What does LOSOM mean to you?

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LAKE OKEECHOBEE SYSTEM OPERATING MANUAL (LOSOM)

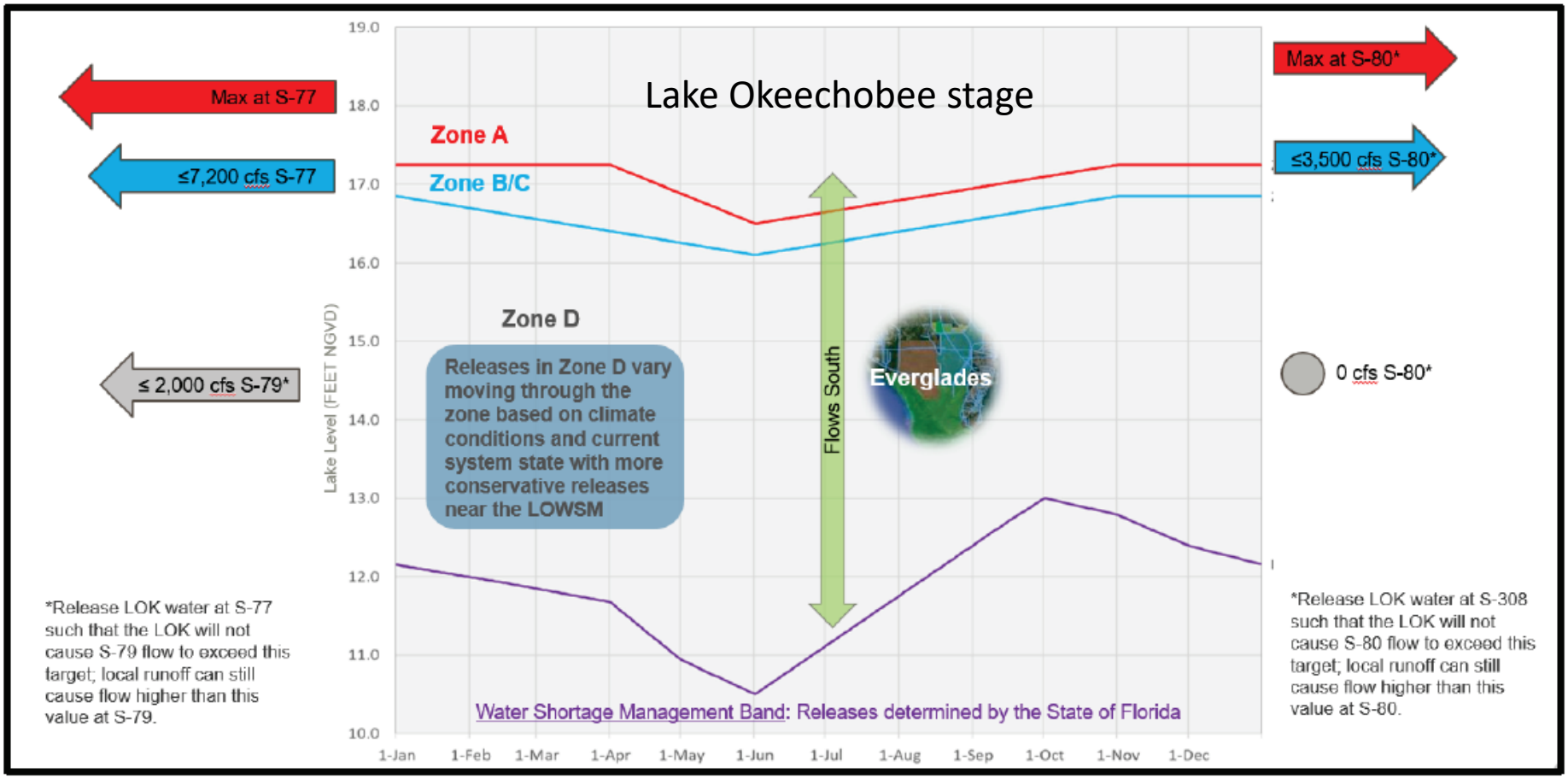


Figure ES-5. LOSOM Preferred Alternative in Water Control Plan.

- DRAFT ENVIRONMENTAL IMPACT STATEMENT (EIS) July 2022

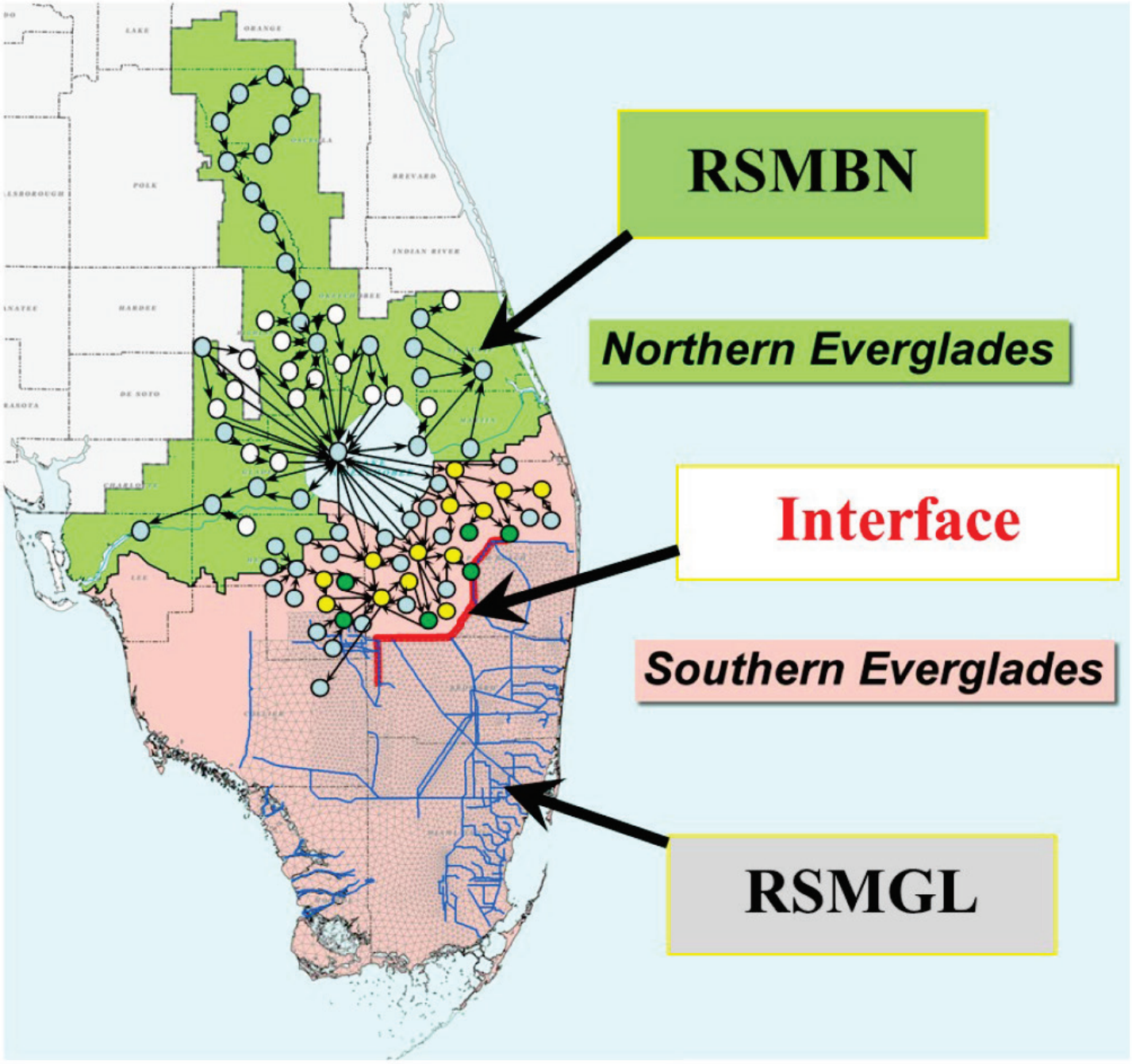


Figure 1-4. Decoupled LOSOM Modeling Approach.

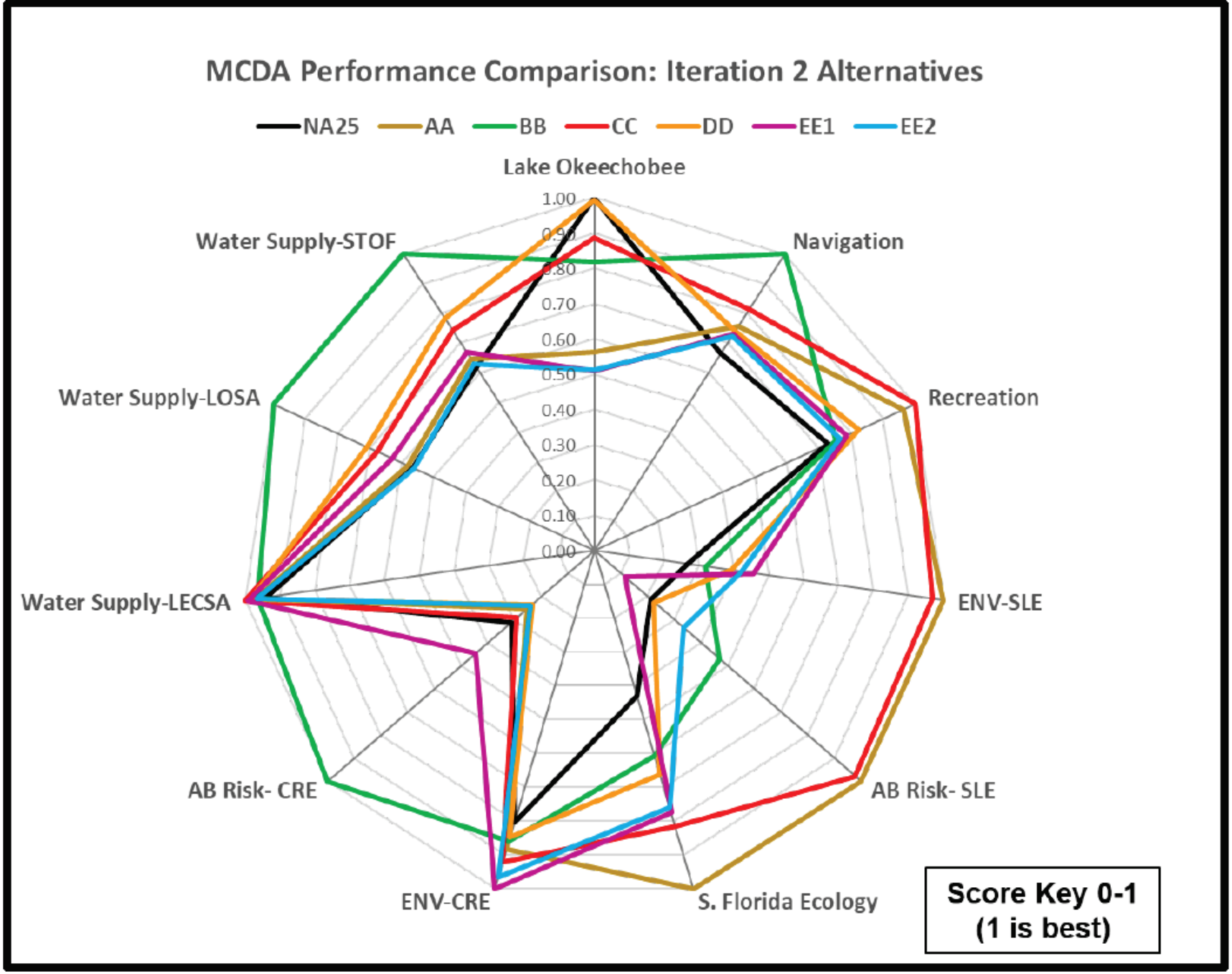


Figure 4-1. MCDA Radar Plot.

LOSOM

- The Preferred Alternative reduces mean annual lake releases to both the Caloosahatchee and St. Lucie estuaries as compared to the No Action Alternative by 4% and 40%, respectively
- As compared to the No Action Alternative, the Preferred Alternative reduces Lake Okeechobee releases to the CRE by 21% from June-Aug (window of peak algal bloom concern for CRE)

Draft EIS states:

- "The Preferred Alternative had mixed performance across the different metrics evaluated for the CRE.
- Model results show improvements for:
  - extreme low flows ↓,
  - RECOVER stress and damaging events ↓,
  - The 4,500-6,500 cfs high flows category ↓, and
  - RECOVER optimal events 750-2,100 cfs ↑
- The Preferred Alternative performed worse for:
  - the extreme high flows. [*i.e., frequency of flows >6500 cfs will increase* ↑ *(some estimate by 31%).*]
- While some aspects of the Preferred Alternative may cause adverse impacts, the overall outcome of the Preferred Alternative is anticipated to have moderate beneficial long-term effects on the CRE."

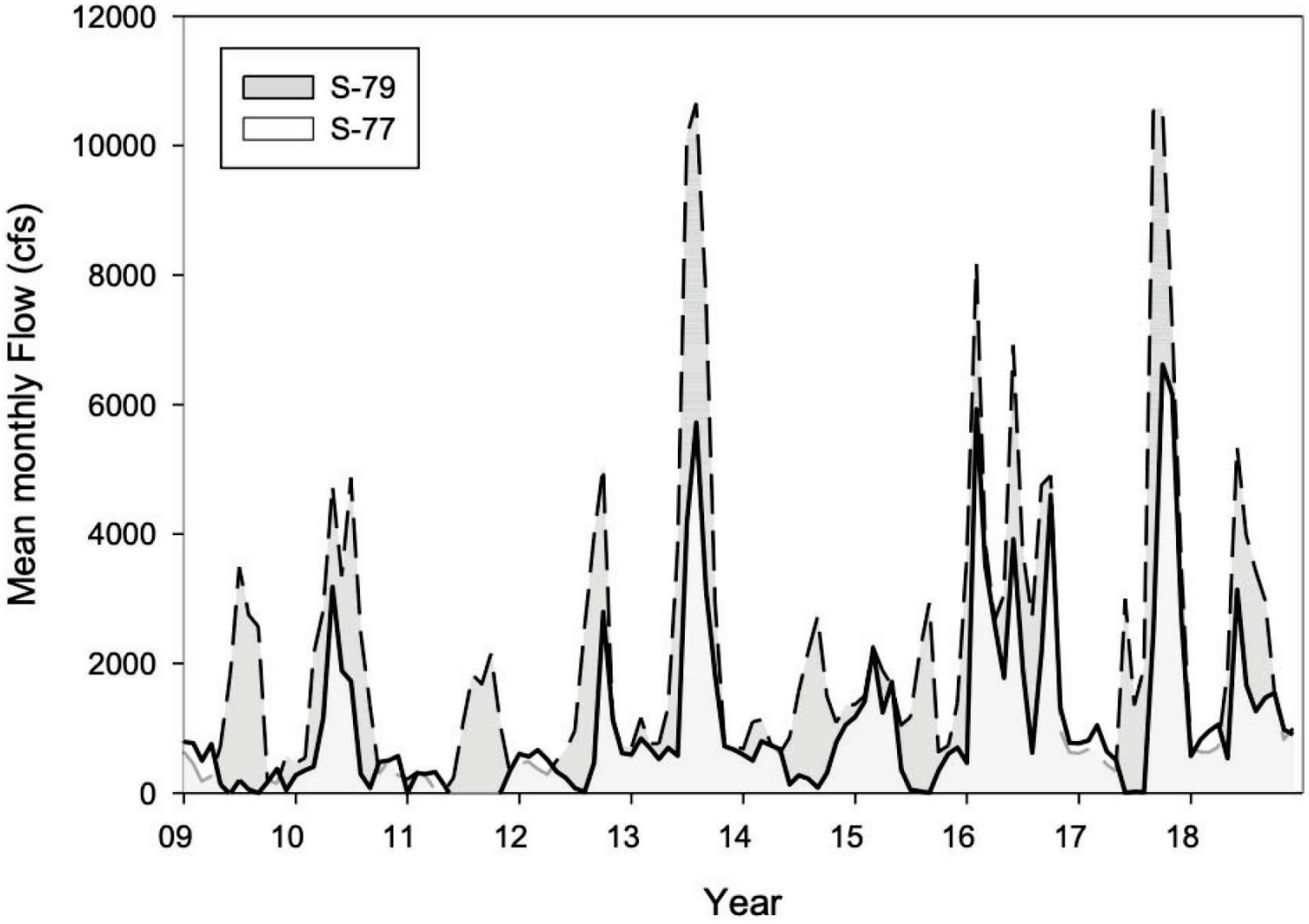


Figure 2. Mean monthly discharge (cfs) at the control structures at the outlet of Lake Okeechobee (S-77) and at the head of the Caloosahatchee River Estuary (Franklin Lock and Dam, S-79) from 2009-2018. The difference between the two curves represents flow from the C-43 basin.

Lake Okeechobee

S-77

Moore Haven

C-43 Basin

S-79

Fort Myers Shores

Fort Myers

Cape Coral

Lehigh Acres

Tidal Basin

CES-10SUR

CES-07

Estero Bay Preserve State Park

Estero

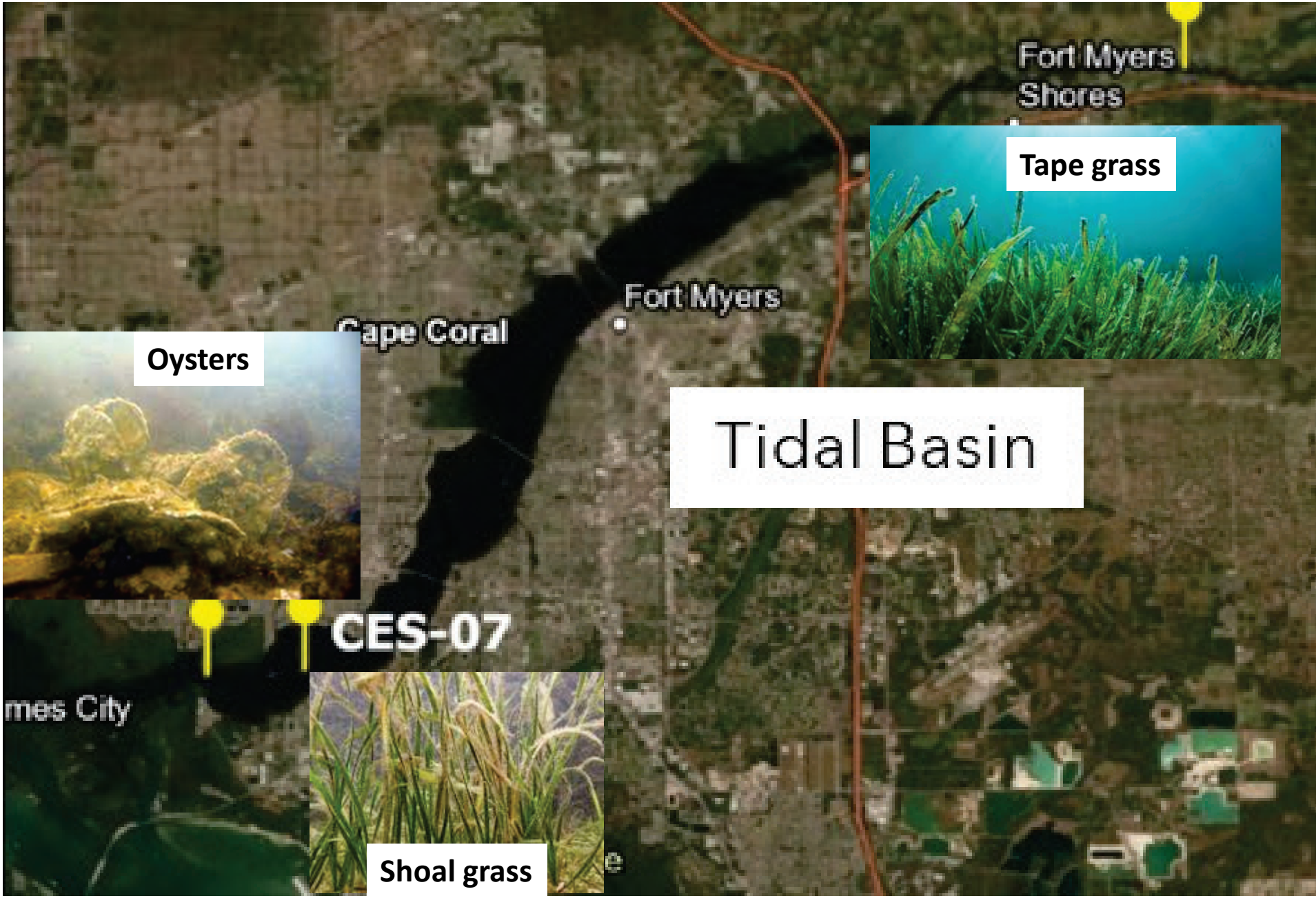
Immokalee

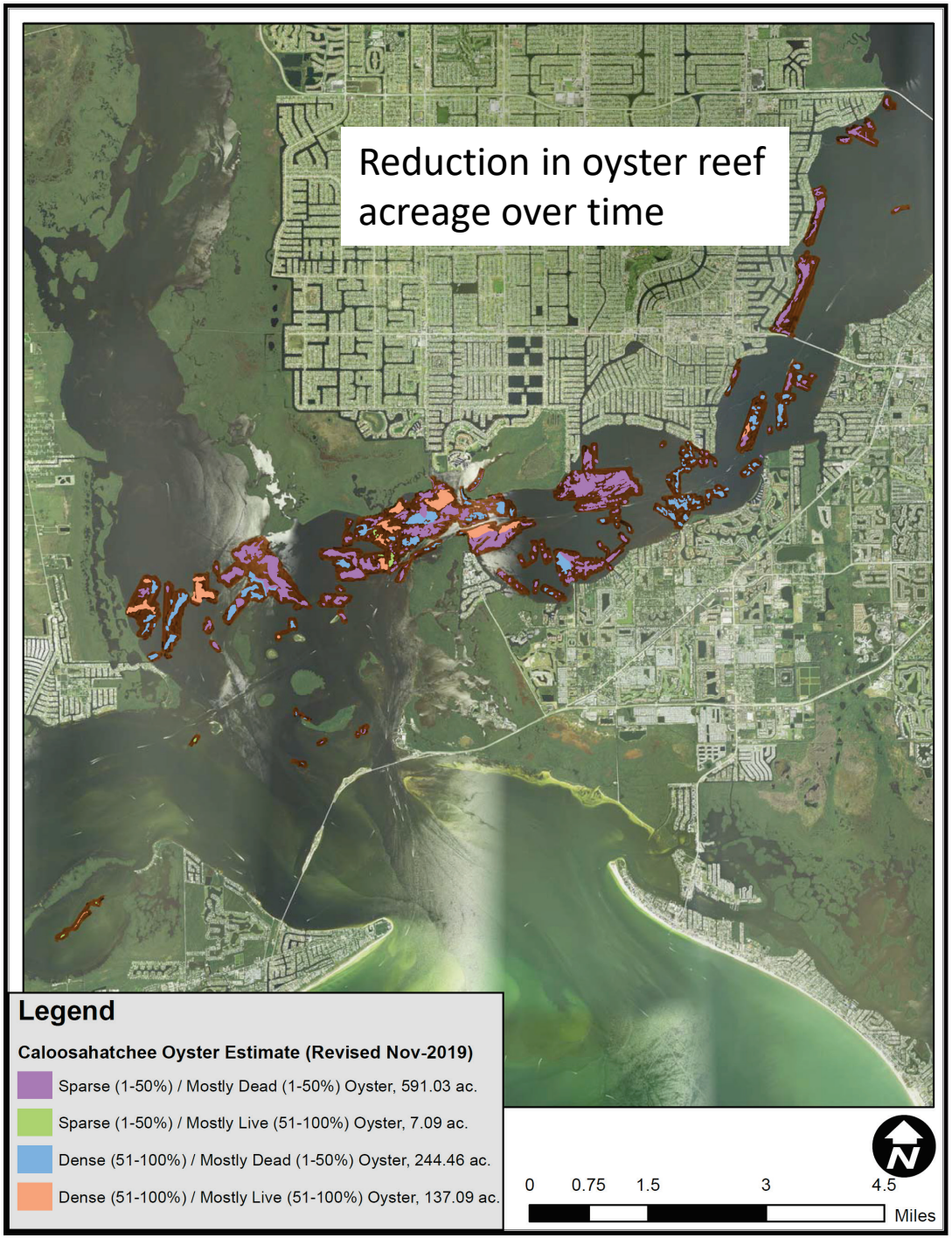
Bonita Springs

Florida

Gulf of Mexico

0 490,190 980,380 1,470,570 1,960,760 Meters


Fort Myers
Shores
Tape grass
Fort Myers
Cape Coral
Oysters
Tidal Basin
CES-07
mes City
Shoal grass

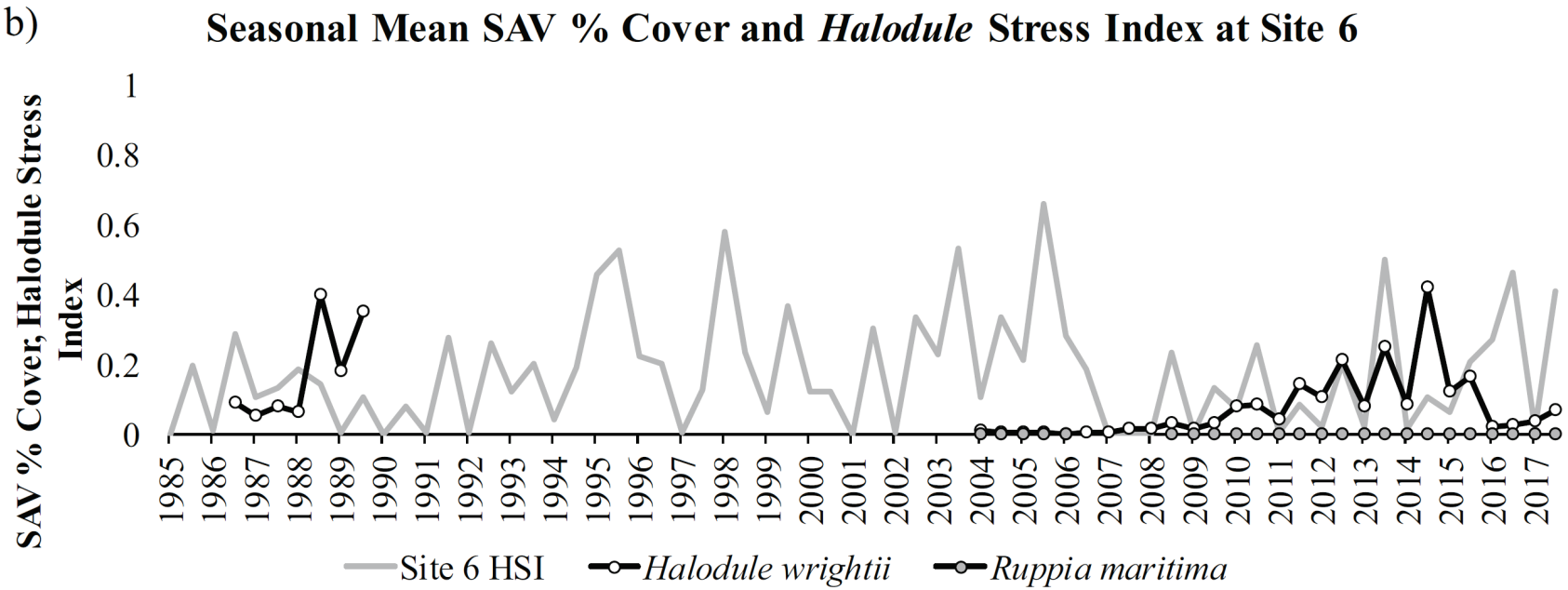


- **591.03** acres consisted of sparse, mostly dead oyster resource,
- **7.09 acres** consisted of sparse, mostly live oyster resource,
- **244.46** acres consisted of dense, mostly dead oyster resource, and
- **137.09 acres** consisted of dense, mostly live oyster resource.

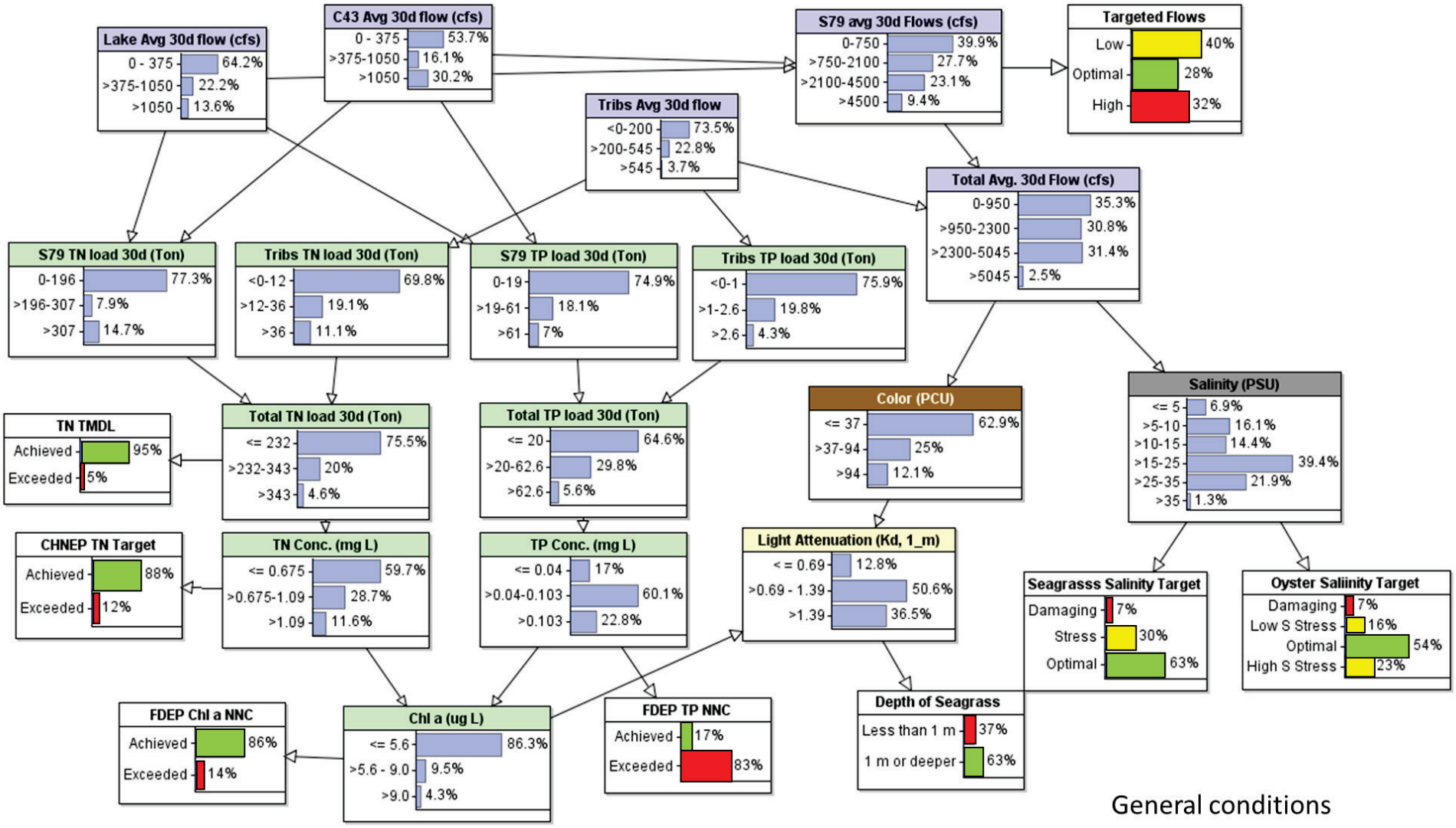
Dial Cordy and Assoc. 2019 report to the USACOE

Fluctuations in Seagrass coverage

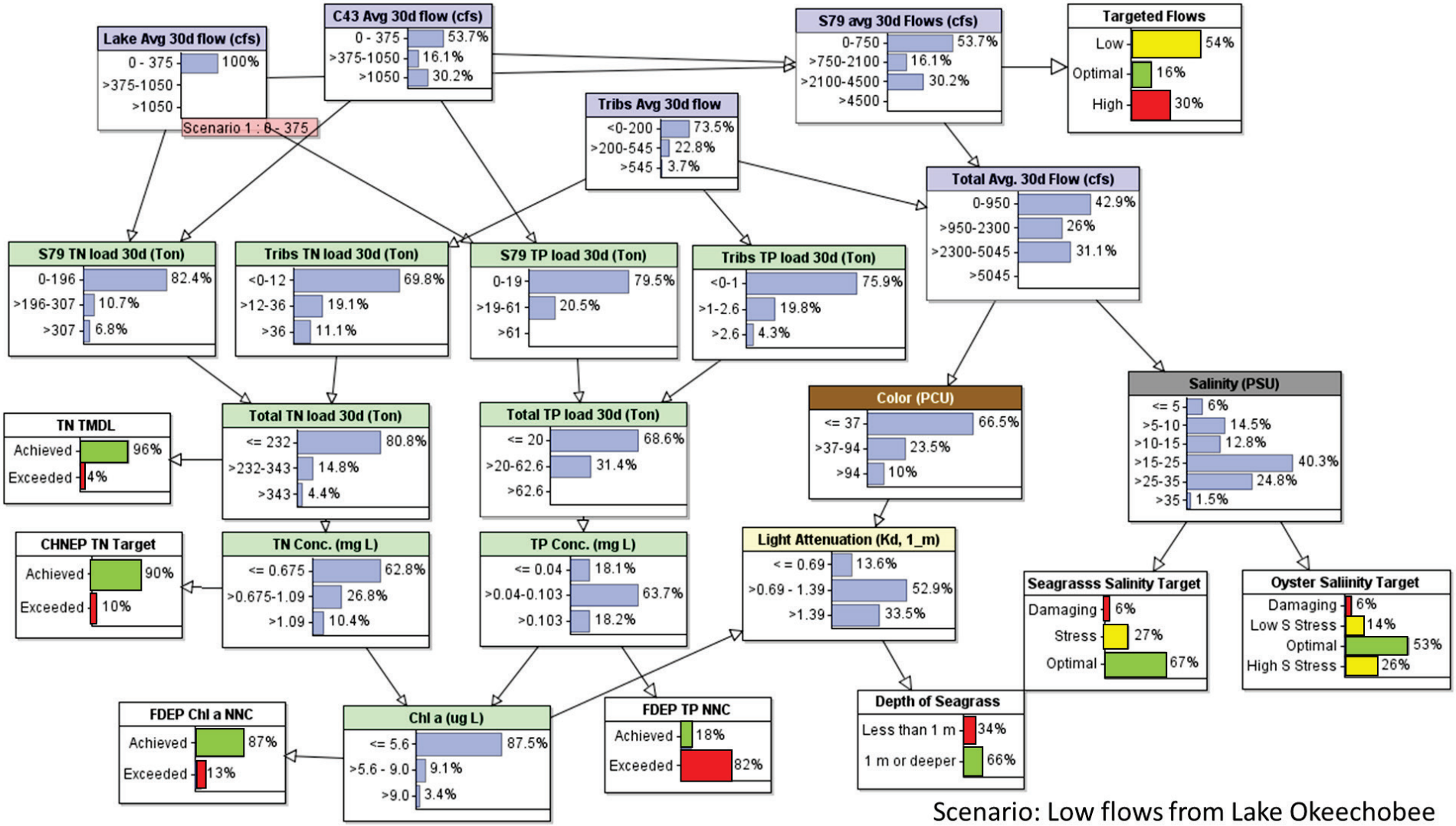
b)



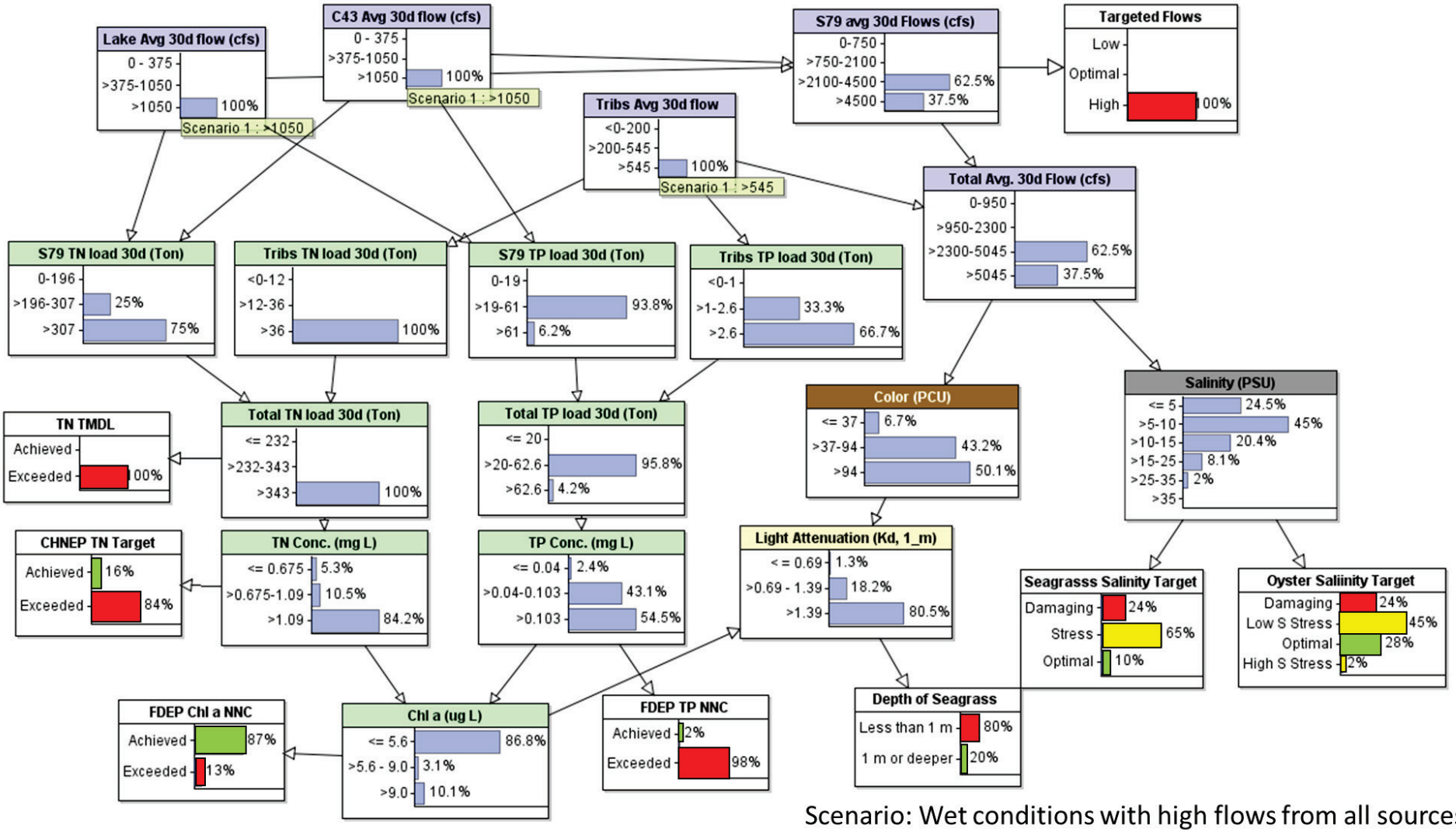
Estuaries and Coasts (2020) 43:1406–1424



Bayesian network based on monitoring data from November 2007 - July 2021; The length of each bar in the node reflects the conditional probabilities for occurrence of an observation in that histogram bin.



Scenario: Low flows from Lake Okeechobee



Scenario: Wet conditions with high flows from all sources

Assessment of Oyster Fitness Relative to Freshwater Inputs

Can the Eastern Oyster, *Crassostrea virginica*, Survive and Grow during Prolonged Exposure Below its Critical, Low-Salinity Threshold, if Given Repeated Short Intervals at Higher Salinity to Recover?

Report to South Florida Water Management District

September, 2021

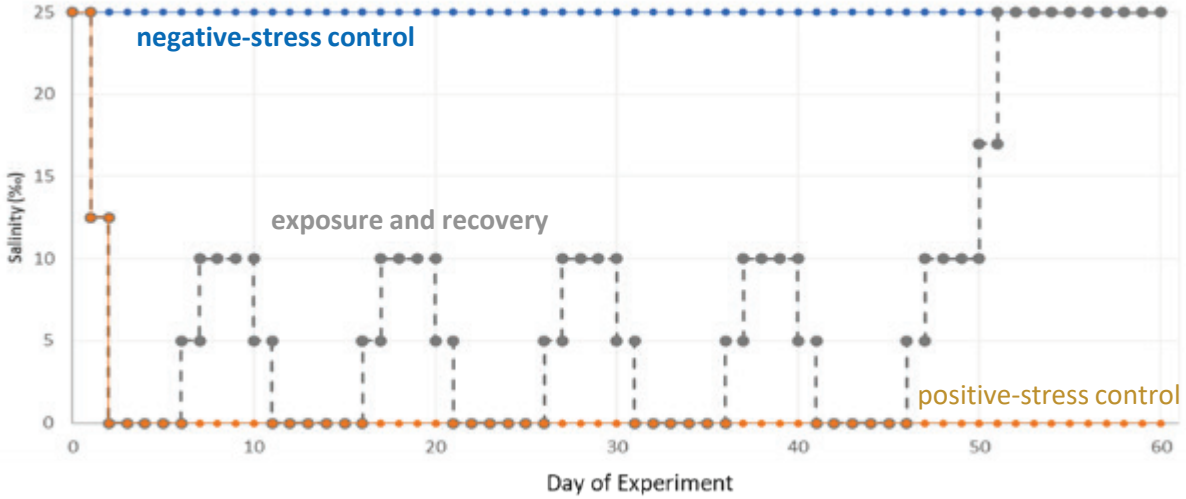
Darren Rumbold[1], Aswani Volety[2,3], Ai Ning Loh[2], Rebecca Werner[2], Samuel Hans[1]

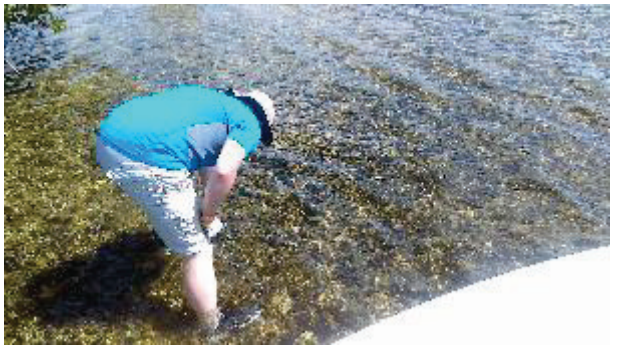
1. Florida Gulf Coast University
2. University of North Carolina Wilmington
3. Elon University

Oyster are highly resistant to short-term changes in environmental conditions

When stressed during periods of low salinity or aerial exposure during low tide, oysters will close their valves and induce a state of metabolic depression.

Study – Adult oysters





Used only Florida oysters

Example of experimental pulsing conditions for adults (in this case Trail 1); **negative-stress control** (blue filled circles at 25‰), **exposure and recovery** (gray filled circles alternating between 0‰ and 10‰), and the positive-stress control (orange filled symbol at 0‰).

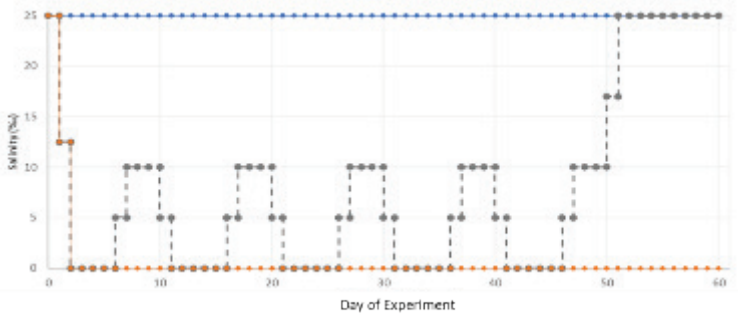
The tank was the experimental unit, with three replicate tanks each with 14-15 per tank, for a total of approximately 45 oysters per treatment. Checked daily; water replacement every 2 days

Study – Spat

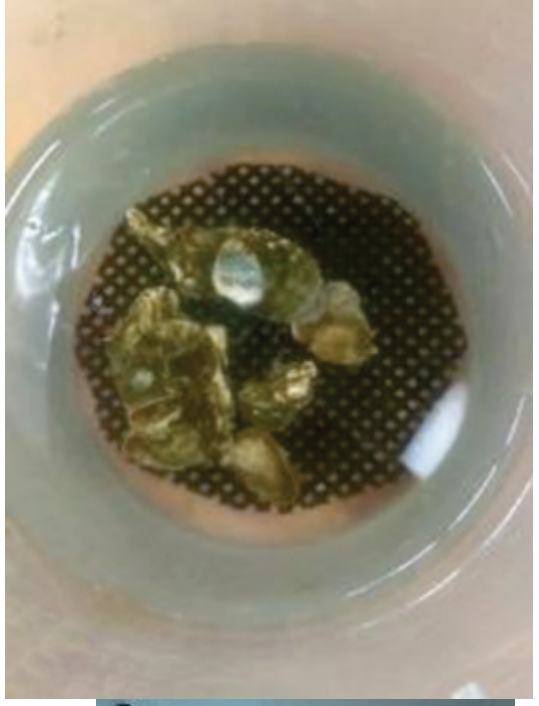
Recently settled Spat collected from Estero Bay and, in one trial (Trial 2), from a commercial hatchery in Florida

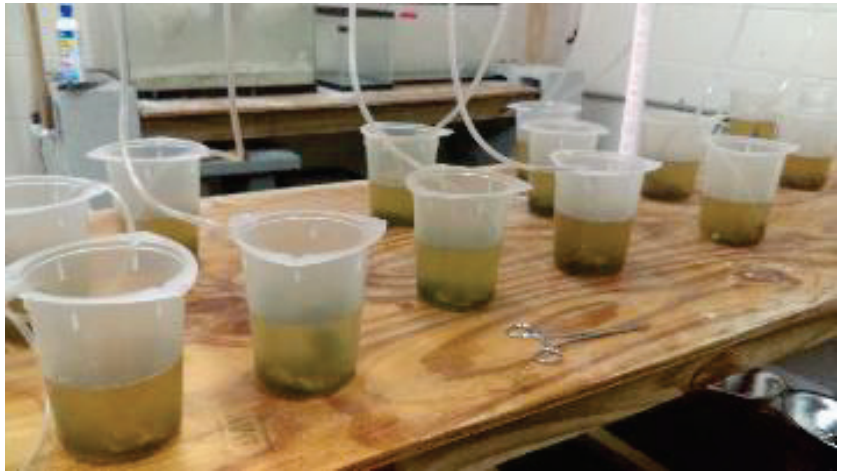
Exposed in 1 L plastic beakers under static conditions with renewal: water was changed every two days

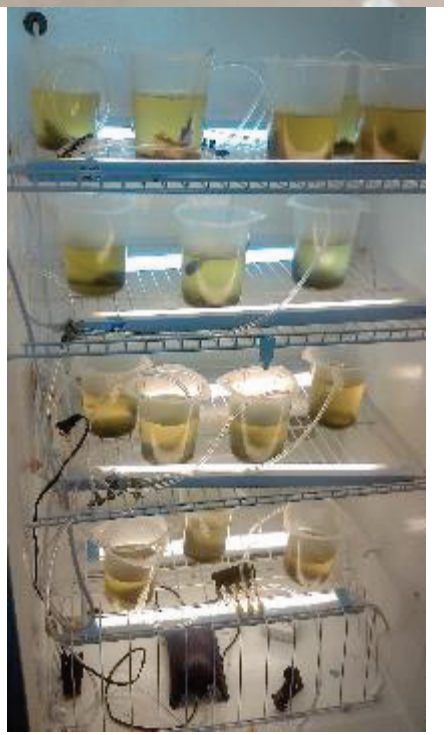
Each treatment had three replicates and each replicate beaker contained at least 10 oyster spat



negative-stress control (blue filled circles at 25‰), **exposure and recovery** (gray filled circles alternating between 0 or 5‰ and 10‰), and the positive-stress control (orange filled symbol at 0 or 5‰).





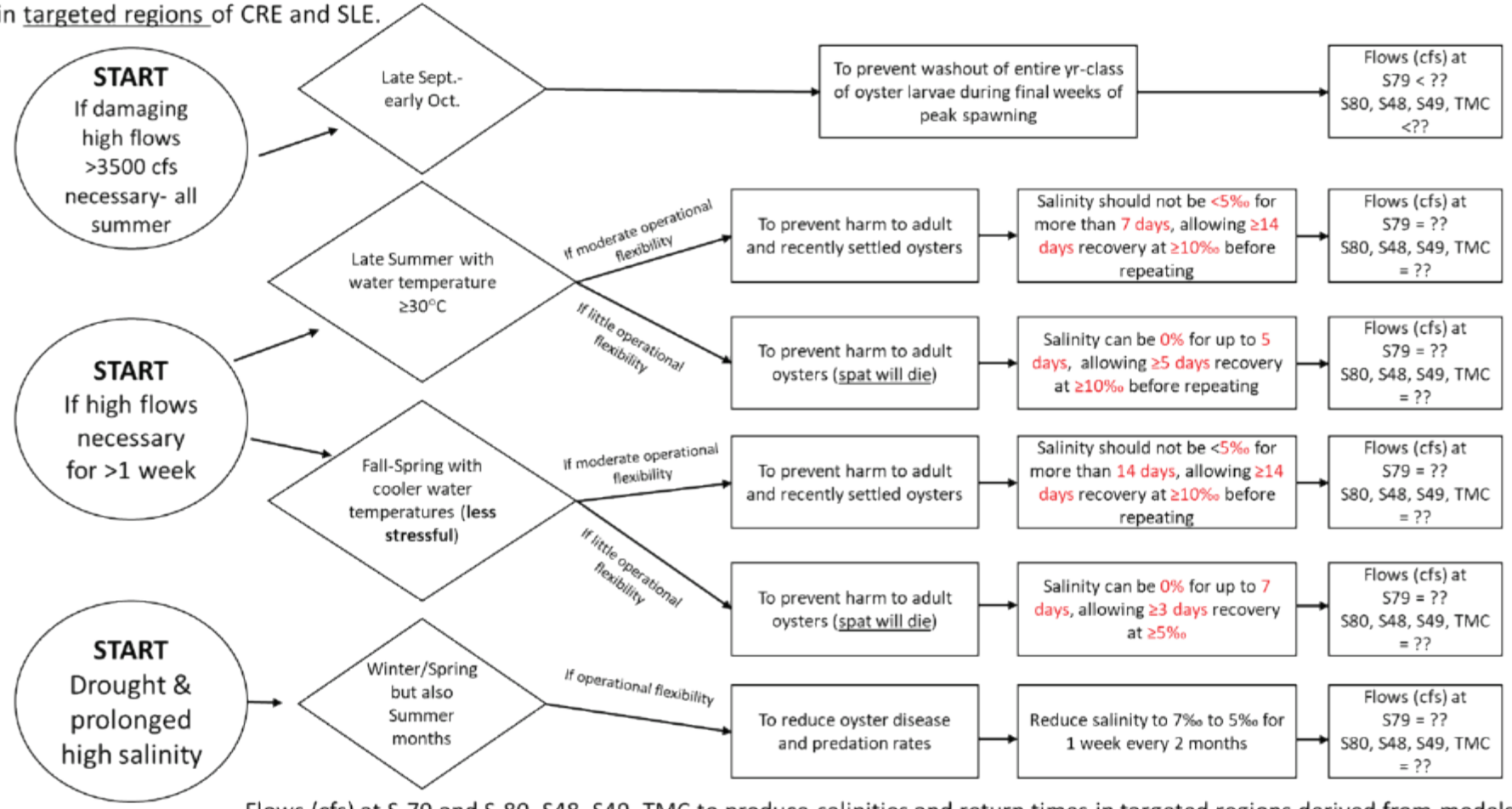


Conclusions

- oysters could survive long duration, high-volume discharges resulting in 0 to 5 ppt – if oysters were allowed repeated short intervals to recover by reducing discharge rates - allowing salinity to return to at least 10 ppt for a few days

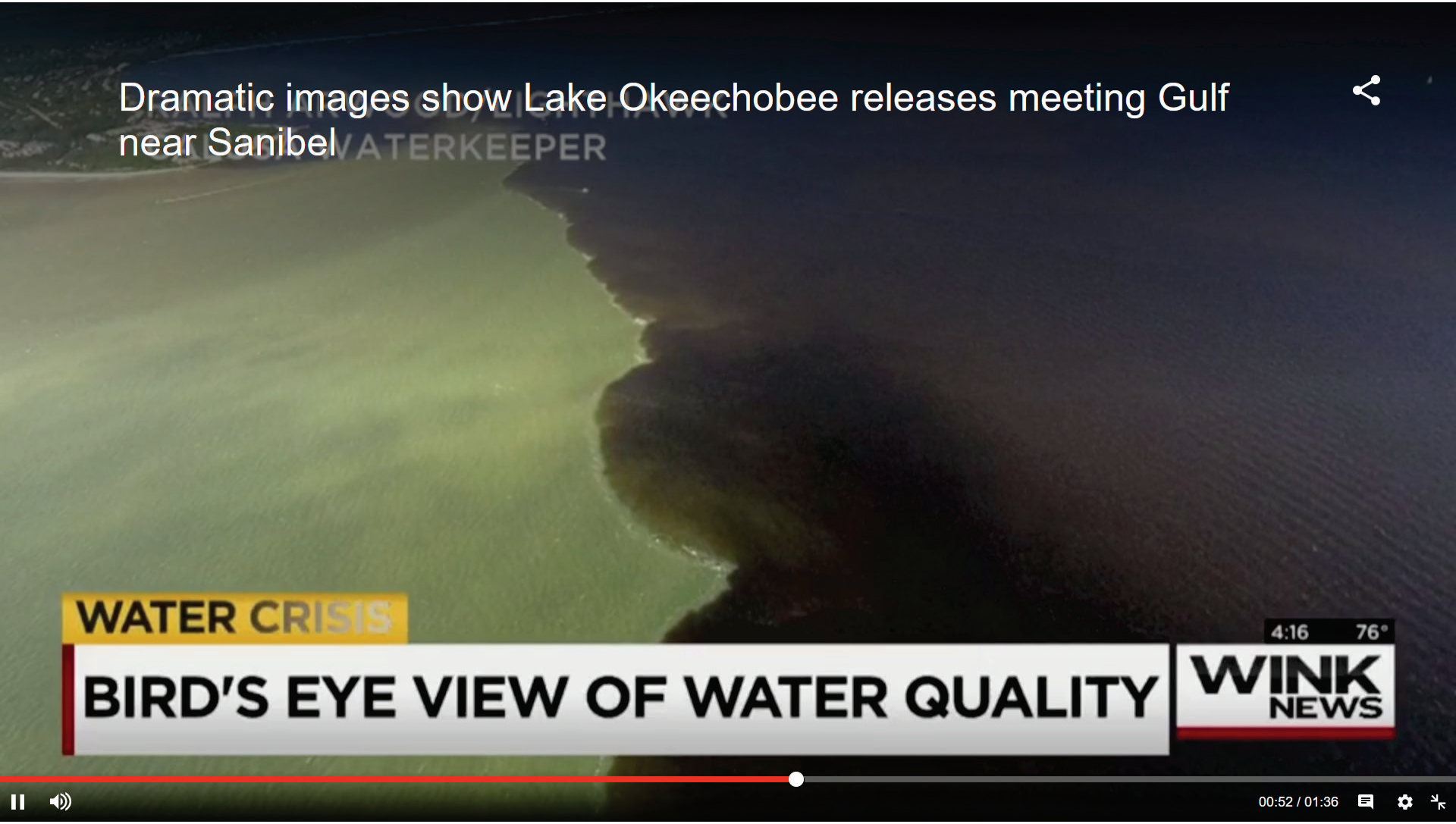
Conclusions

Figure 6. Recommend salinities, durations and return times (stressful but not damaging and for recovery) to reduce damage to oysters in targeted regions of CRE and SLE.



Flows (cfs) at S-79 and S-80, S48, S49, TMC to produce salinities and return times in targeted regions derived from models

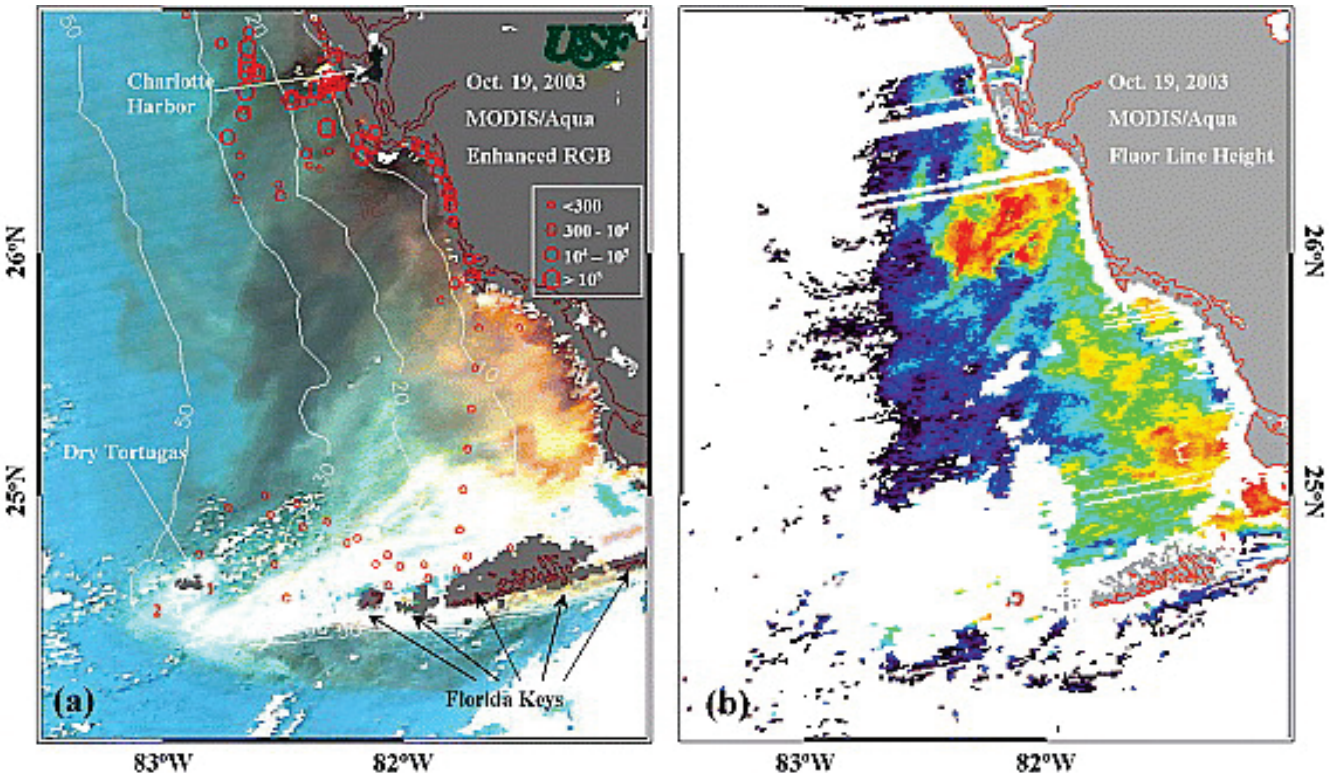
Also concerned about impacts from organic and inorganic nutrients in plumes from high-volume, long duration discharges




6/14/05

Keep in mind that this is organic matter. Photochemical transformations of riverine DOM can stimulate microbial (bacteria) production. The microbial loop will also likely fuel micro- and mesozooplankton within the plume.

Linkages between coastal runoff and the Florida Keys ecosystem: A study of a dark plume event



Hu et al. (2004) tracked a dark water plume, using MODIS and the Sea-viewing Wide Field-of-view Sensor, that originated off the Charlotte Harbor (following a significant rainfall and high discharge event) move south along the coast towards the Florida Keys. The authors reported the dark color was derived by a high concentration of CDOM and Karenia brevis (the red tide forming organism). Dixon et al. (2014) found a strong relationship between K. brevis cell density and **dissolved organic nitrogen (DON).**

Geophysical Research Letters, Volume: 31, Issue: 15, First published: 10 August 2004, DOI: (10.1029/2004GL020382)

Research Proposal to US EPA

- “Tracking Caloosahatchee River plumes enriched in organic and inorganic nutrients and their effects on Harmful Algal Blooms on the West Florida Shelf”