Southwest Florida Water Management District

Sarasota Bay Surface Water Improvement and Management Plan

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SARASOTA BAY
SURFACE WATER IMPROVEMENT AND MANAGEMENT
(SWIM)
PLAN

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EXECUTIVE SUMMARY

Through the reauthorization of the Clean Water Act (Section 320) in 1987, the Congress of the United States directed the U.S. Environmental Protection Agency to develop restoration and/or protection strategies for "estuaries of national significance."

Through the Surface Water Improvement and Management (SWIM) Act of 1987 (Chapter 87-97, Section 1-6, Laws of Florida), the Florida Legislature directed the State's water management districts to design and implement plans to restore and/or protect the ecological, aesthetic, recreational and economic value of the State's water bodies.

In 1988, Sarasota Bay was chosen by the U.S. Environmental Protection Agency as an estuary of national significance. Consequently, the Sarasota Bay National Estuary Program (SBNEP) completed a technical diagnosis of Sarasota Bay, which was summarized in the document "Framework for Action." Included in this document were recommendations from various technical studies on how to better manage Sarasota Bay's natural resources. This diagnosis, and the recommendations within it, set the stage for the development of the SBNEP's Comprehensive Conservation and Management Plan (CCMP).

In 1995, the Southwest Florida Water Management District (SWFWMD) selected Sarasota Bay to be included in its list of priority water bodies for the Surface Water Improvement and Management (SWIM) Program. Designation of Sarasota Bay as a SWIM priority water body allows monies to be spent on the restoration and/or protection of Sarasota Bay from the SWIM Trust Fund, pending the approval of a Sarasota Bay SWIM Plan.

Sarasota Bay is a highly productive estuary. However, the rapid population growth that has occurred throughout Southwest Florida in the post-World War II years has brought about substantial impacts to Sarasota Bay and its natural resources:

- Nitrogen loads have increased 300 percent, compared to pristine conditions
- Tidal wetlands have decreased by 39 percent, compared to 1950 estimates
- Dredging has degraded 14 percent of the bay bottom
- Approximately 30 percent of the historic seagrass coverage has been lost
- Fisheries have declined substantially

However, recent improvements to the treatment of wastewater and stormwater have occurred, and several habitat restoration projects have been completed. Regulatory actions and SBNEP-sponsored "early action demonstration projects" have resulted in the following:

- Nitrogen loads have decreased 43 percent in central Sarasota Bay

- Recent water quality data show a significant reduction of nitrogen concentrations in Phillippi Creek (Sarasota Bay's largest tributary) at the Bahia Vista Street location

- Due to nitrogen load reductions, seagrasses have increased by 614 acres throughout the Bay (a 7 percent increase) during the period 1988-1995

- Restoration projects have increased tidal wetlands by approximately 4 percent

Based on the technical diagnosis carried out on Sarasota Bay by the SBNEP, and using the results from preceding and ongoing regulatory actions, a list of management options was compiled by SBNEP. After numerous public workshops, the SBNEP's Policy Committee approved the SBNEP's CCMP in 1995 (included here as Appendix E). The CCMP contains five major goals for preserving and restoring Sarasota Bay. These goals are:

- Improve Water Transparency

- Reduce the quantity, and improve the quality, of stormwater runoff

- Restore shoreline habitats

- Restore and sustain living resources

- Continue relevant monitoring and research

Within the CCMP, there are numerous activities requiring coordination between local governments and SWFWMD, or direct action by SWFWMD. These activities are intended to protect and restore Sarasota Bay, by devising a plan of action to achieve each of the above-mentioned goals. More specifically, each "Action Item" in the CCMP lists those cooperating organizations whose efforts are needed to carry out the identified activities.

This SWIM Plan is designed to review the existing research and management options pertaining to Sarasota Bay, contained within the CCMP, and to identify those actions requiring support and action by SWIM. These actions, and the framework within which they can be used to better preserve and restore Sarasota Bay, are summarized in the flow chart on page 6.

With adequate funding and implementation, the SWIM Plan for Sarasota Bay will be one of the vehicles through which the State of Florida contributes to ongoing efforts to restore and protect Sarasota Bay. Further, the CCMP summarizes (Sections 8 and 9) the measures needed to manage and maintain Sarasota Bay both during and after implementation of the SWIM Plan.

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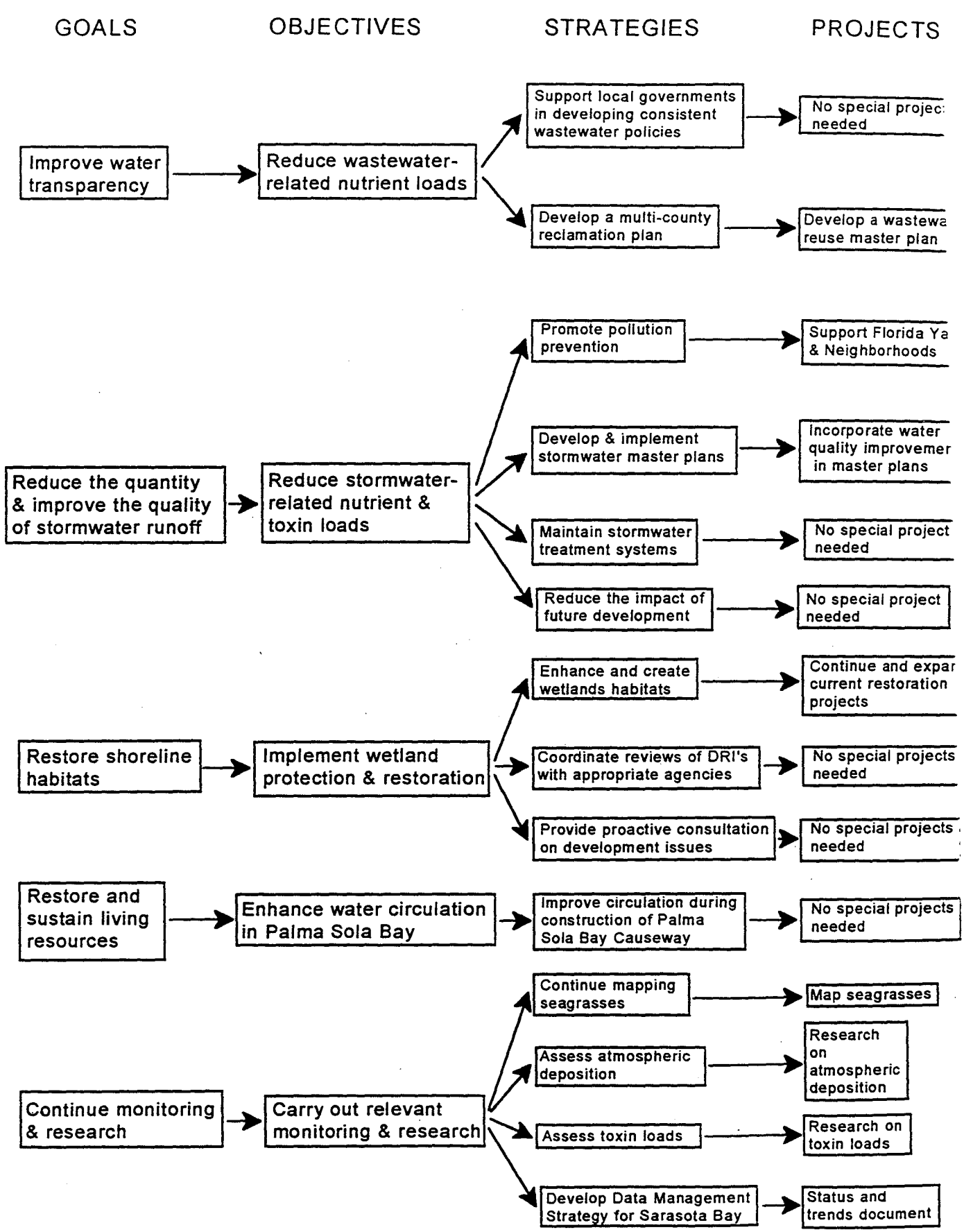

CHAPTER ONE: INTRODUCTION

SWIM ACT

The Florida Legislature, through the Surface Water Improvement and Management (SWIM) Act of 1987, directed the state's water management districts to "design and implement plans and programs for the improvement and management of surface water" (Section 373.451, Florida Statutes). The SWIM legislation requires the water management districts to protect the ecological, aesthetic, recreational, and economic value of the state's surface water bodies, keeping in mind that water quality degradation is frequently caused by point and non-point source pollution, and that degraded water quality can cause both direct and indirect losses of habitats.

Priority Water Bodies

Within the boundaries of each water management district, prioritization of water bodies was based on their relative need for protection and/or restoration. This prioritization process is carried out by the individual water management districts, in cooperation with the Department of Environmental Protection (DEP), the Florida Game and Fresh Water Fish Commission, the Department of Agriculture and Consumer Services, the Department of Community Affairs, and local governments.

Selected water bodies that were to be specifically included on priority lists included: Lake Okeechobee and Biscayne Bay (South Florida Water Management District - SFWMD), the Indian River Lagoon (SFWMD and the St. Johns River Water Management District - SJRWMD), Lake Apopka and the Lower St. Johns River (SJRWMD), and Tampa Bay (Southwest Florida Water Management District - SWFWMD).

The identification of SWIM Priority water bodies is based on the following criteria, developed by the Department of Environmental Protection:

- the degree to which state water quality standards are violated
- evaluation of the nature and extent of conditions adversely affecting the water body
- threats to water supplies and recreational opportunities
- the extent to which local government plans, policies, and ordinances are consistent with efforts to restore and/or preserve the water body
- the feasibility of monitoring successful restoration and/or protection
- the economic and environmental feasibility of accomplishing restoration or conservation goals.

The SWFWMD developed a semi-quantitative approach involving a specially formed ad hoc committee composed of representatives from the district and various state agencies. This committee developed a priority list from a master list of 67 submitted water bodies. Nominations were received by representatives of local and state government and the public at large. From the master list of 67 submitted water bodies, a list of 28 water bodies was developed for those systems that met DEP criteria, and these 28 were ranked in priority order.

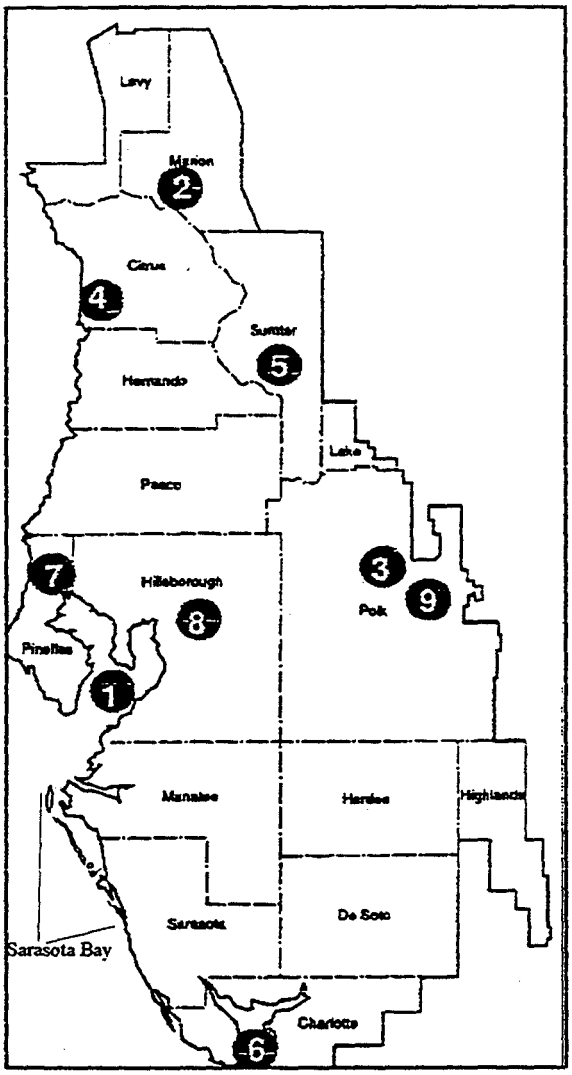

Fig. 1.1 - SWIM Priority water bodies

The eight highest ranked water bodies were chosen for initial prioritization, with a ninth chosen soon afterwards (Fig. 1.1). These water bodies are: 1- Tampa Bay, 2- Rainbow River, 3- Banana Lake, 4- Crystal River, 5- Lake Panasoffkee, 6- Charlotte Harbor, 7- Lake Tarpon, 8- Lake Thonotosassa, and 9- Winter Haven Chain of Lakes.

Based in part on work completed through the National Estuary Program (SBNEP), Sarasota Bay was named as a SWIM priority water body in 1995.

More detailed information on the SBNEP, and its activities in Sarasota Bay, is found in Chapter Two.

Development of a SWIM Plan

For the priority water bodies, an approved SWIM Plan must be developed before funds can be removed from the SWIM trust fund. Strategies for improvements to wastewater treatment and/or stormwater retrofits must undergo review and they must be part of an integrated plan to link various projects to specific management goals. In this sense, the development of a SWIM Plan is similar to the development of the Comprehensive Conservation and Management Plan (CCMP) adopted for Sarasota Bay in the Fall of 1995.

The challenge of the SWIM Plan for Sarasota Bay is to produce a document that incorporates those relevant issues outlined in the SBNEP's CCMP, while including additional elements necessary for the development of a SWIM Plan.

This SWIM Plan is thus focused on reviewing the available data on Sarasota Bay (which is heavily dependent upon the activities and reports of the SBNEP) and using that information to develop a project list for converting CCMP initiatives, whenever appropriate, into SWIM activities. Additionally, by sharing responsibilities with other state and local agencies, SWIM projects can be planned so as to prevent duplication in effort. This coordination will also allow various entities to perform those activities which they are best suited for.

SWIM Funding

Only water bodies with approved SWIM Plans are eligible to draw monies off the SWIM Trust Fund. Initially, the SWIM Trust Fund provided up to 80 percent match on approved projects. More recently, changes to the SWIM Act have reduced Trust Fund contributions to 60 percent, requiring a 40 percent match by the water management districts. Monies placed in the SWIM Trust Fund continue to be dependent upon a yearly appropriation by the state legislature. The lack of a dedicated source of funding for SWIM activities weakens long-term planning and implementation of environmental rehabilitation in priority water bodies. With this background, the Sarasota Bay SWIM Plan sets forth a realistic course of action, with the number of projects identified within the Plan, the size of the projects, and the effort needed to accomplish them being reasonable, given the history of SWIM funding.

Supportive Legislation

In recent years, three land acquisition programs have been created that have aspects that can be coordinated with SWIM Plans. The Conservation and Recreational Lands (CARL) Program (administered through DEP), the Save our Rivers Program (SOR; administered through the water management districts), and Preservation 2000 (P-2000; also administered through the water management districts) are all capable of taking land into public ownership. These programs can be focused on critical habitats, such as wetlands and their interconnected upland communities. Current and proposed areas for land acquisition in both Manatee and Sarasota Counties are included as maps in Appendix D.

Additionally, Florida's Local Government Comprehensive Planning and Land Development Regulation Act of 1985 (Chapter 163, Florida Statutes) requires all counties and municipalities within the state to develop and adopt comprehensive plans. In these plans, local governments are required (Rule 9J-5, Florida Administrative Code) to develop policies to protect and conserve the natural functions of existing water bodies.

SWIM Act - An Ecosystem Approach

SWIM Plans must address natural systems. Implicit in this statement is that focusing solely on achieving water quality targets does not, in and of itself, assure the preservation and/or restoration of desired habitats. SWIM plans must evaluate natural systems functions in addition to water quality issues.

The SWIM Act addresses restoration and protection from a system-wide perspective. For example, nutrient loads must be partitioned between potential sources (e.g., point and non-point sources, atmospheric deposition, etc.). If a certain loading source is shown to be important, such as septic tank systems or atmospheric deposition, additional work may be required to further elucidate the scope of the problem and potential remedies. In this manner, pollution sources that are shown to be of larger impact can be examined more thoroughly. This more comprehensive examination might include a cost:benefit analysis of nutrient control strategies.

The SWIM Act also requires carrying out that level of research necessary for better understanding management issues at the watershed level. Although restoration projects and "dirt moving" are often viewed more favorably than scientific studies, the best strategies for watershed level management might not be apparent from available information. For example, overly simplistic approaches to restoring freshwater inflow requirements might not adequately address concerns about water quality, and vice versa. The SWIM Act clearly states its intent to foster research for better managing water bodies and their watersheds.

SWIM Plan Format

As required in the SWIM Act, DEP established a uniform plan outline, which is the outline used in this document. The Plan Outline is as follows:

A. Introductory Text
B. Identification of Priority Issues and Analysis
C. Strategies
D. Specific Programs/Projects

Review of SWIM Plans

SWIM monies cannot be spent on a water body without a SWIM Plan being approved by the appropriate Governing Board and the DEP. Prior to plan approval by the water management district's Governing Board, the DEP is required to review proposed SWIM Plans. DEP is required to make three determinations:

1) are costs described in the plan reasonable?

2) are programs described in the plan likely to result in significant improvement to the water body?

3) what programs can be funded, based on monies available in the SWIM Trust Fund?

After Governing Board review and approval, the SWIM Plan is again submitted to DEP for final review. This review requires DEP to evaluate the Plan for consistency with state water policy and the State Comprehensive Plan.

State agencies other than DEP also have review responsibilities for SWIM Plans. The Florida Game and Freshwater Fish Commission is required to review SWIM Plans to determine if plan implementation adversely affects fish and wildlife and/or their habitats. The Department of Community Affairs must determine whether SWIM Plans are consistent with the State Comprehensive Plan. The DEP must determine the potential impacts of Plan implementation on state owned lands and marine and estuarine habitats. Also, the Department of Agriculture and Consumer Services reviews SWIM Plans for potential adverse impacts to agricultural resources.

Minimum Plan Requirements

SWIM Plans include at least the following information:

1) A description of the water body, including historic and present uses, hydrogeology, and watershed characteristics. This must include an historic perspective necessary to understand how present degradation has come about.

2) A discussion of governmental entities with jurisdiction over the water body, outlining their respective responsibilities and authorities.

3) A description of land uses, pollution sources, and permitted discharges within the watershed.

4) A list of the owners of point and non-point sources of pollution that discharge to the water body or its tributaries.

5) A description of strategies recommended for restoring or protecting the water body to at least the level of attainment of Class III Standards (as defined in Section 17-3.121 of the Florida Administrative Code).

6) A list of studies both completed and ongoing on the water body.

7) A list of the status of active restoration and/or protection projects for the water body.

8) A description of the research and feasibility studies needed to determine what strategies will be used to restore and/or protect the water body.

9) A description of the measures needed to manage and maintain the water body upon restoration so as to prevent future degradation.

10) A schedule for the restoration and/or protection of the water body.

11) An estimate of the funds needed to implement specific restoration and/or protection strategies.

District Water Management Plans

The DEP and Florida's five water management districts are charged with addressing concerns about present and future water supply, flood protection, water quality, and natural systems. As is required in Chapter 373 of Florida Statutes, SWFWMD is responsible for compiling a District Water Management Plan for its sixteen-county jurisdiction. This plan, a two-volume compendium, lists relevant strategies for protecting and/or restoring natural systems and water quality, while balancing the demands for water from a growing population and the need for adequate protection from excessive flood damage.

The SWFWMD's Water Management Plan (1995) outlines general goals for the area including Sarasota Bay. For water supply, the Sarasota Bay region is not seen as a major source for future potable supply. The combination of small streams and location within the Southern Water Use Caution Area preclude large scale water supply sources from being developed. Instead, the goal in this area is to "maximize the use of alternative supplies, including conservation and reuse, and protect surface water features from adverse impacts associated with water supply development and withdrawal."

For flood protection, large-scale development in low-lying areas is the most important consideration. Here, the goal is to "minimize potential for damage from floods by protecting and restoring the natural water storage and conveyance functions of flood prone areas."

Water quality was addressed through the Water Management Plan, as the combination of urban stormwater runoff and the proliferation of septic tank systems in areas of poor drainage and inappropriate soils was highlighted. For water quality, the goal is to "protect water quality in near shore coastal areas by working with federal and State agencies, local governments, and the public and by enforcing existing District regulations to prevent further degradation."

The Sarasota Bay watershed was noted for the value of its interconnected uplands and freshwater and tidal wetlands. The designation of Sarasota Bay as an Outstanding Florida Water (DEP) and an Estuary of National Concern (U.S. EPA) was also acknowledged. The goal of the Water Management Plan, as concerns natural systems, is to "protect, preserve and restore important upland and wetland systems."

CHAPTER TWO: PRIORITY ISSUES AND ANALYSIS

Management Boundaries

The boundaries of the Sarasota Bay SWIM water body (Fig 2.1) correspond to those used by the Sarasota Bay National Estuary Program (SBNEP). Consequently, the SWIM watershed corresponds to the watershed previously identified by SBNEP. The water body here after referred to as "Sarasota Bay" extends from Anna Maria Sound and Palma Sola Bay, in the north, to Venice Inlet, in the south, a total of 52 square miles of open water. The contributing watershed is approximately 150 square miles in size (Heyl, 1992).

Fig. 2.1 - Sarasota Bay Watershed

The watershed is split between Manatee County and Sarasota County, and encompasses the City of Sarasota, as well as the island communities of Anna Maria, Holmes Beach, Bradenton Beach, and Longboat Key.

The largest tributary to Sarasota Bay is Phillippi Creek, which drains a watershed of 57 square miles, or 38 percent of the entire watershed. Other major tributaries include South Creek, with a watershed of 20 square miles (14 percent of the total watershed), the Bowlees Creek system, which drains 13 square miles (8 percent of the total), and Whitaker Bayou, which drains eight square miles (5 percent of the total).

Bay-wide Segmentation

To facilitate data collection and spatial comparisons, Sarasota Bay was divided into 16 separate segments within the bay itself, and an additional segment for nearshore waters of the Gulf of Mexico. These segments were delineated based on a combination of natural and artificial boundaries, and they will be referred to throughout this text when describing water quality,

circulation, pollutant loads, and fisheries habitats. As shown in Figure 2.2, segments 1 and 2 comprise Anna Maria Sound, segment 3 comprises Palma Sola Bay, segment 4 is the area of Longboat Pass, and segments 5, 6, 7, and 8 comprise upper Sarasota Bay-proper. Segment 9 is New Pass, and segments 10 and 11 are central Sarasota Bay-proper. Segment 12 is Big Pass, and segments 13 and 14 are Roberts Bay and Little Sarasota Bay, respectively. Additionally, segment 15 is the area of Midnight Pass (now closed), and segment 16 is Blackburn Bay. As mentioned above, segment 17 comprises the nearshore areas of the Gulf of Mexico.

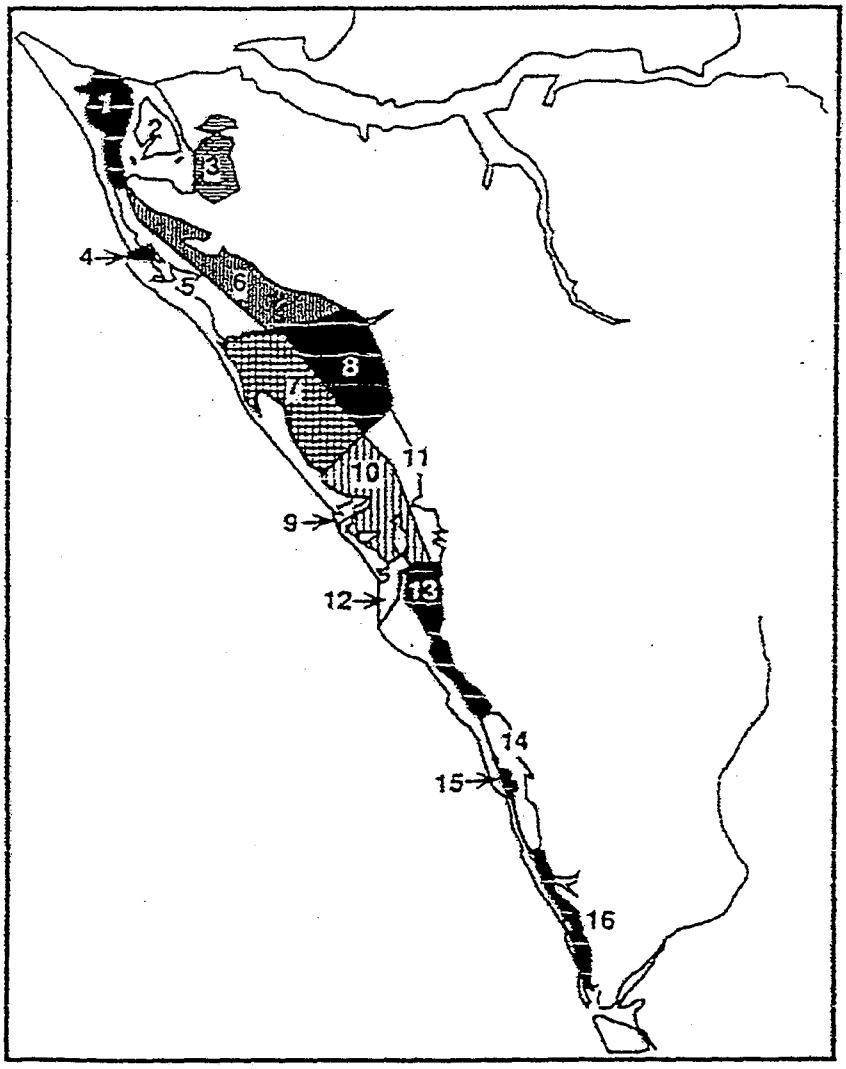

Fig. 2.2 Sarasota Bay segmentation

Hydrogeology

Sarasota and Manatee Counties are located within the Southern West-Central Florida Ground-Water Basin. The Sarasota Bay watershed is underlain by a multi-layered freshwater aquifer system characterized by having surficial, intermediate, and Floridan aquifer systems. The Floridan can itself be divided into both Upper and Lower Floridan aquifers.

The surficial aquifer varies in thickness from approximately 25 feet in the western portions of both counties to 50 feet in eastern Manatee County and 75 feet in eastern Sarasota County (SWFWMD, 1988a, 1988b).

The intermediate aquifer can be divided into the Lower Tamiami - Upper Hawthorn and the Lower Hawthorn - Upper Tampa aquifers. In Sarasota County, the intermediate aquifer varies in thickness from less than 300 feet in the northern portions of the county to more than 375 feet in the southern regions (SWFWMD, 1988b). In Manatee County, the intermediate aquifer varies in thickness from less than 200 feet in the northern portions of the county to more than 400 feet in the southern regions (SWFWMD, 1988a).

The Floridan system thickens from less than 1,200 feet in northern Manatee County to more than 1,800 feet in southern Sarasota County (SWFWMD, 1988a, 1988b). The Floridan aquifer is by far the most productive freshwater aquifer system in the Sarasota Bay watershed. However, as with the surficial and intermediate aquifers, water quality deteriorates with depth, and also as one moves to the south and west (SWFWMD, 1988a, 1988b).

Groundwater recharge rates to the intermediate aquifer are greater than 10 inches per year in eastern Sarasota and Manatee Counties (i.e., near the Verna Wellfield). However, groundwater is discharged from the intermediate aquifer to the surficial aquifer throughout most of Sarasota and Manatee Counties, particularly along the coast (SWFWMD, 1988a, 1988b).

The Floridan aquifer is recharged at rates of five to ten inches per year in eastern portions of Sarasota and Manatee Counties (SWFWMD, 1988a, 1988b). In western portions of both counties, the Floridan aquifer discharges to the intermediate aquifer.

The Sarasota Bay watershed is within the boundaries of the Southern Water Use Caution Area (SWUCA). Increased demand for groundwater resources has increased the concentration of chlorides in the western boundary of the SWUCA, an indication of saltwater contamination. In response, the SWFWMD proposed setting minimum groundwater levels in the SWUCA. These levels, and other actions taken by SWFWMD, are designed to protect both the resource and water users, and result in greater water-use efficiency.

Historic Land Use

Sarasota Bay first took shape approximately 5,000 years ago (Estevez, 1992), as a result of the formation and development of offshore barrier islands during a period of continuing sea level rise. These barrier islands, in turn, appear to be associated with previously subtidal bars originally formed on top of elevated portions of Miocene bedrock (Kuhn, 1983).

The Sarasota Bay watershed contains a number of archeological sites, including shell middens, sand mounds, and cemeteries (Deming et al., 1990). These structures are the sole remaining artifacts of a number of prehistoric cultures. As defined by Deming et al. (1990), these cultures include the following:

Paleo-Indian	10,000 - 6,500 B.C.
Archaic	6,500 - 1,000 B.C.
Manasota	500 B.C. - A.D. 800
Weedon Island-related	A.D. 800 - 1,000
Safety Harbor	A.D. 1,000 - 1600's

The demise of the Native American presence in Sarasota Bay roughly coincides with initial contact with Spanish Conquistadors and settlers (Deming et al., 1990).

During the 1870's, a resort hotel in Osprey was one of the first business ventures to take advantage of Sarasota Bay's wealth of natural beauty, although commercial fishing had occurred

since the late 1700's (Whelan, 1992). During the period of 1895 to 1903, the first large-scale channel alteration activities took place in Sarasota Bay, as the dredge "Suwanee" enlarged and/or created channels at Palma Sola Pass, at Longbar, and in the area between Little Sarasota Bay and Venice (Whelan, 1992).

During the years 1910 and 1911, the City Commission of Sarasota mandated the seawalling of the City waterfront, while the citizens of the City of Sarasota voted for a combination water and sewage treatment system (Whelan, 1992). Ten years later, Sarasota County was officially formed by the partitioning in two of the old Manatee County.

Population growth in the watershed has been dramatic, especially in the post-World War II years. In 1989, the population in both Manatee and Sarasota Counties (which includes areas outside of the Sarasota Bay watershed) was estimated at 425,400 (SBNEP, 1990). By the year 1995, that number was estimated to be approximately 513,900. As population in these two counties was less than 150,000 in 1940, this represents nearly a fourfold increase in population in just over fifty years. In 1960, population in the two counties was estimated at 163,000, indicating a more than threefold increase in population in the last forty years.

During this period of rapid growth, much environmental damage occurred as a result of large-scale dredge and fill projects, such as the conversion of Bird Key into a finger fill canal community, and the dredging (in the 1960's) of the Intracoastal Waterway. The dredging of the Intracoastal Waterway may have increased the hydraulic instability of Midnight Pass, the movement of which precipitated its permitted closure and subsequent failed reopening in the winter of 1983 (Sheng and Peene, 1992; Sheng, personal communication.)

Present Land Use

Water quality in Sarasota Bay is influenced by the amount of watershed that drains into different parts of the Bay. In northern and central portions of the bay (i.e., those areas north of Roberts Bay), 59 square miles of watershed drain into 45 square miles of open water. In the area of Roberts Bay south to Venice Inlet, 91 square miles of watershed drain into seven square miles of open water. Thus, the watershed to open-water ratio in the northern and central parts of Sarasota Bay is 1.3, while in the southern part of Sarasota Bay, this ratio climbs to 13.4, an approximately tenfold increase.

At present, residential land-use accounts for approximately 42 percent of the total watershed, while 36 percent is a combination of forested upland, rangeland, and open/recreational uses (Heyl, 1992). Commercial and industrial land-uses account for 10 percent of the watershed, and cropland and citrus account for 9 percent of the land. The remainder of the watershed (4 percent) consists of both wetlands and open water bodies (lakes and streams).

In Manatee County's portion of the watershed, approximately 64 percent of the land is urbanized, with 72 percent of the urbanized land (46 percent of the total) being residential (Heyl, 1992). In the City of Sarasota, 87 percent of the watershed is urbanized, with 70 percent of the urbanized land (61 percent of the total) being residential. Sarasota County's portion of the watershed is 42

percent urbanized, with 87 percent of the urbanized land (36 percent of the total) being residential. Consequently, residential land uses account for less than 50 percent of the watershed in the northern and southern regions, and more than 50 percent of the watershed in the central region. As such, the water quality characteristics of stormwater runoff from residential land uses (e.g., elevated nitrogen and phosphorus concentrations) have the potential to have a large impact on water quality in the bay itself.

The manner of wastewater treatment used by residents varies throughout the bay's watershed, with large wastewater treatment plants used as the primary means of waste treatment in Manatee County and the City of Sarasota, and numerous small treatment plants and septic tanks as the primary means of treatment in Sarasota County (CDM, 1992).

In Manatee County, wastewater is collected and treated on a regional basis. In the Sarasota Bay watershed, wastewater produced by Manatee County residents goes to the Southwest Sub-Regional Treatment Plant, where it undergoes advanced secondary treatment. Approximately 60 percent of the Southwest Treatment Plant's effluent is used to irrigate agricultural land and recreational areas, with the remaining 40 percent disposed of at a 2,700 foot deep-well injection site (SBNEP, 1995). In the City of Sarasota, wastewater is treated to advanced (nutrient removal) levels, and approximately 50 percent of the effluent is reused for irrigation at parks, golf courses, and the Hi Hat Ranch - the remaining 50 percent is disposed of into Whitaker Bayou.

In Sarasota County, wastewater is dealt with through a variety of techniques (Camp, Dresser, & McKee, Inc. 1992). More than a hundred privately-owned treatment plants exist, including several with nutrient removal technology (e.g., Siesta Key Utilities, Florida Cities Southgate, and Florida Cities Gulfgate), one with a deep well injection site (Atlantic Utilities), and several with a combination of adequate storage capacity and extensive reuse (e.g., Central County Utilities). Other treatment plants use a combination of reuse sites and percolation ponds (e.g., Dolomite Utilities and Kensington Park Utilities). In addition, there are approximately 40,000 septic tanks located in the urbanized areas within Sarasota County's portion of the watershed, including approximately 32,000 in the Phillippi Creek basin alone (Camp, Dresser, & McKee, Inc., 1992).

Status and Trends in Water Quality

Status

Using FDEP's methodology for determining "trophic state indices - TSI" (i.e., Hand et al., 1994), and excluding stations located in tributaries, all bay segments have TSI values in the "good" range, except for Midnight Pass (segment 15), which has a TSI value in the "fair" range (Lowrey, 1992). Comparisons of TSI values suggest that overall water quality in Sarasota Bay is better than the upper and middle portions of Tampa Bay, and about the same as in lower Tampa Bay (Lowrey, 1992). Comparisons with Charlotte Harbor TSI values suggest water quality in Sarasota Bay is roughly equivalent to that of Charlotte Harbor, but substantially better than water quality at the mouth of the Caloosahatchee River, a highly impacted tributary with substantial amounts of runoff associated with agricultural activities (Lowrey, 1992).

When comparing segments against each other in terms of water clarity, a general pattern emerges (Figure 2.3). Areas closest to flushing passes tend to have the greatest water clarity (e.g., Anna Maria Sound, Longboat Pass, etc.). Locations farther away from the influence of the Gulf of Mexico tend to have the lowest water clarity (e.g., Palma Sola Bay, Little Sarasota Bay). However, Roberts Bay has much reduced water clarity, despite its proximity to Big Pass, and the waters just east of central Longboat Key (segment 7) have good water clarity, despite being located in a null zone for circulation (Sheng and Peene, 1992). These differences are thought to be due, in part, to differences in pollutant loads, which are further discussed in the "Nutrient Budget" section later in this chapter.

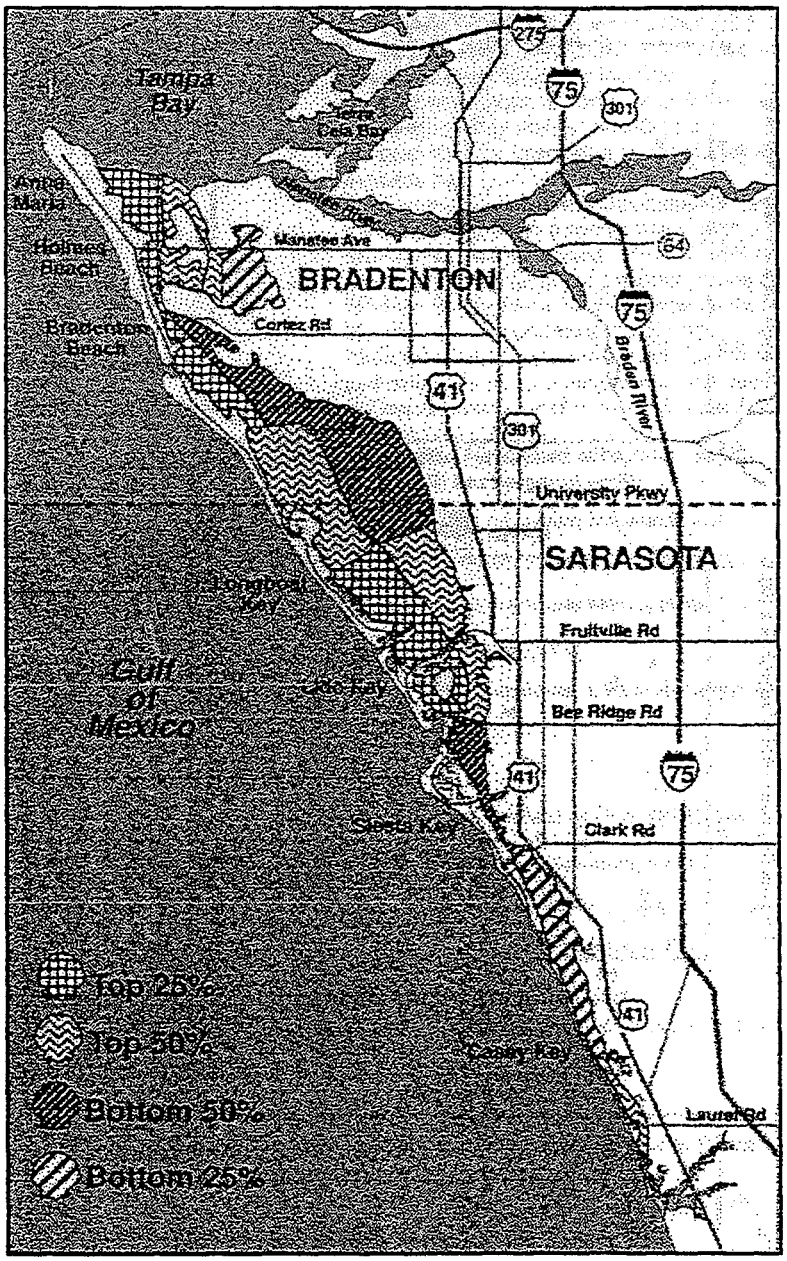

Fig. 2.3 - Relative Water Clarity Index

Trends

Since 1968, the majority of Sarasota Bay has become less saline (Lowrey, 1992). This change has occurred despite the lack of a trend in rainfall in the immediate watershed during the same time frame (Tomasko, unpublished data), and is thought to be related to increases in the amount of impervious surface area that have accompanied the increased urbanization of the watershed.

Out of 17 bay-wide segments (see Fig. 2.2), 11 show trends of decreasing Chlorophyll a concentrations (Lowrey, 1992), an indication of increasing water quality. Additionally, five bay segments show trends of increasing water clarity, five show decreasing trends for total nitrogen concentrations, seven show improvements for total phosphorus concentrations, and four show improving trends for total suspended solids concentrations.

Areas with multi-parameter documented increases in water quality in recent years include segments 6, 11, and 14. These areas correspond to the waters offshore Tidy Island, the area influenced by the City of Sarasota's wastewater outfall, and Little Sarasota Bay, respectively. Improvements to Manatee County's wastewater plant effluent disposal practices are thought to be responsible for improvements in water quality in segment 6, while upgrades to the City of Sarasota's wastewater treatment plant are thought to be responsible for improvements in water quality in segment 11. Determining the causes of recent increases in water quality in segment 14 is more problematic.

In contrast, water quality seems to be declining in the eastern portion of Sarasota Bay between Stevens Point and Bowlees Creek (segment 8), with no known cause. Water quality in Roberts Bay and Palma Sola Bay does not seem to be either increasing or decreasing (Lowrey, 1992).

In the tributaries to Sarasota Bay, there is evidence for decreased nitrogen concentrations in the Phillippi Creek system in the years after 1989, which seems to be mostly associated with upgrading wastewater disposal practices at private utilities (SBNEP, personal communication). However, during the same time period that nitrogen concentrations decreased (i.e., post 1989), the abundance of fecal coliform bacteria continues to exceed state standards for bodily contact (Sarasota County Public Health Unit, personal communication, 1996). Contamination of Phillippi Creek with pathogens associated with human wastes (e.g., bacteria, viruses, and protists) is still a significant health problem (Sarasota County Public Health Unit, personal communication, 1996).

Circulation

Sarasota Bay is characterized by areas with strong tidal influence in and near its major passes, as well as areas with much reduced flushing. Areas of reduced flushing can be associated with "dead ends" such as Palma Sola Bay, as well as "null zones" for circulation where tidal surges coming in from adjacent inlets meet (i.e., Little Sarasota Bay).

Turnover times for the water within different bay segments vary substantially. Turnover times in segments 1, 2, 9, 10, 11, and 12 (Anna Maria Sound and that portion of the bay adjacent to Big Pass and New Pass) average 12 to 13 days (Sheng and Peene, 1992). In the area off Tidy Island (segments 4, 5, and 6), turnover times average 15 to 16 days, and in Roberts Bay (segment 13), turnover time was estimated at 19 days. In contrast, Palma Sola Bay (segment 3) and Little Sarasota Bay (segment 14) have turnover times of 32 and 37 days, respectively (Sheng and Peene, 1992).

Due to the closure of Midnight Pass, turnover times for the water in Little Sarasota Bay increased from 14 to 37 days (Sheng and Peene, 1992). However, due to the shift from two null zones between Venice Inlet and New Pass to one null zone in Little Sarasota Bay (which occurred with the closure of Midnight Pass) turnover time in Roberts Bay decreased from 19 to 13 days (Sheng and Peen, 1992).

The relatively high turnover time for the waters of Little Sarasota Bay (37 days) coincides with the much higher watershed to open water ratio found in this area. From this consideration alone,

it would be expected that water quality in Little Sarasota Bay would be lower than in the central and northern portions of the bay.

Contaminant Levels in Bay Sediments

Using aluminum content as a means to "normalize" data sets, sediment enrichment ratios for copper, lead, and zinc were determined for 35 transects located throughout Sarasota Bay (Figure 2.4). In this figure, enrichment ratios greater than one are indicative of ratios higher than the upper limit to the 95 percent confidence interval of a statewide data base. This relationship was calculated using data from locations throughout Florida where toxin loads are absent or minimal (Lowrey, 1992). In Sarasota Bay, several "hot spots" for toxin contamination are apparent, specifically, Hudson Bayou, Bowlees Creek, Phillippi Creek, Whitaker Bayou, and Cedar Hammock Creek.

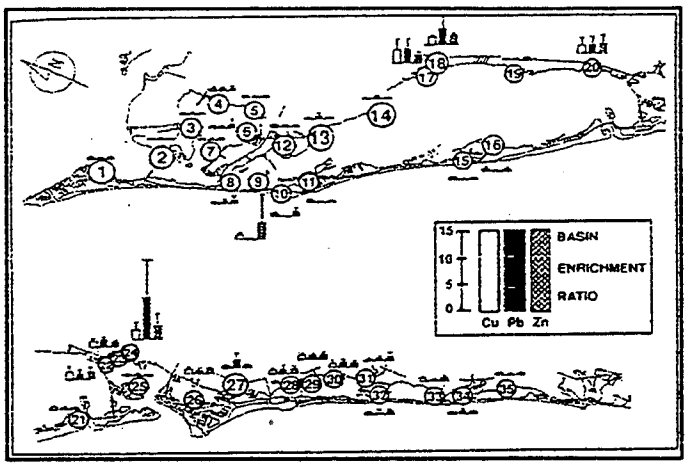

Fig. 2.4 - Metals enrichment ratio

Areas with elevated enrichment ratios are indicative of anthropogenic impacts. Such areas typically show multiple contamination from metals, pesticides, and hydrocarbon residues (Lowrey, 1992). Additionally, areas with elevated levels of toxins in the sediment are usually areas with elevated levels of toxins in shellfish (Dixon, 1992). Therefore, it is of little surprise that Hudson Bayou, with elevated levels of lead, zinc, copper, and chlorinated pesticide residues in its sediments also contains oysters with the highest concentration of lead within their soft tissues of any other oyster samples contained within both state and national data sets (Dixon, 1992).

Status and Trends in Wetlands

Accompanying the post-World War II population boom, tidal wetlands throughout the watershed decreased from approximately 4,104 acres in 1950 to 2,495 acres in 1990, a 39 percent decrease (Estevez, 1992). Forested freshwater wetlands in the Sarasota Bay watershed decreased by 35 percent during the period 1975-1991 (Beaman, 1992).

In Manatee County, much of the original tidal wetland coverage remains intact, although many of the freshwater wetlands have been lost. In Sarasota County, vast stretches of freshwater wetlands remain intact, but the mangrove shoreline is nearly eradicated in most areas (Estevez, 1992). This pattern of wetland loss appears to be related to how development occurred in different parts of the watershed, with Manatee County development mostly expanding into the interior regions south of Bradenton, and Sarasota County development mostly expanding parallel to the Bay's shoreline.

The rate of loss of tidal wetlands during the period of 1975-1990 was about 20 acres per year, which is less than one half the rate experienced during the period of 1950-1975 (52 acres per year; Estevez, 1992). Figure 2.5 illustrates how wetlands loss in Sarasota Bay, represented by trends in Roberts Bay, has typically involved two phenomena: the loss of areal coverage itself, and the fragmentation of remaining wetlands into smaller pieces. As fragmentation alone can have a significant negative impact on wetland processes, regardless of declines in acreage, wetlands productivity, habitat value and stability are dually insulted (Reid and Trexler, 1991).

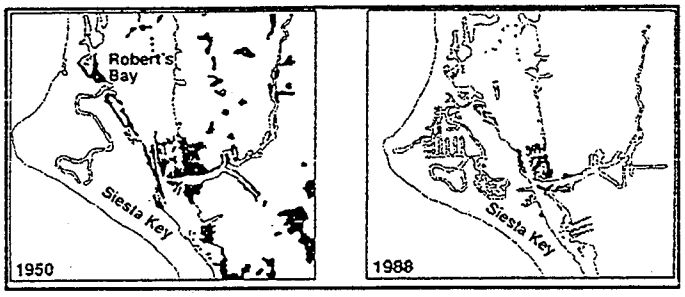

Fig. 2.5 - Wetlands loss in Roberts Bay

For freshwater wetlands, the rate of loss from 1975-1990 equals 119 acres per year, nearly six times the rate of loss for tidal wetlands. Forested wetlands account for 23 percent of the remaining 1,388 freshwater wetlands in the watershed (by number, not acreage), with marshland accounting for 39 percent and wet prairies accounting for 27 percent of all freshwater wetlands (Beaman, 1992). More than 75 percent of all freshwater wetlands have either been dredged or filled to some degree, with only 21 percent exhibiting no signs of human impact (Beaman, 1992). Additionally, up to 95 percent of freshwater wetlands, depending on location in the watershed, have some degree of invasive species problems, with the severity of such problems being greatest in the northern and central portions of the watershed, and least in the southern portions (Beaman, 1992).

Status and Trends in Fisheries

Sarasota Bay includes a variety of habitats that are important in sustaining larval, juvenile, and adult stages of many recreationally and commercially important species of fish. Open water habitats, hard bottom communities, and artificial reefs support large numbers of baitfish such as menhaden (*Brevoortia* sp.) and thread-herring (*Opisthonema oglinum*), as well as occasional schools of pompano (*Trachinotus carolimus*), and large numbers of black sea bass *(Centropristis striata*) and sheepshead (*Archosargus probatocephalus*). Seagrass meadows provide vital habitat for two of the most sought-after species, spotted seatrout (*Cynoscion nebulosus*) and redfish (*Sciaenops ocellatus*), as well as the commercially valuable striped mullet (*Mugil cephalus*). Mangrove fringes support large numbers of juvenile fish, and also provide critical habitat for various species of grunts (*Haemulon* spp.) and snappers (*Lutjanus* spp.).

As is the case in many parts of Florida, the available fisheries data suggest declines in abundance of recreationally and commercially important species have occurred throughout Sarasota Bay. Edwards (1992) used two different figures to graphically illustrate the relative impacts of

harvesting versus habitat loss on fisheries productivity. Figure 2.6, from Edwards (1992), illustrates the decline in striped mullet (*Mugil cephalus*) landings from both Manatee and Sarasota Counties during the last 45 years. As the vast majority of mullet is caught by commercial fishermen, declines in mullet landings are mostly a function of commercial fishing pressure and habitat loss. As mullet harvests were maintained at a consistently higher level during a prolonged period of time (the years 1955-1970), as compared to landings during 1975-1990, the decline in mullet landings is not thought to be related to overfishing alone (Edwards, 1992).

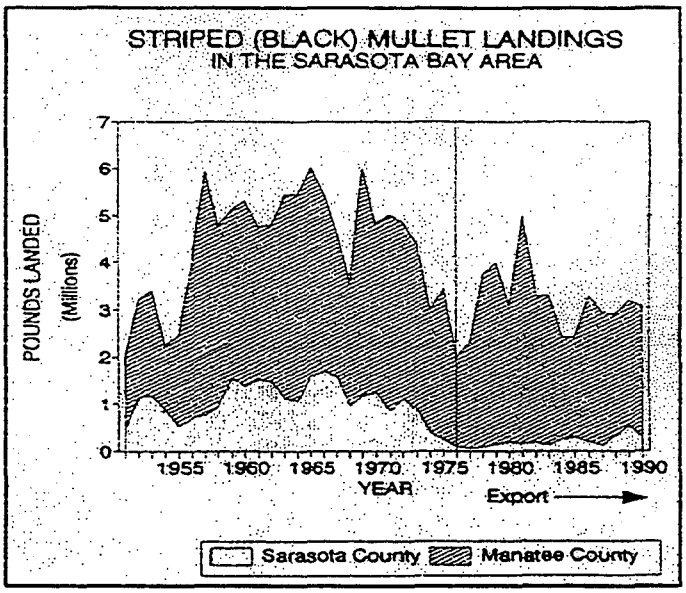

Fig. 2.6 - Commercial landings data for striped mullet

Spotted seatrout (*Cynoscion nebulosus*) show a more significant decline in recent years (Figure 2.7), which may reflect increased harvest pressure from recreational anglers, in addition to impacts associated with habitat loss.

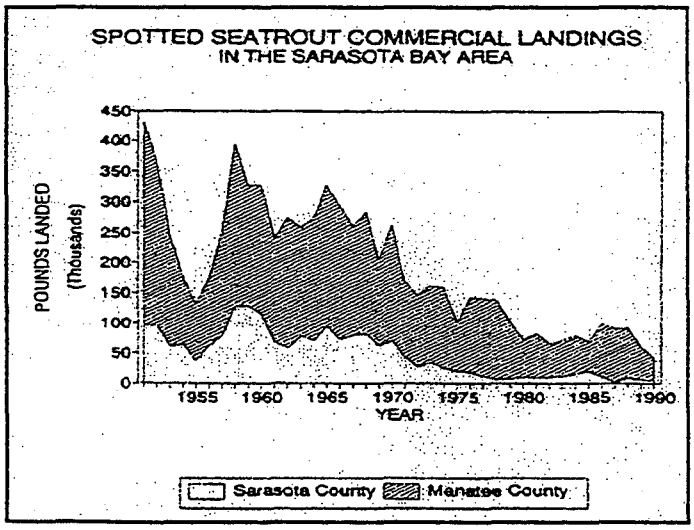

Fig. 2.7 - Commercial landings data for seatrout

When comparing fisheries data with data on status and trends in wetlands and seagrass coverage, Edwards (1992) concluded that "...alteration and degradation of the Sarasota Bay system is the most likely cause of the spotted seatrout fishery decline, with the fishery declines paralleling, in timing and magnitude, the declines of important fishery habitats such as seagrasses, mangroves and natural shorelines."

Benthic Communities

Dredge and fill activities have occurred throughout Sarasota Bay since at least 1895 (Whelan, 1992). The amount of disturbed bay bottom varies spatially, from 4 percent of the bay bottom in Blackburn Bay to 29 percent of the bay bottom in Anna Maria Sound (Culter, 1992). Areas near passes (i.e., segments 4, 9, 12, and 16) range from 51 to 82 percent disturbed. Bay-wide, excluding the pass areas, 14 percent of the bottom of Sarasota Bay is disturbed, with most of these areas containing fine-grained sediments with little or no oxygen in the overlying water column (Culter, 1992).

As water clarity seems to be the primary factor controlling the depth to which seagrasses grow in Sarasota Bay (Figure 2.8), improvements in water clarity would seem to be an important factor associated with recent increases in seagrass coverage in Sarasota Bay.

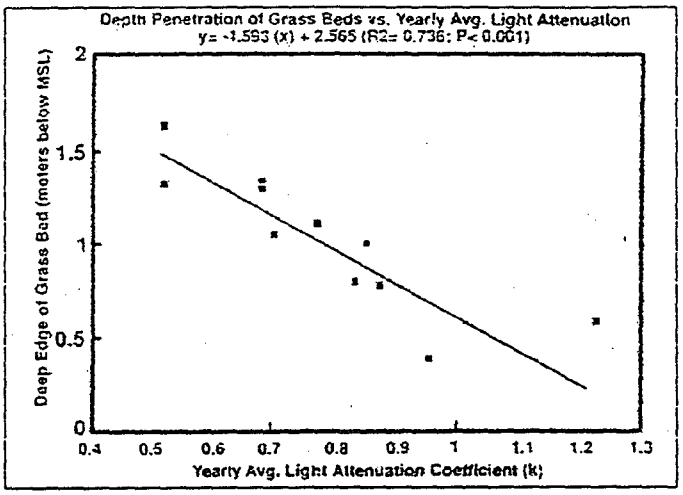

Fig. 2.8 - Light attenuation versus depth of the deep edge of seagrass meadows

Seagrass coverage varies throughout the bay. Excluding passes, areal coverage ranges from 51 percent of the bay bottom in Anna Maria Sound to 6 percent of the bottom in the eastern portion of the bay offshore of the City of Sarasota (segment 11). Bay-wide, seagrasses covered approximately 28 percent of the bay bottom in 1995, a 7 percent increase over 1988 (Geonex, 1996). The depth to which seagrasses grow also varies bay-wide, from less than 50 cm below mean sea level (MSL) in Roberts Bay, to more than 2 m (MSL) in Anna Maria Sound (Tomasko et al., 1992).

Increases in seagrass coverage have been used as "bio-indicators" of improving water quality in Tampa Bay (Johannson, 1991). In years past, the part of Sarasota Bay near the mouth of Whitaker Bayou (segment 11) lost a substantial amount of seagrasses, a phenomenon mostly attributed to the discharge of secondarily treated wastewater from the City of Sarasota (Dr. Robert Orth, personal communication).

Associated with the implementation of nutrient removal technology and increased reuse of treated effluent, wastewater nitrogen loads into Whitaker Bayou have decreased by approximately 95 percent during the past several years (Camp, Dresser, & McKee, Inc., 1992; Tomasko et al., 1992). This load reduction amounts to a 43 percent decline in loads throughout the central portion of the bay (Camp, Dresser, & McKee, Inc., 1992). During this time period, nutrient levels decreased in the waters offshore of Whitaker Bayou (Lowrey, 1992), and seagrass coverage in central Sarasota Bay increased by 11 percent (Geonex, 1996). Another area of decreased wastewater-related nutrient loads, in the vicinity of Tidy Island (segment 6), exhibited a 6 percent increase in seagrass coverage between 1988 and 1995 (Geonex, 1996). Clearly, further reductions in nutrient loads have the potential to further increase the amount of seagrass coverage in Sarasota Bay (Tomasko et al., 1992, 1996).

Nutrient Budget

Nitrogen, rather than phosphorus, seems to be the limiting nutrient for algal growth in Sarasota Bay, as molar N:P ratios are frequently less than five (Tomasko, unpublished data). Nitrogen loads are thought to be approximately three times as high as that which would be expected from a pristine, undeveloped watershed (see below; Camp, Dresser, & McKee, Inc., 1992). Consequently, the elevated nitrogen loads entering Sarasota Bay would be expected to result in

increased abundances of phytoplankton (capable of reducing water clarity and shading seagrasses), epiphytic algae (capable of shading seagrasses and interfering with gas exchange across seagrass blades), and macroalgae (capable of shading seagrasses and producing recurrent hypoxia in shallow waters).

The engineering firm Camp, Dresser & McKee, Inc. was tasked by SBNEP to determine the relative contributions of five sources of pollution (stormwater, point sources, atmospheric deposition, baseflow, and septic tank systems) for four different pollutants (nitrogen, phosphorus, lead, and zinc). Stormwater loads were determined by first mapping the various land-use characteristics of the entire watershed. Using data developed through the U.S. EPA's National Urban Runoff Program (NURP), percent directly connected impervious areas and event mean concentrations of various pollutants were calculated for each land-use. Rainfall and runoff relationships were determined using long-term monitoring data from local stream and rain gauges. Stormwater loads were then determined for individual watersheds.

Baseflow was modeled using known values for nutrient concentrations of uncontaminated groundwater and locally-obtained rates of horizontal groundwater movement. Point sources (sewage treatment plants) were determined for the seventeen largest wastewater plants in the Sarasota Bay watershed that discharge directly or indirectly to surface waters. Flow and nutrient concentration data came from routine monitoring reports for all sewage plants.

Point source discharges are listed in Appendix C. However, it should be noted that an overly simplistic view of "point source" data can lead to incorrect conclusions about the relative impacts of various sources. For example, percolation ponds, which are used as a means of disposal for some of the larger wastewater treatment plants, can be locally significant sources of nitrogen pollution (SBNEP, 1995). In addition, it is likely that some of the nitrogen disposed of via spray irrigation makes its way to Sarasota Bay through overland flows during storm events or via groundwater transport of nitrate, as was shown to be the case in Lake Tarpon (King Engineering Associates, Inc., 1991).

Septic tank system nutrient loads were determined using an algorithm designed by Camp, Dresser, and McKee, Inc. (1992) that was locally calibrated using the available (at that time) nutrient concentrations in receiving waters. The algorithm takes into account septic tank densities per watershed, effluent nutrient concentrations, uptake and absorption rates of nutrients in groundwater, and groundwater migration rates. Recent improvements in nitrogen concentrations for Phillippi Creek at the Bahia Vista Street Bridge warrant a reappraisal of the nutrient loading algorithm for septic tank systems.

Loads from rainfall (direct atmospheric loading of nitrogen to surface waters) were determined using data from local rain gauges and average rainfall nitrogen concentrations from NURP data.

The information presented here is derived from three major reports (Phases I, II, and III of Camp, Dresser, & McKee, Inc., 1992) and one summary of these data (Heyl, 1992).

Baywide, 46 percent of the nitrogen loaded into Sarasota Bay comes from stormwater runoff (Figure 2.9, data from Heyl, 1992). Runoff from residential land uses accounts for 60 percent of the nitrogen loading due to runoff, or approximately 28 percent of nitrogen loading from all sources. The high level of nitrogen loads coming from residential runoff is attributed to two factors: residential land uses account for 42 percent of the watershed, and event mean concentrations of nitrogen for residential land uses are second only to those from row crops, being higher even than those associated with runoff from citrus groves (Camp, Dresser, & McKee, Inc., 1992; Heyl, 1992).

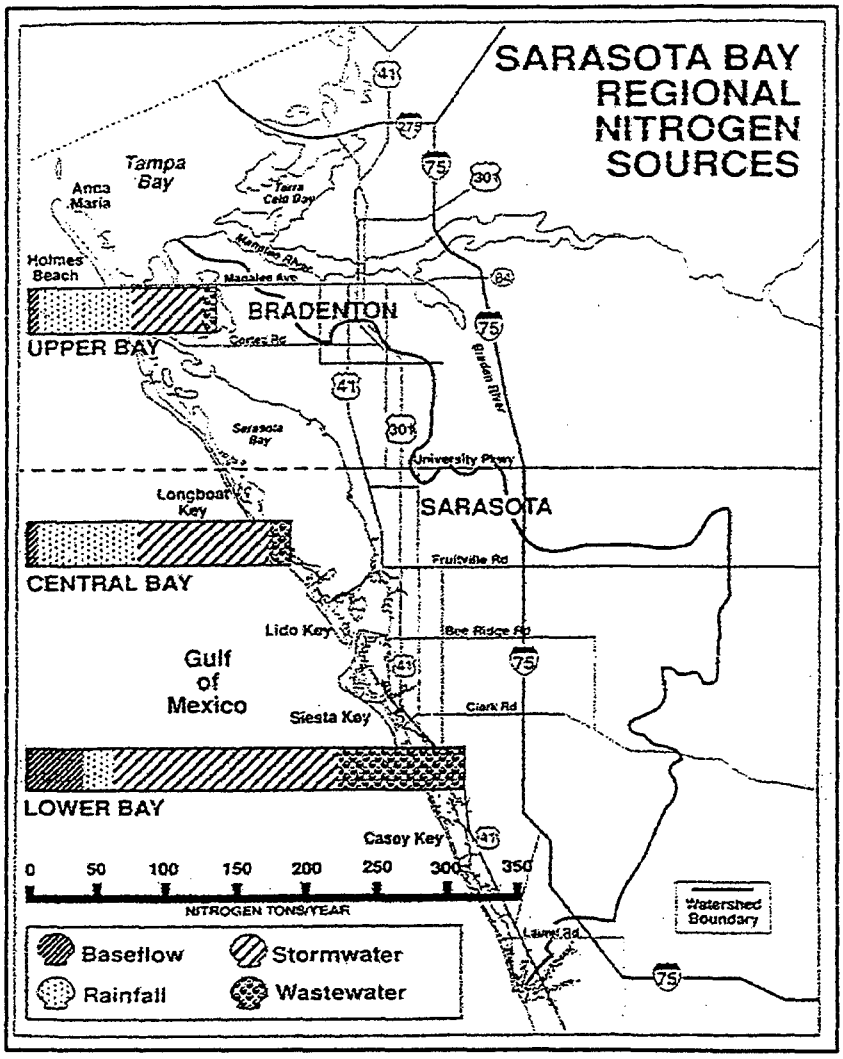

Fig. 2.9 - Nitrogen loading into Sarasota Bay

Atmospheric deposition accounts for 27 percent of the bay-wide nitrogen load, and it is the dominant loading source in the northern portions of the Bay, associated with the low watershed to open water ratio in these areas. In general, these same portions of the bay where atmospheric loads are proportionally and quantitatively greatest (i.e., Anna Maria Sound and areas just to the south) are also areas with the best water quality (Lowrey, 1992), the greatest water clarity (Tomasko et al., 1992), and the deepest growing seagrasses (Tomasko et al., 1992). As important as atmospheric deposition is in terms of loading models, there is the potential that atmospheric loads of nitrogen do not have the same biological consequences as sources such as stormwater and wastewater (i.e., atmospheric loading is associated with low concentrations "applied" over large areas, as opposed to high concentrations loaded into more restricted areas).

Baseflow, that portion of the nitrogen load coming from uncontaminated groundwater, accounts for 9 percent of bay-wide loads (Heyl, 1992).

Although septic tank systems only contribute approximately 10 percent of the bay-wide nitrogen loads, they can be locally important in areas where they are the predominant means of sewage disposal (SBNEP, 1995). In Roberts Bay, septic tank system nitrogen loads were estimated at 21 percent of the total (SBNEP, 1995), although this estimate needs to be reevaluated using newer information on water quality in Phillippi Creek (SBNEP, personal communication). Due to the potential for locally important nitrogen load reductions and the detection of dramatically elevated bacterial abundances in Phillippi Creek, the replacement of septic tanks with central sewers in priority areas is a recommendation of the SBNEP's Comprehensive Conservation and Management Plan (1995).

CHAPTER THREE: STRATEGY

Setting Goals for Sarasota Bay

For the Sarasota Bay SWIM Plan, the Sarasota Bay National Estuary Program's (SBNEP) previous activities and the SBNEP's Comprehensive Conservation and Management Plan (CCMP) are the basis for the SWIM Plan's strategies for the protection and restoration of Sarasota Bay. The CCMP, which is included as Appendix E, outlines specific actions necessary for the preservation and restoration of Sarasota Bay. These action plans were developed by the citizens and technical advisory committees of the SBNEP, and are based on an intensive, multi-year investigation of Sarasota Bay and its watershed. Briefly stated, projects listed within the Sarasota Bay SWIM Plan are those projects within the CCMP that were identified by the SBNEP as requiring coordination and/or direction action by the SWIM Program.

The intent of the Sarasota Bay SWIM Plan is to support a practical combination of anti-degradation measures and restoration activities. As such, a fundamental part of SWIM Plan activities is to initiate and/or continue activities consistent with implementing the Pollutant Load Reduction Goal for Sarasota Bay.

Pollutant Load Reduction Goal for Sarasota Bay

The process for setting a pollutant load reduction goal for Sarasota Bay was different from that used for nearby Tampa Bay. For Sarasota Bay, the approach used was one of a technology-based load reduction goal (SBNEP, 1995), whereas Tampa Bay, through its National Estuary Program (TBNEP), has pursued the development of a resource-based load reduction goal (TBNEP, 1995). The reasons for these two different approaches are discussed below.

In Tampa Bay, there is a wealth of information available on the relationships between pollutant loads, water quality, and resource availability. For example, Johannson (1992) documented the relationships between modeled nitrogen loads, annual average water column chlorophyll a levels, and seagrass acreage in Hillsborough Bay, the northeastern part of Tampa Bay.

In contrast, when nitrogen loads from Sarasota Bay watersheds are compared to either annual average chlorophyll a concentrations or annual average total Kjeldahl nitrogen concentrations, no clear pattern appears (Tomasko et al. 1996). As such, there does not appear to be an empirically evident relationship between modeled nitrogen loads and relevant water quality variables. However, there is a clear relationship between the biomass of seagrass meadows and modeled nitrogen loads (Figure 3.1).

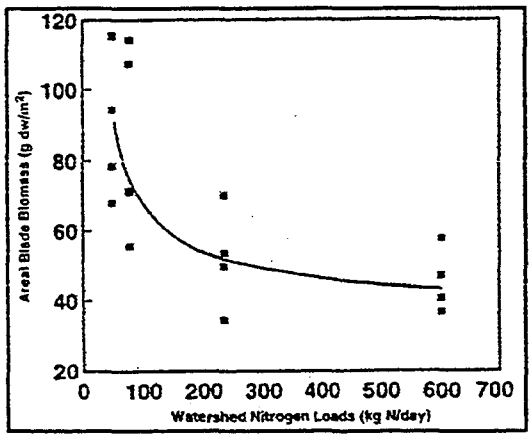

Fig. 3.1 - Nitrogen loads versus seagrass biomass in Sarasota Bay

The specific processes by which elevated nitrogen loads adversely affect seagrass meadows in Sarasota

Bay are not known, but they are probably similar to the multiple impacts thought to affect seagrasses in other systems (e.g., Valiela et al. 1990, Dennison et al. 1993, Short et al. 1996, Lapointe et al. 1994).

Based on the information outlined above, and after careful consideration, the SBNEP recommended that a technology-based pollutant load reduction goal be developed for Sarasota Bay.

The technology-based pollutant load reduction goal for Sarasota Bay consists of two major components: reducing current loads, and reducing the impact of population growth on future loads. Reducing current loads is itself dependent upon treating existing wastewater and stormwater loads. Wastewater loads are to be reduced by pursuing those elements listed in the SBNEP's Wastewater Action Plan, summarized in the CCMP (SBNEP, 1995). These actions, outlined below in greater detail, include replacing septic tanks with central sewers in priority areas, as well as converting several small treatment plants with percolation ponds into pump stations for treatment plants with better treatment processes.

For stormwater, retrofits are to be focused on those watersheds previously identified as "hot spots" for toxins. These areas include Cedar Hammock Creek, Bowlees Creek, Whitaker Bayou, Hudson Bayou, and Phillippi Creek (Dixon, 1992; Lowrey, 1992). The intent of the SBNEP's technology-based pollutant load reduction goal for stormwater is to achieve a 15 percent reduction in nitrogen loads for each of these watersheds. This would be accomplished by retrofitting 50 percent of each of these watersheds with structures that would be expected to average a 30 percent reduction in nitrogen loads (i.e., 0.5 X 0.3 = 0.15; Tomasko et al., 1993.) The feasibility of such a nutrient reduction strategy for stormwater is dependent upon site-specific criteria, such as available land for treatment structures, holding times for water volumes, etc.

Additional nutrient load reductions are anticipated through the widespread implementation of the "Florida Yards and Neighborhoods" Program, which aims to get homeowners to maximize their use of native vegetation and minimize their use of high maintenance landscapes (SBNEP, 1995).

Goals, Objectives, Strategies, and Projects

In general, the goals of the Sarasota Bay SWIM Plan are the same as those of the SWIM Act - improve and/or maintain water quality, along with the natural systems associated with the water body. In the SBNEP's CCMP, a number of "Action Items" were developed, which were identified as priority activities for restoring Sarasota Bay. In broad terms, these Action Items are meant to address five major goals for Sarasota Bay. These are:

Goal 1: Improve water transparency in Sarasota Bay,

Goal 2: Reduce the quantity and improve the quality of stormwater runoff to Sarasota Bay,

Goal 3: Restore shoreline habitats in Sarasota Bay,

Goal 4: Restore and sustain fish and other living resources in Sarasota Bay,

Goal 5: Continue monitoring and applied research in Sarasota Bay.

In greater detail, these goals, and the strategies to achieve them, are discussed below, with full project descriptions, estimated budgets, and proposed time lines found in Chapter 4.

GOAL 1: IMPROVE WATER TRANSPARENCY IN SARASOTA BAY

The depth to which seagrass meadows grow in Sarasota Bay is related to water clarity (Fig. 2.8). An overabundance of nitrogen can adversely affect water clarity, through the stimulation of phytoplankton growth. As such, activities which reduce nitrogen loads, and thus increase water clarity, would be expected to increase seagrass coverage, by allowing seagrasses to expand into deeper portions of the Bay's bottom. As seagrasses are important habitats for a variety of recreationally and commercially important species of finfish and shellfish (Edwards, 1992), improved water transparency would be expected to result in increased fisheries resources in Sarasota Bay. As noted in the SBNEP's CCMP, "significant opportunities exist to improve the treatment and reclamation of wastewater to reduce the amount of nitrogen that is polluting Sarasota Bay." Already, increased reuse efficiency at Manatee County's Southwest Regional Treatment Plant, and improved technology and increased reused efficiency at the City of Sarasota's Wastewater Treatment Plant have brought about a 25 percent nitrogen load reduction (baywide) in recent years. In response, baywide seagrass coverage has increased by approximately 7 percent. However, existing wastewater loads are still thought to be responsible for approximately 20 percent of baywide nitrogen loads (SBNEP, 1995). These loads are in turn split such that 10 percent of baywide nitrogen loads are associated with wastewater treatment plants and 10 percent of baywide nitrogen loads are related to septic tanks.

For dealing with wastewater-related nitrogen loads, a series of objectives, strategies and projects were developed by the SBNEP. Those actions relevant to the Sarasota Bay SWIM Plan are outlined below:

Objective 1. Reduce wastewater-related point and nonpoint source pollutant loadings to Sarasota Bay, by implementing the tasks outlined in the SBNEP's Comprehensive Conservation and Management Plan.

STRATEGY

1. A. Support local governments in their efforts to require wastewater treatment policies consistent with either nutrient removal technology, or advanced secondary treatment with effective reuse.

Project(s): No special projects are required.

The SWFWMD, through regulatory oversight and public education, shall actively participate in the process of educating the public about the need for consistent policies on wastewater treatment and reclamation.

STRATEGY

1. B. Develop a multi-county wastewater reclamation program to minimize discharge of treated wastewater to Sarasota Bay.

Project(s): In coordination with the SBNEP, develop a wastewater reclamation master plan for Manatee and Sarasota Counties.

The SWFWMD shall work with Manatee County, Sarasota County, and the City of Sarasota to develop a regional program to reclaim treated wastewater in the Manasota Basin, which is located in the Southern Water Use Caution Area. This project should address the expansion of reuse for agricultural irrigation and appropriate uses for urban irrigation, as well as the potential for treatment and reuse for the purposes of streamflow augmentation and/or future potable supply. For a more detailed project description, please see page 38.

GOAL 2: DECREASE THE QUANTITY, AND INCREASE THE QUALITY OF STORMWATER RUNOFF TO SARASOTA BAY

Stormwater runoff contributes both nutrients and toxins to Sarasota Bay and its tributaries, with 45 percent of baywide nitrogen loads and 90 percent of baywide lead loads coming from stormwater runoff (Heyl, 1992). An overabundance of nitrogen can adversely affect water clarity, through the stimulation of phytoplankton growth. Additionally, nitrogen loads are inversely correlated with the biomass of seagrass meadows in Sarasota Bay (Fig. 3.1). While toxin levels in the open waters of Sarasota Bay are generally low, heavy metals such as lead and copper are found at elevated levels in various tributaries. Concentrations of metals in Hudson Bayou, Bowlees Creek, Phillippi Creek, Cedar Hammock Creek and Whitaker Bayou are especially high (Dixon, 1992; Lowrey, 1992).

While stormwater treatment technologies, such as retention and detention ponds, can be highly effective at handling heavy metals and sediments, they are not as efficient at reducing nitrogen loads (Tomasko et al., 1993). As a result of numerous discussions within its Technical Advisory Committee, the SBNEP had decided upon a course of action for reducing stormwater-related pollutant loads that focuses on promoting pollution prevention strategies and creating and maintaining stormwater treatment systems that focus mainly on reducing toxin loads.

For dealing with stormwater-related pollutant loads, a series of objectives, strategies and projects were developed by the SBNEP. Those actions relevant to the Sarasota Bay SWIM Plan are outlined below:

Objective 2. Reduce stormwater-related pollutant loads to Sarasota Bay and its tributaries, by implementing the tasks outlined in the SBNEP's Comprehensive Conservation and Management Plan.

STRATEGY

2. A. Promote pollution prevention through improved landscape design and maintenance of residential areas.

Project(s): Implementation of the Florida Yards & Neighborhoods Program.

The SWFWMD shall continue to develop and implement the Florida Yards & Neighborhoods Program, and to integrate this Program with existing regional and local water-conservation programs. For a more detailed project description, please see page 39.

STRATEGY

2. B. Reduce stormwater-related sediment and contaminant loadings in priority watersheds through the development and implementation of stormwater management master plans for the Sarasota Bay region, with priority placed on tributaries where the highest levels of contaminants were found (i.e., Hudson Bayou, Bowlees Creek, Phillippi Creek, Cedar Hammock Creek, and Whitaker Bayou).

Project(s): Incorporate water quality improvements into stormwater master plans for priority watersheds.

The SWFWMD shall cooperate with Manatee County, Sarasota County, and the City of Sarasota to develop and implement stormwater master plans for the priority watersheds of Hudson Bayou, Bowlees Creek, Phillippi Creek, Cedar Hammock Creek, and Whitaker Bayou. Through SWFWMD's cooperative funding program, the District shall continue to fund planning and construction of stormwater retrofits that incorporate flood protection and water quality improvement. For a more detailed project description, please see page 40.

STRATEGY

2. C. Maintain stormwater management and treatment systems for maximum efficiency in reducing pollutant loads to Sarasota Bay.

Project(s): No special projects are required.

Recognizing the pressure placed on local governments associated with localized flooding, the District shall continue to coordinate its research and regulatory activities such that Manatee County, Sarasota County, and the City of Sarasota can maintain appropriate levels of flood control without contributing to water quality degradation.

STRATEGY

2. D. Reduce or mitigate the impact of future development on stormwater loadings to Sarasota Bay.

Project(s): No special projects are required.

In coordination with the comprehensive plan process, the District shall cooperate with local governments to aid in the reduction of the amount of existing impervious surface area in the watershed. Additionally, the District shall aid in the search for alternative practices for reducing hardened surfaces in future development.

GOAL 3: RESTORE SHORELINE HABITATS IN SARASOTA BAY

Since 1950, intertidal wetlands in the Sarasota Bay watershed have declined by approximately 39 percent (Estevez, 1992). These wetlands provide a number of benefits to the Bay and its living resources, such as providing food and shelter for finfish and shellfish, filtering pollutants before they enter the Bay, and moderating the flow of freshwater into the Bay. In addition to outright loss of wetlands, decreased quality of wetlands is an important issue. For mangrove shorelines, 66 percent of these wetlands are affected by infestation with exotic species (mainly Brazilian Pepper and Australian Pine).

As wetlands habitats have multiple benefits to the Sarasota Bay ecosystem, the Sarasota Bay Program, in its CCMP, decided upon a course of action that would include both better management of existing wetlands, as well as continuing current efforts to increase wetlands habitats in the Sarasota Bay watershed.

For dealing with shoreline habitat-related issues, a series of objectives, strategies and projects were developed by the SBNEP. Those actions relevant to the Sarasota Bay SWIM Plan are outlined below:

Objective 3. Implement comprehensive wetland protection and restoration in the Sarasota Bay watershed.

STRATEGY

3. A. Enhance, restore and create wetlands throughout the Sarasota Bay region.

Project(s): Continue and expand ongoing restoration projects in the Sarasota Bay watershed.

The SWFWMD's SWIM Department has been involved with more than 80 projects involving either wetlands restoration or stormwater retrofits. With designation as a SWIM priority water body, monies shall be used, in coordination with funds from DEP's Pollution Recovery Trust Fund and various local funds, to continue and expand habitat restoration efforts already undertaken by SBNEP. For a more detailed project description, please see page 41.

STRATEGY

3. B. Integrate reviews of development proposals among all appropriate governmental agencies and jurisdictions when wetlands are an issue.

Project(s): No special projects are required.

The District, through its oversight of dredge and fill permits, shall continue to integrate its review process with all appropriate state, regional, and local governments. In addition, upon the successful hiring of a SBNEP-recommended "wetlands coordinator", the District shall include such a coordinator in all relevant deliberations.

STRATEGY

3. C. Provide proactive, cooperative consultation to the private and public sectors on development proposals and regulatory issues that impact wetlands.

Project(s): No special projects are required.

In cooperation with both local governments and the SBNEP-recommended "wetlands coordinator", the District shall share the responsibility of acting in a proactive fashion on those regulatory and development issues deemed appropriate.

GOAL 4: RESTORE AND SUSTAIN FISH AND OTHER LIVING RESOURCES IN SARASOTA BAY

In Sarasota Bay, there have been substantial reductions in the Bay's fisheries (Edwards, 1992). While much of this decline has been associated with losses of wetlands and seagrasses, and much of the seagrass loss is associated with declines in water quality, other activities have also negatively affected fisheries in Sarasota Bay. For example, careless boaters have scarred seagrass meadows throughout the Bay (Culter, 1992), and substantial losses of hard bottom communities have occurred for reasons not directly related to changes in water quality (Culter, 1992). In addition, over harvesting by commercial and recreational anglers is thought to be an issue for some species (Edwards, 1992). In locations such as Little Sarasota Bay and Palma Sola Bay, changes in water circulation have resulted in substantial changes in water quality (Sheng, 1992).

For dealing with issues related to fisheries and other living resources, a series of objectives, strategies and projects were developed by the SBNEP. Those actions relevant to the Sarasota Bay SWIM Plan are outlined below:

Objective 4. Enhance circulation in critical areas where human activities have resulted in a decline in water quality.

STRATEGY

4. A. Improve circulation in northeastern Palma Sola Bay during the reconstruction of the Palma Sola Causeway.

Project(s): No special projects are required.

The SWFWMD, through its regulatory oversight of dredge and fill permits, shall coordinate its activities with those of Manatee County and the Florida Department of Transportation, such that maximal increases in circulation can be achieved during the reconstruction of the Palma Sola Causeway.

GOAL 5: CONTINUE MONITORING PROGRAMS AND APPLIED RESEARCH PROJECTS IN SARASOTA BAY

Substantial progress has been made towards restoring water quality and natural systems in Sarasota Bay. For example, a modeled 25 percent reduction in baywide nitrogen loads is thought to be responsible for a documented 614 acre increase in seagrass coverage in Sarasota Bay (Geonex, Inc., 1996). Further, completed habitat restoration projects have resulted in a baywide increase in intertidal habitat of more than 70 acres in recent years (SBNEP, 1995). Artificial reefs have been placed along seawalls and in the open waters of the Bay.

After careful consideration, the SBNEP's Technical Advisory Committee (TAC) recommended that monitoring programs for Sarasota Bay should incorporate both traditional and newer elements to ensure that changes in fisheries resources (both negative and positive) would be more effectively assessed. Traditional water quality monitoring programs would continue, with Manatee and Sarasota Counties continuing to support them, but additional monitoring of wetlands and seagrasses would be needed. Also, to enhance the ability to determine the status and trends (if any) in water quality, a data management strategy was developed for Sarasota Bay.

In addition to monitoring requirements, additional research needs were cited by the SBNEP (1995). The SBNEP's TAC recommended that research efforts should be focused on further assessments of the sources and biological implications associated with atmospheric deposition of nitrogen and metals in the Sarasota Bay watershed. Also, to better identify the specific sub-basins that might be contributing excessive amounts of contaminants within priority watersheds, the SBNEP's TAC recommended that further identification of the sources of toxin loads should be a research priority.

For dealing with issues related to monitoring programs and applied research projects in Sarasota Bay, a series of objectives, strategies and projects were developed by the SBNEP. Those actions relevant to the Sarasota Bay SWIM Plan are outlined below:

Objective 5. Continue to carry out relevant monitoring and research necessary to better manage Sarasota Bay and its watershed.

STRATEGY

5. A. In cooperation with ongoing efforts in Tampa Bay and Charlotte Harbor, determine the status and trends in seagrass coverage in Sarasota Bay.

Project(s): Seagrass mapping in Sarasota Bay.

The SWFWMD, through its SWIM Section, shall continue to monitor the status and trends in seagrass coverage in Sarasota Bay. As positive trends in seagrass coverage have been used to indicate fishery habitat responses to pollution prevention programs, such information is invaluable to both the public and natural resource managers. For a more detailed project description, please see page 42.

STRATEGY

5. B. In coordination with the SBNEP, carry out the research necessary to better understand the sources of, and biological implications associated with atmospheric nitrogen and toxin loads to Sarasota Bay.

Project(s): Further assessment of atmospheric deposition in Sarasota Bay.

In coordination with SBNEP, TBNEP, and DEP, SWFWMD shall assist in the further assessment of both the spatial and temporal variation in atmospheric deposition of nutrients and selected metals, as well as hosting a workshop aimed at determining the biological significance of such impacts. For a more detailed project description, please see page 43.

STRATEGY

5. C. In coordination with the SBNEP, carry out the research necessary to better identify the sources of elevated toxin loads in priority tributaries in the Sarasota Bay watershed (i.e., Hudson Bayou, Bowlees Creek, Cedar Hammock Creek, Phillippi Creek, and Whitaker Bayou).

Project(s): Identification of toxic load sources in Sarasota Bay.

The SWFWMD shall assist SBNEP in determining, with greater precision, the sources of contamination with metals and other toxins in the priority watersheds. These activities shall assist in the development of stormwater master plans and effective strategies to reduce the impact of stormwater-related pollution. For a more detailed project description, please see page 44.

STRATEGY

5. D. In coordination with the SBNEP, develop a data management system that will facilitate the analysis of water quality, seagrass coverage, and wetlands condition for status and trends (if any).

Project(s): Data management for Sarasota Bay.

In coordination with both SBNEP and FDEP, the SWFWMD shall assist in the development of a permanent and easily-accessible repository for the various data sets compiled on Sarasota Bay. For a more detailed project description, please see page 45.

CHAPTER FOUR: PRIORITY PROJECTS

Overview

Chapter One of this SWIM Plan was written to put the Sarasota Bay SWIM Plan into perspective, in terms of how SWIM priority water bodies are chosen, how SWIM Plans are written and reviewed, and how the various elements in SWIM Plans are funded. Also, Chapter One includes a description of the required elements that all SWIM Plans must include.

Chapter Two was meant to provide an overview of the problems facing Sarasota Bay - how increased population throughout the watershed has resulted in the direct loss of wetlands and seagrass habitats, and how stormwater and wastewater have further degraded the Bay.

Chapter Three was designed to summarize proposed activities in Sarasota Bay, by outlining the goals, initiatives, and strategies for restoring and protecting Sarasota Bay that were proposed as part of the SBNEP's Comprehensive Conservation and Management Plan (CCMP). Within the CCMP, there are numerous activities that were identified by the SBNEP as requiring the cooperation and/or direct involvement of the State of Florida though the Sarasota Bay SWIM Plan. These activities were then briefly outlined as they related to specific strategies, objectives and goals for Sarasota Bay.

The following pages contain more detailed information regarding the specific projects discussed in Chapter Three. Many of the proposed projects involve better coordination with local governments, or involvement by SWFWMD in permitting issues. Such projects are difficult to cost out, as the level of effort might vary between a few meetings to a few weeks' worth of work.

Projects that are outlined and budgeted in this chapter have well-defined purposes and objectives that are consistent with the Sarasota Bay SWIM Plan, the SBNEP's CCMP, and the District's Water Management Plan.

Included in this chapter are objectives and strategies of various projects, as well as budget estimates and proposed time lines. To facilitate thorough review of these projects, each one is listed in its entirety on its own page. These projects include:

Project Title: Reuse Master Plan for Sarasota Bay's watershed.

Strategy 1. B. - Develop a multi-county wastewater reclamation program to minimize discharge of treated wastewater to Sarasota Bay.

Objective(s) Addressed:

Objective 1 - Reduce wastewater-related point and nonpoint source pollutant loadings to Sarasota Bay, by implementing the tasks outlined in the SBNEP's Comprehensive Conservation and Management Plan.

Summary:

The SWIM Plan for Sarasota Bay, in keeping with its stated goal of close coordination with the SBNEP's CCMP, will be used to minimize the discharge of highly treated wastewater into Sarasota Bay or its tributaries. The SWFWMD was charged with performing an inventory of reuse plans and to consolidate such plans into a comprehensive planning document that would allow for the design of a large, watershed-wide reuse system.

Annual Budget Estimates:

This project was requested by the Manasota Basin Board in FY95. The anticipated completion date was in the fall of 1995, and a draft final report was presented to the Manasota Basin Board in the spring of 1996. Pending further considerations, it may be possible that this element is completed to the satisfaction of all interested parties. In the event that a revisit to this issue is necessary, the proposed budget reflects further work.

	FY 97	FY 98	FY 99
Salaries:	$ 0	$ 30,000	$ 0
Contracts:	$ 0	$ 0	$ 0
Expenses:	$ 0	$ 0	$ 0
Equipment:	$ 0	$ 0	$ 0
Total:	$ 0	$ 30,000	$ 0

Project Title: Florida Yards and Neighborhoods.

Strategy 2. A. - Promote pollution prevention through improved landscape design and maintenance of residential areas.

Objective(s) Addressed:

Objective 2 - Reduce stormwater-related pollutant loads to Sarasota Bay and its tributaries, by implementing the tasks outlined in the SBNEP's Comprehensive Conservation and Management Plan.

Summary:

Residential stormwater runoff is a major source of pollution to Sarasota Bay. Additionally, it is a goal of the SWFWMD to reduce the amount of water used for residential landscaping purposes. The Florida Yards and Neighborhoods Program (FY&N) offers a unique opportunity to combine the twin messages of pollution prevention and water conservation. Funding would support one FY&N coordinator for Sarasota and Manatee Counties. Additional funding is dependent upon verification of program results.

Annual Budget Estimates:

	FY 97	FY 98	FY 99
Salaries:	$ 0	$ 35,000	$ 0
Contracts:	$ 0	$ 0	$ 0
Expenses:	$ 0	$ 0	$ 0
Equipment:	$ 0	$ 0	$ 0
Total:	$ 0	$ 35,000	$ 0

Project Title: Incorporating water quality improvements into stormwater master plans.

Strategy 2. B. - Design water quality improvement projects to be incorporated into stormwater management master plans for the following tributaries: Hudson Bayou, Bowlees Creek, Cedar Hammock Creek, Phillippi Creek, and Whitaker Bayou.

Objective(s) Addressed:

Objective 2 - Reduce stormwater-related pollutant loads to Sarasota Bay and its tributaries, by implementing the tasks outlined in the SBNEP's Comprehensive Conservation and Management Plan.

Summary:

The SWFWMD needs to provide technical and financial assistance to help Sarasota and Manatee Counties develop and implement stormwater master plans for priority water bodies. Master Plans need to ensure that improvements to flood protection are constructed such that improvements to water quality are incorporated to the greatest extent possible. Project goals would include assessing site-specific pollutant load reduction goals, determining the feasibility of regional stormwater systems, and designing alternative construction methods for optimizing pollution reduction. As Master Plans are completed or underway for Phillippi Creek and Hudson Bayou, the proposed budget estimates costs needed to fulfill master plan assistance for the remaining priority tributaries, as well as any additional work on Phillippi Creek and Hudson Bayou.

Implementation dollars would be sought through the Basin Board's Cooperative Funding Program.

Annual Budget Estimates:

	FY 97	FY 98	FY 99
Salaries:	$ 0	$ 10,000	$ 5,000
Contracts:	$ 0	$ 50,000	$ 50,000
Expenses:	$ 0	$ 500	$ 0
Equipment:	$ 0	$ 0	$ 0
Total:	$ 0	$ 60,500	$ 55,000

Project Title: Habitat restoration in Sarasota Bay.

Strategy 3. A. - Enhance, restore and create wetlands throughout the Sarasota Bay region.

Objective(s) Addressed:

Objective 3 - Implement comprehensive wetland protection and restoration in the Sarasota Bay watershed.

Summary:

The SWFWMD's SWIM Department has been involved with more than 80 projects involving either wetlands restoration or stormwater retrofits. Some projects involved both. With the designation of Sarasota Bay as a SWIM priority water body, monies and staff time can be used in coordination with DEP's Pollution Recovery Trust Fund and various local funds to continue the restoration efforts already underway by SBNEP. The budget is based on the SBNEP goal of 18 acres of tidal restoration projects per year, and uses cost estimates from ongoing SWIM projects. Restoration activities would be limited to those sites recommended by the SBNEP's Technical Advisory Committee.

Annual Budget Estimates:

	FY 97	FY 98	FY 99
Salaries:	$ 15,000	$ 17,000	$ 20,000
Contracts:	$ 45,000	$ 45,000	$ 50,000
Expenses:	$ 5,000	$ 7,000	$ 10,000
Equipment:	$ 1,000	$ 1,000	$ 1,000
Total:	$ 66,000	$ 70,000	$ 81,000

Project Title: Seagrass mapping in Sarasota Bay.

Strategy 5. A. - In cooperation with ongoing efforts in Tampa Bay and Charlotte Harbor, determine the status and trends in seagrass coverage in Sarasota Bay.

Objective(s) Addressed:

Objective 5 - Continue to carry out relevant monitoring and research necessary to better manage Sarasota Bay and its watershed.

Summary:

The SWFWMD, through its SWIM Department, shall continue to monitor the status and trends in seagrass coverage in Sarasota Bay. As positive trends in seagrass coverage have been used to indicate fishery habitat responses to pollution prevention programs, such information is invaluable to both the public and natural resource managers.

Annual Budget Estimates:

	FY 97	FY 98	FY 99
Salaries:	$ 8,000	$ 0	$ 9,000
Contracts:	$ 28,000	$ 0	$ 30,000
Expenses:	$ 1,000	$ 0	$ 2,000
Equipment:	$ 1,000	$ 0	$ 1,000
Total:	$ 38,000	$ 0	$ 42,000

Project Title: Further assessment of atmospheric deposition in Sarasota Bay.

Strategy 5. B. - In coordination with the SBNEP, carry out the research necessary to better understand the sources of, and biological implications associated with atmospheric nitrogen and toxin loads to Sarasota Bay.

Objective(s) Addressed:

Objective 5 - Continue to carry out relevant monitoring and research necessary to better manage Sarasota Bay and its watershed.

Summary:

The SBNEP's Technical Advisory Committee (TAC) reviewed 14 proposals for additional technical studies. Of these 14 proposals, this project was ranked as the number one priority.

In coordination with SBNEP, TBNEP, and DEP, SWFWMD shall assist in the further assessment of both the spatial and temporal variation in atmospheric deposition of nutrients toxins, as well as hosting a workshop aimed at determining the biological significance of such impacts.

Annual Budget Estimates:

	FY 97	FY 98	FY 99
Salaries:	$ 5,000	$ 0	$ 0
Contracts:	$ 50,000	$ 0	$ 0
Expenses:	$ 1,000	$ 0	$ 0
Equipment:	$ 0	$ 0	$ 0
Total:	$ 56,000	$ 0	$ 0

Project Title: Identification of toxic load sources in Sarasota Bay.

Strategy 5. C. - In coordination with the SBNEP, carry out the research necessary to better identify the sources of elevated toxin loads in priority tributaries in the Sarasota Bay watershed (i.e., Hudson Bayou, Bowlees Creek, Cedar Hammock Creek, Phillippi Creek and Whitaker Bayou).

Objective(s) Addressed:

Objective 5 - Continue to carry out relevant monitoring and research necessary to better manage Sarasota Bay and its watershed.

Summary:

The SBNEP's Technical Advisory Committee (TAC) reviewed 14 proposals for additional technical studies. Of these 14 proposals, this project was ranked as the number two priority.

The SWFWMD shall assist SBNEP in determining, with greater precision, the sources of contamination with metals and other toxins in the priority watersheds. These activities will assist in the development of stormwater master plans and effective strategies to reduce the impact of stormwater-related pollution. The initial phase of this project will be a less intensive survey of previously identified "hot spots." The second phase will involve the use of more sophisticated techniques and more detailed assessments, to better document point sources of toxin loading.

Annual Budget Estimates:

	FY 97	FY 98	FY 99
Salaries:	$ 5,000	$ 5,000	$ 0
Contracts:	$ 20,000	$ 60,000	$ 0
Expenses:	$ 1,000	$ 1,000	$ 0
Equipment:	$ 0	$ 0	$ 0
Total:	$ 26,000	$ 66,000	$ 0

Project Title: Data management for Sarasota Bay.

Strategy 5. D. - In coordination with the SBNEP, develop a data management system that will facilitate the analysis of water quality, seagrass coverage, and wetlands condition for status and trends (if any).

Objective(s) Addressed:

Objective 5 - Continue to carry out relevant monitoring and research necessary to better manage Sarasota Bay and its watershed.

Summary:

In coordination with both SBNEP and FDEP, the SWFWMD shall assist in the development of a permanent and easily-accessible repository for the various data sets compiled on Sarasota Bay. In addition, SWFWMD shall assist the SBNEP and local governments in producing a document that updates and summarizes existing water quality data for Sarasota Bay.

Annual Budget Estimates:

	FY 97	FY 98	FY 99
Salaries:	$ 2,000	$ 0	$ 0
Contracts:	$ 30,000	$ 0	$ 0
Expenses:	$ 1,000	$ 0	$ 0
Equipment:	$ 0	$ 0	$ 0
Total:	$ 33,000	$ 0	$ 0

APPENDIX A

GOVERNANCE WITHIN THE SARASOTA BAY BASIN

A. Overview

Five levels of government are involved in resource management and regulatory activities within the Sarasota Bay Basin. These include single purpose local governments (i.e., independent taxing districts), general purpose local governments (i.e., cities and counties), regional agencies (i.e., SWFWMD and the Southwest Florida Regional Planning Council), as well as state and federal agencies. Detailed assessment of the roles of each of these entities is found within the SBNEP's Comprehensive Conservation and Management Plan (Appendix E), with a summary of responsibilities found on pages 2-12 and 2-13.

B. Agencies

1. Local Governments

a. Sarasota County

Sarasota County, established in 1921, has an estimated (1995) population of 309,000 and a land area of 573 square miles. It contains five general purpose local governments: the Board of County Commissioners, the City of Sarasota, the City of Venice, the City of North Port, and the Town of Longboat Key, which is shared with Manatee County. With the exception of the City of North Port, the above-mentioned entities have jurisdiction within the Sarasota Bay SWIM Plan area. Ninety-four special districts have been formed, of which 52 are operative arms of County government.

b. Manatee County

Manatee County has an estimated (1995) population of 235,800 and a surface area of 747 square miles. It is served by a Board of County Commissioners and contains the City of Bradenton and several smaller towns and municipalities. At this time, the City of Bradenton-proper does not appear to be located within the immediate watershed of Sarasota Bay, although out-parcels located along the Palma Sola Causeway are within the watershed of Palma Sola Bay.

2. Sub-state Agencies

Three sub-state agencies exist that would be involved in the implementation of the SWIM plan. These are the West Coast Inland Navigation District, the Southwest Florida Regional Planning Council, the Tampa Bay Regional Planning Council, and the Southwest Florida Water Management District.

The West Coast Inland Navigation District includes the intracoastal waterway of Sarasota and Manatee County. It is the local sponsor for the maintenance activities of the waterways, and has been the local sponsor for inlet and pass maintenance programs for navigation purposes.

The Southwest Florida Regional Planning Council is the Regional Planning Agency designated in Section 186.505 of the Florida Statutes. It performs the responsibilities described in that section and the Regional Planning Agency roles assigned in Section 380.05, F.S. (Resource Planning Committees, DRI reviews and Ch. 163, Local Plan Reviews), for the Counties and Cities listed above.

The Tampa Bay Regional Planning Council performs these duties for Manatee County.

The Southwest Florida Water Management District is responsible for performing duties assigned under Ch. 373, F.S., as well as duties delegated through DEP for Chs. 253 and 403, F.S., and for local plan review (Ch. 163, F.S.). It performs those duties for an area that includes Sarasota County and Manatee County, as well as those cities contained within these two counties.

3. State Agencies (after Barile et al. 1987)

Many state agencies are involved in environmental regulation and resource management in the Sarasota Bay watershed and estuary. The Florida Department of Environmental Regulation (FDER) and the Florida Department of Natural Resources (FDNR), recently merged into the Florida Department of Environmental Protection (FDEP) are leading agencies in the protection and management of Sarasota Bay. Other relevant entities include the Florida Department of Community Affairs, the Florida Game and Freshwater Fish Commission, the Marine Fisheries Commission, Florida Department of Agriculture and Consumer Services, Florida Department of Health and Rehabilitative Services, Florida Sea Grant Program, and the Florida Department of Transportation.

a. Department of Agriculture and Consumer Services

This department regulates the purchase and use of restricted pesticides and assists in resource management through the activities of the Soil and Water Conservation Districts and the Division of Forestry.

b. Department of Community Affairs

This department is responsible for reviewing local comprehensive plans and has jurisdiction over developments of regional impact (DRI's). DRI investigations are concerned with proposed developments which have the potential to affect the health, safety, or welfare of citizens of more than one county.

The Comprehensive Plans of both Sarasota and Manatee counties have been reviewed by the DCA. All have come into compliance with the Local Comprehensive Planning Act, either through a final review action, a stipulation agreement, or a settlement agreement.

c. Department of Environmental Protection

The Department of Environmental Protection, itself a result of the merger of the old Department of Environmental Regulation and the Department of Natural Resources, is the lead state agency involved in water quality, pollution control, and resource recovery programs. The department sets state water quality standards and has permit jurisdiction over point and nonpoint source discharges, certain dredge and fills activities, drinking water systems, power plant siting, and many construction activities conducted within waters of the state. The Water Resources Restoration and Preservation Section is responsible for waterbody restoration programs in Florida, in conjunction with the U.S. EPA. The department also interacts closely with other federal and state agencies on water-related matters.

The department is the primary reviewer of SWIM plans and is responsible for the disbursement of monies from the SWIM Trust Fund to the water management districts.

The Department is also highly involved in the management of estuarine resources, primarily through the divisions of Law Enforcement, Marine Resources, Resource Management, and State Lands.

The Department, through its Division of Law Enforcement's Marine Patrol, serves as an enforcement agency for the Florida Endangered and Threatened Species Act and the Oil Spill Prevention and Pollution Control Act. The Florida Marine Patrol also enforces state motorboat laws and the saltwater fisheries regulations of the Marine Fisheries Commission.

The Division of Marine Resources includes the Florida Marine Research Institute (FMRI) and the Bureau of Marine Resource Regulation and Development's Shellfish Environmental Assessment Section (SEAS). The FMRI conducts studies throughout Sarasota Bay with respect to habitat quality (e.g., marsh and seagrass habitats), habitat utilization and value with respect to important fisheries, and fish population dynamics and stock assessment. However, at present, the Juvenile Fish Monitoring Program does not include sample sites in Sarasota Bay. The SEAS classifies and determines the opening and closure of shellfish harvesting areas.

The Division of State lands oversees the management of state lands, including state parks such as Oscar Scherer.

The Department's Bureau of Geology reviews leasing requests involving nearshore and state waters. The Bureau of Beaches and Shores oversees beach renourishment activities.

d. Florida Game and Freshwater Fish Commission

The purpose of the Commission is to manage, protect, and conserve wild animal life and freshwater aquatic life. Its efforts within the SWIM plan area primarily involve freshwater sport and commercial fishing, fisheries and habitat management, fish stocking, fisheries research,

wildlife monitoring, enforcement of fisheries/wildlife regulations, listed species protection, wildlife research, development review, and regional planning.

The Commission is directed to review SWIM plans to determine if the plan has adverse effects on wild animal life and fresh water aquatic life and their habitats.

e. Marine Fisheries Commission

The Marine Fisheries Commission manages marine fish species (excluding endangered or threatened species) by regulating their harvesting. The Commission's jurisdiction covers the following areas: a) gear specifications, b) prohibited gear, c) bag limits, d) size limits, e) species that may not be sold, f) protected species, g) closed areas, h) quality control codes, I) harvesting seasons, j) special considerations related to egg-bearing females, and k) oyster and clam relaying. The MFC is required to make annual recommendations to the Governor and Cabinet regarding marine fisheries research priorities.

f. Department of Health and Rehabilitative Services

The Department of Health and Rehabilitative Services is responsible for the permitting of septic systems and other on-site disposal systems (OSDS's) through its county health departments. It also coordinates mosquito control programs.

g. Department of Transportation

The Department of Transportation's Project Development and Environmental Offices in Bartow assist in the design, review, and permitting of road and right-of-way projects in the Sarasota Bay region, and would play an important role in the enhancement of circulation in northeaster Palma Sola Bay during the reconstruction of the Palma Sola Causeway.

h. Florida Sea Grant Program

The Florida Sea Grant Program is supported by awards from the Office of Sea Grant (National Oceanic and Atmospheric Administration) under provisions of the National Sea Grant College and Programs Act of 1966. The Florida Sea Grant Program has three major components: applied marine research, education, and advisory services (through local marine extension agents).

Florida Sea Grant provides scientific research and habitat-related information that are useful in the management of Sarasota Bay's natural resources.

4. Federal Agencies

Federal jurisdiction in Sarasota Bay involves the regulatory responsibilities of the U.S. Army Corps of Engineers, the U.S. Environmental Protection Agency, the U.S. Coast Guard, the U.S. Fish and Wildlife Service, and the U.S. Department of Interior. Their main regulatory functions include overseeing dredge and fill activities, maintaining navigability of the waters of the United

States, overseeing cleanups following pollution spills, protecting endangered species, protecting overall environmental quality, and managing offshore activities. These agencies, in conjunction with the U.S. Geological Survey and the National Oceanic and Atmospheric Administration, also contribute to the collection of technical data concerning Sarasota Bay and its watershed.

a. U.S. Environmental Protection Agency

The U.S. Environmental Protection Agency is the primary federal agency responsible for water quality protection. The agency oversees hazardous waste cleanups, protection of public drinking water systems, all point source pollutant discharges into waters of the United States (National Pollutant Discharge Elimination System permits), and the protection and restoration of surface and groundwater. The agency also reviews Corps of Engineers permit activities, sets minimum quality standards, and sets guidelines for state environmental programs. EPA also funds sewerage facilities' studies through the SWFRPC and the TBRPC, and system improvements through the Florida Department of Environmental Protection.

The EPA's greatest presence in Sarasota Bay is through its National Estuary Program, established under Section 320 of the Clean Water Act. Sarasota Bay was selected for inclusion in the National Estuary Program in July 1988. The Sarasota Bay National Estuary Program (SBNEP) officially began with the signing of a five-year agreement among local, regional, state and federal agencies on June 26, 1989.

The SBNEP has produced three documents needed for the preservation and restoration of Sarasota Bay. These documents include: State of the Bay Report (SOB - 1990), Framework for Action (FFA - 1992), and the Comprehensive Conservation and Management Plan (CCMP - 1995). The SOB was designed to be a primer on general bay problems, as well as a blueprint for establishing the research and restoration goals for the SBNEP. Upon completion of the necessary technical projects, the principal investigators and SBNEP staff produced the FFA. The FFA included preliminary management options, identified by principal investigators, that were designed to improve the quality of Sarasota Bay. After reviewing the proposed management options through a series of more than 30 public workshops and committee hearings, a course of action was finalized for the restoration and preservation of Sarasota Bay. This document, the CCMP, is the final work product specified by the original five-year agreement. At present, the SBNEP is actively involved in the process of implementing the actions called for in the CCMP, as well as fostering relationships between various governmental bodies for facilitating restoration and protection projects.

b. U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers is concerned with all activities which affect navigable waters of the United States, particularly those involving construction of structures and dredging and filling in navigable waters. The Corps is also involved in permitting the placement of dredge and fill material into navigable waters and adjacent wetlands, and in funding aquatic plant control in navigable and public waters.

c. U.S. Coast Guard

The U.S. Coast Guard is the primary federal agency entrusted with marine law enforcement. The Guard's mission also includes hazardous materials cleanups, search and rescue, buoys replacement, vessel safety inspection, and right-of-way clearance on navigable waterways.

d. U.S. Department of Commerce

Within the department, the National Oceanic and Atmospheric Administration, which includes the National Weather Service and the National Hurricane Center, is a scientific and data collection agency which assimilates oceanographic and meteorological information in the form of maps, charts, interpretive reports, and other documents. The National Marine Fisheries Service administers NOAA's program to manage living marine resources for commercial and recreational use. It supports fisheries management operations, international fisheries affairs, fishery development, trade, and industry assistance activities, habitat conservation activities, and scientific and technical aspects of NOAA's marine fisheries resources programs.

f. U.S. Department of Interior

The primary water-related functions performed by this agency involve the review of proposed activities which may impact threatened or endangered species, review of U.S. Army Corps of Engineers permits for potential effects on fish and wildlife, and management of all federally-owned public lands. Within the department, the U.S. Geological Survey conducts investigations concerning hydrology, hydrogeology, water use, and ground and surface water quality. The U.S. Fish and Wildlife Service manages and restores fish and wildlife populations and conducts research on the effects of pollution on those resources. The National Park Service maintains federal parks and sanctuaries, regulating multiple uses on these lands to achieve a balance of benefits for both man and wildlife. The department also oversees those requests and offshore activities associated with exploration and development on the outer continental shelf.

APPENDIX B

PREVIOUS AND ONGOING PROJECTS

The SBNEP's Comprehensive Conservation and Management Plan (Appendix E) lists projects carried out to investigate the health of Sarasota Bay (pp. 12-1 to 12-19). In addition, the CCMP also includes a full description of various completed and/or ongoing restoration projects throughout the watershed (pp. 12-7 to 12-12). These habitat restoration projects include: Sarasota BayWalk at City Island, Coquina BayWalk at Leffis Key, Sixth Street Canal, Quick Point Preserve, Hog Creek, and Shoreline Naturalization at the New College Campus. Finally, future technical projects, some of which are projects within this SWIM Plan, are listed and described on pages 11-1 to 11-11 in the CCMP.

This section summarizes characterization efforts for Sarasota Bay, including those that preceded the SBNEP, or those that were not specifically identified within the SBNEP's CCMP. In addition, this section includes citations for references from the SWIM Plan itself, including studies not listed within the CCMP.

These efforts include:

NOAA Estuary of the Month Series

Clark, P.A., and R.W. MacAulay. 1987. Geography and economy of Tampa Bay and Sarasota Bay. Pp. 1-17. In: E.D. Estevez (ed.). Tampa and Sarasota Bays: Issues, Resources, Status, and Management. NOAA Estuary of the Month Seminar Series. No. 11. U.S. Department of Commerce, NOAA, Estuarine Programs Office, Washington, D.C.

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Collins, K.M. 1988. Growth and land use around Sarasota Bay: 1860-1987. In: E.D. Estevez (ed.). Proceedings: Sarasota Bay Scientific Information Symposium.

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APPENDIX C

POINT SOURCE DISCHARGES

Unexpired permits as listed by FDEP (courtesy of Kathy Liles).

Permit Type Codes: DO = Domestic Operating, IO = Industry Operating

	Facility	Type	Comments
1.	Southbay Utility Co.	IO	R/O Plant discharge to South Bay Yacht Basin, warning letter sent as to metals toxicity problems
2.	Singeltary Concrete	IO	Outfall to stormwater ditch (no longer a surface discharge as of 6/11/07)
3.	City of Sarasota	IO	R/O Plant discharge to Hog Creek, under enforcement action by U.S. EPA, as related to toxicity problems
4.	APAC-Florida, Inc.	IO	Two outfalls: 1- stormwater ditch & Cooper Creek, 2- stormwater ditch & Curry Creek (no longer surface discharges as of 6/11/07)
5.	Florida Cities Water Co. - Gulf Gate	DO	AWT discharge to Matheny Creek & Little Sarasota Bay, in compliance
6.	Florida Cities Water Co. - South Gate	DO	AWT discharge to Phillippi Creek & Roberts Bay, in compliance
7.	Southeast Plaza	IO	Outfall to stormwater ditch & Phillippi Creek, no longer a surface dishcharge as of 6/11/97)
8.	Tamaron Utilities	DO	Discharge to stormwater ditch, (no longer a surface discharge as of 6/11/97)
9.	City of Sarasota	DO	AWT discharge to Whitaker Bayou, in compliance

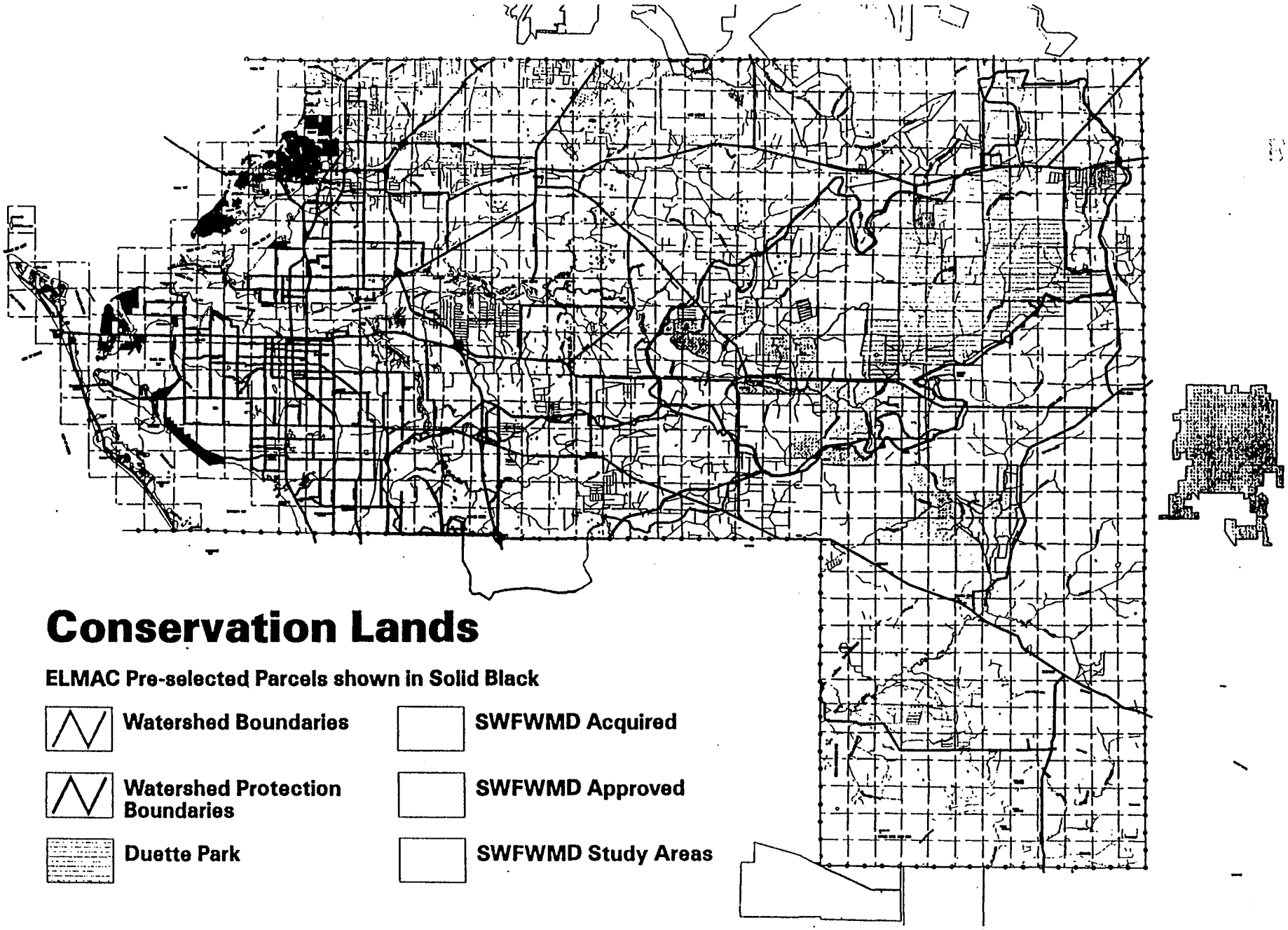
APPENDIX D

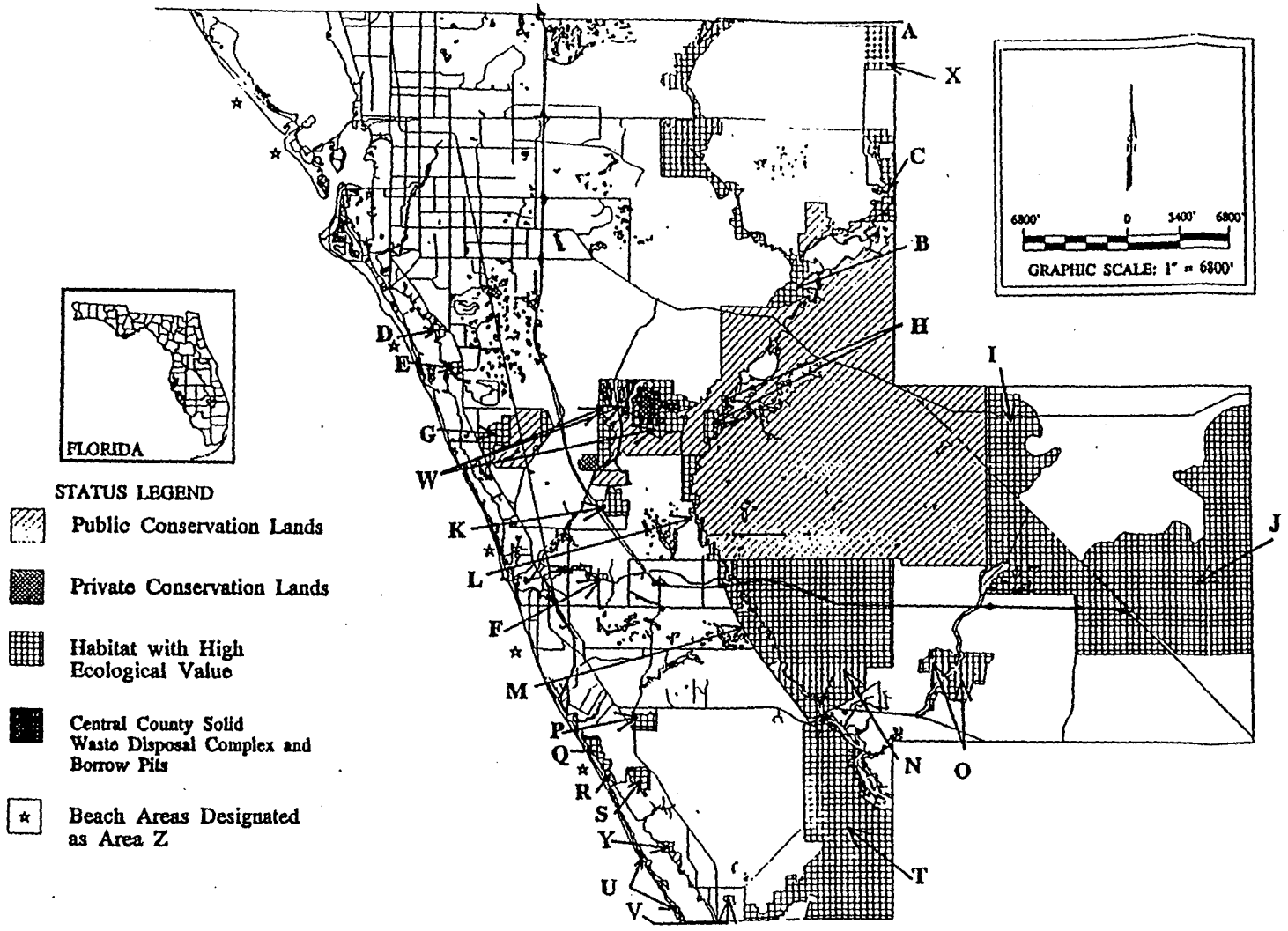
CURRENT AND PROPOSED AREAS FOR LAND ACQUISITION

During the June 18, 1996 Public Workshop on the Sarasota Bay SWIM Plan, members of the public made the request that current and proposed areas for land acquisition in the Sarasota Bay watershed be included in the Sarasota Bay SWIM Plan.

For Manatee County, the enclosed map depicts the efforts of the County's Environmental Lands Management and Acquisition Advisory Committee (ELMAC). Pre-selected parcels are shown in solid black, as are areas approved for purchase by SWFWMD, and lands already purchased by SWFWMD.

For Sarasota County, the enclosed map depicts the efforts of the Board of County Commissioners Environmentally Sensitive Land Protection Program. The tracts of land identified have been approved by the Sarasota County Environmentally Sensitive Lands Advisory Committee.


Conservation Lands
ELMAC Pre-selected Parcels shown in Solid Black
Watershed Boundaries
Watershed Protection Boundaries
Duette Park
SWFWMD Acquired
SWFWMD Approved
SWFWMD Study Areas



BIOLOGICAL RESEARCH ASSOCIATES, INC.
A DIVISION OF GENESIS GROUP, INC.

DJD	20 SEPTEMBER 1995
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SITES OF HIGH ECOLOGICAL VALUE IN SARASOTA COUNTY

APPENDIX E

SARASOTA BAY NATIONAL ESTUARY PROGRAM'S

COMPREHENSIVE CONSERVATION AND MANAGEMENT PLAN