# 2012 Tampa Bay Water Quality Assessment

A Tampa Bay Estuary Program Initiative to Maintain and Restore the Bay's Seagrass Resources

Estuary Program

**For additional info visit:**

**www.tbeptech.org**

**Original Reference:**

Janicki, A., D. Wade, & R.J. Pribble. 2000. Developing & Establishing a Process to Track the Status of Chlorophyll-a Concentrations and Light Attenuation to Support Seagrass Restoration Goals in Tampa Bay. Tampa Bay Estuary Program Technical Report # 04-00.

**Historic Results:**

| Year | Old TB | Hills. Bay | Middle TB | Lower TB |
|---|---|---|---|---|
| 1977 | Red | Red | Red | Red |
| 1978 | Red | Red | Red | Yellow |
| 1979 | Red | Red | Red | Red |
| 1980 | Red | Red | Red | Red |
| 1981 | Red | Red | Red | Red |
| 1982 | Red | Red | Red | Red |
| 1983 | Red | Yellow | Red | Red |
| 1984 | Red | Green | Red | Yellow |
| 1985 | Red | Red | Red | Yellow |
| 1986 | Red | Yellow | Red | Green |
| 1987 | Red | Yellow | Red | Green |
| 1988 | Yellow | Green | Yellow | Green |
| 1989 | Red | Yellow | Red | Yellow |
| 1990 | Red | Green | Red | Yellow |
| 1991 | Green | Yellow | Yellow | Yellow |
| 1992 | Yellow | Green | Yellow | Yellow |
| 1993 | Yellow | Green | Yellow | Yellow |
| 1994 | Yellow | Yellow | Red | Red |
| 1995 | Red | Yellow | Red | Yellow |
| 1996 | Yellow | Green | Yellow | Green |
| 1997 | Yellow | Green | Red | Yellow |
| 1998 | Red | Red | Red | Red |
| 1999 | Yellow | Green | Yellow | Yellow |
| 2000 | Green | Green | Yellow | Yellow |
| 2001 | Yellow | Green | Yellow | Yellow |
| 2002 | Yellow | Green | Green | Green |
| 2003 | Red | Yellow | Green | Yellow |
| 2004 | Red | Green | Green | Yellow |
| 2005 | Green | Green | Yellow | Yellow |
| 2006 | Green | Green | Green | Green |
| 2007 | Green | Green | Green | Green |
| 2008 | Yellow | Green | Green | Yellow |
| 2009 | Yellow | Yellow | Green | Green |
| 2010 | Green | Green | Green | Green |
| 2011 | Red | Green | Yellow | Green |
| 2012 | Green | Green | Green | Green |

Continuing water quality monitoring support provided by the EPCHC.

Consulting support provided by Janicki Environmental, Inc.

## Background

Light availability to seagrass is the guiding paradigm for TBEP's Nitrogen Management Strategy. Because excessive nitrogen loads to the bay generally lead to increased algae blooms (higher chlorophyll-a levels) (Figure 1) and reduce light penetration to seagrass, an evaluation method was developed to assess whether load reduction strategies are achieving desired water quality results (i.e. reduced chlorophyll-a concentrations and increased water clarity).

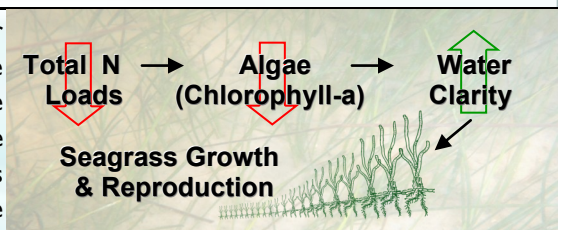



**Figure 1:** Guiding paradigm for Tampa Bay seagrass restoration through the management of nitrogen loads.

## Decision Support Approach

Year to year algae abundance (measured as chlorophyll-a concentrations) and visible light penetration through the water column (depth of secchi disk visibility) have been identified as critical water quality indicators in Tampa Bay. Tracking the attainment of bay segment specific targets for these indicators provides the framework from which bay management actions are developed & initiated. TBEP management actions adopted in response to the annually-assessed decision support results are as follows:

| | |
|---|---|
| Green | "Stay the Course." Continue planned projects. Report data via annual progress reports and Baywide Environmental Monitoring Report. |
| Yellow | "Caution Alert." Review monitoring data and nitrogen loading estimates. Begin/continue TAC and Management Board development of specific management recommendations. |
| Red | "On Alert." Finalize development and implement appropriate management actions to get back on track. |

## 2012 Decision Matrix Results

Bay water quality improved in 2012 compared to observations in 2011. Both Old Tampa Bay (OTB) and Middle Tampa Bay (MTB) improved from the red and yellow management responses observed in 2011. MTB's average 2012 chlorophyll-a concentration was above the target, but below the small magnitude exceedence level (yellow oval, Fig. 2). Fewer individual stations exceeded their respective bay segment targets in 2012 relative to previous years (Fig. 3). The nuisance algae, *Pyrodinium bahamense,* was reported in OTB during 2012; however, blooms did not appear to reach sufficient levels to affect annual water quality conditions in this bay segment.

Observed water quality indicators & management outcomes for 2012. *Less than small magnitude exceedence.

| Bay Segment | Chlorophyll-a (ug/L) | | Effective Light Penetration ($m^{-1}$) | | Management Response |
|---|---|---|---|---|---|
| | 2012 | Target | 2012 | Target | |
| OTB | 7.8 | 8.5 | 0.69 | 0.83 | Green |
| HB | 12.6 | 13.2 | 0.97 | 1.58 | Green |
| MTB | 7.8* | 7.4 | 0.62 | 0.83 | Green |
| LTB | 4.4 | 4.6 | 0.60 | 0.63 | Green |

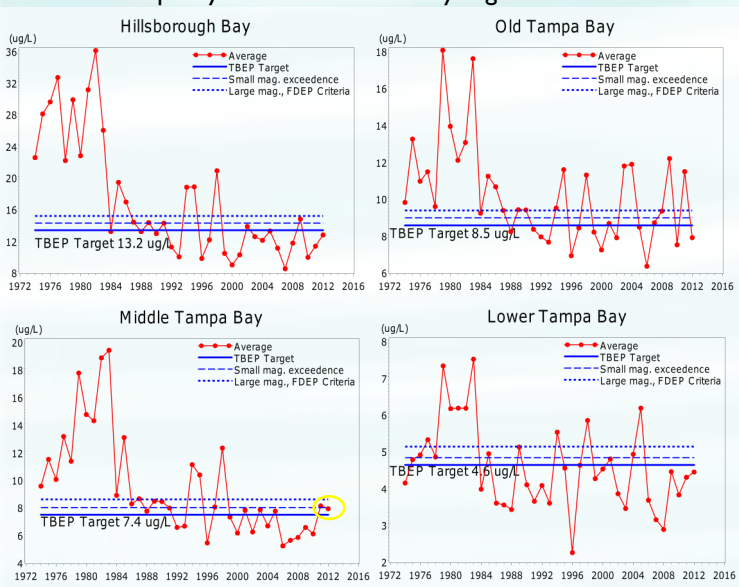



**Figure 2:** Historic chlorophyll-a annual averages for the four bay segments. Chlorophyll-a concentrations were within target levels for each bay segment.

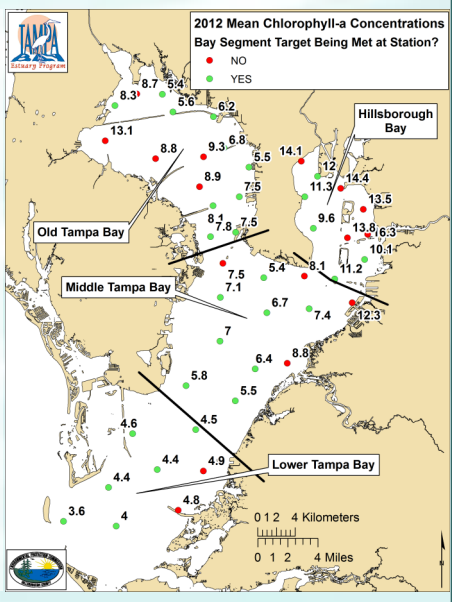



**Figure 3:** Map depicting individual station chlorophyll-a exceedences in Tampa Bay.

Sherwood, E.T. 2013. 2012 Tampa Bay Water Quality Assessment. Tampa Bay Estuary Program Technical Report #01-13. TBEP, St. Petersburg, FL.

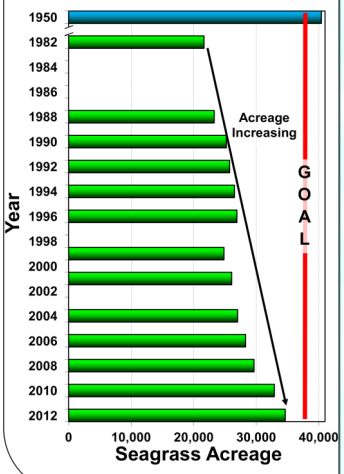
# Progress Towards Meeting Regulatory Goals

An initiative of the Tampa Bay Nitrogen Management Consortium (NMC)

## FDEP Criteria Met:

| Year | Old TB | Hills. Bay | Mid. TB | Low. TB |
|---|---|---|---|---|
| 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 |

**Figure 5:** Historic seagrass acreage estimates for Tampa Bay from 1950-2010 (Source: SWFWMD).




## Attaining FDEP Reasonable Assurance & EPA TMDLs

The TBEP, in partnership with the Tampa Bay Nitrogen Management Consortium, submitted the 2012 Reasonable Assurance (RA) Update to FDEP that: a) summarized load reduction projects completed since 2007 for each bay segment based on the updated Partner Action Plan Database; b) summarized the past 5 years of water quality data (2007-2011) for the bay; and c) compiled and reported 2007-2011 estimates of TN loads and hydrologic loads relative to the established 2009 allocations and nitrogen delivery ratios for each major bay segment.

Some of the highlights from this update included:

- The Action Plan Database was ported to an online, web-based reporting system for partners to update (Fig. 4);
- Cumulatively, baywide TN load reductions over the 2007-2011 time period were estimated to be 98.1 tons/yr. Additional planned and budgeted projects after 2011 are expected to reduce TN loading by 62 tons/yr in the future 2012-2016 RA Implementation period.
- Total seagrass acreage in the bay is the greatest it has been since the 1950s (Fig. 5; 34,642 acres).
- The Tampa Bay NMC partners have committed to maintain TN load allocations through 2016 consistent with those adopted & accepted by FDEP in 2010.

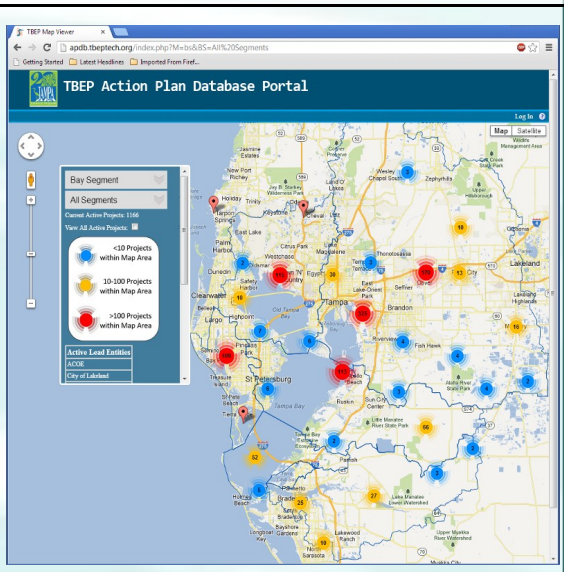



**Figure 4:** Screenshot of the online Tampa Bay Action Plan Database (http://apdb.tbeptech.org) showing the approximate spatial locations of projects implemented in the watershed.

## 2012 Chl-a Monthly Variation Compared to 1974-2010

Chlorophyll-a concentrations were evaluated within the bay on a monthly basis (Fig. 6) during 2012 and compared to prior years' levels. Concentrations were, for the most part, within the historic monthly ranges. A slightly elevated level was observed in Middle Tampa Bay in September 2012 (highlighted by the yellow oval below), and may have contributed to this bay segment's higher value relative to its TBEP target.

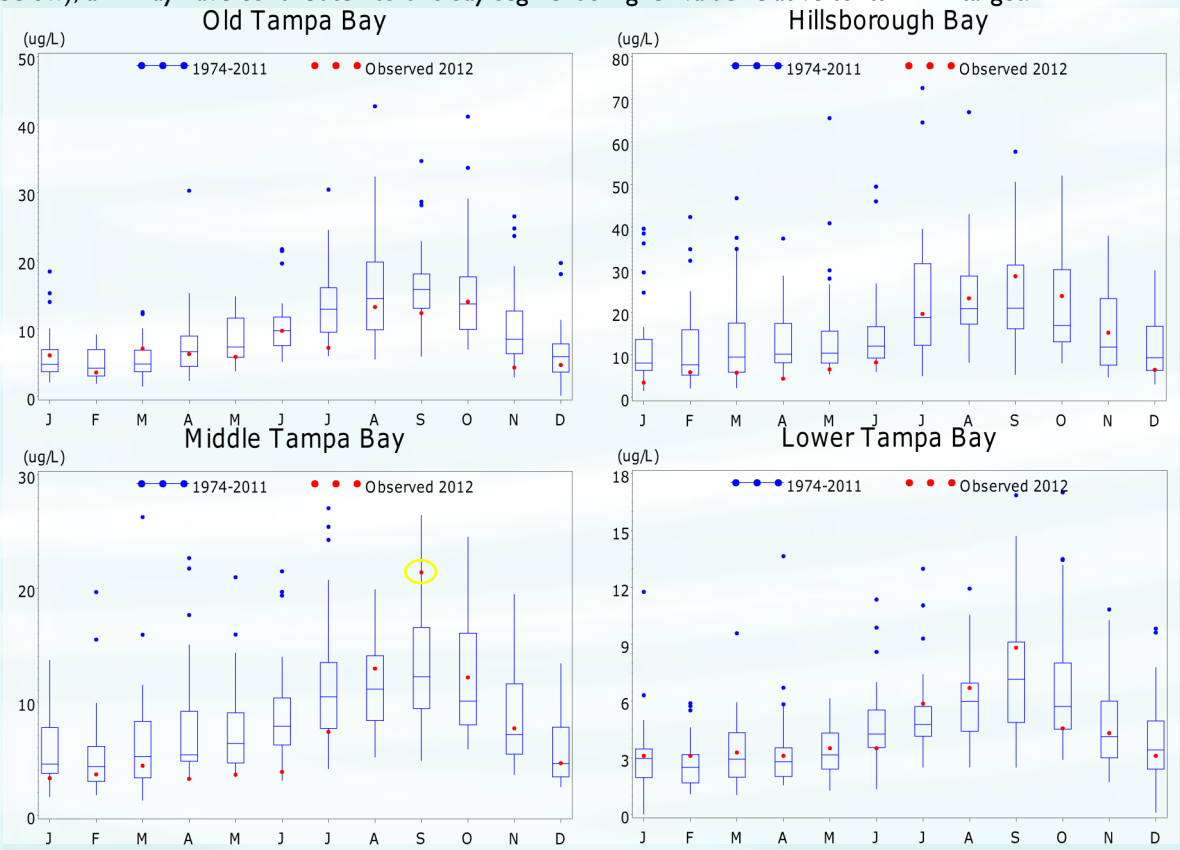



**Figure 6:** 2012 monthly chlorophyll-a bay segment averages (red dots) compared to monthly distributions from 1974-2011 (blue box plots). Boxes encompass the 25th and 75th percentiles, while whiskers bound the interquartile range. Blue dots represent outliers.