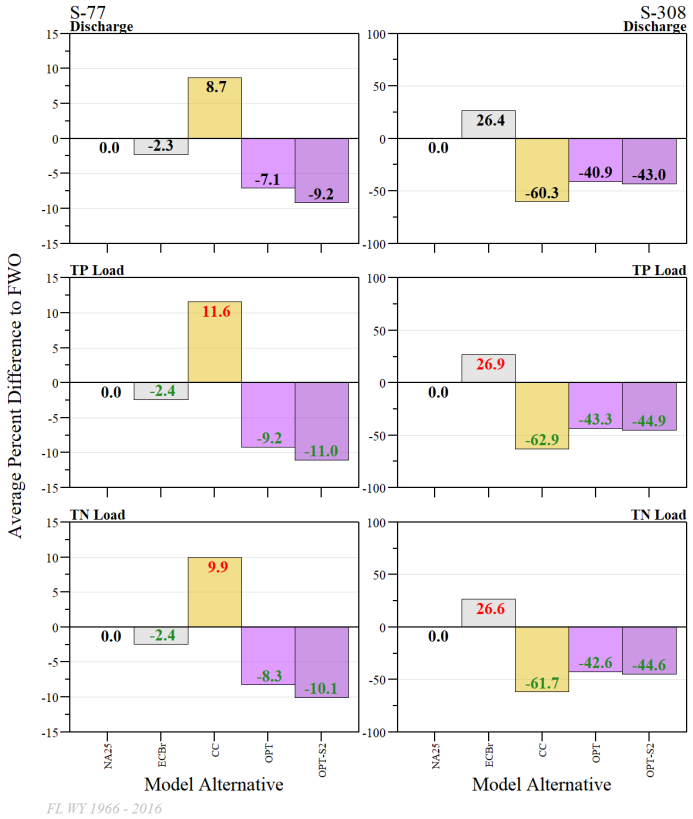
Flood control discharges



Iteration 2 results. Mean annual flood control releases from Lake Okeechobee for the 52 year (1965 - 2016) simulation period of record.

Average annual flood control discharges from Lake Okeechobee to Water Conservation Areas and Northern Estuaries over the simulation period of record.

Load



Average percent difference from FWO (NA25) for discharge and estimated nutrient loads over the May 1965 - April 2016 (FL WY 1966 - 2016) period of simulation.

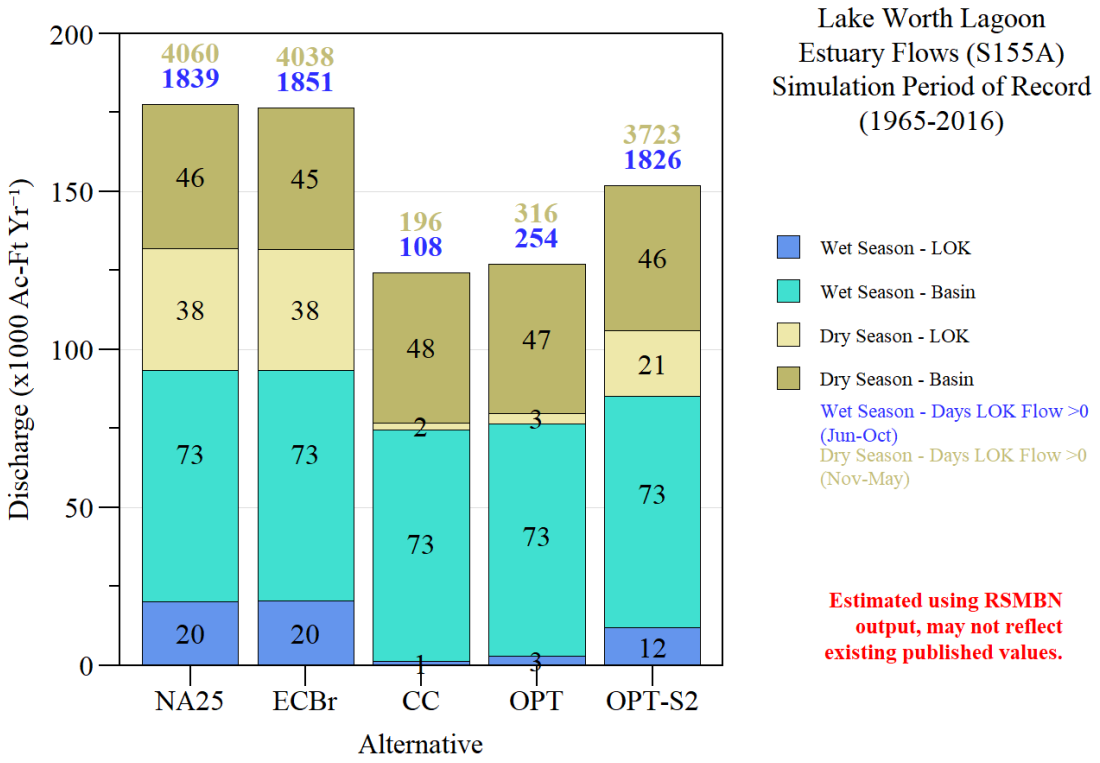
Back Flow/Pump

Average annual load and average percent change relative to FWO (NA25) over the simulation period or record between May 1965 and April 2016 for back flow/pumping from S77, S308 and EAA (S2, S3 and S4) to Lake Okeechobee.

		Average Annual[1]				% Change Compare to FWO		
Area	Alt[1]	Percent Total Inflow Water Budget[1]	Discharge (kAcf-Ft WY^{-1})[1]	TP Load (kg WY^{-1})	TN Load (kg WY^{-1})	Discharge	TP Load	TN Load
S77	NA25	1.8%	34.0	5957	70334	---	---	---
	ECBr	1.8%	35.2	6370	74002	3.7	6.9	5.2
	CC	1.6%	31.5	5839	66730	-7.3	-2.0	-5.1
	OPT	1.7%	33.3	6142	70661	-1.8	3.1	0.5
	OPT-S2	1.8%	34.8	6381	73601	2.4	7.1	4.6
S308	NA25	2.1%	38.8	9894	84024	---	---	---
	ECBr	2.4%	45.9	11421	96162	18.2	15.4	14.4
	CC	2.4%	45.6	11882	101066	17.5	20.1	20.3
	OPT	2.3%	43.4	11315	95784	11.9	14.4	14.0
	OPT-S2	2.3%	44.8	11746	99339	15.5	18.7	18.2
EAA	NA25	2.5%	47.3	13790	169512	---	---	---
	ECBr	2.7%	52.8	14516	187490	11.7	5.3	10.6
	CC	3.4%	64.4	15760	228985	36.2	14.3	35.1
	OPT	3.8%	73.9	16916	265371	56.3	22.7	56.5
	OPT-S2	3.8%	73.6	16968	264103	55.5	23.0	55.8

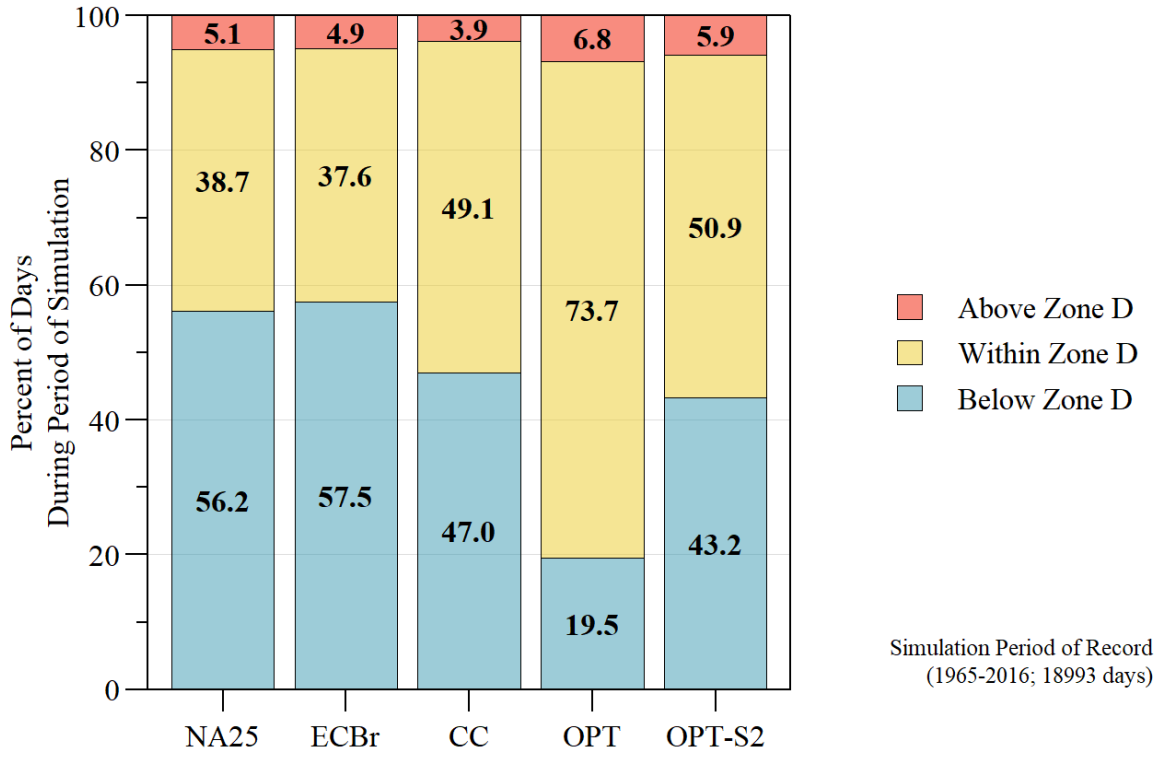
[1]Simulation period of record between Florida Water Year 1966 - 2016 (May 1965 - April 2016)

Lake Worth Lagoon



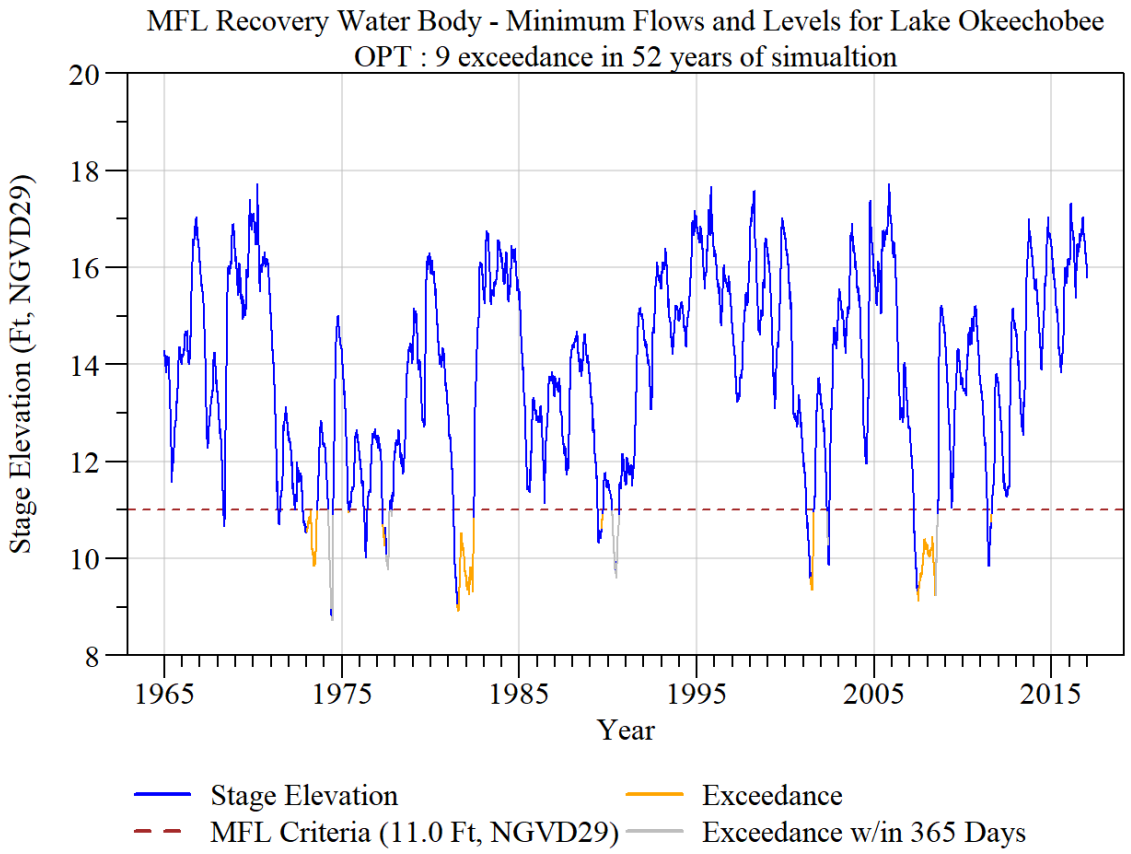
- Prior analysis uses a combination of RSMBN (C10A) and RSMGL (S155A) models.
  - RSMGL provides a finer detail modeling of flows used within the basin that is passed through S155A.
- Due to limited information (for OPT Alternative), RSMBN was used to evaluate LOK and Basin flows to LWL.

Lake Okeechobee Regulation Schedule



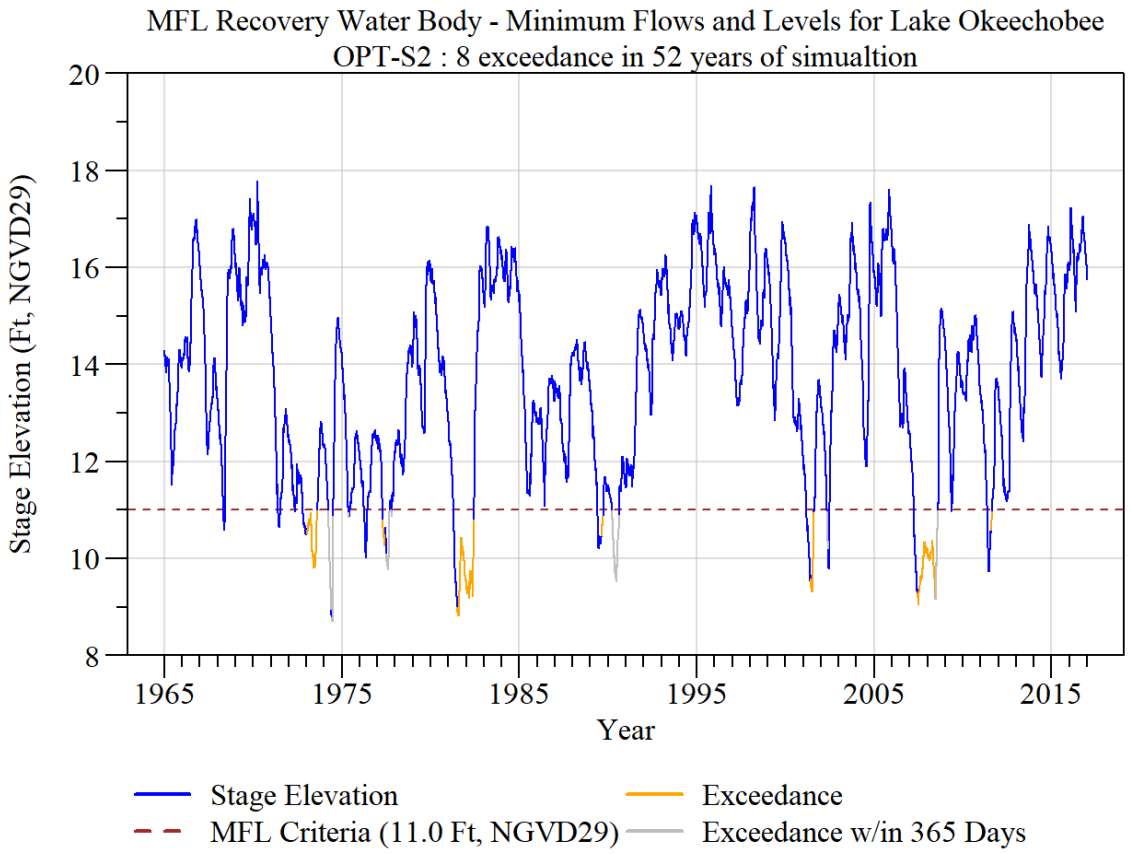
Percent of time above, within, and below Zone D of the regulation schedule.

Lake Okeechobee MFL



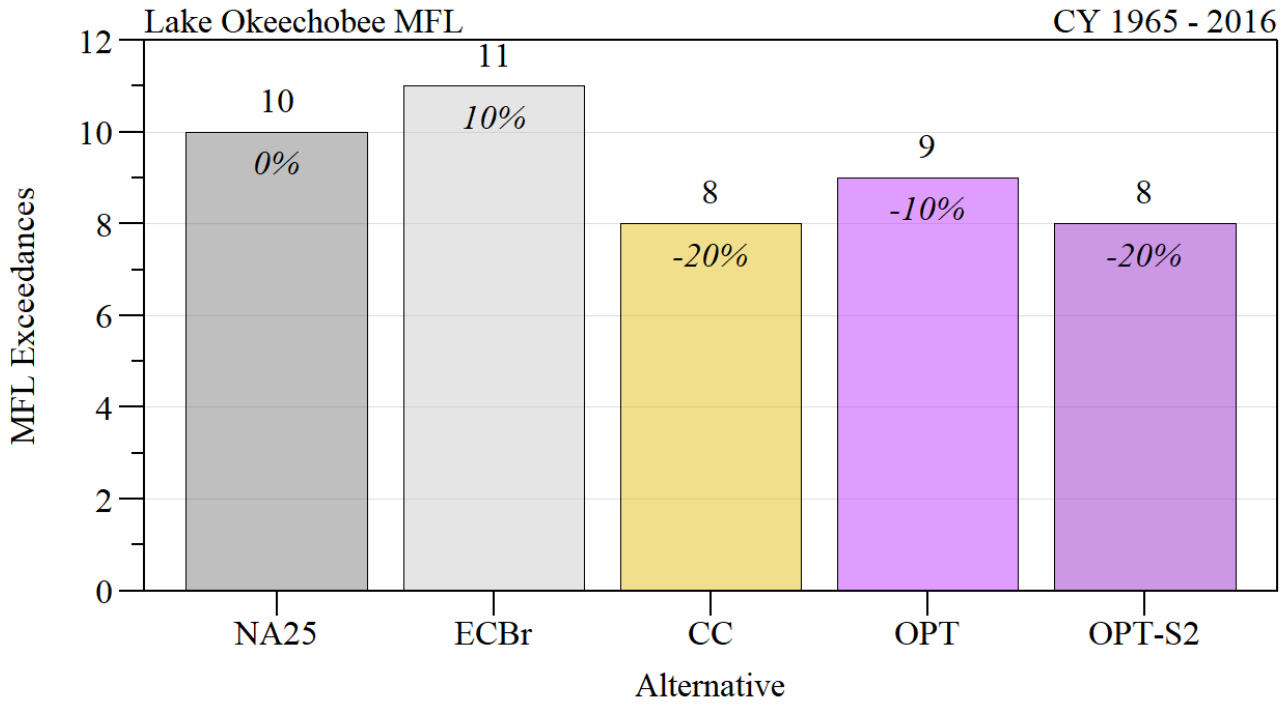
Minimum flow and levels evaluation for the Lake Okeechobee for alternative 'OPT' during the simulated period of record. Percentage within bar represents percent difference relative to

Lake Okeechobee MFL



Minimum flow and levels evaluation for the Lake Okeechobee for alternative 'OPT-S2' during the simulated period of record. Percentage within bar represents percent difference

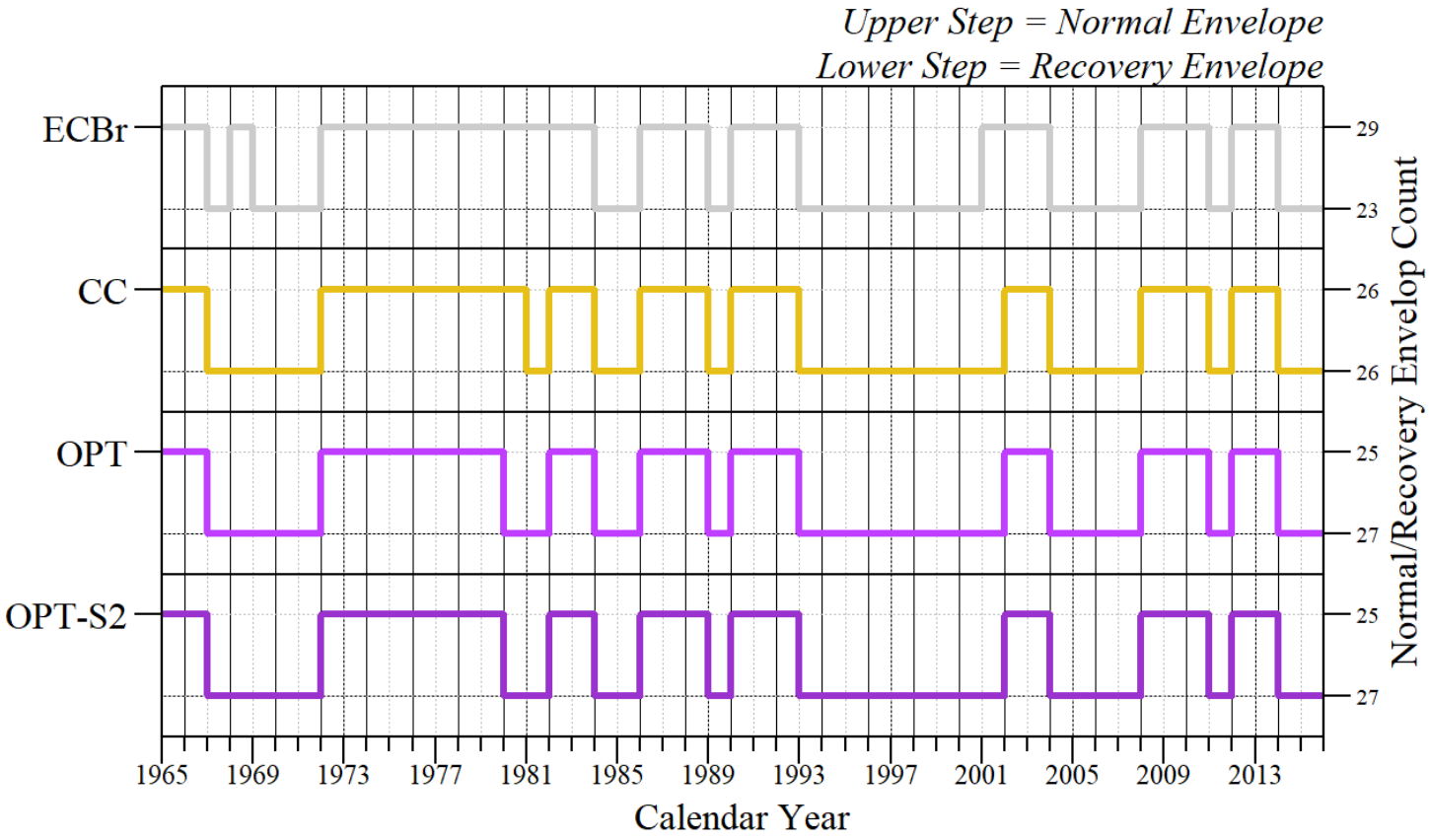
Lake Okeechobee MFL



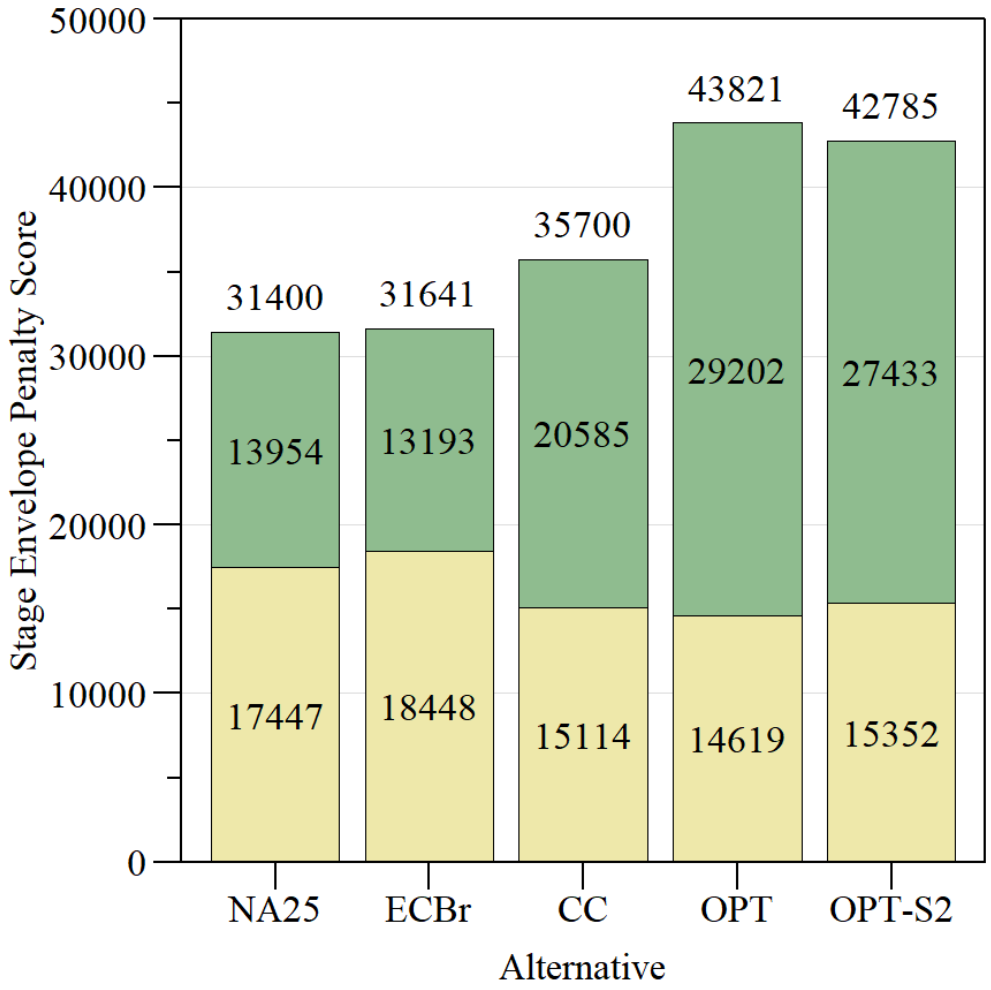
Comparison of MFL exceedances across FWO, ECB, CC and OPT during the simulated period of record.

- In our analysis ECBr had 11 exceedances (USACE is reporting 12 **currently troubleshooting**)

Lake Okeechobee



Lake Okeechobee



Lake Okeechobee
Envelope Penalty Score
All Years

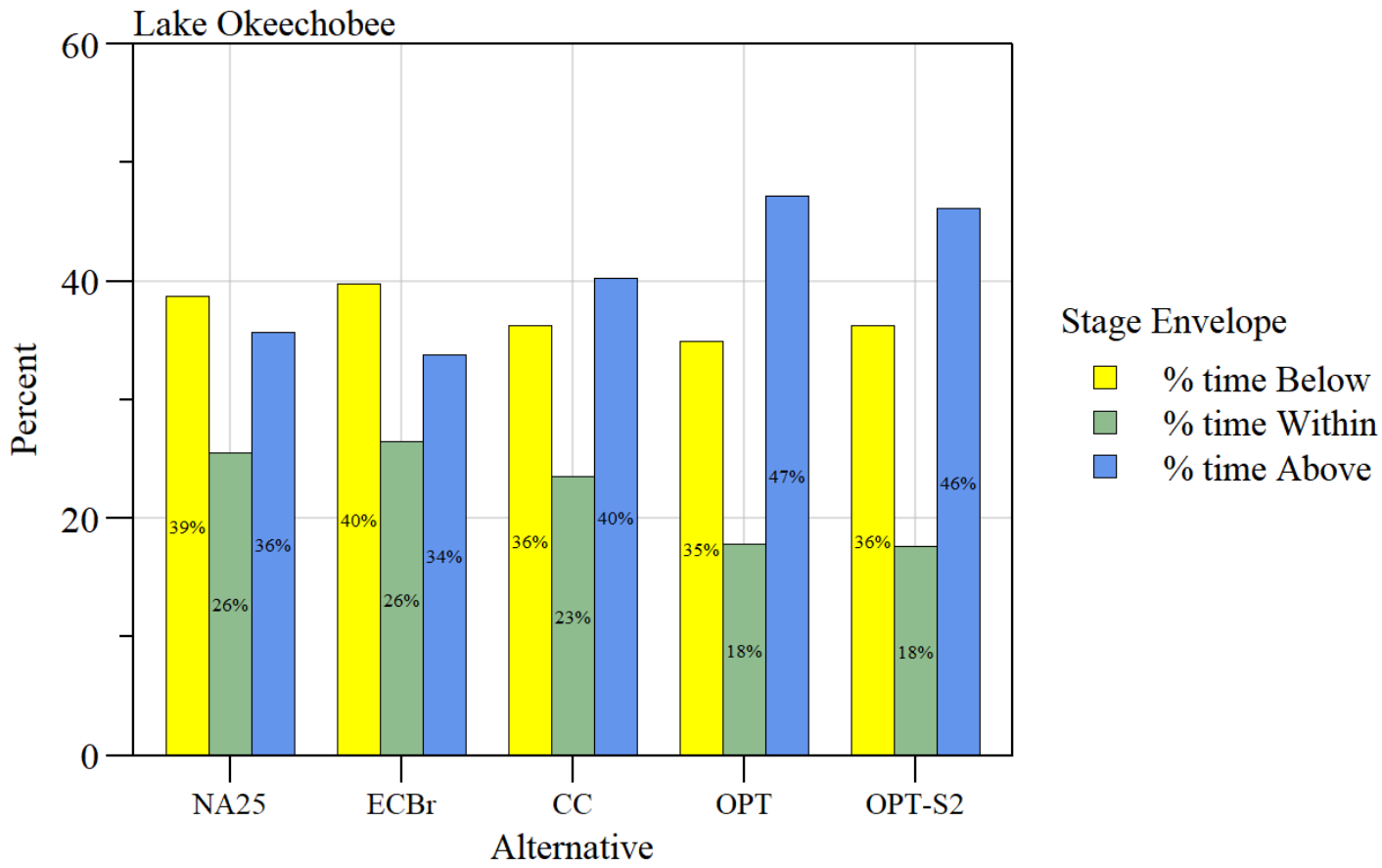
Total Score

Lower Penalty
(Below Envelope)

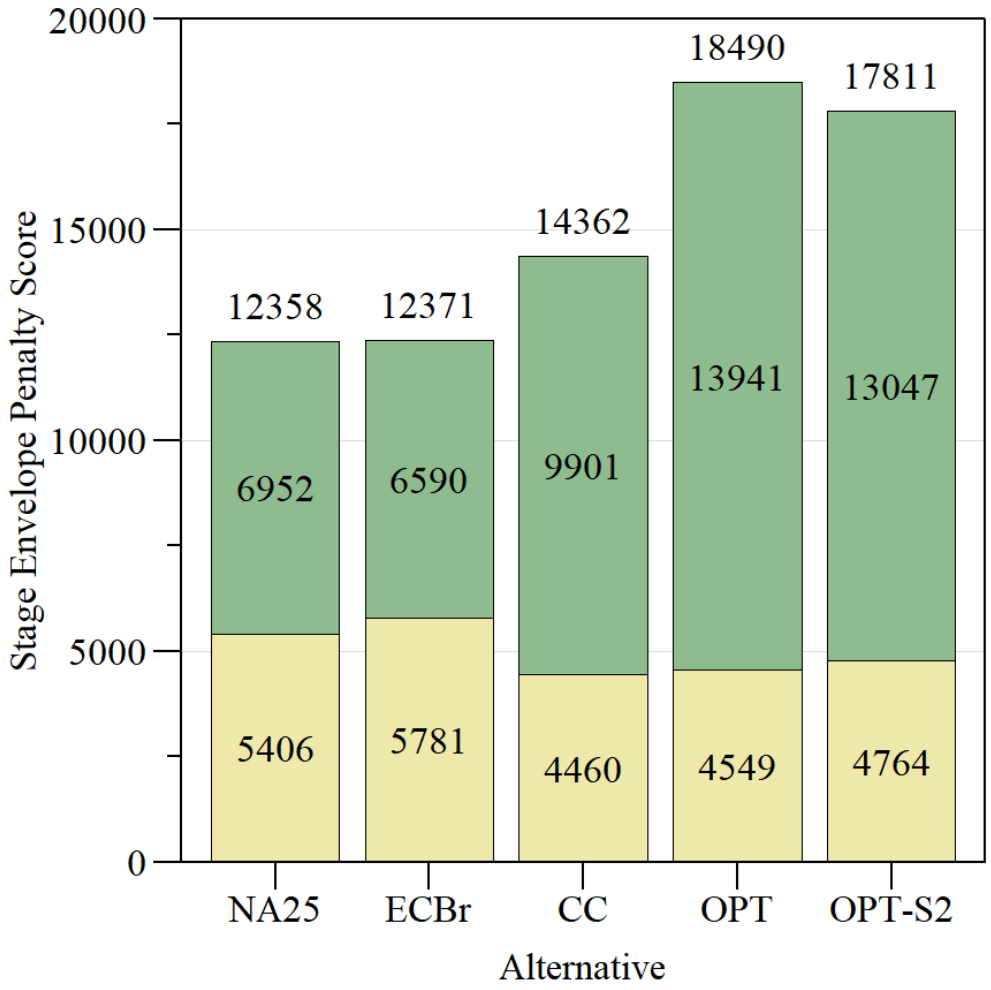
Upper Penalty
(Above Envelope)

Simulation Period of Record
(1965-2016). Includes Normal
and Recovery envelope.

Lake Okeechobee



Lake Okeechobee



Lake Okeechobee
Envelope Penalty Score
May-Sep
All Years

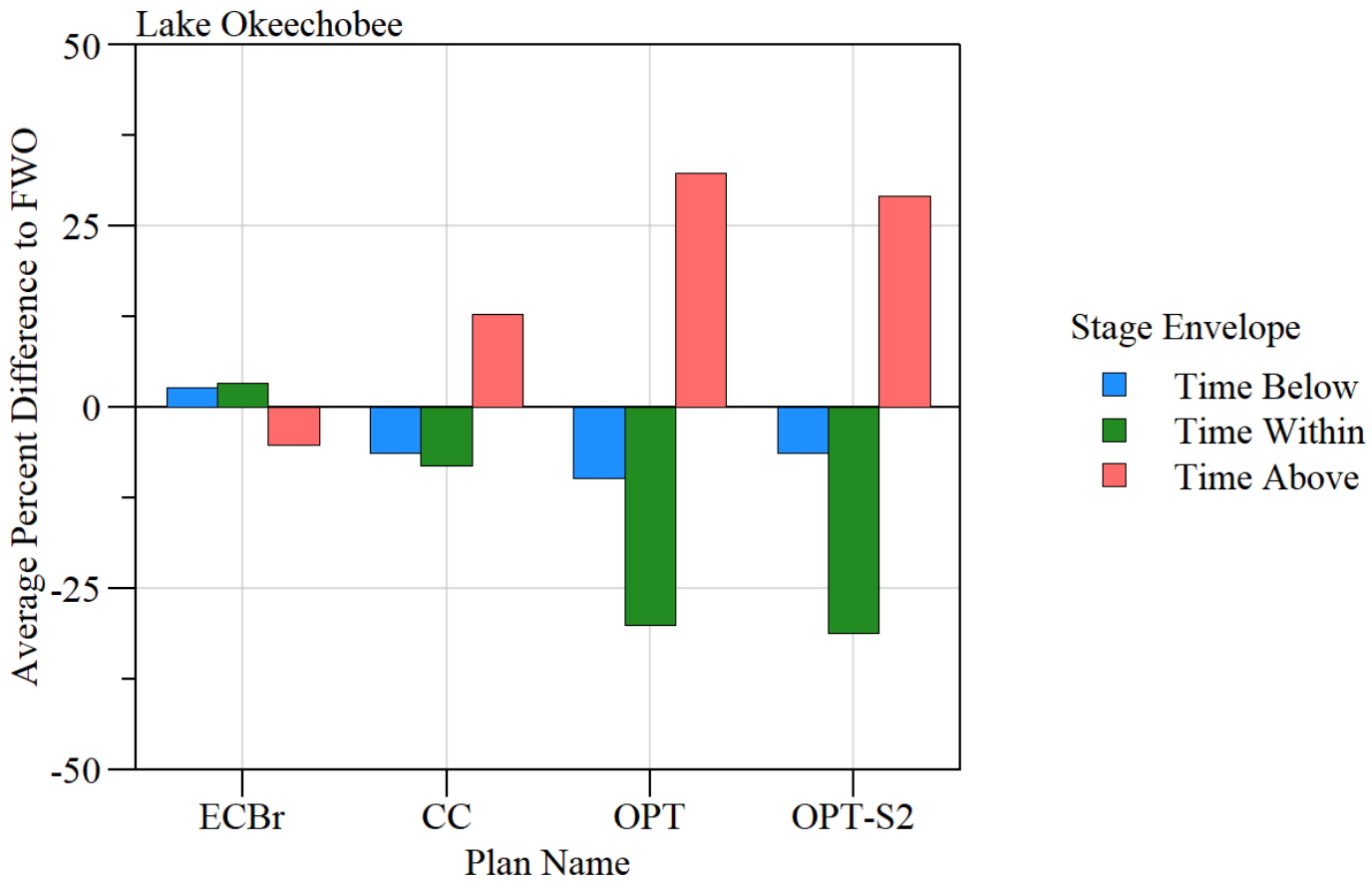
Total Score

Lower Penalty
(Below Envelope)

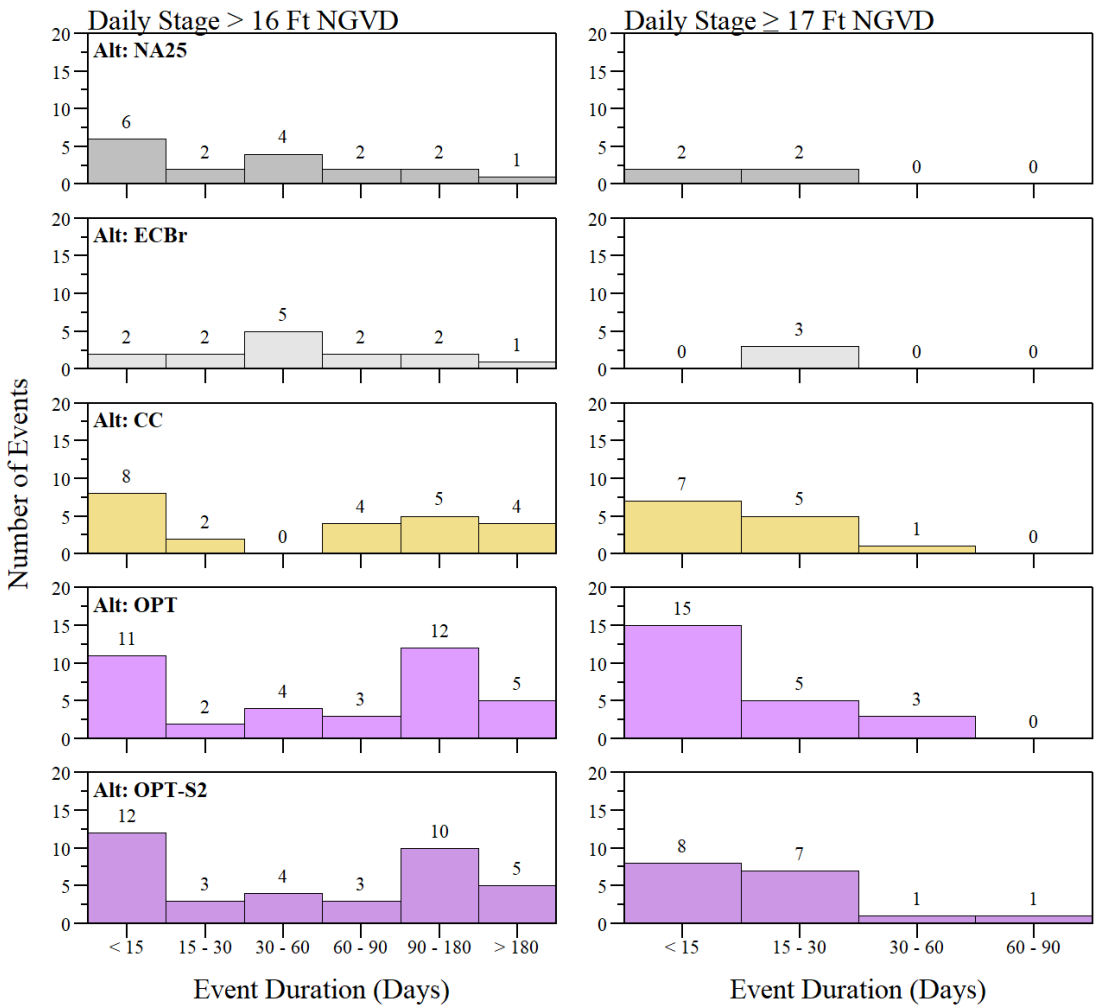
Upper Penalty
(Above Envelope)

Simulation Period of Record
(1965-2016). Includes Normal
and Recovery envelope.

Lake Okeechobee



Lake Okeechobee - High Stage Events



Lake Okeechobee - Low Stage Events