

Caloosahatchee Estuary in Fort Myers



RECOVER 2012-2017 System Status Report

Key Findings: Northern Estuaries

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GEER

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Background

Northern Estuaries

Located at the northern end of the system:

- **Caloosahatchee Estuary (CRE)** on the West (Gulf) Coast
- **St. Lucie Estuary (SLE)/South Indian River Lagoon(SIRL) & Loxahatchee River and Estuary (LRE)** on Atlantic Coast

Connected to the greater Everglades region through historical alterations to the landscape → **Hydrologic alterations**



Background

Historical Alteration to the Landscape

- Expansive drainage system via network of canals
- **Altered the volume, timing, and distribution of freshwater inflows** to the estuaries
- **Restoration** focuses on salinity as the primary driver to reestablish healthy estuarine ecosystems

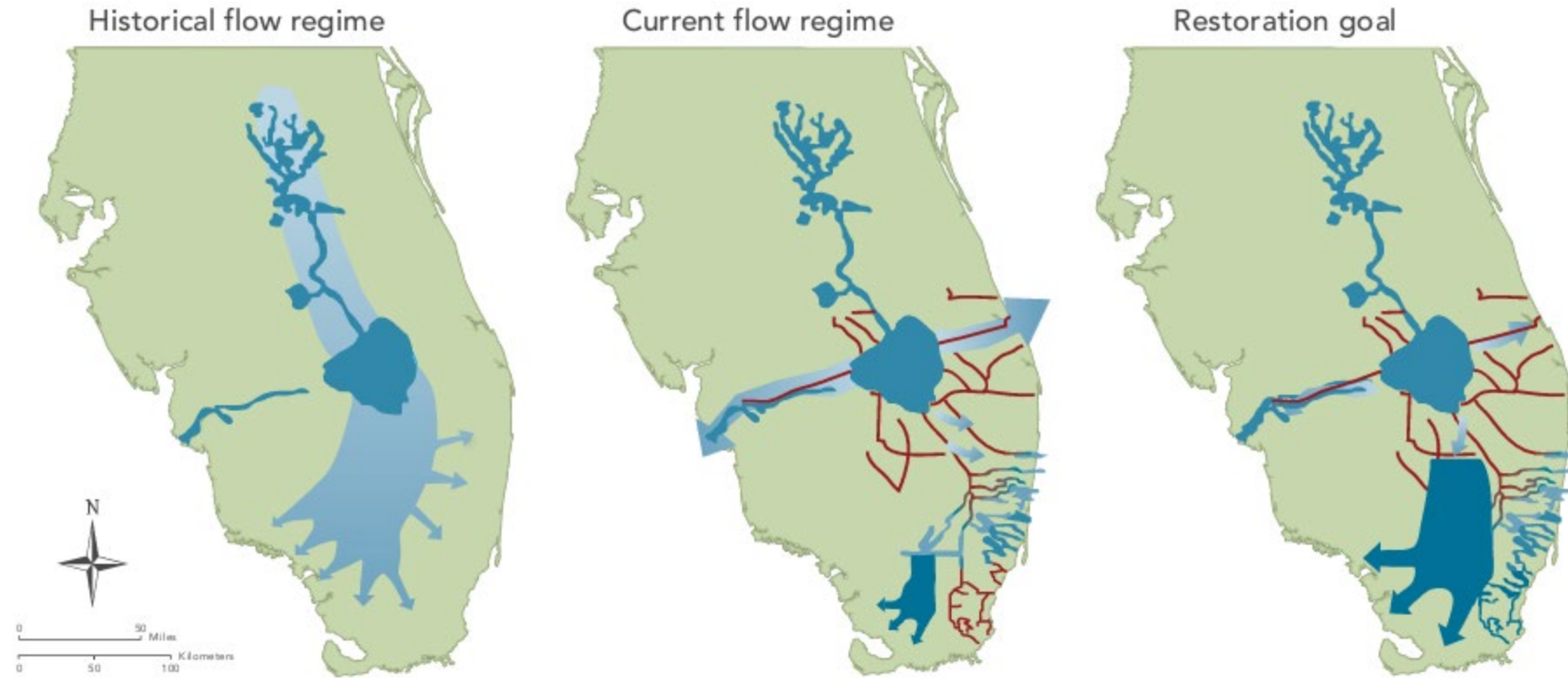


Figure 1.1. The removal of water in the Everglades through a system of drainage canals (red lines) converted wetlands into areas suitable for farming and land development. Reestablished freshwater flows in the future will improve hydrologic conditions throughout south Florida and decrease salinity levels in Florida Bay and Biscayne Bay.

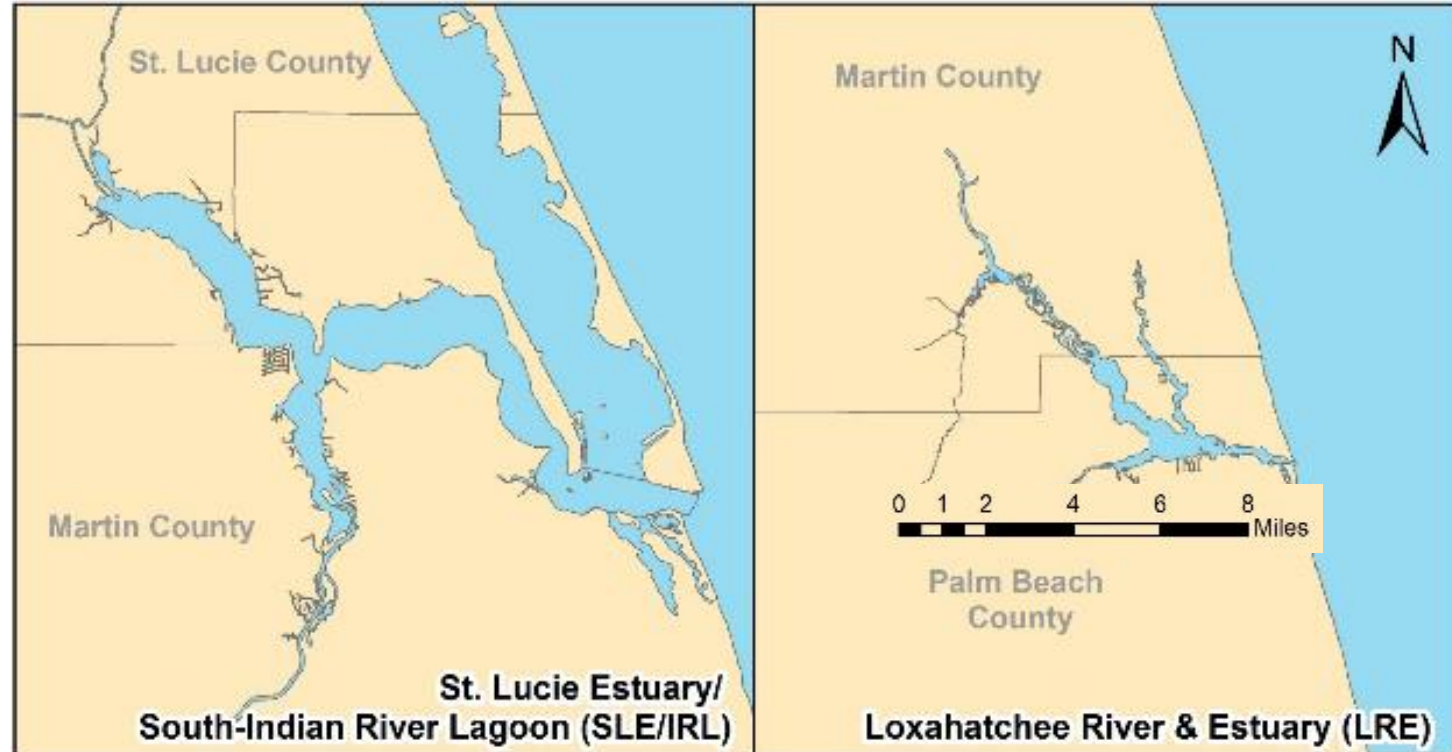
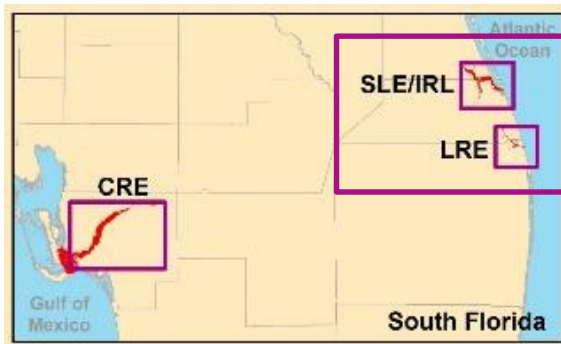
Atlantic Coast Estuaries

St. Lucie Estuary & South Indian River Lagoon

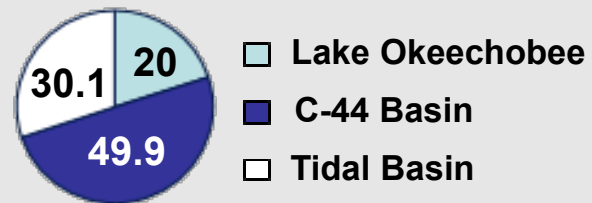
- **Extensive watershed influence**
- SLE receives sufficient freshwater (FW) except in multi-year droughts, but **prone to high inflows and low salinities** as a response to flood control

Loxahatchee River and Estuary

- **Extensive watershed influence**
- River has become more estuarine, leading to **habitat shifts** in floodplain and submerged aquatic vegetation



SLE WY97–WY17 Mean FW Contributions



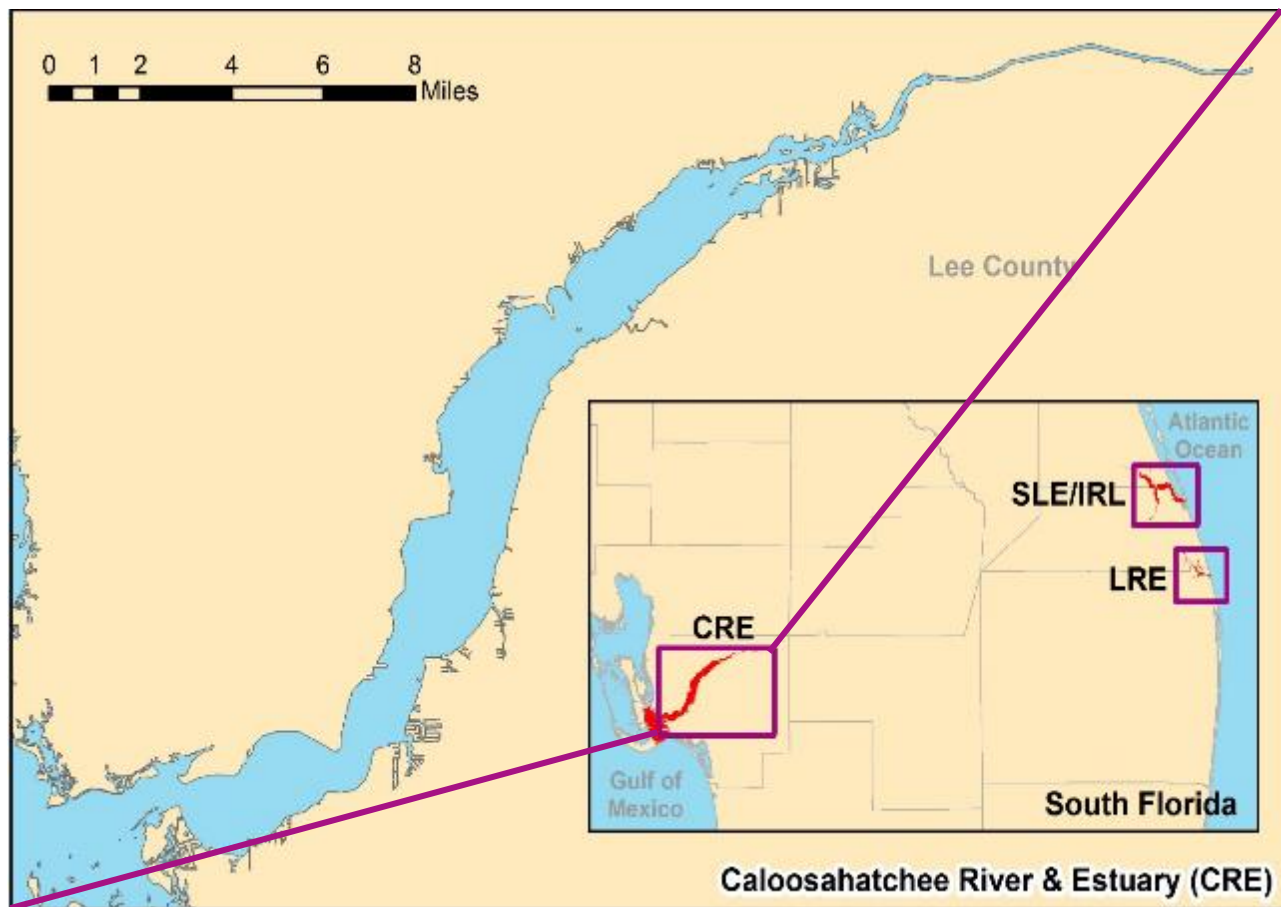
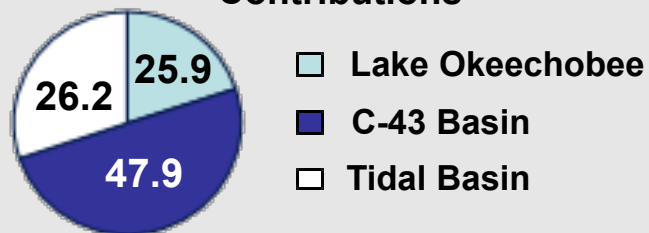
**Comparable information not available for LRE*

West Coast

Caloosahatchee River and Estuary

- High inflows as a result of **wet season precipitation and hurricanes** → **low salinities in the lower estuary**
 - Impacts to oysters and marine SAV species downstream
- Drought or other demands for water storage in the **dry season** → **high salinities in the upper estuary**
 - Impacts to brackish and freshwater SAV upstream
 - High salinity + high temp interactive effects exacerbate oyster disease

CRE WY97–WY17 Mean Freshwater Contributions



Northern Estuaries Ecological Indicators



Submerged Aquatic Vegetation

- Freshwater, brackish, & marine species
- Habitat, food, nutrient cycling, carbon sequestration, substrate stabilization



Eastern oyster

- *Crassostrea virginica*
- Ecosystem engineers; Water filtration, nutrient cycling, food, habitat
- Historical significance to regional harvest



Benthic Infauna

- Reliable indicators of ecosystem health
- Functional groups
- Only monitored in the St. Lucie and South IRL



Past and/or Potential Future Indicators

- Smalltooth sawfish
- Snook, spotted sea trout
- Large-bodied fish, e.g. goliath grouper
- Clam (*Rangia cuneata*)

Events of Ecological Significance

Source: Florida Atlantic University



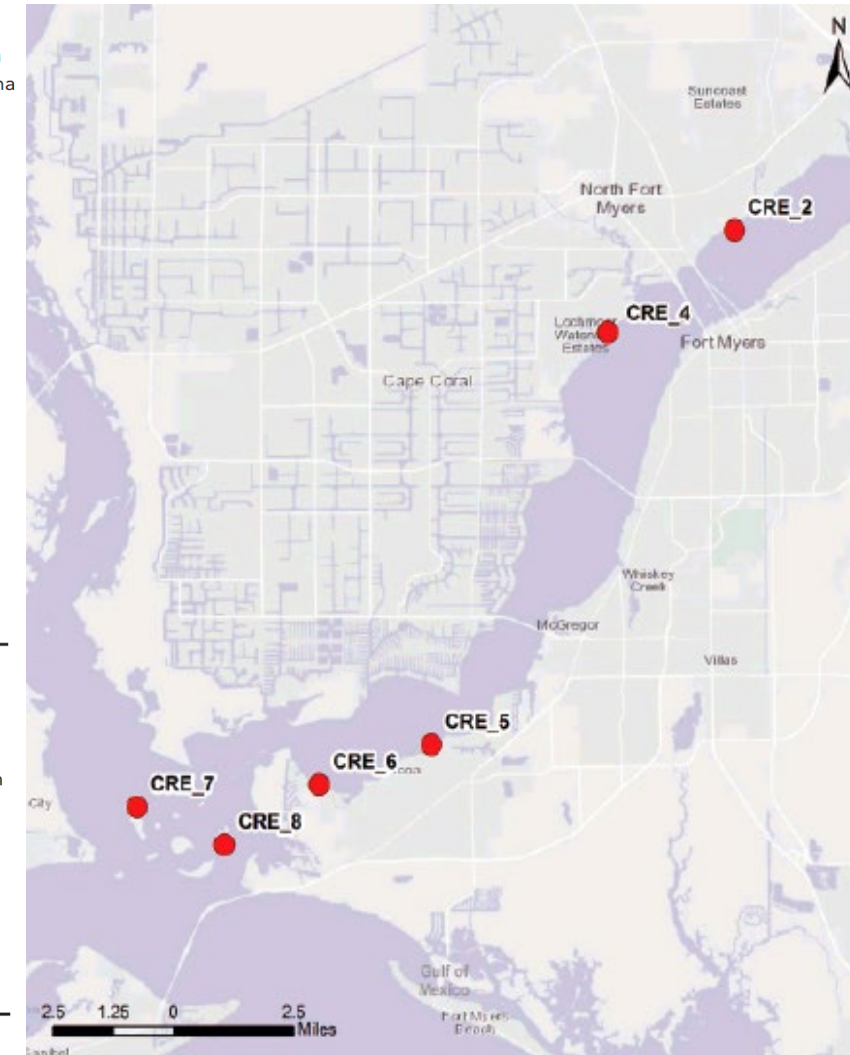
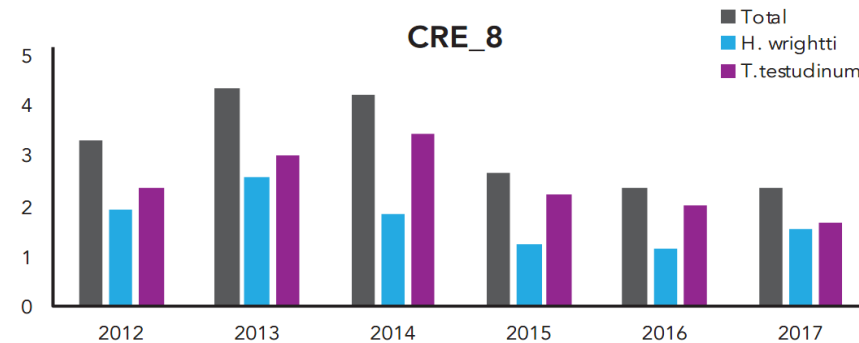
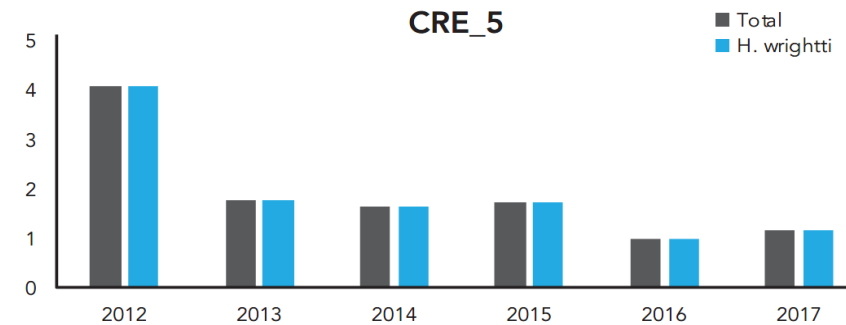
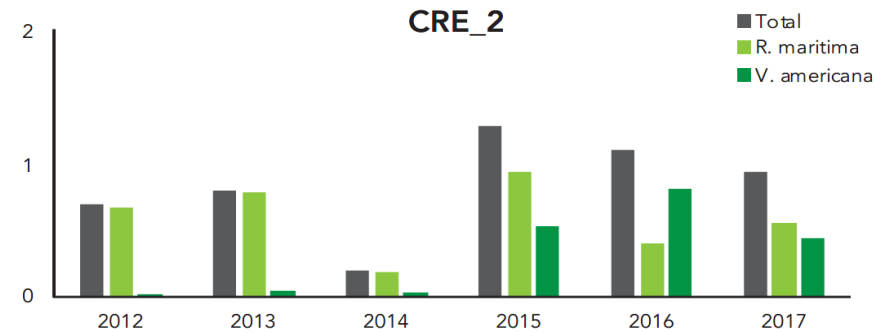
Harmful Algal Blooms (2016)

- **Cyanobacteria**, e.g. *Microcystis aeruginosa*
 - Naturally occurring
 - Exacerbated by anthropogenic stressors
 - Sometimes produce toxins
- Wet winter and early wet season Nov '15 – May '16 → **Bloom started in Lake Okeechobee**, microcystin detected
- Lake discharges and watershed runoff + nutrient laden water + prevailing winds → **estuary bloom**
- Affect light attenuation, fish kills, etc. Toxins present from June - July

Submerged Aquatic Vegetation

SAV

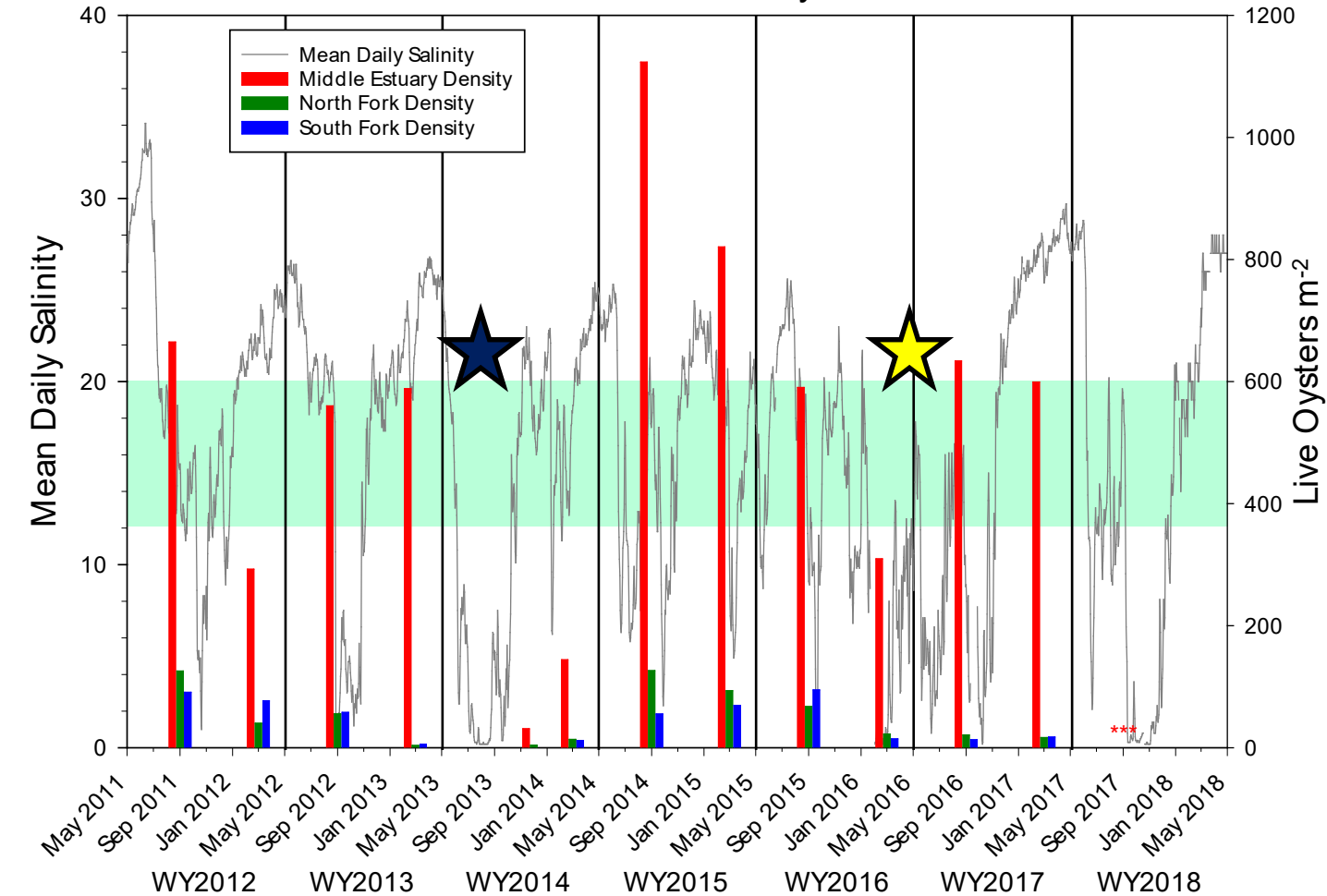
- **Generally declined or remained stable** in low densities based on Braun-Blanquet Cover & Abundance (BBCA; SLE & CRE) or percent occurrence (LRE)
- **Reflects regional trends of seagrass decline** in other systems, such as the Lake Worth Lagoon and North Indian River Lagoon
- **A new robust SAV monitoring program implemented in 2018**, includes estuary-wide trends, cover and abundance, biomass, shoot counts, and additional environmental metrics including PAR



Oysters



St. Lucie Estuary



Eastern Oyster

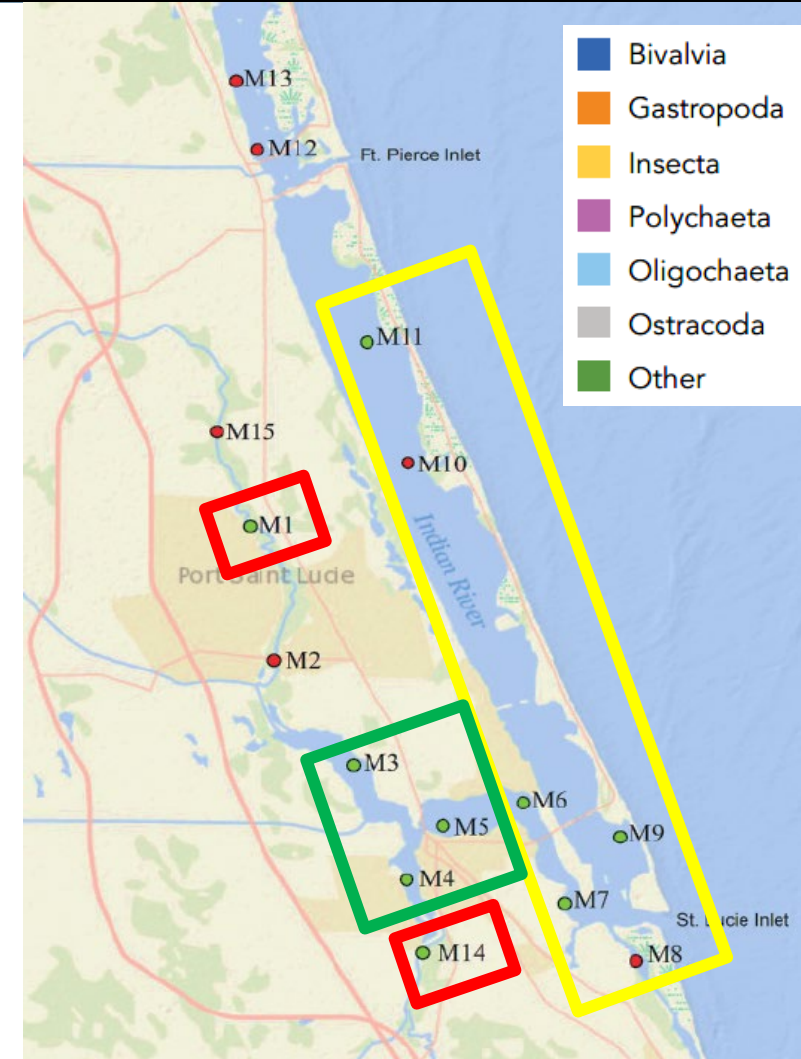
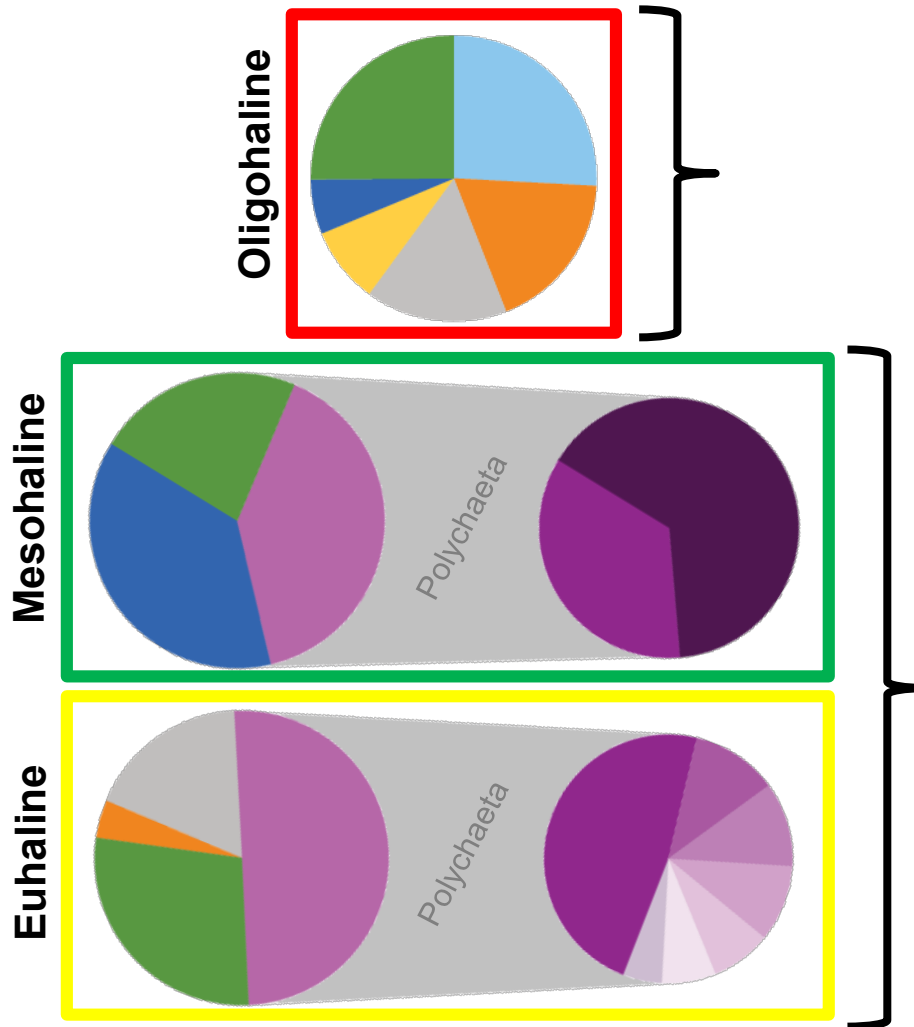
- Impacted by highly variable freshwater inflows
- **Salinity + Temperature interactive effects:**
 - High salinity + high temperature = higher prevalence and intensity of Dermo (*Perkinsus marinus*)
 - Periods of lower salinities can combat disease
- **Timing** of inflows & other variables impacts oyster “recovery”:
 - **Large-scale mortality** in the SLE in 2013
 - No die off in 2016 despite El Niño and high releases (see stars)



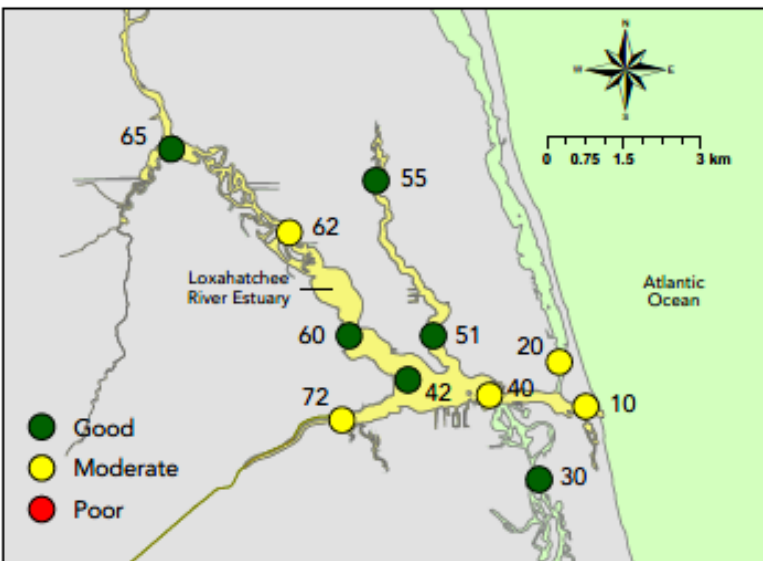
Benthic Infauna

St. Lucie Estuary & South Indian River Lagoon

- **Distinct communities** between the SLE and the SIRL
- Driven by two main factors: **sediment characteristics and salinity**
- Fine-grained sediments + high water content substrate in SLE south fork → lower overall diversity
- **Important indicator for CERP Project IRL-South: includes sediment mitigation (dredging)**



Other Indicators



Chlorophyll a annual median in the LRE, scores based on deviation from long-term median



Source: Collier Sea Grant

Other Indicators Not Currently Used as RECOVER Performance Metrics

Salinity & Temperature

- Salinity variability a shared stressor among indicators

Chlorophyll a

- Proxy for phytoplankton abundance. Regularly monitored by SFWMD Water Quality Monitoring Network

Fisheries

- Fish & Wildlife Research Institute Fisheries Independent Monitoring in the SLE, and acoustic tagging of large-bodied fishes in SLE & CRE



2012-2017 SSR Northern Estuaries Report Card

Report Card:

Lessons Learned & Moving Forward

- Scoring over the 5-year POR masks “extreme” events (e.g. salinity conditions vs. score) which may last only several weeks
- Long-term ecological effects indicative of environmental stressors
- Further refine targets and salinity, salinity + temp, and chl *a* scoring methods
- New SAV monitoring program will broaden our understanding of plant responses and regional trends
- Long-term monitoring and evaluations such as these will inform CERP project planning and operations

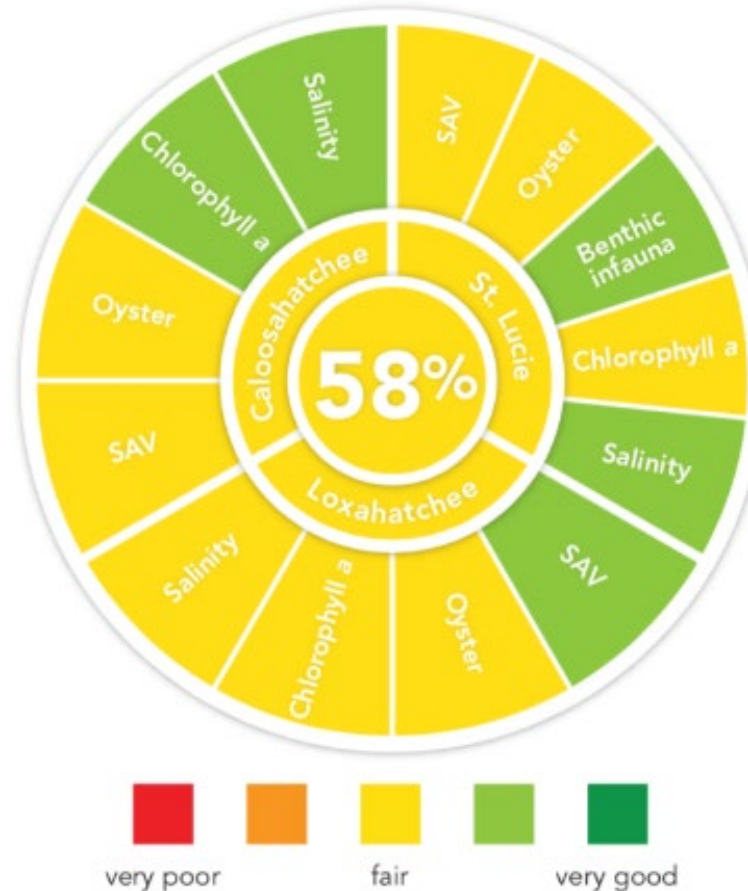
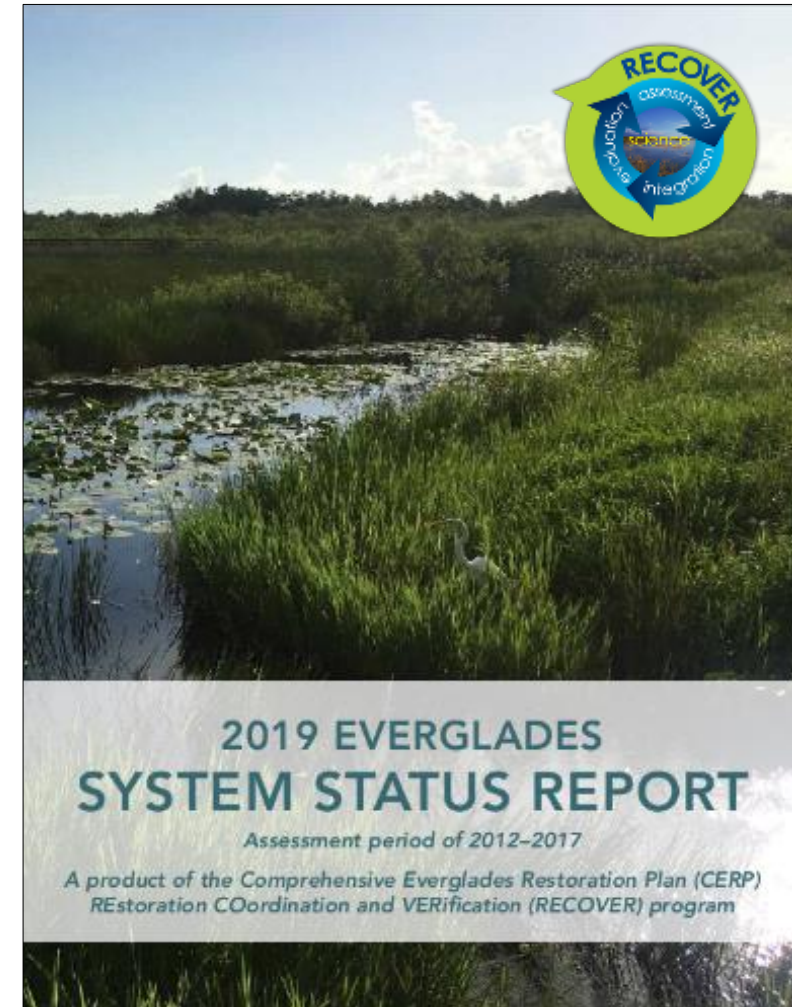
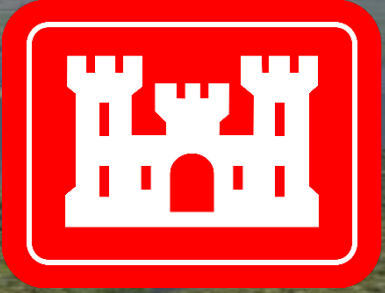


Figure 3.2. Northern Estuaries indicator scores from the 2012-2017 Everglades Report Card.



Caloosahatchee Estuary in Fort Myers



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Thank you!

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