SARASOTA BAY WATERSHED MANAGEMENT PLAN

for the Sarasota Bay Planning Unit, Florida

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Introduction

This document provides reasonable assurance that the activities of the Sarasota Bay Management Conference, and the implementation of the Comprehensive Conservation and Management Plan (CCMP) for Sarasota Bay, will restore and maintain water quality conditions to levels set forth in the Impaired Surface Waters Rule (IWR), Chapter 62-303, Florida Administrative Code (F.A.C.). It presents an overview of the impaired waters in the Sarasota Bay Planning Unit and documents management activities by local programs that will be implemented to address the impairments.

The report provides a schedule and performance expectations for addressing the impairments that may exceed those of total maximum daily load (TMDL) implementation, or those of a Basin Management Action Plan following TMDL development. A TMDL represents the maximum amount of a given pollutant that a waterbody can assimilate and meet the waterbody's designated uses (such as drinking water, recreation, and shellfish harvesting). A waterbody that does not meet its designated uses is defined as impaired.

The Sarasota Bay stakeholders group was originally formed as the Sarasota Bay Management Conference in 1989 to develop and implement a comprehensive restoration plan for the bay and watershed, with a major focus on baywide water quality and related resource management issues. The Management Conference consists of elected and appointed officials representing governments and agencies involved in bay restoration and management; it includes both a citizen and technical committee. The goal of the Management Conference is to improve surface water quality in Sarasota Bay Planning Unit watersheds verified as impaired, with the purpose of attaining Class III water quality standards.

The Sarasota Bay National Estuary Program (SBNEP) has formed a Water Quality Consortium through an Interlocal Agreement (IA) approved on July 23, 2004, to oversee the implementation of the action plans outlined in this document. The IA establishes the SBNEP as a Special District of the state. The agency established through the IA became operational on October 1, 2004.

Contents of the Report

Chapter 1 describes the purpose of the report, provides information on the activities that are already under way to improve water quality in Sarasota Bay and its tributaries through the National Estuary Program's Management Conference structure, and provides information on FDEP's Total Maximum Daily Load (TMDL) Program. The chapter also describes the Sarasota Bay Planning Unit's physical setting and summarizes water quality status and trends for drainage basins with impaired waters and for Sarasota Bay.

Chapter 2 lists the impaired waters in the planning unit, summarizes the data analysis process, and provides a number of recommendations to FDEP before the adoption of the Sarasota Bay Planning Unit Verified List. In addition, it describes the pollutants causing impairment and the suspected or documented sources of the pollutants. Chapter 3 describes the water quality or aquatic ecological goals for impaired waters in the planning unit.

Chapter 4 provides details on the management activities to reduce pollutant loads and provide reasonable assurance that water quality standards will be met for impaired waters. Finally, Chapter 5 presents procedures for monitoring and reporting results, and Chapter 6 describes proposed corrective actions if water quality does not improve as expected.

Reasonable Assurance

The Sarasota Bay National Estuary Program (SBNEP) prepared this package in accordance with provisions of the Florida Watershed Restoration Act of 1999, specifically Subsection 403.067–4–Approved List. As required by the act, the Florida Department of Environmental Protection (FDEP) evaluates whether existing programs, including the National Estuary Program, and existing or propsosed pollution control mechanisms, will effectively address the impairment before placing a water on the state's Verified List of impaired waters. If FDEP can document that there is reasonable assurance that a control measure will effectively address an impairment, then the waterbody will not be placed on the final Verified List, and TMDL development and implementation will not be required.

Reasonable assurance consists of (1) the implementation of proposed pollution control mechanisms for addressing impaired waters that will result in the attainment of applicable water quality standards (designated uses) at a clearly defined point in the future, and (2) reasonable progress towards the restoration of designated uses by the time the next 303(d) list of impaired waters is due to be submitted to the U.S. Environmental Protection Agency (EPA). An FDEP memorandum published in February 2002 specifies the information that should be documented for an assessment of reasonable assurance.[1]

Water quality–based targets or aquatic ecological goals, both interim and final, have been established for the pollutants causing impairment, in order to measure whether reasonable progress is being made towards the restoration of designated uses. Site-specific alternative criteria (SSACs) can also be used as interim targets.

Chlorophyll is used as a surrogate measure for nutrients. The current FDEP chlorophyll standard for Sarasota Bay is 11 micrograms per liter (μg/L), based on the IWR, and is expressed as an annualized average. For coliform bacteria, load reduction estimates are developed, based on the average percent reduction required to achieve a fecal coliform concentration less than the state threshold of 400 colony-forming units per 100 milliliters (cfu/100mL). The averages will be calculated monthly. Using this methodology, the target for fecal coliform bacteria from human

[1] *Guidance Document for Development of Documentation to Provide Reasonable Assurance that Proposed Pollution Control Mechanisms will Result in the Restoration of Designated Uses in Impaired Waters* (FDEP memorandum, February 2002).

sources is the achievement of Class III water quality standards, which must support recreation, propagation, and maintenance of a healthy, well-balanced population of fish and wildlife.

Impaired Waters

The relatively low number of impaired segments with waterbody identification numbers (WBIDs) in the Sarasota Bay Planning Unit, based on FDEP's recent assessment for the Total Maximum Daily Load (TMDL) Program, is due to the successful implementation of the CCMP and SWIM Plan by Sarasota Bay partners, as documented in this report. Over XX million have been spent on the implementation of various projects to date, and another XX million in expenditures are already programmed.

The results of these efforts have been significant. ***For example, since the implementation of projects outlined in the CCMP and SWIM Plan, the number of WBIDs impaired for chlorophyll (due to excess nutrients) has dropped from 13 on the 1998 303(d) list of impaired waters to only 2 (Palma Sola Bay and Clark Lake). Only 1 (Clark Lake) is a high-priority waterbody scheduled for a TMDL in 2005. Delisting has been requested for 3 other WBIDs (Clower Creek, Roberts Bay, and Blackburn Bay) due to data quality issues or recent declining trends.***

Not only were 13 WBIDs impaired for a number of different parameters before the implementation of the CCMP and SWIM Plan, but there were also widespread water quality problems throughout the planning unit. Efforts to improve water quality are now more focused, and will need to be redoubled to achieve further improvements.

The following sections identify, by drainage system, the WBIDs that are currently impaired and the parameters causing impairment. They briefly describe the problems causing the impairment, the major management actions and projects that are being implemented or proposed, progress towards goals, the amount spent (if available) for each project, on what schedule future improvements can be expected, and how they will be identified.[2]

Palma Sola Bay System

Palma Sola Bay (WBID 1883) is impaired for bacteria and nutrients (chlorophyll).

Palma Sola Bay is in northern part of the Sarasota Bay system. The embayment is bisected by a causeway (State Road 64) that has impeded natural circulation. Several creeks flow to Palma Sola Bay through residential and commercial development including Palma Sola Creek and Palma Sola Creek 2. Loading estimates are shown in the table below.

[2] Although mercury is identified as a pollutant causing impairment in a number of WBIDs in the Sarasota Bay Planning Unit, it is not addressed in this report, because it is a statewide problem with widespread sources that are not controlled by the Sarasota Bay stakeholder group.

Watershed Name	Acres	Total Runoff (in)	TP (lb)	TN (lb)	Lead (lb)	Zinc (lb)
West Bradenton	4395	28.9	7250	35910	1490	1410
Palma Sola Creek 2	1120	25.1	1640	8340	350	320
South Bradenton	4635	27.9	12550	56260	590	1120
Palma Sola Creek	900	23.5	1710	7490	230	220
Perico Island	860	33.1	1040	4750	50	100

In the Palma Sola Creek 2 watershed, there are agricultural operations (ornamental flower nurseries) and several golf courses in the watershed that are potential sources of nutrients. The Palma Sola Creek 2 watershed is presently undergoing development activity converting agricultural lands to medium density residential development.

The Palma Sola Creek watershed is developed in low, medium and several high density residential developments. No industrial activity is noted in the region.

The Palma Sola causeway is used on weekends as a recreational destination. Alcoholic beverage consumption was banned from the causeway several years ago which has significant reduced weekend use. The causeway is a location for dog walking and horseback riding as well as fishing and boating. A boat launch is also on the causeway. The SBEP recently completed a restoration project restoring a historic cut to Perico Bayou and Palma Sola Bay to increase flushing. Water transfer will be further enhanced through the Robinson preserve project that will connect Palma Sola Bay and Tampa Bay with a canoe trail. The main sewer transmission line to Perico and Anna Maria Islands runs under the causeway. The source of bacteria contamination has not been identified; funds have been made available for such purpose.

The other watersheds that drain directly to the Bay are comprised of low/medium density residential land uses.

Bowlees Creek System

Bowlees Creek (WBID 1896) is impaired for fecal coliform, total coliform, and nutrients (chlorophyll).

This highly urbanized, 10-square-mile watershed in southwestern Manatee County drains to Sarasota Bay. Extensive dredging and filling has been carried out through the system and at the mouth of Bowlees Creek since the 1920s. During the last decade, maintenance dredging has also been carried out to remove sediments and improve navigation at the mouth of the creek.

Because of the extensive hydrological modifications in the watershed, the impaired segment may be acting as a sink for sediments and nutrients. Research is under way to determine the source of the fecal contamination.

Segments in Sarasota Bay adjacent to WBID 1896 have low concentrations of chlorophyll and fecal coliform bacteria, and seagrass beds in adjacent areas are healthy. In addition, trends in chlorophyll and total and fecal coliform bacteria in Bowlees Creek have declined in recent years, possibly because of a return to more normal rainfall patterns and wastewater improvements.

Phillippi Creek System

Matheny Creek (WBID 1975B) is impaired for fecal coliform. Phillippi Creek (WBID 1937) is impaired for fecal and total coliform bacteria; and Phillippi Creek (WBID 1947) is impaired for total coliform bacteria. Clower Creek (WBID 1975AA) is impaired for nutrients (chlorophyll), and Roberts Bay (WBID 1968D) is impaired for nutrients (chlorophyll).

Note: The SBEP has requested FDEP consider the delisting of Clower Creek (1975 AA) and Roberts Bay (1968 B). Clower Creek (1975AA) has one high 150 ug/l value for chlorophyll a. Trends in annual average chlorophyll for Roberts Bay have been declining however, the calculated historic chlorophyll value of 7.2 ug/l was exceeded by 0.13 ug/l in 2004. Clower Creek (1975AA) has not been addressed in this plan pending a decision by FDEP on verification of impairment.

The Phillippi Creek system, a highly urbanized watershed in west-central Sarasota County, is a channelized drainage system covering about 41 square miles. Numerous septic tanks and small treatment plants were constructed during the 1980s, and the failure rates of septic tanks in the region are high. The Florida Department of Health has posted the creek as "No Swimming; No Fishing," and shellfish harvesting has not been approved for more than 25 years.

About 15,000 homes and businesses in the watershed, producing about 3 million gallons per day of wastewater, are on septic systems, including several large areas near Phillippi Creek. Fecal coliform concentrations routinely exceed the state standard in both Phillippi and Matheny Creeks. The impairment is likely caused by septic tank systems. However, coliform concentrations in Phillippi Creek have recently exhibited a downward trend.

Management Activities

To improve water quality, SBNEP is implementing a number of significant management activities. Other important activities, such as FDEP/EPA National Pollutant Discharge Elimination System (NPDES) Program and Southwest Florida Water Management District (SWFWMD) resource regulation (i.e., Environmental Resource Permits for stormwater discharges), are also under way. This report does not discuss these activities, however, because other agencies oversee the implementation of these programs.

The following activities are expected to measurably reduce either chlorophyll (nutrients), or total and fecal coliform bacteria concentrations, or both, in impaired waterbody segments in the Palma Sola Bay, Bowlees Creek, and Phillippi Creek systems:

A. Septic System Replacement Program

The Phillippi Creek Septic System Replacement Program (PCSSRP) is being implemented to abandon septic systems and improve wastewater treatment/disposal by connecting approximately 14,000 homes and businesses to central sewer in the Phillippi Creek watershed. The program will significantly reduce nitrogen and total and fecal coliform bacteria loading to Phillippi Creek (WBIDs 1937 and 1947) and Matheny Creek (WBID 1975B). The interim water quality targets consist of reducing by 20% the exceedances of total and fecal coliform bacteria criteria, and reducing nitrogen loads to achieve <11 ug/L chlorophyll in Roberts Bay, which is the receiving water for Phillippi Creek. Currently, the exact load reduction has not been determined due to the complexity of the spatial distribution, soil conditions, and potential loading rate of each septic tank system.

Approximately 1,500 septic systems have been removed to date. About 8,170, or 58%, of the septic tanks will be removed by 2007, and it is anticipated that the remaining 42% will be removed by 2012. The cost for the initial implementation phases of the PCSSRP was estimated at $121 million in 2003. Associated project costs total $68 million. At this point, the program is not fully funded through completion, and Sarasota County is pursuing federal and state funds to continue implementation.

B. Regional Wastewater Improvement Programs

The interim water quality targets consist of reducing by 20% the exceedances of total and fecal coliform bacteria criteria, and reducing nitrogen loads to achieve <11 ug/L chlorophyll in Roberts Bay. Achieving advanced wastewater treatment (AWT) standards at the city of Sarasota's plant in 1991 reduced the plant's nitrogen loading to the bay by 80 to 90%, a 14% decline in loadings baywide. In the early 1990s, Manatee County also upgraded its wastewater treatment plant and installed a deep-well injection system, and many of Sarasota County's wastewater plants also upgraded to AWT or installed deep-well injection systems. Sarasota County has systematically removed several small treatment plants in the Sarasota Bay watershed, and additional small package plants are being removed systematically throughout the county based on a rating system.

The City of Sarasota has also spent approximately $77 million over the past several years to improve wastewater distribution and treatment in the Sarasota Bay watershed. Numerous wastewater distribution system upgrades and maintenance activities have taken place during the past several decades.

Manatee County has also made the Bowlees Creek area a priority for sewer line inspections during the past several years. A phased project to retrofit the Trailer Estates Mobile Home Park, in order to reduce the potential for sewer overflows or leaks that could reach Bowlees Creek during incoming tides, is currently in design and permitting. The Holiday Inn Marina has been modernized, and live-aboards were phased out in 2004.

C. Wastewater Reclamation Activities

The interim water quality targets consist of reducing by 20% the exceedances of total and fecal coliform bacteria criteria, and reducing nitrogen loads to achieve <11 ug/L chlorophyll in Roberts Bay. The CCMP has recommended the development of a regional wastewater reclamation system for Manatee and Sarasota Counties. In 1995, the SWFWMD's Manasota Basin Board requested that a master water reuse plan be developed. Currently, Sarasota County and the city of Sarasota have interconnected their reclaimed water reuse networks to provide for an extensive reuse system in northern Sarasota County. SBNEP has assisted the city and the county in completing reclaimed water aquifer storage and recovery (ASR) feasibility studies associated with each system.

In 1990, the Agricultural/Urban Reuse Project pumping station and transmission main—which supplies reclaimed water to a number of facilities—was completed, along with the 185-million-gallon reclaimed Water Storage Pond "A" at the Hi-Hat Ranch. The city-owned property (Site III) was added to this system in 1993. In 1993, construction began on a separate distribution system for reuse within the city limits, and a number of projects have been completed.

Manatee County has developed the Manatee Agricultural Reuse Supply (MARS) to develop a reliable reclaimed water supply system to serve agricultural needs, thus preserving a portion of high-quality water resources to meet Manatee County's drinking water demands. The system is expected to cost $35 million, with half the funds to be provided by SWFWMD and the federal government. A regional approach to reuse has been selected for Sarasota and Manatee Counties, focusing on reuse systems around Bradenton–Palmetto, Sarasota, and Venice, and using aquifer storage and technology to increase reclaimed water capability.

The Sarasota Bay region now reclaims about 46% of its wastewater from treatment plants for reuse. This percentage will increase in the future as the demand for water increases. In addition to the substantial environmental benefits achieved by removing this nitrogen source to the bay, wastewater reuse may defer the construction of wellfields, reduce capital investment in potable water treatment and storage facilities, and reduce long-term ground water impacts in the SWUCA. In essence, the region is working toward solving both water supply and nitrogen pollution problems simultaneously.

Stormwater reuse is also being considered regionally. Sarasota County recently completed a feasibility study to evaluate the conversion of the Atlantic Wastewater Treatment Plant on Phillippi Creek to a stormwater treatment facility.

D. Regional Stormwater Improvement Projects

The interim water quality targets consist of reducing by 20% the exceedances of total and fecal coliform bacteria criteria, and reducing nitrogen loads to achieve <11 ug/L chlorophyll in Roberts Bay.

Sarasota County has constructed the Celery Fields Regional Stormwater Facility in the Phillippi Creek watershed (in WBID 1947) at a cost of approximately $30 million. The system removes about 40 to 50% of fecal coliform bacteria. The county is currently expanding the capacity of the system to provide additional storage and water quality treatment components. The Phillippi Creek Levee Project (Phillippi Creek, WBID 1947) was constructed at a cost of $5.2 million to reduce flooding and improve water quality. The levee project has also helped to prevent wastewater transfer and lift stations (both in the city and the county) from being flooded during extreme storm event conditions. Several other stormwater projects have been completed in Sarasota County at Clower Creek and Aqualane Canal, and others are under construction.

Manatee County has embarked on several major retrofitting projects to improve water quality in Bowlees Creek (WBID 1896). These include cooperative projects with SBNEP and SWFWMD's SWIM Program. Projects completed or in the planning phases include the Airport Retrofit, a master stormwater plan to characterize stormwater conveyance and pollutant loadings in the basin, the Nicholson Drainage Channel Stormwater Treatment Project, the Lake Brendan project to expand treatment capacity, the Trailer Estates project to reduce potential sewer overflows or leads containing fecal contamination, and the Holiday Inn modernization and phasing-out of live-aboards.

E. Land Acquisition Programs

No specific interim water quality targets have been set; land acquisition will reduce future potential population growth in the watershed and reduce total nitrogen and fecal coliform loads.

F. Habitat Restoration Activities

SBNEP has planned and constructed 35 wetland restoration projects, 20 artificial reef projects, and 2 oyster restoration projects throughout the Sarasota Bay region, creating approximately 200 acres of habitat. An additional 30 projects totaling approximately 584 acres of restored habitat are currently planned over the next 5 to 10 years by SBNEP and various partnering agencies, including Sarasota and Manatee Counties, the town of Longboat Key, U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, SWFWMD, and FDEP.

G. Education and Outreach Activities

No specific interim water quality targets have been set for reductions in chlorophyll (nutrients) and coliform bacteria. A number of environmental education initiatives listed in the CCMP are ongoing throughout the Sarasota Bay watershed. Activities include the PIER Program (annual cost, $30,000), the Sarasota County Water Atlas (annual cost, $10,000), and the Florida Yards & Neighborhoods Program (annual cost, $130,000).

H. Research Activities

No specific interim water quality targets have been set for reductions in chlorophyll (nutrients) and coliform bacteria. Activities include the Sarasota Bay integrated water resource evaluation (cost, $126,000), Sarasota Bay seagrass analysis (cost, $30,000), TMDL support—tributary analysis (cost, $40,000), water quality control retrofits for urban stormwater (cost, $50,000), improved landscape management practices (cost, $120,000), and urban ecosystem analysis (cost, $50,000).

I. Water Conservation Programs

No specific interim water quality targets have been set for reductions in chlorophyll (nutrients) and coliform bacteria. Programs include Sarasota County's Water Efficient Landscape Ordinance and Get WET (Water Efficient Toilet) Toilet Rebate Program, Manatee County's Water Conservation Rebate Program, and SWFWMD's Water-Wise Landscape Recognition Program.

Studies recently synthesized by USGS for the SBEP indicate an upward pressure gradient in the local ground water table. The analysis also indicated a clay confining layer approximately 20-30 feet below the surface. Therefore, water usage in the region is likely linked to the volume of groundwater discharge to surface waters. Decreased usage in the region should therefore decrease overall volume of discharge and decrease loading of both fecal coliform and nitrogen to surface systems.

J. Marina Upgrades/Improvements

The Holiday Inn Marina on Bowlees Creek (WBID 1896) no longer allows live-a-board vessels in their facility, possibly resulting in declines in bacteria contamination. It was suspected that the live-a-boards were directly discharging wastewater to the surface waters near the sampling station in this WBID.

K. Improved tidal circulation in hydrologically altered systems

The SBEP is investigating projects to improve tidal circulation in hydrologically altered systems throughout the bay. An example of this is a recently completed restoration project restoring a historic cut to Perico Bayou and Palma Sola Bay to increase flushing.

L. Managed Recreational Use

Additional management measures will be developed in high recreational use areas to reduce bacterial loading. This may include limitations on pet or horseback riding activities at recreational beaches or parks adjacent to sensitive waterbodies.

CHAPTER 1: INTRODUCTION

Purpose of Document

The purpose of this document is to provide reasonable assurance that the activities of the Sarasota Bay Management Conference and the implementation of the Sarasota Bay National Estuary Program's (SBNEP) Comprehensive Conservation and Management Plan (CCMP) for Sarasota Bay will restore and maintain water quality conditions in the Sarasota Bay Planning Unit, such that Class III water quality standards are met in waterbody segments identified as impaired in the 1998 303(d) list of impaired waters and through the Impaired Surface Waters Rule (IWR). An impaired waterbody is one that does not meet its designated use (such as drinking water, recreation, and shellfish harvesting).

Table 1-1 lists the impaired waters and parameters causing impairment in the Sarasota Bay Planning Unit, by drainage system. Total maximum daily loads (TMDLs) must be developed for all waters identified as impaired through the IWR, unless the impairment is documented to be a naturally occurring condition that a TMDL cannot abate, or there is documentation of reasonable assurance that water quality standards will be met through a management plan already in place to correct the problem. A TMDL represents the maximum amount of a given pollutant that a waterbody can assimilate and remain healthy, such that all of its designated uses are met. The SBNEP CCMP provides a framework for future restoration activities and, if fully implemented, should result in the attainment of water quality standards throughout the Sarasota Bay Planning Unit.

Table 1-1. WBIDs and parameters addressed through the Sarasota Bay Reasonable Assurance Plan

WBID	Waterbody Name	Waterbody Type	Acres	Parameters Causing Impairment
Palma Sola Bay System				
1883	Palma Sola Bay	Estuary	2,191	Bacteria, nutrients (chlorophyll)
Bowlees Creek System				
1896	Bowlees Creek	Estuary	6,313	Fecal coliform, total coliform, nutrients (chlorophyll)
Phillippi Creek System				
1975B	Matheny Creek	Stream	73	Fecal coliform
1937	Phillippi Creek	Stream	5,951	Fecal coliform, total coliform, unionized ammonia
1947	Phillippi Creek	Estuary	16,242	Total coliform
1975AA*	Clower Creek	Estuary	530	Nutrients (chlorophyll)
1968D*	Roberts Bay	Estuary	2,842	Nutrients (chlorophyll)

***Note: the SBEP has requested FDEP consider the delisting of Clower Creek (1975 AA) and Roberts Bay (1968 B).**

To provide documentation of reasonable assurance, this report reviews and analyzes water quality data for the Sarasota Bay Planning Unit and describes projects and plans to address impairments in the individual waterbody segments identified in **Table 1-1** that are caused by elevated levels of total and fecal coliform bacteria, chlorophyll, unionized ammonia, and low dissolved oxygen. Of particular significance in addressing these impairments are the improvements in wastewater effluent discharges to the bay and the associated improvements in reducing bacterial and nutrient loads and chlorophyll concentrations (phytoplankton blooms). The report also provides a schedule and performance expectations that may well exceed those of TMDL implementation, or of a Basin Management Action Plan (BMAP) following TMDL development.

The content of this document follows the elements described in the Florida Department of Environmental Protection's (FDEP) February 2002 memorandum, ***Guidance Document for Development of Documentation to Provide Reasonable Assurance that Proposed Pollution Control Mechanisms will Result in the Restoration of Designated Uses in Impaired Waters*** (**Appendix A**). To provide reasonable assurance that existing or proposed pollution control mechanisms will restore designated uses, the guidance document specifies the information that should be evaluated and documented for the Administrative Record, as follows:

- ***A Description of the Impaired Water****—name of the water listed on the Verified List of impaired waters, the location of the waterbody and watershed, the watershed/8-digit cataloging unit code, the U.S. Geological Survey's (USGS) National Hydrography Dataset (NHD) identifier, the waterbody type (lake, stream, or estuary), the water use classification (the functional designation applied to each water, such as drinking water, recreation, and shellfish harvesting), the designated use not being attained, the length (miles) or area (acres) of the impaired waterbody, the pollutant(s) of concern (i.e., those identified as causing or contributing to the impairment), and the suspected or documented source(s) of the pollutant(s) of concern.*

- ***A Description of the Water Quality or Aquatic Ecological Goals****—a description of the water quality–based targets or aquatic ecological goals (both interim and final) that have been established for the pollutant(s) of concern, the averaging period for any numeric water quality goals, a discussion of how these goals will result in the restoration of the waterbody's impaired designated uses, a schedule indicating when interim and final targets are expected to be met, and a description of procedures (with thresholds) to determine whether additional (backup) corrective actions are needed.*

- ***A Description of the Proposed Management Actions To Be Undertaken****—names of the responsible participating entities (government, private, others), a summary and list of existing or proposed management activities designed to restore water quality, the geographic scope of any proposed management activities, documentation of the estimated pollutant load reduction and other benefits anticipated from implementation of individual management actions, copies of written agreements committing participants to the management actions, a discussion on how future growth and new sources will be addressed, confirmed sources of funding, an implementation schedule (including interim*

milestones and the date by which designated uses will be restored), and any enforcement programs or local ordinances, if the management strategy is not voluntary.

- ***A Description of Procedures for Monitoring and Reporting Results****—a description of the water quality monitoring program to be implemented (including station locations, parameters sampled, and sampling frequencies) to demonstrate reasonable progress; quality assurance/quality control elements that demonstrate the monitoring will comply with Rule 62-160, Florida Administrative Code (F.A.C.); procedures for entering all appropriate data into STORET, the U.S. Environmental Protection Agency's (EPA) national water quality database; the responsible monitoring and reporting entity; the frequency and format for reporting results; the frequency and format for reporting on the implementation of all proposed management activities; and methods for evaluating progress towards goals.*

- ***A Description of Proposed Corrective Actions****—a description of proposed corrective actions (and any supporting document[s]) that will be undertaken if water quality does not improve after implementation of the management actions or if management actions are not completed on schedule, and a process for notifying FDEP that these corrective actions are being implemented.*

Chapters 2 through 6 discuss each of these elements as they apply to the Sarasota Bay Planning Unit. At the beginning of each chapter, the specific guidance contained in FDEP's February 2002 memorandum is cited. This provides a "checklist" for ensuring that the information in each chapter is complete. The documentation, which will become part of the Administrative Record, is important because the Verified List for the Sarasota Bay–Peace–Myakka Basin will be adopted by order of FDEP's Secretary, and third parties will be provided an opportunity to challenge, through an administrative hearing, all listing decisions (to list and not to list a water for a given pollutant).

Background

Comprehensive Conservation and Management Plan for Sarasota Bay

In 1986, community leaders and scientists from Mote Marine Laboratory in Sarasota began to compile information documenting the problems and issues facing Sarasota Bay. With this information, community leaders sought congressional support to include Sarasota Bay in pending federal legislation: the Water Quality Act. In 1987, the U. S. Congress named Sarasota Bay as an estuary of "national significance." In 1989, Sarasota Bay was formally designated as a part of the National Estuary Program.

As specified in the legislation, in 1989 a stakeholders group was formed as the Sarasota Bay Management Conference to address baywide water quality and resource management issues, and to develop partnerships among stakeholders. The Management Conference comprises 20 governmental agencies that are represented on a Management and Policy Committee. It also includes a citizens' committee (20 members) and a technical advisory committee (75 members).

These federal, state, regional, and local officials were responsible for overseeing the development and implementation of a final Comprehensive Conservation and Management Plan (CCMP) for Sarasota Bay in 1995. The Sarasota Bay National Estuary Program (SBNEP) Policy Committee established the goals, objectives, budgets, and work plans for the conference and helped to establish local and regional policy to improve the bay and tributaries.

The following priority concerns for Sarasota Bay were identified early in the process:

- Declines in water (clarity) and sediment quality,
- Loss of wetlands and other coastal habitats,
- Loss of seagrasses,
- Declines in finfish and shellfish populations, and
- Overuse.

The implementation of the CCMP was actually initiated in the early 1990s, well before the signing of the final CCMP, as the SBNEP Policy Committee made "action now" a principal theme. Nitrogen pollution was identified early on as a major concern in relation to chlorophyll and water clarity in the bay. No specific goal was established for seagrass recovery, but in 1994 a nitrogen load reduction target was set at 48% of 1989 levels. The implementation of the CCMP has resulted in significant improvements in the watershed during the past nine years.

The SBNEP has formed a Water Quality Consortium (**Appendix A**) to review the applicability of state standards and to set new standards as applicable through site-specific alternative criteria (SSACs). SSACs are moderating provisions used when the costs of applying water quality standards are determined to outweigh the benefits, and are designed to ensure the attainment of water quality standards.

In 1996, Sarasota Bay became a state Surface Water Improvement and Management Program (SWIM) priority waterbody for restoration, and the Sarasota Bay SWIM Plan was approved in 1997. This designation provided for the use of SWIM program funding to achieve the goals outlined in the CCMP. The SWIM Program addresses a waterbody's needs as a system of connected resources, rather than isolated wetlands or waterbodies. The Sarasota Bay SWIM Plan, developed by the Southwest Florida Water Management District (SWFWMD), focuses on cooperative efforts among federal, state, and local governments and the private sector to restore the bay's damaged ecosystems, prevent pollution from runoff and other sources, and educate the public.

The relatively low number of impaired waters in the Sarasota Bay Planning Unit, based on FDEP's recent assessment for the Total Maximum Daily Load (TMDL) Program, is due to the successful implementation of the CCMP and SWIM Plan by Sarasota Bay partners, as documented in this report. ***Since the implementation of projects outlined in the CCMP and SWIM Plan, the number of segments with waterbody identification numbers (WBIDs) that were impaired for chlorophyll (due to excess nutrients) has dropped from 13 on the 1998 303(d) list of impaired waters to only 2 (Palma Sola Bay and Clark Lake). Only one (Clark Lake) is a high-priority waterbody scheduled for a TMDL in 2005. Delisting has been***

requested for three other WBIDs (Clower Creek, Roberts Bay, and Blackburn Bay) due to data quality issues or recent declining trends.

Total Maximum Daily Load Program

Section 303(d) of the 1972 federal Clean Water Act requires states to submit to the U.S. Environmental Protection Agency (EPA) lists of surface waters that do not meet applicable water quality standards and establish TMDLs for each of these waters on a schedule. A TMDL represents the maximum amount of a given pollutant that a waterbody can assimilate and remain healthy, such that all of its designated uses are met.

The 1999 Florida Watershed Restoration Act (Chapter 99-223, Laws of Florida) included a provision that required FDEP to develop a methodology for identifying impaired waters (i.e., those not meeting their designated use). The Identification of Impaired Surface Waters Rule (IWR) (Rule 62-303, F.A.C.) was formally adopted in 2001. It provides FDEP with a science-based approach to evaluating water quality data in order to identify impaired waters and establishes specific criteria for impairment, as well as thresholds for data sufficiency and data quality, based on a statistical approach designed to provide greater confidence that the outcome of the water quality assessment is correct.

TMDLs are currently being developed, and the corresponding reductions in pollutant loads allocated, as part of FDEP's watershed management approach, which rotates through the state's 52 river basins over a 5-year cycle. This approach does not focus on individual causes of pollution. Instead, each basin is assessed as an entire functioning system. Water resources are evaluated from a basinwide perspective that considers the cumulative effects of human activities and are managed on the basis of natural boundaries, such as river basins, rather than political or regulatory boundaries.

The watershed management approach is not new, nor does it compete with or replace existing programs. Rather than relying on single solutions to water resource issues, it is intended to intended to protect and enhance the ecological structure, function, and integrity of Florida's watersheds and provide a framework for setting priorities; focusing resources on protecting and restoring water quality; increasing cooperation among state, regional, local, and federal interests; and strengthening public support and involvement. It aims to strengthen coordination among such activities as monitoring, stormwater management, wastewater treatment, wetland restoration, land acquisition, and public involvement, and to speed up projects by focusing funding and other resources on priority water quality problems, establishing agreements, and funding multiagency projects. It avoids duplication by building on existing assessments and restoration activities and promotes cooperative monitoring programs. It also encourages accountability for achieving water quality improvements through improved monitoring and the establishment of TMDLs.

Determining impairment in individual waterbodies takes place in two phases. First, in each river basin or bay, FDEP evaluates existing water quality data, using the methodology in the IWR. Waters found to be potentially impaired are placed on a *Planning List* for further assessment. Once additional data gathering and strategic monitoring have been carried out, FDEP determines

if these potentially impaired waters are, in fact, impaired and if the impairment is caused by pollutant discharges. Following the publication of the Planning List, FDEP and interested parties have approximately one year (i.e., Phase 2 of the watershed management cycle) to monitor waters on the Planning List and prepare documentation, as appropriate, to provide reasonable assurance that impaired waters will be restored.

At the end of Phase 2, a *Verified List* of impaired waters is developed, which is adopted by order of FDEP's Secretary in accordance with the Florida Watershed Restoration Act and submitted to the EPA for approval as the state's Section 303(d) list of impaired waters for the basin. TMDLs must be developed for waters on the Verified List, under Subsection 403.067(4), Florida Statutes (F.S.), unless the impairment is documented to be a naturally occurring condition that a TMDL cannot abate, or there is documentation of reasonable assurance that water quality standards will be met through an existing management plan.

Under the IWR (Section 62-303.600, F.A.C., Evaluation of Pollution Control Mechanisms), reasonable assurance is defined as the following:

1. *Upon determining that a waterbody is impaired, FDEP shall evaluate whether existing or proposed technology-based effluent limitations and other pollution control programs under local, state, or federal authority are sufficient to result in the attainment of applicable water quality standards.*

2. *If, as a result of the factors set forth in (1), the waterbody segment is expected to attain water quality standards in the future and is expected to make reasonable progress towards attainment of water quality standards by the time the next 303(d) list is scheduled to be submitted to EPA, the segment shall not be listed on the Verified List. The Department shall document the basis for its decision, noting any proposed pollution control mechanisms and expected improvements in water quality that provide reasonable assurance that the waterbody segment will attain applicable water quality standards.*

Reasonable assurance must be provided for **each pollutant** that is documented to be causing impairment of a waterbody segment. However, some entities, including FDEP, may want to provide reasonable assurance only for selected pollutants. As a result, the waterbody segment would not be listed as impaired for those pollutants, but would still be listed for others. In this event, TMDLs will only be developed for the remaining listed pollutants.

Under the Florida Watershed Restoration Act and the IWR, the pollution control mechanisms or watershed restoration plan must provide reasonable assurance that designated uses (such as will be met at some time **in the future**. Thus the documentation submitted to FDEP must provide a specific date when designated uses (such as drinking water, recreation, and shellfish harvesting) are expected to be restored. When designated uses will not be met for many years, the documentation must also justify the specified time needed to restore designated uses.

Chapter 1

Physical Setting

(A large map showing all the drainage systems together, and then separate maps for each system, with all of the impaired waters discussed here identified, would provide the reader with a context for understanding the later discussion. Map(s) would need to be considerably more detailed than Figure 1-1, but the overlay of the WBIDs as in Figure 1-2 obscures a lot of detail.

The Sarasota Bay Planning Unit is located in southwest Florida between Tampa Bay and Lemon Bay. The watershed and bay comprise approximately 430 square miles, or 275,186 acres (**Figure 1-1**). The planning unit extends from the Interstate 75 corridor in the east to the Gulf of Mexico, to a depth of approximately 30 feet. The region includes some of Florida's most beautiful and productive estuaries, as well as numerous freshwater and saltwater wetlands and several tidally influenced coastal streams and sloughs. The latter are typically intersected by human-made drainage canals.

The watershed encompasses the barrier islands, tributaries, and uplands surrounding the bay. The bay, which covers 52 square miles of open water, extends from Venice Inlet in the south through Anna Maria Sound and Palma Sola Bay in the north. It comprises two major embayments—Sarasota Bay and Little Sarasota Bay—and many smaller embayments, and is encompassed by parts of Manatee County to the north and Sarasota County to the south. Seven municipalities bound Sarasota Bay: Bradenton, Anna Maria, Holmes Beach, Bradenton Beach, Longboat Key, Sarasota, and Venice.

The Sarasota Bay community is home to more than 550,000 people in Manatee and Sarasota Counties, which encompass nine incorporated cities or towns. The communities within Manatee and Sarasota County depend on the bay for both recreation and commerce. Boating, fishing, swimming, and nature tours are a few typical recreational uses that also help support more than 50 water-dependent industries. The bay and beaches are also at the center of a multimillion-dollar tourism industry. Tourism is the number one industry in Sarasota County and number two in Manatee County. Florida's seasonal community, while promoting the tourism economy, presents a challenge to environmental education and protection efforts. However, a public opinion survey conducted for the SBNEP in 1990 revealed a general concern for the bay's health.

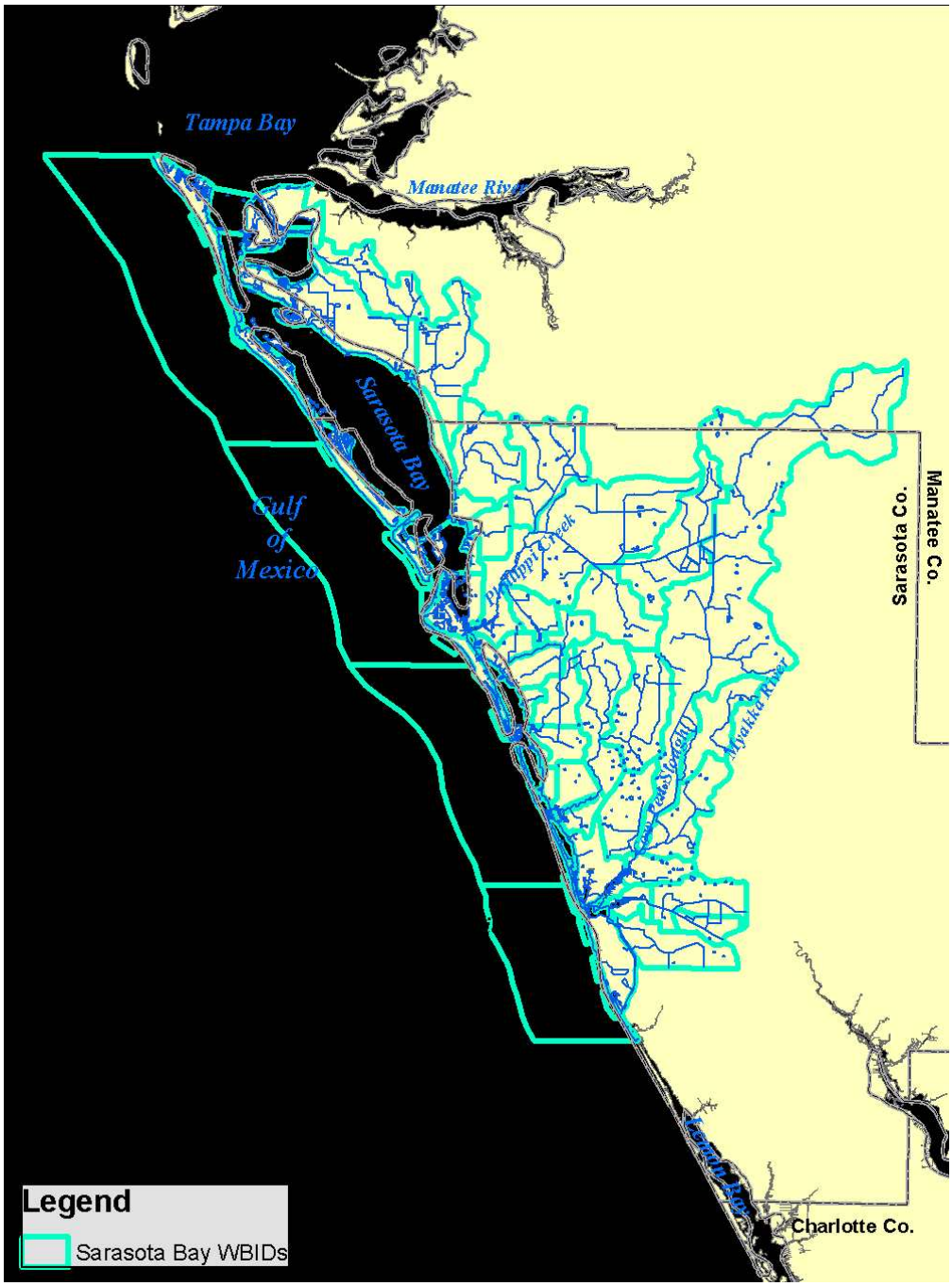


Figure 1-1. Sarasota Bay watershed boundary (draft)

The bay area has a mean annual rainfall of 54.6 inches, with the wet season occurring primarily from mid-June to mid-October. Much of this rainfall enters Sarasota Bay as stormwater runoff via a series of creeks and bayous on the mainland, including Palma Sola Creek, Bowlees Creek, Whitaker Bayou, Hudson Bayou, Phillippi Creek, Clower Creek, Catfish Creek, North Creek, South Creek, Cow Pen Slough, and Blackburn Canal.

A series of inlets provides for water exchange between Sarasota Bay and the Gulf of Mexico: Tampa Bay at Anna Maria Sound, Longboat Pass, New Pass, Big Pass and Venice Inlet. A former inlet, Midnight Pass, is currently closed. The bay is relatively shallow, with an average depth of 5 feet. The mean depth in the central part of the bay is 8 to 10 feet; the bay's maximum depth, in Longboat Pass, is 27 feet. Within the bay, widths from barrier islands to the mainland range from 300 feet (north of Stickney Point Bridge between Siesta Key and the mainland, and near Point Crisp and Mangrove Point south of the Stickney Point Bridge) to 4.5 miles (at an east-west line from Buttonwood Harbor on Longboat Key to the John and Mable Ringling Museum of Art on the mainland).

In the northern portion of the planning unit, a small area drains into Palma Sola Bay. Palma Sola Bay is bisected by a causeway (State Road 64) that has significantly impacted natural water circulation. The major creeks in the area flow into the southern half of the Palma Sola Bay system. The watershed is mostly comprised of residential development, but includes some significant areas characterized by agricultural use. Several large golf courses exist in the watershed as well.

Freshwater runoff also enters Sarasota Bay from the Bowlees Creek system. Located in southwestern Manatee County, this highly urbanized watershed covers approximately 9 square miles. It comprises mainly residential, commercial, and light industrial land uses. Bounded by the Sarasota/Bradenton International Airport to the south, U. S. 41 to the west, and U. S. 301 to the east, it extends approximately 1.5 miles to the north of Oneco Road (CDM, 2002). Most of the watershed is served by centralized sewer or small package plants. Only a few smaller areas are still served by septic systems.

Significant hydrologic modifications have occurred throughout the Bowlees Creek system and also at the mouth of Bowlees Creek due to dredge-and-fill activities. Dredging was initiated in the 1920s to provide navigation and reduce flooding. Major expansions of these man-made systems took place in the 1940s, especially to the north and northeast, resulting in the creation of several large drainage canals. Maintenance dredging has also been frequently carried out over the last decade to remove sediments in several stormwater treatment areas and to improve navigation at the mouth of the creek.

In addition, Whitaker Bayou (8 square miles), Hudson Bayou, other mainland coastal areas, and the barrier islands of Longboat Key, Lido Key, and Anna Maria Island drain to Sarasota Bay. Portions of Anna Maria Island also drain to Anna Maria Sound.

To the south, Phillippi Creek and Matheny Creek empty into Roberts Bay and Little Sarasota Bay. The Phillippi Creek system, a highly urbanized watershed south of downtown Sarasota, in

the west-central portion of Sarasota County, consists of a highly channelized drainage system covering about 25 square miles. The watershed comprises mainly residential, commercial, and light industrial land uses. Flooding has been an issue, especially along Bahia Vista Road. Septic tanks (and small treatment plants) predominated in the watershed during the 1980s, and the failure rates of septic tanks in this region are well documented (Hazen and Sawyer, 2000). Portions of the watershed are currently served by centralized sewer; however, several large areas near Phillippi Creek are still served by septic systems.

Significant hydrologic modifications have occurred throughout the Phillippi Creek system and also at the mouth of Phillippi Creek due to dredge-and-fill activities. Dredging was initiated in the 1920s to provide navigation and reduce flooding. These man-made systems were expanded in the 1940s. The lower reaches of the creek have been significantly modified from dredging, and the natural meanders in the creek have been straightened. The upper reaches of the creek have been altered for stormwater control. Maintenance dredging was performed in 2001 at the mouth of the creek and several miles upstream.

Catfish Creek and North Creek also drain into Little Sarasota Bay. Downshore, South Creek empties into a region known as Dryman Bay. Runoff from other coastal regions of the mainland, Siesta Key, and Casey Key also contributes to the freshwater flow entering Little Sarasota Bay. Farther south, Blackburn Bay, Dona Bay, Roberts Bay (the southern one), and Red Lake receive drainage from inland areas.

Clark Lake lies in the Red Bug Slough sub-basin, within the Phillippi Creek system. A man-made lake created when soil was removed to build up adjoining areas for development (i.e., a borrow pit), it is currently the site of a large bird rookery. The lake has limited drainage through a weir system into Phillippi Creek.

Still farther south, Dona Bay and Roberts Bay (the second "Roberts Bay" in the planning unit), which become contiguous at their western ends, are small estuaries near the city of Venice. Dona Bay receives some discharge from coastal regions, but most flow into the estuary is from Shakett Creek/Cow Pen Slough, a network of canals and natural stream segments that drains approximately 90 square miles. Cow Pen Slough's watershed extends from southern Manatee County south and west to its outfall into Dona Bay in Sarasota County. The watershed is characterized by flat topography and undefined drainage ways, with primary drainage conveyed through approximately 14 miles of improved channel."

Increased seasonal freshwater flow and sediment loads transported by this highly modified drainage system have contributed to the degradation of water quality and habitat in Dona Bay. Roberts Bay is the terminus for Curry Creek. Hatchett Creek, a highly channelized system, drains into the Intercoastal Waterway near the southern end of Roberts Bay. Blackburn Canal/Curry Creek provides a hydraulic connection between the Myakka River and Roberts Bay during periods of high flow. Up to 10 percent of the Myakka River's flows are diverted to Roberts Bay during high flow (Hammett, 1978).

Water Quality Summary

During the post-World War II period of rapid growth, much environmental damage occurred in the Sarasota Bay Planning Unit as a result of large-scale dredge-and-fill projects. These included the conversion of Bird Key into a finger-fill canal community, and the dredging (in the 1960s) of the Intracoastal Waterway. The latter may have increased the hydraulic instability of Midnight Pass. The movement of the pass resulted in its permitted closure and subsequent failed reopening in 1983.

Human activities in the Sarasota Bay watershed directly affect the bay's overall water quality. Land use/cover in the Sarasota Bay Planning Unit is an amalgam of urban, agricultural, and wetland or open water habitats. Land uses are approximately 32% urban (residential, commercial, and light industrial), 9% agriculture (rangeland, pastureland, and row-crop farming), and 59% natural systems (wetlands and uplands). Urban land use is most dense along the coastal areas, while agriculture and natural areas are more prevalent in the eastern portion of the watershed (**Figure 1-2**). The upper and lower Sarasota Bay watersheds are largely residential.

Natural habitats of importance in the planning unit include seagrass beds, mangrove forests, estuarine and oligohaline marshes, freshwater marshes, forested wetlands, riparian forests, and remaining native uplands (pine flatwoods, scrub, and mesic hammocks). A substantial amount of upland forest (mostly slash pines and southern slash pines) is present in the lower Sarasota Bay watershed, particularly in the area of Oscar Scherer State Park. Large tracts of rangeland also are found in the Dona and Roberts Bay watersheds, especially in the headwaters of Cow Pen Slough. Nonforested freshwater wetlands are found in significant quantities in the upper and lower Sarasota Bay watersheds, especially in the upper reaches of South Creek. Nonforested wetlands are also common in the Dona and Roberts Bay watersheds, and as fragmented parcels in the eastern portions of the lower Sarasota Bay watershed.

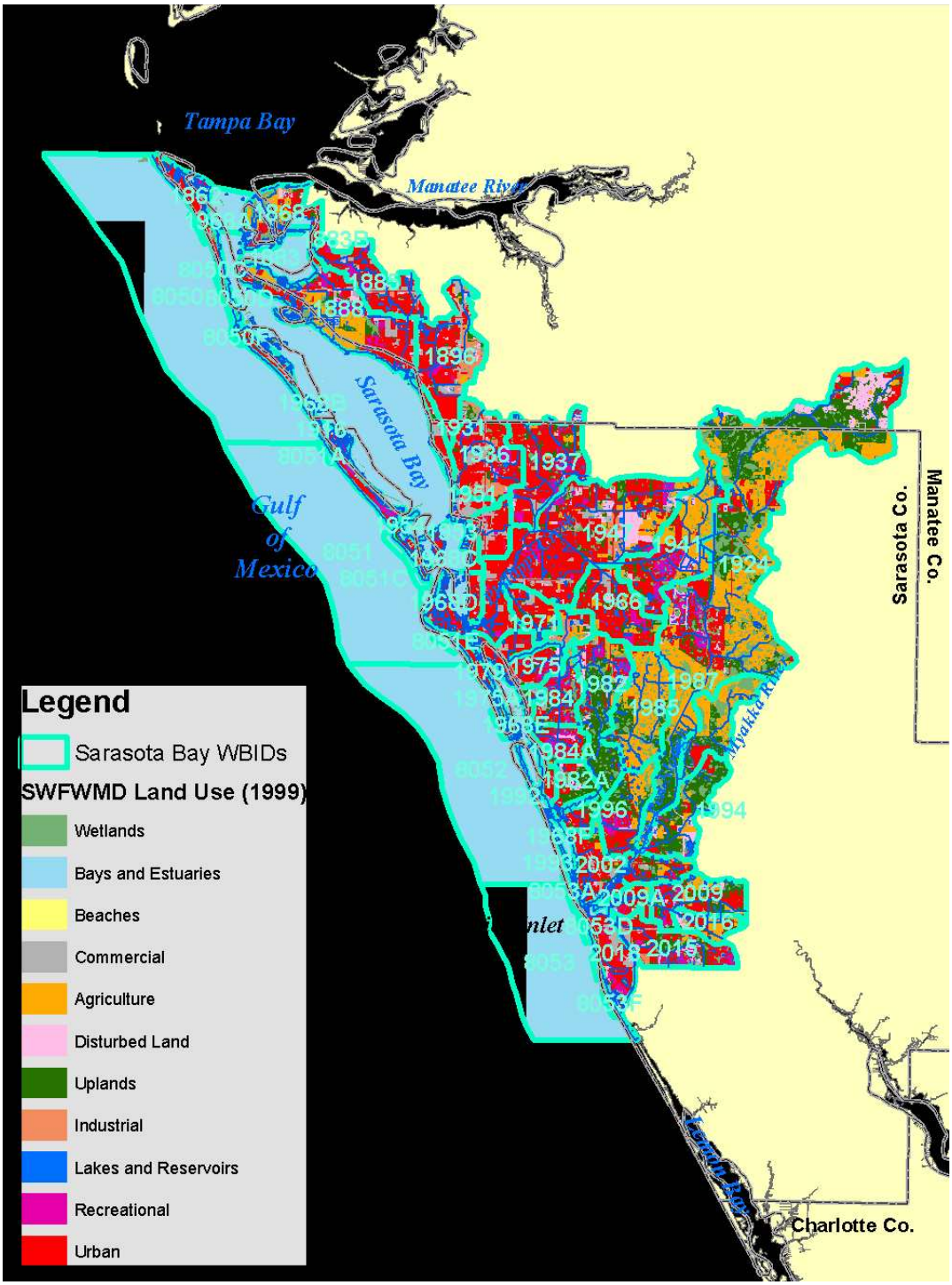


Figure 1-2. Land uses in the Sarasota Bay watershed

The Sarasota Bay region continues to rapidly develop. The urbanization process has resulted in the construction of both effective and ineffective wastewater and stormwater treatment systems. As a result of significant growth that occurred between the early 1900s and the mid-1980's,

Sarasota Bay has significantly degraded as reflected in the 1998 303(d) report. Since the 1980s, significant management actions have been implemented to restore and protect the bay including:

- septic tank construction regulations in the early 1980s,
- stormwater management regulations in the mid 1980s,
- Grizzle-Figg legislation in the late 1980s requiring Advanced Wastewater Treatment (AWT) technology for direct discharge of wastewater, and
- SWFWMD Water Conservation and Re-use Systems in the 1990s

As a result, significant reductions in nitrogen loads have been observed with a subsequent response of seagrass bed expansion in several areas of the bay. The following figure (**Figure 1-3**) depicts the changes in total nitrogen concentrations in the main portion of Sarasota Bay (WBID 1968B).

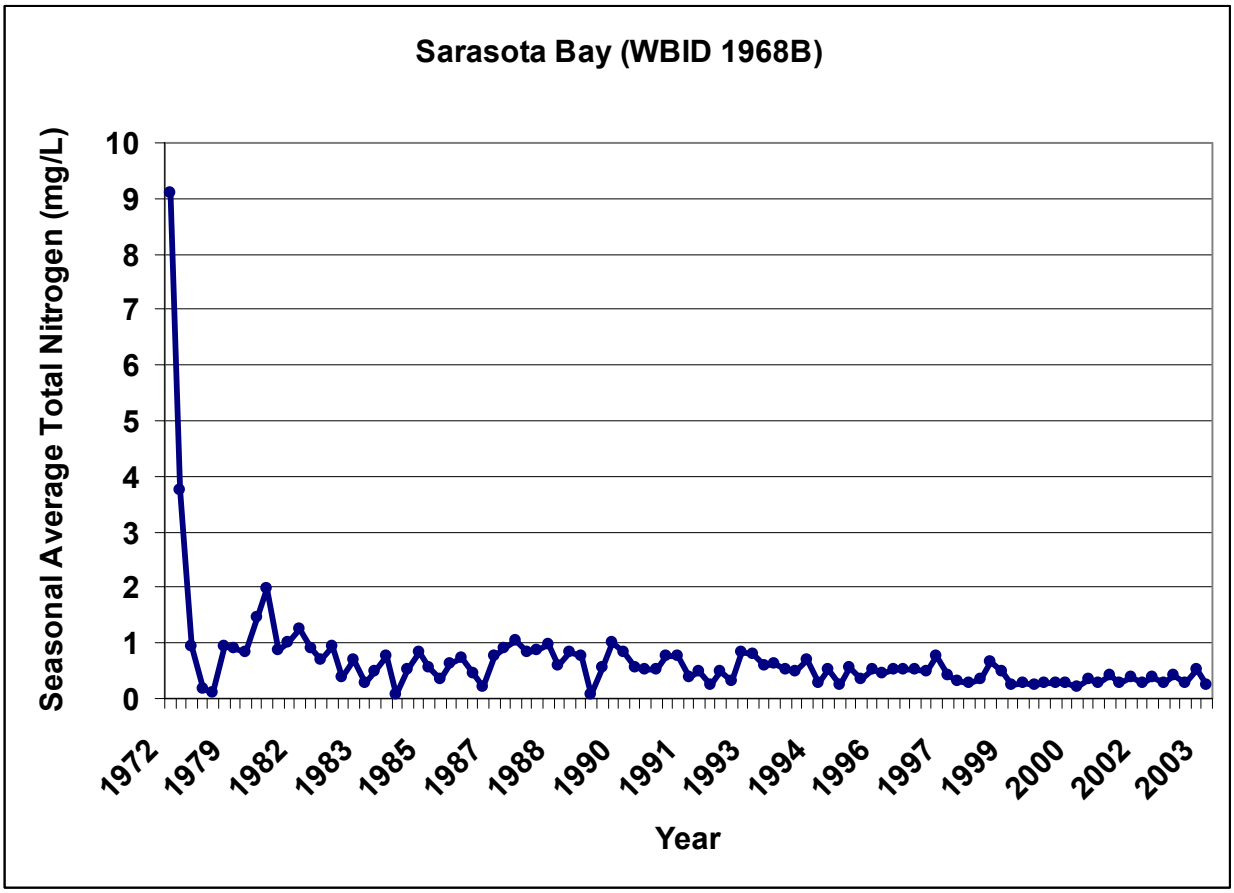


Figure 1-3. Seasonal average trends in total nitrogen concentrations in Sarasota Bay (WBID 1968B) based on IWR Run 19_1.

In addition, significant reductions in fecal coliform concentrations have also been accomplished in many areas of the bay. The following figure (**Figure 1-4**) depicts the changes in fecal coliform bacteria concentrations in the tidal portion of Whitaker Bayou (WBID 1936).

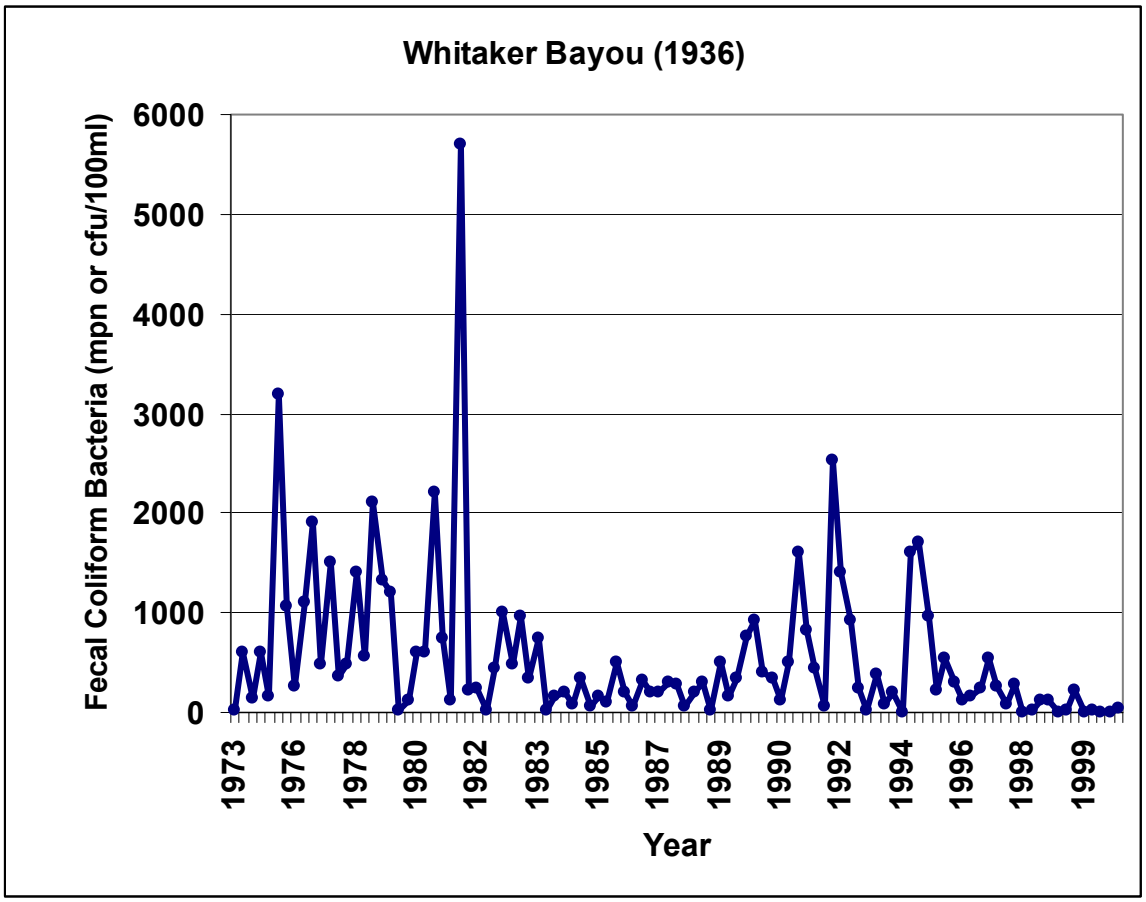


Figure 1-4. Seasonal average trends in fecal coliform bacteria concentrations in Whitaker Bayou (WBID 1936) based on IWR Run 19_1.

Status

Palma Sola Bay System

Palma Sola Bay (WBID 1884), an estuary covering 2,191 acres, is impaired for bacteria and nutrients (chlorophyll)

The Palma Sola Bay system exceeded chlorophyll thresholds during three years in the reporting cycle (1997, 1998, 2003). Elevated bacteria levels, exceeding State standards, were also noted along the Palma Sola Causeway. At this time, the sources of impairment have not been clearly identified. The SBEP has reviewed local red tide data to determine if relationships exist between outbreaks and high chlorophyll concentrations; however, for this bay system these relationships could not be established.

Bowlees Creek System

Bowlees Creek (WBID 1896), an estuary covering 6,313 acres, is impaired for fecal coliform, total coliform, and nutrients (chlorophyll).

The Sarasota Bay segments adjacent to the mouth of the creek have low concentrations of chlorophyll and fecal coliform bacteria, indicating that the impairment may be restricted to the more oligohaline and freshwater reaches. As discussed earlier, the mouth and main channels of the creek are highly altered because of historical dredge-and-fill activities. The impaired area may be acting as a sink for sediments and nutrients due to these extensive hydrologic modifications. Seagrass beds in the adjacent main bay are healthy, and less than one acre of seagrass could be reasonably expected to be present, because of the scope of historical dredging.

All of the data used for assessing impairment at Bowlees Creek have been from a single location at the U.S. 41 bridge near the mouth of the creek. Although previous microbiological testing in the area identified the presence of human enteroviruses, the sources of fecal contamination have not yet been determined. Research is under way to determine whether the causes of elevated fecal coliform bacteria are from humans or animals, and whether a specific source can be identified from the spatial distributions of elevated concentrations.

Phillippi Creek System

Within the Phillippi Creek system, **Phillippi Creek** and **Matheny Creek** do not meet the state's Class III water quality standards. Fecal coliform concentrations routinely exceed the standard of 200 colony-forming units per 100 milliliters (cfu/100mL) in both Phillippi and Matheny Creeks. In addition, other studies have isolated human intestinal viruses and other fecal indicators from Phillippi Creek water samples, indicating that contributions from a human waste source are likely.

This pollution is most likely caused by septic tank systems. Approximately 15,000 homes and businesses in the watershed, representing approximately 3 million gallons per day (mgd) of

wastewater flows, are on septic systems. Phillippi Creek now contains pollutants associated with human wastes. The Florida Department of Health has posted it as "No Swimming; No Fishing." The state has not approved shellfish harvesting in Phillippi Creek for more than 25 years.

The elevated fecal coliform concentrations in Phillippi Creek have been presumed to be from numerous sources, including septic tanks, small wastewater treatment plants, and stormwater runoff. However, to evaluate the effectiveness of the various management activities proposed over the next several years, research is under way to determine whether the elevated fecal coliform bacteria are from humans, livestock, or wildlife, and whether the source patterns shift from humans to wildlife once various wastewater improvement projects are implemented, both temporally and spatially. Once this monitoring is completed, fecal coliform issues will be re-evaluated during the next five-year watershed management cycle.

In addition, **Clower Creek** (WBID 1975AA), a 530-acre estuary in the Phillippi Creek system, is impaired for nutrients (chlorophyll). **Roberts Bay** (WBID 1968D), an estuary covering 2,842 acres, is impaired for nutrients (chlorophyll). Phillippi and Matheny Creeks drain into Roberts Bay.

Sarasota Bay

Tides, winds, physical structure, and freshwater flows from inland areas affect water quality in the planning unit's estuaries, including the largest estuary, Sarasota Bay. These flows come from the impaired waters discussed in this report—drainage into Palma Sola Bay, and flows from the Bowlees Creek system and Phillippi and Matheny Creeks—as well as numerous other waters. The flushing and circulation patterns created by the interaction of these various factors determine the movement and distribution of pollutants, salinity levels, and the kinds of biological communities that are present.

Water quality in Sarasota Bay is influenced by the amount of watershed that drains into different parts of the bay and the size of the bay area receiving the drainage. In the northern and central portions of the bay (i.e., upper Sarasota Bay), 59 square miles of watershed drain into 45 square miles of open water. From Roberts Bay south to Venice Inlet (lower Sarasota Bay), 91 square miles of watershed drain into 7 square miles of open water. Thus, the ratio of watershed to open water in the northern and central parts of Sarasota Bay (upper Sarasota Bay) is 1:3, while in the southern part of Sarasota Bay (lower Sarasota Bay), this ratio climbs to 13:4, a roughly tenfold increase.

Water quality in most parts of the bay has improved in recent years, especially between 1990 and 1992, when the city of Sarasota upgraded its wastewater treatment plant and Manatee County's Southeast Treatment Plant and Atlantic Utilities began using deep-well injection. As discussed earlier, water quality in Palma Sola Bay appears to be declining with respect to chlorophyll concentrations.

Between 1970 and 1992, the majority of Sarasota Bay became less saline, despite the lack of a trend in rainfall in the watershed during the same period. The change may be related to increases

in the amount of impervious surface area that accompanied the increased urbanization of the watershed.

The bay is characterized by areas with strong tidal influence in and near its major passes, and by areas with greatly 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 waves coming in from adjacent inlets meet (i.e., Little Sarasota Bay).

Residence times for the water in different bay segments vary substantially. Residence times in Anna Maria Sound and the portion of the bay adjacent to Big Pass and New Pass average 12 to 13 days. In the area off Tidy Island, residence times average 15 to 16 days, and in Roberts Bay, residence time is estimated at 19 days. In contrast, Palma Sola Bay and Little Sarasota Bay have residence times of 32 and 37 days, respectively.

Due to the closure of Midnight Pass, residence times for the water in Little Sarasota Bay increased from 14 to 37 days. However, due to the shift from two null zones between Venice Inlet and New Pass to one null zone in Little Sarasota Bay, residence time in Roberts Bay decreased from 19 to 13 days.

The relatively low turnover time for the waters of Little Sarasota Bay (37 days) thus coincides with the much higher watershed-to-open-water ratio in this area. From this consideration alone, water quality in Little Sarasota Bay is expected to be lower than in the central and northern portions of the bay.

When comparing segments in terms of water clarity, a general pattern emerges. Areas closest to flushing passes tend to have the greatest water clarity (e.g., Anna Maria Sound and Longboat Pass). Areas farther away from the influence of the Gulf of Mexico tend to have the lowest water clarity (e.g., Palma Sola Bay and Little Sarasota Bay). However, there are some exceptions. For example, Roberts Bay has reduced water clarity, despite its proximity to Big Pass, and the waters just west of central Longboat Key have good water clarity, despite being located in a null zone for circulation.

Seagrasses

The depth to which seagrasses grow in Sarasota Bay is related to water clarity and water quality. Activities that reduce nitrogen loads, and thus improve water quality, would be expected to improve these important nursery habitats, enabling fish populations to grow.

Seagrass coverage varies throughout the bay. Water clarity appears to be a dominant factor controlling the depth to which seagrasses grow in Sarasota Bay, and so improvements in water quality have the potential to increase seagrass coverage by allowing seagrasses to expand into deeper portions of the bay that lie farther offshore. Analysis of seagrass and water clarity data from the 1980s to the late 1990s by Kurz et al., (1999) indicated a positive correlation between seagrass coverage and secchi depth in the main Sarasota Bay segment (WBID 1968B).

Nitrogen Loading

Nitrogen (N), rather than phosphorus (P), has been shown to be the limiting nutrient for algal growth in Sarasota Bay, as N:P ratios (milligrams per liter [mg/L]) average less than 6. Nitrogen loads are thought to be approximately three times higher than those expected in a pristine, undeveloped watershed. Consequently, the elevated nitrogen loads entering Sarasota Bay are expected to result in increased levels 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).

Baywide, 55 percent of the nitrogen load to the bay comes from stormwater runoff, and rainfall provides about 27% of the bay's total nitrogen load. Runoff from residential land uses accounts for 60 percent of this amount, or approximately 33 percent of all loads. 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.

Direct atmospheric deposition accounts for about 15 percent of the baywide nitrogen load. In some cases, activities outside the watershed may indirectly affect the bay's water quality, as pollution from atmospheric sources may be generated elsewhere and transported and deposited there. Atmospheric deposition is the dominant loading source in the northern portions of the bay, associated with the low watershed-to-open-water ratio in these areas. Overall, the portions of the bay where atmospheric loads are proportionally and quantitatively greatest (i.e., Anna Maria Sound and areas just to the south) have the best water quality, the greatest water clarity, and the deepest-growing seagrasses.

As important as atmospheric deposition is in terms of loading models, atmospheric loads of nitrogen may not have the same biological consequences as sources such as stormwater and wastewater (i.e., loading 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 ground water, accounts for 10 percent of baywide loads.

Properly installed and functioning septic systems do not pose a health problem or the risk of fecal coliform bacteria contamination in surface waters. However, septic systems play a significant role in nitrogen and fecal coliform loading in some areas of Sarasota Bay, because many septic systems constructed before 1983 in the Sarasota area do not adequately treat waste.

Although septic tanks only contribute about 10 percent of the baywide nitrogen loads, they can be locally important in areas where they are the predominant means of sewage disposal. The areas that are most affected are Phillippi Creek and Whitaker Bayou, which have numerous septic tanks. In Roberts Bay, septic tank nitrogen loads are estimated at 21 percent of the total.

Trends

Palma Sola Bay System

Chlorophyll concentrations in Palma Sola Bay WBID 1883 were above the 11 ug/L threshold in 1997 and 1998, then declined for three years following this El Nino event. In 2003, the annual average chlorophyll concentration was above the threshold at 12 ug/L.

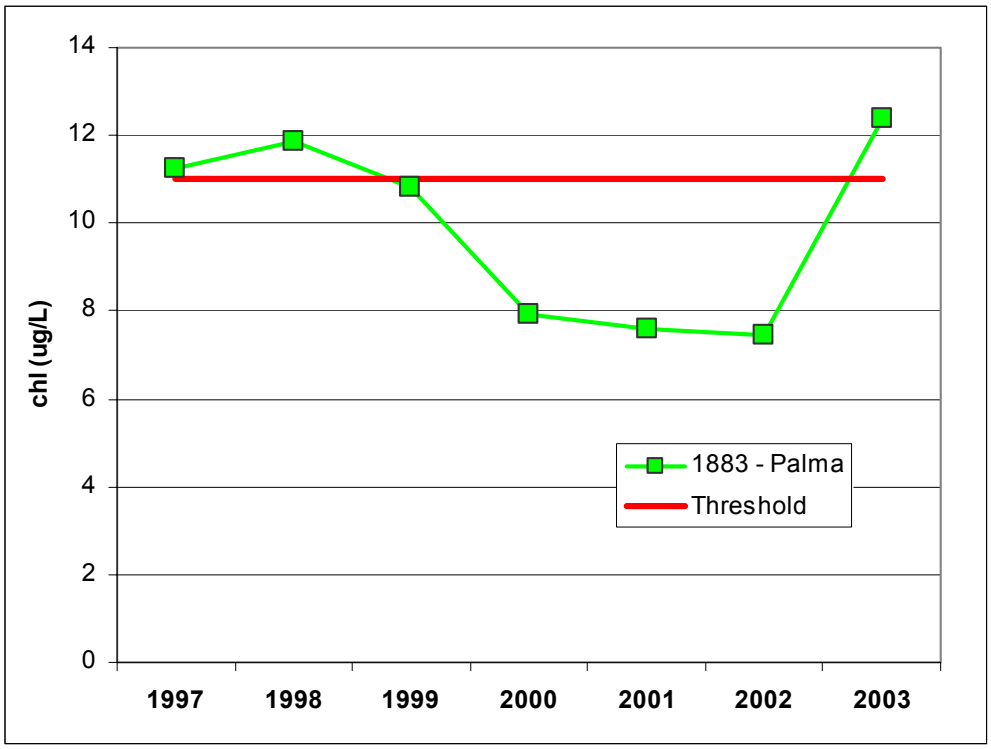


Figure 1-5. Annual average trends in chlorophyll concentrations in Palma Sola Bay (WBID 1883) based on IWR Run 19_1.

Total seagrass coverage in this bay segment varied during the 1990s. However, continuous or dense seagrass beds expanded significantly between 1994 and 2004 and did not seem to be affected by potential light limitations caused by annual average chlorophyll values which exceeded the 11 ug/L threshold (**Figure 1-6**).

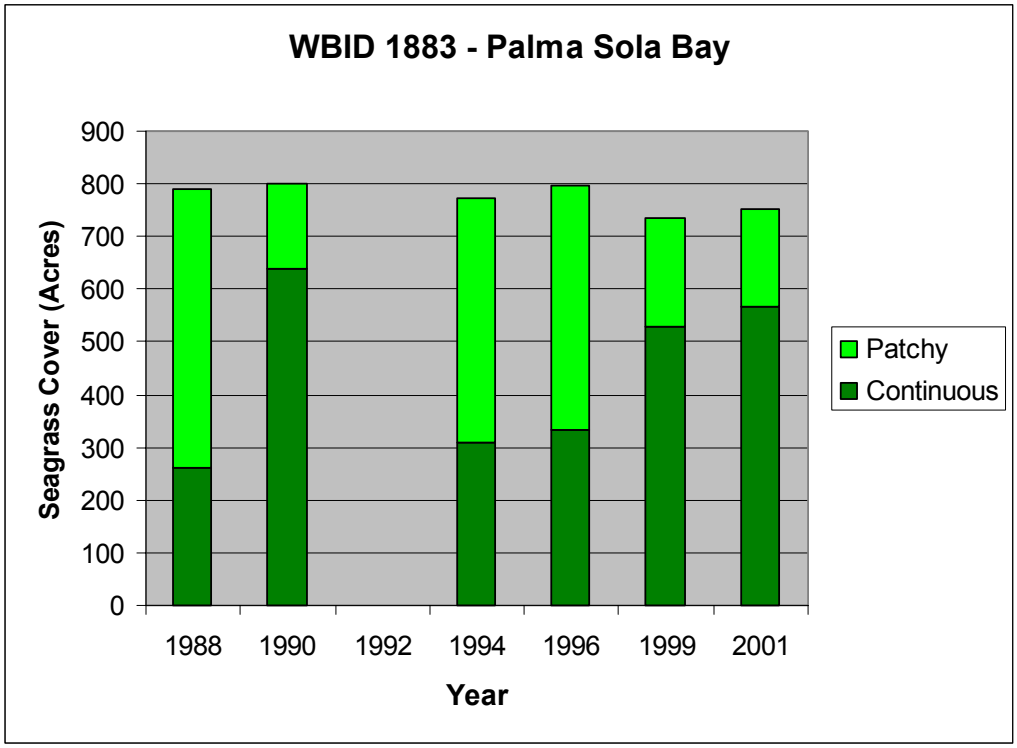


Figure 1-6. Trends in seagrass cover in Palma Sola Bay (WBID 1883).

Bowlees Creek System

Trends in chlorophyll and total and fecal coliform bacteria in Bowlees Creek have declined in recent years, possibly because of a return to more normal rainfall patterns and wastewater improvements.

Due to the declining trends in chlorophyll since 1998, routine monitoring results will be evaluated during the next five years to assess the effects of existing and planned stormwater projects on reducing nutrient loads to the creek and subsequent reductions in chlorophyll. It is anticipated that chlorophyll levels will drop below the 11 ug/L threshold as a result of management actions to improve water quality.

Phillippi Creek System

Fecal coliform concentrations in Phillippi Creek have recently exhibited a downward trend. Is anything available on trends in Matheny Creek?

Sarasota Bay

Sarasota Bay water quality trends were evaluated for the period 1989–1998, using a segmentation scheme in which water quality data were grouped into 16 geographic bay segments and one offshore segment. Northern bay segments, along with the southern half of Little

Sarasota Bay, have experienced significant declines in inorganic nitrogen concentrations (**Figure 1-7**). Instances of elevated inorganic nitrogen (greater than 0.5 mg/L) declined dramatically in the eastern portion of the bay along the city of Sarasota's shoreline after about 1991, when the city completed its advanced wastewater treatment program and reduced its discharge and total load to Sarasota Bay. The expansion of wastewater reuse and reclamation has also led to significant reductions in discharges to Sarasota Bay.

Total nitrogen concentrations significantly declined in 12 of 16 bay segments, including Little Sarasota Bay; nitrogen increased only in the Gulf of Mexico segment (**Figure 1-8**). In Palma Sola Bay, the allocation between organic and inorganic nitrogen changed substantially, with increases in organic nitrogen and decreases in inorganic nitrogen; these patterns are consistent with algal uptake and an observed increase in chlorophyll for this segment in 1998 (**Figure 1-9**). Data in the IWR database show a decline in chlorophyll after 1998 and then an exceedance in 2003 in Palma Sola Bay.

Water transparency improved throughout most of Sarasota Bay. Secchi depth measurements, a measure of water clarity, increased in 10 of 16 bay segments and were generally accompanied by significant declines in turbidity, suspended solids, color, or chlorophyll. In Big Sarasota Bay, Secchi depths improved from a mean of 1.1 meters to 1.5 meters between 1987 and 1996. More importantly, the percentage of Secchi depth measurements that exceeded 1.5- and 2-meter depths increased by approximately 7 and 21 %, respectively.

This analysis indicates improving or no change in water quality in most of Sarasota Bay for WBIDs 1968 A,B,C,D,E, AND F. The only declining trend noted in the analysis was for chlorophyll in Palma Sola Bay (1883) which is now listed as impaired. The other WBIDs identified as impaired in the 1998 303(d) list were determined not to be impaired.

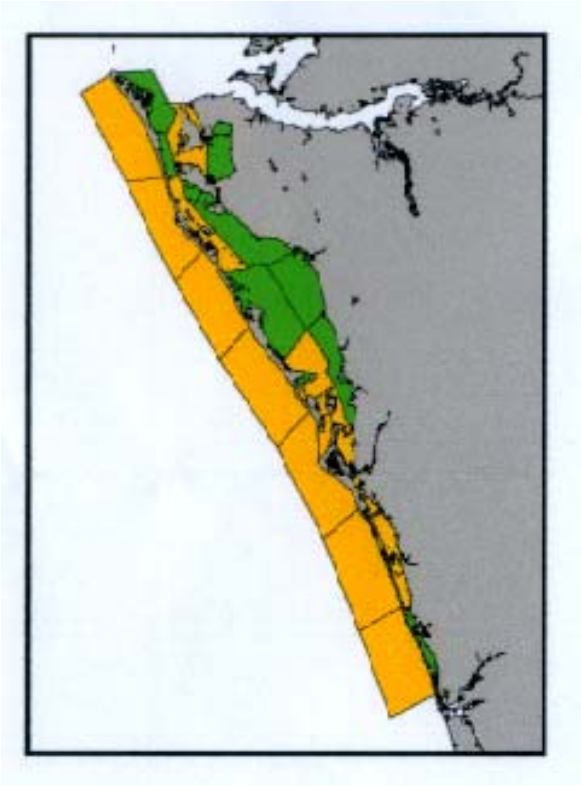


Figure 1-7. Trends in inorganic nitrogen concentrations in Sarasota Bay, 1989–1998 (Dixon and Heyl, 1999)

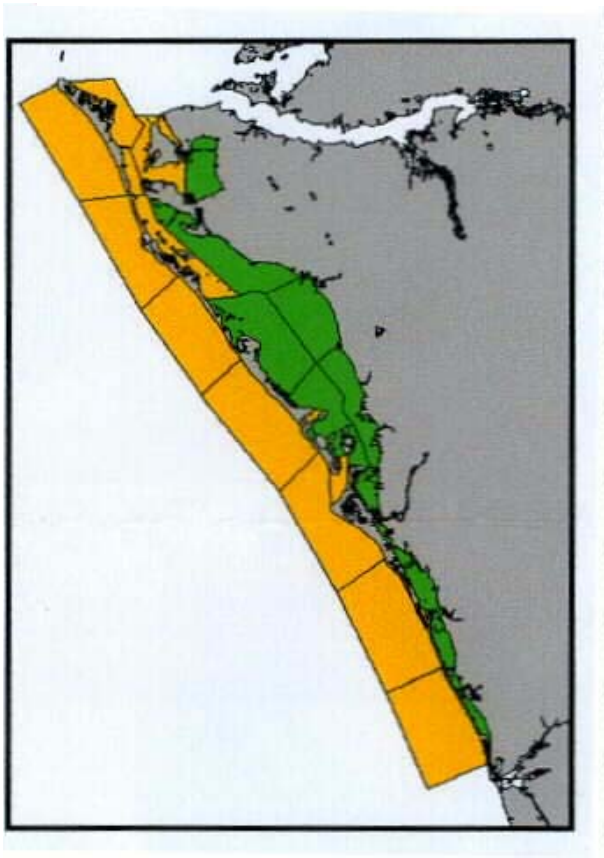


Figure 1-8: Total nitrogen trends in Sarasota Bay, 1989–1998 (Dixon and Heyl, 1999)

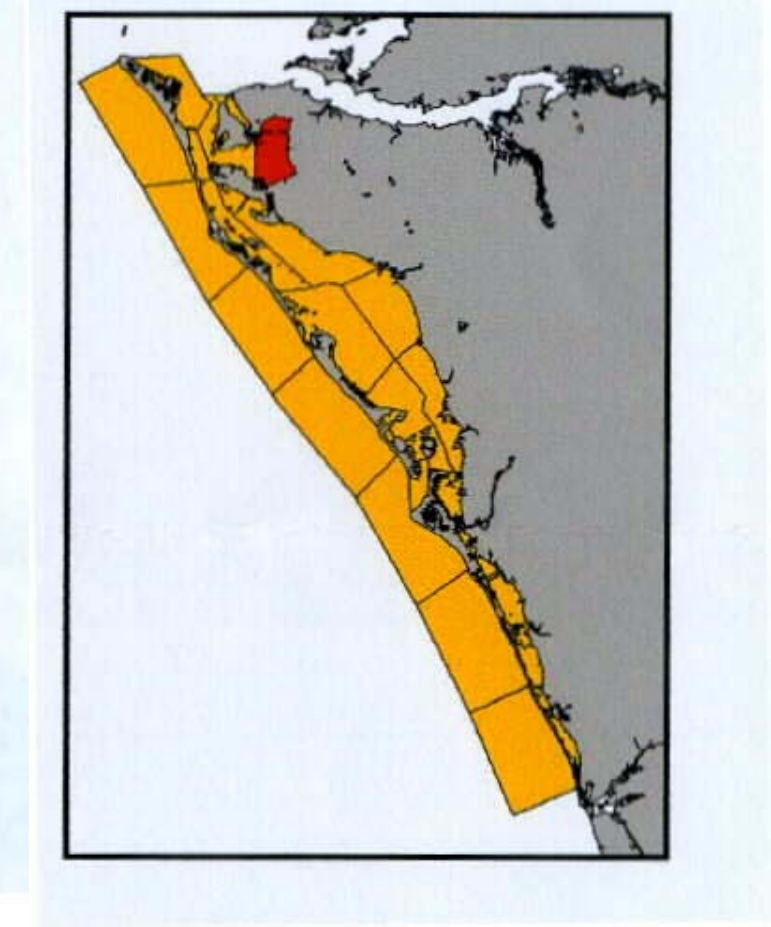


Figure 1-9. Trends in chlorophyll (a) concentrations in Sarasota Bay, 1989–1998

CHAPTER 2: DESCRIPTION OF THE IMPAIRED WATERS

FDEP's Guidance Document

"To provide reasonable assurance that existing or proposed pollution control mechanisms will restore designated uses, the following information should be evaluated and documented for the Administrative Record:

***A Description of the Impaired Water**—name of the water listed on the Verified List, the location of the waterbody and watershed, the watershed/8-digit cataloging unit code, the NHD identifier (when they become available), the type (lake, stream, or estuary) of water, the water use classification, the designated use not being attained, the length (miles) or area (acres) of impaired area, the pollutant(s) of concern (those identified as causing or contributing to the impairment), and the suspected or documented source(s) of the pollutant(s) of concern.*

Waters on the Verified List

The waterbodies within the Sarasota Bay Planning Unit are designated as Hydrologic Unit Code (HUC) #3100201. **Table 2-1** lists waterbodies that were verified as impaired in 2004 (IWR Run 18-1). **Figure 2-1** shows the locations of the impaired WBIDs.

Table 2-1. Verified List of impaired waterbodies for the Sarasota Bay Planning Unit (IWR Run 18-1)

WBID	Waterbody Segment	Waterbody Type[1]	Waterbody Classification[2]	1998 303(d) Parameters of Concern	Parameters Assessed Using the IWR	Priority for TMDL Development[3]	Projected Year For TMDL Development
Palma Sola Bay System							
1883	Palma Sola Bay	Estuary	II		Nutrients (chla)	Medium	2009
1883B,C	Palma Sola South	Coastal	IIIM		Bacteria	Medium	2009
Bowlees Creek System							
1896	Bowlees Creek	Estuary	IIIM		Fecal Coliform	Medium	2009
1896	Bowlees Creek	Estuary	IIIM		Nutrients (chla)	Medium	2009
1896	Bowlees Creek	Estuary	IIIM		Total Coliform	Medium	2009
Phillippi Creek System							
1971	Clark Lake[4]	Lake	IIIF	Nutrients	Nutrients (TSI)	High	2004
1975B	Matheny Creek	Stream	IIIF		Fecal Coliform	Medium	2009
1937	Phillippi Creek	Stream	IIIF	Coliforms	Fecal Coliform	Medium	2008
1937	Phillippi Creek	Stream	IIIF	Coliforms	Total Coliform	Medium	2008
1937	Phillippi Creek	Stream	IIIF		Unionized Ammonia	Medium	2009
1947	Phillippi Creek	Estuary	IIIM	Coliforms	Total Coliform	Medium	2009

[1]The designation "stream" includes canals, rivers, and sloughs. The designation “lake” includes some marshes.
[2]The state’s surface water classifications are as follows:

Class I: Potable water supplies
Class II: Shellfish propagation or harvesting
Class III: Recreation, propagation, and maintenance of a healthy, well-balanced population of fish and wildlife
Class IV: Agricultural water supplies
Class V: Navigation, utility, and industrial use (there are no state waters currently in this class)

[3] Priorities were retained from the 1998 303(d) list (i.e., High or Low), but High, Medium, and Low are used for newly listed waters identified under the IWR.

[4] FDEP and Sarasota County have begun TMDL development for Clark Lake, outside the Reasonable Assurance Plan. Several coastal WBIDs (8999) have been listed for mercury in fish. This is a statewide issue and will not be addressed until 2011.

F = Fresh water M = Marine

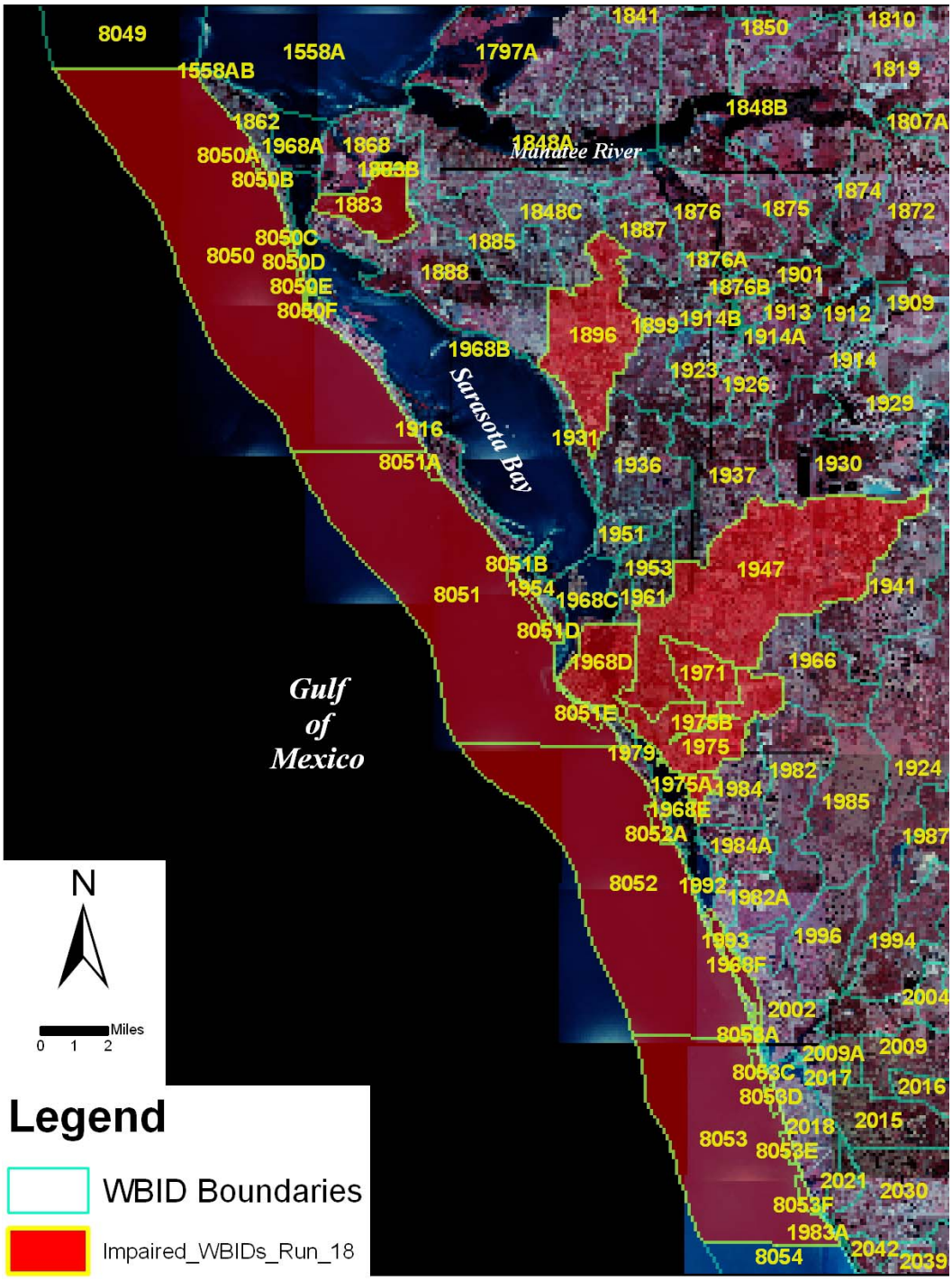


Figure 2-1. Location of impaired WBIDs in the Sarasota Bay Planning Unit (as of November 18, 2004)

Note: All coastal WBIDs are also impaired for mercury in fish tissue. This is a statewide issue.

Table 2-2 lists each impaired WBID addressed in this Reasonable Assurance Plan, its size (determined using ArcGIS Version 8.0), and the parameters causing impairment.

Table 2-2. Impaired WBIDs in the Sarasota Bay Planning Unit

WBID	Waterbody Name	Acres	Parameters Causing Impairment
Palma Sola Bay System			
1883 (A,B,C)	Palma Sola Bay	2,191	Bacteria, nutrients (chlorophyll)
Bowlees Creek System			
1896	Bowlees Creek	6,313	Fecal coliform, total coliform, nutrients (chlorophyll)
Phillippi Creek System			
1937	Phillippi Creek	5,951	Fecal coliform, total coliform, unionized ammonia
1947	Phillippi Creek	16,242	Total coliform
1975B	Matheny Creek	73	Fecal coliform

WBID Descriptions

Palma Sola System

Palma Sola Bay, WBID 1883

Nonpoint Sources. WBID 1883 covers about 3.5 square miles. Based on Level 1 and 3 land use summary information, the predominant land uses are water (more than 95 percent), followed by wetlands, at about 4 percent. Most of the open water consists of bays and estuaries. Urban and built-up land uses comprise less than 1 percent of the WBID; these can be associated with nonpoint discharges of pollutants and eroded sediments.

Point Sources. The WBID contains no permitted domestic or industrial facilities.

Bowlees Creek System

Bowlees Creek, WBID 1896

Nonpoint Sources. WBID l896 is about 10 square miles in size. Based on Level 1 and 3 land use summary information, the predominant land uses are urban and built-up (almost 74 percent) and transportation, communication, and utilities (14 percent). High-density residential comprises most of the urban and built-up category, which can be associated with nonpoint discharges of pollutants and eroded sediments.

Point Sources. The WBID contains no permitted domestic or industrial facilities.

Phillippi Creek System

Nonpoint Sources. The Phillippi Creek system covers about 41 square miles. Based on Level 1 and 3 land use summary information, the predominant land uses are urban and built-up (31 percent) and water (3 percent). Medium-density residential comprises most of the urban and built-up category, which can be associated with nonpoint discharges of pollutants and eroded sediments.

Point Sources. There are 29 permitted domestic and industrial facilities in the Phillippi Creek system. Nine of them discharge more than 0.1 million gallons per day (mgd) through surface water discharges or by land application of the effluent. Three of the domestic facilities discharge advanced wastewater treated effluent.

Clark Lake, WBID 1971

Nonpoint Sources. The WBID covers about 2 square miles. Based on Level 1 and 3 land use summary information, the predominant land uses are urban and built-up (83 percent), water (6 percent), and agriculture (4 percent). Medium-density residential development accounts for most of the urban and built-up category. This land use, as well as agriculture, can be associated with nonpoint discharges of pollutants and eroded sediments.

Point Sources. The WBID contains 2 permitted industrial wastewater facilities. Neither facility discharges more than 0.1 mgd through surface water discharges or by land application of the effluent.

Roberts Bay, WBID 1968D

Nonpoint Sources. The WBID is about 4 square miles in size. Based on Level 1 and 3 land use summary information, the predominant land uses are urban and built-up (59 percent) and water (36 percent). Most of the urban and built-up category is medium-density residential, which can be associated with nonpoint discharges of pollutants and eroded sediments. Most of the water consists of bays and estuaries.

Point Sources. The WBID contains 2 permitted domestic facilities. One facility discharges more than 0.1 mgd through surface water discharges or by land application of the effluent. One facility discharges advanced wastewater treated effluent.

Clower Creek, WBID 1975AA

Nonpoint Sources. The WBID covers less than 1 square mile. Based on Level 1 and 3 land use summary information, the predominant land uses are urban and built-up (about 72 percent), upland forests (almost 14 percent), and water (about 12 percent). Most of the urban and built-up

category is high-density residential, which can be associated with nonpoint discharges of pollutants and eroded sediments.

Point Sources. The WBID contains no permitted domestic and industrial facilities.

Phillippi Creek, WBID 1947

Nonpoint Sources. The WBID is about 24 square miles in size. Based on Level 1 and 3 land use summary information, the predominant land uses are urban and built-up (75 percent) and agriculture (7 percent), both of which can be associated with nonpoint discharges of pollutants and eroded sediments. Medium-density residential accounts for most of the urban and built-up category.

Point Sources. The WBID contains 24 permitted domestic and industrial facilities. Eight of these discharge greater than 0.1 mgd through surface water discharges or by land application of the effluent. Three of the domestic facilities discharge advanced wastewater treated effluent.

Phillippi Creek, WBID 1937

Nonpoint Sources. The WBID comprises about 10 square miles. Based on Level 1 and 3 land use summary information, the predominant land uses are urban and built-up (75 percent) and upland forests (8 percent). Medium- and high-density residential account for most of the urban and built-up category; these land uses can be associated with nonpoint discharges of pollutants and eroded sediments.

Point Sources. The WBID contains 1 permitted domestic facility, which discharges less than 0.1 mgd through surface water discharges or by land application of the effluent.

Matheny Creek, WBID 1975B

Nonpoint Sources. The WBID covers less than 1 square mile. Based on Level 1 and 3 land use summary information, the predominant land uses are urban and built-up (83 percent), most of which is medium-density residential, and water (9 percent). The former can be associated with nonpoint discharges of pollutants and eroded sediments.

Point Sources. The WBID contains no permitted domestic or industrial facilities.

Data Analysis

Prior to finalizing the Verified List of impaired waters, independent assessments of the IWR database (Runs 14_2, 14_3, 16, 17, and 18) were performed. These assessments are summarized as two separate documents in **Appendix C**. The independent analyses were conducted such that the results could be compared with FDEP's Draft Group 3 Verified List and any data anomalies identified prior to Secretarial adoption of the final listing of impaired waters.

The independent assessment followed a multi-step process. The procedure began with the collection of water quality sampling data and a spatial allocation of water quality sampling locations to FDEP's waterbody coverage. This process was followed by quality control of the water quality sampling location allocations to waterbody segments. The quality control process validates both the spatial location of the sampling points and how representative an individual sampling location is to the overall waterbody segment.

Recommended Revisions

Based on the data analysis described above, a number of recommendations were provided to FDEP prior to the adoption of the Verified List for the Sarasota Bay Planning Unit:

Palma Sola Bay System

- Reallocating a water quality station that was incorrectly assigned to WBID 1888 (Direct Runoff) to WBID 1883 (Palma Sola Bay).

Bowlees Creek System

- Performing bacterial source identification/additional sampling at WBIDs having fecal coliform bacteria impairments, including WBID 1896 (Bowlees Creek).

Phillippi Creek System

- Revising the boundary for WBID 1968D (Roberts Bay) to reflect SBNEP bay segmentation maps.
- Performing bacterial source identification/additional sampling at WBIDs having fecal coliform bacteria impairments, including WBIDs 1937 and 1947 (Phillippi Creek).
- Considering delisting or site-specific alternative criteria (SSACs) for WBID 1971 (Clark Lake) which is impaired for high TSI. The likely source of nutrient imbalance and elevated chlorophyll levels is a bird rookery, and the problem is exacerbated by restricted flushing from this man-made pond/lake.
- Subdividing WBID 1947 (Phillippi Creek) into freshwater and estuary WBIDs to allow better assessment of water quality impairments (e.g., conductance).
- Reallocating stations from WBID 1975 (Elligraw Bayou) to WBID 1975B (Matheny Creek) due to an error in data reporting.
- Reallocating several water quality sampling stations in WBID 1968E (Little Sarasota Bay) to WBID 1968D (Roberts Bay) as a result of the WBID boundary change.
- Delisting WBID 1968D (Roberts Bay) for chlorophyll due to declining trends for the past three years and increasing seagrass acreage during the past three years.

Blackburn Bay System

- Delisting for chlorophyll in WBID 1968F (Blackburn Bay), since annual average chlorophyll values for the past three years have not exceeded the historical chlorophyll standard.

Other

- Revising the boundary for WBID 1968A (Anna Maria Sound) to reflect SBNEP bay segmentation maps.
- Re-evaluating an apparent outlier for chlorophyll for WBID 1984A (North Creek). A single value of 640 mg/L is causing the WBID to be impaired, despite consistently low chlorophyll values for all other sampling events at this site. As of October 26, 2004, FDEP had placed this WBID on the Planning List.
- Changing the waterbody category from "stream" to "estuary" for WBID 1979 (Direct Runoff), since this is a coastal barrier island with no freshwater hydrologic feature.
- Re-evaluating an apparent outlier for chlorophyll for WBID 1975A (Clower Creek). A single value of 150 mg/L is causing the WBID to be impaired, despite consistently low chlorophyll values for all other sampling events at this site.
- Adding missing fecal coliform bacteria data to the IWR database for WBID 1936 (Whitaker Bayou).
- Subdividing WBID 1936 (Whitaker Bayou) into freshwater and estuary WBIDs to allow better assessment of water quality impairments (e.g., conductance).

The result of the data verification and analysis process was the exclusion of a number of WBIDs from the Verified List that were not supported by sufficient or accurately assigned data. As discussed earlier, mercury contamination in fish is a statewide issue that is currently a low-priority TMDL projected for development in 2011, and so this Reasonable Assurance Plan addresses only the WBIDs listed in **Table 2-2.**

This plan does not address the following waterbodies:

- *Clark Lake (WBID 1971), in the Phillippi Creek system, is impaired for nutrients. It is not included in this report because a TMDL is under development by FDEP and Sarasota County. The TSI in this man-made lake is "poor"; however, no fish kills have been observed. The large bird rookery appears to be the major source of nutrients. Although the lake flushes into the Phillippi Creek system, flushing is restricted because of a weir system. Currently, the lake is acting as an effective stormwater treatment system. Sarasota County is planning to address Clark Lake West as part of the Red Bug Slough sub-basin in which it is located. The bird rookery in Mirror Lake is considered to be the leading cause of lake eutrophication in the sub-basin. The contributions from septic systems, stormwater, sanitary sewers, and air deposition need to be quantified. A group of local engineers and scientists will be assembled to look for opportunities to improve water quality, habitat values, environmental education, and recreational opportunities in the Red Bug Slough sub-basin. Since there is some industrial land use in the sub-basin, stormwater improvements will also be considered*

- *The plan does not address Elligraw Bayou (WBID 1975) because, as just discussed, the report recommends that it should be moved to Matheny Creek (WBID 1975B) due to an error in data reporting.*

- *Service Club Beach (WBID 8053E) is not addressed in this report because a beach closing for a fungicide treatment of the pier was erroneously interpreted as a closing for bacterial contamination.*

- *Mercury-related load reductions in Palma Sola North (WBID 1883B), Palma Sola South (WBID 1883C), and Florida Gulf Coast (WBID 8999) are also not addressed here, because mercury is a statewide problem with widespread sources that are not under the direct control of the Sarasota Bay stakeholder group.*

Water Use Classification of Impaired Waters

Waters in the planning unit are designated as either Class II or III waters. Class II (shellfish harvesting) waters are found in the northern portion of Sarasota Bay. All of the impaired waterbodies in the planning unit, except for WBID 1883 (Palma Sola Bay) are Class III waters. This Reasonable Assurance Plan does not address Class II shellfish harvesting impairment due to fecal coliforms.

Florida's water quality standards, the foundation of the state's program of water quality management, designate the "present and future most beneficial uses" of the waters of the state (Subsection 403.061[10], Florida Statutes [F.S.]). Water quality criteria for surface water and ground water, expressed as numeric or narrative limits for specific parameters, describe the water quality necessary to maintain these uses. Florida's surface water is classified using the following five designated use categories:

Class I	**Potable water supplies**
Class II	**Shellfish propagation or harvesting**
Class III	**Recreation, propagation, and maintenance of a healthy, well-balanced population of fish and wildlife**
Class IV	**Agricultural water supplies**
Class V	**Navigation, utility, and industrial use (there are no state waters currently in this class)**

Table 2-3 presents the criteria for surface water quality classifications for specific parameters causing impairment in the Sarasota Bay Planning Unit. Elevated chlorophyll concentrations in WBID 1971 (Clark Lake) and WBID 1968D (Roberts Bay) are believed to be caused by an imbalance in nutrient concentrations in estuarine and lake waterbodies. In addition, due to historically elevated fecal coliform concentrations and samples indicating the presence of human enteroviruses, WBIDs 1937 and 1947 (Phillippi Creek) are currently posted as closed to swimming and other contact recreational activities.

Table 2-3. Criteria for Surface Water Quality Classifications, Chapter 62-302.530, F.A.C.

Parameter	Units	Class I	Class II	Class III: Fresh	Class III: Marine	Class IV	Class V
(38) Imbalance (see Nutrients)							
(39) Iron	Milligrams/L	≤ 0.3	≤ 0.3	≤ 1.0	≤ 0.3	≤ 1.0	
(40) Lead	Micrograms/L See Notes (1) and (3).	$Pb \leq e^{(1.273[\ln H]- 4.705)}$	≤ 8.5	$Pb \leq e^{(1.273 [\ln H] -4.705)}$	≤ 8.5	≤ 50	≤ 50
(41) Manganese	Milligrams/L		≤ 0.1				
(42) Mercury	Micrograms/L	≤ 0.012	≤ 0.025	≤ 0.012	≤ 0.025	≤ 0.2	≤ 0.2
(43) Minimum Criteria (see Section 62-302. 500, F.A.C.)							
(44) Mixing Zones (See Section 62-4.246, F.A.C.)							
(45) Nickel	Micrograms/L See Notes (1) and (3).	$Ni \leq e^{(0.846[\ln H]+0.0584)}$	≤ 8.3	$Ni \leq e^{(0.846[\ln H]+0.0584)}$	≤ 8.3	≤ 100	
(46) Nitrate	Milligrams/L as N	≤ 10 or that concentration that exceeds the nutrient criteria					
(47) Nuisance Species		Substances in concentrations which result in the dominance of nuisance species: none shall be present.					
(48) (a) Nutrients		The discharge of nutrients shall continue to be limited as needed to prevent violations of other standards contained in this chapter. Man-induced nutrient enrichment (total nitrogen or total phosphorus) shall be considered degradation in relation to the provisions of Sections 62-302.300, 62-302.700, and 62-4.242, F.A.C.					
(48) (b) Nutrients		In no case shall nutrient concentrations of a body of water be altered so as to cause an imbalance in natural populations of aquatic flora or fauna.					

Parameter	Units	Class I	Class II	Class III: Fresh	Class III: Marine	Class IV	Class V
(6) Bacteriological Quality (Fecal Coliform Bacteria)	Number per 100 ml (Most Probable Number (MPN) or Membrane Filter (MF))	MPN or MF counts shall not exceed a monthly average of 200, nor exceed 400 in 10% of the samples, nor exceed 800 on any one day. Monthly averages shall be expressed as geometric means based on a minimum of 5 samples taken over a 30 day period.	MPN shall not exceed a median value of 14 with not more than 10% of the samples exceeding 43, nor exceed 800 on any one day.	MPN or MF counts shall not exceed a monthly average of 200, nor exceed 400 in 10% of the samples, nor exceed 800 on any one day. Monthly averages shall be expressed as geometric means based on a minimum of 10 samples taken over a 30 day period.	MPN or MF counts shall not exceed a monthly average of 200, nor exceed 400 in 10% of the samples, nor exceed 800 on any one day. Monthly averages shall be expressed as geometric means based on a minimum of 10 samples taken over a 30 day period.		
(7) Bacteriological Quality (Total Coliform Bacteria)	Number per 100 ml (Most Probable Number (MPN) or Membrane Filter (MF))	$\leq$ 1,000 as a monthly avg., nor exceed 1,000 in more than 20% of samples examined during any month, nor exceed 2,400 at any time, using either MPN or MF counts.	Median MPN shall not exceed 70, and not more than 10% of the samples shall exceed an MPN of 230.	$\leq$ 1,000 as a monthly average; nor exceed 1,000 in more than 20% of the samples examined during any month; $\leq$ 2,400 at any time. Monthly averages shall be expressed as geometric means based on a minimum of 10 samples taken over a 30 day period, using either the MPN or MF counts.	$\leq$ 1,000 as a monthly average; nor exceed 1,000 in more than 20% of the samples examined during any month; $\leq$ 2,400 at any time. Monthly averages shall be expressed as geometric means based on a minimum of 10 samples taken over a 30 day period, using either the MPN or MF counts.		

Pollutants of Concern

The pollutants causing impairment in the planning unit are total and fecal coliform bacteria, nutrient imbalance, and mercury in fish tissue (**Table 2-1**):

- *Fecal coliform contamination is causing impairment due to elevated levels in freshwater stream systems, especially Phillippi Creek (WBIDs 1937 and 1947). Subsequent microbiological studies performed by the University of South Florida for the SBNEP indicated that human viruses were present in several waterbodies (Bowlees and Phillippi Creeks) with elevated fecal coliform concentrations.*

- *Nitrogen pollution was identified early in the CCMP development process as a principal pollutant causing impairment, as historical algal blooms frequently occurred in many areas of Sarasota Bay.*

- *As discussed previously, this Reasonable Assurance Plan does not address mercury-related impairments, because mercury in fish tissue is a statewide problem.*

Suspected or Documented Sources of Pollutants

According to the CCMP, documented sources of pollutants include point sources (wastewater treatment plant discharges), on-site disposal systems (i.e., septic tanks), stormwater runoff, residential and agricultural fertilizers, and atmospheric deposition. These sources are the result of human population growth and resulting urban, commercial, light industrial, and agricultural development in the watershed. A series of studies assessing pollutant loading was performed by Camp Dresser and McKee in 1992 (CDM, 1992).

In 1993, SBNEP modeling estimated that rainfall provided 26.5 % of the total nitrogen load to Sarasota Bay. Given the magnitude of the loading and the fact that the estimates were based on data collected in Tampa, the SBNEP recognized atmospheric deposition as a priority issue for further research and monitoring.

The impact of atmospheric deposition on the health of the bay was assessed through a multilayered approach: monitoring, algal response studies, and airshed modeling. Two projects have been completed to determine the sources of nitrogen responsible for fueling primary productivity (algae) in different areas of the bay and to determine if atmospheric loadings produce the same biological effects as point source loadings of nitrogen. Results indicate that concentrations found in local rainfall do not stimulate algal growth in bay waters. While the magnitude of atmospheric deposition is much smaller than originally estimated, atmospheric deposition remains a significant source of nitrogen. Because contributions have approximately doubled over the last decade, it is important that the significance of this source not be forgotten.

A review by SBNEP staff in 1994 indicated high levels of fecal coliform bacteria in the Phillippi Creek area that stemmed from numerous small treatment plants and thousands of septic tanks.

CHAPTER 3: DESCRIPTION OF WATER QUALITY OR AQUATIC ECOLOGICAL GOALS

FDEP's Guidance Document

"To provide reasonable assurance that existing or proposed pollution control mechanisms will restore designated uses, the following information should be evaluated and documented for the Administrative Record:

***"A Description of the Water Quality or Aquatic Ecological Goals**—a description of the water quality–based targets or aquatic ecological goals (both interim and final) that have been established for the pollutant(s) of concern, the averaging period for any numeric water quality goals, a discussion of how these goals will result in the restoration of the waterbody's impaired designated uses, a schedule indicating when interim and final targets are expected to be met, and a description of procedures (with thresholds) to determine whether additional (backup) corrective actions are needed.*

Water Quality–based Targets or Aquatic Ecological Goals Established for the Pollutant(s) of Concern

FDEP's guidance document contains two requirements: (1) to provide water quality–based targets or aquatic ecological goals, both interim and final, and (2) to discuss how the resultant pollutant(s) reduction targets/goals will result in the restoration of designated uses. Some people have expressed concern about these targets because they equate a water quality–based restoration target with a TMDL (thus assuming a "Catch 22" that a TMDL is needed to demonstrate that a TMDL is not needed). However, as is also the case for TMDLs, water quality–based targets can take many forms and need not be a result of a complex hydrodynamic/water quality model.

In some cases, there may be sufficient historical data (e.g., paleolimnological data, data on loadings from periods predating the impairment, or baseline data for Outstanding Florida Waters[3]) that could be used to determine an appropriate water quality target. In other cases, simplified modeling (including regression analysis) may allow for conservative estimates of the assimilative capacity that could then be used as the basis for restoration goals. Finally, a water quality target may have been developed that would be scientifically equivalent to (or act as the basis for) a TMDL, but the target has not been administratively adopted as a TMDL. In each of these cases, a sound water quality target could be used to evaluate whether the proposed pollution control mechanisms will sufficiently reduce loadings to meet the assimilative capacity of the water in question and result in the attainment of designated uses.

[3] Baseline data are data for the year prior to the designation of the Outstanding Florida Water.

Interim Targets

Because it will usually take many years to restore fully the designated uses of an impaired water, interim water quality targets are used to measure whether reasonable progress is being made towards the restoration of designated uses. SSACs can also be used.

Aquatic Ecological Goals

The aquatic ecological goals of the Sarasota Bay stakeholders group are to improve surface water quality in the watershed to sustain important natural and economic resources such as seagrass coverage, fish and shellfish species, instream biological diversity, and recreational uses (swimming/bathing).

The CCMP recommended specific actions to reduce pollution and improve water quality in both stormwater and wastewater discharges to achieve water quality and habitat goals for the bay (**Appendix B**). As a result of actions outlined in the CCMP, water quality in Sarasota Bay has improved significantly over the past decade, with 4,260 acres of new or improved seagrass habitat added since 1988. It is anticipated that the full implementation of the CCMP will ultimately result in the attainment of water quality standards or SSACs in impaired WBIDs.

The primary target for restoration and the goal of the Reasonable Assurance Plan (through the specific projects and plans outlined in this document) is to consistently meet Class III standards for the designated uses of each of the impaired streams, lakes, and estuarine waters identified in **Table 2-1**, by reducing levels of nutrients (total nitrogen) and total and fecal coliform bacteria, as follows:

- ***Nutrients (chlorophyll)—****To achieve nutrient reduction goals, chlorophyll is being used as a surrogate measure for nutrients. A re-evaluation was performed at the end of 2004 for WBID 1968D (Roberts Bay) and WBID 1968F (Blackburn Bay), which are impaired for chlorophyll. These WBIDs have exhibited declining trends in chlorophyll during the past 2 consecutive years and may be delisted pending a review of the complete 2004 water quality data set.*

- ***Coliform bacteria—****To address bacteria reduction goals, additional testing will likely be required to determine and allocate sources of fecal contamination for each WBID.*

The following key index stations will be used to measure progress towards these goals:

Palma Sola Bay System
Palma Sola Bay (WBIDs 1883 A, B, C)

Bowlees Creek System
Bowlees Creek (WBID 1896)

Phillippi Creek System

Phillippi Creek (WBID 1937)
Matheny Creek (WBID 1975B)

A network of water quality monitoring stations has been established throughout Sarasota Bay to assist in evaluating and prioritizing resource management actions identified in Chapter 4. Additional sampling stations will be added as needed to evaluate the effectiveness of the Reasonable Assurance Plan and proposed projects. The time frame to achieve the goals and targets described above is 10 years, or by the year 2014.

Chlorophyll (nutrients)

The estuarine waters of Sarasota Bay are nitrogen limited. The amount of nitrogen entering the bay is a measure of bay health. Too much nitrogen in bay waters causes the growth of phytoplankton that are detrimental to marine life. Excess chlorophyll results in increased turbidity, reduced light penetration, and decreased productivity in seagrass beds. In this regard, chlorophyll concentrations are an indicator of bay health. The current FDEP standard for Sarasota Bay is 11 micrograms per liter (μg/L), based on the IWR, and is expressed as an annualized average.

The principal sources of nitrogen to the bay are wastewater, stormwater, rainfall, and atmospheric deposition. Human waste, fertilizers, automobiles, lawnmowers, power plants, boats, personal watercraft, and other human activities also provide excess nitrogen to Sarasota Bay. Computer modeling by SBNEP indicates that in 1989, nitrogen-loading levels had increased to 480% above predevelopment conditions.

The original goal of the CCMP was to cost-effectively limit (using the best available technology) and control the amount of nitrogen entering the bay, and then monitor bay response. Unlike Tampa Bay, no specific seagrass restoration targets were set for Sarasota Bay. A 41% nitrogen load reduction goal was established in 1995, with a monitoring program in place to assess recovery. Since 1990, nitrogen loading has been reduced by 47 to 58% baywide, resulting in an increase in water clarity by approximately 1.5 feet and 530 acres of new seagrass coverage. It is thought that this load reduction is directly responsible for the main bay segment (WBID 1968B) achieving water quality standards for chlorophyll.

Although there appears to be a decline in "patchy" seagrass beds (which represent an area containing approximately 25% actual seagrass coverage), continuous or dense seagrass beds (representing about 75% of actual seagrass coverage) increased by approximately 3,729 acres since 1988. As a result, the best available technology goals have resulted in an improvement in both water clarity and seagrass coverage/biomass throughout Sarasota Bay. At this time, no additional seagrass recovery goals have been established.

In order to assess trends in water quality conditions on a relatively short time scale, a "warning system" similar to the Tampa Bay chlorophyll/nitrogen warning system will be developed and implemented to address upward trends in chlorophyll. The Water Quality Consortium will use this warning system to implement management decisions/actions, if water quality trends indicate

potential impacts to living resources (e.g., seagrasses). **Table 3-1** provides an example of this warning system.

A low annual average chlorophyll value would result in no action. A historical chlorophyll impairment or elevated annual average chlorophyll value would result in the WBID being placed in the yellow or caution category. Further analysis of the most recent seagrass trends or transect data would then be performed to evaluate whether declining seagrass coverage trends have occurred concurrently with increasing chlorophyll concentrations. However, this evaluation will require up to two years, due to the lag between successive years of seagrass mapping performed by SWFWMD's SWIM Program. If seagrass coverage has declined, then management actions will be initiated to reduce nitrogen loading to that WBID. If the 11 µg/L standard is exceeded during any one year, the data will be re-evaluated and, if validated by declining seagrass coverage, then management actions will be initiated to reduce nitrogen loading to the WBID.

Table 3-1. Chlorophyll-based water quality target decision matrix

Chlorophyll	ug/L*
Stay the Course	0-8
Caution, Review Data and Loading Estimates, Identify Causes of Target Exceedences	9-10
	or increase of >50% during past 2 years?
High Alert, Management Response Needed	11+

Coliform Bacteria

Prior to establishing load reduction goals, a bacterial source identification evaluation will be performed for WBIDs with total and/or fecal coliform bacteria impairments. For several impaired waterbodies, such as WBID 1896 (Bowlees Creek) and WBID 1975B (Matheny Creek), no major point source discharges are present within the WBID. The bacterial source identification and tracking project will be implemented to determine (1) whether the causes of elevated fecal coliform bacteria are from human or nonhuman sources, and (2) whether a specific source can be identified through the spatial distributions of elevated concentrations.

Newer techniques such as polymerase chain reaction (PCR) ribotyping will be used. Sarasota County has already begun work (with PBS&J, the University of South Florida, and Biological Consulting Services of North Florida) to assess fecal coliform and enterococci sources on Siesta Key Beach as a result of a beach closure, and will use the information and techniques developed for this assessment for other Sarasota Bay waterbodies with suspected fecal contamination. Despite high concentrations of both fecal coliform and enterococci bacteria at Siesta Key Beach,

no samples were found to contain human pathogens. However, high levels of genetic similarity were found, indicating that the bacterial population may be reproducing in the environment. Once this monitoring is completed, fecal coliform issues will be re-evaluated during the next five-year watershed management cycle.

For WBIDs that have confirmed human fecal coliform sources, the "simple method" approach described by FDEP (Wayne Magley, presentation at the Florida Stormwater Association Meeting, 2003) could be used to develop load reduction estimates. Preliminary estimates have been calculated for Bowlees Creek (WBID 1896) and Phillippi Creek (WBID 1947) based on fecal coliform data in the IWR Run 16_2 database. The simple method calculates the average percent reduction required to achieve a fecal coliform concentration less than the 400 cfu/100mL threshold. Only those samples with fecal coliform concentrations above the threshold were used in the following calculation:

% reduction = (sample concentration – 400 cfu/100mL) / sample concentration x 100%

The average percent reductions in fecal coliform bacteria loads were calculated and are shown in **Table 3-2** for Bowlees Creek (WBID 1896) and Phillippi Creek (WBID 1947):

Table 3-2. Average percent reductions for fecal coliform bacteria loading

WBID	Waterbody Name	Average Reduction (%)	Number of Exceedances	Total Samples
1896	Bowlees Creek	65%	18	56
1947	Phillippi Creek	49%	34	76

Using this load reduction calculation methodology, the target for human source fecal coliform bacteria is the achievement of Class III water quality standards, based on calculations from existing and future monitoring data for each of the impaired WBIDs.

Averaging Period for Numeric Goals

According to FDEP's guidance document, while the averaging period for water quality–based targets should be consistent with how the underlying standard is expressed, they can often be expressed in a variety of ways and need not be expressed as "daily loads." Annual averages or medians are often appropriate for some parameters, but shorter-term (e.g., seasonal) averages may be necessary if the impairment is limited to specific seasons or parts of the year. Multiyear averages may be appropriate in limited circumstances where there is naturally high variation of the water quality target.

The averaging periods for chlorophyll (nutrients) and coliform bacteria are as follows:

- ***Chlorophyll (nutrients)—****The recommended averaging period for a detailed analysis of the effects of the various watershed management activities is monthly. However, an annual average will be used for tracking chlorophyll water quality targets. FDEP uses monthly average values extensively as criteria for surface water quality classifications, including the established criteria for 11 μg/L as a monthly average (Section 62-302.530, F.A.C.).*

- ***Coliform bacteria—****Monthly coliform bacteria data will be used to develop monthly averages for long-term trend analysis and performance monitoring. Flow-weighted monthly averages can also be tracked to assist in evaluating progress in response to seasonal rainfall/discharge patterns.*

Sarasota County is currently collecting, and will continue to collect, baywide water quality samples based on a stratified random sampling design. Sarasota Bay has been subdivided into bay segments, which are each sampled monthly for chlorophyll, nutrients, biological oxygen demand (BOD), total suspended solids, turbidity, color, and physicochemical parameters (dissolved oxygen, temperature, salinity, pH, conductivity, and wind speed). Light penetration is also measured via Secchi depth measurements and Licor readings. These data are maintained in a centralized database and will be evaluated monthly and annually.

How Goals Will Result in Restoration of Designated Uses

- ***Chlorophyll (nutrients)—****Maintaining chlorophyll concentrations at target levels is expected to result in the maintenance of water clarity levels adequate to protect existing seagrass beds and support eventual seagrass expansion to depths observed in 1950, ensuring that nutrient levels do not result in an imbalance in the flora or fauna of Sarasota Bay.*

- ***Coliform bacteria—****Reductions in fecal coliform bacteria will restore Bowlees Creek (WBID 1896), Phillippi Creek (WBIDs 1937 and 1947), and Matheny Creek (WBID 1975B) to Class III standards, which would reduce health risks for human contact. These reductions would also improve and protect water quality conditions in portions of the downstream estuary that are designated as Class II (shellfish harvesting) waters.*

Procedures To Determine Whether Additional Corrective Actions Are Needed

Sarasota County, Manatee County, and FDEP have established monitoring networks to assess the effectiveness of the management programs designed to improve water quality. This information is tracked closely to assist in directing priorities for the implementation of water quality improvement programs (SWFWMD's SWIM Program, Sarasota County Stormwater Management, and the Sarasota Bay CCMP), as well as for reporting on water quality conditions as a part of this Reasonable Assurance Plan and other initiatives. The monthly baywide

monitoring performed by Sarasota County and Manatee County is critical to pinpointing specific bay segments for management priorities. These data collection programs will serve as the primary mechanism to identify priority bay segments, assign corrective management actions, and assess the effectiveness of those corrective actions.

CHAPTER 4: CURRENT AND PROPOSED MANAGEMENT ACTIONS

FDEP's Guidance Document

To provide reasonable assurance that existing or proposed pollution control mechanisms will restore designated uses, the following information should be evaluated and documented for the Administrative Record:

***A Description of the Proposed Management Actions To Be Undertaken**—names of the responsible participating entities (government, private, others), a summary and list of existing or proposed management activities designed to restore water quality, the geographic scope of any proposed management activities, documentation of the estimated pollutant load reduction and other benefits anticipated from implementation of individual management actions, copies of written agreements committing participants to the management actions, a discussion on how future growth and new sources will be addressed, confirmed sources of funding, an implementation schedule (including interim milestones and the date by which designated uses will be restored), and any enforcement programs or local ordinances, if the management strategy is not voluntary.*

Responsible Participating Entities

The SBNEP Policy Committee has approved the formation of a Special District to oversee the continued restoration of Sarasota Bay through the signing of an Interlocal Agreement (**Appendix A**). The agreement includes the establishment of a water quality consortium to ensure that water quality standards are achieved and maintained in WBIDs verified as impaired. This Special District will be the lead coordinating entity for the Sarasota Bay Planning Unit and will be supported by the following governmental and other entities:

- City of Sarasota
- Sarasota County
- City of Bradenton
- Manatee County
- Town of Longboat Key
- Southwest Florida Water Management District (SWFWMD)
- Florida Fish and Wildlife Conservation Commission (FFWCC)
- Florida Marine Research Institute (FMRI)
- Florida Department of Environmental Protection (FDEP)
- U.S. Environmental Protection Agency (EPA)
- U.S. Fish and Wildlife Service (USFWS)
- U.S. Army Corps of Engineers (USACOE)

The proposed Interlocal Agreement will ensure accurate reporting on implementation to the regulatory agencies. **Appendix B** provides a copy of the SBNEP Benchmark Assessment used by the EPA to evaluate National Estuary Program progress. The Wastewater Treatment and Reclamation Action Plan and the Stormwater Action Plan (**Appendix B**) are the basis for the actions taken to improve conditions in WBIDs verified as impaired. The Benchmark Assessment (**Appendix B**) will be used to assist in evaluating the stakeholder group's commitment to the bay in relation to the overall attainment of water quality standards.

Existing and Proposed Management Activities To Restore Water Quality

As discussed in Chapter 1, after Sarasota Bay was designated as part of the National Estuary Program, a Management Conference was formed to oversee the development and implementation of a CCMP for the bay. The implementation of the plan has been under way since 1995. Addressing wastewater and stormwater impacts has been a major priority of the CCMP.

Sarasota Bay became a state SWIM priority waterbody in 1996. This designation provided for the use of SWIM Program funding to achieve the goals outlined in the CCMP.

Sarasota County has also begun the development of watershed management plans for all of its bays and tributaries. These watershed plans address water quality, natural systems, flooding, and water supply issues in each watershed. The plans are similar to, although more detailed than, SWFWMD's Southern Coastal Watershed Comprehensive Watershed Management (CWM) Plan. Both the watershed management plans and the CWM plans have identified issues and projects to address water quality improvement in the Sarasota Bay Planning Unit.

To improve water quality in the planning unit, a number of significant management activities have already been completed, others are currently being implemented, and still others are proposed. The following activities, discussed in detail in this chapter, are expected to measurably reduce either chlorophyll (nutrients), or total and fecal coliform bacteria concentrations, or both, in the Palma Sola Bay, Bowlees Creek, and Phillippi Creek systems:

A. Septic System Replacement Program: Coliform bacteria
B. Regional Wastewater Improvement Programs: Chlorophyll (nutrients), coliform bacteria
C. Wastewater Reclamation Activities: Chlorophyll (nutrients)
D. Regional Stormwater Improvement Projects : Chlorophyll (nutrients)
E. Land Acquisition Programs: Chlorophyll (nutrients), coliform bacteria
F. Habitat Restoration Activities: Chlorophyll (nutrients), coliform bacteria
G. Education and Outreach Activities: Chlorophyll (nutrients), coliform bacteria
H. Research Activities: Chlorophyll (nutrients), coliform bacteria
I. Water Conservation Programs: Chlorophyll (nutrients), coliform bacteria
J. Marina Upgrades/Improvements: Chlorophyll (nutrients), coliform bacteria
K. Improved tidal circulation in hydrologically altered systems; Chlorophyll (nutrients), coliform bacteria

L. Managed Recreational Use: coliform bacteria

Table 4-1 lists these management actions, prioritized by projected effectiveness (based on meeting the proposed interim water quality target) and describes the anticipated benefit for the WBIDs listed below. While the Reasonable Assurance Plan focuses on these impaired waters, the management actions that are currently being implemented or proposed will also improve water quality in Sarasota Bay (WBID 1968C), Little Sarasota Bay (WBID 1968E), and Blackburn Bay (WBID 1968F).

Palma Sola Bay System
Palma Sola Bay (WBID 1883)

Bowlees Creek System
Bowlees Creek (WBID 1896)

Phillippi Creek System:
Phillippi Creek (WBIDs 1937 and 1947)
Matheny Creek (WBID 1975B)
Roberts Bay (WBID 1968D)

Tables 4-2 and **4-3** list the management actions, with the approximate load-based and concentration-based improvements that are expected, for Bowlees Creek (WBID 1896) and Palma Sola Bay (WBIDs 1883 A, B, and C). The following sections summarize each of these efforts.

Table 4-1. Resource management actions to address parameters causing impairment and interim water quality targets for the Phillippi Creek system (Phillippi Creek, WBIDs 1937 and 1947, and Matheny Creek, WBID 1975B)

Resource Management Actions	Management Activity	Proposed Interim Water Quality Target	Management Goal
Phillippi Creek Septic Tank Replacement Program	A	Exceedances of total and fecal coliform bacteria criteria reduced by 20%. Nitrogen loads reduced to achieve <11 ug/L chlorophyll in Roberts Bay.	58% of 14,000 septic tanks to be removed by 2007
Sarasota County Centralized Sewer Program	B, C	Exceedances of total and fecal coliform bacteria criteria reduced by 20%. Nitrogen loads reduced to achieve <11 ug/L chlorophyll in Roberts Bay.	Consolidation of wastewater treatment plants not meeting water quality standards
Expansion of Celery Fields Stormwater Treatment Area	D	Exceedances of total and fecal coliform bacteria criteria reduced by 20%. Nitrogen loads reduced to achieve <11 ug/L chlorophyll in Roberts Bay.	Further reduce nitrogen and fecal coliform bacteria loading to Phillippi Creek and Roberts Bay
Conversion of Atlantic Wastewater Treatment Plant to Stormwater Treatment Facility	C, D	Exceedances of total and fecal coliform bacteria criteria reduced by 20%. Nitrogen loads reduced to achieve <11 ug/L chlorophyll in Roberts Bay.	Reduce nitrogen and fecal coliform bacterial loading and restore hydrologic conditions in creek and bay systems.
Florida Yards and Neighbors Program	G	No specific interim water quality targets set.	Reduce dependence on potable water supplies for irrigation, reduce fertilizer usage.
Land Acquisition (Sarasota County/SWFWMD)	E	No specific interim water quality targets set. Land acquisition will reduce future potential population growth in the watershed and reduce total nitrogen and fecal coliform loads.	Enhance ecological integrity of the watershed by providing wildlife corridors or sanctuaries, reduce future pollutant loading.
Education/Outreach	G	No specific interim water quality targets set.	Increase awareness of water quality issues so that future generations manage the water resource more effectively.
Research	H	No specific interim water quality targets set.	Identify existing and future nitrogen, bacteria and other pollutant loads, determine optimal treatment methods to reduce non-point source pollution.
Water Conservation Programs	G	No specific interim water quality targets set.	Increase awareness of water quality issues and linkages to water supply so that future generations manage the water resource more effectively.

Table 4-2. Resource management actions to address parameters causing impairment and interim water quality targets for Bowlees Creek, WBID 1896

Resource Management Actions	Management Activity	Proposed Interim Water Quality Target
Holiday Inn Marina Upgrade	B, D	Exceedances of total and fecal coliform bacteria criteria reduced by 20%. Nitrogen loads reduced to achieve <11 ug/L chlorophyll in Bowlees Creek.
Sarasota/Bradenton Airport Retrofit	D	Reduce nitrogen loads to achieve < 11 ug/L in Bowlees Creek.
Nicholson Drainage Channel Stormwater Treatment Project	D	Exceedances of total and fecal coliform bacteria criteria reduced by 20%. Nitrogen loads reduced to achieve <11 ug/L chlorophyll in Bowlees Creek.
Lake Brendan Dredging and Weir Installation	D	Exceedances of total and fecal coliform bacteria criteria reduced by 20%. Nitrogen loads reduced to achieve <11 ug/L chlorophyll in Bowlees Creek.
Trailer Estates Sewer Upgrades	B	Exceedances of total and fecal coliform bacteria criteria reduced by 20%. Nitrogen loads reduced to achieve <11 ug/L chlorophyll in Bowlees Creek.
Florida Yards and Neighbors Program	G	No specific interim water quality targets set.
Education/Outreach	G	No specific interim water quality targets set.
Research	H	No specific interim water quality targets set.
Water Conservation Programs	G	Increase awareness of water quality issues and linkages to water supply so that future generations manage the water resource more effectively.
Marina Upgrades/Improvements	J	Exceedances of total and fecal coliform bacteria criteria reduced by 20%. Nitrogen loads reduced to achieve <11 ug/L chlorophyll in Bowlees Creek.

Table 4-3. Resource management actions to address parameters causing impairment and interim water quality targets for Palma Sola Bay, WBID 1883 and 1883B and C

Resource Management Actions	Management Activity	Proposed Interim Water Quality Target	Management Goals
Improved tidal circulation in hydrologically altered systems	K	Reduce beach closures due to fecal coliform bacteria at artificially restricted tidal embayments used for recreational use. Improve tidal flushing to achieve 11 ug/L chlorophyll threshold in Palma Sola Bay.	Improve tidal flushing to achieve 11 ug/L chlorophyll threshold in Palma Sola Bay.
Managed Recreational Use Areas	L	Reduce beach closures due to fecal coliform bacteria.	Improve recreational usage within Sarasota Bay
Research	H	Development of fecal coliform sources and nutrient loading targets	Identification of fecal coliform bacteria and excess nutrient loading sources

A. Septic System Replacement Program

Parameter addressed: Coliform bacteria

WBIDs addressed:

Phillippi Creek System:

WBID 1971, Clark Lake
WBID 1937, Phillippi Creek
WBID 1947, Phillippi Creek
WBID 1975B, Matheny Creek
WBID 1968D, Roberts Bay

Sarasota County's efforts to develop an efficient, regional wastewater treatment system date back to an analysis in the late 1960s on consolidating existing wastewater treatment franchises. Today, the Phillippi Creek Septic System Replacement Program (PCSSRP) is under way to abandon septic systems and improve wastewater treatment/disposal by connecting approximately 14,000 homes and businesses to central sewer in the Phillippi Creek watershed. These parcels represent approximately 3 mgd of wastewater flows. Additional information on the program, including maps and schedule updates, is available at http://www.MyCentralSewer.org.

It is anticipated that this program will have a significant, measurable effect on reducing nitrogen and total and fecal coliform bacteria loading to three impaired WBIDs: Phillippi Creek (WBIDs 1937 and 1947) and Matheny Creek (WBID 1975B). The interim water quality targets consist of reducing by 20% the exceedances of total and fecal coliform bacteria criteria, and reducing nitrogen loads to achieve <11 ug/L chlorophyll in Roberts Bay, which is the receiving water for Phillippi Creek. At this time, however, the exact load reduction has not been determined due to the complexity of the spatial distribution, soil conditions, and potential loading rate of each septic tank system. Water quality monitoring in Phillippi and Matheny Creeks will provide the necessary data to determine the overall effectiveness of the program. Further improvements in water quality should also be seen in Roberts Bay as a result of these activities.

Based on an extensive evaluation of collection system technologies, the county determined that vacuum sewer systems would be the most cost-effective alternative for the Phillippi Creek area, where the average residential lot size is less than one-half acre. Most of the area will be connected to vacuum sewer systems. The remaining parcels will use low-pressure or gravity sewer collection systems. Design and construction is being performed in eight phases. Several phases are either in design or being bid for construction at this time (**Figure 4-1** and **Table 4-4**). Approximately 1,500 septic systems have been removed to date. About 8,170, or 58%, of the septic tanks will be removed by 2007, and it is anticipated that the remaining 42% will be removed by 2012.

Figure 4-1. Map of Sarasota County's Phillippi Creek Septic Tank Replacement Program project areas
Note: A portion of Project Area P is within Clark Lake (WBID 1971), and Project Q borders Matheny Creek (WBID 1975B) to the south.

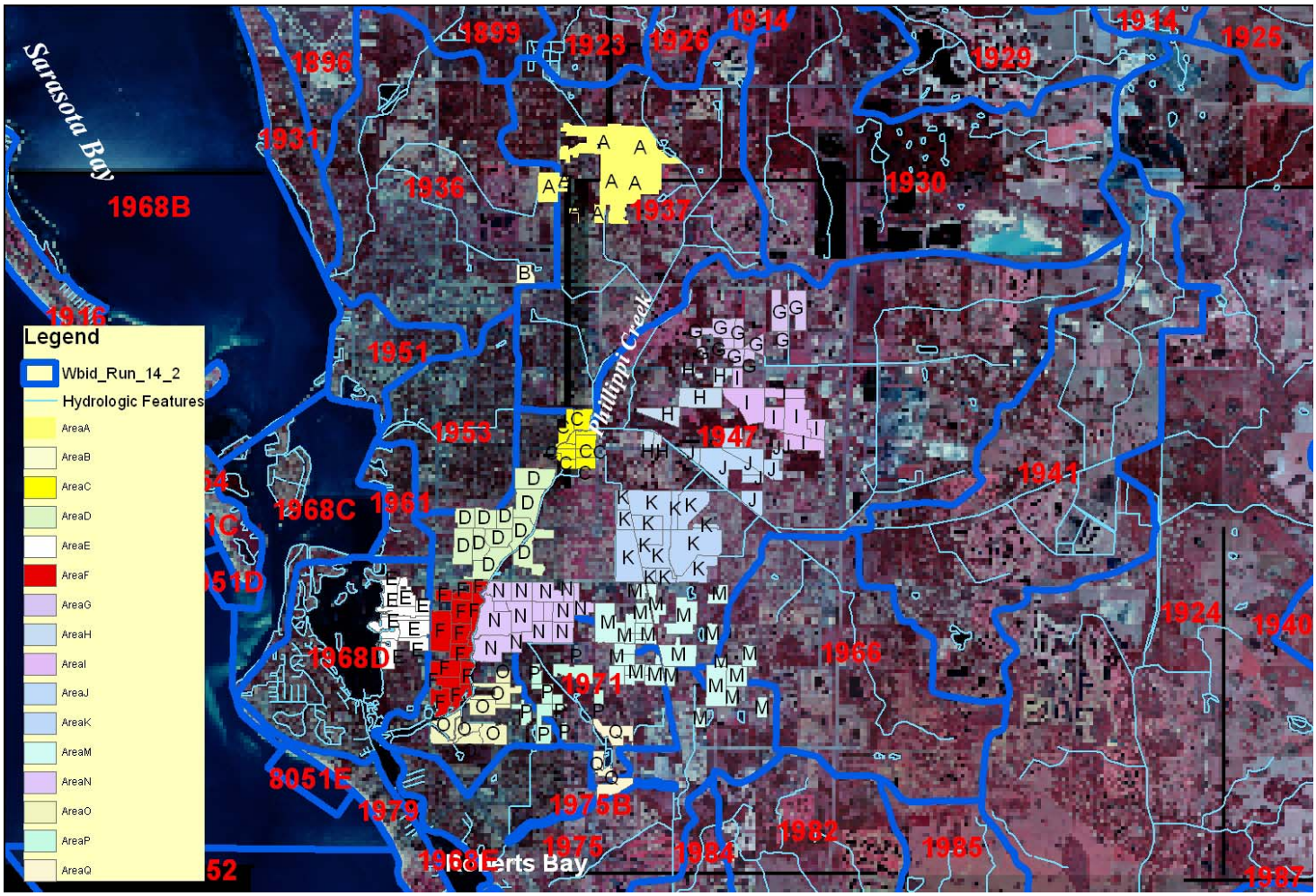


Table 4-4. Status of the Phillippi Creek Septic System Replacement Program (as of May 3, 2004)

Area	Status	Septic Tanks To Be Removed	Expected Year of Completion
Area A	Construction 2004	1400	2004/2005
Area B	Design complete, bidding 2004	106	2005/2006
Area C	Design complete, bidding 2004	700	2004/2005
Area D	50% design complete	1700	2006/2007
Area E	Complete	584	2004
Area F	Design complete, bidding 2004	1062	2004/2005
Area G	Planned		2010
Area H	Planned		2010
Area I	Planned		2009
Area J	Planned		2009
Area K	Design contract awarded	2618	2006/2007
Area M	Planned		2011
Area N	Planned		2007
Area O	Planned		2012
Area P	Planned		2012
Area Q	Planned		2012

Source: Personal communication with Alex Dargham, Program Manager, Sarasota County.

Project Status

Completed to Date

Area E. The Area E wastewater collection system for 577 connections was substantially completed in 2003, at a cost of $5.1 million. Eighty-four percent (482 connections) of the existing homes and businesses have been connected to the system.

Ongoing Activities

Area A. The Area A project will make central sewer and water available to approximately 1,125 and 300 connections, respectively. The construction has an estimated completion date of May 2005 for the base contract (September 2005 for the five alternatives) and is approximately 45% complete, including the installation of water lines, gravity sewer, forcemain, vacuum pump station, vacuum mains, and vacuum valve pits. Initially, wastewater flow will be sent to the Meadowood Water Reclamation Facility (WRF). Upon completion of the University I-75 Force Main Phase 2 pipeline project, wastewater flow will be sent to the Bee Ridge WRF.

Area F. The Area F project will make central sewer available to approximately 1,063 homes. Substantial completion is estimated in October 2005, with final completion scheduled for November 2005. The construction is approximately 15% complete. A low-pressure system, versus the county-preferred vacuum collection system, is needed in some locations because lot elevation and extensive lateral run lengths prohibits the use of a vacuum system.

The three projects in Areas E, A, and F will make central sewers available to nearly 2,765 homes by the end of 2005.

Area B. The Area B project will make central sewer available to approximately 106 homes. The project, which began in 2002, was put on hold at 90% completion. The design is based on serving the area with gravity sewers, a lift station, and low-pressure sewers (30 lots). With its close proximity to the AquaSource franchise area, wastewater flow is expected to be discharged to the AquaSource sewer system. Negotiations are ongoing with AquaSource to arrive at an agreement to send this wastewater to their system.

Area C. The Area C project will make central sewer available to approximately 694 homes. Construction is scheduled to begin in mid-2006, and will coincide with the completion of the Bahia Vista forcemain and road-widening project, which will allow wastewater from this area to be treated at the newly expanded Bee Ridge WRF.

Area D. The Area D project will make central sewer available to approximately 1,485 connections. Construction is scheduled to begin in Fiscal Year (FY) 2006. Wastewater from this area will be pumped to the South Gate advanced wastewater treatment plant (AWWTP), where it will be repumped to the Bee Ridge WRF.

Area K. The Area K project will make central sewer available to approximately 2,618 connections. The engineering design is scheduled to be completed in January 2006. Wastewater flow will be treated at the Bee Ridge WRF and will be pumped there via a new transfer pump station to be constructed near the Atlantic WRF. The new transfer pump station will be constructed to coincide with the completion of the Bahia Vista forcemain project. Construction is scheduled to start in FY07.

Area N. The Area N project will make central sewer available to approximately 1,949 connections. A Call for Professional Services was advertised in December 2004 for engineering services for various areas of the PCSSRP. Area N will be the first project assigned from this contract. Construction for Area N is expected to start in FY07. Wastewater collected from this area will be pumped to the Central County WRF.

Areas G, H, I, J, M, O, P, and Q are scheduled for completion by 2012 but have not yet advanced to the design phase.

Wastewater Transmission and Treatment

The expansion of the Bee Ridge WRF, which will be completed by April 2005, will increase the plant's treatment capacity from 2.1 to 9.0 mgd on a maximum monthly average daily flow basis (MMADF). The Central County WRF will be expanding from 4.0 to 5.4 mgd MMADF. Construction is scheduled to start in May 2005, with completion in September 2006.

Critical transmission projects include several new pump stations and forcemains. Notice to proceed was given in December 2004 for the design of the demolition and replacement with master pump stations for the South Gate and Gulf Gate plants, respectively. Design for both decommissioning projects will be completed in FY05, and the construction of replacement pump stations will be completed in FY07. The Bahia Vista forcemain project has been segmented into two phases to integrate concurrent county projects. Phase I will advertise for bids in January 2005. Phase II is an integrated Public Works and Environmental Services forcemain and road

widening design and construction project along Bahia Vista from McIntosh to Cattlemen. Combining the Bahia Vista forcemain and road improvements into a single integrated design/construction project is expected to save up to $1 million. Phase II construction is scheduled to begin in early 2006, with completion in mid-2007.

FY05-FY09 Budget Activities

The total FY05–09 budget is $110.2 million, the same as the FY04–08 budget. Area K is crucial to meeting this budget. If Area K can be completed for $15.5 million or less, a greater degree of confidence can be placed on the total budget figure. Some recent management and tactical changes are calling for more in-house program management and construction services to better meet this budget.

Funding

The cost for the initial implementation phases of the PCSSRP was estimated at $121 million in 2003. This estimate includes the construction of the collection systems, associated pumping stations, required transmission facilities, program management, engineering, and the early hook-up incentive. **Table 4-5** shows the current adopted budget for FY05–09, by project area (**Figure 4-1**).

Table 4-5. Current adopted budget for the PCSSRP area, FY2005–09

PCSSRP Area	Adopted PCSSRP Budget Cost for FY05–09 (in millions of dollars)
E	$ 5.1
A	$ 7.9
F	$ 9.2
B	$ 1.5
C	$ 5.2
D	$ 11.8
K	$ 15.5
N	$ 10.5
I & J	$ 7.9
G & H	$ 7.2
M	$ 10.2
O	$ 5.9
P	$ 4.3
Q	$ 2.3
Program Management	$ 5.5
Early Hookup Incentive	$ 11.0
TOTAL PROJECT COST	**$121.0**

In addition to the direct project costs of the program, associated project costs include the expansion of existing treatment plants to handle the increased wastewater collection and the

construction of new pipelines and pump stations to pump collected wastewater to treatment facilities. **Table 4-6** lists these additional associated costs, by project.

Table 4-6. Additional associated costs, by project, for the PCSSRP

Associated Project	Amount (in millions of dollars)
Bee Ridge Water Reclamation Expansion	$ 5.7
Central County Expansion	$ 9.2
Area A Interconnect	$ 1.2
Area M Interconnect	$ 2.6
Bahia Vista Pipe Line Corridor	$ 7.3
University I-75 Force Main	$ 12.0
TOTAL ASSOCIATED COSTS	**$ 68.0**

Funding for the PCSSRP is currently provided by the local one-cent sales tax (infrastructure surtax); federal and state grants; and customer rates, fees, and assessments. At this point, the program is not fully funded through completion. The county is actively pursuing federal and state funds to continue the implementation of the septic tank replacement program.

The procurement of grants is a critical issue. Sarasota County is requesting up to $2 million each from the state and federal governments. An additional $8.1 million in grants is projected in the FY05–09 budget, but there are no assurances of any future grants. The substitution of debt for the unobtained grants will delay the program until utility revenues are able to support the additional debt burden.

After Areas A and F are completed in FY06, the majority of grant funds approved to date by either the EPA or FDEP will be exhausted ($6.2 million). Significantly, the construction of Area E (577 connections) was funded without an SRF construction loan. The same will be true for Areas A, B, and C (1,925 connections). Grants, user fees, and surtax are leveraged to the greatest extent possible to minimize and delay new debt, as dictated by the Utilities Rate Model. Area F is the first area to use an SRF construction loan. It is projected that the next SRF construction loan application will be in FY06 to meet the start of construction for Areas D and N in FY07. Although a significant portion of the PCSSRP grant funds approved to date will be used for the construction of Area A and F, there will be some unused amounts that can be allocated to the next areas in line (i.e., Areas C, B, D, and K). However, only Areas A and F currently have EPA approval.

B. Regional Wastewater Improvement Programs

Parameters addressed: chlorophyll (nutrients), coliform bacteria

WBIDs addressed:

All main bay segments (*1968B, C, D, E, F)*

Palma Sola Bay System:
WBID 1883, Palma Sola Bay

Bowlees Creek System:
WBID 1896, Bowlees Creek

Phillippi Creek System:
WBID 1937, Phillippi Creek
WBID 1947, Phillippi Creek
WBID 1975B, Matheny Creek

The interim water quality targets consist of reducing by 20% the exceedances of total and fecal coliform bacteria criteria, and reducing nitrogen loads to achieve <11 ug/L chlorophyll in Roberts Bay, which is the receiving water for Phillippi Creek. The management goal is to remove 58% of 14,000 septic tanks in the Sarasota Bay Planning Unit by 2007.

Significant improvements have occurred in wastewater treatment and disposal practices in the Sarasota Bay region in response to legislation enacted in 1990 that required all wastewater treatment plants to meet advanced wastewater treatment (AWT) standards for direct discharge to surface waters. Secondary treatment levels are 20 mg/L, while AWT levels are 3 mg/L for nitrogen removal. These higher standards for wastewater treatment, in combination with water conservation policies, have reduced nitrogen loadings to the bay from wastewater by more than 80%.

Achieving AWT standards at the city of Sarasota's plant in 1991 reduced the plant's nitrogen loading to the bay by 80 to 90%, a 14% decline in nitrogen loadings baywide. At the same time, Manatee County upgraded its wastewater treatment plant and installed a deep-well injection system, essentially removing Manatee County's discharge into the bay. This action, combined with the city's upgrades, resulted in approximately a 50% decrease in nitrogen pollution in the central bay. During this period, many of Sarasota County's wastewater treatment plants were also upgrading to AWT or installing deep-well injection systems, resulting in significant pollution reductions in southern Sarasota Bay.

Sarasota County has systematically removed several small treatment plants in the Sarasota Bay watershed, including Atlantic Utilities, Tamaron, KPU, Tri-Par, Dolomite, and others with historical water quality problems. Additional small package plants are being removed systematically throughout the county based on a rating system, including their proximity to

surface waters and their potential for significant environmental impacts (see the memorandum from Kent Kimes to Eric Sutton, March 19, 2003, in **Appendix E**). The county is currently expanding its Bee Ridge facility to ultimately provide regional service.

In the 1980s, nutrient concentrations approximated 3 mg/L for nitrogen in Phillippi Creek, while fecal levels were in the thousands. Today, nitrogen concentrations average approximately 0.6 mg/L, and fecal coliform concentrations typically average less than 1,000 cfu/100 mL. **Figure 4-2** shows abandoned and existing wastewater treatment facilities in Phillippi Creek (WBID 1947).

The city of Sarasota has taken a number of recent management actions to improve water quality in Whitaker Bayou and Sarasota Bay. The city built its first wastewater facility in 1953. The plant had a capacity of 4 mgd and provided secondary treatment consisting of sand removal, primary settling, and the first type of biological treatment, called a trickling filter, followed by final settling. The first expansion occurred in 1958, increasing capacity to 6 mgd.

In 1968, as methods to improve the quality of treatment were developed, the city built its first aerated biological treatment system, with a capacity of 9.1 mgd. In order to meet limits for total suspended solids (TSS), filtration was added in 1975; additional aeration was built in 1980. Expansion from 9.1 to 13 mgd of secondary treatment capacity and the construction of the Compost Facility for the treatment of biosolids were completed in 1987. Associated with development of the effluent reuse system discussed below, a chlorine contact chamber was constructed in 1987, and the treatment system was modified to a 10.2 mgd annual average design capacity in 1990, providing AWT nutrient removal.

The city of Sarasota completed several wastewater collection system upgrades in the early 1990s and has provided sewer service to many homes in the Whitaker Bayou watershed from Earl Avenue north to the city limits. In fact, the city has spent approximately $77 million over the past several years to improve wastewater distribution and treatment in the Sarasota Bay watershed. Numerous wastewater distribution system upgrades and maintenance activities have taken place during the past several decades. **Figure 4-3** shows the locations of these upgrades, and **Appendix D** presents a map legend/key**.**

Manatee County has also made the Bowlees Creek area a priority for sewer line inspections during the past several years. Several communities have been analyzed using television scopes; however, no major problems with the sewer lines beyond Trailer Estates have been found. The Trailer Estates Mobile Home Park is located north of Bowlees Creek and immediately west of U.S. 41 (Tamiami Trail) at the boundary between WBID 1888 (Direct Runoff to Bay) and Bowlees Creek (WBID 1896).

Previous residents' complaints regarding sewage backups and overflows resulted in a five-phased project to retrofit the trailer park with new sewer lines. The Phase II area is currently in design and permitting. This project is expected to reduce the potential for sewer overflows or leaks containing fecal contamination that could reach Bowlees Creek during incoming tides.

In addition, the Holiday Inn Marina in Manatee County has been modernized in the past few years (the boat basin is south and downstream of the primary water quality sampling station for Bowlees Creek, but tidal action may carry discharge upstream during tidal exchange). The marina contains a significant number of "live-aboards" that may be a possible fecal and nutrient source. Enhancements at the marina are expected to result in reduced fecal contamination to Bowlees Creek. In addition, the marina recently placed a moratorium on new live-aboards and phased out all remaining live-aboards in May 2004 (Rob Brown, Manatee County, personal communication).

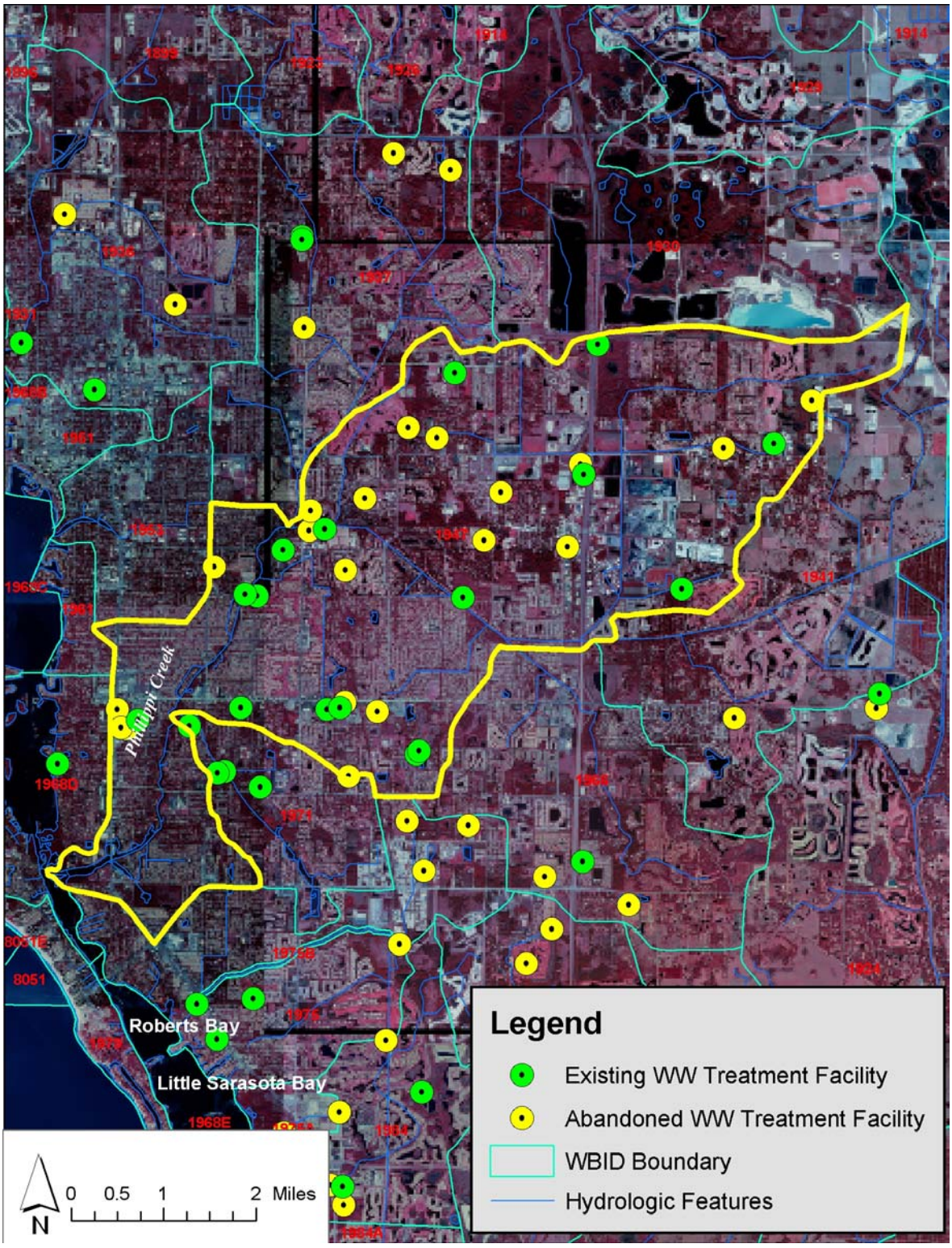


Figure 4-2. Abandoned and existing wastewater treatment facilities in Phillippi Creek (WBID 1947)

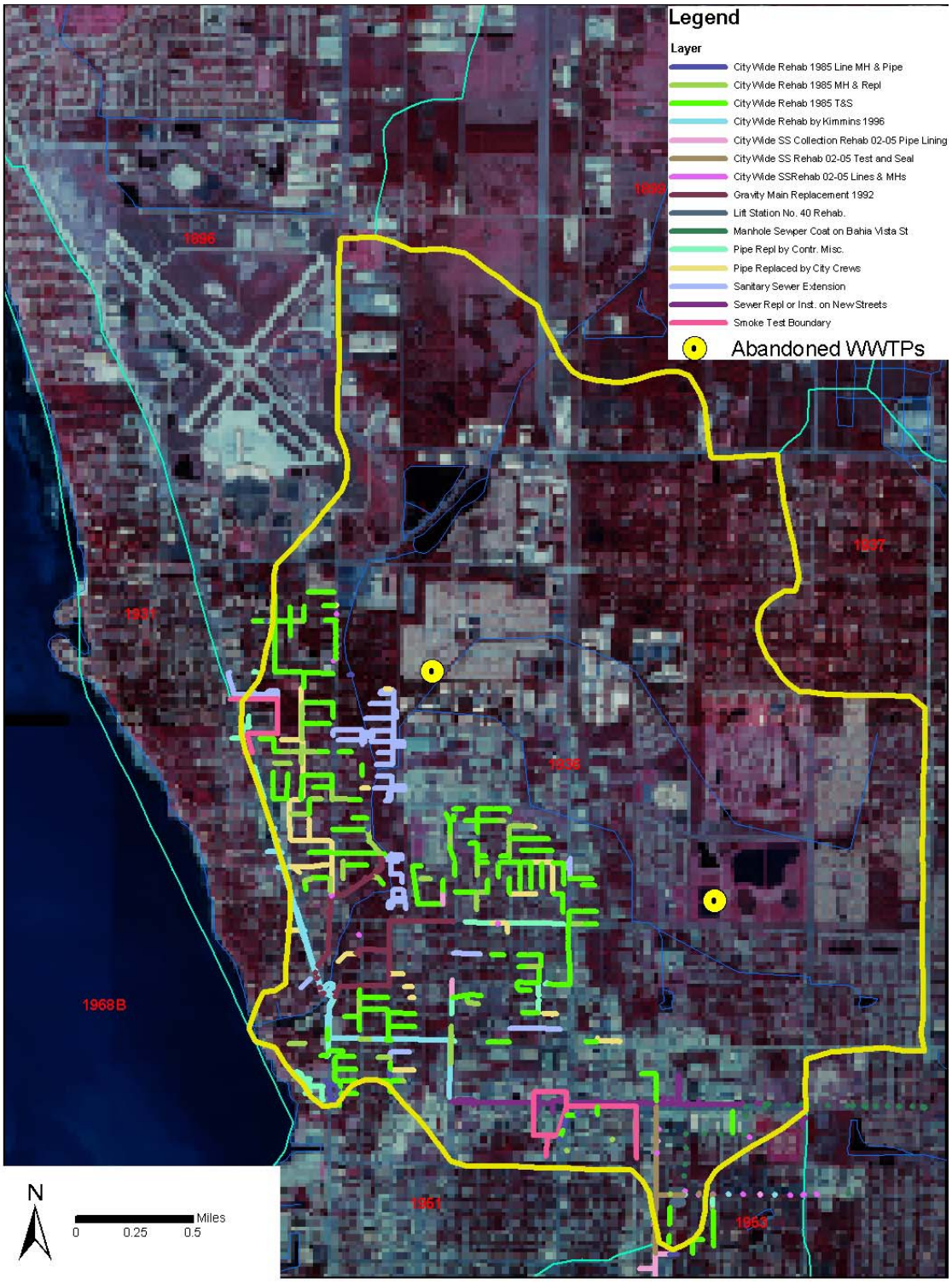


Figure 4-3. Wastewater infrastructure improvements in Whitaker Bayou between the 1980s and 2000

C. Wastewater Reclamation Activities

Parameter addressed: Chlorophyll (nutrients)

WBIDs addressed:

All main bay segments (*1968B, C, D, E, F)*

Palma Sola Bay System:
WBID 1883, Palma Sola Bay

Bowlees Creek System:
WBID 1896, Bowlees Creek

Phillippi Creek System:
WBID 1937, Phillippi Creek
WBID 1947, Phillippi Creek
WBID 1975B, Matheny Creek

The interim water quality targets consist of reducing by 20% the exceedances of total and fecal coliform bacteria criteria, and reducing nitrogen loads to achieve <11 ug/L chlorophyll in Roberts Bay, which is the receiving water for Phillippi Creek.

Additional improvements in bay water quality occurred in response to regional water conservation policies. Studies by SWFWMD indicate that potable water demands in the region exceed the safe yield by 50 mgd, and that water levels in the Floridian aquifer have decreased by approximately 50 feet since the 1930s, primarily in central Manatee County, due to overpumpage. This area of significant ground water impact, designated as the Southern Water Use Caution Area (SWUCA), includes all of Sarasota and Manatee Counties, as well as others. The current goal of the SWUCA plan is to reduce permitted withdrawals and convert to alternative sources. The Sarasota Bay CCMP recognized that efforts to reduce wastewater pollution must be integrated with water supply needs to most efficiently use public funds and improve natural resources. The overall concept was to substantially reduce or eliminate the discharge of wastewater throughout the region and to use this wastewater to offset withdrawals from the Floridan aquifer and reduce nitrogen pollution. The CCMP recommended the development of a regional wastewater reclamation system for Manatee and Sarasota Counties.

In 1995, SWFWMD's Manasota Basin Board requested that a master water reuse plan be developed. A task force comprising staff from Manatee County, Bradenton, Palmetto, the city of Sarasota, Sarasota County, Venice, and the SBNEP, and chaired by SWFWMD, evaluated options for a regional reuse system. Studies funded by local governments, SWFWMD, and SBNEP evaluated multiple storage scenarios and the regionalization of a reclaimed water system.

Currently, Sarasota County and the city of Sarasota have interconnected their reclaimed water reuse networks to provide for an extensive reuse system in northern Sarasota County. In conjunction with that regionalization, SBNEP has assisted the city and the county in completing reclaimed water aquifer storage and recovery (ASR) feasibility studies associated with each system. An ASR well has been permitted at Payne Park; the city and county may potentially use the well to expand distribution opportunities and eliminate the city of Sarasota discharge at Whitaker Bayou.

In 1990, the Agricultural/Urban Reuse Project pumping station and transmission main—which supplies reclaimed water to the Youth Athletic Complex, Ed Smith Stadium, Bobby Jones Golf Club, Meadows County Club, Britt Grove, and Hi-Hat Ranch—was completed, along with the 185-million-gallon reclaimed Water Storage Pond "A" at the Hi-Hat Ranch. The city-owned property (Site III) was added to this system in 1993.

In 1993, construction began on a separate distribution system for reuse within the city limits. Projects included the Downtown and South Loops in 1996 and the North Trail Area Reclaimed Water Transmission Mains Project in 1997.

Manatee County has developed the Manatee Agricultural Reuse Supply (MARS). The overall goal of MARS is to develop a reliable reclaimed water supply system to serve agricultural needs, thus preserving a portion of high-quality water resources to meet demands for drinking water in Manatee County. The MARS system is expected to cost $35 million, with half the funds to be provided by SWFWMD and the federal government.

Through extensive water resource and hydraulic analyses, it was determined that a reuse water interconnection between Sarasota and Manatee Counties was not economically feasible at present. A separate, regional approach was selected, focusing on reuse systems around Bradenton–Palmetto, Sarasota, and Venice, and using aquifer storage and technology to increase reclaimed water capability.

SWFWMD has estimated that the Sarasota Bay region now reclaims 46% of its wastewater from treatment plants for reuse. This percentage will certainly increase in the future as the demand for water increases. In addition to the substantial environmental benefits achieved by removing this nitrogen source to the bay, wastewater reuse may defer the construction of wellfields, reduce capital investment in potable water treatment and storage facilities, and reduce long-term ground water impacts in the SWUCA. In essence, the region is working toward solving both water supply and nitrogen pollution problems simultaneously.

Stormwater reuse is also being considered regionally. Sarasota County recently completed a feasibility study to evaluate the conversion of the Atlantic Wastewater Treatment Plant on Phillippi Creek to a stormwater treatment facility. The plant would be used to treat stormwater runoff that is transported along an existing man-made channel (Channel A) adjacent to the plant to remove nitrogen and fecal coliform bacteria. The flow would either be returned to the channel or removed and blended with the existing county reuse system to provide a water source for irrigation during periods of excess flows. A hydrologic analysis is being conducted during

2004–2005 to determine the timing and quantity of excess flows to the downstream Roberts Bay estuary.

D. Regional Stormwater Improvement Projects

Parameter addressed: Chlorophyll (nutrients)

WBIDs addressed:

All main bay segments (*1968B, C, D, E, F)*

Palma Sola Bay System:
WBID 1883, Palma Sola Bay

Bowlees Creek System:
WBID 1896, Bowlees Creek

Phillippi Creek System:
WBID 1937, Phillippi Creek
WBID 1947, Phillippi Creek
WBID 1975B, Matheny Creek
WBID 1968D, Roberts Bay

The interim water quality targets consist of reducing by 20% the exceedances of total and fecal coliform bacteria criteria, and reducing nitrogen loads to achieve <11 ug/L chlorophyll in Roberts Bay, which is the receiving water for Phillippi Creek.

Stormwater is now the most significant overall source of nitrogen pollution to Sarasota Bay since stringent wastewater standards have been enacted regionally. **Figure 4-4** shows stormwater treatment priorities in the Sarasota Bay Planning Unit. Stormwater runoff was recently estimated to contribute more than 56% of the total nitrogen loading to Sarasota Bay, with 60% of the modeled stormwater nitrogen load originating from residential areas. In addition, while few toxic substances were found in the central bay, elevated levels of heavy metals such as lead, zinc, and copper were found in the sediments of several creeks and bayous.

SBNEP has supported local efforts to improve stormwater conveyance and treatment system in the region. It has also recognized that nitrogen reductions from retrofits would be marginal, based on SWFWMD research indicating that nitrogen-removal efficiencies in stormwater treatment systems are relatively low (30%), while efficiencies for toxic substance removal are very high.

Sarasota and Manatee Counties have both developed stormwater master plans for several priority watersheds in the Sarasota Bay Planning Unit, including Bowlees Creek, Whitaker Bayou, and Phillippi Creek. The Bowlees Creek stormwater master plan was completed in 2002 (CDM,

2002). These master plans will provide a framework for developing future water quality improvement projects and have already been used as a basis to implement several existing projects, including the Celery Fields Regional Stormwater Facility and Phillippi Creek Levee Project. The Bowlees Creek stormwater master plan resulted in the development of a regional stormwater treatment facility that will provide both flood protection and water quality improvements (the reduction of nutrient and sediment loading to the bay).

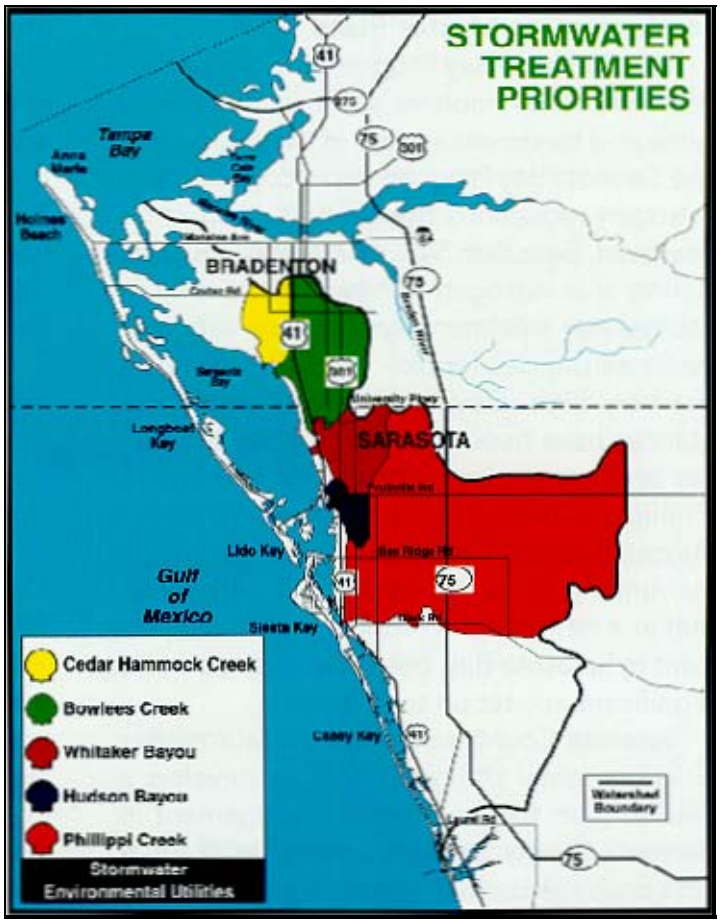


Figure 4-4. Stormwater treatment priority areas in the Sarasota Bay watershed

Sarasota Bay tributaries that were given priority for treatment primarily for nutrient removal are Phillippi Creek, Bowlees Creek, and Whitaker Bayou (**Figure 4-4**). During the planning process, it was assumed that about 50% of these watersheds could be realistically treated for stormwater and that overall, retrofitting these watersheds will result in a net nitrogen reduction of about 5% in Sarasota Bay. For example, Bowlees Creek contributes about 5% of the total nitrogen to the bay (**Table 4-7**). If 50% of the watershed were treated at 30% removal efficiency, a 0.75% total nitrogen load reduction would be achieved in the bay. This type of analysis was done for each priority watershed.

Table 4-7. Nutrient loading estimates for Sarasota Bay watersheds

Watershed Name	Acres	Total Runoff (in)	TP (lb)	TN (lb)	Lead (lb)	Zinc (lb)
➔Phillippi Creek	36417	25.2	66860	362950	7410	9450
South Creek	12995	18.8	11050	53190	250	1400
➔Bowlees Creek	6489	33.6	11100	64320	6970	4270
➔Whitaker Bayou	5015	40.7	20270	89870	3630	3630
South Bradenton	4635	27.9	12550	56260	590	1120
West Bradenton	4395	28.9	7250	35910	1490	1410
Matheny Creek	3800	36.0	11390	57290	2040	2100
Catfish Creek	3360	21.7	3590	18640	240	560
Cedar Hammock	1930	32.4	4090	20830	1280	970
North Creek	1920	20.6	2160	11170	220	350
Longboat Key	1697	23.6	2730	13000	440	450
Hudson Bayou	1595	32.6	3070	16570	1940	930
➔West Bowlees	1559	27.9	2990	14800	710	590
Siesta Key	1385	45.9	8410	30230	580	1030
Palma Sola Creek 2	1120	25.1	1640	8340	350	320
Anna Maria Island	919	28.3	1740	8660	450	360
Palma Sola Creek	900	23.5	1710	7490	230	220
Other Islands	900	27.9	1640	8360	310	290
Perico Island	860	33.1	1040	4750	50	100
Direct to Bay	4241	31.9	8760	51120	2290	1850
Bay Surface	33280	54.6	61730	337460	2470	60080
	129412	34.3	245770	1271210	33940	91480

Source: FFA, 1992.

Phillippi Creek System (WBIDs 1937 and 1947)

Sarasota County developed a Stormwater Environmental Utility in the early 1990s to provide a dedicated funding source for stormwater management activities. A master plan for Phillippi Creek, the largest watershed in the Sarasota Bay area, was developed and implemented. The county has constructed the Celery Fields Regional Stormwater Facility (within WBID 1947) at a cost of approximately $30 million (**Figure 4-5**). Water quality data collected at the inflow and outfalls of this system indicate a range of approximately 40 to 50% fecal coliform bacteria removal (**Figure 4-6**). The county is currently expanding the capacity of the system within the Walker Parcel (labeled on the map in **Figure 4-5**) to provide additional storage and water quality treatment components.

Figure 4-5. Aerial view of Celery Fields Regional Stormwater Facility
Note: Light blue arrows represent flow paths through the treatment system; dark blue arrows indicate outfalls to the Main C channel.

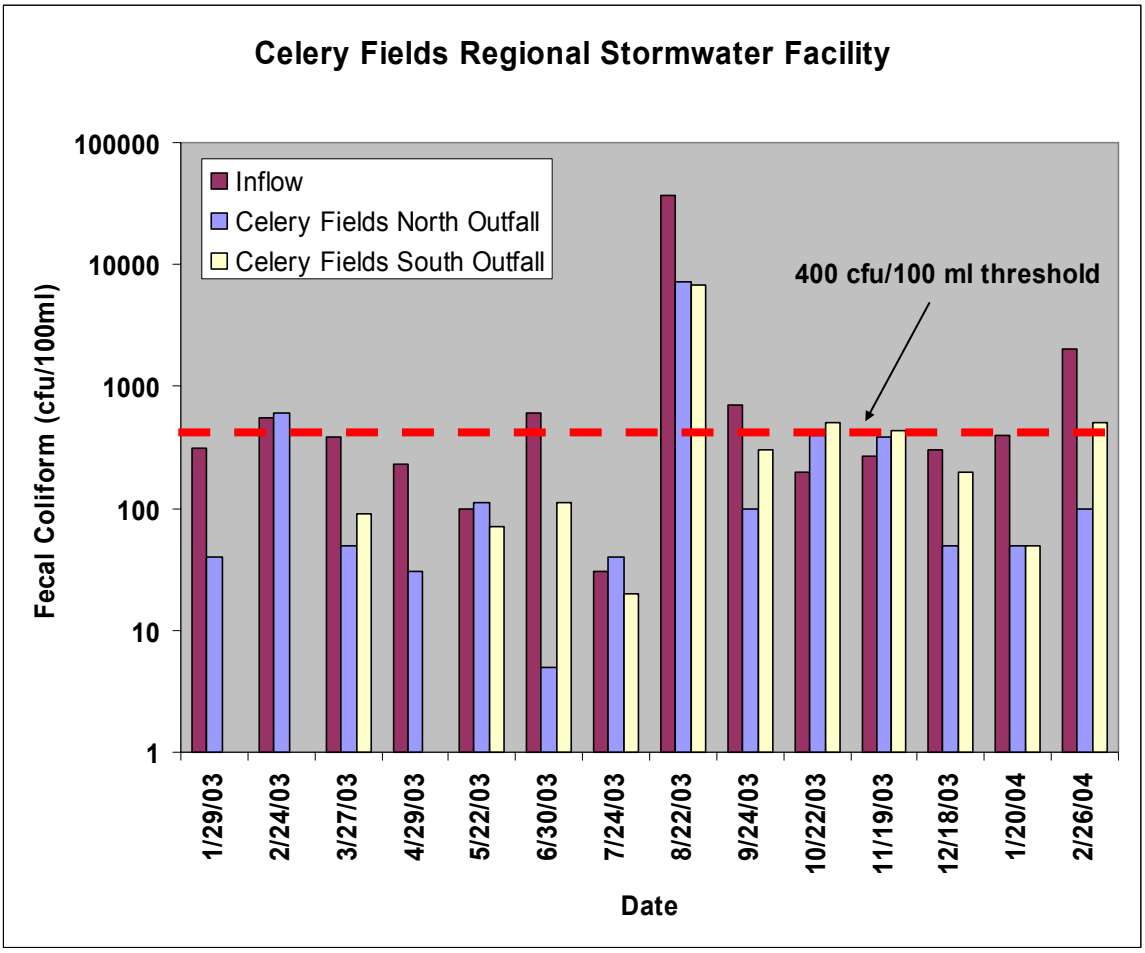


Figure 4-6. Fecal coliform data from the Celery Fields Regional Stormwater Facility

The Branch AA Cattlemen Project (Phillippi Creek, WBID 1947) was constructed in 1999 at a cost of several million dollars. The project involved the regrading and revegetation of the canal bank slopes in Phillippi Creek Branch AA and the installation of concrete weirs approximately every 3,000 feet to generate a pool effect for continued water quality enhancement.

The Phillippi Creek Levee Project (Phillippi Creek, WBID 1947) was constructed at a cost of $5.2 million to reduce flooding and improve water quality. The levee project has also had a significant impact on preventing wastewater transfer and lift stations (both in the city and the county) in the watershed from being flooded during extreme storm event conditions. Several other stormwater projects have been completed in Sarasota County at Clower Creek and Aqualane Canal, and others are under construction.

Bowlees Creek System (WBID 1896)

Unlike Sarasota County, Manatee County has not developed a stormwater utility at this time, and therefore does not have a dedicated funding source to design and construct stormwater treatment systems. However, it has embarked on several major retrofitting projects to improve water quality in Bowlees Creek (WBID 1896) (**Figure 4-7**). These include cooperative projects with SBNEP and SWFWMD's SWIM Program. The following individual projects are completed or in the planning phases:

1. **Airport Retrofit**—In 1997, a project sponsored by SBNEP was completed on the Airport Drain to improve water quality draining from the southeastern portion of the Bowlees Creek WBID, including runoff from the Sarasota/Bradenton International Airport. The project involved the creation of a series of in-line silt basins along McArthur Avenue. The silt basins are maintained annually to remove excess sediments and trash that have accumulated in the treatment area. The project has contributed to a reduction in the loads of nutrients, heavy metals, and possibly coliform bacteria that are associated with suspended solids to the lower reaches of Bowlees Creek.

2. **Master Planning**—In 2002, Camp, Dresser, and McKee (CDM) completed a master stormwater plan that characterized stormwater conveyance and pollutant loadings in the basin. Several recommendations were developed to improve water quality.

3. **Nicholson Drainage Channel Stormwater Treatment Project**—Manatee County and SWFWMD/SWIM entered into a cooperative agreement in 2004 to construct a stormwater retrofit project on Nicholson Channel, which is located north of Tallevast Road and west of 15th Street East. When completed in 2005, the project will result in the construction of a control structure to provide additional flood storage, a sediment trap, and littoral zone plantings to improve water quality for this tributary to Bowlees Creek. This stormwater retrofit system is expected to reduce and attenuate nutrient, heavy metal, and possibly coliform bacteria loading to the lower reaches of Bowlees Creek.

4. **Lake Brendan—**In 2003, Manatee County completed a project on Lake Brendan (SWFWMD Permit No. 43021908.0001) expanding the treatment capacity of a 6-acre, man-made lake via the installation of a dual weir system with biological treatment. The project provides treatment for approximately 50% of the Bowlees Creek watershed (the main tributary). The lake was recently dredged to provide additional sediment storage capacity and to remove the existing sediment load. Approximately 20,000 cubic yards of sediments have been removed during the past few years. This sedimentation basin has contributed to a reduction in the transport of nutrients, heavy metals, and possibly coliform bacteria that are associated with suspended solids to the lower reaches of Bowlees Creek.

1. **Trailer Estates—**As discussed in Section B of this chapter, ***Regional Wastewater Improvement Programs,*** a phased project is under way to retrofit the Trailer Estates Mobile Home Park in Manatee County with new sewer lines. The park is located at the boundary between WBID 1888 (Direct Runoff to Bay) and the Bowlees Creek WBID. The project will reduce potential sewer overflows or leaks containing fecal contamination that could reach Bowlees Creek during incoming tides.

2. **Holiday Inn—**As discussed in Section B of this chapter, ***Regional Wastewater Improvement Programs,*** modernization of the Holiday Inn Marina in Manatee County over the past few years is expected to reduce fecal contamination to Bowlees Creek. The marina also phased out live-aboards in 2004; these were another possible source of nutrients and fecal contamination.

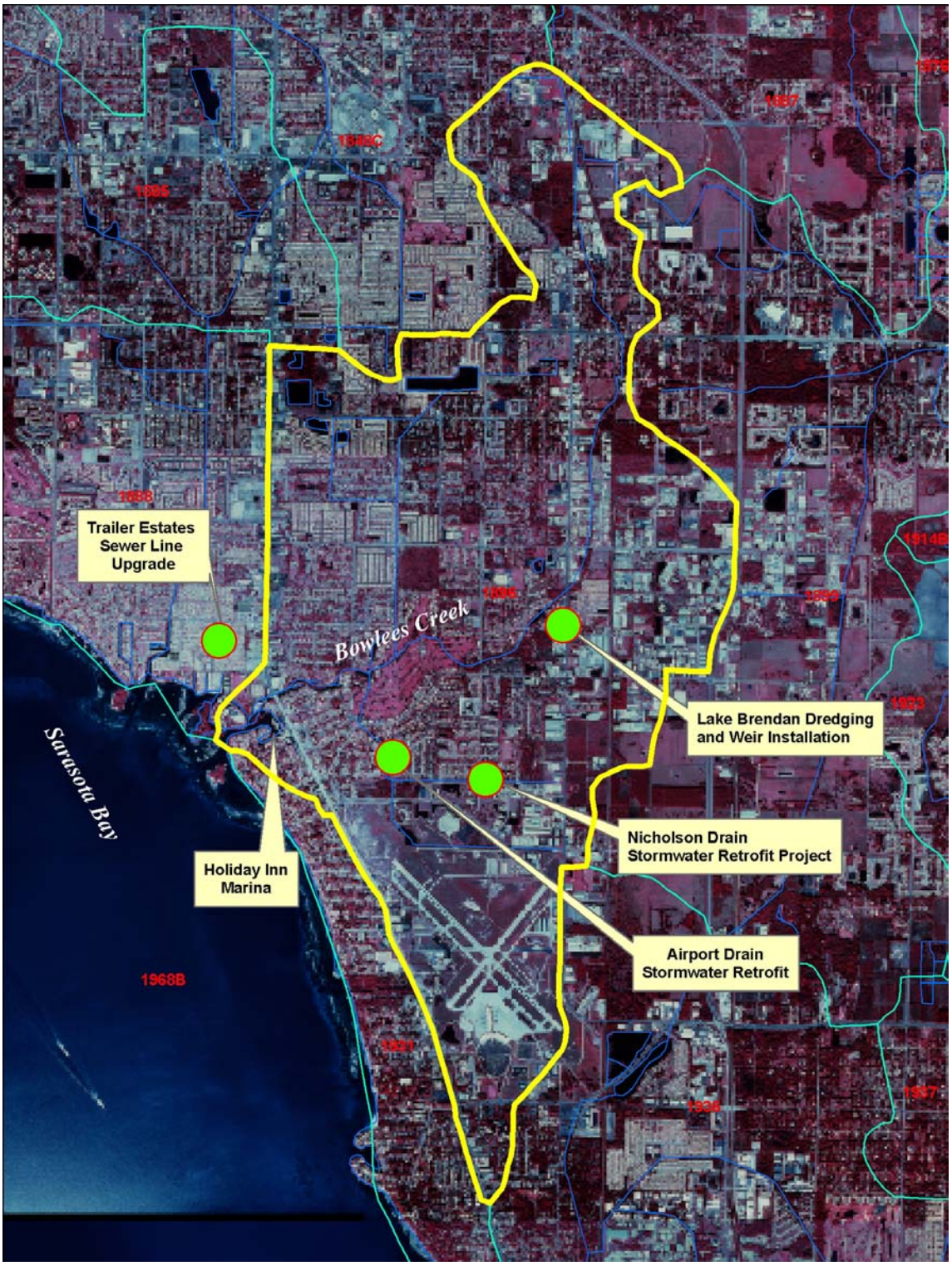


Figure 4-7. Recent and proposed regional stormwater improvement projects in Bowlees Creek (WBID 1896)

E. Land Acquisition Programs

Parameters addressed: Chlorophyll (nutrients), coliform bacteria

WBIDs addressed:

Phillippi Creek System
Phillippi Creek, WBID 1937
Phillippi Creek, WBID 1947

Land acquisition programs will help address future growth and pollutant loading by protecting parcels of land from potential urban development and its associated stormwater runoff. Funding for land acquisitions is provided through the Florida Forever Program, the Florida Communities Trust (FCT), and Sarasota County's Environmentally Sensitive Lands Acquisition and Protection Program (ESLAPP). Several parcels have been acquired in the Phillippi Creek watershed (WBIDs 1937 and 1947), including Red Bug Slough and Pinecraft Park; however, available natural lands in these and other impaired WBIDs are relatively scarce due to the extent and history of development in the Sarasota Bay Planning Unit.

F. Habitat Restoration Activities

Parameters addressed: Chlorophyll (nutrients), coliform bacteria

WBIDs addressed:

All main bay segments (*1968B, C, D, E, F)*

Palma Sola Bay System:
WBID 1883, Palma Sola Bay

Bowlees Creek System:
WBID 1896, Bowlees Creek

Phillippi Creek System:
WBID 1937, Phillippi Creek
WBID 1947, Phillippi Creek
WBID 1975B, Matheny Creek
WBID 1968D, Roberts Bay

The Sarasota Bay community has embarked on a series of restoration projects to enhance wetlands, oysters and artificial reefs to improve habitat and water quality via filtering and biological processes. SBNEP has planned and constructed 35 wetland restoration projects, 20 artificial reef projects, and 2 oyster restoration projects throughout the Sarasota Bay region, creating approximately 200 acres of habitat.

An additional 30 projects totaling approximately 584 acres of restored habitat are currently planned over the next 5 to 10 years by SBNEP and various partnering agencies, including Sarasota and Manatee Counties, the town of Longboat Key, USFWS, USACOE, SWFWMD, and FDEP. **Table 4-8** contains SBNEP's Five-Year Habitat Restoration Plan list of projects throughout the watershed.

Table 4-8. SBNEP Five-Year Habitat Restoration Plan's list of proposed projects

Site Name	WBID	Total Land Area (ac) within proposed property boundary	Approximate Project Area (ac)	Fiscal Year
Bowlees Creek (Nicholson Branch) Water Treatment	1896	-	-	2005-2006
Robinson Preserve	1883	705.02	130.00	2004-2005
Pine Island[2]	n//a	86.79	58.93	2004-2005
Fox Creek[2]	n//a	227.02	50.00	2006-2007
South Creek	1968E	1704.76	50.00	2007-2008
Celery Fields	1937, 1947, 1968D	480.71	50.00	2005-2006
Jim Neville Preserve[1]	1968E	107.66	33.87	USACE
Red Bug Slough	1947	69.49	27.08	2006-2007
Sister Keys	1968B	64.42	25.77	2006-2007
Lido Beach	1968C	160.68	22.13	2004-2005
FISH Property	1968B	70.07	20.00	2005-2006
Curry Creek[2]	n/a	82.48	18.55	2008-2009
River Run City Golf Course	n/a	35.29	14.03	2005-2006
Rattle Snake Key	n/a	13.02	13.02	2007-2008
North Lido Shores	1968C	61.19	12.57	2007-2008
Skier's Spoil Island[1]	1968D	8.76	8.76	USACE
New College Shoreline	1968B	102.30	7.91	2007-2008
Perico Bay South	1883	78.41	6.81	2008-2009
Big Edwards Spoil Island[1]	1968D	6.37	6.37	USACE
Airport/Crosley Connection II	1968B	19.00	4.91	2008-2009
Bowlees Creek Spoil Island	1896	4.71	4.71	2008-2009
Palmer Point[1]	1968E	40.56	4.00	USACE
Grassy Point - City of Holmes Beach	n/a	33.53	3.81	2007-2008
Gap Creek Public	n/a	9.08	3.80	2006-2007
Fort Hamer	n/a	6.84	2.24	2006-2007
Sixth Street Canal	1968B	32.53	1.67	2004-2005
Ballard Elementary on Wares Creek	n/a	9.02	1.60	2004-2005
Robert's Bay/Bird Colony Spoil Island[1]	1968D	1.18	1.18	USACE
Ringling School (Whitaker Bayou)	1968B	9.15	1.08	2005-2006
Broadway Public	1968B	0.71	0.18	2008-2009

G. Education and Outreach Activities

Parameters addressed: Chlorophyll (nutrients), coliform bacteria

WBIDs addressed:

All main bay segments (*1968B, C, D, E, F)*

Palma Sola Bay System:
WBID 1883, Palma Sola Bay

Bowlees Creek System:
WBID 1896, Bowlees Creek

Phillippi Creek System:
WBID 1937, Phillippi Creek
WBID 1947, Phillippi Creek
WBID 1975B, Matheny Creek
WBID 1968D, Roberts Bay

A number of environmental education initiatives are ongoing throughout the Sarasota Bay watershed **(Table 4-9).** Activities discussed in greater detail in this section are the PIER Program, which provides hands-on learning experiences for school-aged children and adults; the Sarasota County Water Atlas, a Web-based public information system; and the Florida Yards & Neighborhoods Program, which educates homeowners about environmentally friendly practices.

Table 4-9. Implementation status of environmental education initiatives listed in the CCMP

Education/Outreach Activity	Implementation Status as of October 2004
Wastewater Treatment and Reclamation	
Educating the public about the need for consistent policies on wastewater treatment and reclamation.	Full implementation
Working with private utility owners/operators to develop infrastructure in the Phillippi Creek watershed to facilitate advanced treatment of wastewater (with reuse) in areas where effluent now percolates or is discharged within 900 feet of Sarasota Bay or its tributaries. Such effluent may originate from septic systems and/or package treatment plant percolation ponds and drainfields.	Full implementation
Working with private utility owners/operators to develop and implement appropriate funding mechanisms to pay for infrastructure, such as public-private partnerships or special assessment districts.	Significant implementation
Working with the private sector to develop and implement appropriate funding mechanisms to pay for plant expansion or improvements, such as appropriate rate structures, public-private partnerships, or special assessment districts.	Full implementation

Stormwater	
Implementing the Florida Yards & Neighborhoods Program, which emphasizes reductions in use of pesticides and water, and encourages broader use of slow-release nitrogen fertilizers.	Significant implementation
Coordinating the Florida Yards & Neighborhoods Program with state, regional, and local water-conservation education programs and policies for integrated pest management.	Significant implementation
Educating stormwater management staff and the public on appropriate stormwater runoff maintenance techniques.	Partial implementation
Wetlands	
Coordinating wetlands activities with the Sarasota Bay Program, citizen organizations, and existing citizen advisory committees of local governments.	Significant discussion (no action)
Providing proactive, cooperative consultations to the private and public sectors on development proposals and regulatory issues that affect wetlands.	Significant discussion (no action)
Providing technical information to programs providing public education and citizen involvement in wetlands issues.	Significant implementation
Providing opportunities for citizen involvement in wetlands protection, enhancement and acquisition.	Significant implementation
Supporting an ongoing education program on mangrove protection and care.	Partial implementation
Encouraging citizen groups to "adopt" restored or protected wetlands for trash and exotic-plant removal.	Significant discussion (no action)
Promoting neighborhood wetlands protection and homeowner shoreline management through the Florida Yards & Neighborhoods Program.	Partial implementation
Fisheries and Other Living Resources	
Educating the public on the need for improved fishery habitat.	Significant implementation
Encouraging the voluntary installation of seawall habitat modules by homeowners through education, incentives, and permitting assistance.	Partial implementation
Educating boaters on the need to protect seagrass beds.	Significant discussion (no action)
Recreational Use	
Discouraging deliberate feeding of seabirds and marine mammals through education and/or signage.	Significant discussion (no action)
Working with appropriate organizations to increase enrollment in boater education programs to promote better protection of Sarasota Bay resources.	Significant discussion (no action)
Targeting youths, tourists, and visitors to improve awareness and sensitivity about Sarasota Bay.	Significant implementation

PIER Program

(Annual Cost: $30,000)

The PIER Program, which stands for Protection, Involvement, Education, and Restoration, began in February 2003. Its purpose is to educate students about local coastal ecology, promote the benefits of environmental stewardship, and increase students' environmental literacy and stewardship behaviors.

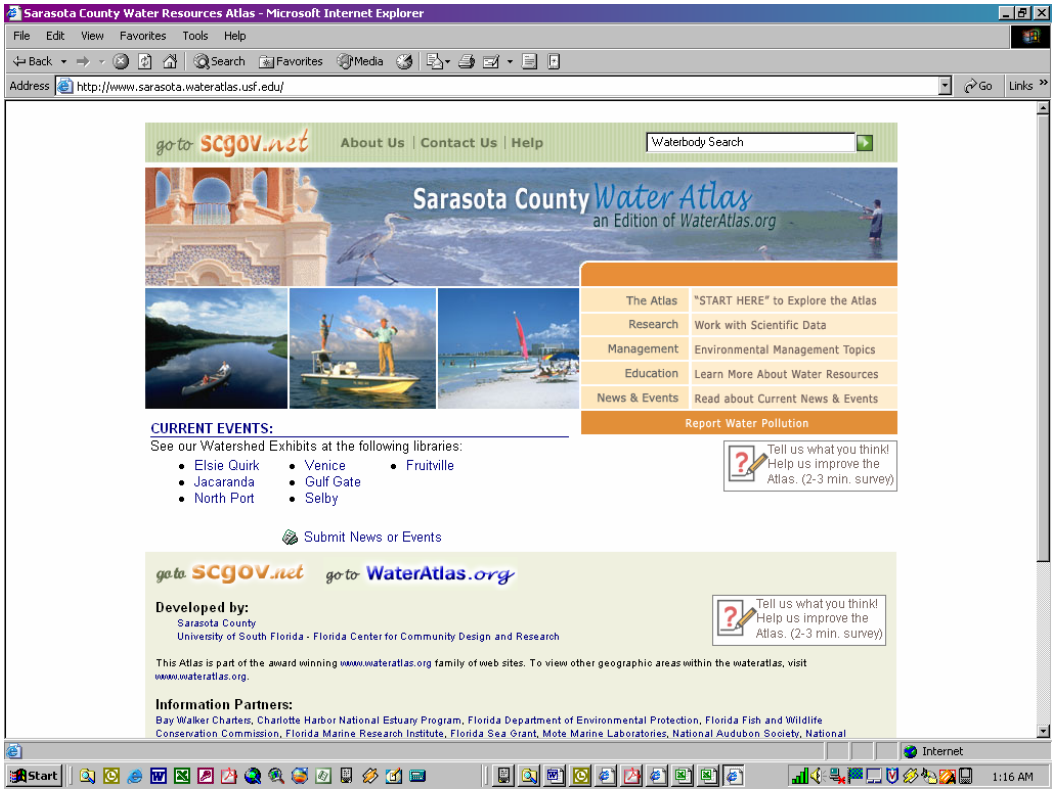
The program provides local teachers with a free curriculum about coastal habitats, free field trips to parks around Sarasota Bay, and funding for high school environmental research projects. The PIER Program is offered to public and private schools, grades K–12, in Sarasota and Manatee Counties. The program's field trips provide hands-on activities such as water sampling and water quality testing, conservation games, and plant and animal identification skills. Field trip activities directly correlate to the in-class curriculum lesson plans and activities. The field trips give students the chance to personally experience the beauty of Sarasota Bay.

Sarasota County Water Atlas

(Annual Cost: $10,000)

The Sarasota County Water Atlas is an interactive Web site about local waterbodies, where anyone with Internet access can find updated information from multiple sources. Users can create maps by selecting from dozens of map layers; read reports about water and the environment; enjoy underwater, historical, and aerial photos; acquire water quality and water flow data; learn about fish, birds, and the ecology of waterways; and connect to numerous other informative Web sites.

Almost everything on the atlas can be downloaded in useful formats, but users can also submit information from their own personal computers, such as news and event announcements, photos, documents, reports of pollution, and fishing reports. The atlas, which is expected to serve as a database management tool for future water quality data collection and analysis efforts by the Water Quality Consortium and Sarasota County, is available at http://www.sarasota.wateratlas.usf.edu/.



Alternative Landscapes—Florida Yards & Neighborhoods Program

(Annual Cost: $130,000)

Stormwater from residential areas is estimated to contribute one-third of the total nitrogen load to Sarasota Bay. The Florida Yards & Neighborhoods (FYN) Program was developed in 1993 to promote environmentally friendly landscaping with plants suited to the southwest Florida climate, natural conditions, and wildlife. Using these FYN principles, homeowners can reduce water, fertilizer, and pesticide use while increasing habitat for wildlife. The University of Florida's Institute of Food and Agricultural Sciences (IFAS) is developing the program statewide through county Cooperative Extension Service offices.

A series of educational materials about the FYN Program and what homeowners can do to implement FYN principles has been developed, including the *Florida Yards & Neighborhoods Program Handbook*.

In 1997, a Statewide Implementation Strategy was developed by a joint committee of Cooperative Extension Service agents and staff, IFAS staff, and SBNEP staff. Funding for a phased integration of the FYN Program throughout the state was approved. The FYN Program is now reaching out to the landscape and "green" industries, builders, developers, and lending institutions to show the importance and economic benefits of alternative landscapes.

A series of 12 demonstration Florida yards was constructed in the Sarasota Bay area to provide residents with living models and educational information. The models, which vary in size and complexity, offer a variety of Florida-friendly landscape designs.

In 1998, SBNEP, FYN, Manatee County, and River Forest Residential Development hosted an event to introduce area developers, planners, and lenders to FYN concepts. In 2002, Sarasota County passed landmark legislation requiring more "Florida-friendly" landscapes on all new development in Sarasota County. Sarasota County also requires detention of the first inch of rainfall on site which is above state standards.

A builder/developer outreach program (sponsored by SWFWMD) indicates a high degree of compliance and shows that developers in Manatee County are beginning to use the same methods. SBNEP is addressing existing development through in-school (K–12) education and mini-grants to neighborhood associations to modify common areas. Within the next decade, major cultural changes are anticipated in southwest Florida. The efforts of Manatee and Sarasota Counties have focused on new development, targeting condominium owners. More than 90% of those contacted have changed practices.

H. Research Activities

This section discusses ongoing and planned research activities to improve water quality in the Sarasota Bay watershed. It discusses the Sarasota Bay integrated water resource evaluation, Sarasota Bay seagrass analysis, TMDL support—tributary analysis, water quality control retrofits for urban stormwater, improved landscape management practices, and urban ecosystem analysis. **Table 4-10** lists the implementation status of a number of other activities, by area.

Table 4-10. Implementation status of research initiatives listed in the CCMP

Research Activity	Implementation Status as of October 2004
Wastewater Treatment and Reclamation	
Investigating the appropriateness of available nutrient-removal septic systems for the Sarasota Bay watershed (Sarasota County, Florida Department of Health and Rehabilitative Services, FDEP, and EPA).	Fully implemented
Stormwater	
Research, develop, and use stormwater treatment technologies to achieve the greatest possible nutrient removal.	Significant discussion (no action)
Fisheries and Other Living Resources	
Seek designation of Sarasota Bay as a test area for enhanced fisheries management measures combined with careful monitoring.	Significant discussion (no action)

Parameters addressed: Chlorophyll (nutrients), coliform bacteria

WBIDs addressed:

All main bay segments (*1968B, C, D, E, F)*

Palma Sola Bay System:
WBID 1883, Palma Sola Bay

Bowlees Creek System:
WBID 1896, Bowlees Creek

Phillippi Creek System:
WBID 1937, Phillippi Creek
WBID 1947, Phillippi Creek
WBID 1975B, Matheny Creek
WBID 1968D, Roberts Bay

Sarasota Bay Integrated Water Resource Evaluation (U.S. Geological Survey/University of Florida)

(Cost: $126,000)

Significant changes in freshwater flows to the Sarasota Bay estuary have occurred during the last century. The predominant changes have been the conversion of natural upland and wetland communities to urban land uses, including residential and commercial development and agriculture. With these land use changes, alterations in the timing, duration, and volume of freshwater inputs to Sarasota Bay have occurred that may significantly affect estuarine biota (fish, invertebrates, and vegetation) and productivity.

To address the water quality issues caused by increased urban development in the watershed, a number of projects are currently under way or planned, including flood storage ponds (detention), stormwater conveyance improvements, aquifer storage and recovery wells, brackish water treatment/disposal, septic tank replacement/wastewater collection system construction, reclaimed water transmission/distribution, and the regional distribution of surface water supplies.

Also, pervious surfaces like porous concrete, porous rubber pavement, and various loosely aggregated materials have been developed to allow a certain degree of infiltration, minimizing stormwater runoff. Compacted fill dirt decreases rainwater infiltration and increases stormwater runoff. However, a lack of data limits the understanding of the impact of these surfaces. An investigation of their effects in actual situations could allow decision making that would minimize total stormwater runoff and decrease the destruction of natural systems during the construction of additional stormwater retention systems. SBNEP initiated a study with the USGS in 2003. The results of this study will be presented to the Technical Advisory Committee for action in 2004. Based on the USGS hydrology study, SBNEP is currently contracting with the University of Florida to study soil compaction to develop runoff coefficients for urbanizing areas.

Sarasota Bay Seagrass Analysis

(Cost: $30,000)

The seagrass analysis consists of conducting a monitoring program and reanalyzing (if necessary) a subset of archived Sarasota Bay aerial photographs available from SWFWMD to examine whether the shift in seagrass polygon category from patchy to continuous can be attributed to changes in seagrass species dominance (e.g., *Halodule wrightii* to *Thalassia testudinum*), changes in seagrass shoot density, or changes in interpretation capabilities. The project will be coordinated through the regional Southwest Florida Seagrass Working Group.

Total Maximum Daily Load Support—Tributary Analysis

(Cost: $40,000)

The SBNEP evaluation completed in FY04 identified several tributaries as impaired, based on the TMDL assessment. PBS&J is currently under contract to verify impairment of the 22 WBIDs identified as impaired by FDEP and placed on the 1998 303(d) list. This analysis will support the refinement of the management plans produced by local governments during the reasonable assurance process and support the Water Quality Consortium.

Water Quality Control Retrofits for Urban Stormwater

(Cost: $50,000)

This project would identify and plan water quality control retrofits for urban stormwater (including possible residential and commercial areas), especially in locations with direct discharges. The criteria should include low price, easy accessibility for maintenance, and a receiving water of high resource value (e.g., bays rank higher than ditches). The study should include information needed for implementation, such as structure type, cost, and property ownership. No effort should be directed to high-cost fixes, a need for more study, or a new funding initiative; instead, only readily doable suggestions should be produced. The project was highly ranked by the SBNEP Technical Advisory Committee at a goal-setting meeting in 2001.

Improved Landscape Management Practices (University of Florida)

(Cost: $120,000)

SBNEP has sponsored research through the University of Florida to demonstrate the measurable benefits of adopting FYN landscape and management principles. The project included an evaluation of ornamental and traditional turf landscapes; it also includes controlled and replicated plot study at the university's Fort Lauderdale Research and Education Center, and a field study at two waterfront homes on Orange Avenue within the city of Sarasota.

Instrumentation was installed in the ornamental and turf plots and home lawns to measure nutrient levels in runoff and leachate resulting from irrigation and storms. The results indicated

that both turf and ornamentals landscaping can be used to control nitrogen leachate, if effectively managed. A mixture of trees (canopy), turf, and ornamental shrubs is environmentally prudent.

Urban Ecosystem Analysis (Sarasota County Forestry Division)

(Cost: $50,000)

This study, completed in 2004 for the Sarasota County Forestry Division, evaluated large-scale (countywide) changes in vegetation coverage over the past 30 years and evaluated the functions and values of the urban forest with respect to stormwater runoff, energy savings, and air quality. The results of this study were also compared with other similar studies performed throughout the United States. They establish a benchmark of data that Sarasota County can use to evaluate the effectiveness of public policy on urban forestry management in the future.

Two separate but parallel analyses were performed to evaluate the changes, functions, and values of the vegetation in Sarasota County. The first analysis involved a regional vegetation mapping and trend analysis using satellite imagery. The second analysis involved a small area mapping and modeling effort focusing on the urbanized portion of the county. The resulting data from this second, "local" analysis were used to develop estimates of air quality benefits and energy cost savings provided by the vegetation canopy. To address the benefits of vegetation coverage on stormwater runoff, existing studies related to rainfall interception by tree canopies were reviewed. Based on a review of this literature (primarily from studies in California), rainfall interception ranges from about 5% to nearly 100%, with an average of approximately 11%. The variability in interception is mainly due to differences in the intensity (amount and duration) of precipitation, humidity, temperature, and tree species (leaf area, branch structure, and canopy cover). The percentage of rainfall intercepted is generally greatest for small, short duration storms and with trees having large leaf areas.

The existing vegetation canopy in areas with medium-density residential land use also provides a significant economic benefit to Sarasota County. Many older neighborhoods are becoming more heavily canopied as a result of decades of tree growth since their original development. Tree-planting programs may also significantly improve air and water quality in commercial and recreational areas; however, these effects will likely take several years to be realized.

Based on the results of previous studies evaluating the mechanism for rainfall interception by the tree canopy, future tree plantings in urban areas should target residential areas, open lands, and impervious surface areas (e.g., roads and parking lots). Rainfall interception by the tree canopy will have the greatest effect when impervious surfaces are directly shaded or covered by the canopy, since nearly all of the rainfall falling on impervious areas runs off into drainage systems. Sarasota County's Public Works Division has already begun implementing a program where tree plantings are incorporated into the medians and shoulders of new roadway improvement projects. Tree species that provide a large tree canopy, high leaf-to-area ratios, are leafed out year-round or only briefly deciduous, and that can withstand pruning and disturbance should provide the greatest reductions in stormwater runoff and pollutant loads to receiving waters. Optimal tree-planting scenarios for this ongoing county program should be identified. The

expected benefits could be calculated using the results of the additional rainfall interception research described above.

I. Water Conservation Programs

Parameters addressed: chlorophyll (nutrients), coliform bacteria

WBIDs addressed:

Palma Sola Bay System:
WBID 1883, Palma Sola Bay

Bowlees Creek System:
WBID 1896, Bowlees Creek

Phillippi Creek System:
WBID 1937, Phillippi Creek
WBID 1947, Phillippi Creek
BID 1975B, Matheny Creek
WBID 1968D, Roberts Bay

Water Efficient Landscape Ordinance

In 2002, Sarasota County adopted a Water Efficient Landscape Ordinance (WELO) that recognized the need for and protection of water as a natural resource through the application of enhanced landscape practices. The ordinance applies to the following:

- Promotes the installation of rain sensor devices on automatic lawn sprinkler systems,
- Supports water conservation through the use of site-adapted plants and efficient watering methods,
- Reduces energy expenditures in individual landscapes, *and*
- Saves significant amounts of water.

Water Conservation Rebate Program

In 2003, Manatee County Utility Operations implemented a Water Conservation Rebate Program that addressed landscape retrofits and landscape irrigation. The program offers financial incentives in the form of rebates to encourage residents to install cisterns, repair old irrigation wells or install new ones, and install pumps and similar equipment in natural storage areas such as retention ponds for irrigation. It also promotes the conservation of drinking water, which in turn helps Sarasota Bay.

In addition, the rebate program recognizes those who modify existing landscape irrigation systems to use less water and those who retrofit an existing landscape with a Florida-friendly design that minimizes water use through proper plants, placement, and microirrigation.

Water-Wise Landscape Recognition Program

In the country's third-fastest growing state, where the population increases by 2.3 percent each year, or 1,000 people per day, the development industry has a significant impact on Florida's water resources. SWFWMD recently initiated a program that recognizes the developers, builders, architects, landscape contractors, and others in the industry who make the majority of decisions about new landscapes.

To call attention to the efforts of good water stewards in the community's commercial and building industry and in government,, the Water-Wise Landscape Recognition Program recognizes new and retrofitted water-conserving commercial landscapes. Through the application process for individual projects, five areas pertaining to water conservation are judged: the retention of existing trees/vegetation, reduced stormwater runoff, landscape design and plant selection, efficient irrigation, and waterfront considerations.

As discussed earlier, the FYN program is working through a business outreach program to advocate changes in technology and landscaping practices. The largest development in the Sarasota Bay region—Lakewood Ranch—recently won a national Award of Excellence as a green community.

J. Marina Upgrades/Improvements

Parameters addressed: chlorophyll (nutrients), coliform bacteria

WBIDs addressed:

Bowlees Creek System:
WBID 1896, Bowlees Creek

The Holiday Inn Marina on Bowlees Creek (WBID 1896) no longer allows live-a-board vessels in their facility, possibly resulting in declines in bacteria contamination. It was suspected that the live-a-boards were directly discharging wastewater to the surface waters near the sampling station in this WBID.

K. Improved tidal circulation in hydrologically altered systems

Parameters addressed: chlorophyll (nutrients), coliform bacteria

WBIDs addressed:

Palma Sola Bay System:

WBID 1883, Palma Sola Bay

The SBEP is investigating projects to improve tidal circulation in hydrologically altered systems throughout the bay. An example of this is a recently completed restoration project restoring a historic cut to Perico Bayou and Palma Sola Bay to increase flushing.

L. Managed Recreational Use

Parameters addressed: coliform bacteria

WBIDs addressed:

Palma Sola Bay System:
WBID 1883B and C, Palma Sola Bay North and South

Additional management measures will be developed in high recreational use areas to reduce bacterial loading. This may include limitations on pet or horseback riding activities at recreational beaches or parks adjacent to sensitive waterbodies.

Geographic Scope of Proposed Management Activities

The action plans and projects described in this document are located throughout the SBNEP watershed. The proposed activities will be carried out in the same basin as the impairment, or in basins that contribute loading to impaired WBIDs.

Documentation of Estimated Pollutant Load Reductions and Other Benefits

Certain individual management actions developed in response to water quality issues in the watershed, as well as established water resource management actions, have documented benefits in the form of pollutant load reductions. A discussion of actual pollutant reductions and observed results from the implementation of management actions is presented below. Other management actions are projected to have an impact on pollutant load reductions, but the quantifiable reduction achieved, or projected to be achieved, has not been documented to date. **Table 4-11** presents information on the anticipated effectiveness of all management actions in reducing pollutant concentrations and loads in impaired waters in the Sarasota Bay Planning Unit.

Table 4-11. Percent effectiveness of resource management actions to address parameters causing impairment and interim water quality targets for the Palma Sola Bay, Bowlees Creek, and Phillippi Creek systems

Resource Management Actions	Management Activity	Affected WBID	Percent Effectiveness	Project Type	Comments
Phillippi Creek Septic Tank Replacement Program	A	1937, 1947, 1968D	50%	Point Source–Immediate Remediation	Highly effective and reduces both nutrients and fecal contamination. Allows centralization of wastewater which will lead to decreased potable water use and increased ability for providing reclaimed water.
Sarasota County Centralized Sewer Program	B	1937, 1947, 1968D, 1975B	35%	Point Source–Immediate Remediation	Highly effective and reduces both nutrients and fecal contamination. Allows centralization of wastewater which will lead to decreased potable water use and increased ability for providing reclaimed water.
Conversion of Atlantic WWTP to Stormwater Treatment Facility	C	1937, 1947, 1968D	5%	Point Source–Immediate Remediation	Very effective since all loads are treated at plant resulting in high efficiency. Also may result in reduced potable water use if treated water is blended with reuse system.
Expansion of Celery Fields Stormwater Treatment Area	D	1937, 1947, 1968D	5%	Nonpoint Source–Longer Term Remediation	Very effective and also serves dual role of improving water quality and also serves as flood attenuation and wildlife habitat.
Land Acquisition (Sarasota County/ SWFWMD)	G	1937, 1947, 1968D	1%	Nonpoint Source–Longer Term Remediation	Has the potential for a greater future percent effectiveness. Time frame for land acquisition undetermined.
Florida Yards and Neighbors Program	I	All	2%	Nonpoint Source–Longer Term Remediation	Effective in promoting awareness of issues and incentive programs.
Other Education/Outreach Programs	I	All	1%	Nonpoint Source–Longer Term Remediation	Effective in promoting awareness of issues and incentive programs.
Research	J	All	1%	Nonpoint Source–Longer Term Remediation	Effective in continuous assessment of water quality problems to focus management actions for greatest effectiveness.

An important concept that needs to be understood is that one of the primary management actions for Phillippi Creek (WBIDs 1937 and 1947) and Matheny Creek (WBID 1975B) focuses specifically on septic tank removal. The reduction in bacteria loading will also reduce nitrogen loading via ground water transport to Phillippi Creek and Sarasota Bay. Therefore, a portion of

the load reduction for nitrogen in the Phillippi Creek watershed will be attributed to septic tank removal, in addition to the consolidation of package wastewater treatment plants, and stormwater retrofit projects. However, the ability to quantify the actual improvement in water quality as a result of decreased numbers of septic tanks is difficult to quantify, due to the paucity of research in this area.

Based on earlier pollutant loading model development, the management actions proposed above will reduce nitrogen loading to Roberts Bay by 27%. Roberts Bay is the only high-priority WBID in Sarasota County that has exceeded water quality standards. It is anticipated that Blackburn Bay (WBID 1968F) will be delisted after 2004 due to declining trends in chlorophyll over the past 3 years. The monitoring networks designed to document the effectiveness of the various management actions will provide quantifiable results for the annual progress report (submitted to FDEP) associated with these and other management activities.

Copies of Written Agreements Committing Participants to Management Actions

The SBNEP Policy Committee has approved the formation of a Special District to oversee the continued restoration of Sarasota Bay through the signing of an Interlocal Agreement (**Appendix A**). The agreement includes the establishment of a Water Quality Consortium to ensure that water quality standards are achieved and maintained in WBIDs verified as impaired.

Addressing Future Growth and New Sources

In 1993, SBNEP modeling indicated that nitrogen loads to Sarasota Bay were estimated to increase by approximately 8 percent of 1990 levels in the year 2020. The SBNEP Policy Committee has approved a series of actions to remediate this increase. SBNEP has commissioned the U.S. Geological Survey (USGS) to review the literature on local hydrology prior to conducting applied research or recommending management actions related to existing land development practices.

The objectives of the study are to summarize existing hydrologic data, identify gaps, and determine recharge, water quality, and constituent loads in the Sarasota Bay watershed. The study specifically addresses soil compaction during land development. The study's preliminary findings are as follows:

- *The natural water retention of soils in the area is low due to high water tables and soil profiles,*
- *The bulk density of soils increases during construction to levels that may inhibit plant growth and water infiltration,*
- *There is a direct relationship between bulk density and porosity, but the local relationship cannot be established without study,*

- *It is unlikely that recharge of the intermediate aquifer is occurring due to the presence of a confining clay layer, and*

- *The Sarasota Bay area is in a natural ground water discharge zone.*

The study is expected to result in recommendations for various stormwater treatment trains (multiple in-line treatment systems) in addition to typical detention systems; however, this information will be assessed along with ongoing work in Tampa Bay and with the South Florida Water Management District.

Confirmed Sources of Funding

Table 4-12 presents confirmed and proposed funding sources and amounts for each management action as of December 2004.

Table 4-12. Proposed funding sources for management actions under the Sarasota Bay Reasonable Assurance Plan to address parameters causing impairment

Resource Management Actions	Funding Source	Comments
Phillippi Creek Septic Tank Replacement Program (WBIDs 1937, 1947, 1971, 1975B)	Local, state, and federal funding	Additional funding sources will be explored during the next several phases of implementation. Project is not fully funded through completion.
Sarasota County Centralized Sewer Program (WBIDs 1937, 1947, 1975AA, 1975B)	Local, state, and federal funding	Additional funding sources will be explored during the next several phases of implementation. Project is not fully funded through completion.
Expansion of Celery Fields Stormwater Treatment Area (WBID 1947)	Local and state funding	Additional funding sources will be explored during the next several phases of implementation. Project is not fully funded through completion.
Conversion of Atlantic WWTP to Stormwater Treatment Facility (in WBID 1947)	Local funding	Funding for feasibility study was provided by Sarasota County. No funding earmarked for design or construction at this time. Still undergoing feasibility analysis.
Trailer Estates Sewer Line Replacement (WBID 1896)	Local funding	Funding for design has been budgeted by Manatee County.

Florida Yards and Neighbors Program	Local and state funding (SWFWMD).	Annual funding has been secured through 2006.
Land Acquisition (Sarasota County/SWFWMD)	Local and state funding	Funding for land acquisition can be cost-shared with SWFWMD or state. No new sites have been identified in impaired WBIDs
Education/Outreach	Local, state, and federal funding	Funding ($100,000 per year) secured through SBEP. Funded through 2005.
Research	Local, state, and federal funding	**$154,000** budgeted for USGS and UF study. **$40,000** budgeted for bacterial source tracking.

Implementation Schedule

The following implementation schedule has been established for specific management actions to achieve the goal of this plan—i.e., restoring designated uses—by 2014:

- *Annual progress report—beginning January 2006,*
- *Basin management action plan cost estimates*[4]*—October 2006, and*
- *Implementation schedules finalized by January 2008 for implementation..*

Enforcement Programs or Local Ordinances

Enforcement programs and local ordinances that apply to the Sarasota Bay Reasonable Assurance Plan include the following:

- *NPDES Program (facility permitting) and*
- *SWFWMD Resource Regulation (stormwater management permitting).*

Local ordinances that affect the plan are as follows:

- *Sarasota County land development (the ordinance requires greater treatment volume, greater than 1 inch of rainfall),*

[4] The basin management plan, or BMAP, developed in Phase 4 of FDEP's watershed management cycle, specifies how pollutant loadings from point and nonpoint sources will be allocated and reduced in order to meet TMDL requirements. The plans will include regulatory and nonregulatory (i.e., voluntary) and structural and nonstructural strategies, and existing management plans will be used where feasible.

- *Tree protection ordinance, and*
- *Earth-moving permits.*

CHAPTER 5: DESCRIPTION OF PROCEDURES FOR MONITORING AND REPORTING RESULTS

FDEP's Guidance Document

To provide reasonable assurance that existing or proposed pollution control mechanisms will restore designated uses, the following information should be evaluated and documented for the Administrative Record:

***A Description of Procedures for Monitoring and Reporting Results**—a description of the water quality monitoring program to be implemented (including station locations, parameters sampled, and sampling frequencies) to demonstrate reasonable progress; quality assurance/quality control elements that demonstrate the monitoring will comply with Rule 62-160, F.A.C.; procedures for entering all appropriate data into STORET; the responsible monitoring and reporting entity; the frequency and format for reporting results; the frequency and format for reporting on the implementation of all proposed management activities; and methods for evaluating progress towards goals.*

Water Quality Monitoring Programs To Be Implemented

Baywide Monitoring Program

Sarasota County

In January 1995, Sarasota County began a stratified-random monthly sampling program for Sarasota Bay. The sampling design was based on EPA's Environmental Monitoring and Assessment Program for Estuaries (EMAP-E) approach. The purpose of the monitoring program is to measure the status and trends of significant waterbodies in Sarasota County. The data complement pollutant load analyses conducted by the EPA, FDEP, and SWFWMD, as well as local decision makers and interested parties. The data from this effort comprise the majority of the current IWR database for Sarasota Bay.

The geographic areas of the bay are divided into segments and subdivided into stations. Within the area of each station, 12 sample locations are randomly located to correspond with the 12 months of the year. The sample locations are never rerandomized. The same sample location is sampled each year in the same month of every year. Segments have between 2 and 5 stations. As many as 12 segments are sampled, including as many as 51 stations, with a resultant maximum of 612 stations sampled per year.

The sample locations are not visited during the same tidal stage or weather conditions. Discrete samples are always taken mid-day and mid-depth. Meter measurements are taken at various times and depths. No sampling is conducted on weekends.

Dataloggers for the continuous measurement of water quality conditions are frequently deployed to collect diel measurements at 15-minute intervals at approximately 2 locations per month from a near-bottom depth for water temperature, pH, specific conductance, salinity, dissolved oxygen, and dissolved oxygen saturation.

Sarasota County National Pollutant Discharge Elimination System Monitoring

The monitoring plan for the state's municipal separate storm sewer system (MS4) Permit No. FLS000004 requires permittees in Sarasota County (the town of Longboat Key, city of Sarasota, Sarasota County, and city of North Port) to develop a monitoring plan and submit it to FDEP for review and approval. The purposes of the monitoring program are to determine the effectiveness of the Stormwater Management Program (SWMP), identify sources of stormwater pollution, and evaluate trends in pollutant loads. The monitoring applies to activities that reduce the discharge of pollutants to waters of the state during the permit term.

Many water quality studies have been completed, and substantial programs to reduce pollutant loading have been implemented. Foremost is the ongoing reduction of wastewater discharges, but full implementation of the SWMP has been beneficial. Although there is no evidence of acute water quality impairment, additional reductions in polluted discharges are considered necessary. Both the Sarasota Bay and Charlotte Harbor National Estuary Programs have established two similar goals for bays and creeks that affect the county's stormwater management, as follows:

- *Restore natural hydrology (or reduce stormwater flows), and*
- *Reduce pollutant loading (nitrogen and toxicants generally identified).*

It is known that the bays in Sarasota County have altered hydraulic regimes, increased nitrogen loads, and, in some instances, harmful toxicant loads. Some rivers and creeks are impaired from bacteria related to the presence of wildlife, pets, or septic tanks. On May 20, 2003, the co-permittees proposed a two-part monitoring plan, described below, that identifies areas where pollutant loads are affecting waterbodies, tracks water quality trends, evaluates the effectiveness of the SWMP by comparing drainage basins, and is expected to document substantial reductions in pollutant loading by the implementation of stormwater reuse. FDEP approved the plan on July 2, 2003.

1. Continuous Monitoring of Tributaries

A. This monitoring plan identifies water quality problem areas related to stormwater runoff that can be targeted for corrective actions.

B. Four dataloggers will be programmed to measure turbidity, dissolved oxygen, pH, specific conductance, and water temperature at least once every 15 minutes for 24-hour periods. Each datalogger will be deployed at least 100 days per year.

C. The dataloggers are located where flow data from the county's Automated Rainfall Monitoring System (ARMS) stations can be analyzed in relation to the physical parameter data that are collected, but may occasionally be located elsewhere. For flood protection purposes, Sarasota County has established an ARMS program that continuously measures rainfall and water level at about 32 locations. Continuous metering with dataloggers will provide a useful description of when water quality is best and worst throughout changing flow regimes related to season, time of day, tide, or weather. By comparing basins with one another, watersheds with water quality problems will be identified for corrective actions. Having accurate flow data is paramount to any pollutant-loading model. Data loggers have been deployed in several tidal creek systems, including Phillippi Creek (WBID 1947).

The primary corrective action being considered is reducing pollutant loading by decreasing the volume of stormwater runoff. Once the water needs of the natural systems are determined, historical flows, predevelopment flows and existing flows will be compared. Excess flows, created by flood control improvements, will be diverted to restore natural systems and to enhance the water supply. Cooperation from all watershed management agencies is essential to the implementation of this plan.

2. Monthly Estuarine Monitoring

A. This plan fulfills portions of all three specific monitoring goals for stormwater monitoring plans, as required for MS4 permits. It will help identify watersheds with water quality problems that are affecting receiving waters, measure the overall effectiveness of stormwater best management practices (BMPs) implemented throughout the county, and indicate trends in pollutant loading for watersheds. This monitoring program was generally described in the section on ***Baywide Monitoring Program****.*

B. Mid-day monthly samples are analyzed for dissolved ammonia nitrogen, dissolved nitrate and nitrite nitrogen, total nitrate and nitrite nitrogen, total Kjeldahl nitrogen, dissolved orthophosphate phosphorus, total phosphorus, 5-day biochemical oxygen demand, total suspended solids, turbidity, apparent color, and chlorophyll-a corrected for pheophytin. Field measurements include Secchi depth, light attenuation, cloud cover, wind direction, wind speed, wave height, actual latitude, actual longitude, total water depth, and actual sample depth. Field meter readings are taken at top, middle, and bottom depths for temperature, salinity, dissolved oxygen concentration, percent oxygen concentration, pH, and specific conductance. Two dataloggers are deployed monthly to measure temperature, salinity, dissolved oxygen concentration, percent oxygen concentration, pH, and specific conductance at 15-minute intervals for at least one complete 24-hour period.

C. Samples are taken generally mid-depth from Sarasota Bay, Roberts Bay (Sarasota), Little Sarasota Bay, Blackburn Bay, Lyons Bay, Dona Bay, Roberts Bay (Venice), Lemon Bay, and the estuarine portion of the Myakka River. This randomized, stratified

monitoring plan was designed to characterize overall estuarine health by describing entire bay and river segments, rather than isolated locations in each waterbody. Most segments contain 5 randomized stations. Each station consists of an area that contains (usually) 12 specific locations, one of which is sampled each month. Randomization was done only once, so each sample location is resampled every year in the same month as the preceding years.

Dataloggers will be deployed at the same stations defined by the sampling program. Datalogger site selection will produce a balanced distribution of data from throughout the study area. Within the next year, some consolidation of adjacent stations will occur in order to achieve budget constraints, but no significant parameters or waterbodies will be eliminated.

Since 1995, these monitoring program data have become the foundation of all major water quality studies in Sarasota County and have been required by the MS4 permit since 1997. The program has had only minor modifications during that time. In August 2001, the northernmost part of Sarasota Bay in Sarasota County was added to the program, and in 2003 the estuaries near the city of Venice were added. The consistency of the locations, frequency, and methods has allowed powerful spatiotemporal statistical analyses to be carried out. The value of the monitoring program is demonstrated by the agencies relying on the data. These include SBNEP (1999 trends study), the Charlotte Harbor National Estuary Program (2003 pending status and trends study), SWFWMD's SWIM Program, EPA (2001 Myakka TMDL), FDEP's Bureau of Watershed Management (2003 Basin Status Reports), Mote Marine Laboratory, and many others.

Additional monitoring of impaired WBIDs will also be implemented for Clower Creek (WBID 1975AA), Phillippi Creek (WBIDs 1937 and 1947), and Matheny Creek (WBID 1975B). Samples will be collected periodically to assess progress in meeting Class III water quality targets. The existing monitoring program for Bowlees Creek (WBID 1896) will be modified to perform source tracking for fecal contamination.

Sarasota Bay Seagrass Monitoring Program

The Tampa Bay Estuary Program initiated a fixed transect seagrass monitoring program for Tampa Bay in 1998 that was subsequently extended into Sarasota Bay and Charlotte Harbor. The program was designed to monitor the spatial and temporal changes of seagrass species in established meadows and document new colonization where no current vegetation was present. FDEP monitors the transects annually.

Transects are oriented perpendicular to shore, begin near the high-tide mark, and extend to a seaward endpoint. Water quality data are taken at three sites along each transect, using a Hydrolab multiparameter water quality monitoring instrument. The hydrographic data collected include dissolved oxygen, pH, salinity, temperature, and photosynthetically active radiation (PAR), and samples are taken to measure chlorophyll-*a* and turbidity. Secchi depth is also recorded at the deep end of each transect.

The extinction coefficient of PAR measures the amount of light penetrating the water column. This is an important parameter to monitor, because seagrass communities depend on light for survival. The apparatus is made up of two light sensors that give readings at two different depths. FDEP takes a total of three replicate readings at each of the sensors.

The Braun Blanquet system is used to rate seagrass coverage along each transect. Coverage is determined using a meter square placed at predetermined locations. Other data collected from this meter square placement include seagrass epiphytic cover and sediment composition, water column depth, and time of the depth measurement. Shoot density and blade length are recorded for threee seagrass species: *Halodule wrightii*, *Syringodium filiforme*, and *Thalassia testudinum*.

Manatee County

Manatee County's Environmental Management Department (EMD) currently conducts a number of water quality monitoring programs in and around the county. These programs vary in their scope and subject matter. EMD's programs monitor ambient water quality, benthic biology, and seagrass health and conditions. Some of the programs are run solely by EMD, and the data are shared among local, state, and federal agencies, while others are run in cooperation with several of these agencies. These programs include EMD's Regional Ambient Monitoring Program (RAMP) and Surface Water Ambient Monitoring Program (SWAMP), and the Sarasota Bay Estuary Program/Tampa Bay Estuary Program Seagrass Monitoring Program.

Regional Ambient Monitoring Program Estuary Monitoring

The EMD's Regional Ambient Monitoring Program (RAMP) for Manatee County's estuarine waters began operating in November 1995. The successor to EMD's old AWP station network that had operated since 1988, it uses EPA's EMAP stratified random sampling design to infer water quality trends on an areal basis. RAMP evolved from a series of Tampa Bay Estuary Program–sponsored workshops on the methods, variables, and field techniques of estuarine water quality monitoring. An important objective of the workshops was to improve data compatibility among the water quality monitoring programs of the different jurisdictions that all monitor portions of a larger area, such as Sarasota and Tampa Bays. All RAMP implementations use the same sampling design and include the same set of core measurements. The RAMP concept has been endorsed and approved by both the Sarasota Bay and Tampa Bay Estuary Programs.

Manatee County RAMP divides the county's lower estuarine area into 2 segments of 24, 3.56-square-kilometer, hexagonal sampling areas each (**Figure 5-1**). The segment boundaries approximate the boundaries of the two local National Estuary Programs. The north segment encompasses lower Tampa Bay north of the Manatee River mouth and south of the county line, Terra Ceia Bay, and the lower Manatee River below the Braden River confluence. The south segment includes Anna Maria Sound and adjoining parts of lower Tampa Bay, Palma Sola Bay, and Sarasota Bay north of the county line.

Sampling points were randomly located within each hexagon at the start of the program. A hexagonal sampling area was included in the program if the sampling point was at least 4 feet

deep based on nautical charts and verified during program reconnaissance. If an old AWP estuarine station was located in the sampling area and met the depth criteria, that station was used as the sampling point in the hexagon. This allowed some degree of data continuity with the previous monitoring program. Ten RAMP sampling points are old AWP stations. The statistical basis of the EMAP design allows preselected stations to be added if there is no overriding physical reason for the station's geographic placement at a particular point.

One-third of the sampling points in each segment, or eight points, are sampled monthly. All sampling points in a segment are visited within each calendar quarter. Inferences on ambient water quality trends for each segment are made on quarterly time scales. **Table 5-1** lists the program's water quality observations.

Surface Water Ambient Monitoring Program Watershed Monitoring
The Surface Water Ambient Monitoring Program (SWAMP) is the EMD's ambient water quality monitoring program for the county's watersheds, rivers, and tidal creeks. The program uses a conventional, fixed-station design where all stations are sampled monthly (**Figure 5-2**). It is an amalgam of two predecessor water quality monitoring programs. Stations in the upper estuary, the Lake Manatee watershed, and the Myakka River were originally part of the AWP network. **Table 5-2** lists the program's water quality measurements.

Special Monitoring Programs
A variety of special water quality studies has been conducted on an "as-needed" basis. These are generally of short duration and/or of limited geographical scope.

Data Management
EMD's historical data are available from the EPA Legacy STORET archive under the agency code 21FLMANA. This system has most data from the ongoing program, and predecessor programs are current through the end of 1998. Data submitted to EPA after January 1, 1999, are available from the Modernized STORET system via the Internet.

EMD utilizes ArcGIS 8/ArcView to map station locations as needed. Coastlines, basin topography, soils, land use/land cover, and data collection points are represented on the GIS and may be linked with water quality observations. **Table 5-3** lists all the station locations for Manatee County's permanent water quality monitoring programs. These data are subject to change.

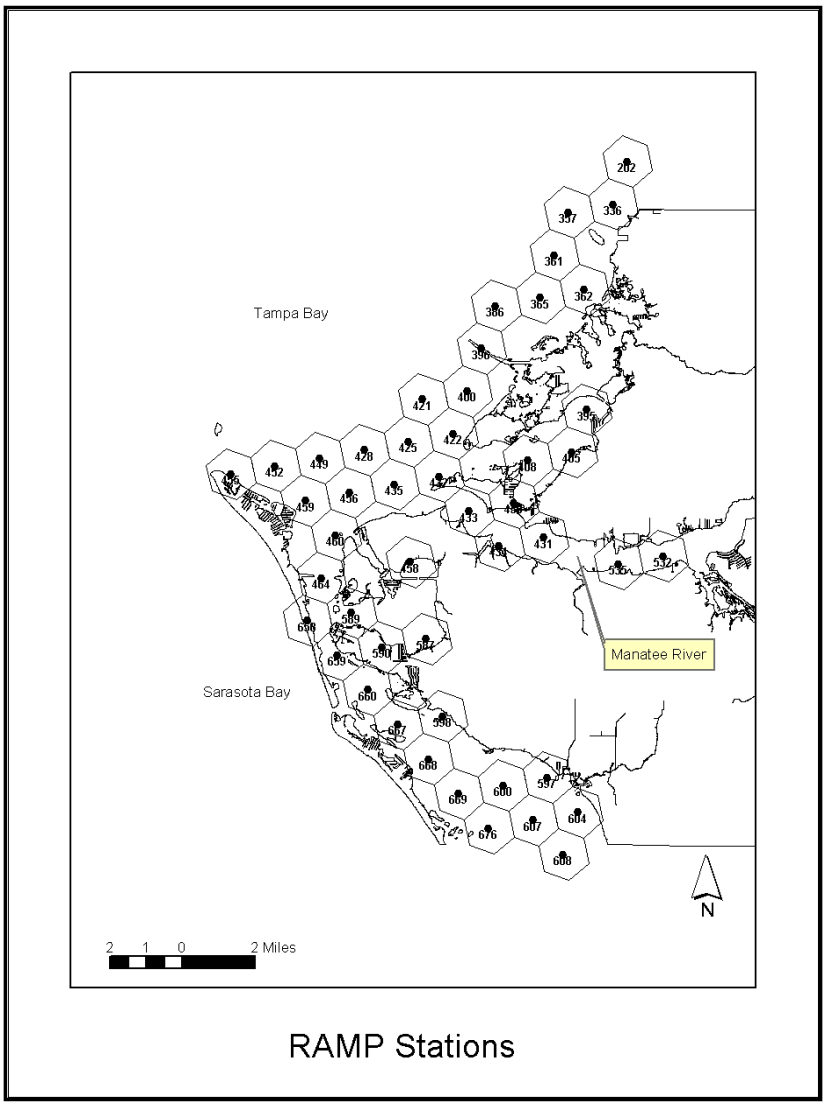


Figure 5-1. Manatee County RAMP stations

Table 5-1. RAMP water quality measurements

Note: All in situ measurements and laboratory samples are taken at 1 meter in depth.

In situ

Depth
pH
Temperature
Dissolved Oxygen
Salinity
Conductivity
Transparency
Photometry (extinction coefficient for PAR between 1.0 and 1.5 meters)

Laboratory

Turbidity (Method # SM2130B)
Total Suspended Solids (Method # SM2540D)
Total Phosphorous (Method # EPA365.4)
Total Kjeldahl Nitrogen (Method # EPA351.2)
Ammonia (Method # EPA350.3)
Nitrate (Method # EPA352.1)
Nitrite+Nitrate
Chlorophyll-*a* (fluorometric)
Color (Method # SM2120B)

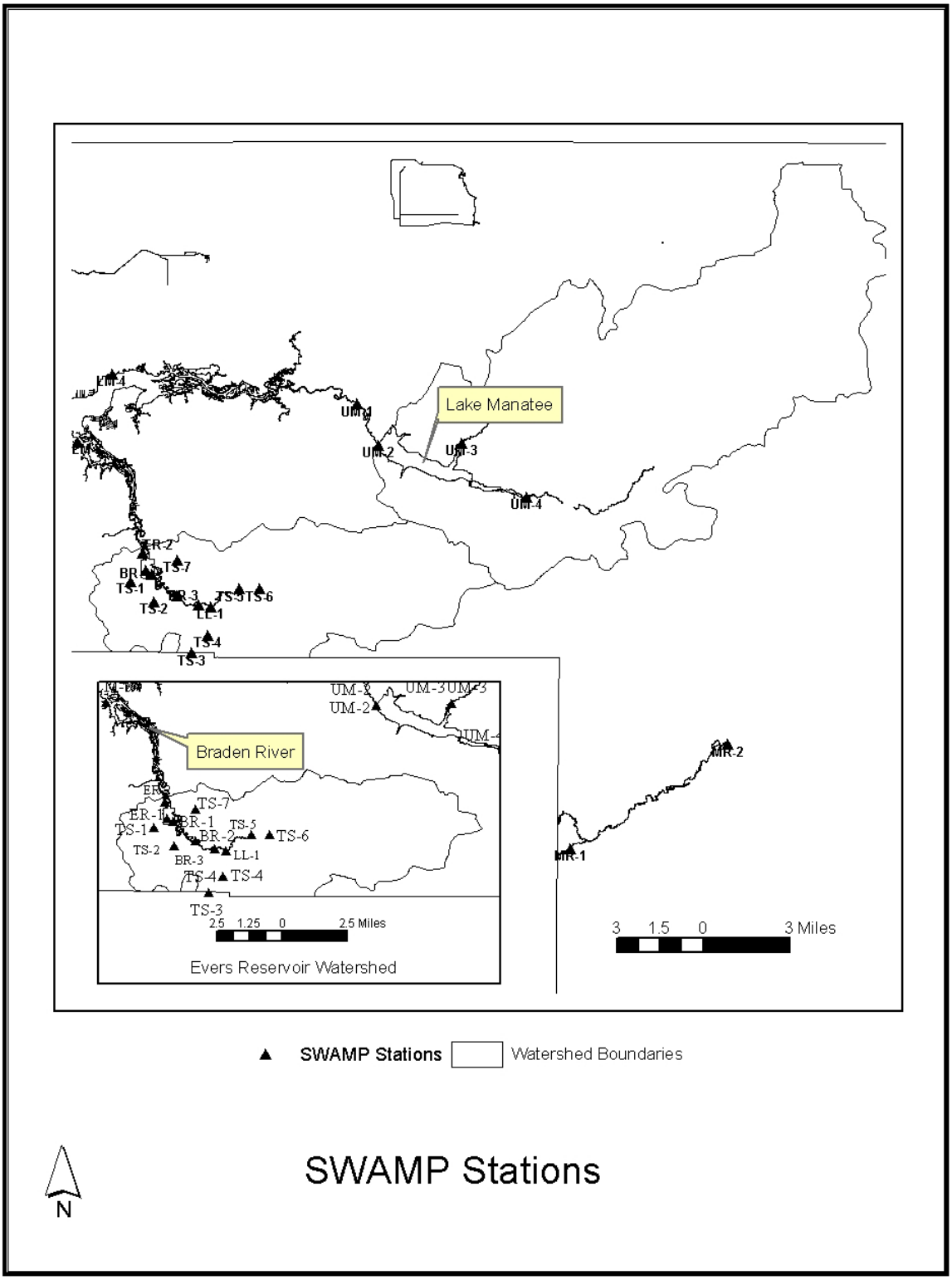


Figure 5-2. Manatee County SWAMP stations

Table 5-2. SWAMP water quality measurements

Note: Variables and collection methods vary based on the predecessor program that established the station. Laboratory samples are depth-composites for main-stem stations in the Evers watershed. All other measurements and sample collections are made at the surface.

In situ

Depth (other than tributary stations)
Temperature
Salinity (at Bowlees Creek and Pelican Peir [I-75] stations only)
Conductivity
pH
Dissolved Oxygen

Laboratory

Biochemical Oxygen Demand (Method # EPA405.1)
Turbidity (Method # SM2130B)
Total Suspended Solids (Method # SM2540D)
Total Dissolved Solids (Method # SM2540C) (Evers Reservoir watershed stations only)
Total Phosphorus (Method # EPA365.4)
Orthophosphorus (Method # SM4500-PE)
Total Kjeldahl Nitrogen (Method # EPA351.2)
Ammonia (Method # EPA350.3)
Nitrate (Method # EPA352.1)
Nitrite+Nitrate
Chlorophyll-*a* (fluorometric)
Color (Method # SM2120B)
Fluoride (Method # SM4500 F-C)
Bacteria (Fecal coliform)

Table 5-3. Sampling station locations for all permanent water quality monitoring programs in the Sarasota Bay Planning Unit

Note: Some RAMP program stations may be known by both the 3-digit numerical designation or the name of the old AWP program station actually sampled for that grid cell. Most stations are shown on the accompanying maps.

Station ID	Station Description	Latitude (d m s)	Longitude (d m s)
BC41	Bowlees Creek (Relocated 12/95)	27 24 59.1	82 34 29.7
202	RAMP North Segment	27 39 56.53	82 33 32.64
336	"	27 38 50.72	82 33 54.58
357	"	27 38 58.12	82 34 42.43
361	"	27 37 42.66	82 35 30.96
362	"	27 36 46.71	82 34 39.51
365	"	27 36 44.81	82 36 23.94
386	"	27 36 21.55	82 37 4.2
395	"	27 34 3.19	82 34 23.06
396	"	27 35 27.81	82 37 18.32
400	"	27 34 21.3	82 37 46.72
405	"	27 33 9.6	82 35 14.4
408	"	27 32 52.2	82 35 57
421	"	27 34 35.43	82 39 8.98
422	"	27 33 26.94	82 37 59.58
425	"	27 32 53.78	82 39 38.64
428	"	27 33 7.23	82 40 18.12
430	"	27 31 38.39	82 36 34.49
431	"	27 30 40.31	82 35 52.58
432	"	27 32 35.16	82 38 40.39
433	"	27 31 15.47	82 37 57.65
434	"	27 31 2.4	82 37 7.8
435	"	27 31 58.8	82 40 0.6
532	"	27 30 20.5	82 32 31.28
535	"	27 30 12	82 34 3
449	RAMP South Segment	27 32 44.91	82 42 3.42
452	"	27 32 28.06	82 43 1.4
455	"	27 32 6	82 43 52.8
456	"	27 31 56.25	82 41 18.4
458	"	27 29 49.2	82 39 24.6
459	"	27 31 43.78	82 42 13
460	"	27 31 0.15	82 41 7.14
464	"	27 29 45.73	82 41 43.59
587	"	27 28 23.48	82 38 55.47
589	"	27 28 53.41	82 40 59.07
590	"	27 28 8.4	82 39 49.2
597	"	27 24 54.91	82 35 40.82
598	"	27 26 8.1	82 38 23.31
600	"	27 25 7.49	82 36 21.36
604	"	27 24 8.71	82 34 50.31
607	"	27 23 56.55	82 36 1.86
608	"	27 22 48.73	82 35 32.08
658	"	27 28 52.02	82 41 57.43
659	"	27 27 59.4	82 41 15
660	"	27 27 11.95	82 40 30.8
667	"	27 26 13.72	82 39 38.81
668	"	27 25 17.47	82 38 48.68
669	"	27 24 40.2	82 38 35.4
676	"	27 23 51.66	82 37 36.7

Chapter 5

Quality Assurance/Quality Control Elements

All monitoring efforts will be conducted in compliance with FDEP's Quality Assurance Rule, Chapter 62-160, F.A.C., and all applicable FDEP Standard Operating Procedures will be followed, including administrative, field quality control, equipment cleaning, sampling, and analysis procedures. All data will be reported in annual reports and will include narrative, tabular, graphical depictions, and trend analysis when appropriate. Data transfer to FDEP's Bureau of Watershed Management will continue, as will efforts to migrate data to STORET.

Procedures for Entering Data into STORET

Sarasota County is currently developing a database management system in concert with the Water Atlas (available at http://www.wateratlas.org) developed by the University of South Florida. The database management system is anticipated to include an automated STORET upload component that will facilitate the review and conversion of laboratory and field data into the appropriate STORET data format.

Responsible Monitoring and Reporting Entity

SBNEP (now the Sarasota Bay Estuary Program, or SBEP) was established in 1989 to assist the Sarasota Bay area in developing a comprehensive plan to restore and protect Sarasota Bay. SBEP is governed by a Policy Committee and advised by a Management Committee. It is part of a national network of 28 estuary programs established under the federal Clean Water Act and administered nationally by the EPA.

Frequency and Reporting Format for Reporting Monitoring Results

SBEP will serve as the coordinating body for reporting monitoring results for the Sarasota Bay Planning Unit. It will report annually to the Policy Board the status of water quality trends for established targets (the achievement of Class III water quality standards) based on the monitoring plan implemented by the Water Quality Consortium. SBEP will also prepare a comprehensive baywide environmental monitoring report every three years describing overall conditions and trends in Sarasota Bay.

Frequency and Format for Reporting on Implementation of Proposed Management Activities

SBEP will report annually to the Policy Board regarding each stakeholder's compliance with the Interlocal Agreement and the status of each stakeholder's Action Plan implementation. The format will be a technical memorandum summarizing the efforts of each stakeholder with respect to each impaired WBID and parameter.

Methods for Evaluating Progress Towards Goals

Progress toward achieving water quality improvements and goals will be evaluated for each parameter. Specific concentration-based targets or load reduction goals will be assessed using graphical and tabular data, based on the results of the monitoring program. Reductions in water quality exceedances (e.g., fecal coliforms exceeding 400 cfu/100 mL), reductions in concentration (e.g., chlorophyll), or load reductions (based on gaged streams and water quality samples) will be plotted and described in the annual reports described above.

CHAPTER 6: DESCRIPTION OF PROPOSED CORRECTIVE ACTIONS

FDEP's Guidance Document

To provide reasonable assurance that existing or proposed pollution control mechanisms will restore designated uses, the following information should be evaluated and documented for the Administrative Record:

***A Description of Proposed Corrective Actions**—a description of proposed corrective actions (and any supporting document[s]) that will be undertaken if water quality does not improve after implementation of the management actions or if management actions are not completed on schedule, and a process for notifying FDEP that these corrective actions are being implemented.*

Proposed Corrective Actions

FDEP's guidance document requires the documentation of corrective actions that will be undertaken if water quality does not improve after the implementation of management actions, or if management actions are not completed on schedule. The management actions currently being implemented, and those proposed for implementation over the next ten years, may not correct water quality impairment as quickly as proposed (i.e., achieving the stated goal of no impairment by 2014). Historical data suggest that several Sarasota Bay WBIDs have experienced continued improvement in water clarity, reduced chlorophyll concentrations, and expanding seagrass coverage. However, the ultimate water quality response of the Phillippi Creek and Roberts Bay WBIDs to the removal of septic systems can only be determined after additional monitoring has been completed. Therefore, it is anticipated that a 10-year period will be sufficient to restore the impaired WBIDs to Class III standards, but additional time may be required.

Process for Notifying FDEP that Corrective Actions Are Being Implemented

FDEP is an active member in the SBNEP Committee (and will continue to be active through the Water Quality Consortium) and will be aware of all actions of the stakeholder group, including the implementation status of corrective management actions. The annual report will be the formal mechanism for reporting the progress of various management actions, the overall success of the plan, and the need for corrective actions.

Corrective actions that are implemented will be documented in the annual report as a separate category to ensure that FDEP is provided sufficient information on the plan's implementation and success. If a corrective action is deemed very significant, such as the introduction of a new

management action to address the failure of an existing management action, FDEP will be notified formally through written correspondence of this significant change to the plan's implementation. In addition, this Reasonable Assurance Plan will be updated and resubmitted to FDEP to address the proposed changes.

APPENDICES

Appendix A: Information on Reasonable Assurance

TO: Interested Parties

FROM: Mimi Drew, Director
Division of Water Facilities

DATE: September 2002

SUBJECT: Guidance for Development of Documentation To Provide Reasonable Assurance that Proposed Pollution Control Mechanisms Will Result in the Restoration of Designated Uses in Impaired Waters

The purpose of this memo is to describe the types of information that should be considered, and subsequently documented, when evaluating whether there is sufficient reasonable assurance that:

1. *Proposed pollution control mechanisms (typically described in watershed management or restoration plans) addressing impaired waters will result in the attainment of applicable water quality standards (designated uses) at a clearly defined point in the future, and*

2. *Reasonable progress towards restoration of designated uses will be made by the time the next 303(d) list of impaired waters is due to be submitted to the EPA.*

There are many site-specific issues related to determining whether reasonable assurance has been provided. Accordingly, this document describes the elements or issues that should be considered when evaluating a submittal or when documenting the basis for the Department's decision, rather than attempting to establish specific criteria on what constitutes reasonable assurance.
It should be noted that the term "reasonable assurance" is used throughout many Department programs and rules, and this guidance specifically addresses the issues related to the "reasonable assurance" provided by proposed pollution control mechanisms. This guidance should not be used to evaluate the meaning of reasonable assurance in other contexts, particularly in permitting decisions.

Background

The Impaired Surface Waters Rule (IWR), Rule 62-303, F.A.C. (Identification of Impaired Surface Waters), establishes a formal mechanism for identifying surface waters in Florida that are impaired (do not meet applicable water quality standards) by pollutants. Most waters that are verified as being impaired by a pollutant will be listed on the state's 303(d) list pursuant to the Florida Watershed Restoration Act (FWRA) and Section 303(d) of the Clean Water Act. Once

listed, Total Maximum Daily Loads (TMDLs) will be developed for the pollutants causing the impairment of the listed waters. However, as required by the FWRA, the Department will evaluate whether existing or proposed pollution control mechanisms will effectively address the impairment before placing a water on the state's Verified List. If the Department can document there is reasonable assurance that the impairment will be effectively addressed by the control measure, then the water will not be listed on the final Verified List (other impaired waters that will not be listed include waters with TMDLs and waters impaired by pollution).

Current Rule Text Relating to Evaluation of Pollution Control Mechanisms

The rule text addressing the evaluation of proposed pollution control mechanisms is as follows:

Section 62-303.600, Evaluation of Pollution Control Mechanisms

1. *Upon determining that a waterbody is impaired, the Department shall evaluate whether existing or proposed technology-based effluent limitations and other pollution control programs under local, state, or federal authority are sufficient to result in the attainment of applicable water quality standards.*

2. *If, as a result of the factors set forth in (1), the waterbody segment is expected to attain water quality standards in the future and is expected to make reasonable progress towards attainment of water quality standards by the time the next 303(d) list is scheduled to be submitted to EPA, the segment shall not be listed on the Verified List. The Department shall document the basis for its decision, noting any proposed pollution control mechanisms and expected improvements in water quality that provide reasonable assurance that the waterbody segment will attain applicable water quality standards.*

Responsible Parties for Reasonable Assurance Demonstration

It is ultimately the Department's responsibility to assure adequate documentation in the administrative record whenever the Department decides to not list an impaired waterbody segment for a given pollutant. This documentation will be very important because the Verified Lists will be adopted by Order of the Secretary and third parties will be provided an opportunity to challenge, via an administrative hearing, all listing decisions (both those listing a water and those to not list a water for a given pollutant). However, the Department expects that local stakeholders will often offer to prepare the necessary documentation to demonstrate reasonable assurance that proposed control mechanisms will restore a given waterbody. The Department will provide guidance to stakeholders on what information is needed and how it should be submitted.

Time Frame for Development of Documentation

The Department plans to prepare basin-specific Verified Lists as part of its watershed management cycle, which rotates through all of the state's basins over a five-year, five-phased cycle[5]. During the first phase of the cycle, the Department will assess water quality in the basin and prepare a draft Planning List of potentially impaired waters. The Department and interested parties will then have approximately one year (Phase 2) to monitor waters on the planning list and prepare documentation, as appropriate, to provide reasonable assurance that impaired waters will be restored. The Department will review submittals from interested parties during Phase 2, before adopting the Verified List for the basin containing the waterbody segment in question.

What It Means To Be Under Local, State, or Federal Authority

Both the FWRA and the IWR require that the pollution control programs under consideration be "under local, state, or federal authority." A pollution control program will be considered "under local, state, or federal authority" if the program is subject to or required by a local ordinance, state statute or rule, or federal statute or regulation.
Programs will also be considered under local, state, or federal authority if they are subject to a written agreement, signed by both local stakeholders and at least one governmental entity, that includes measurable goals, performance criteria, benchmarks, and back-up corrective actions to assure the further progress of the program. It is important to note that these written agreements do not need to be enforceable for nonregulated nonpoint sources.

Many nonpoint sources are currently outside of the regulatory programs of EPA, the Department, and the water management districts, and reductions at these nonpoint sources will be voluntary. In fact, pollution control mechanisms for these nonpoint sources would be voluntary even if a TMDL were developed. As such, these agreements may provide the same level of reasonable assurance that can be provided for a TMDL implementation plan as long as they maintain the Department's enforcement capability over all point sources involved.

Time Frame for Attaining Water Quality Standards

The FWRA and the IWR do not establish a specific time limit by which waters must attain applicable water quality standards or designated uses. However, the pollution control mechanisms or watershed restoration plan must provide reasonable assurance that designated uses will be met at some time **in the future**. As such, the documentation submitted to the Department must provide a specific date by which time designated uses are expected to be restored. In cases where designated uses will not be met for many years, the documentation should also provide justification as to why the specified time is needed to restore designated uses.

[5] Federal regulations currently call for state 303(d) lists every two years, but Florida plans to submit annual updates based on the basin-specific Verified Lists.

Parameter-Specific Nature of Demonstration

For the Department not to place an impaired waterbody segment on the Verified List, reasonable assurance must be provided for each pollutant that has been documented to be causing impairment of the waterbody segment. However, some entities, including the Department, may want to provide reasonable assurance addressing only selected pollutants, which could result in the Department not listing the waterbody segment for those pollutants, but still listing it for others. In this event, TMDLs will only be developed for the remaining listed pollutants.

Information To Consider and Document when Assessing Reasonable Assurance in the IWR

To provide reasonable assurance that existing or proposed pollution control mechanisms will restore designated uses, the following information should be evaluated and documented for the Administrative Record:

1. ***A Description of the Impaired Water****—name of the water listed on the Verified List, the location of the waterbody and watershed, the watershed/8-digit cataloging unit code, the NHD identifier (when they become available), the type (lake, stream, or estuary) of water, the water use classification, the designated use not being attained, the length (miles) or area (acres) of impaired area, the pollutant(s) of concern (those identified as causing or contributing to the impairment), and the suspected or documented source(s) of the pollutant(s) of concern.*

2. ***A Description of the Water Quality or Aquatic Ecological Goals****—a description of the water quality–based targets or aquatic ecological goals (both interim and final) that have been established for the pollutant(s) of concern, the averaging period for any numeric water quality goals, a discussion of how these goals will result in the restoration of the waterbody's impaired designated uses, a schedule indicating when interim and final targets are expected to be met, and a description of procedures (with thresholds) to determine whether additional (backup) corrective actions are needed.*

3. ***A Description of the Proposed Management Actions To Be Undertaken****—names of the responsible participating entities (government, private, others), a summary and list of existing or proposed management activities designed to restore water quality, the geographic scope of any proposed management activities, documentation of the estimated pollutant load reduction and other benefits anticipated from implementation of individual management actions, copies of written agreements committing participants to the management actions, a discussion on how future growth and new sources will be addressed, confirmed sources of funding, an implementation schedule (including interim milestones and the date by which designated uses will be restored), and any enforcement programs or local ordinances, if the management strategy is not voluntary.*

4. ***A Description of Procedures for Monitoring and Reporting Results****—a description of the water quality monitoring program to be implemented (including station locations, parameters sampled, and sampling frequencies) to demonstrate reasonable progress;*

quality assurance/quality control elements that demonstrate the monitoring will comply with Rule 62-160, F.A.C.; procedures for entering all appropriate data into STORET; the responsible monitoring and reporting entity; the frequency and format for reporting results; the frequency and format for reporting on the implementation of all proposed management activities; and methods for evaluating progress towards goals.

5. ***A Description of Proposed Corrective Actions****—a description of proposed corrective actions (and any supporting document[s]) that will be undertaken if water quality does not improve after implementation of the management actions or if management actions are not completed on schedule, and a process for notifying the Department that these corrective actions are being implemented.*

Water Quality–Based Targets and Aquatic Ecological Goals

Some of the most important elements listed above are the requirements to provide water quality–based targets or aquatic ecological goals and a discussion on how resultant pollutant(s) reduction targets/goals will result in restoration of designated uses. Some people have expressed concern about these targets because they equate a water quality–based restoration target with a TMDL (thus assuming a "Catch 22" that a TMDL is needed to make a demonstration that a TMDL is not needed). However, as is also the case for TMDLs, water quality–based targets can take many forms, and need not be a result of a complex hydrodynamic/water quality model.

In some cases, there may be sufficient historical data (paleolimnological data, loadings from periods predating the impairment, or baseline data for Outstanding Florida Waters, for example[6]) that could be used to determine an appropriate water quality target. In other cases, simplified modeling (including regression analysis) may allow for conservative estimates of the assimilative capacity that could then be used as the basis for restoration goals. And, finally, a water quality target may have been developed that would be scientifically equivalent to (or act as the basis for) a TMDL, but the target has not been administratively adopted as a TMDL. In each of these cases, a sound water quality target could be used to evaluate whether the proposed pollution control mechanisms will sufficiently reduce loadings to meet the assimilative capacity of the water in question and result in attainment of designated uses.

Interim Targets

Because it will usually take many years to restore fully the designated uses of an impaired water, interim water quality targets will often be needed to measure whether reasonable progress is being made towards the restoration of designated uses. Examples of such interim targets are provided in the last chapter of this document, but site-specific measures are also encouraged.

[6] Baseline data would be data for the year prior to designation of an Outstanding Florida Water.

Averaging Periods for Water Quality Targets

While the averaging period for water quality–based targets should be consistent with how the underlying standard is expressed, they can often be expressed in a variety of ways and need not be expressed as "daily loads." Annual averages or medians are often appropriate for some parameters, but shorter-term (seasonal, for example) averages may be necessary if the impairment is limited to specific seasons or parts of the year. Multi-year averages may be appropriate in limited circumstances where there is naturally high variation of the water quality target.

Estimates of Pollutant Reductions from Restoration Actions

It will often be difficult to estimate precisely the pollutant reductions that will result from specific restoration activities. This is particularly true for the implementation of best management practices (BMPs). However, to provide reasonable assurance that a BMP or other restoration action will reduce loadings of the pollutant of concern to a level that will restore the water's designated uses, documentation should address how the reductions were calculated, including providing documented values from the scientific literature for reductions attributed to similar management actions. If the expected reductions are expressed as a range, the midpoint of the range should be used as the basis for estimating reductions, unless documentation is provided supporting the use of different removal efficiencies in this specific application.

New Sources/Growth

Another key element is the discussion on how future growth and new sources will be addressed. Restoration goals must address possible increased loadings of the pollutant of concern that are anticipated due to population growth or land use changes in contributing watersheds, both from point and nonpoint sources. This will be particularly important for waters impaired by nutrients, given that so many Florida watersheds are faced with continuing urban, residential, and agricultural development that results in increased nutrient loading from stormwater, septic tanks, and wastewater discharges.

Examples of Reasonable Progress

The determination of whether there will be reasonable progress towards attainment of water quality standards will be very site- and pollutant-specific. Documentation should be provided supporting specific progress towards restoration of the designated uses of the impaired water. Possible examples of reasonable progress include, but are not limited to the following:

- A written commitment to implement controls reducing loadings within a specified time frame from watershed stakeholders representing at least 50 percent of the anthropogenic load of the pollutant(s) of concern;

- Evidence of at least a 10 percent reduction (or alternatively, a percent reduction consistent with meeting the water quality target by the specified date) in annual anthropogenic loading of the pollutant(s) of concern;

- Evidence of at least a 10 percent decrease (or alternatively, a percent decrease consistent with meeting the water quality target by the specified date) in the annual average concentration of the pollutant(s) of concern in the water;

- Bioassessment results showing there has been an improvement in the health of the biological community of the water, as measured by bioassessment procedures similar to those used to determine impairment and conducted in similar conditions; or

- Adoption of a local ordinance that specifically provides water quality goals, restricts growth or loads tied to the pollutant(s) of concern, and provides an enforcement option if the proposed management measure(s) are not implemented as required.

Reasonable progress must be made by the time the next 303(d) list is due to be submitted to EPA, which is currently every two years. EPA has contemplated changing the listing cycle to every four or five years, and the IWR was specifically worded to allow a longer time frame for requiring reasonable progress in the event that the listing cycle changes.

Long-Term Requirements

If at any time the Department determines that reasonable assurance and reasonable progress are not being met, the order adopting the Verified List will be amended to include the waterbody on the Verified List for the pollutant(s) in question. Additional reasonable progress must be made each time a waterbody is considered for listing under Rule 62-303, F.A.C. (every five years)**.**
If you have any questions about this guidance memo, contact Daryll Joyner of FDEP's Bureau of Watershed Management in Tallahassee at 850-245-8431.