Tampa Bay Estuary: An Urban Watershed

- Urban Centers in Pinellas County & City of Tampa
- 2.5 million people reside in Tampa Bay area
- Agriculture / Mining Activities in Eastern Portion
Tampa Bay in the 1970s

- Phytoplankton and macroalgae dominated

- 50% loss of seagrass coverage between 1950 and 1980

- Newspapers declared Tampa Bay “dead”

- Poorly-treated Domestic Point Source, Untreated Industrial Point Sources & Stormwater, Rampant Dredge & Fill Activities
Citizens Adopt Goals for a Healthier Bay

To make the Bay look more like it did in 1950 than in 1980

*Citizen Input:*

- Clear water, like the “good old days”
- Better fishing
- Swimming without “seaweed” (macroalgae)
Citizens Demanded Action

• Citizens in Tampa demanded legislative action

• In 1978, State legislation (Grizzle-Figg Act) for Tampa Bay required all wastewater treatment plants discharging in the Tampa Bay watershed to reach AWT standards (3 mg/L TN max) or 100% reuse within 3 years.

• Resulted in a 90% reduction of TN loading from WWTP point source discharges.
Tampa Bay Nitrogen Management Strategy

Paradigm

Reduce Nitrogen Loads → Reduce Chlorophyll → Increase Water Clarity → Increase Sea-grass Cover
Tampa Bay Nitrogen Management Consortium

- Formed in 1998, now includes 40+ public/private partners

- Members include TBEP government and regulatory agency participants, local phosphate companies, agricultural interests and electric utilities

- Mid-1990s, collectively accepted responsibility for meeting nitrogen load reduction goals

- Consortium members may choose to implement any combination of projects to maintain loads to Tampa Bay at 1992-1994 levels
Voluntary Actions Become Regulatory Requirements

• In mid-1990s, TBEP established goal to “hold the line” on TN loadings to the bay & preclude 17 tons TN / yr from entering bay to offset anticipated loads from continued growth

• 1998 – TMDL for TN first established by EPA (based on 1992-1994 TN loads to Tampa Bay)

• 2002 – NMC and TBEP granted “Reasonable Assurance” that TB will meet State WQ Criteria for Nutrients

• 2007 – FDEP and EPA require allocations to be developed to meet federal TMDL and continue State “Reasonable Assurance” determination

• 2009 – NMC voluntarily developed TN load allocations to 189+ sources in the bay; Effectively capping TN loads
TN Loads Capped & Reductions Documented

- All TN Loads Apportioned to Sources
- Future loads will require offsets/transfers

http://apdb.tbeptech.org
- Load reductions reported every 5-yrs

Table IX-3: Proposed allowable, transferable nitrogen allocations for 2008-2012 for Middle Tampa Bay. SW = Surface water discharge, RE = Reuse discharge.

<table>
<thead>
<tr>
<th>Entity</th>
<th>Source</th>
<th>Proposed MS4 and Point Source Permit Limit (%)</th>
<th>TMDL Load (tons/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harbor Bay</td>
<td>NPS</td>
<td>&lt;0.1%</td>
<td>0.2</td>
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<tr>
<td>Hillsborough County</td>
<td>MS4</td>
<td>9.9%</td>
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<td>Point Source - South County RE</td>
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<td>MacDill Air Force Base</td>
<td>MS4</td>
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<td>Point Source - WWTP RE</td>
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<td>Manatee County</td>
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<td>Pinellas County</td>
<td>MS4</td>
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<tr>
<td>City of Pinellas Park</td>
<td>MS4</td>
<td>0.7%</td>
<td>5.3</td>
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<tr>
<td>City of St. Petersburg</td>
<td>MS4</td>
<td>6.5%</td>
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<td>Point Source - St. Pete Facilities RE</td>
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<td>Mosaic</td>
<td>Point Source - Four Corners SW</td>
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<td>TECO Big Bend*</td>
<td>Point Source – SW</td>
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<td>Point Source – RE</td>
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<td>Non-MS4/Non-Ag NPS</td>
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<td>0.5%</td>
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<td>Atmospheric Deposition</td>
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<td>35.2%</td>
<td>252.1</td>
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<td>Other (Groundwater, Springs, Conservation)</td>
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<td>5.1%</td>
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<td>FDACS (Agriculture)</td>
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<td>33.4%</td>
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<td>Small Sources</td>
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</table>

Note: The resulting MS4 and point source TMDL loads based on percent allocations are not proposed as permit limits.

*Includes a Set Allocation of 35.0 tons/year and an Interim Allocation through 2012 of an additional 21.5 tons/year to allow determination of new discharge loads.
• Partners can enter either NPS or PS load reductions
• Default calculations and BMP efficiencies used based on land use, subbasin, and treatment method
• User-defined efficiencies & reductions can also be entered
• TBEP collates and reports to FDEP/EPA on a 5-yr basis by major bay segment

Reducing TN Loads to Tampa Bay

<table>
<thead>
<tr>
<th>Source</th>
<th>1976 (Worst Case Loadings)</th>
<th>2007-2011 (Annual Averages)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total: 9,904 tons/yr</td>
<td>9,904 tons/yr</td>
<td>2,747 tons/yr</td>
</tr>
<tr>
<td>Springs</td>
<td>5,023 tons/yr</td>
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<td>Groundwater</td>
<td>1,015 tons/yr</td>
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<td>Material Losses</td>
<td>2,060 tons/yr</td>
<td>797 tons/yr</td>
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<td>Nonpoint Sources</td>
<td>606 tons/yr</td>
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<td>Point Sources</td>
<td>20 tons/yr</td>
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<tr>
<td>Atmospheric Deposition</td>
<td>14 tons/yr</td>
<td>5 tons/yr</td>
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</table>
Water Quality Has Improved

**Hillsborough Bay**

- **Average**
- **Regulatory Threshold**

- Chlorophyll –a (ug/L)


- Yes: Water Quality Improved
- No: Water Quality Not Improved

**Old Tampa Bay**

- **Average**
- **Regulatory Threshold**

- Chlorophyll –a (ug/L)


- Yes: Water Quality Improved
- No: Water Quality Not Improved

- AWT & Reuse Standards Implemented
- Stormwater Regulations Enacted
- TBEP Partner & NMC Actions Implemented
Seagrass Coverage Continues to Expand

Seagrass Coverage Recovery Goal (38,000 acres)

Seagrass Coverage (x1,000 acres)

- 1950: 40,000 acres
- 1984: 20,000 acres
- 1988: 25,000 acres
- 1992: 30,000 acres
- 1996: 35,000 acres
- 2000: 40,000 acres
- 2004: 45,000 acres
- 2008: 50,000 acres
- 2012: 55,000 acres

Seagrass Coverage (x1,000 acres) 0 10 20 30 40
Sustaining Success: Adaptively Managing TB

- Can recovery be maintained with increasing population?
- Expected to double by 2050
- New Actions / Offsets will be Needed
New Management Actions That Will Make a Future Difference on Water Quality

• Reduce Residential Fertilizer Contributions to Stormwater Runoff

• Continue to Reduce Wastewater & Stormwater Inputs Through Expansion of Reuse / Recharge Projects

• Develop & Fund Localized Research & Management Actions for Problematic Areas (e.g. Old Tampa Bay)

• Improve and Restore Other Coastal Habitats
TBEP’s Role In the Process

• Facilitate scientific and technical discussions and evaluations – Convene the NMC

• Provide public education and communication

• Develop and convene partnerships to restore and protect Tampa Bay

• Keep the ball-rolling and showcase partner’s continuing, successful efforts ...
Key Elements in Tampa Bay’s Adaptive Management Approach

- Long-term monitoring
- Target resources identified by both public and scientists as “worthwhile” indicators (seagrass)
- Science-based numeric goals & targets
- Multiple tools: Regulation; Public/private collaborative actions; Citizen actions
- Recognized “honest broker” to track, facilitate, assess progress
- Ongoing assessment & adjustment
Thank You!

Ed Sherwood
Tampa Bay Estuary Program
esherwood@tbep.org
http://www.tbep.org

Visit TBEP on Facebook
Tracking our Progress

Reduce Nitrogen Loads
- Limits voluntarily and proactively developed by NMC local partners
- Regulatory agencies partners in the process
- Load allocation targets periodically re-assessed

Reduce Chlorophyll

Increase Water Clarity

Sea-grass Recover
- Local-program consistently estimates seagrass coverage since 1980's
- Restoration endpoint clearly defined

Bottom Line
- ~2-Yr Assessment; Water-quality Targets Re-Evaluated, if necessary
- 5-Yr Annual Assessment; Tied to Observed Bay Conditions
- Bottom Line; Annually-Assessed; Localized Management Responses Implemented, if necessary

Local-programs consistently monitor water quality since 1970's
- Bay-Segment Specific Annual Targets Developed
- Targets tied to Seagrass Restoration Goal

Increase Water Clarity

Reduce Chlorophyll

Reduce Nitrogen Loads
Open Bay Segments & Drainage Areas

- Old Tampa Bay
- Hillsborough Bay
- Boca Ciega Bay
- Middle Tampa Bay
- Lower Tampa Bay
- Terra Ceia Bay
- Manatee River
- Coastal Lower Tampa Bay
- Coastal Middle Tampa Bay
Meeting Regulatory Thresholds

**Hillsborough Bay**

- Average
- Regulatory Threshold


- Year
- Old Tampa Bay
- Hillsborough Bay
- Mid Tampa Bay
- Low Tampa Bay

<table>
<thead>
<tr>
<th>Year</th>
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<th>Hillsborough Bay</th>
<th>Mid Tampa Bay</th>
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**Old Tampa Bay**

- Average
- Regulatory Threshold


- Year
- Old Tampa Bay
- Hillsborough Bay
- Mid Tampa Bay
- Low Tampa Bay

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<tr>
<th>Year</th>
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**Stormwater Regulations Enacted**

- TBEP Partner & NMC Actions Implemented

- AWT & Reuse Standards Implemented

15.0 ug/L

9.3 ug/L
Annual Decision Support Process

• Annual report card for Tampa Bay

• Specific to each of the 4 major bay segments

• Provides for adaptive management of a sentinel estuarine indicator (seagrass)
Restoration Success Tied to Significant Nutrient Reductions

Total Nitrogen Load (1000s tons/year)

<table>
<thead>
<tr>
<th>Time Period</th>
<th>Total: 9,904 tons/yr</th>
<th>Total: 2,747 tons/yr</th>
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</thead>
<tbody>
<tr>
<td>1976</td>
<td>Springs</td>
<td>Groundwater</td>
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<td></td>
<td>Nonpoint Sources</td>
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</tbody>
</table>

1976 (Worst Case Loadings)

2007-2011 (Annual Averages)
Water Quality Assessment / Management Framework

- Bay segment observed values compared to established bay segment targets for chlorophyll-a and light attenuation

- Results of each comparison placed into a decision matrix framework

- Overall management response determined for each bay segment in a clear, “policy-level” format

### Table 1. Decision matrix identifying appropriate categories of management actions in response to various outcomes of the monitoring and assessment of chlorophyll-a and light attenuation data.

<table>
<thead>
<tr>
<th>CHLOROPHYLL</th>
<th>LIGHT ATTENUATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outcome 0</td>
<td>GREEN</td>
</tr>
<tr>
<td>Outcome 1</td>
<td>YELLOW</td>
</tr>
<tr>
<td>Outcome 2</td>
<td>YELLOW</td>
</tr>
<tr>
<td>Outcome 3</td>
<td>YELLOW</td>
</tr>
<tr>
<td></td>
<td>YELLOW</td>
</tr>
</tbody>
</table>

Green

“Stay the course;” partners continue with planned projects to implement the CCMP. Data summary and reporting via the Baywide Environmental Monitoring Report and annual assessment and progress reports.

Yellow

TAC and Management Board on caution alert; review monitoring data and loading estimates; attempt to identify causes of target exceedences; TAC report to Management Board on findings and recommended responses needed.

Red

TAC, Management and Policy Boards on alert; review and report by TAC to Management Board on recommended types of responses. Management and Policy Boards take appropriate actions to get the program back on track.
TBEP Nitrogen Management Strategy

Reduce Nitrogen Loads → Reduce Chlorophyll → Reduce Light Attenuation → Sea-grass Recover

1998: NMC Partnership Formed to “Hold the Line”

1996-2009: NMC Projects Preclude >430t N / yr

2010: RA Accepted & Adopted by FDEP, N Load Allocations Voluntarily & Proactively Developed

2006: First-time All Segments Meet TBEP Water Quality Targets

2011+: Demonstrating RA Compliance & Providing Input on Criteria Development