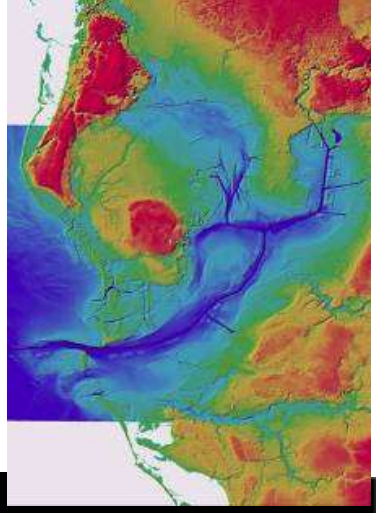


CCMPs and EBM: A case study from Tampa Bay, Florida

Holly Greening, Tampa Bay Estuary Program

November 2010

Tampa Bay

Open water: 1,036 sq km

Watershed: 6,734 sq km

Average water depth:
4 meters

Watershed population:
2.3 million

Top 10 Ports in the U.S.

Flushing rate: 3-100 days,
average 13 days

Tampa Bay in the 1970s-80s

- Phytoplankton and macroalgae dominated
- 50% loss of seagrass between 1950 and 1980
- Newspapers declared Tampa Bay "dead"

Ulva mats, Hillsborough Bay

Photo courtesy of JOR Johansson

Tampa Bay Estuary Program

- Inter-governmental; EPA, FDEP, six local gov'ts
- Started in 1991
- science-based management plan
- 1998- Interlocal Agreement committing annual funding from all partners

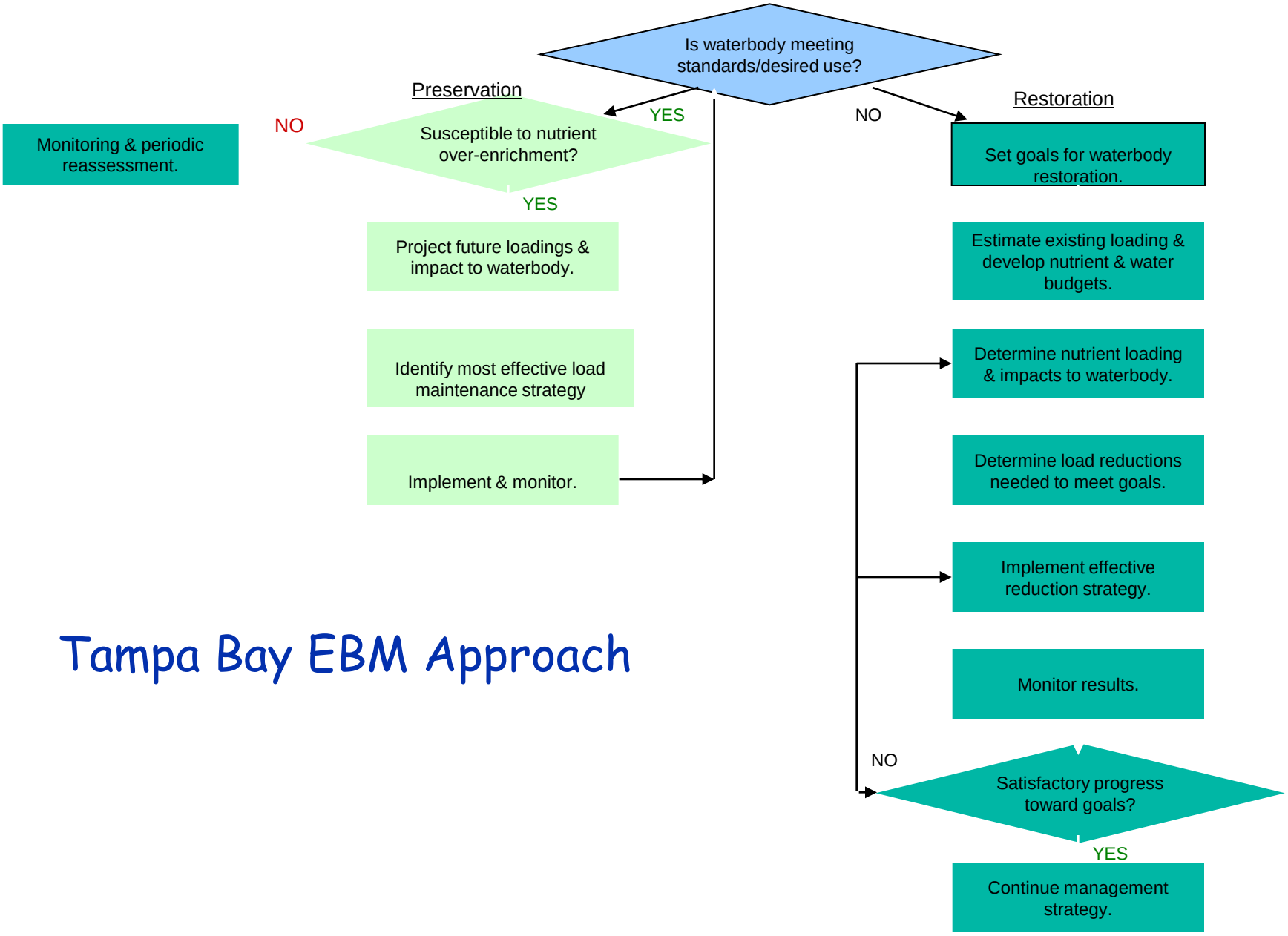
Tampa Bay
CCMP Seagrass Restoration Goal

Difference between 1950 and 1990 seagrass cover

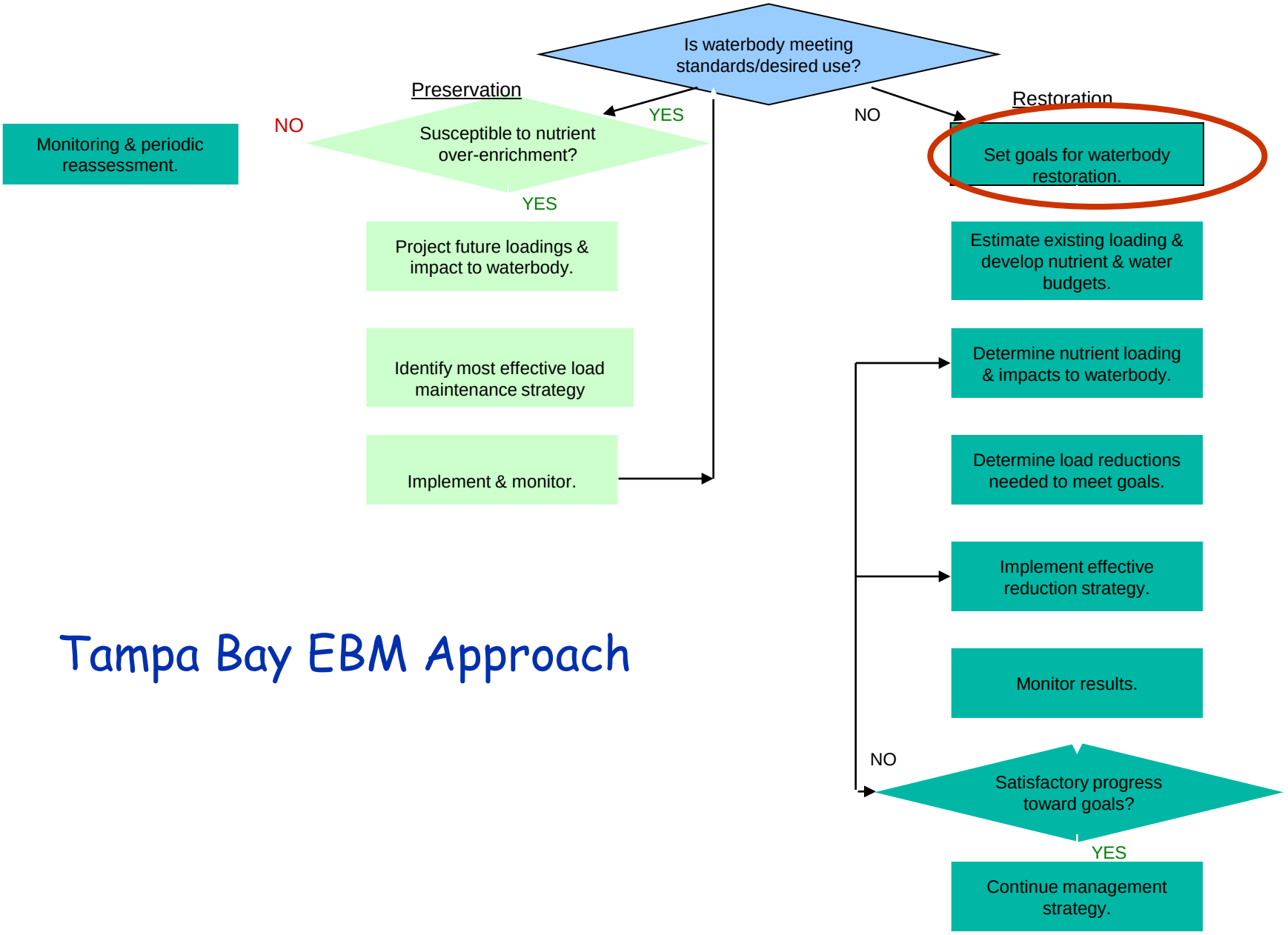
Seagrass Restoration Goal:

Restore seagrass acreage to that observed in ~1950.

Tampa Bay EBM Approach



Tampa Bay EBM Approach

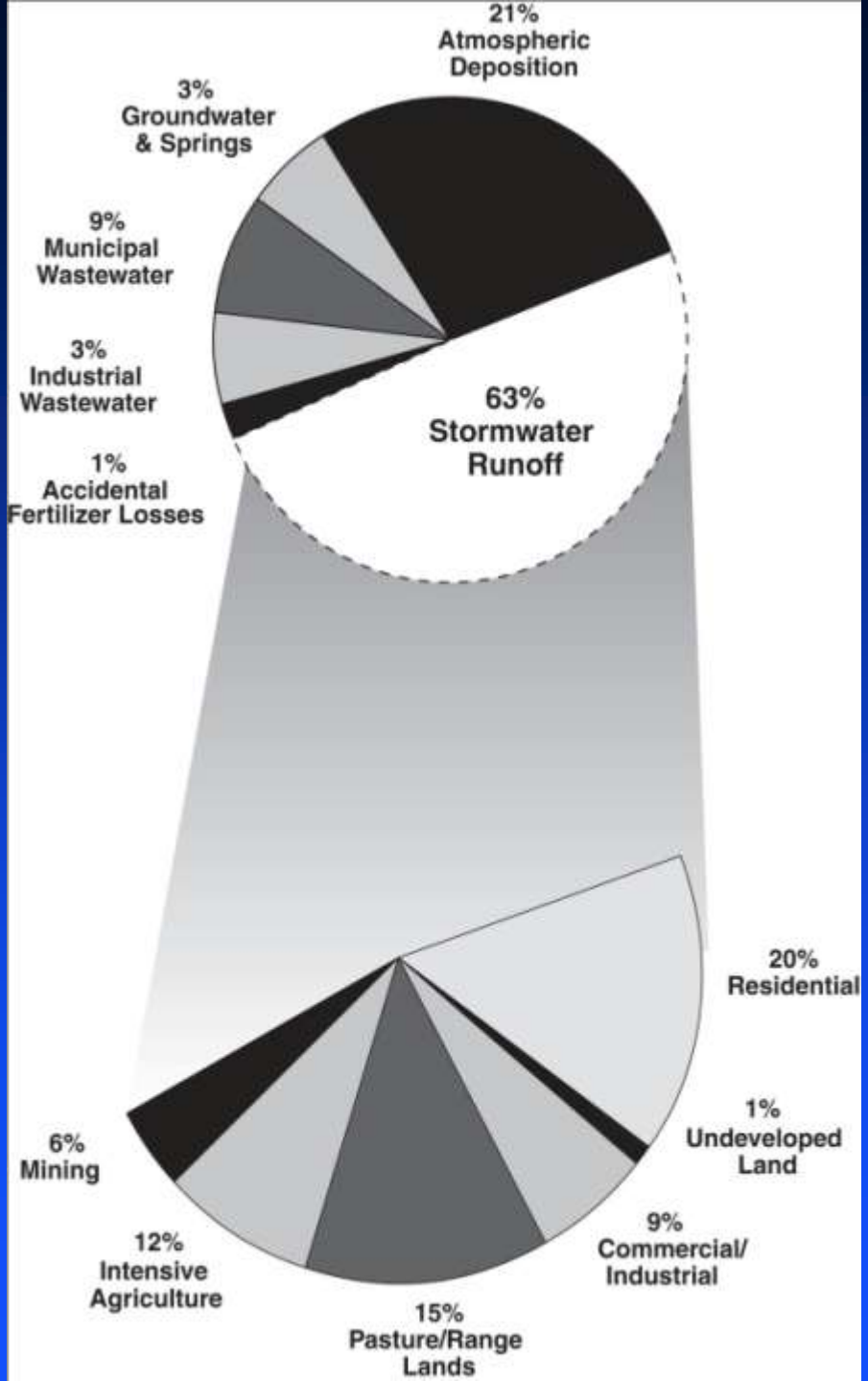


Tampa Bay Nitrogen Management Strategy Paradigm: Scientific Basis

TN Load → Chlorophyll → Light Attenuation

Seagrass Light Requirement

Seagrass Growth & Reproduction



Current nitrogen contributions are distributed among many source types.

No one "silver bullet" that will meet load reduction goals

Will require management of all sectors

Tampa Bay Nitrogen Management Consortium

- Watershed government and regulatory agency participants, local phosphate companies, agricultural interests and electric utilities
- Formed in 1996
- Accepts responsibility for collectively meeting nitrogen load management goals.

250 projects implemented between 1996-2009

Residential actions

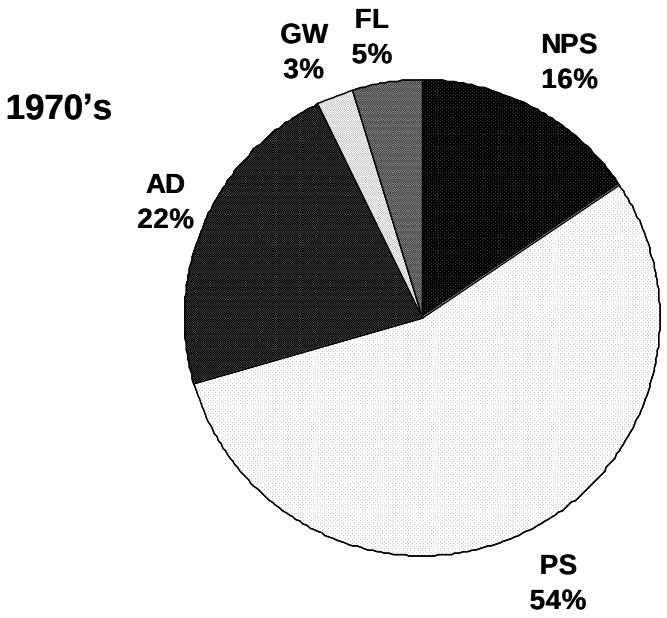
Improved fertilizer handling at ports

Residential fertilizer restrictions

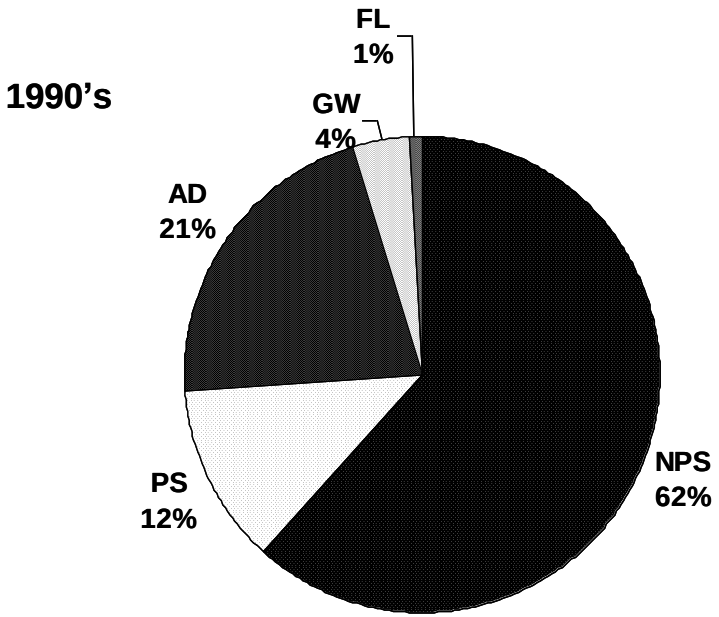
Reduced industrial and municipal nitrogen loading to the bay

Reduced atmospheric deposition from power plants

Significant nutrient reductions



- Overall nitrogen load reduction and large shift in predominant sources, from point source to NPS.



-Total nitrogen loading in 1970s about 10,000 tons/year

-Total nitrogen loading 1998-2007 about 5,000 tons/year.

Greening and Janicki 2006

Assess water quality annually: Historical chlorophyll-*a* compliance

AWT Standards take effect

Stormwater regulations enacted

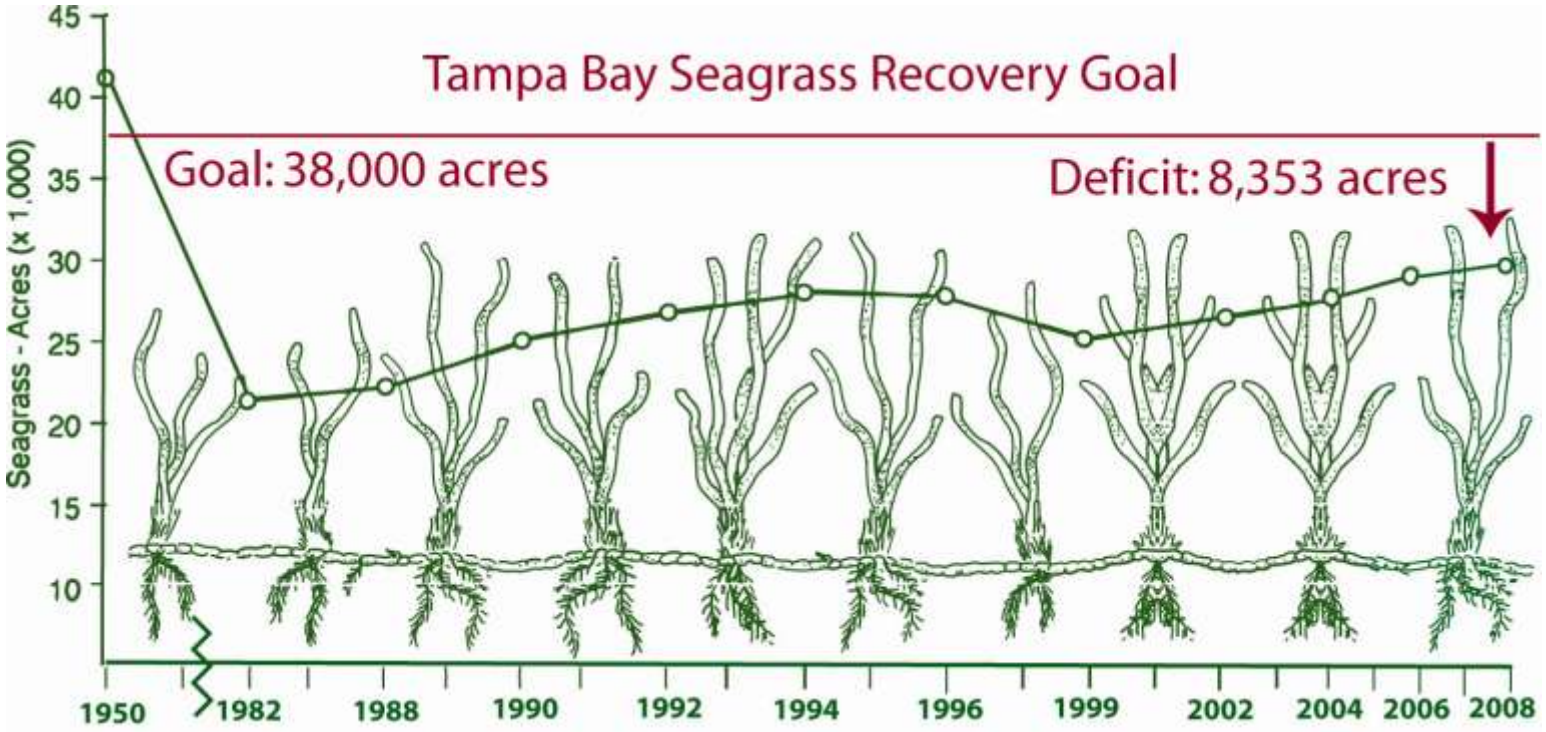
Consortium actions initiated

chl *a* targets:

- Hillsborough Bay: 15.0 ug/L
- Old Tampa Bay: 9.3 ug/L
- Middle Tampa Bay: 8.5 ug/L
- Lower Tampa Bay: 5.1 ug/L

Year	Old Tampa Bay	Hills. Bay	Mid. Tampa Bay	Lower Tampa 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

Baywide Seagrass Coverage, 1950 - 2008



Data source: SWFWMD

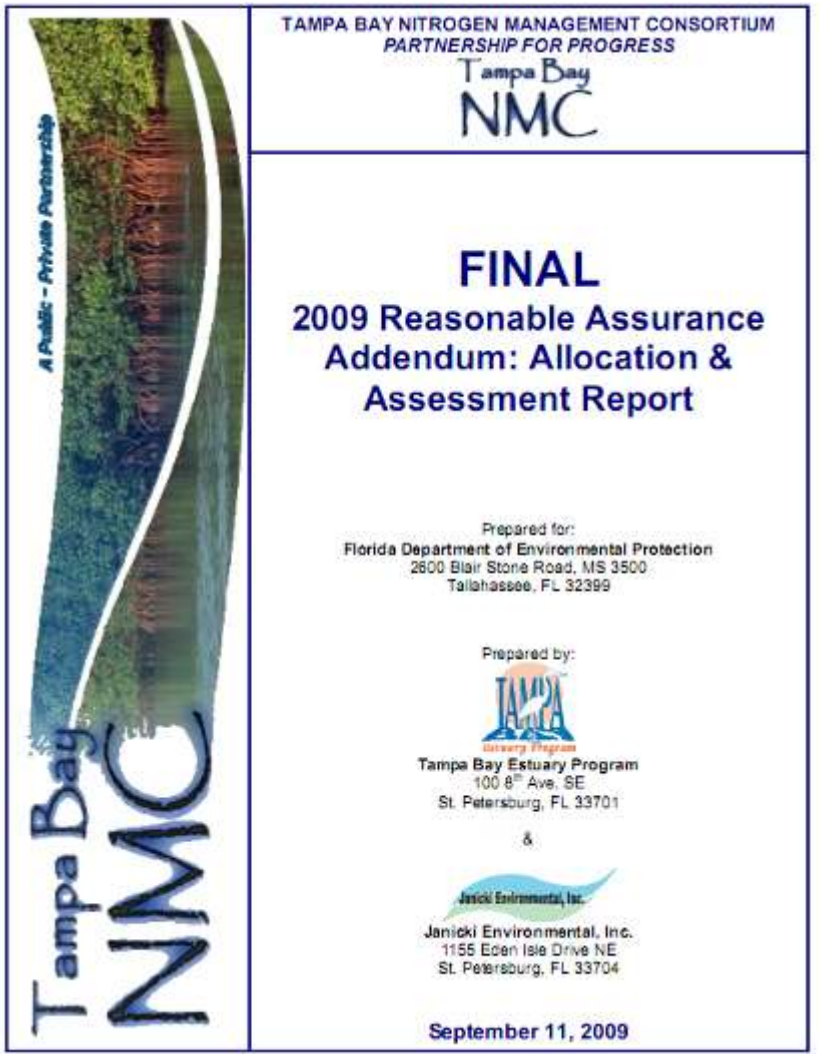
Status: Since 1999, 4,800 acres increase- an average of more than 500 acres per year.

Management Approach meets regulatory requirements

- In 1998, EPA accepts Consortium nitrogen load goals as regulatory TMDLs for Tampa Bay.
- 2008- EPA stated that allocations would be incorporated into permits in 2010
- EPA allowed the Consortium to collaboratively develop recommended allocations to all sources within the watershed

Tampa Bay TMDL/RA

- 40+ public and private partners throughout watershed
- Consortium developed and agreed to limits on nitrogen loads for 189 sources in Sept. 2009
- Incorporation into permits ongoing



The Challenge Ahead

- Accepted allocation limits will result in wastewater plants & stormwater permits that are based on loading levels for 2003-2007
- New or expanded nitrogen sources associated with growth will have to show offsets to be permitted
- Offsets can include new N reduction actions or transfers between sources.

Key Elements in Tampa Bay's Ecosystem-Based Management Approach

- Target resources identified by both public and science as "worthy" indicators
- Science-based numeric goals and targets
- Multiple tools: Regulation; Public/private collaborative actions; citizen actions
- Long-term monitoring
- Recognized "honest broker" to track, facilitate, assess progress
- Assessment and adjustment

Questions
#1- Indicators and metrics

- Primary Resource Indicator: Seagrass extent compared to recovery goal
  - Metric- SAV acres as mapped from aerial photographs every 2 years (SWFWMD)
- Primary Causal Indicator: Light attenuation compared to light requirement (20.5% at target depth)
  - Metric- Secchi disc depth monthly at 80 stations throughout bay

Questions
#1, con't- Indicators and metrics

- **Causal Indicator: chl-a concentration compared to segment target levels**
  - Metric- Annual average chl-a concentration by bay segment from monthly monitoring program (counties)

- **Causal Indicator: Annual TN loadings from all sources compared to target TN loads**
  - Metrics- monthly PS and NPS TN loading estimates from monitoring (flow and concentration; PS permits, wet deposition) and models (runoff estimates, dry deposition)

Questions
#1, con't- Indicators and metrics

- **Action Indicator: nutrient reduction actions and estimated reductions**
  - Metric- Partner self-reporting actions for inclusion in the Action Plan Database. Estimated reductions calculated from standardized and agreed-upon methods (TBEP)

Questions
#2- NEP assessment and reporting role

Yearly "stoplight" graphic reporting attainment of chl-a and light attenuation targets over time. Two years of "reds" require Board action.

- Seagrass extent every two years- this is our bottom line indicator
- Nitrogen reduction estimates from partner actions- critical to recognize all partners' participation

Questions
#2- NEP assessment and reporting role

- TN, TP and BOD loading estimates from all sources- every 5 years, using empirical and modeled estimates. Required for TMDL/RA compliance.
- Load: response model (TN load: chl-a concentration)- empirical (TBEP) and mechanistic (SWFWMD) initially, now empirical model every 5 years.

Questions
#2- NEP assessment and reporting role

Tracking partners' load reduction projects and programs

- Action Plan Database maintained by TBEP.
- Reduction estimates from each project calculated using standardized methods, unless partner provides documentation of alternative reductions.
- Estimated reductions used to document TMDL compliance, secondary to bay chl-a levels.

Questions
#3- Monitoring, including funding

*** Long-term, consistent monitoring has been a critical element to EBM approach

- Monthly ambient water quality monitoring at 80 stations baywide
  - TN, TP, chl-a, light attenuation, DO, others
  - Conducted by three counties- incorporated into their MS4 stormwater and NDPES permit requirements, which has preserved funding
  - Results compared through Regional Ambient Monitoring Program to assist with compatibility between labs

Questions
#3- Monitoring, including funding

- Monthly ambient water quality monitoring in streams and rivers discharging to the Bay
- Flow estimates (gages) in streams and rivers discharging to the Bay
  - TN, TP concentrations and flow needed for load estimates
  - WQ monitoring from counties, USGS
  - Flow measurements from USGS

BOTTOM LINE

- Long-term WQ monitoring critical- possibly link to permit requirements to help preserve funding
- Measurable, "worthy" goals drive the rest of the process
- Involve stakeholders
- Identify an "honest broker" to coordinate and facilitate process
- Get ahead of NNC, TMDLs by defining resource goals and how to get to your goals.