# Lake Okeechobee Operations Interactive Simulation Exercise

## *Are you smarter than a water manager?*

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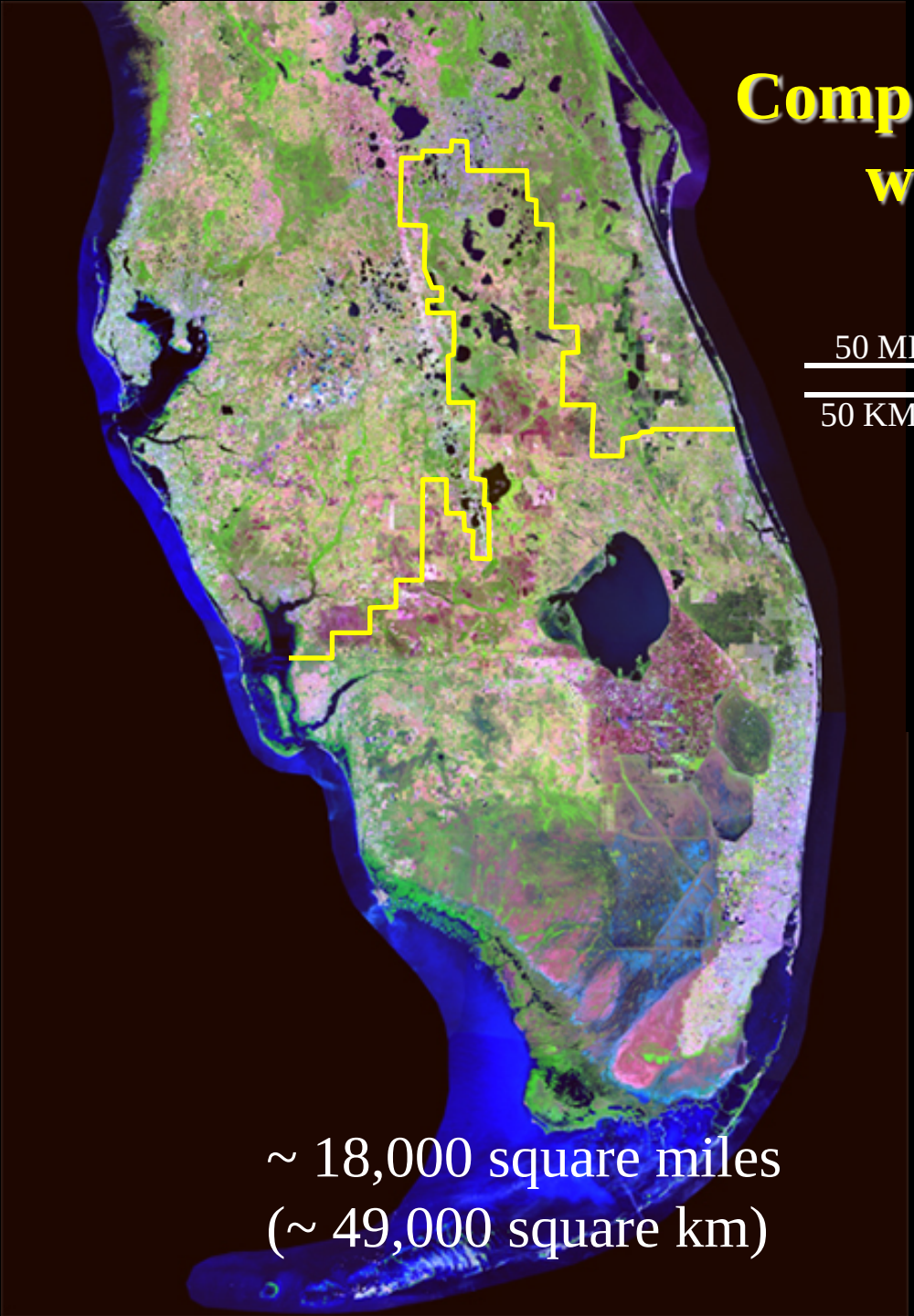
*Water Control Operations*
*South Florida Water Management District*

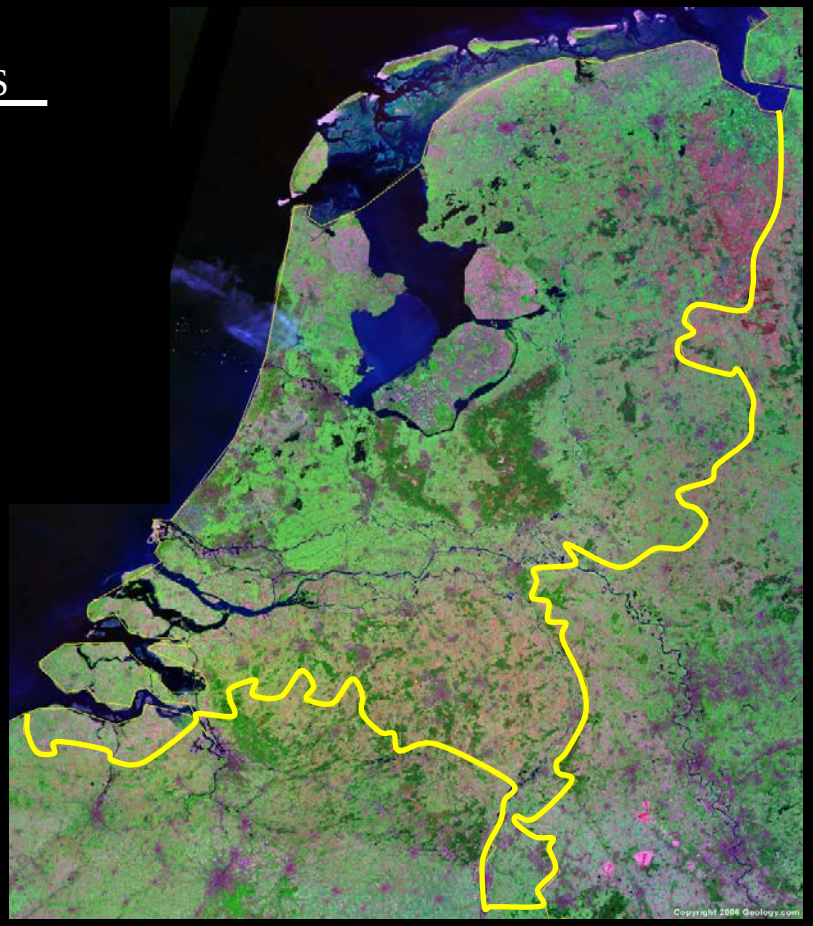
*Photo: looking southwest at C-59, S-191 and Lake Okeechobee; July 2010*

# Comparison of South Florida with the Netherlands



50 MILES

50 KM

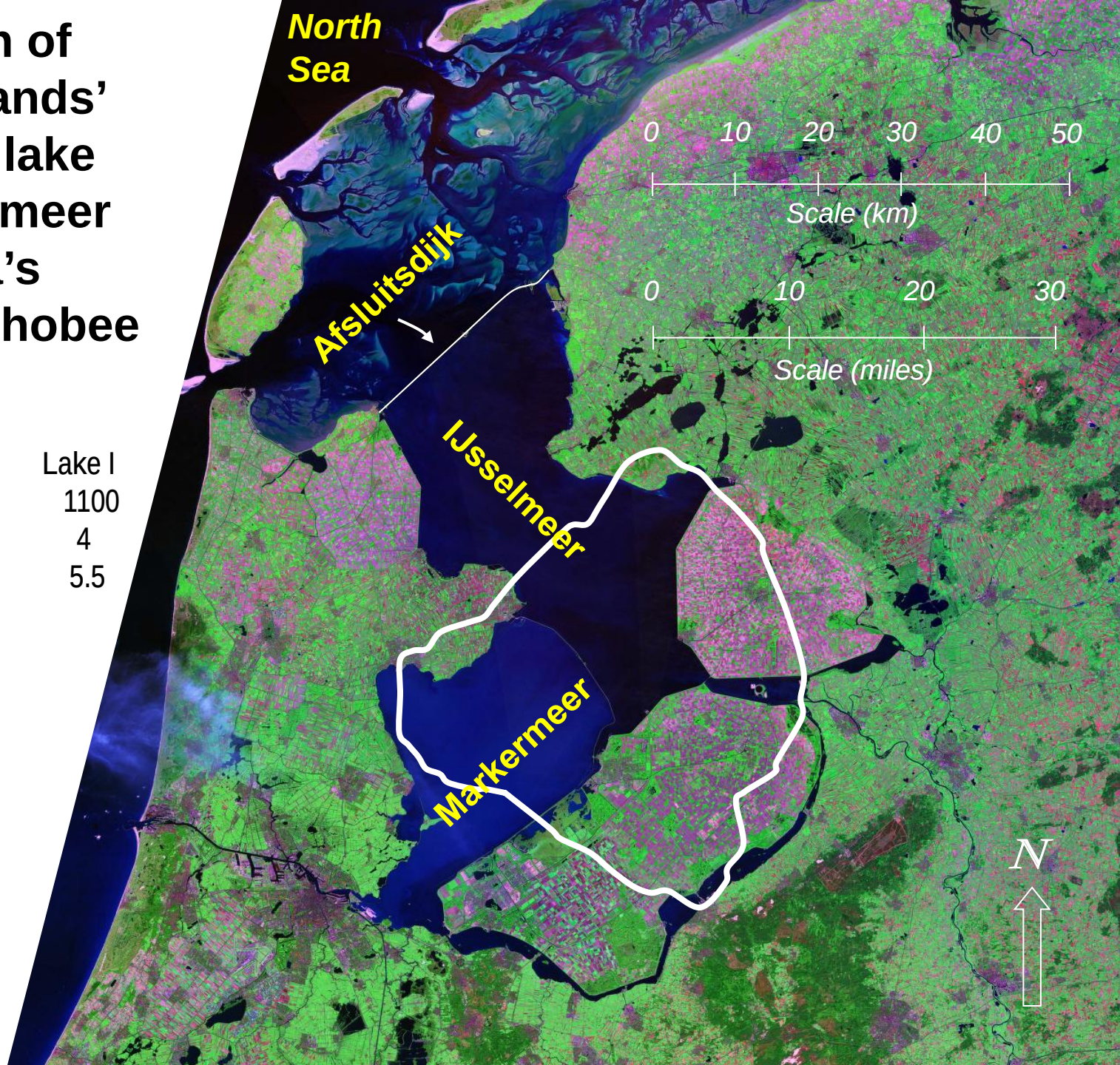


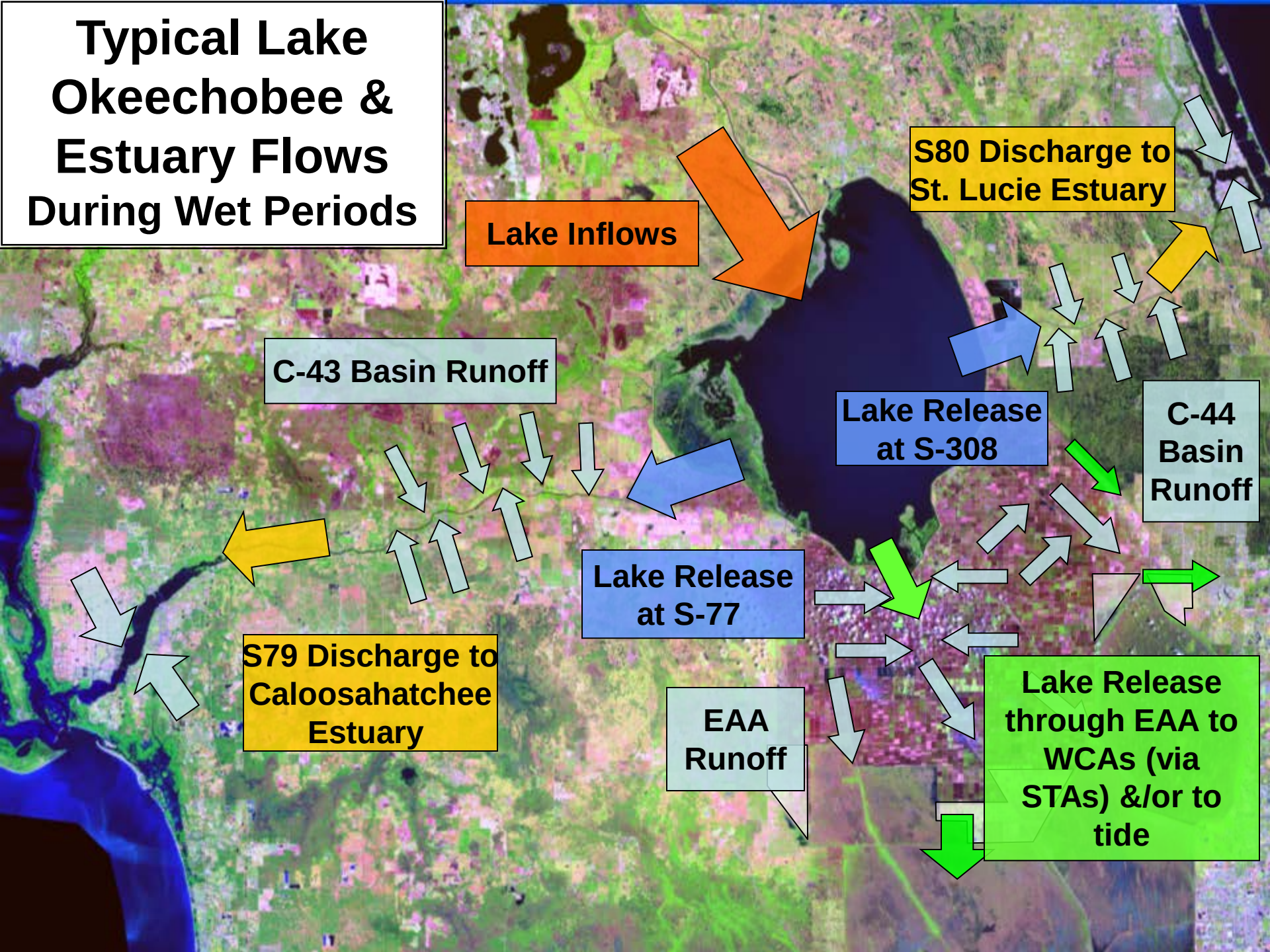
~ 18,000 square miles
(~ 49,000 square km)

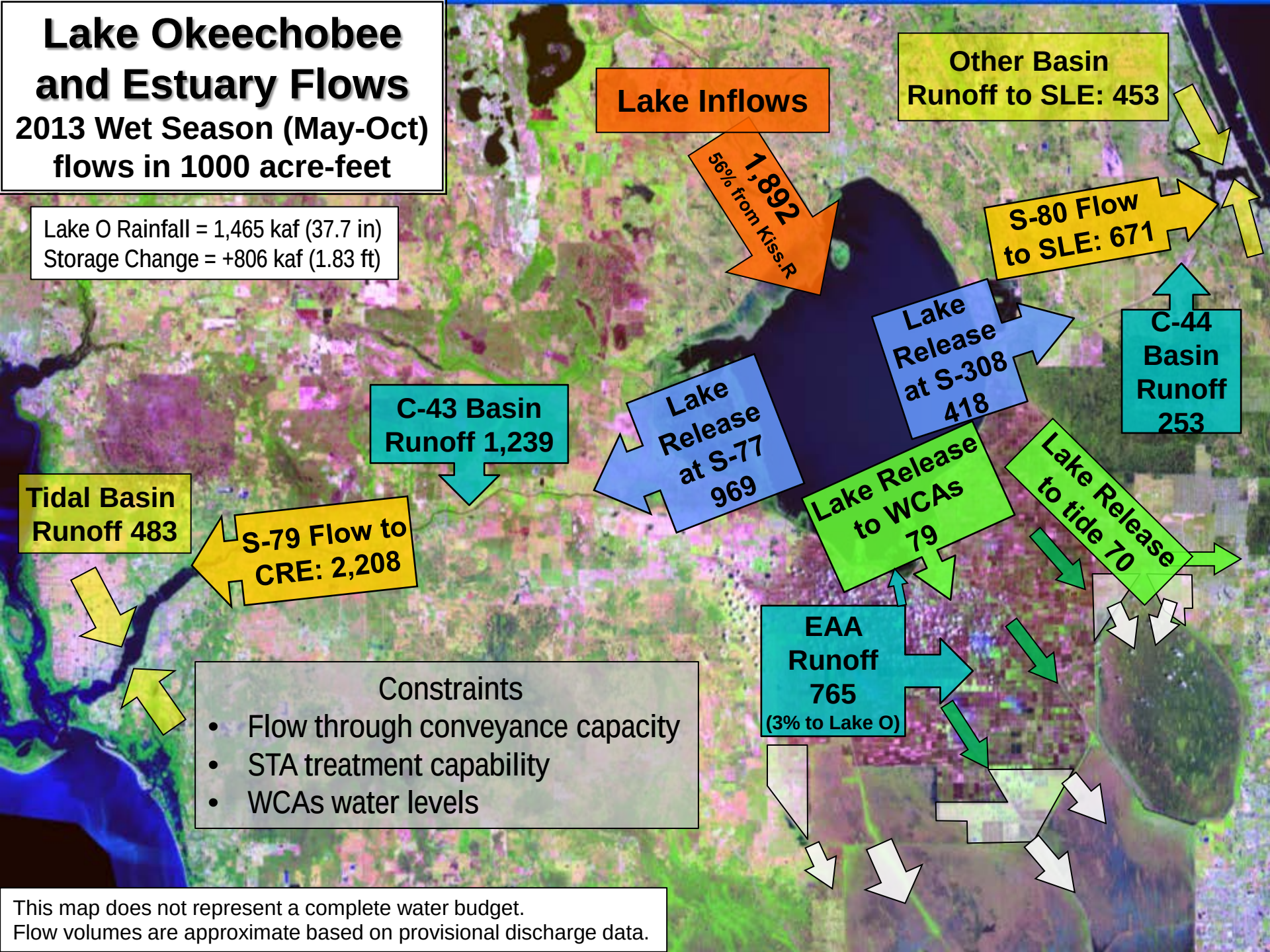
~ 16,000 square miles
(~ 41,500 square km)

# Comparison of the Netherlands' fresh water lake of the Ijsselmeer with Florida's Lake Okeechobee

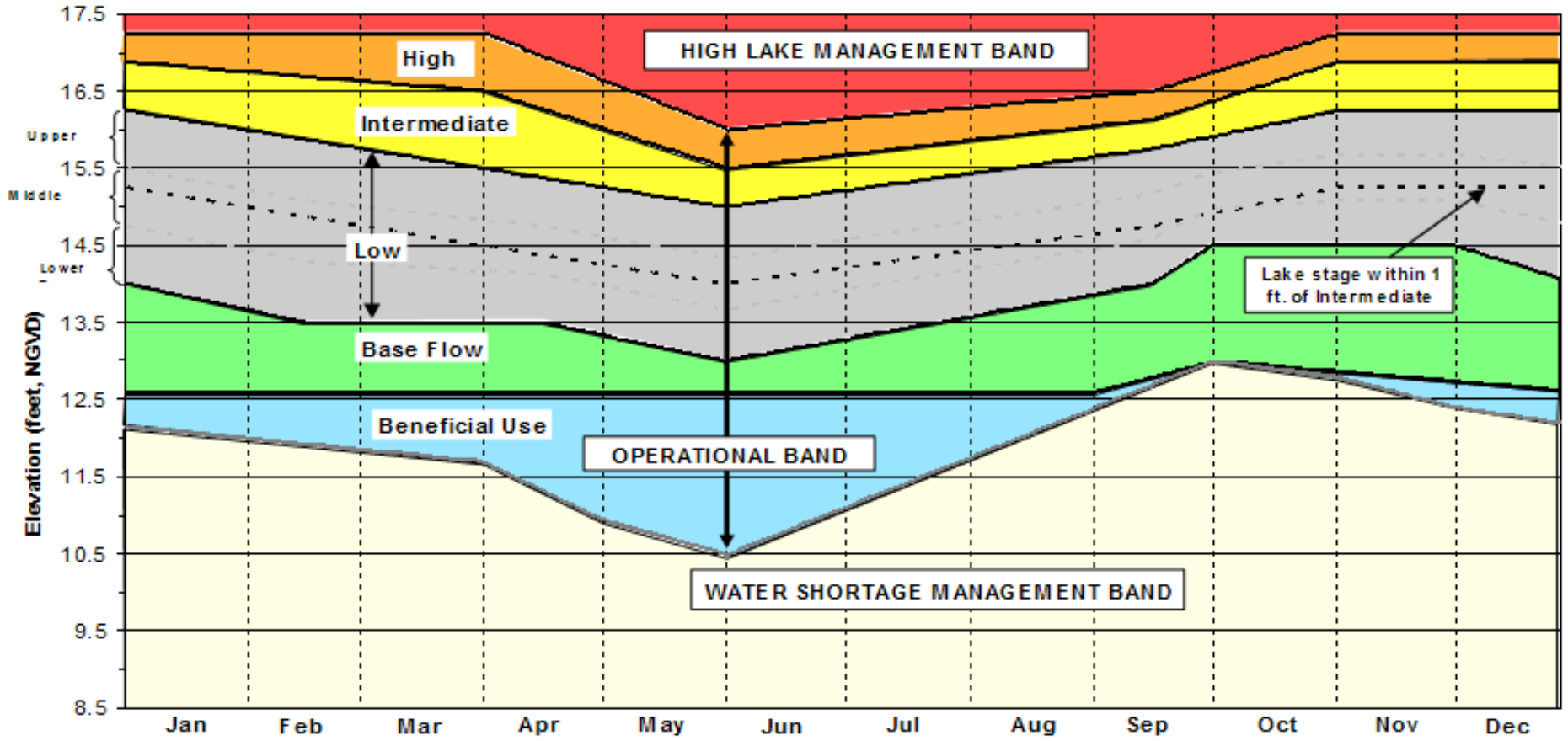
| | Lake O | Lake I |
|---|---|---|
| Area(km) | 1890 | 1100 |
| Mean Depth (m) | 2.4 | 4 |
| Max Depth (m) | 8-9 | 5.5 |




Typical Lake Okeechobee & Estuary Flows
During Wet Periods
Lake Inflows
S80 Discharge to St. Lucie Estuary
C-43 Basin Runoff
Lake Release at S-308
C-44 Basin Runoff
Lake Release at S-77
S79 Discharge to Caloosahatchee Estuary
EAA Runoff
Lake Release through EAA to WCAs (via STAs) &/or to tide


Lake Okeechobee and Estuary Flows
2013 Wet Season (May-Oct) flows in 1000 acre-feet
Lake O Rainfall = 1,465 kaf (37.7 in)
Storage Change = +806 kaf (1.83 ft)
Lake Inflows
1,892
56% from Kiss.R
Other Basin Runoff to SLE: 453
S-80 Flow to SLE: 671
C-44 Basin Runoff 253
Lake Release at S-308 418
Lake Release at S-77 969
C-43 Basin Runoff 1,239
Tidal Basin Runoff 483
S-79 Flow to CRE: 2,208
Lake Release to WCAs 79
Lake Release to tide 70
EAA Runoff 765
(3% to Lake O)
Constraints
• Flow through conveyance capacity
• STA treatment capability
• WCAs water levels
This map does not represent a complete water budget.
Flow volumes are approximate based on provisional discharge data.

# 2008 Lake Okeechobee Interim Regulation Schedule (aka LORS-2008)




NOTES:

High Lake Management Band: Outlet canals may be maintained above their optimum water management elevations.

Operational Band: Outlet canals should be maintained within their optimum water management elevations.

Water Shortage Management Band: Outlet canals may be maintained below optimum water management elevations.

CENTRAL AND SOUTHERN FLORIDA PROJECT

2008 LAKE OKEECHOBEE
INTERIM REGULATION SCHEDULE

PART B

DATED: March 2008
DEPARTMENT OF THE ARMY, JACKSONVILLE DISTRICT
CORPS OF ENGINEERS, JACKSONVILLE, FLORIDA

Figure 7-2

# 2008 LORS

## Part D: Establish Allowable Lake Okeechobee Releases to Tide (Estuaries)

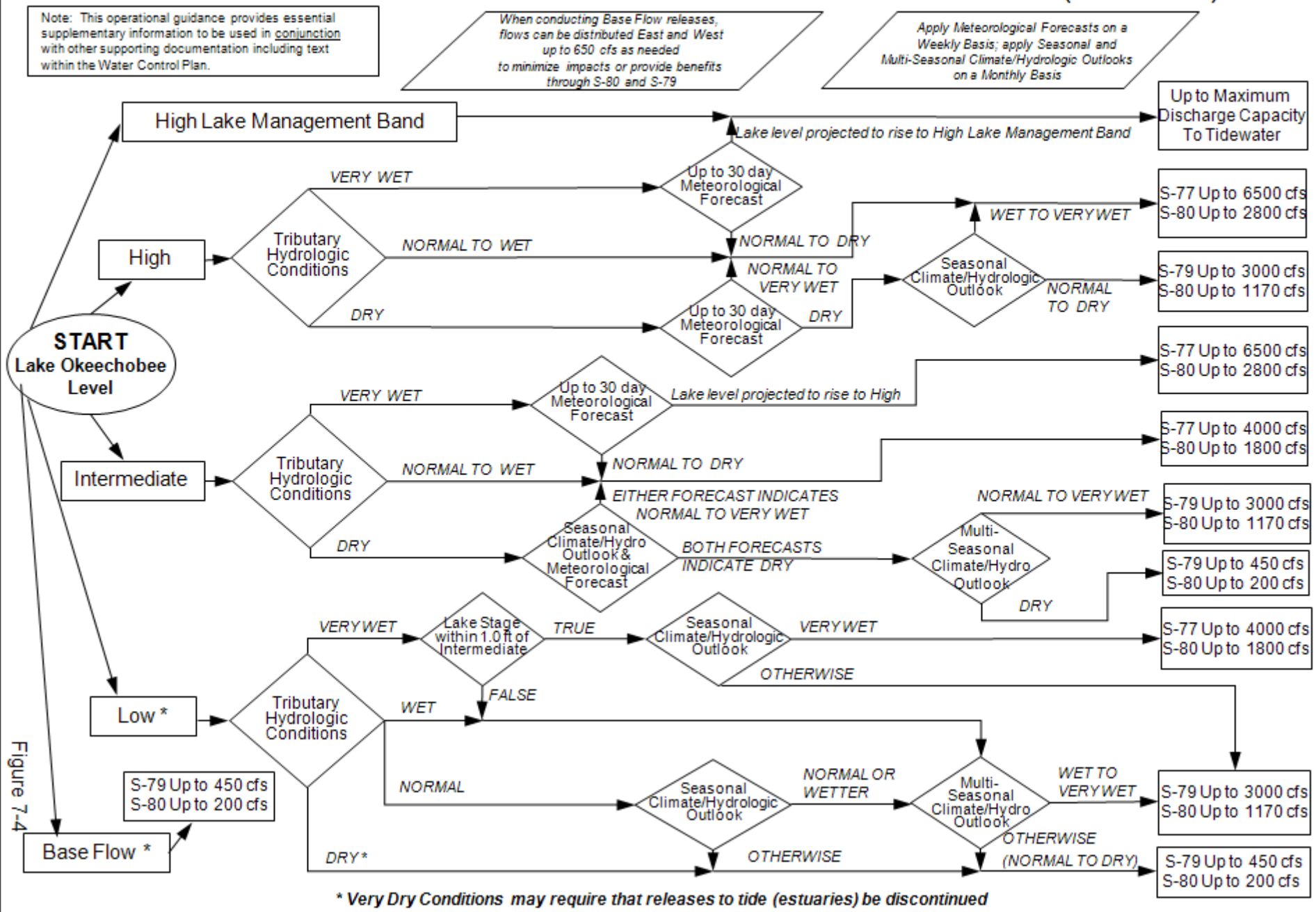



Figure 7-4

# 2008 LORS

## Part C: Establish Allowable Lake Okeechobee Releases to the Water Conservation Areas

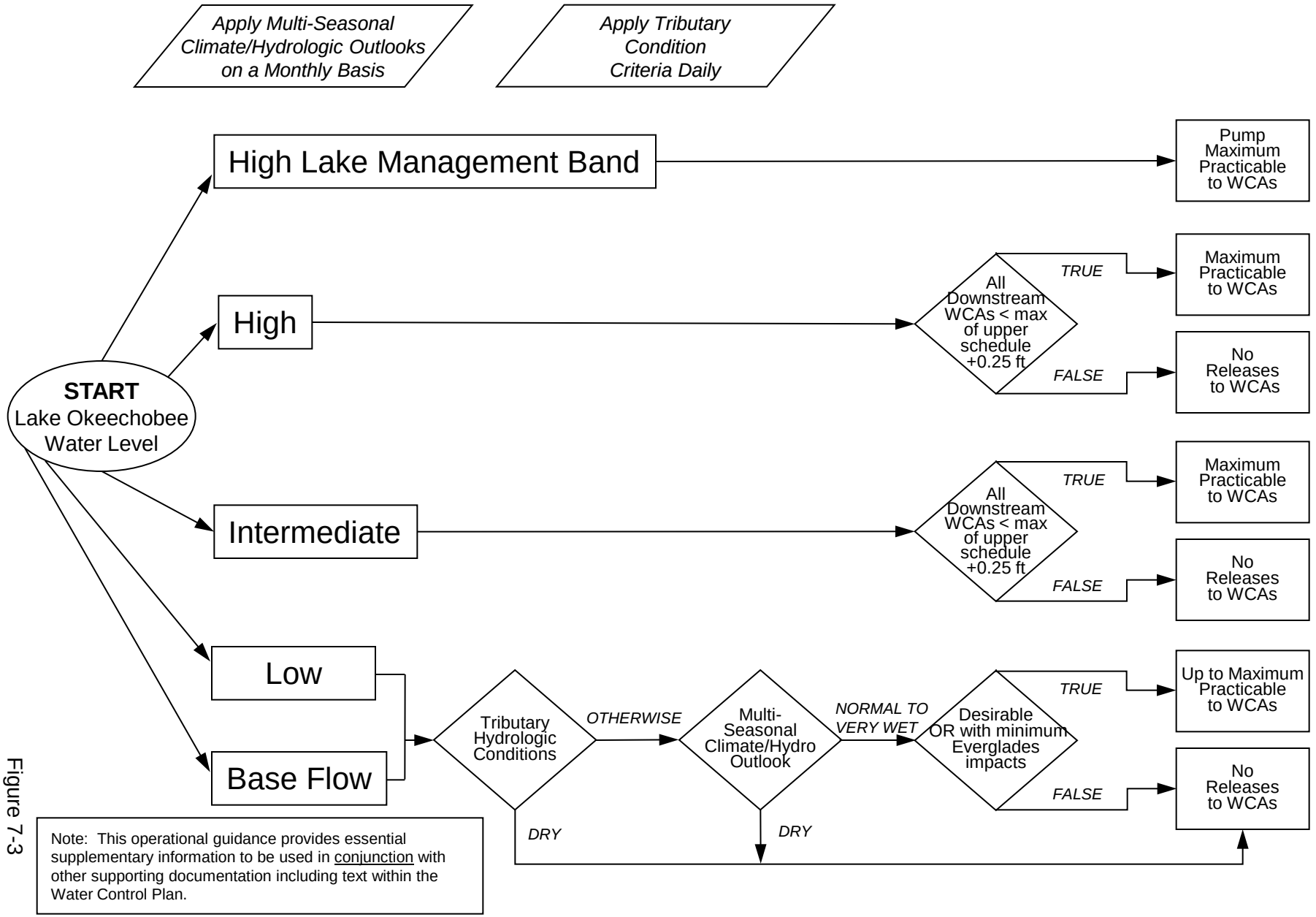
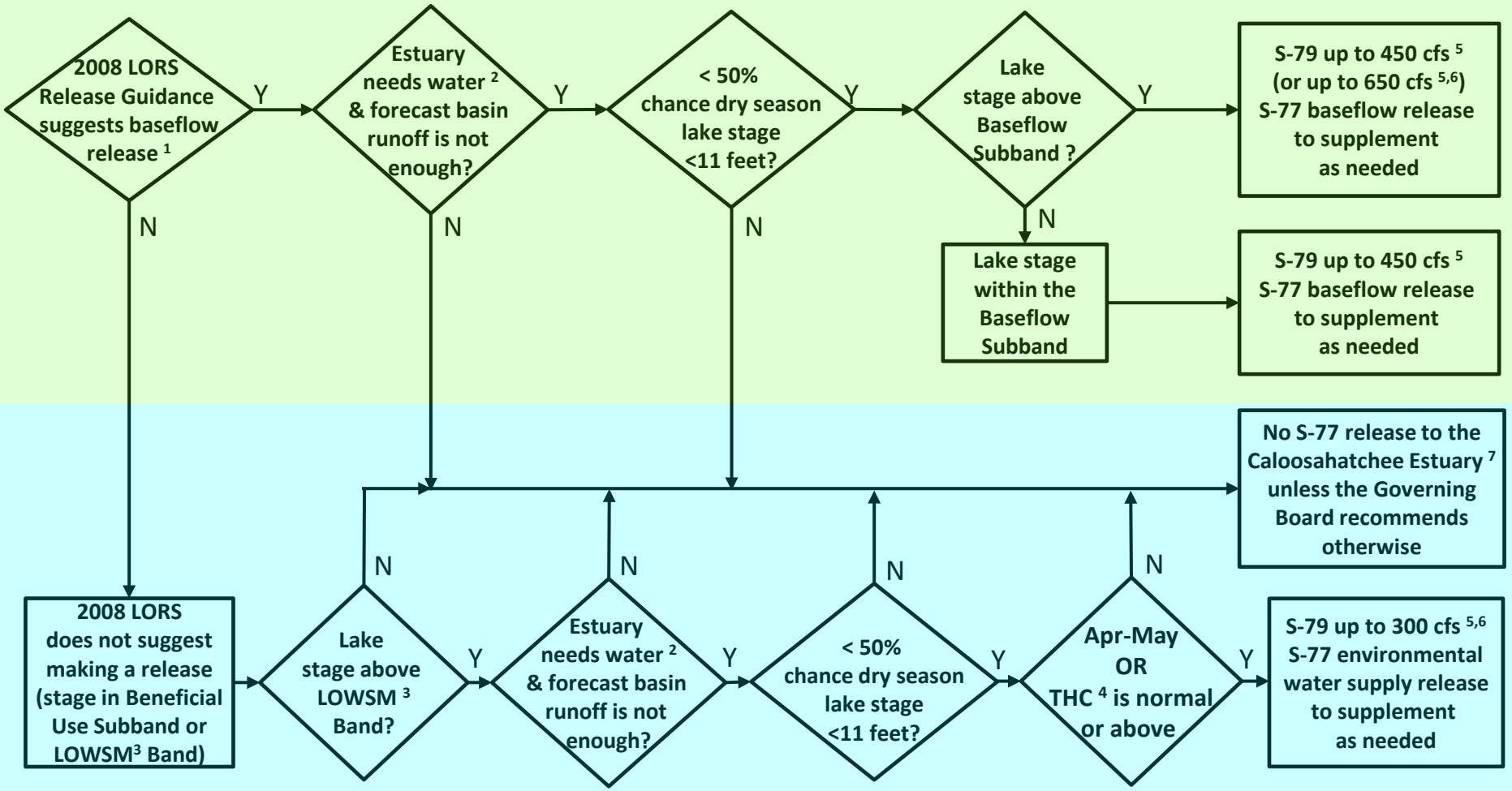



Figure 7-3

# Flowchart to Guide Recommendations for Lake Okeechobee Releases to the Caloosahatchee Estuary for 2008 LORS Baseflow & for Environmental Water Supply (revised 9-Aug-2012)




[1]The 2008 LORS Release Guidance (Part D) can suggest baseflow releases in the Intermediate, Low, or Baseflow Subbands.

[2]Estuary "needs" water when the 30-day moving average salinity at I-75 bridge is projected to exceed 5 practical salinity units (psu) within 2 weeks.

[3]LOWSM = Lake Okeechobee Water Shortage Management.

[4]Tributary Hydrologic Condition (THC) is based on classification of Lake Okeechobee Net Inflow and Palmer Index.

[5]Can release less than the "up to" limit if lower release is sufficient to reach or sustain desired estuary salinity; cfs = cubic feet per second.

[6]After reviewing conditions in Water Conservation Areas (WCAs), Stormwater Treatment Areas (STAs), ENP, St. Lucie Estuary and Lake Okeechobee.

[7]Should this condition be reached, the Governing Board will be briefed at their next regularly scheduled meeting as part of the State of the Water Resources agenda item.

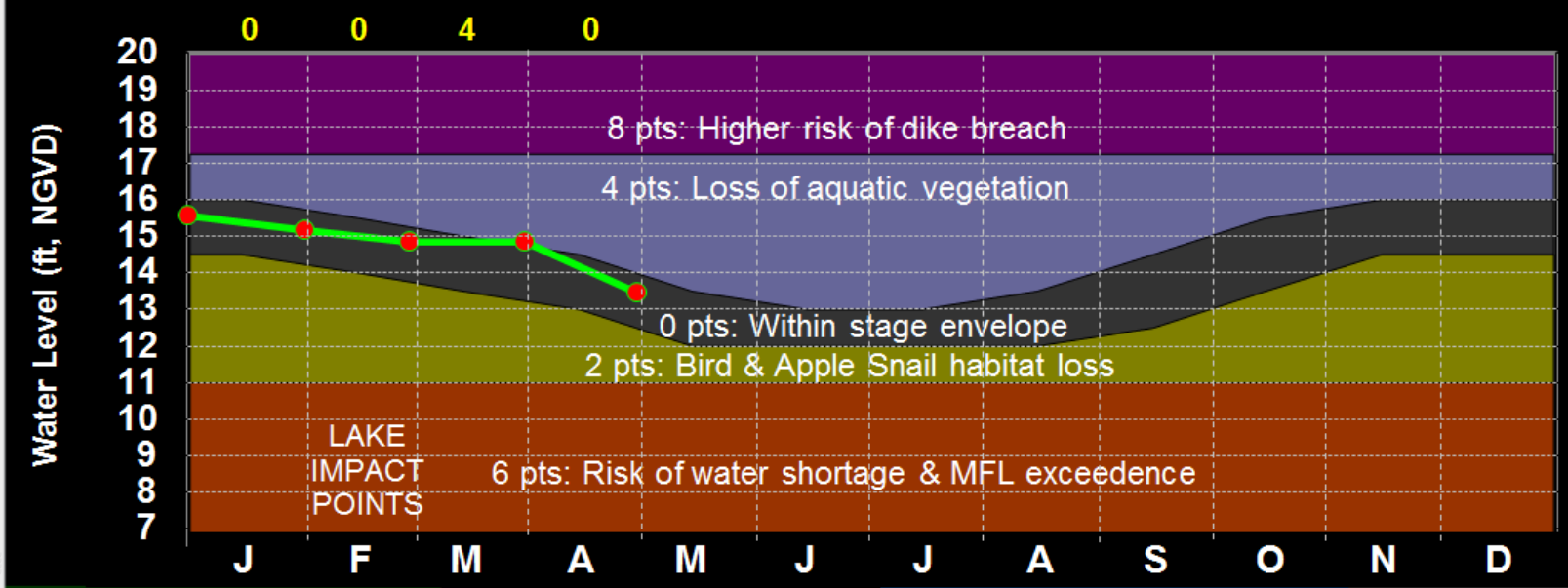
# Reality vs Simulated Reality

- Reality – the USACE makes the release decisions to manage (regulate) Lake O water levels
  - Weekly decisions based on:
    - federal regulation schedule
    - SFWMD and other agency input
- Simulated Reality – You make the decision
  - One year simulation, monthly decisions
  - Goal: minimize penalty points, which are assessed:
    - for Lake stages that are too high or too low
    - for Estuary discharges that are outside preferred ranges

# Lake Okeechobee Interactive Simulator

*Calvin Neidrauer, P.E., SFWMD*

## Lake Okeechobee Water Level & Release Simulator




**4**

**TOTAL LAKE POINTS**

**TOTAL ESTUARY POINTS**

| CAL | STL |
|---|---|
| 14 | 4 |

### CONDITIONS ON: 1-May

| | |
|---|---|
| LAKE LEVEL (ft, NGVD) | 13.44 |
| TRIBUTARY HYDROLOGIC CONDITION | Normal |
| WCA CAPACITY AVAILABLE? | YES |
| STA TREATMENT CAPACITY AVAILABLE? | YES |

CASE 6 ☐ Show Historical

### FORECASTS & OUTLOOKS

| | |
|---|---|
| MIDDLE 50% WATER LEVEL PROJECTION | 13.58<br>13.24 |
| SEASONAL NET INFLOW OUTLOOK | V.Wet |
| MULTI-SEASONAL NET INFLOW | V.Wet |
| HURRICANE FORECAST NS<br>H<br>MH | 15<br>8<br>4 |

### RELEASE DECISIONS

EVERGLADES WCAs: NO RELEASE

ST.LUCIE via S-80: HIGH RELEASE (2800cfs,~0.36'/mo)

CALOOS. via S-77: HIGH RELEASE (6500cfs,~0.83'/mo)

**TAKE ACTION**

### OUTCOME

| | |
|---|---|
| START STAGE: | 14.86 |
| NET INFLOW (FT): | -0.24 |
| RELEASE (FT): | 1.17 |
| END STAGE: | 13.44 |

### IMPACT SUMMARY

| | |
|---|---|
| LAKE LEVEL POINTS:<br>Within stage envelope | 0 |
| ST.LUCIE EST. PTS:<br>Seagrass damage in IRL | 2 |
| CALOOS. EST. PTS:<br>Freshwater plume enters Gulf | 4 |
| TOTAL FOR MONTH: | 6 |
| TOTAL FOR YEAR: | 22 |

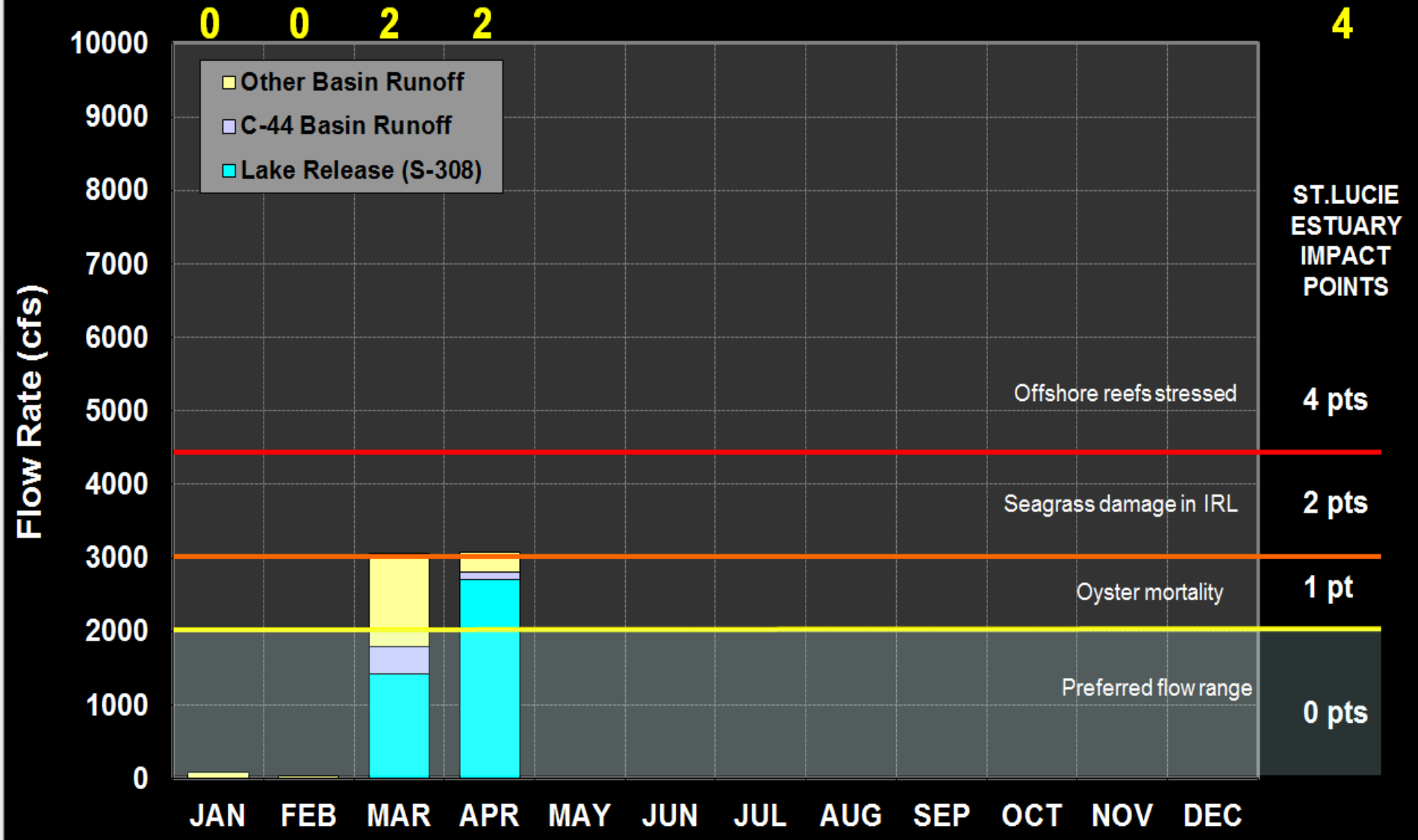
LOK

CAL

# Discharge to St. Lucie Estuary

## St.Lucie Lock & Dam (S-80) + Other Basin Runoff

TOTAL STL ESTUARY POINTS



LOK

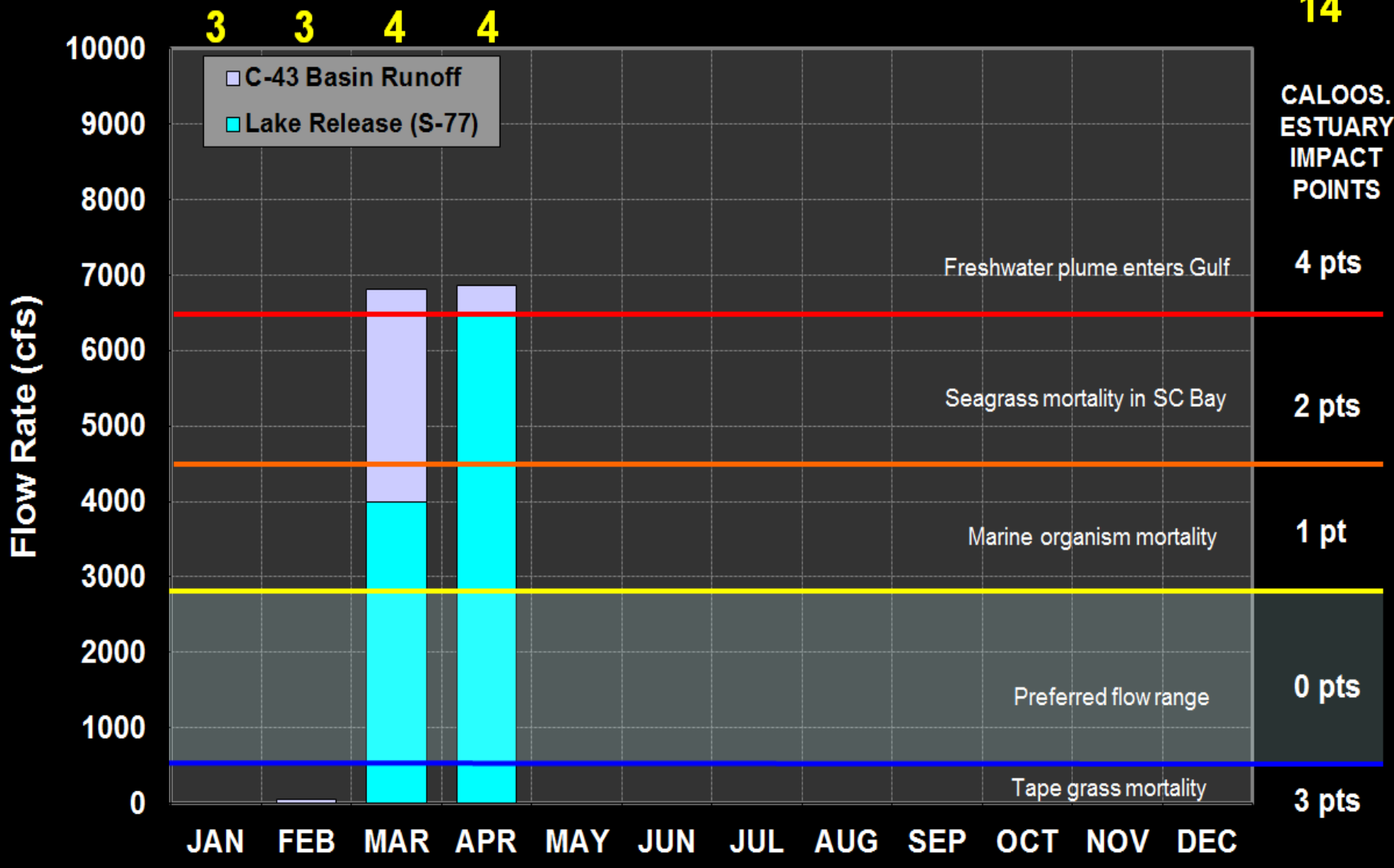
STL

# Discharge to Caloosahatchee Estuary

## at the Franklin Lock & Dam (S-79)

TOTAL CAL ESTUARY POINTS

14



# Lake Okeechobee Discharge Options for the Interactive Simulation Exercise

## CALOOSAHATCHEE VIA S-77

1. MAX RELEASE (7800cfs,~0.99'/mo)
2. HIGH RELEASE (6500cfs,~0.83'/mo)
3. MEDIUM RELEASE (4000cfs,~0.51'/mo)
4. LEVEL 3 PULSE (3000cfs,~0.38'/mo)
5. LEVEL 2 PULSE (2300cfs,~0.29'/mo)
6. LEVEL 1 PULSE (1600cfs,~0.20'/mo)
7. (450cfs,~0.06'/mo)
8. (300cfs,~0.04'/mo)
9. NO RELEASE

## ST. LUCIE VIA S-80

1. MAX RELEASE (7200cfs,~0.92'/mo)
2. HIGH RELEASE (2800cfs,~0.36'/mo)
3. MEDIUM RELEASE (1800cfs,~0.23'/mo)
4. LEVEL 3 PULSE (1170cfs,~0.15'/mo)
5. LEVEL 2 PULSE (950cfs,~0.12'/mo)
6. LEVEL 1 PULSE (730cfs,~0.09'/mo)
7. NO RELEASE

## EVERGLADES WCAs

1. MAX RELEASE (1500cfs,~0.25'/mo)
2. HIGH RELEASE (1000cfs,~0.13'/mo)
3. LOW RELEASE (500cfs,~0.06'/mo)
4. NO RELEASE


Kissimmee River
St. Lucie Estuary
S-80
St. Lucie Canal
S-308
C-10A
Lake Okeechobee
S-352
S-77
Caloosahatchee River
S-351
S-354
S-79
Caloosahatchee Estuary
EAA
Water Conservation Areas (WCAs)

# Lake Okeechobee Interactive Simulation Exercise

## Scores from recent sessions (same simulation year)

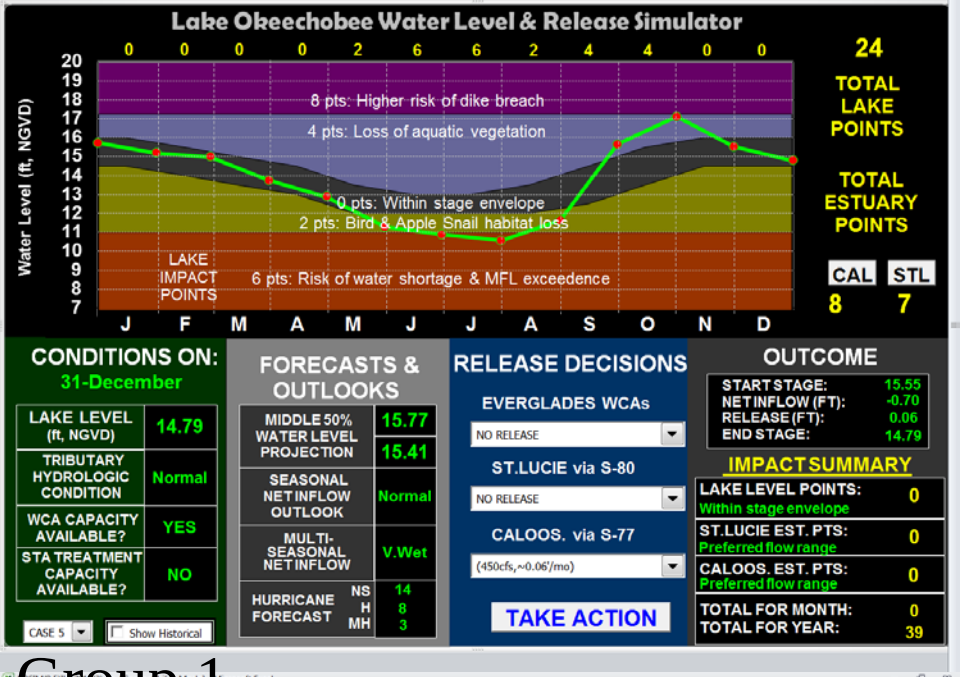
| | 2008 Lake O Regulation Schedule | SFWMD Governing Board May-2010 | Broward Co. WRTF & TAC Oct-2010 | CISRERP A.M. GROUP May-2011 | CISRERP P.M. GROUP May-2011 | UF Water Institute Students Aug-2011 |
|---|---|---|---|---|---|---|
| Caloosahatchee | 15 | 19 | 11 | 7 | 11 | 7 |
| St. Lucie | 10 | 10 | 6 | 7 | 10 | 6 |
| Lake Okeechobee | 16 | 26 | 20 | 20 | 24 | 28 |
| Total | 41 | 55 | 37 | 34 | 45 | 41 |

# Lake Okeechobee Interactive Simulation Exercise

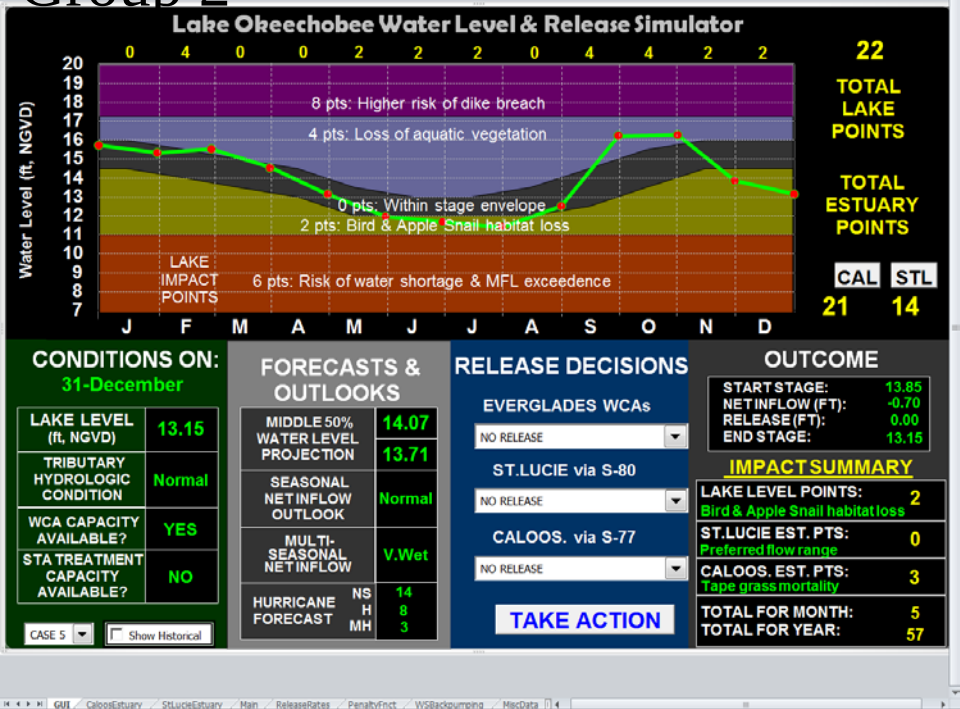
## Scores from recent sessions (same simulation year)

| | 2008 Lake O Regulation Schedule | WRAC New Member Briefing Oct-2013 | UNESCO IHE Student Group #2 May-2012 | UNESCO IHE Student Group #1 May-2013 | UNESCO IHE Student Group #1 May-2014 | UNESCO IHE Student Group #2 May-2014 |
|---|---|---|---|---|---|---|
| Caloosahatchee | 15 | 7 | 11 | 9 | 8 | 21 |
| St. Lucie | 10 | 8 | 10 | 8 | 7 | 14 |
| Lake Okeechobee | 16 | 20 | 20 | 24 | 24 | 22 |
| Total | 41 | 35 | 41 | 41 | 39 | 57 |

**Best Possible Score (known inflows) (10+9+6=25)*




Group 1

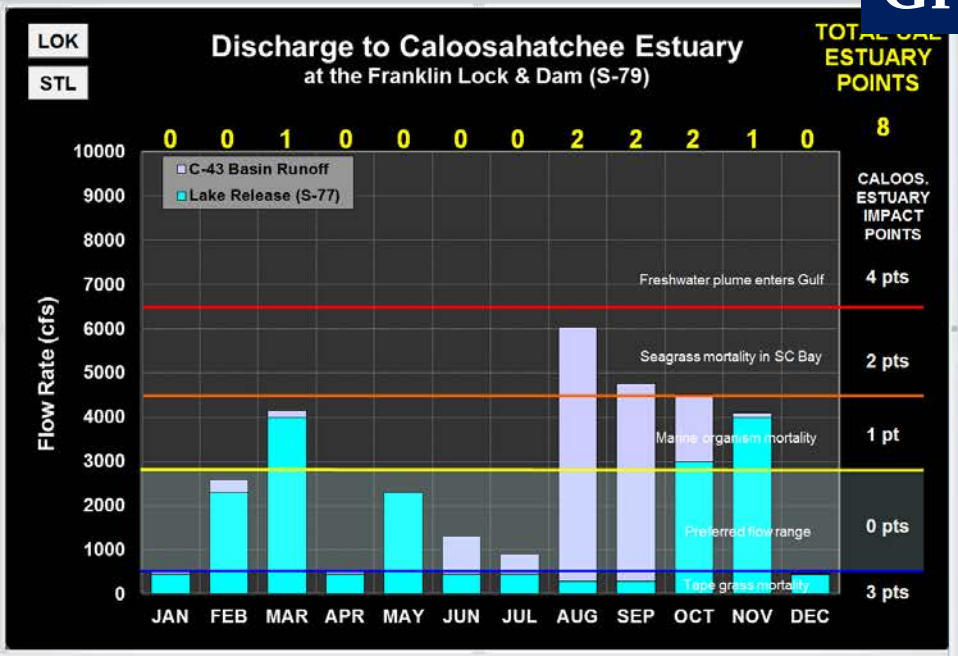


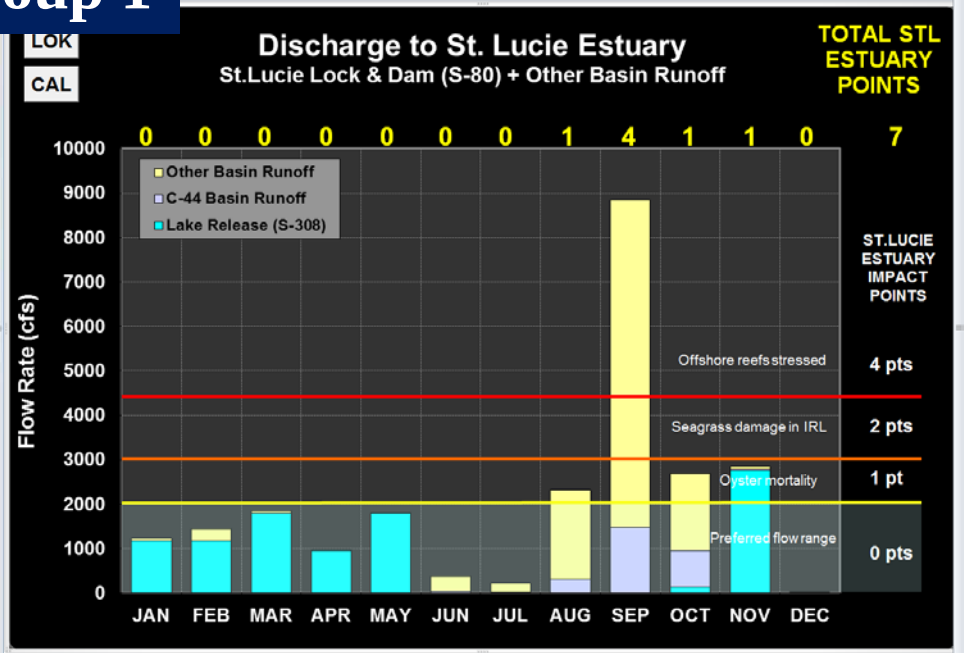

Group 2

# Comparison IHE 2014 Group 1 vs Group 2

- Group 1 was a little more aggressive with releases early & judicial in Sep-Nov
- Group 2 over-reacted to September inflow and made max releases in Oct and Nov, costing 7 addl points for CRE and 6 addl points for SLE
- Group 2 did not provide 450 cfs low-level releases in July and Dec, costing 6 addl penalty points
- Total Score
  - GRP1 = 39
  - GRP2 = 57

# Group 1




# Group 2