This document contains overall and specific condition of the Sarasota Bay Estuary Program from the National Estuary Program Coastal Condition Report. The entire report can be downloaded from
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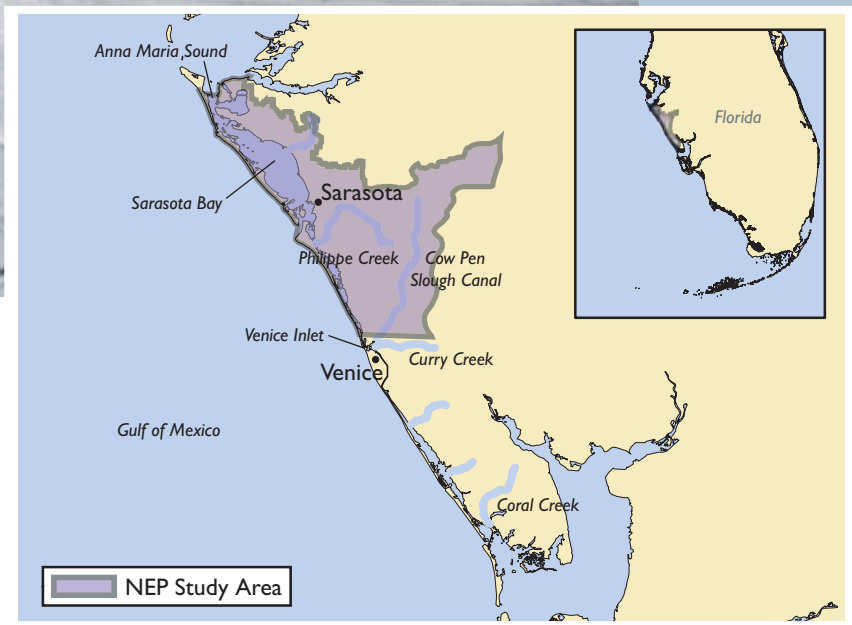
National Estuary Program Coastal Condition Report

Chapter 5: Gulf of Mexico National Estuary Program Coastal Condition, Sarasota Bay Estuary Program

June 2007

Sarasota Bay Estuary Program



SARASOTA BAY ESTUARY PROGRAM

www.sarasotabay.org

Background

Sarasota Bay is a small, subtropical estuary that is located on the southwestern coast of Florida and covers 52 mi^2 of surface water area. The Bay's watershed spreads across Manatee and Sarasota counties and covers 150 mi^2 of land area. This watershed extends from Venice Inlet to Anna Maria Island and includes the barrier islands and mainland east to Interstate 75 (SWFWMD, 2002). Sarasota Bay is classified as an Outstanding Florida Water Body and was classified as an Estuary of National Significance in 1987 (SBNEP, 2000; FDEP, 2005). The Sarasota Bay Estuary Program (SBEP) estuarine area includes Sarasota, Roberts, Little Sarasota, and Blackburn bays, which are characterized by stretches of barrier islands. The Bay region is home to a wide variety of marine life, including dolphins, manatees, black mullet, red drum, spotted sea trout, snook, blue crab, stone crab, bait shrimp, and the endangered loggerhead sea turtle. Common birds in this region include the great blue heron, cattle egret, great egret, white ibis, brown pelican, osprey, wood stork, yellow-crowned night heron, bald eagle, and the endangered Florida scrub jay.

Sarasota Bay proper is the largest and deepest bay between Tampa Bay and Charlotte Harbor. The Bay is well flushed by three passes (Big Sarasota, New, and Longboat), and its water is much clearer than the waters of the smaller bays to the south (Roberts, Little Sarasota, and Blackburn bays) (Florida Center for Community Design and Research, 2004). Improved drainage levels in the urban watersheds around Sarasota Bay provide more fresh water than historical levels, and numerous improvements have been made in the Bay's water quality, seagrass coverage, and natural habitat areas. Most of the waterbodies in the SBEP estuarine area are designated as recreational-use waters, which means that waters should be fishable and swimmable. Some waterbodies, including Palma Sola Bay and parts of Sarasota Bay, are suitable for shellfish propagation or harvesting (U.S. EPA, 2005c). Of all of the Gulf Coast NEP estuaries, the Sarasota Bay watershed has the greatest percentage of urban land use.

The tourism industry is the largest industry in Sarasota County and the second-largest industry in Manatee County. Seasonal residents are estimated to represent up to 25% of the study area's total population and more than 70% of the population on the barrier islands. Although this multi-million dollar industry helps to raise the revenue used to fund monitoring and conservation efforts, tourism and recreational activities can also take a toll on the water quality, habitat, and wildlife of Sarasota Bay. Human activities, including the management of waste and the operation of automobiles and watercraft, can contribute nitrogen and other contaminants to Sarasota Bay and degrade the Bay's water quality. In addition, dredging has been conducted in the area to create navigable waterways and new home sites and has destroyed habitat and reduced the populations of fish and shellfish in the Bay (SBNEP, 2000). Tourism and recreational activities can also directly harm wildlife; for example, more than 30% of the annual manatee deaths in Sarasota Bay are caused by collisions with boats (Sarasota Dolphin Research Program, 2005).

Environmental Concerns

Population increases and the accompanying development around Sarasota Bay between 1930 and 1990 resulted in the loss of historic seagrass habitat and mangrove wetlands (SBNEP, 2000). For example, 2,495 acres of tidal wetlands were lost between 1950 and 1990 due to dredge-and-fill activities, construction, and invasive species (SBNEP, 1992). Over time, loss of habitat areas has been accompanied by declines in marine life, fish, birds, and shellfish. Increased development has also resulted in excess nitrogen pollution and stormwater runoff, both priority concerns of the SBEP. Nitrogen is the major pollutant of concern in Sarasota Bay, with nitrogen loads transported to the Bay through baseflow, wastewater, stormwater, and atmospheric deposition (Figure 5-16) (SBNEP, 2000). In 1990, nitrogen loadings were approximately 300% of the levels that existed prior to development of the region (U.S. EPA, 2005b), and loadings are projected to increase by another 8% during the next 20 years and by 16% when the area is fully developed according to existing plans. Tributaries to Sarasota Bay act as pipelines for dispensing stormwater and suspended matter into the estuary. Although the overall trophic status index for Sarasota Bay is good, the Bay segments that receive water from the tributaries have the poorest water quality. Chlorinated pesticides, PAHs, and metals have been found in tributary sediments; those tributaries with the highest levels of these contaminants are Hudson Bayou, Cedar Hammock Creek, and Whitaker Bayou (Lowrey et al., 1992).

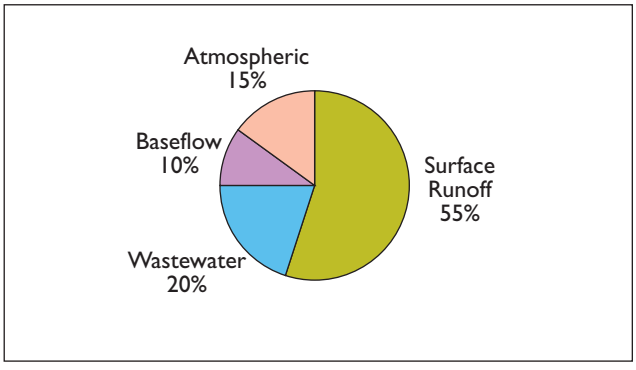


Figure 5-16. Percentages of nitrogen distributed to Sarasota Bay (SBNEP, 2000).

Population Pressures

The population of the 2 NOAA-designated coastal counties (Manatee and Sarasota) coincident with the SBEP study area increased by 304% during a 40-year period, from 0.14 million people in 1960 to 0.59 million people in 2000 (Figure 5-17) (U.S. Census Bureau, 1991; 2001). This rate of population growth for the SBEP study area substantially exceeded the population growth rate of 133.3% for the collective NEP-coincident coastal counties of the Gulf Coast region and was the highest rate of population growth for any of the individual Gulf Coast NEPs. In 2000, the population density of these 2 coastal counties was 447 persons/mi^2, significantly higher than the population density of 287 persons/mi^2 for the collective NEP-coincident coastal counties of the Gulf Coast region (U.S. Census Bureau, 2001). Development and population pressures are especially strong in NEP study areas that serve as major shipping centers for commercial and recreational activities.

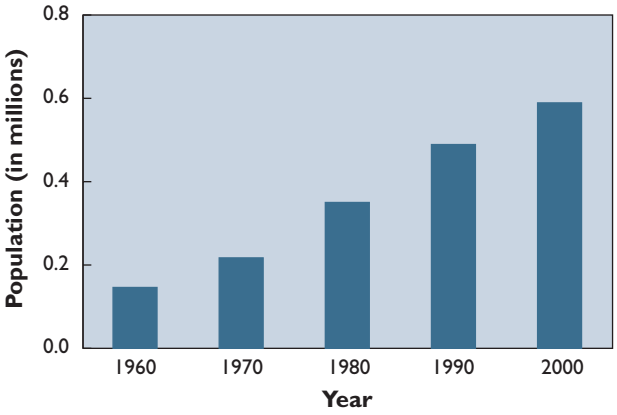


Figure 5-17. Population of NOAA-designated coastal counties of the SBEP study area, 1960–2000 (U.S. Census Bureau, 1991; 2001).

NCA Indices of Estuarine Condition—Sarasota Bay

The overall condition of Sarasota Bay is rated fair based on three of the four indices of estuarine condition used by the NCA (Figure 5-18). The water quality index for Sarasota Bay is rated fair, the sediment quality index is rated good, and the benthic index is rated poor; no data were available to calculate a fish tissue contaminants index for this estuary. Figure 5-19 provides a summary of the percentage of estuarine area rated good, fair, poor, or missing for each parameter considered. This assessment is based on data collected by the Florida Fish and Wildlife Research Institute, in partnership with the NCA, from 20 stations sampled in the SBEP estuarine area in 2000. Please refer to Tables 1-24, 1-25, and 1-26 (Chapter 1) for a summary of the criteria used to develop the rating for each index and component indicator.

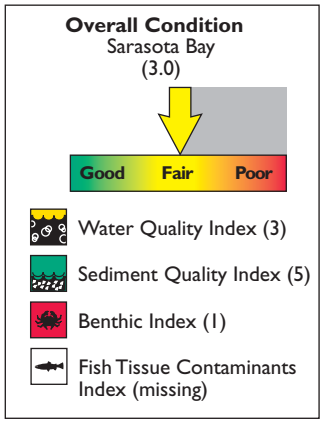


Figure 5-18. The overall condition of the SBEP estuarine area is fair (U.S. EPA/NCA).

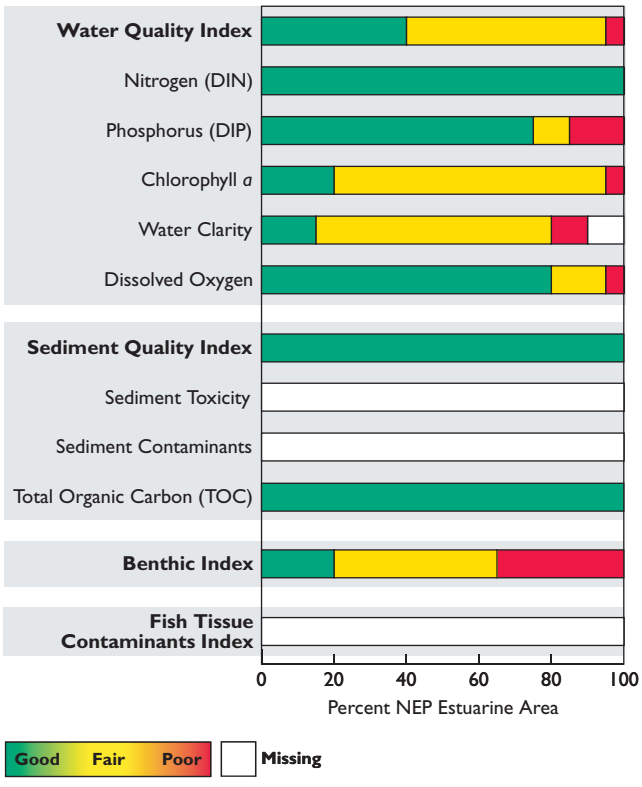


Figure 5-19. Percentage of NEP estuarine area achieving each rating for all indices and component indicators — Sarasota Bay (U.S. EPA/NCA).

Water Quality Index

Based on NCA survey results, the water quality index for Sarasota Bay is rated fair (Figure 5-20). This index was developed using NCA data on five component indicators: DIN, DIP, chlorophyll *a*, water clarity, and dissolved oxygen. In NOAA's Estuarine Eutrophication Survey, Sarasota Bay was listed as having medium DIN concentrations, high DIP concentrations, and high chlorophyll *a* levels (NOAA, 1997). Results from the 2000 NCA survey show some improvement over the previous study, with low DIN, moderate DIP, and moderate chlorophyll *a* concentrations measured.

Dissolved Nitrogen and Phosphorus | Sarasota Bay is rated good for DIN concentrations, with 100% of the estuarine area rated good for this component indicator. NCA data for Sarasota Bay were collected in the summer, when elevated DIN concentrations are less likely to occur because freshwater inputs are low and dissolved nutrients are more rapidly utilized by phytoplankton populations. Sarasota Bay is rated fair for DIP concentrations, with 15% of the estuarine area rated poor, 10% of the area rated fair, and 75% of the area rated good for this component indicator.

Chlorophyll a | Chlorophyll *a* concentrations in Sarasota Bay are rated fair. Although only 5% of the estuarine area was rated poor for this component indicator, 75% was rated fair, and 20% was rated good.

Water Clarity | Water clarity in Sarasota Bay is also rated fair; however, expectations for water clarity are high because one of the goals of the SBEP is to re-establish SAV. Water clarity in Sarasota Bay was rated poor at a sampling site if light penetration at 1 meter was less than 20% of surface illumination. Ten percent of the estuarine area was rated poor for water clarity, 15% of the area was rated good, and 65% of the area was rated fair. NCA data on water clarity were unavailable for 10% of the SBEP estuarine area.

Dissolved Oxygen | Dissolved oxygen conditions in Sarasota Bay are rated fair. NCA estimates show that 5% of the estuarine area was rated poor for dissolved oxygen concentrations, 15% of the area was rated fair, and 80% of the area was rated good.

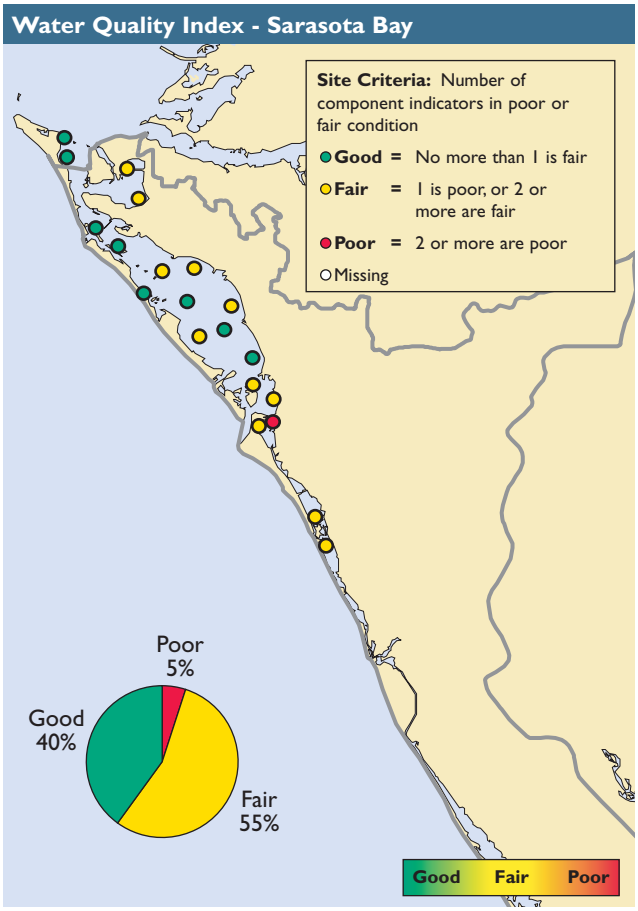


Figure 5-20. Water quality index data for Sarasota Bay, 2000 (U.S. EPA/NCA).

Sediment Quality Index

The sediment quality index for Sarasota Bay is rated good; however, this rating is based on measurements of sediment TOC only (Figure 5-21). Sediment quality was rated good in 100% of the Bay's estuarine area.

Sediment Toxicity | The NCA surveys did not collect sediment toxicity data for Sarasota Bay in 2000; therefore, sediment toxicity in the Bay has not been rated for this report.

Sediment Contaminants | The NCA surveys did not collect sediment contaminants data for Sarasota Bay in 2000; therefore, sediment contaminant concentrations in the Bay have not been rated for this report.

Total Organic Carbon | Sediment TOC concentrations were the only sediment quality component indicator monitored in Sarasota Bay by the NCA in 2000. TOC concentrations in Sarasota Bay sediments are rated good, with 100% of the estuarine area rated good for this component indicator.

Benthic Index

The condition of benthic invertebrate communities in Sarasota Bay is rated poor, based on the Gulf Coast Benthic Index and data from the NCA. Benthic index estimates indicate that 35% of the estuarine area in Sarasota Bay has degraded benthic resources and is rated poor (Figure 5-22).

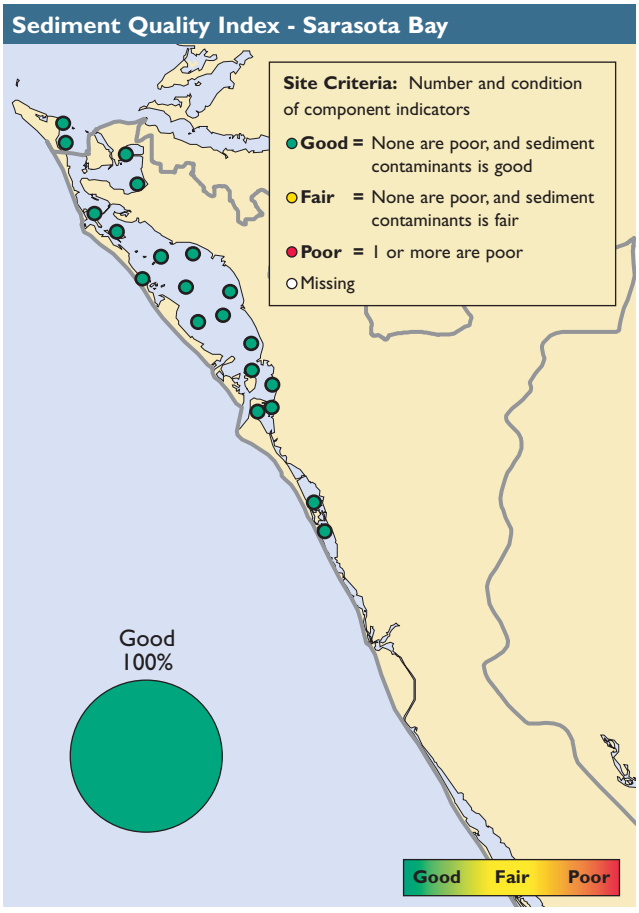


Figure 5-21. Sediment quality index data for Sarasota Bay, 2000 (U.S. EPA/NCA).

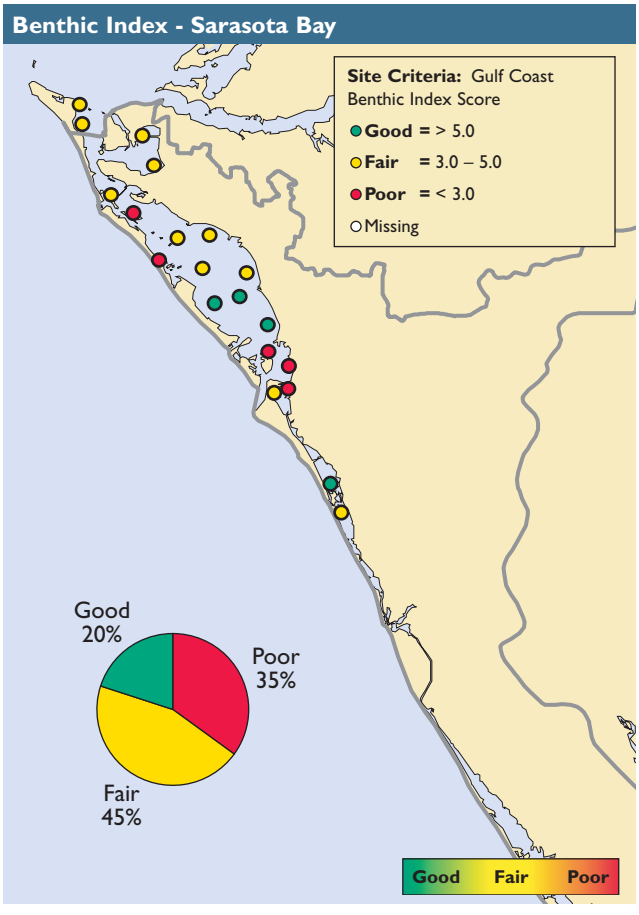


Figure 5-22. Benthic index data for Sarasota Bay, 2000 (U.S. EPA/NCA).

Fish Tissue Contaminants Index

The NCA did not assess the level of fish tissue contaminants in the SBEP estuarine area in 2002; therefore, a fish tissues contaminants index for Sarasota Bay was not developed for this report.

Sarasota Bay Estuary Program Indicators of Estuarine Condition

Water and Sediment Quality

The SBEP's specific indicators for measuring water quality in Sarasota Bay are the following:

- Chlorophyll *a*
- Nitrogen (e.g., DIN levels, total nitrogen levels, nitrogen load)
- Inorganic phosphorus
- Transparency (as measured using Secchi depth).

In general, water quality trends for Sarasota Bay have shown improvements with time. Data from 1968 through 1991 indicate that nutrient and chlorophyll *a* levels are decreasing in the Bay, and Secchi depths are increasing over time. For northern Sarasota Bay, regional trends in chlorophyll *a* levels, inorganic nitrogen, organic nitrogen, total nitrogen, and inorganic phosphorus have been declining since 1980; however, Manatee County data have shown significant increases in these parameters. The middle portion of Sarasota Bay has displayed declining trends similar to those observed in the northern portion of the Bay, with the exception of chlorophyll *a* and total phosphorus concentrations, which were increasing. SBEP data for the southern portion of Sarasota Bay indicate a regional increase in both chlorophyll *a* and ammonium nitrogen levels. Other significant improvements observed in the trend analysis for the southern portion of the Bay were long-term declines in nitrate-nitrite, total nitrogen, and inorganic phosphorus. The transparency of Sarasota Bay waters is measured by Secchi depth and can be used to help indicate overall water quality or the effects of erosion and increased rainfall. Data from 1968 to 1991 show that Secchi depth has increased (greater water transparency) in all segments that demonstrated significant trends (Lowrey et al., 1992), and recently collected monthly data show that Secchi depth generally fluctuates between 4 and 8 feet (Florida Center for Community Design and Research, 2004). Trend analyses that examined data from 1980 to 2002 suggest that inorganic nitrogen and chlorophyll *a* levels have declined during the long term; inorganic phosphorus levels have also declined, although increases were noted in total phosphorus, particularly from 1995 to 2002 (Dixon, 2003).

In addition to the SBEP's formal indicators, other water quality parameters monitored for the Bay include salinity, temperature, dissolved oxygen, pH, *Enterococci*, and fecal coliform. Salinity in the Bay has increased over time, except for the period from 1995 to 1998, when salinity declined (Dixon, 2003). Beach water samples are collected every 2 weeks at 14 different beach sites in Sarasota County and are analyzed for *Enterococci* and fecal coliform bacteria (Florida Center for Community Design and Research, 2004).

A great egret (*Ardea alba*) hunts in the waters of an SBEP restoration site (SBEP).

Sarasota Bay Estuary Program

HIGHLIGHT

Improving Water Quality in the Sarasota Bay Watershed

Reducing nitrogen inputs to Sarasota Bay has been recognized as a primary water quality concern since the 1980s. A central tenet of these reduction efforts has been to address all contributors to water quality degradation in the restoration of Sarasota Bay. Nutrient loads in Sarasota Bay in 1988 were approximately 400% higher than those expected from a pristine, undeveloped watershed (SBNEP, 2000). By comprehensively addressing the sources of nitrogen and other pollutants, the water quality throughout most of Sarasota Bay has steadily improved during the past decade.

The SBEP and its partners have been working with the community to cost-effectively limit and control the amount of nitrogen entering Sarasota Bay. The integration of different water quality improvement components that address wastewater, stormwater, groundwater, and atmospheric deposition as a whole is an important step to ensure that issues of timing, cost, and effectiveness are considered.

The widespread implementation of advanced wastewater treatment, required by federal legislation in 1990, resulted in reductions of more than 80% of nitrogen loadings from wastewater to Sarasota Bay. At the present time, stormwater from all areas is the primary source of nitrogen pollution, with stormwater from residential areas estimated to contribute more than

Urban stormwater runoff deposits large amounts of sediments and other pollutants into Sarasota Bay through drainage ditches (above) and tributaries (Gary Raulerson, SBEP).

one-third of the total nitrogen load to Sarasota Bay. Currently, an unquantified number of stormwater pipelines that discharge directly into Sarasota Bay or its tributaries do not receive any type of wastewater treatment (SBNEP, 2000). Beginning in September 2005, a new SBEP project will identify and prioritize water quality control retrofits for urban stormwater, especially in direct-discharge locations. Information to be gained will include project price, maintenance accessibility, and a receiving water of high resource value. This information can be used by local, state, and federal agencies to help determine where to direct resources to continue the restoration of Sarasota Bay.

The Florida Yards and Neighborhoods (FYN) Program was developed in 1993 to promote environmentally friendly landscaping using plants suited to the southwest Florida climate, natural conditions, and wildlife. Using FYN's principles, homeowners can reduce fertilizer and pesticide use, thereby helping to maximize the quality of stormwater runoff. Improvements in stormwater conveyance and treatment systems also impact water quality. Designed primarily for flood and sediment control, these systems have an important effect on toxic loading, as well as a smaller, but significant impact on nutrients.

The SBEP is also pursuing other management strategies, including septic tank replacement (such as that currently underway within the Phillippi Creek watershed). This strategy is being pursued primarily from a public health perspective, but should also reduce nitrogen loadings to Sarasota Bay. Regionally instituted water conservation policies can also help improve the water quality of Sarasota Bay. Through the creation and implementation of a master reuse plan, the discharge of wastewater to the Bay is being substantially reduced. At the same time, this wastewater is offsetting withdrawals from the Floridian aquifer.

Human-related atmospheric deposition (from auto emissions, industry, and other sources) plays a role within the Sarasota Bay watershed; however, this role is not as large as previously believed. Although nitrogen emissions from automobiles and other mobile sources (such as lawn mowers) may not be as great as originally thought, this may become an important area for further reductions.

Habitat Quality

The following indicators are used to evaluate habitat quality in Sarasota Bay:

- Freshwater wetlands coverage
- SAV (seagrass) coverage
- Intertidal habitat coverage
- Abundance of juvenile fish in restored areas vs. abundance in natural areas
- Effectiveness of artificial reef construction.

Freshwater wetlands have declined 16% since 1975, and non-forested freshwater wetlands have declined by 35% (U.S. EPA, 2005b). Since 1950, the area of saltwater wetlands in Sarasota Bay has declined 39%, and seagrass acreage has generally declined by 30%, mainly due to nitrogen pollution and dredging impacts (SBNEP, 2000). Seagrass coverage in the Bay is an indicator of the success or failure of restoration activities and the area of suitable habitat, as well as an indirect indicator of the effects of water quality changes, sediment contamination, or other human-induced impacts on the ecosystem.

Approximately every two years, the Southwest Florida Water Management District (SWFWMD) uses aerial photography to analyze seagrass communities in waterbodies (including Sarasota Bay) located within its watershed. The SWFWMD's analysis distinguishes between patchy seagrass beds (less than 75% coverage within a given area) and continuous seagrass beds (greater than 75% coverage within a given area). Since 1988, approximately 600 new acres of seagrasses have appeared in the Sarasota Bay estuarine area. Additionally, the amount of continuous seagrass beds in Sarasota Bay has increased by more than 120% (SBEP, 2006). Figure 5-23 illustrates the percent changes in seagrass coverage in Sarasota Bay (from the Anna Maria Sound at State Road 64 to Venice Inlet), both for continuous and patchy distributions of seagrass.

At least 15 artificial reefs are being established in Sarasota Bay to help create additional juvenile fish habitat (U.S. EPA, 2005b). To help monitor the abundance of fish species in natural areas in comparison with fish abundance in restored areas, the SBEP continues to study the effectiveness of artificial structures in providing juvenile fish nursery habitat. The SBEP, with funding from EPA and the Florida Department of Environmental Protection (FDEP), has sponsored the development of inexpensive seawall modules to attract larval, juvenile, and adult fish. An early pilot project demonstrated the potential benefit of deploying artificial reefs along hardened seawalls, with some types of structures showing fish abundances more than 100 times that of nearby areas without artificial reefs (SBNEP, 2000). In a recent shoreline survey, researchers found that more than 200 miles of armored and altered shoreline exist in Sarasota Bay (U.S. EPA, 2003); altered shorelines typically do not provide enough complex or suitable habitat for fish.

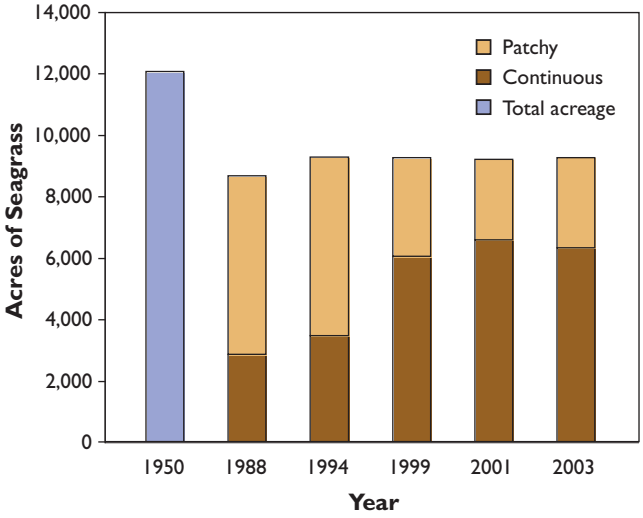


Figure 5-23. Changes in continuous, patchy, and total seagrass coverage areas in Sarasota Bay (SBEP, 2006).

Living Resources

Sarasota Bay is home to a variety of fish and wildlife, including the great blue heron, cattle egret, bald eagle, Florida scrub jay, red drum, spotted seatrout, flounder, blue crab, manatee, and bottlenose dolphin. The SBEP and other organizations monitor the populations of fish and wildlife in the SBEP study area.

Aerial surveys used to monitor manatee populations in Sarasota Bay indicate that the number of manatees in the Bay has increased since the early 1990s (Florida Center for Community Design and Research, 2004). Manatees are typically found along the fringes of the Bay from April to December, with seasonal migration patterns reducing the number of manatees in the Bay between January and February.

The bottlenose dolphins that use Sarasota Bay have been monitored since the 1970s, and mark-recapture estimates in 1976 and 1983 indicated that about 100 dolphins were present on a regular basis. Since 1984, researchers have monitored individual dolphins using distinctive dorsal fin features. The bottlenose dolphin population in Sarasota Bay has increased since the mid-1990s due to the dolphin immigration from other areas, seasonal migration patterns of dolphins from Tampa Bay, and high birth rates of native dolphins. These increases correlate with presumed fish stock increases since the net ban, but cause-effect relationships have not been conclusively established (Florida Center for Community Design and Research, 2004).

Current Projects, Accomplishments, and Future Goals

Much of Sarasota Bay's habitat for young fish was recently destroyed when the natural mangrove shoreline was replaced by concrete seawalls during the development of waterfront communities. As a result, the SBEP is embarking on an artificial habitat enhancement and wetland restoration strategy to increase its young fish population and overall fishery production. A recent study by the SBEP indicated that intertidal restoration sites less than 10 years old provide habitat for more than 68,000 fish per acre (Serviss and Sauers, 2003). Because most of the seawalls cannot be removed without causing severe damage to homes, the SBEP seeks to convert them into an asset for the Bay rather than a liability. Four different styles of small artificial reefs attached to seawalls are being tested for their ability to provide a home for young fish (SBNEP, 2000). Early results show more than 400 young fish living near these artificial reefs (U.S. EPA, 2006d), whereas only a few young fish have been seen in similar areas without reefs.

EPA plans to restore or create at least 18 acres of intertidal wetlands and 11 acres of non-forested, freshwater wetlands per year, as well as to increase the quantity, improve the quality, and protect the diversity of freshwater and saltwater wetlands in the Sarasota Bay watershed (U.S. EPA, 2005b). Twenty-one wetland-enhancement projects have been proposed and funded since 1989, and 13 significant habitat-restoration initiatives have been completed, with 12 more initiatives currently in the design phase (SBNEP, 2000; U.S. EPA, 2005b). In addition, new channel markers are being installed in Sarasota Bay (with artificial reefs built on each) to protect seagrass beds. The SBEP and the surrounding community has achieved a number of environmental success stories:

- Nitrogen pollution to the Bay has been reduced by 47% since 1990
- Seagrass habitat has increased by 7% (592 acres) since 1988
- More than 200 acres of intertidal wetland habitat have been restored since 1990
- More than 20 artificial reef projects have been permitted and constructed
- The Bay supports an estimated 110 million more fish, 71 million more crabs, and 330 million more shrimp than it did in 1988
- Several urban watershed areas around Sarasota Bay have been retrofitted for improved stormwater management
- Scallops have been reintroduced to the Bay to re-establish stocks
- SBEP policies have been integrated into local government CCMPs (SBNEP, 2000; SBEP, 2006).

Conclusion

Based on NCA survey results, the overall condition of Sarasota Bay is rated fair. SBEP analyses have shown that although temporal trends by segment indicate that water quality in Sarasota Bay is improving, water quality problems still exist in the tributaries and the Bay segments receiving water from the tributaries. Seagrass coverage in Sarasota Bay has improved substantially in the past few years, with declines in SAV occurring at a much slower rate. Although there is no substitute for natural habitat with respect to the diversity and productivity of organisms, engineering options for some environments (e.g., dredge holes, canal communities, and channel markers) exist to create artificial habitats for juvenile and adult finfish, shellfish, and other invertebrates.