Forecasting Effects of Nutrient Loading and Availability of an Ecosystem Restoration Program in the Caloosahatchee and St. Lucie Estuaries of Florida

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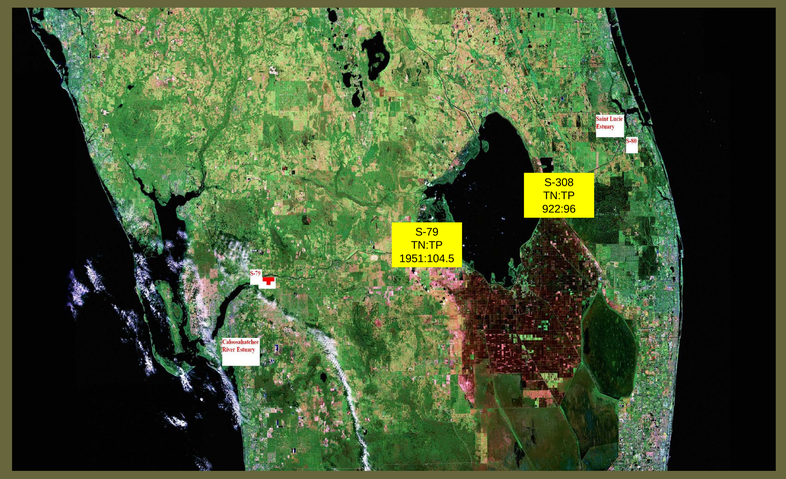
Introduction

The Redfield Ratio is a method for determining the ecological health of a water body. It is based upon a molecular balance of Total Nitrogen (TN) to Total Phosphorus (TP). A ratio of 16:1 based upon mole ratios of nitrogen to phosphorus is a balanced system. Very high Redfield ratios favor faster growing macro algae taxa, which cause chronic problems for estuaries.

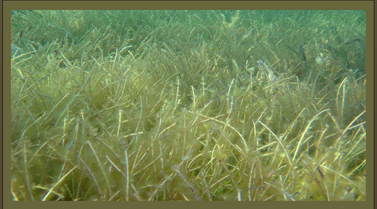
Restoring estuarine sea grass communities is one of the goals of the Comprehensive Everglades Restoration Plan (CERP). CERP will accomplish this via components that reduce pulsed releases to both estuaries. Total flow from Lake Okeechobee (LO) will be significantly reduced. This poster presents past trends in these ratios and evaluates the plan's possible effects on these ratios.

LO's contribution to the estuaries is significant. Per the South Florida Water Management District Watershed Protection Plans (2008), it has been estimated that LO contributes 105 metric tones of TP and 1950.9 metric tones of TN to the Caloosahatchee River Estuary (CRE). Similarly, LO contributes 96 metric tones of TP and 922 metric tones of TN to the St. Lucie Estuary (SLE). These constitute a large part of the total nutrient load to the estuaries and significantly impact these ecosystems.



A mixed seagrass meadow of turtle grass (Thalassia testudium) and Manatee grass (Syringodium filiforme).

Image courtesy of Heather Dine Florida Keys National Marine Sanctuary

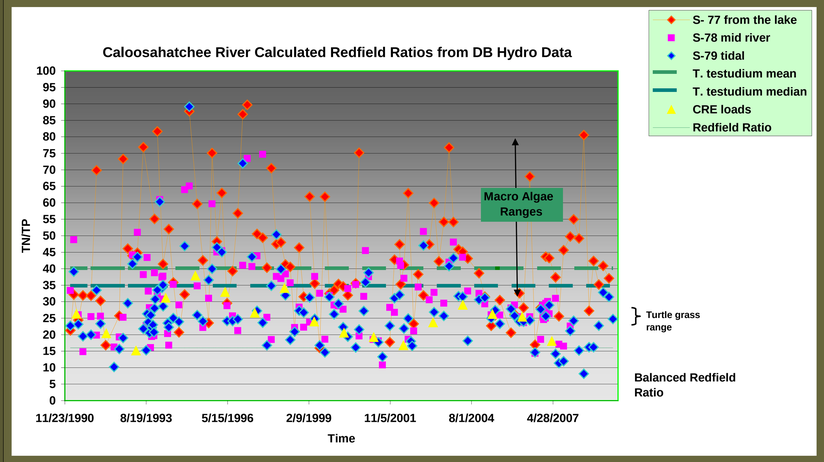


A meadow of Manatee grass (Syringodium filiforme). Note algae growth on the blades.

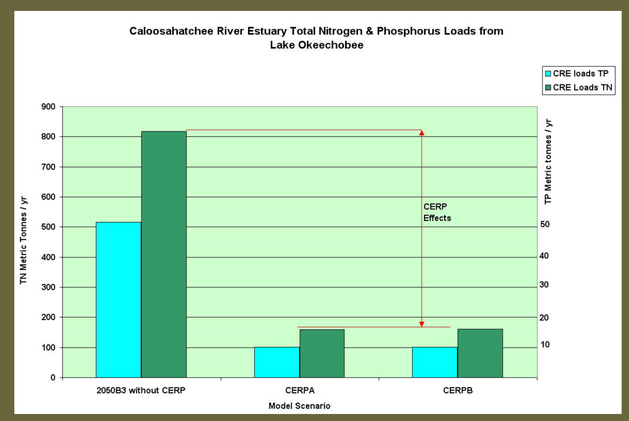
Image courtesy of Nancy Diersing Florida Keys National Marine Sanctuary

Results

Caloosahatchee River Estuary (CRE)

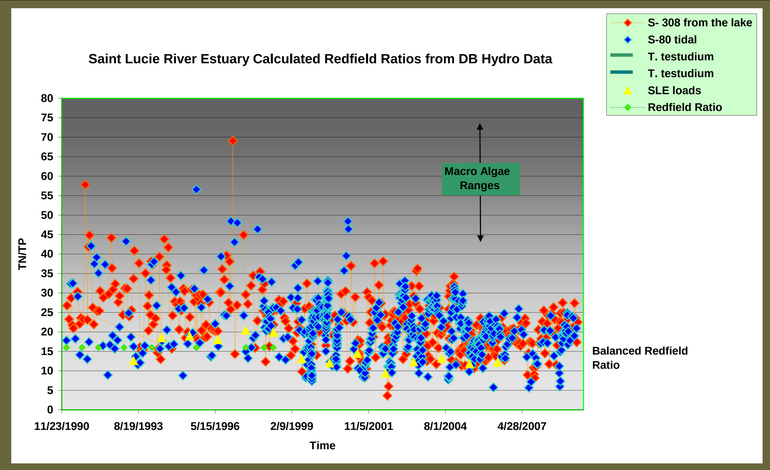


Nitrogen: Phosphorus molar ratios for structures along the Caloosahatchee River from 1990-2009. Note the higher Redfield Ratios at S-77, which discharges from the Lake. With CERP, these loads will be drastically reduced.

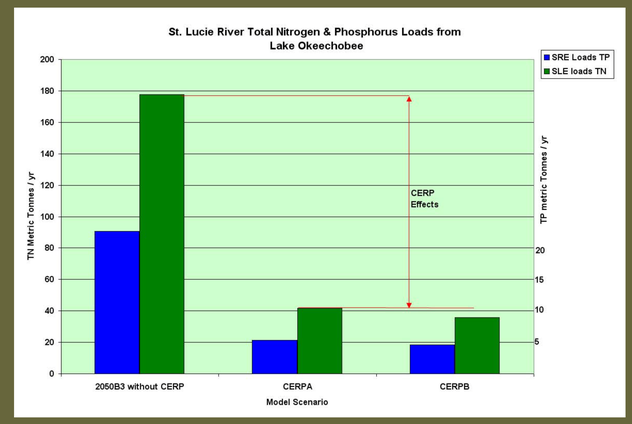


CERP will reduce Lake Okeechobee net discharges through a variety of components such as reservoirs, impoundments, aquifer storage and lake stage management. This chart compares estimated Total Nitrogen (TN) and Total Phosphorus (TP) of "No CERP" (2050B3 scenario) and two model scenarios of "CERP" (CERP A and CERP B) on the Caloosahatchee River.

Saint Lucie River Estuary (SLE)



Nitrogen: Phosphorus molar ratios for structures along the St. Lucie River from 1990-2009. The Redfield Ratios at S-308 (discharges from east side of the lake) are not as high as those impacting the Caloosahatchee River Estuary. These loads will be drastically reduced.



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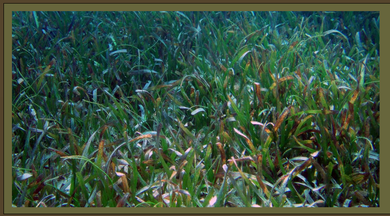

A mixed seagrass meadow of turtle grass (Thalassia testudium) and Manatee grass (Syringodium filiforme).

Image courtesy of Alex Harber Florida Keys National Marine Sanctuary

Conclusion

LO releases deliver significant nutrient loads to the estuaries. These loads have higher Redfield Ratios than are hospitable to sea-grasses. This especially applies to the Caloosahatchee River Estuary . CERP will provide many components that will reduce these releases and commensurate loads. This poster qualitatively evaluates the effect on sea-grasses.