Conflicting Indicators of Estuarine Health in a Southwest Florida Estuary Susceptible to Harmful Algal Blooms

Presentation to the National Water Quality Monitoring Council
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The Sarasota Bay Estuary includes a 50 mile long coastal lagoon with four inlets.

The Sarasota Bay Estuary Program was established in 1989.

Between 1980’s and 2010:

- Nitrogen pollution was reduced by an estimated 64%.
- Seagrasses rebounded by 46% and have recently been above historical acreages.
- Water quality achieved state standards.
Factors Affecting Improvements

• Grizzle Figg Act – required wastewater discharges to SW Florida estuaries be treated to Advanced Wastewater Treatment (AWT) standards

• Improved stormwater treatment

• Septic to Sewer conversions in priority watersheds

• Eliminating small package plants and increasing production for reclaimed water supply
Increased Volume of Reclaimed Water Production

Bee Ridge Monthly Average Reuse Production (MGD)
Seagrass – Our Keystone Indicator

Increases mostly due to PSB, SB, and LSB.
However:

• Trends in nitrogen concentrations have recently been increasing throughout the watersheds and estuaries

• Water quality standards for chlorophyll are now being exceeded in most segments

• Coincident episodes of harmful algal blooms have heightened concerns regarding nutrient pollution and its effects on estuarine health
Timeseries Trends in TN
1998-2017
2008-2017
http://www.sarasota.wateratlas.usf.edu
“Red Tide”

*Karenia brevis*

Naturally occurring

Historical records back to 1500’s

Blooms initiated offshore

Evidence that intensity and duration is increasing

High P makes area susceptible to nitrogen

Statewide *Karenia brevis* concentrations
*September 1 - 30, 2018*
Relevance to Water Quality Standards

• Sarasota Bay Estuary Program established targets and thresholds for chlorophyll and nitrogen

• Based on a reference period when seagrasses (key ecological indicator) were stable
Water Quality Indicators
Reference Period Approach

Chlorophyll a
Reference Period

Total Nitrogen
Linear Regression

Accepted By FDEP as NNC
## Likely Outcome of Next FDEP Assessment

<table>
<thead>
<tr>
<th>Segment</th>
<th>WBID</th>
<th>Chlorophyll α</th>
<th>TN</th>
<th>TP</th>
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<tbody>
<tr>
<td>Sarasota Bay</td>
<td>1968C</td>
<td>Impaired</td>
<td>Not Impaired</td>
<td>Not Impaired</td>
</tr>
<tr>
<td>Roberts Bay</td>
<td>1968D</td>
<td>Impaired</td>
<td>Not Impaired</td>
<td>Not Impaired</td>
</tr>
<tr>
<td>Little Sarasota Bay</td>
<td>1968E</td>
<td>Impaired</td>
<td>Not Impaired</td>
<td>Not Impaired</td>
</tr>
<tr>
<td>Blackburn Bay</td>
<td>1968F</td>
<td>Impaired</td>
<td>Impaired</td>
<td>Not Impaired</td>
</tr>
</tbody>
</table>

FDEP Evaluation Due in 2020
Sarasota Bay

2008-2017

Good exchange with Gulf
Robert’s Bay

Large creek discharge
Limited exchange with Gulf

2008-2017

Restorable Seagrass Target
Least exchange with Gulf
Blackburn Bay

2008-2017

Mixing of freshwater inputs and exchange with Gulf
Summary

- Chlorophyll now exceeding state standards

- Nitrogen concentrations increasing

+ Nitrogen not yet exceeding state standards in most Bays

+ Seagrasses remain above historic levels for most Bays

- Downward seagrass trends in Bays less exchange with Gulf
What’s With These TN Trends?

• **Lots of Ideas**
  • Laboratory results systematically biased? No
  • Rainfall /Atmospheric deposition changing?
  • Groundwater concentrations increasing?
  • Background conditions increasing?
  • Has increased volume of reuse affected nitrogen trends?

• **Need for a systematic approach**
Proposed Restoration and Protection Strategy (RA Plan)

SBEP serve as honest broker - existing inter-local agreements and WQ consortium and management structure in place

- Reevaluate Water Quality Targets
- Update/Reevaluate Loading Model
- Update Evaluation of Estuarine Responses
- Identify Nutrient Loading Limits
- Identify Nutrient Load Reduction Projects that Achieve Loading Limits

Many of the tools and data sources are in place
Benefits of FDEP Approved RA Plan

• Eligibility for funding and cost sharing

• Stresses proactive efforts to reduce nutrients in the watershed

• Maintains local control - Provides opportunity to demonstrate local efforts and provide local expertise

• Cleaner water faster
Lessons Learned

• A lot of benefits of having multiple indicators but it can lead to confusion / inaction

• Seagrasses may have threshold responses that have not been exceeded in Bays with better exchange

• Power of a strong monitoring program to pick up changes in water quality

• Having targets and thresholds works even if they aren’t perfect