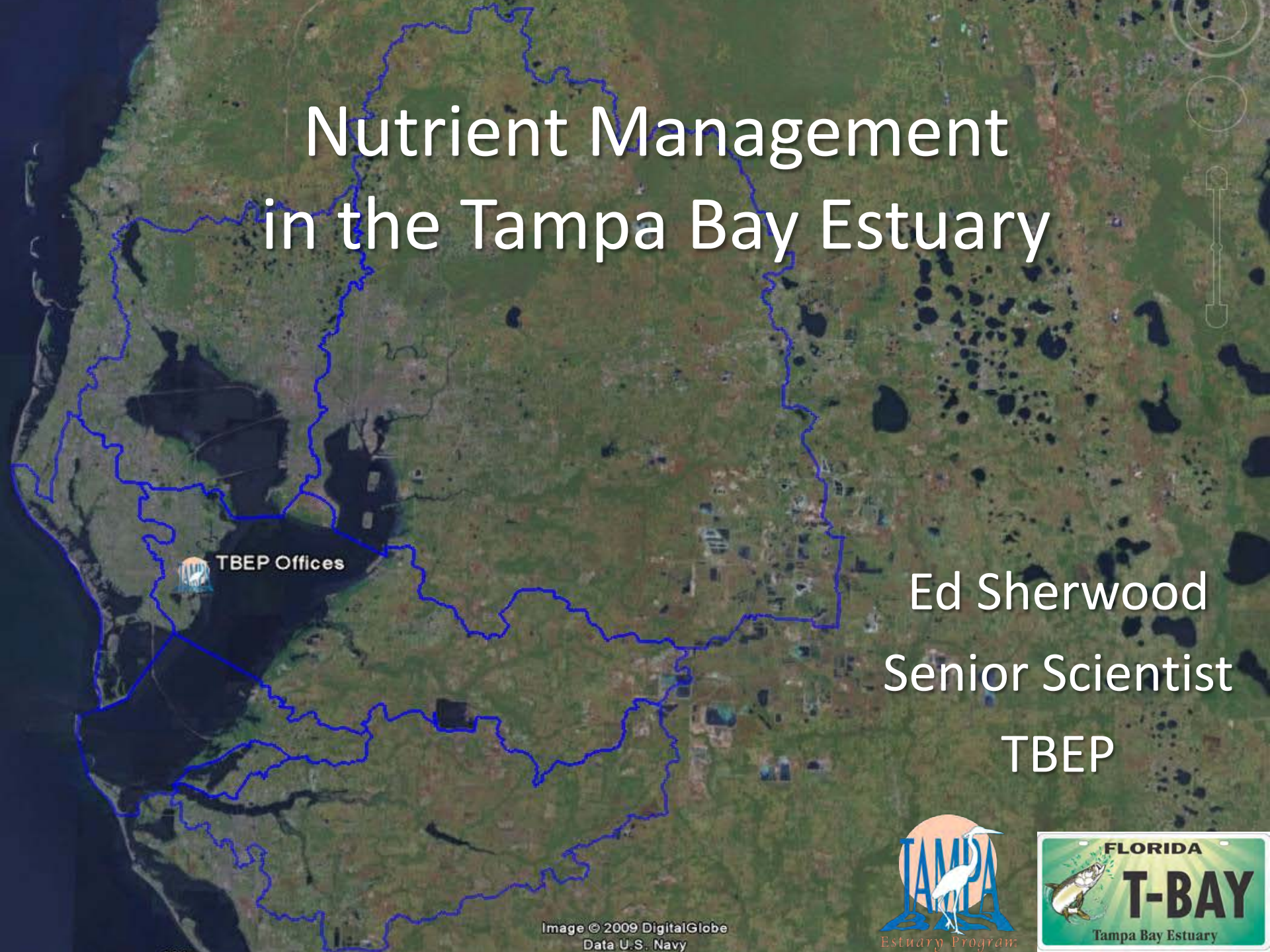
Nutrient Management in the Tampa Bay Estuary

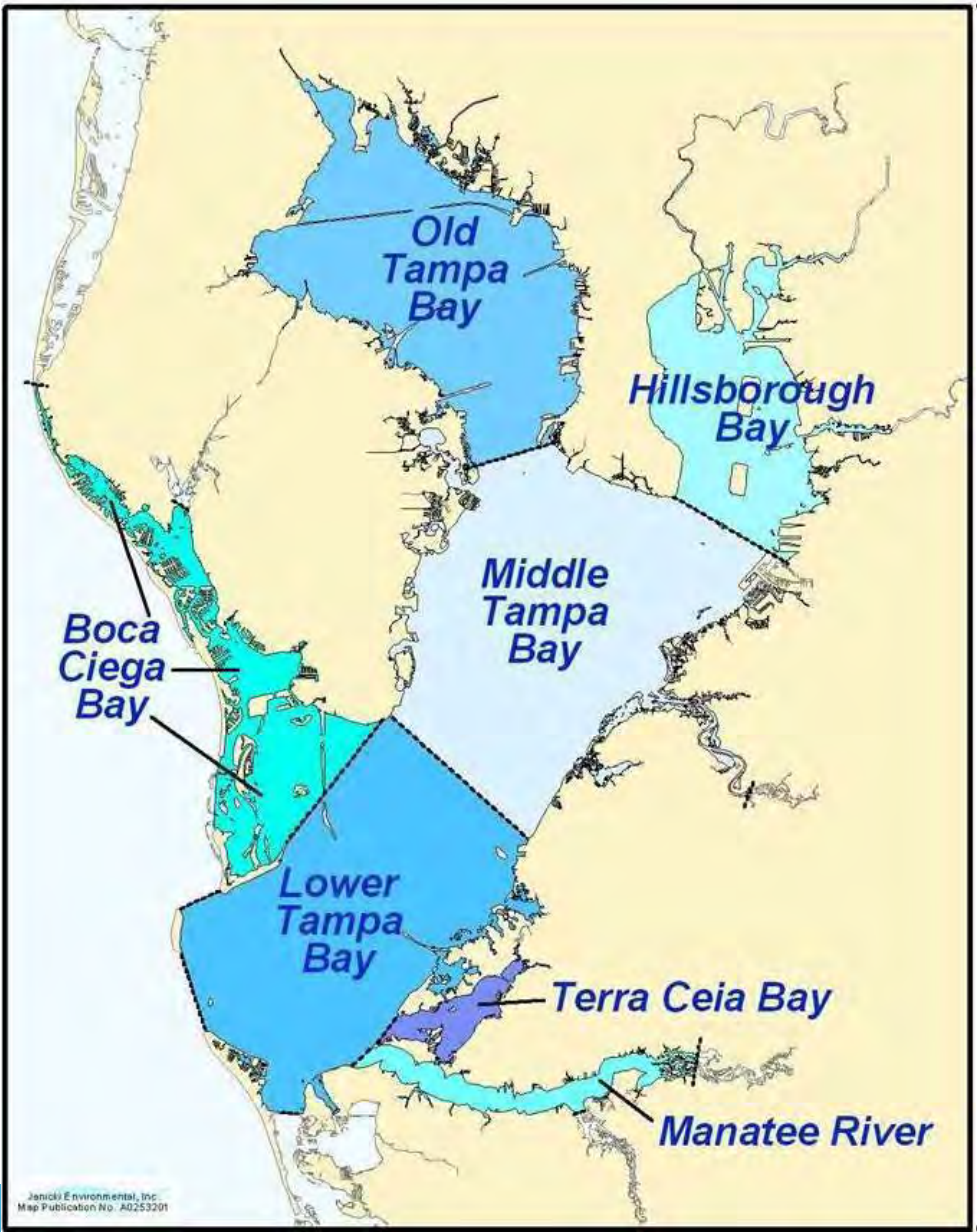


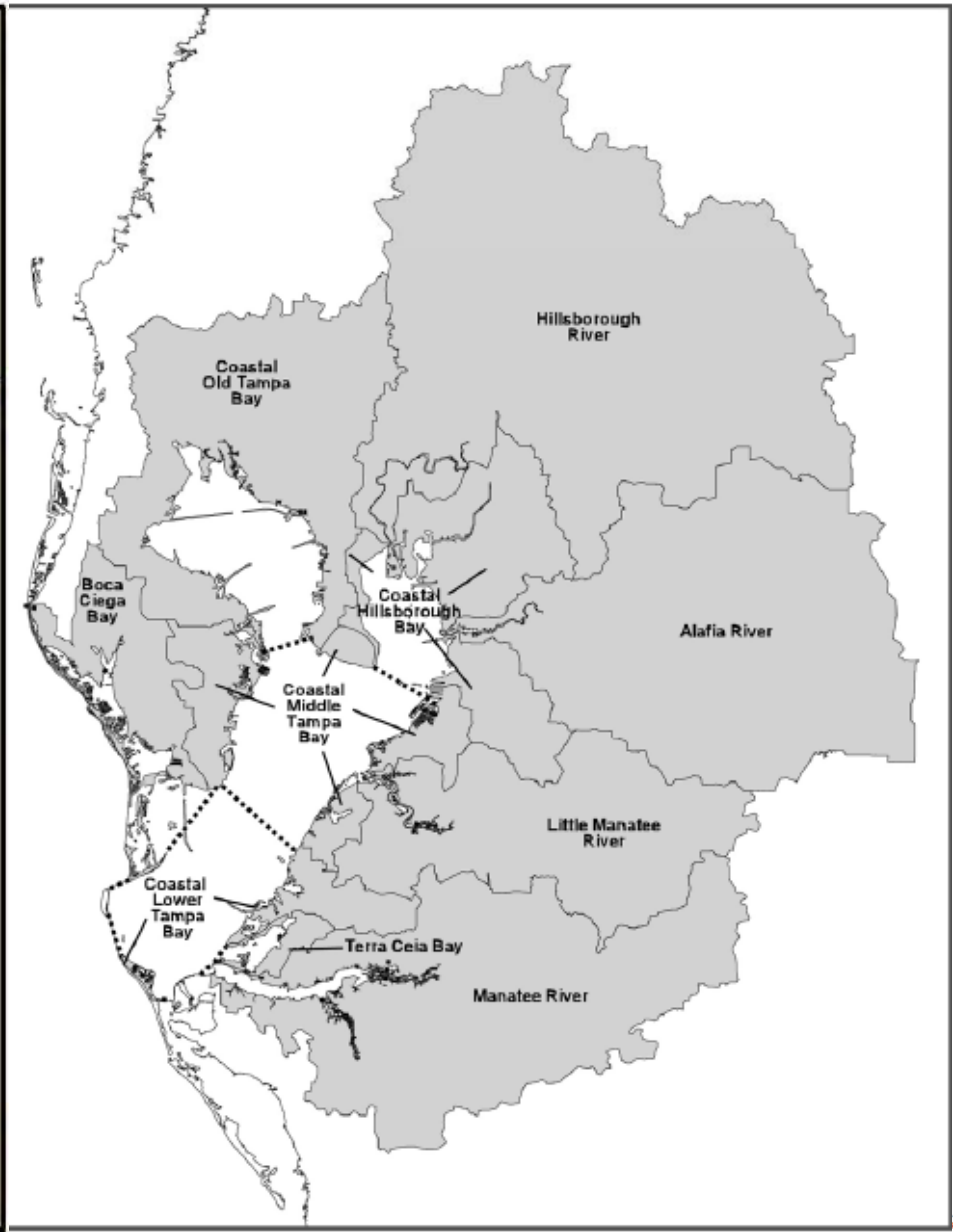
Ed Sherwood
Senior Scientist
TBEP

TAMPA Estuary Program

FLORIDA T-BAY Tampa Bay Estuary

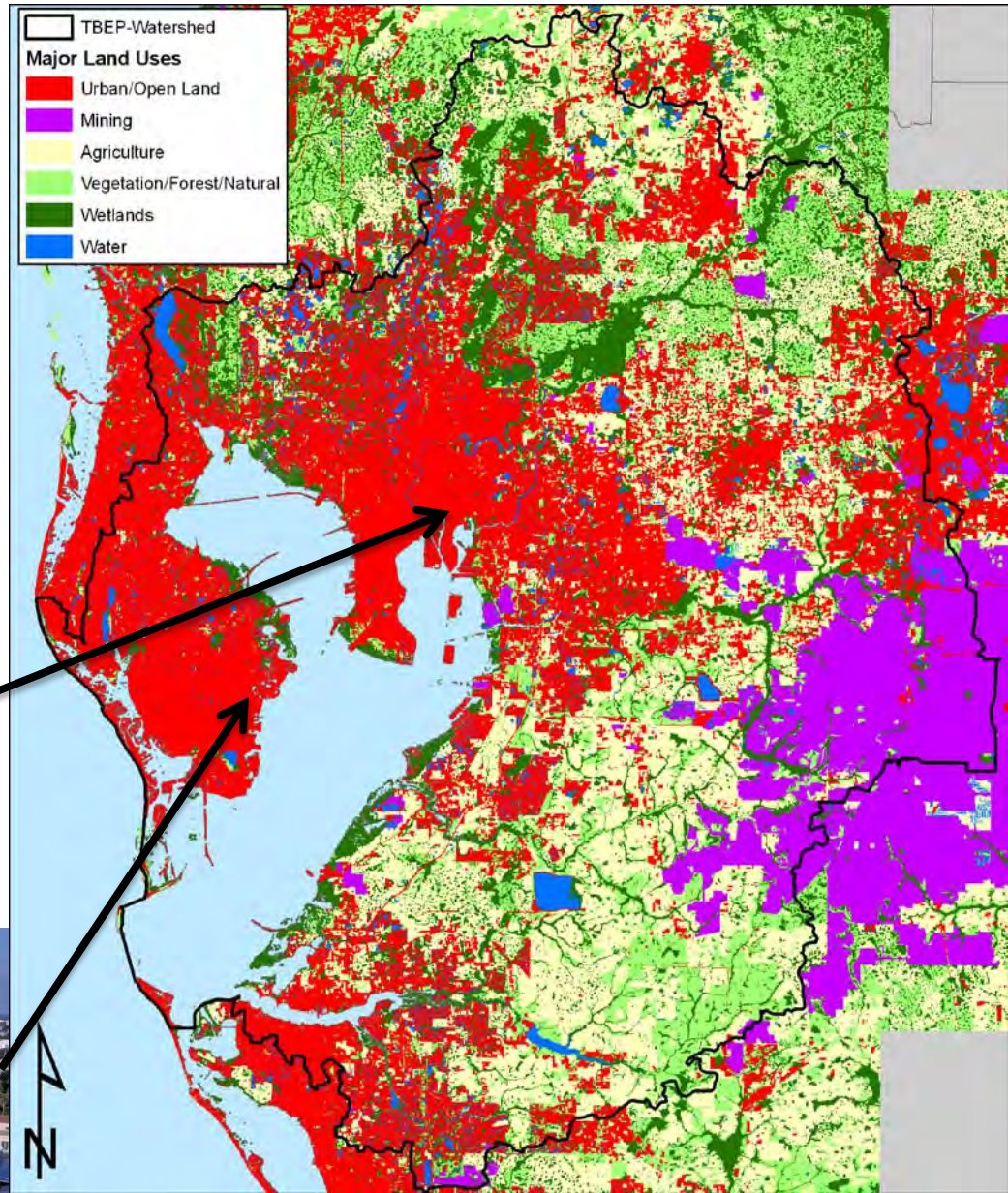
Open Bay Segments & Drainage Areas





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 did in 1980

Citizen Input:

- Clear water, like the "good old days"
- Better fishing

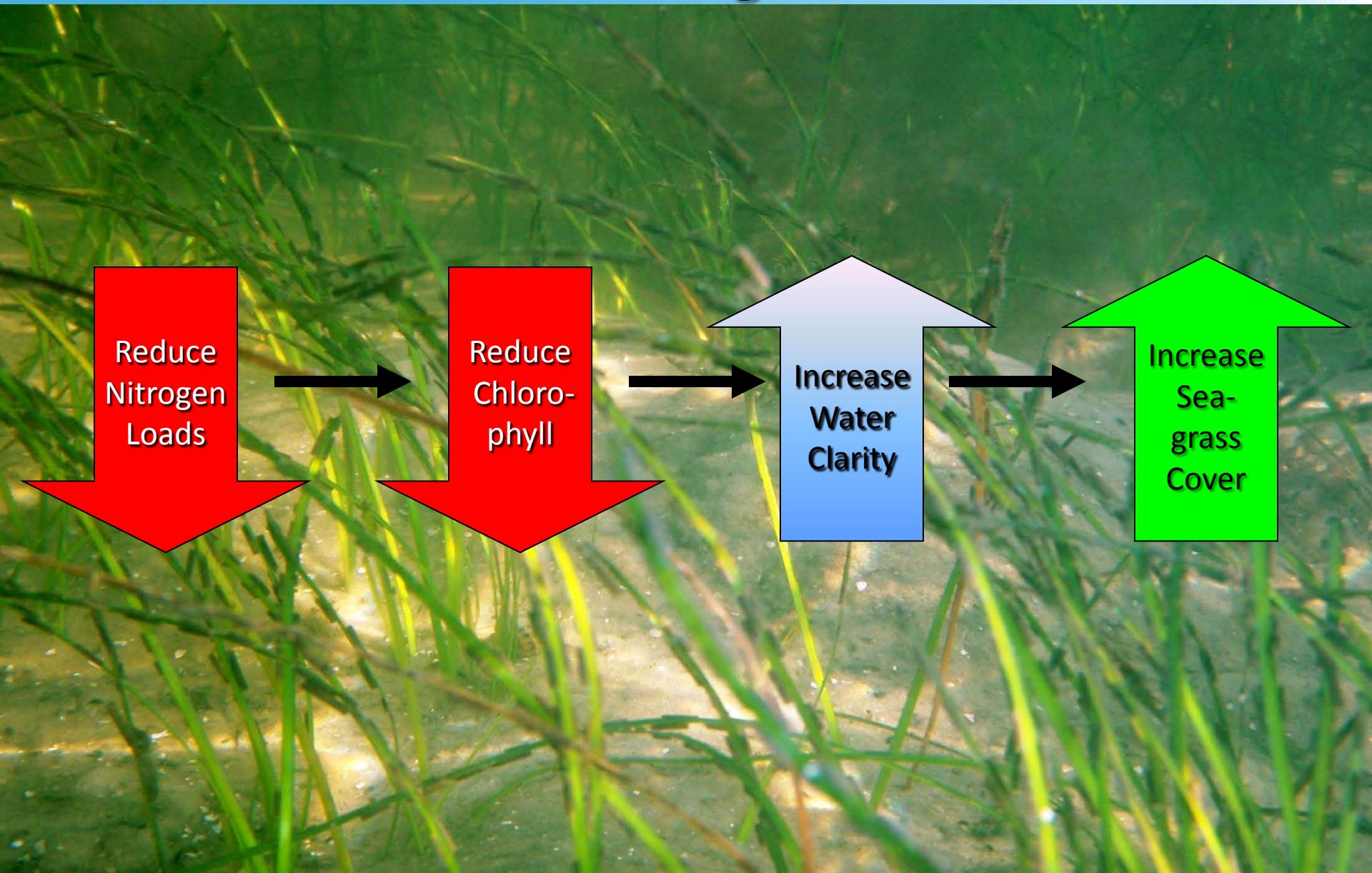
- Swimming without "seaweed" (macroalgae)

Photo by Capt. Bryon Chamberlin

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



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

Public Partners:

- Hillsborough County
- Manatee County
- Pinellas County
- Pasco County
- Polk County
- Sarasota County
- City of Tampa
- City of St. Petersburg
- City of Clearwater
- City of Palmetto
- City of Bradenton
- City of Largo
- City of Lakeland
- City of Oldsmar
- City of Gulfport
- City of Mulberry
- City of Plant City
- City of Safety Harbor
- SWFWMD
- US EPA
- FDEP
- FDACS
- FDOH
- FDOT
- MacDill AFB
- TBRPC
- Tampa Bay Water
- Tampa Port Authority
- EPC of Hillsborough County
- AEDC of Hills. County

Private Partners:

- Eastern Terminals
- Mosaic
- CSX Transportation
- Florida Power & Light
- CF Industries
- Tampa Electric Co.
- Kinder Morgan Bulk T., Inc.
- Progress Energy
- Tropicana Products, Inc.
- Kerry I&F
- Trademark Nitrogen
- Yara N.A.
- Alafiia Preserve, LLC
- Eagle Ridge, LLC
- LDC Donaldson Knoll Investments, LLC

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

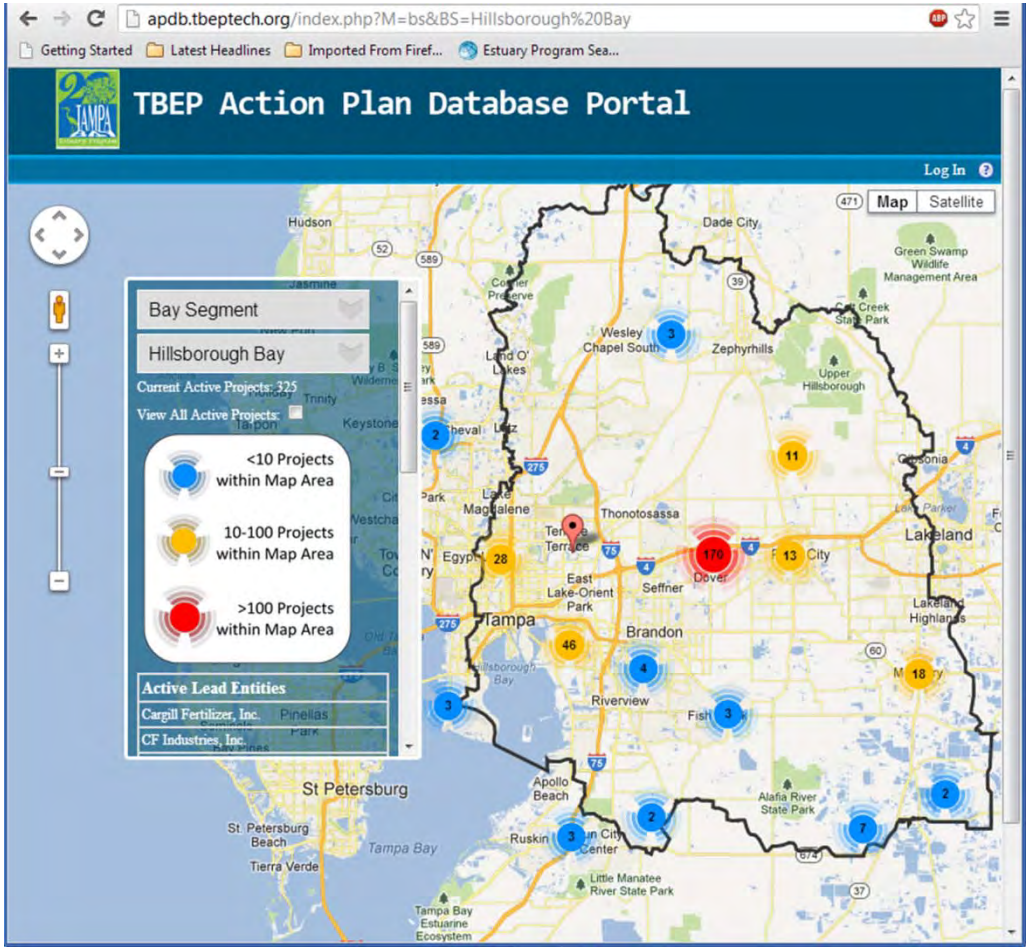
- http://apdb.tbeptech.org
- Load reductions reported every 5-yrs

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

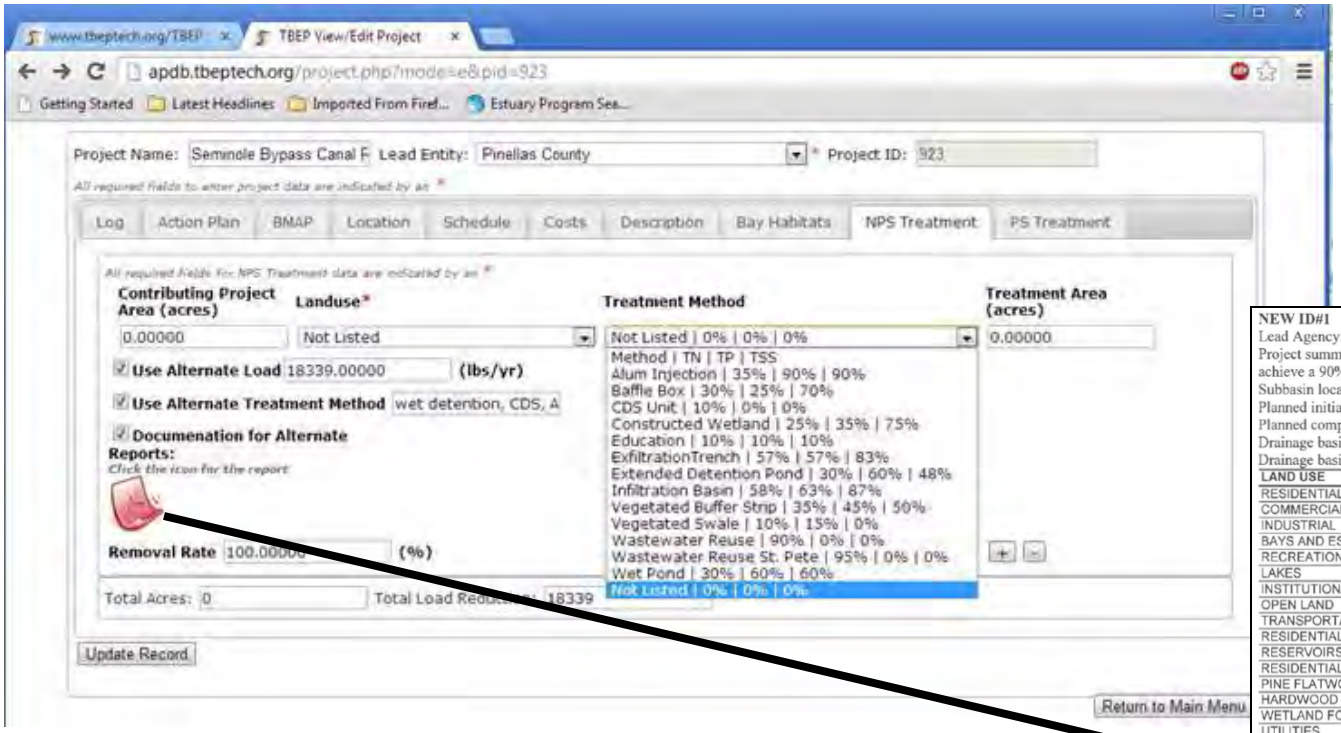
Entity	Source	Proposed MS4 and Point Source Permit Limit (%)	TMDL Load (tons/year)
Harbor Bay	NPS	<0.1%	0.2
Hillsborough County	MS4	9.9%	70.9
	Point Source - South County RE		0.5
MacDill Air Force Base	MS4	1.0%	7.0
	Point Source - WWTP RE		0.7
Manatee County	MS4	3.0%	21.8
Pinellas County	MS4	0.5%	3.2
City of Pinellas Park	MS4	0.7%	5.3
City of St. Petersburg	MS4	6.5%	46.5
	Point Source - St. Pete Facilities RE		20.8
Mosaic	Point Source - Four Corners SW	4.1%	29.3
TECO Big Bend*	Point Source – SW*		56.5*
	Point Source - RE		2.1
Non-MS4/Non-Ag NPS		0.5%	3.8
Atmospheric Deposition		35.2%	252.1
Other (Groundwater, Springs, Conservation)		5.1%	36.7
FDACS (Agriculture)		33.4%	239.2
Small Sources			2.4
Total			**799**

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.



Partner-Driven Load Reduction Reporting



NEW ID#1 Seminole Bypass Canal Regional Stormwater Treatment Facility
Lead Agency: Pinellas County
Project summary: Diverted water from the Seminole Bypass Canal will be treated with alum to achieve a 90% reduction in TP, 35% reduction in TN, and 85% reduction in TSS.
Subbasin location: 501 and 524
Planned initiation: 10/2004
Planned completion: 3/2007
Drainage basin area (acres): 5120 acres
Drainage basin land use and percentages or acres by land use type (approximate):

LAND USE	ACRES	%
RESIDENTIAL HIGH DENSITY	6536.2622	45.07%
COMMERCIAL AND SERVICES	1078.5667	7.44%
INDUSTRIAL	991.2254	6.84%
BAYS AND ESTUARIES	857.3327	5.91%
RECREATIONAL	677.2572	4.67%
LAKES	668.6781	4.61%
INSTITUTIONAL	578.0629	3.99%
OPEN LAND	502.7464	3.47%
TRANSPORTATION	415.7077	2.87%
RESIDENTIAL MED DENSITY 2->5 DWELLING UNIT	323.9821	2.23%
RESERVOIRS	305.6389	2.11%
RESIDENTIAL LOW DENSITY < 2 DWELLING UNITS	266.5345	1.84%
PINE FLATWOODS	235.9539	1.63%
HARDWOOD CONIFER MIXED	191.6533	1.32%
WETLAND FORESTED MIXED	176.4321	1.22%
UTILITIES	113.8942	0.79%
OTHER	581.3124	4.01%
LAND USE TOTAL (ACREAGE AND %)	14501.2407	100.00%

Treatment method (wet detention, CDS, etc): Alum
Current load: 23,772 kg/yr (52,398 lbs)
TN removal rate for alum injection: 35%
Load reduction (lbs/yr): 18,339 lbs/yr
Total estimated cost, if available: $1,198,500
Funding sources, if available: SWFWMD SWIM, FDEP 319(h), and Pinellas County

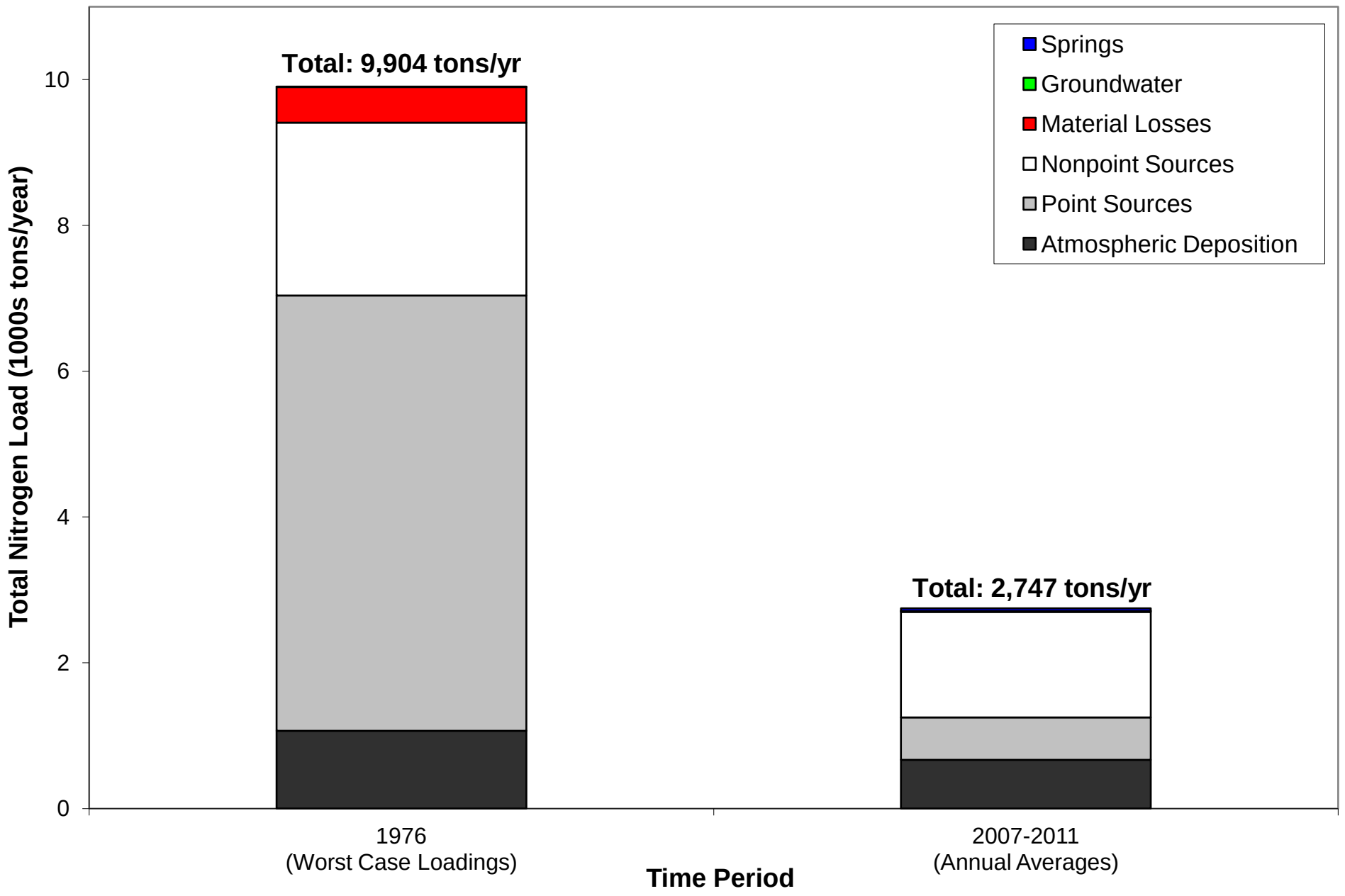
NEW ID#2 Alum treatment of five priority sub basins discharging to Lake Seminole
Lead Agency: Pinellas County
Project summary: Alum treatments of stormwater systems in Lake Seminole SubBasins 1,2,3,6 and 7.
Subbasin location: 524
Planned initiation: 10/2004
Planned completion: Phase I: 3/2007; Phase II 12/2009
Drainage basin area (acres): 2,532

- 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

- Guidelines for Calculating Nitrogen Load Reduction Credits. 1997. Technical Report #02-97 of the Tampa Bay National Estuary Program. Prepared by Coastal Environmental (H.W. Zarbock and A.J. Janicki).

Reduce Nitrogen Loads

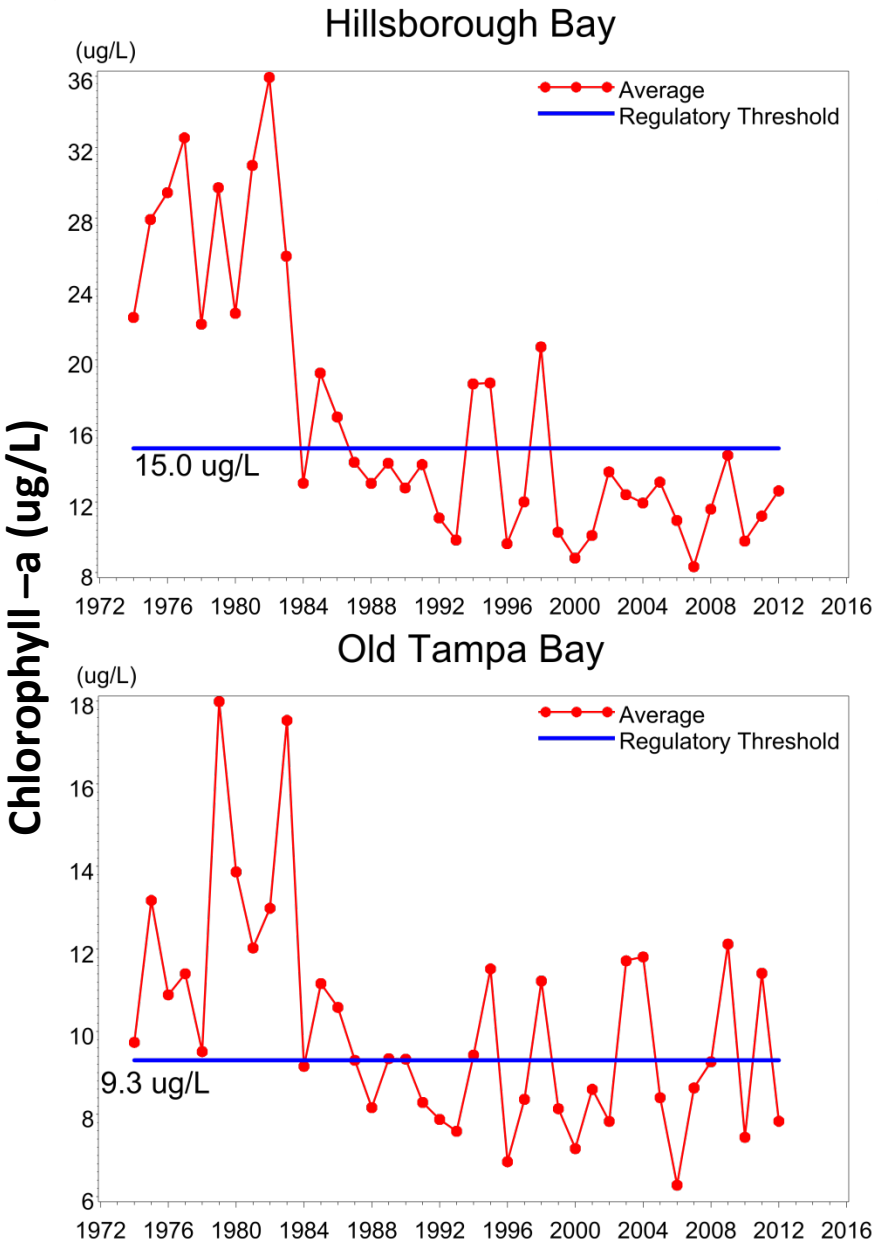
Reducing TN Loads to Tampa Bay



Reduce Chloro-phyll

Water Quality Has Improved

Increase Water Clarity



AWT & Reuse Standards Implemented

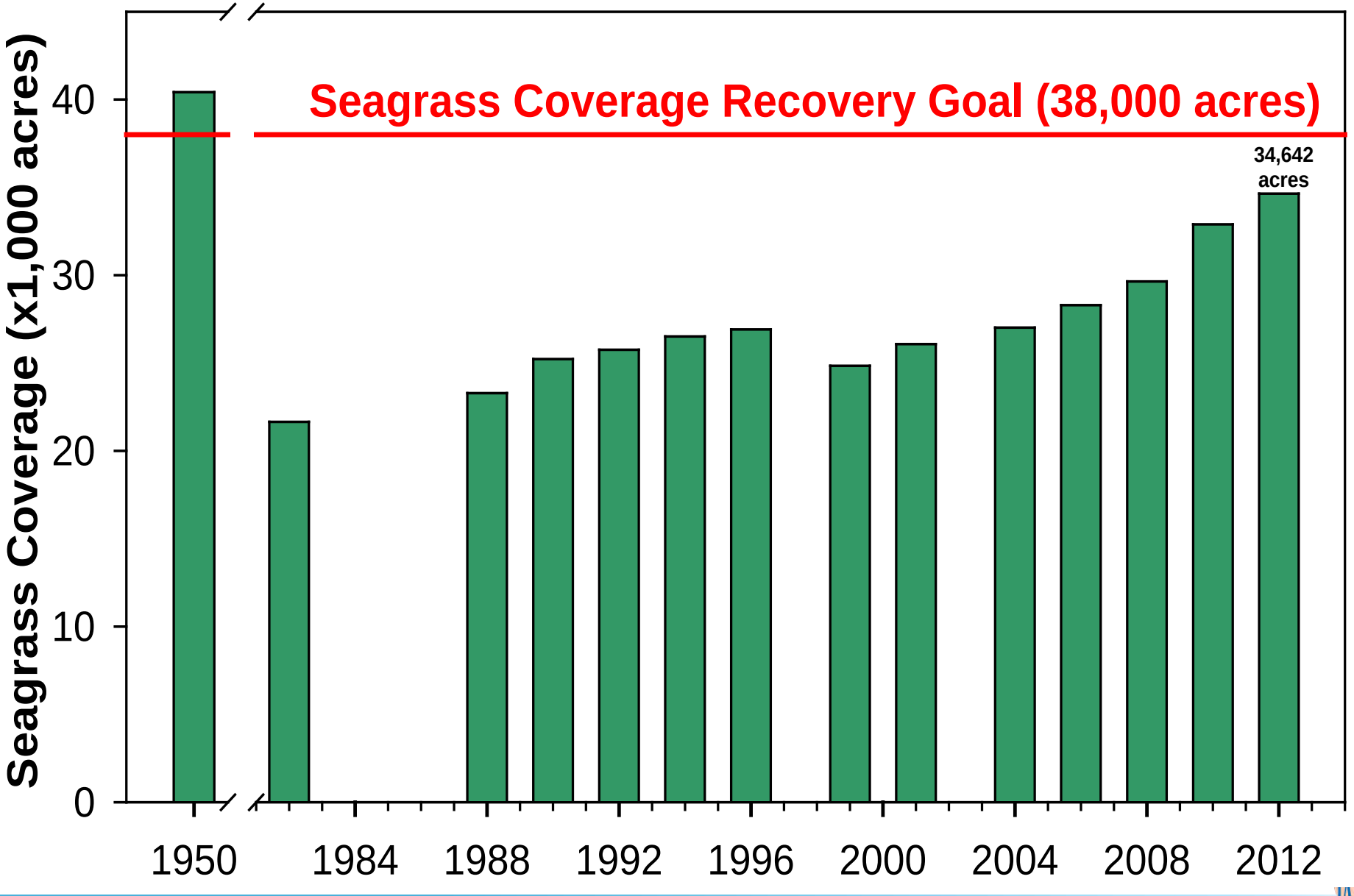
Stormwater Regulations Enacted

TBEP Partner & NMC Actions Implemented

Year	Old Tampa Bay	Hillsbor-ough Bay	Mid Tampa Bay	LowTampa Bay
1974	No	No	No	Yes
1975	No	No	No	Yes
1976	No	No	No	Yes
1977	No	No	No	No
1978	No	No	No	Yes
1979	No	No	No	No
1980	No	No	No	No
1981	No	No	No	No
1982	No	No	No	No
1983	No	No	No	No
1984	Yes	Yes	No	Yes
1985	No	No	No	Yes
1986	No	No	Yes	Yes
1987	No	Yes	No	Yes
1988	Yes	Yes	Yes	Yes
1989	No	Yes	Yes	Yes
1990	No	Yes	Yes	Yes
1991	Yes	Yes	Yes	Yes
1992	Yes	Yes	Yes	Yes
1993	Yes	Yes	Yes	Yes
1994	No	No	No	No
1995	No	No	No	Yes
1996	Yes	Yes	Yes	Yes
1997	Yes	Yes	Yes	Yes
1998	No	No	No	No
1999	Yes	Yes	Yes	Yes
2000	Yes	Yes	Yes	Yes
2001	Yes	Yes	Yes	Yes
2002	Yes	Yes	Yes	Yes
2003	No	Yes	Yes	Yes
2004	No	Yes	Yes	Yes
2005	Yes	Yes	Yes	No
2006	Yes	Yes	Yes	Yes
2007	Yes	Yes	Yes	Yes
2008	Yes	Yes	Yes	Yes
2009	No	Yes	Yes	Yes
2010	Yes	Yes	Yes	Yes
2011	No	Yes	Yes	Yes
2012	Yes	Yes	Yes	Yes

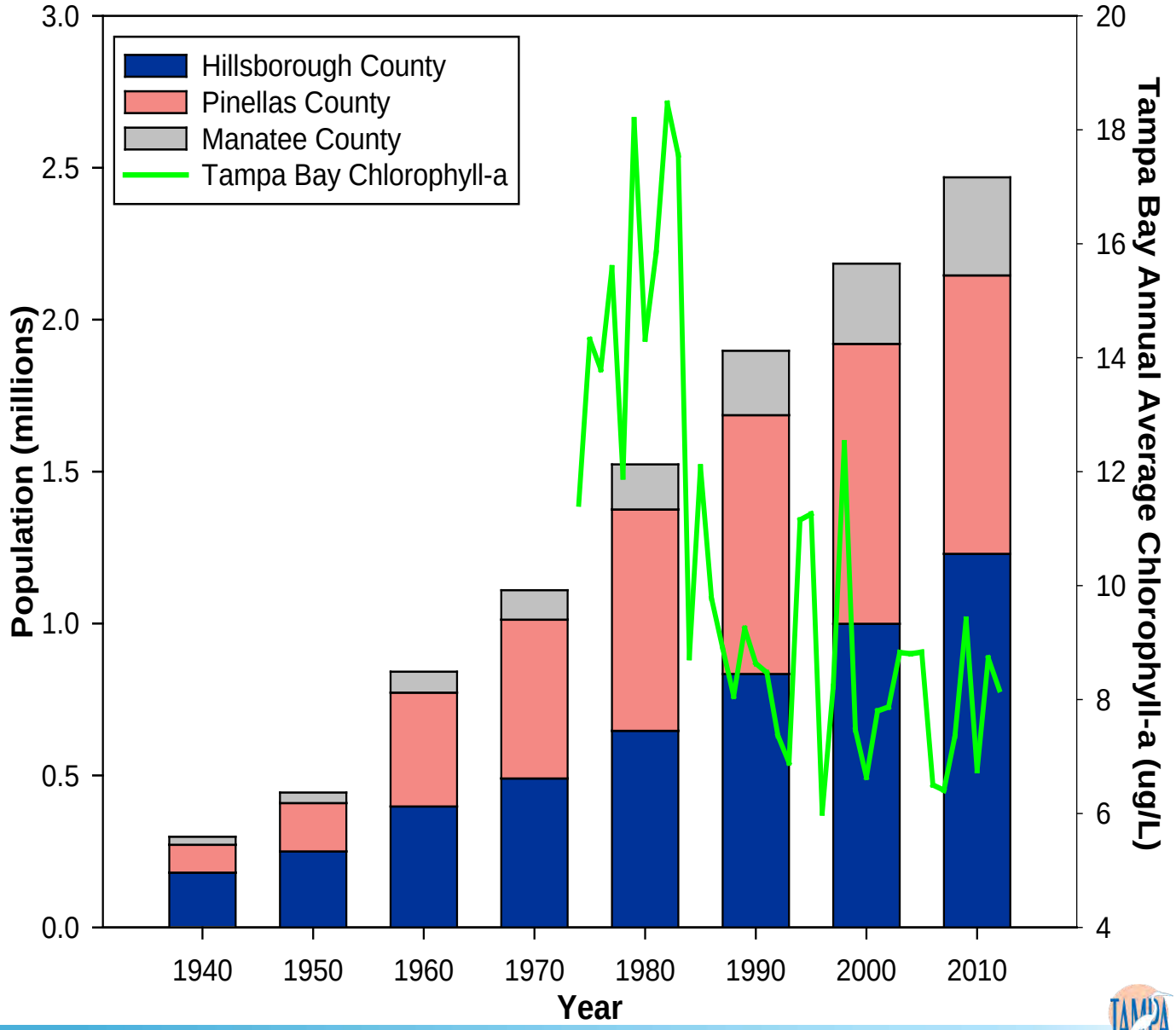
Increase Sea-grass Cover

Seagrass Coverage Continues to Expand



Sustaining Success: Adaptively Managing TB

- Can recovery be maintained w/ 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

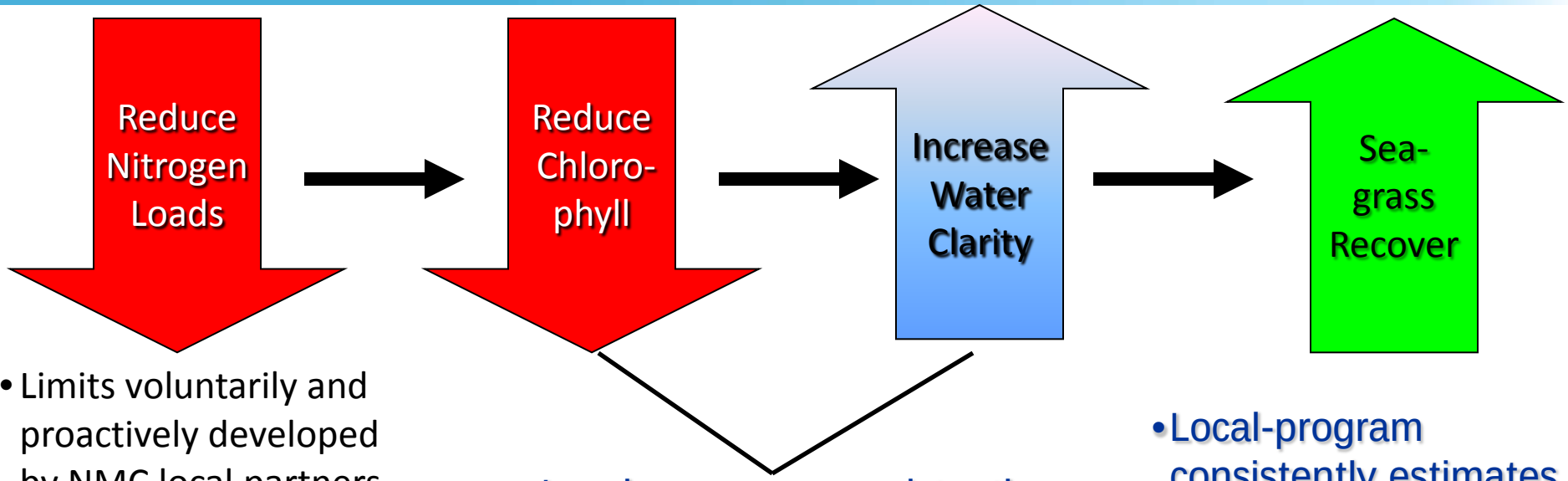
- Long-term monitoring
- Target resources identified by both public and scientists as "worthwhile" indicators (seagrass)
- Science-based numeric goals & targets
- Multiple tools: Regulation; Public/private collaborative actions; Citizen actions
- Recognized "honest broker" to track, facilitate, assess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



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

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

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

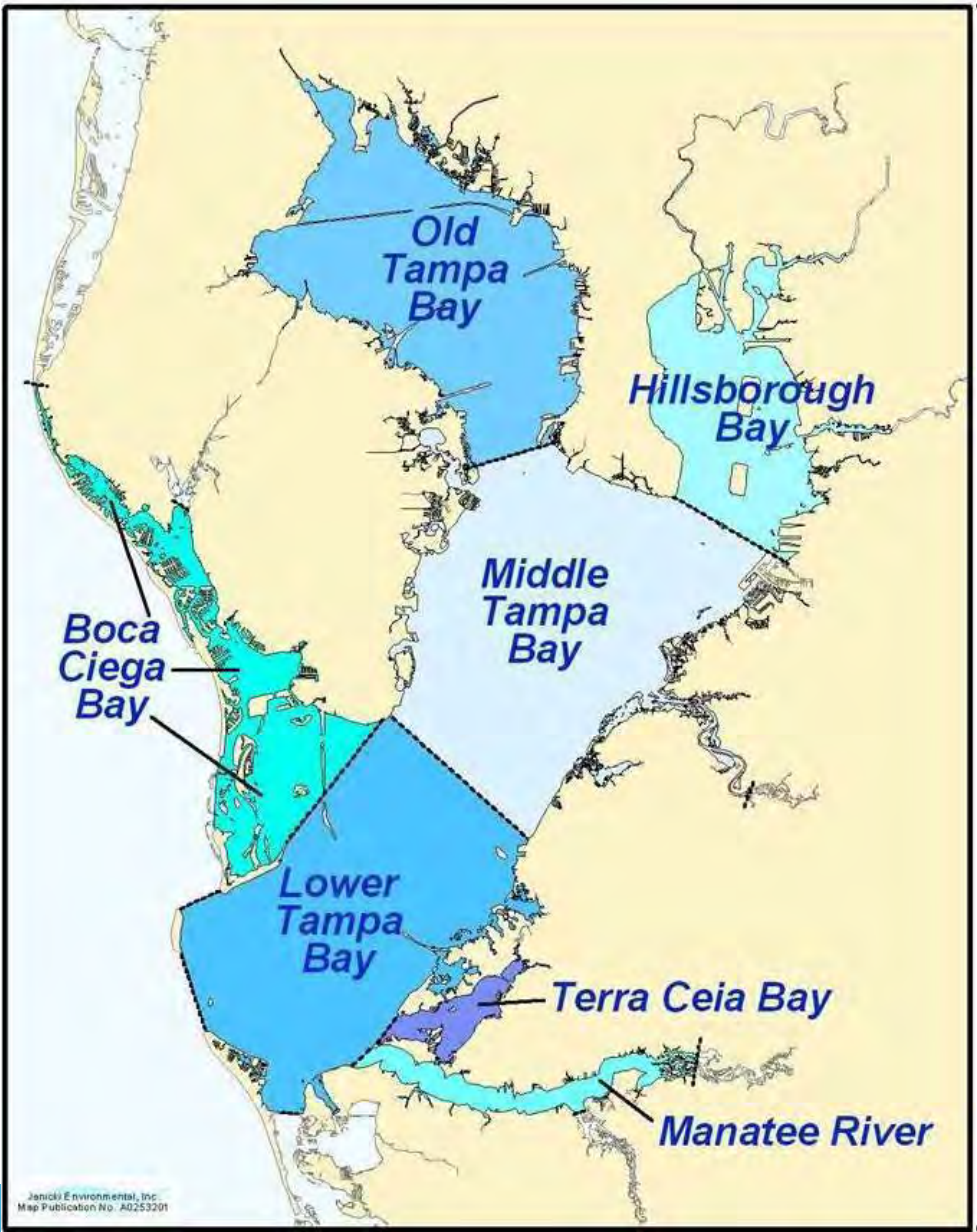
5-Yr Annual Assessment;
Tied to Observed Bay Conditions

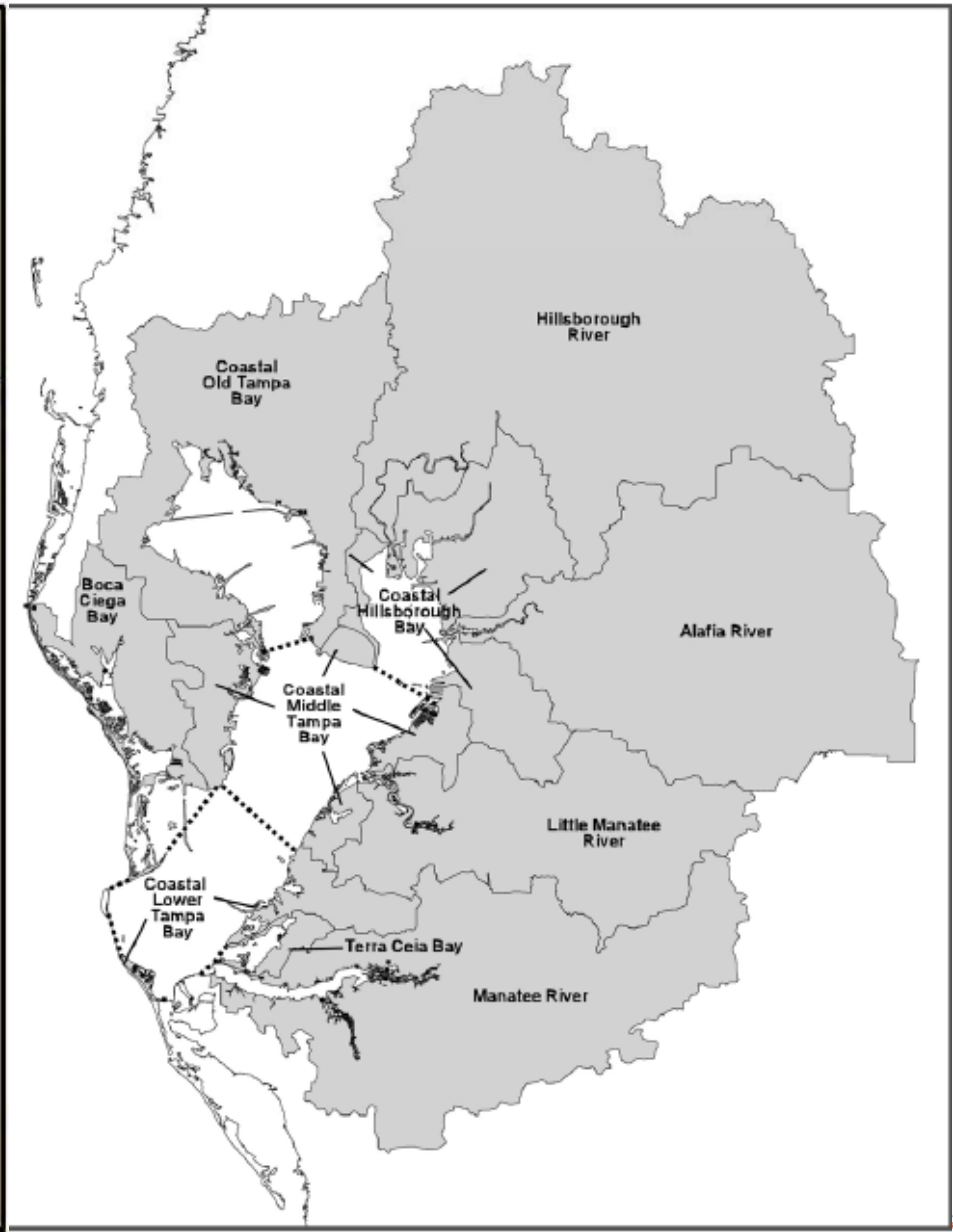
Bottom Line

Annually-Assessed;
Localized Management Responses Implemented, if necessary

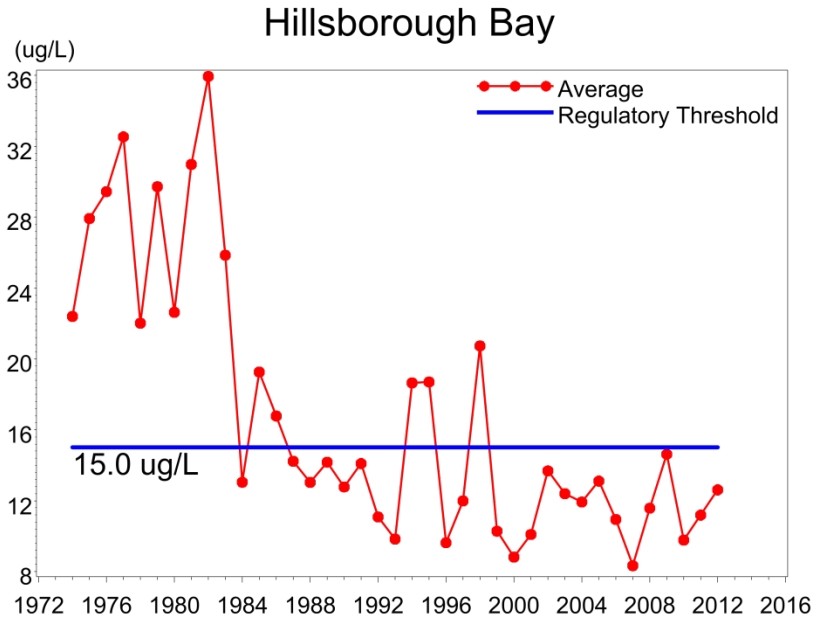
~2-Yr Assessment;
Water-quality Targets Re-Evaluated, if necessary

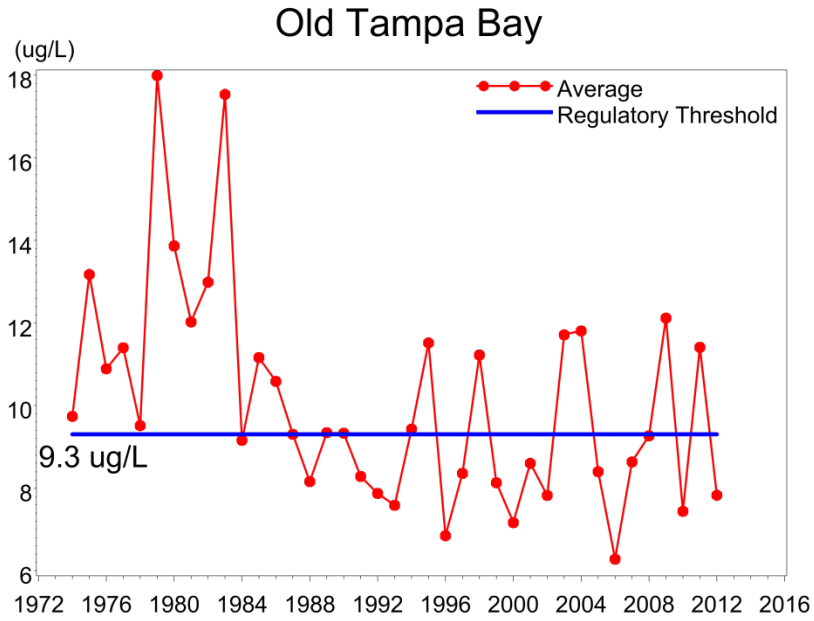
Open Bay Segments & Drainage Areas





Meeting Regulatory Thresholds





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1984	Yes	Yes	No	Yes
1985	No	No	No	Yes
1986	No	No	Yes	Yes
1987	No	Yes	No	Yes
1988	Yes	Yes	Yes	Yes
1989	No	Yes	Yes	Yes
1990	No	Yes	Yes	Yes
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1995	No	No	No	Yes
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2000	Yes	Yes	Yes	Yes
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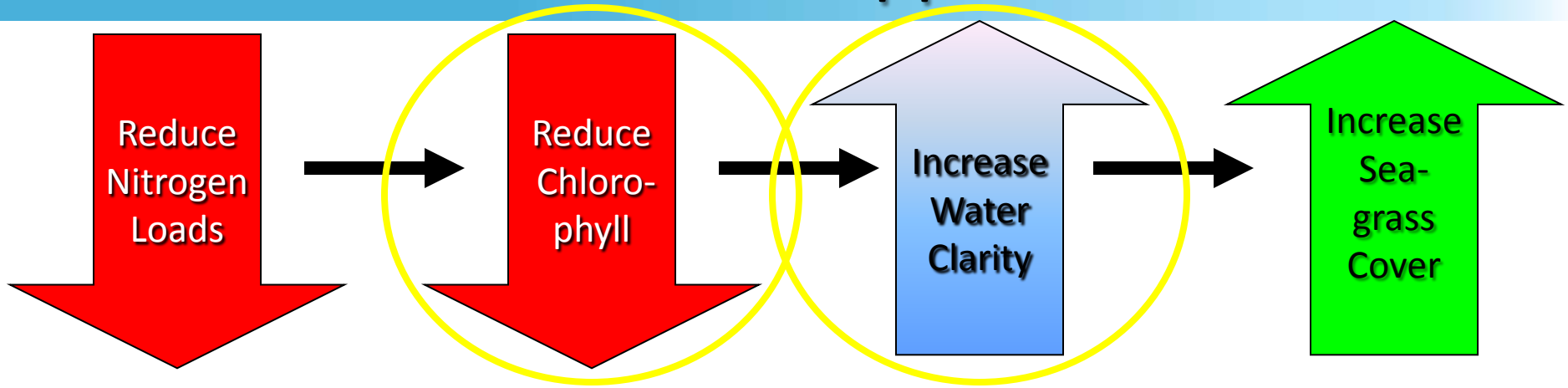
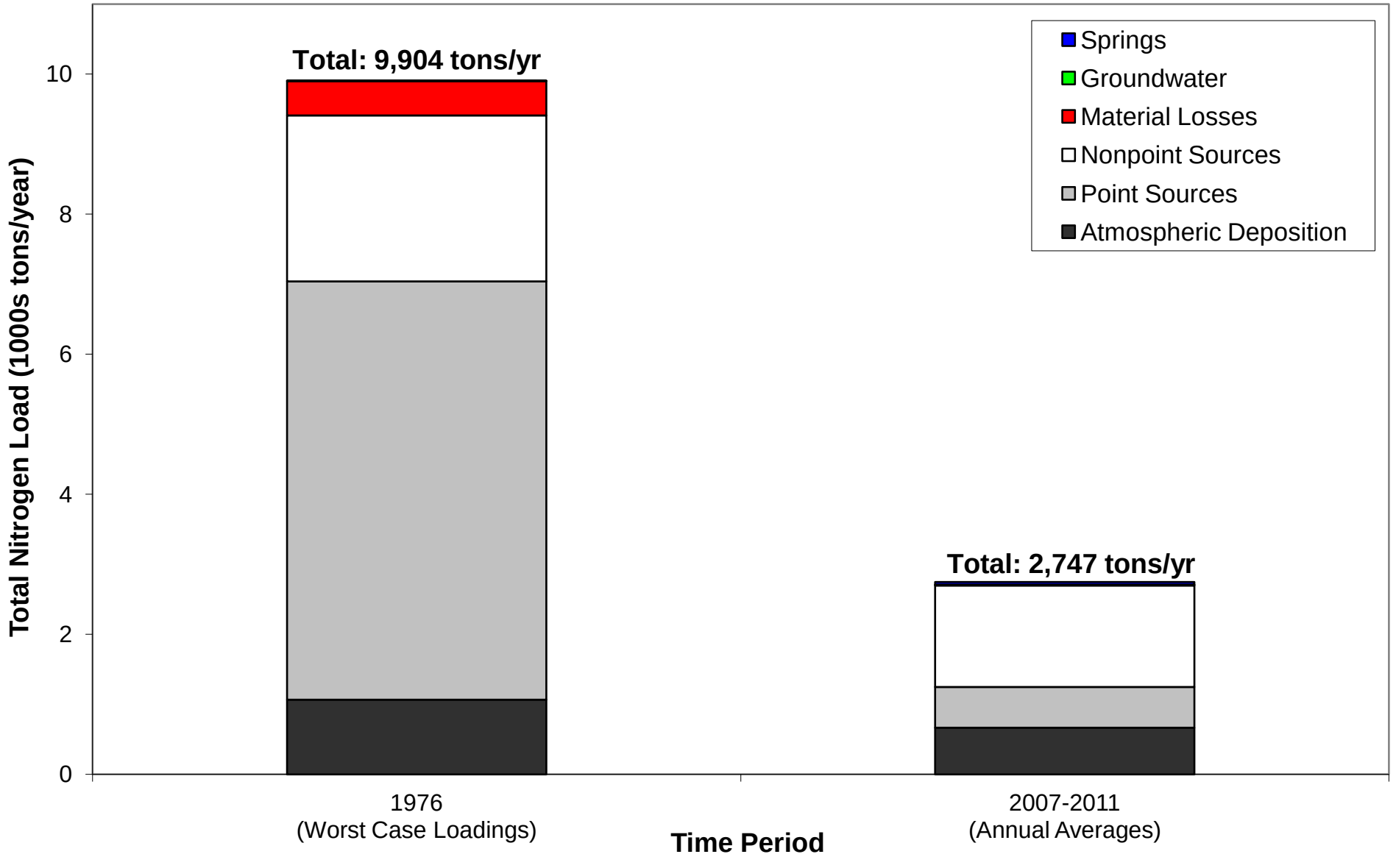
2002	Yes	Yes	Yes	Yes
2003	No	Yes	Yes	Yes
2004	No	Yes	Yes	Yes
2005	Yes	Yes	Yes	No
2006	Yes	Yes	Yes	Yes
2007	Yes	Yes	Yes	Yes
2008	Yes	Yes	Yes	Yes
2009	No	Yes	Yes	Yes
2010	Yes	Yes	Yes	Yes
2011	No	Yes	Yes	Yes
2012	Yes	Yes	Yes	Yes

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



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

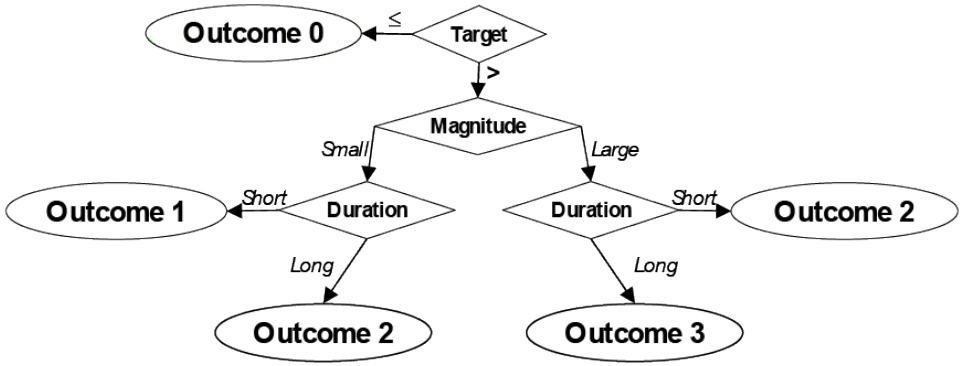


Table 1. Decision matrix identifying appropriate categories of management actions in response to various outcomes of the monitoring and assessment of chlorophyll-*a* and light attenuation data.

CHLOROPHYLL	LIGHT ATTENUATION			
↓	Outcome 0	Outcome 1	Outcome 2	Outcome 3
Outcome 0	GREEN	YELLOW	YELLOW	YELLOW
Outcome 1	YELLOW	YELLOW	YELLOW	RED
Outcome 2	YELLOW	YELLOW	RED	RED
Outcome 3	YELLOW	RED	RED	RED

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 Chloro-phyll → Reduce Light Atten-uation → Sea-grass Recover

1998: NMC Partnership Formed to “Hold the Line”

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

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

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

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