Northern Coastal Basin

Surface Water Improvement and Management Plan

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EXECUTIVE SUMMARY

Overview

The St. Johns River Water Management District (SJRWMD) initiated the Northern Coastal Basin (NCB) project in 1995 in response to general water quality concerns and the closure of historic shellfish harvesting areas. Potential negative impacts from current and anticipated growth on coastal resources, particularly shellfish harvesting, highlighted the need for a dedicated program to address surface water quality and estuary issues. In addition, a number of water bodies in the NCB are listed by the U.S. Environmental Protection Agency (303d list) as not having sufficient water quality to meet their designated uses. SJRWMD is legislatively mandated to assess these water bodies and determine the potential need for establishment and implementation of pollutant load reduction goals (PLRGs). Through a series of workshops and public forums, management agencies, local governments, and stakeholders were requested to identify issues and provide listings of reports and related studies for the portions of the NCB within their jurisdiction. This was used for development of an initial NCB Reconnaissance Report (Bonnie Holub & Associates 1998).

The Reconnaissance Report was used as a resource guide in development of the NCB Surface Water Improvement and Management (SWIM) Plan by a team of SJRWMD staff members and Frazel, Inc. The purpose of the NCB SWIM Plan is to set forth a proactive course of action, identifying the projects that address both estuarine water quality and habitat protection, and the effort needed to accomplish them, consistent with the levels and trends of available funding. Input on the draft SWIM Plan was solicited for, and provided by, government and agency stakeholders and other interested parties, through a series of meetings held throughout the NCB. This document represents the culmination of that effort.

Northern Coastal Basin Summary

The NCB is located on the northern Atlantic coast of Florida. The NCB extends nearly 100 miles from lower Duval County, just south of the urban center of Jacksonville, Florida, south through the coastal watersheds of St. Johns, Flagler, and Volusia counties to Ponce de Leon Inlet, near the city of New Smyrna Beach.

The NCB covers four “planning units,” which can be an individual, usually large, tributary basin or a group of small adjacent primary tributary basins with similar characteristics. The major planning units comprising the NCB, from north to south, are the Tolomato River (9D), the Matanzas River (9C), Pellicer Creek (9B), and the Halifax River (9A). For the purposes of this management plan, the Tolomato and Matanzas river basins are treated as one basin and are referred to as Tolomato/Matanzas. This combination provides general consistency with the federal Guana-Tolomato-Matanzas National Estuarine Research Reserve (GTMNERR) Program, which encompasses parts of the estuaries in both of these planning units.

- The **Tolomato/Matanzas River** planning unit is located within northeast Florida, in portions of Duval, St. Johns, and Flagler counties, and has a contributing drainage area of approximately 127,000 acres, within 37 basins. Portions of the Tolomato/Matanzas River planning unit are designated as Class II waters, which is the standard for commercial and recreational shellfish harvesting. In 1995, extensive shellfish harvesting areas were re-classified from "conditionally approved" to "conditionally restricted" for shellfish harvesting due to high coliform bacteria levels. The net result was a closure of virtually all the primary shellfish harvesting areas available for either commercial sale or recreational usage.

  The Tolomato River north of St. Augustine has good but degrading water quality, and urban runoff and other sources of sediment load impact the Tolomato/Matanzas River planning unit. It has a contributing drainage area of approximately 102,000 acres. The system as a whole has high average total suspended solids and somewhat elevated turbidity. Overall development in the planning unit and the corresponding increase in human-related activities may be the causes of increased fecal coliform bacteria levels and other water quality parameters in the receiving waters.

- The **Pellicer Creek** planning unit is located south of St. Augustine and includes southern St. Johns County and northern Flagler County. Pellicer Creek, which forms the boundary between St. Johns and Flagler counties, is the only natural watershed drainage feature in this planning unit. Pellicer Creek is designated by the state of Florida as an Outstanding Florida Water (OFW). The Pellicer Creek planning unit consists of vast wetlands, many miles of which were drained for pine plantations or real estate development, and to reduce mosquito breeding sites. Commercial shellfishing for oysters and clams has historically occurred in the southern St. Johns County portion of this planning unit.

  Pellicer Creek is a 303(d) listed water body with a variety of water quality constituents exceeding limits, including lead, nutrients, coliform bacteria, dissolved oxygen, and iron. The man-made canals of Palm Coast are also collectively identified as a 303(d) listed water body. The water quality parameters of concern at Palm Coast are cadmium, lead, selenium, nutrients, coliforms, dissolved oxygen, silver, and thallium.

- The **Halifax River** planning unit includes portions of Flagler and Volusia counties along the northeast Florida coast and encompasses an area of nearly 208,000 acres, within 33 basins. Major drainage into the estuary comes from Bulow Creek, the Tomoka River, and Spruce Creek, and their natural tributaries. Rose Bay, which is a large embayment partially isolated from the main part of the Halifax River by an abandoned causeway and the present U.S. 1 causeway, also contributes drainage to the Halifax River. Both the Tomoka River and Spruce Creek basins are listed as OFWs.

  The Halifax River unit has several 303(d) listed water bodies, including the Halifax River for nutrients, coliform bacteria, copper, lead, and iron; Rose Bay for nutrients, coliform bacteria,

and dissolved oxygen; the Tomoka River for lead, nutrients, and iron; the B-19 canal network for nutrients and dissolved oxygen; and Spruce Creek, with a variety of constituents exceeding state water quality criteria, including lead, nutrients, coliform bacteria, dissolved oxygen, and iron.

Overall Management Strategy

The basic strategy of restoring, protecting, and managing the surface water resources of the NCB is through the use of a prioritized, objective, applied, sustainable ecosystem or watershed approach with periodic public review and input. The NCB SWIM Plan is organized around a project delivery system of goals, initiatives, strategies, and action steps.

In this system, *goals* are broad-based and identify objectives of SJRWMD. *Initiatives* are general categories that have been used to divide the plan into distinct subject areas developed by SJRWMD staff in conjunction with the NCB Advisory Group. *Strategies* are more-detailed descriptions of the underlying work proposed to achieve results. They identify the approaches and methods that will be used to implement the initiatives. *Action steps* represent specific activities under each strategy suggested to reach project delivery. Each action step includes a schedule for completion and an estimate of the funding requirements needed to accomplish the action step. These action steps, as well as the strategies and initiatives referenced above, are not mutually exclusive and may be undertaken concurrently and/or sequentially.

The plan focuses on five primary initiatives:

1. **Water quality.** This initiative consists of three distinct but interrelated strategies: water quality and flow monitoring; hydrodynamics, and water quality modeling, a prioritization process based on water quality enhancement opportunities for improving both 303(d) listed surface waters and degraded waters identified by SJRWMD so that they will meet and maintain their designated classification (i.e., OFW, Class II, Class III water quality standards).

2. **Watershed master planning.** Watershed master planning is an evaluation of stormwater management in the geographic area and identification of problem areas, with detailed remedial actions derived using hydrologic models simulating water volumes and flows under a range of climatic conditions.

3. **Stormwater retrofit and master plan implementation.** This initiative consists of development and implementation of a prioritized stormwater retrofit program focusing on areas built prior to 1983; support for the development of local government land acquisition programs for buying land to site facility construction; and evaluation of available federal and state funding sources and other partnering opportunities.

4. **Compliance and rules enforcement.** This initiative consists of strategies to collect and evaluate compliance information from existing permitted stormwater quality treatment systems. Information gained from a compliance monitoring program to evaluate proper system operation can be compared with water quality monitoring results to specify where in-place treatment devices are providing the necessary pollutant reductions, and where additional treatment is needed to maintain the water resource.

5. **Resource assessment, protection and restoration.** This initiative consists of strategies to evaluate existing data on NCB habitats and implement additional data collection efforts, if necessary, to identify and provide habitat protection and restoration in the NCB.

A number of strategies and associated action steps were developed to fulfill these initiatives. The strategies for each initiative are listed as follows:

Water Quality Initiative
- Examine the existing water quality monitoring network and, if necessary, design and implement a more integrated network.
- Develop and assess water quality and habitat protection targets using hydrologic and hydrodynamic water quality models and water quality and biological indices, where appropriate.
- Develop and assess water quality and habitat protection targets using hydrologic and hydrodynamic water quality models, where necessary.
- Enhance, where necessary, and maintain surface waters.

Watershed Master Planning Initiative
- Evaluate and refine existing watershed master plans.
- Assist in the development and endorsement of local master stormwater plans and implementation schedules.

Stormwater Retrofit and Master Plan Implementation Initiative
- Prioritize stormwater retrofit programs.
- Partner with local governments to implement stormwater plans.

Compliance and Rules Enforcement Initiative
- Implement existing compliance monitoring programs.
- Assess and manage resources and funding to support the requirements of current and emerging National Pollutant Discharge Elimination System (NPDES) regulations, pollutant load reduction goals (PLRGs), and total maximum daily load (TMDL) regulations.

Resource Assessment, Protection, and Restoration Initiative
- Complete habitat mapping and resource assessments.
- Protect and manage important estuarine habitats.

- Provide habitat enhancement and restoration.

The successful implementation of this NCB SWIM Plan will require staff resources and dedicated funding both from SJRWMD and, even more important, from outside sources. To accomplish all of the action steps in this ambitious endeavor, it is estimated that full implementation of the NCB SWIM Plan will cost $9.51 million over the next 5 years to complete. At current funding levels, SJRWMD will provide $3 million over the 5-year planning period. The remaining funds will have to be appropriated from other sources. In the event that full funding does not become available, the timeline for completion will be extended according to the levels of funding provided. The NCB SWIM Plan also calls for a re-evaluation every 3 years, at which time appropriate adjustments will be made. The completion of diagnostic studies previously outlined and an evaluation of management options must be completed before a more accurate total program cost can be set.

The following table shows funding estimates by initiative.

Initiative	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
Water quality	$295K	$655K	$615K	$615K	$615K
Watershed master planning	$90K	$40K	$200K	$200K	$200K
Stormwater retrofit and master plan implementation	$565K	$1.115M	$1.065M	$1.065M	$1.065M
Compliance and rules enforcement	$105K	$25K	$25K	$25K	$25K
Resource assessment, protection, and restoration	$215K	$220K	$165K	$140K	$565K
Total	$1.27M	$2.055M	$2.07M	$2.045M	$2.47M

In addition to the activities defined in this plan, local government has a role in maintaining water quality in the NCB, through the improvement and maintenance of projects under their jurisdiction. Ongoing capital improvement programs are costly, but necessary, and provide a good example of local governments' commitment to good water quality. These local governments have identified over $77 million in their 5-year land acquisition and capital improvement programs that would directly benefit the NCB.

CONTENTS

FIGURES AND TABLES

Figures

Tables

INTRODUCTION

Surface Water Improvement and Management Act

In recognition of the need to place additional emphasis on the restoration, protection, and management of the surface water resources of the state, the Florida Legislature, through the Surface Water Improvement and Management (SWIM) Act of 1987, directed the state's water management districts to "design and implement plans and programs for the improvement and management of surface water" (Section 373.451, *Florida Statutes* [*FS*]). The SWIM legislation requires the water management districts to protect the ecological, aesthetic, recreational, and economic value of the state's surface water bodies, keeping in mind that water quality degradation is frequently caused by point and nonpoint source pollution and that degraded water quality can cause both direct and indirect losses of aquatic habitats.

Under the SWIM Act, water management districts prioritize water bodies based on their need for protection and/or restoration. This prioritization process is carried out in cooperation with the Florida Department of Environmental Protection (FDEP), the Department of Agriculture and Consumer Services, the Department of Community Affairs, and local governments. The St. Johns River Water Management District (SJRWMD) ranked the Northern Coastal Basin (NCB) as the sixth priority SWIM program. Priority water bodies 1 through 5 are current SWIM programs.

Following the selection of the priority water bodies, and in accordance with the SWIM Act, a SWIM Plan must be drafted, reviewed, and approved before state SWIM funds can be spent on restoration, protection, or management activities. Also, recent changes to the SWIM Act that occurred in the 2003 legislative session (Chapter 2003-265, *Laws of Florida*), mandate that plans "shall be updated as necessary to ensure that they effectively address the restoration and protection needs of the priority water bodies and that they reflect current scientific understandings and budgetary adjustments." Further, while SWIM plans are still reviewed by FDEP, they are no longer subject to FDEP approval. Water management district governing boards provide the sole approval of these plans. SWIM plans must be updated at a minimum of once every 3 years.

Northern Coastal Basin Plan Evolution

SJRWMD initiated the NCB project in 1995 in response to general water quality concerns and the closure of historic shellfish harvesting areas. Potential negative impacts from current and anticipated growth on coastal resources, particularly shellfish harvesting, highlighted the need for a dedicated program to address surface water quality and estuary issues (SJRWMD 1997). In addition, a number of water bodies in the NCB are listed on the U.S. Environmental Protection Agency (EPA) 303d list by the state of Florida as not having sufficient water quality to meet their designated uses. SJRWMD is legislatively mandated to assess these water bodies and

determine the potential need for establishment and implementation of pollutant load reduction goals (PLRGs).

As a precursor to management plan development, SJRWMD sponsored a series of estuary workshops to update and inform community leaders, resource managers, and technical staff on current management efforts and estuary issues. One of the short-term objectives identified through the workshops was the development of a reconnaissance report as an information source and guide with recommendations to aid in development of the NCB Watershed Management Plan.

The Northern Coastal Basin Reconnaissance Report (Bonnie Holub & Associates 1998) is a compilation and summary of information provided by state, federal, and local agencies, universities, private institutions, and individuals within and outside the NCB. Data, reports, documents, and information about ongoing programs in the NCB were identified and included in the report.

To develop the NCB Watershed Management Plan, the reconnaissance report was used as the primary resource by a team of SJRWMD staff members and Frazel, Inc., to develop a draft plan. Input on the draft plan was solicited for, and provided by, government and agency stakeholders (Appendix I) and other interested parties, through a series of three workshops held throughout the NCB. This document represents the culmination of that effort.

Acknowledgments

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SECTION A

DESCRIPTION OF THE WATER BODY SYSTEM

A.1. General Overview

The NCB is located on the northern Atlantic coast of Florida (Figure 1). The NCB extends nearly 100 miles from lower Duval County, just south of the urban center of Jacksonville, Florida, south through St. Johns, Flagler, and Volusia counties to Ponce de Leon Inlet, near the city of New Smyrna Beach.

The NCB encompasses over 680 square miles of coastal lowlands interspersed with numerous creeks and small rivers draining east to form a series of shallow bays and lagoons. These are separated from the Atlantic Ocean by a barrier island system with three inlets: St. Augustine, Matanzas, and Ponce de Leon.

The NCB is composed of a variety of landscapes, with development throughout the region. Residential, commercial, and industrial lands occupy approximately 23% of the total NCB watershed. This area includes the intensively urbanized areas around St. Augustine Inlet, throughout the Daytona Beach area, and the urbanized area in the vicinity of Ponce de Leon Inlet. Interspersed between these urbanized areas are sections of public conservation and undeveloped lands consisting of natural communities, including uplands, floodplain and riverine wetlands, and tidal marshes. Wetlands, wetland forest, and open water cover more than 29% of the area; upland forest, agriculture, and open/range lands make up more than 41% of the area; and open water covers nearly 7% of the area (SJRWMD 2000).

The natural hydrology of the NCB has been altered by a combination of water control structures, dikes, drainage ditches, and man-made canals. The Intracoastal Waterway (ICW) runs the entire length of the NCB's coastal lagoons.

SJRWMD is divided into 10 major basins that are subdivisions of the U.S. Geological Survey (USGS) defined hydrologic units. The NCB, or major basin "9," is further subdivided into four planning units. A planning unit can be an individual, usually large, tributary basin or a group of small adjacent primary tributary basins with similar characteristics. The major planning units comprising the NCB, from north to south, are the Tolomato River (9D), the Matanzas River (9C), Pellicer Creek (9B), and the Halifax River (9A) (Figure 2). For the purposes of this management plan, the Tolomato and Matanzas river basins are treated as one basin and will be referred to as Tolomato/Matanzas. This combination provides general consistency with the federal Guana-Tolomato-Matanzas National Estuarine Research Reserve (GTMNERR) Program, which encompasses parts of the estuaries in both of these planning units. Areal details on the three planning units in the NCB are listed in Table 1.

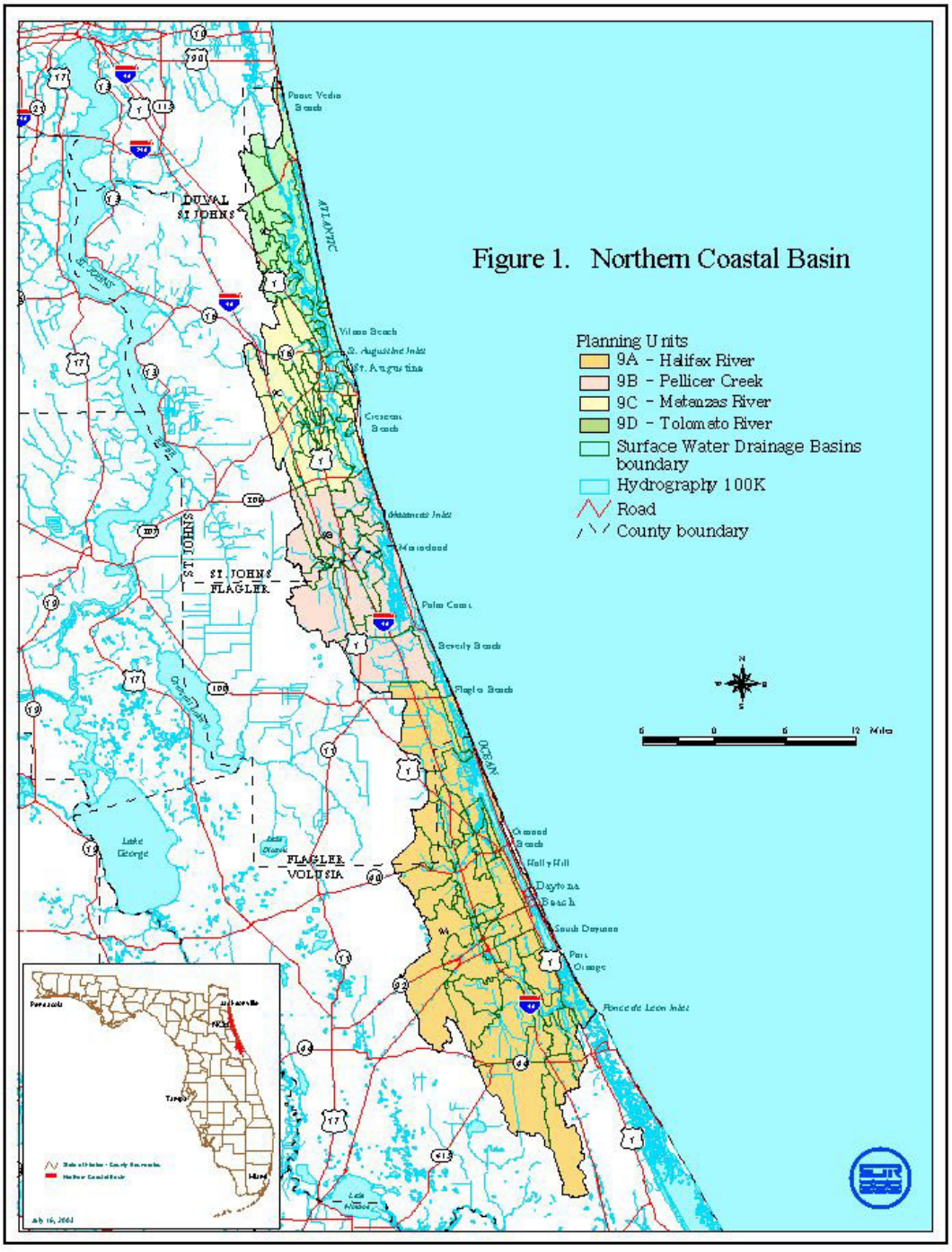


Figure 1. Northern Coastal Basin
Planning Units
9A - Halifax River
9B - Pellicer Creek
9C - Matanzas River
9D - Tolomato River
Surface Water Drainage Basins boundary
Hydrography 100K
Road
County boundary
DUVAL
ST JOHNS
FLAGLER
VOLUSIA
OCEAN
Daytona Beach
Ponce de Leon Inlet
6 0 6 12 Miles

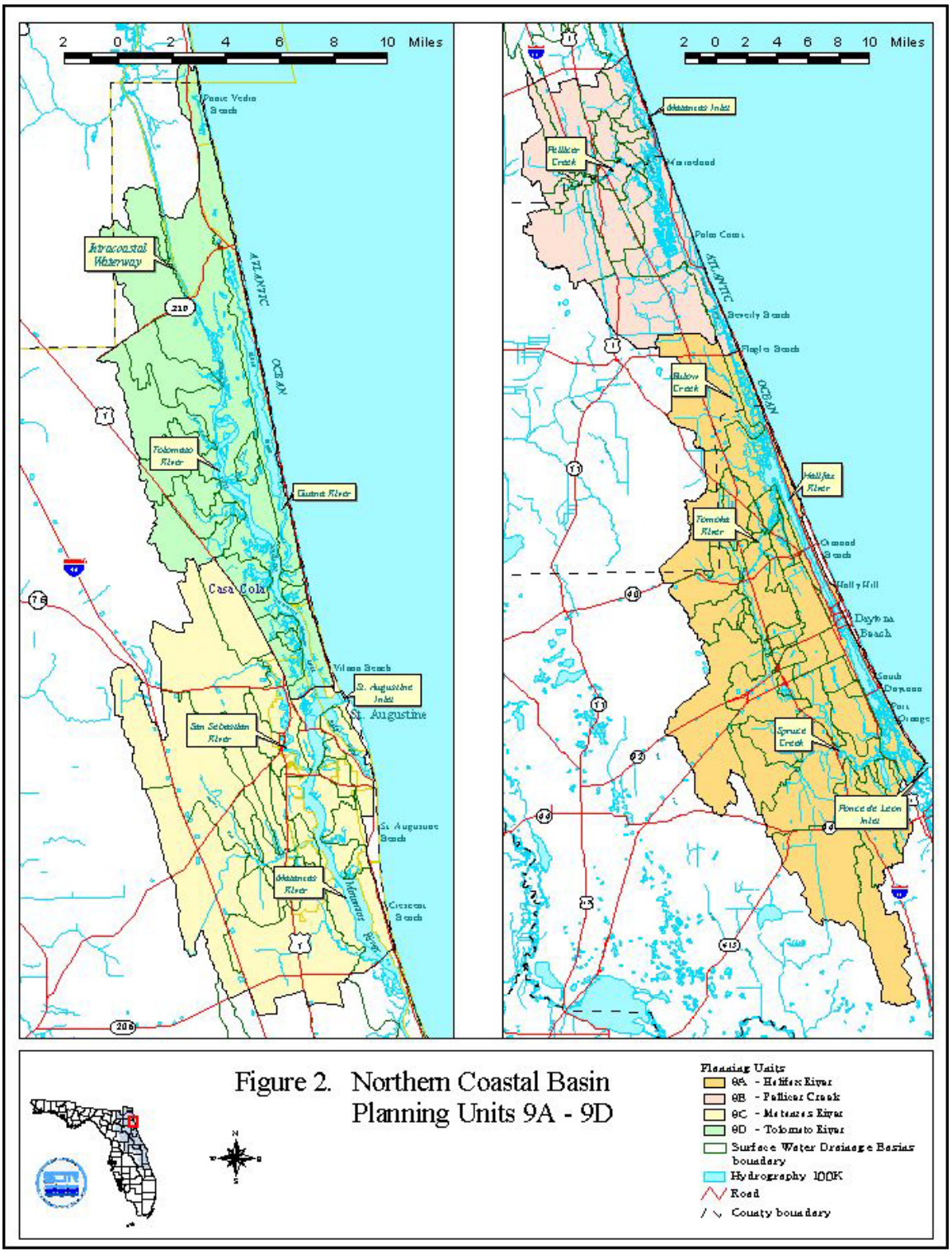

2 0 2 4 6 8 10 Miles
Intracoastal Waterway
ATLANTIC OCEAN
Tolomato River
Guana River
Casa Cola
San Sebastian River
St. Augustine
Matanzas River
Halifax River
Spruce Creek
Ponce de Leon Inlet
Daytona Beach
Figure 2. Northern Coastal Basin
Planning Units 9A - 9D
Planning Units
9A - Halifax River
9B - Pellicer Creek
9C - Matanzas River
9D - Tolomato River
Surface Water Drainage Basins boundary
Hydrography 100K
Road
County boundary

Table 1. Planning units in the Northern Coastal Basin

Planning Unit No.	Planning Unit Name	Area (acres)	Area (square miles)
9D/C	Tolomato/Matanzas River	125,521.3	196.1
9B	Pellicer Creek	102,050.6	159.5
9A	Halifax River	208,122.0	325.2
Total		435,693.9	680.8

Source: Adamus et al. 1997

The major planning units described above contain 83 distinct watersheds described by SJRWMD as "7.5-minute quad basins." A 7.5-minute quad basin is the smallest delineated area in the drainage basin data layer maintained by SJRWMD. Details of the naming conventions, as well as maps of these hydrologic areas, can be found in Adamus et al. 1997.

The NCB contains over 87,000 acres of managed public conservation areas, ranging from the 40,000-acre Guana River Marsh Aquatic Preserve to the 6-acre Addison Blockhouse State Historic Site. Approximately 55,000 acres of these lands occur within the federally designated GTMNERR Program.

A.2. Hydrography

The NCB is located within the Upper East Coast Drainage Basin (part of the Florida East Coast Basin as defined by FDEP), which covers 467,195 acres. The majority of the watersheds in this basin drain by way of small tidal creeks into shallow coastal lagoons, toward the Atlantic Ocean. Tidal exchange is accomplished through four ocean inlets located in or near the borders of the NCB. At the northern extreme of the Upper East Coast Drainage Basin, the St. Johns River flows to the Atlantic Ocean at Mayport. Five river miles west of the inlet, the ICW connects to the St. Johns River.

Moving approximately 15 miles south of the St. Johns River, the ICW crosses into the NCB where it joins and becomes part of the Tolomato River. North of St. Augustine, the Tolomato River connects to the Guana River and flows to the Atlantic Ocean via the St. Augustine Inlet. South of St. Augustine, the Matanzas River is a lagoonal estuary with the flow of water discharging to the Atlantic Ocean by way of the Matanzas Inlet. The Matanzas River estuary connects to the Halifax River estuary, to the south, via an artificial channel created as an extension of the ICW.

The Halifax River extends south from the artificial channel north of Daytona Beach, exiting the NCB at the Ponce de Leon Inlet. Tidal flow in this area also originates through the Ponce de Leon Inlet. Six causeways that cross the Halifax River estuary within a distance of 10.5 miles inhibit circulation in the area.

A.2.1. Water Quality

Under Section 303(d) of the Clean Water Act, each state must prepare a list of waters that are not of sufficient quality to meet their designated uses. These lists are required to be submitted to EPA for review and approval every April of even-numbered years, that is, every 2 years. It is those water bodies in the NCB that appear on the 303(d) list that will automatically receive the highest priority for establishment of PLRGs and TMDLs (total maximum daily loads) for restoration and protection (Table 2). Details on the PLRG and TMDL process are provided in Section F.

The 303(d) list is developed from data provided from a number of sources, primarily the EPA STORET databases, USGS, and the Florida Department of Health. The STORET databases contain water quality data from a variety of sources including FDEP, the water management districts, local governments, and volunteer monitoring groups. EPA has requested that states merge their reporting requirements under the Clean Water Act for Section 305(b) surface water quality reports and Section 303(d) lists of impaired waters into an "Integrated Water Quality Monitoring and Assessment" report. Following the publication of the status reports and further data evaluation, FDEP will produce an assessment report integrating the 303(d) list and the basin-specific 305(b) report for this area. An updated 303(d) list for the NCB will be submitted to EPA by FDEP in 2006.

An individual state 305(b) report, which is a biennial assessment of the water quality of a state's waters, provides a summary of water quality by water body type — good, fair, or poor — displayed on maps organized by hydrologic units (FDEP 2000). The summary data that are contained in these reports are developed from comparisons of a variety of water quality indices, described below, known as the Water Quality Index (WQI), the Trophic State Index (TSI), and the Stream Condition Index (SCI).

The WQI, developed by FDEP, represents an average of six water quality index categories (water clarity [turbidity, total suspended solids], dissolved oxygen, biological oxygen demand, nutrients [total nitrogen and total phosphorus], bacteria [fecal and total coliforms], and biological diversity). It is a percent value ranging from 0 to 100, with low WQI values representing the best quality and high WQI values having the worst quality (Hand et al. 1988). Over the years, FDEP has modified the WQI to accommodate blackwater streams and springs. (Note that a WQI presented in the 305(b) report for a water segment could represent anywhere from only one category to all six. Consequently, some care must be exercised if WQIs within or between watersheds are compared.)

Table 2. Northern Coastal Basin 303(d) listed water bodies*

Water Body Name	Water Body ID	Priority	TMDL Year	Impairment Parameters	County
Tolomato/Matanzas River Planning Unit					
Cracker Branch	2553	Low	2011	Coliforms, dissolved oxygen, iron	St. Johns
Guana River	2320	Low	2011	Coliforms, dissolved oxygen	St. Johns
ICW (Matanzas River)	2205C	Low	2008	Coliforms, nutrients	St. Johns
Matanzas River	2363H	Low	2011	Coliforms, nutrients	Flagler
Matanzas River	2363I	Low	2011	Coliforms, nutrients	Flagler
Pellicer Creek Planning Unit					
Pellicer Creek	2580B	Low	2011	Lead, coliforms, nutrients, dissolved oxygen, iron	Flagler
Palm Coast	2363D	Low	2011	Cadmium, lead, nutrients, coliforms, dissolved oxygen, silver, selenium, thallium	Flagler
Halifax River Planning Unit					
Halifax River	2363A	Low	2011	Nutrients, coliforms	Volusia
Halifax River	2363B	Low	2011	Copper, lead, nutrients, iron	Volusia
Rose Bay	2672	Low	2011	Nutrients, coliforms, dissolved oxygen	Volusia
Spruce Creek	2674A	High	2006	Nutrients, dissolved oxygen, iron	Volusia
Spruce Creek (OFW portion)	2674	High	2006	Nutrients, coliforms, dissolved oxygen, iron	Volusia
Tomoka River	2634A	Low	2011	Lead, nutrients, iron	Volusia
Tomoka River	2634	Low	2011	Nutrients, coliforms, dissolved oxygen, iron, lead	Volusia
Unnamed ditch (B-19 Canal)	2666	Low	2011	Nutrients, dissolved oxygen	Volusia

Note: ICW = Intracoastal Waterway
OFW = Outstanding Florida Water
TMDL = total maximum daily load

*Table 2 is provided to show the most current Northern Coastal Basin (NCB) 303(d) list, approved 11/24/98 (EPA 1998). Although the state of Florida has submitted a year 2000 305(b), the U.S. Environmental Protection Agency has not yet released an updated 303(d) list for the NCB region. The only current adopted and draft 2002 303(d) lists of impaired waters in Florida are Group 1 watersheds. The NCB is listed as a Group 5 watershed.

The TSI is a water quality parameter ranging from 0 to 100 on a log scale, especially developed for Florida lakes (Huber et al. 1982). It is also used for estuaries as a measure of the degree of eutrophication, or nutrient enrichment of a water body, with water bodies classified as good (0 to <50), fair (50 to <60), or poor (60 to 100). Historic TSI calculations use annual averages of either total nitrogen and phosphorus concentrations (depending on which is the limiting nutrient in the system), or an average of the two values, in addition to chlorophyll *a*. The calculation also included Secchi disk transparency values; the calculation method was revised by FDEP to provide consistent TSI values without the inclusion of a transparency value. Here again, low values indicate good water quality while high values indicate poor water quality.

Finally, the SCI is an assessment tool developed by FDEP for determining the biological condition of a stream. The SCI is used in monitoring efforts and is an aggregation of seven different measures of the macroinvertebrate community structure. Sampling consists of 20 sweeps of the most productive habitats found in a 100-meter stretch of stream, using a dip net. Organisms collected are brought back to the laboratory for identification. A higher diversity of taxa of organisms indicates better stream condition health. Although FDEP uses this index, SJRWMD scientists have not used this assessment tool in the NCB.

The most current status and trends of water quality in the NCB is provided in Miller and Sigua (2003). This report summarizes data collected between 1997 and 2000 for the Tolomato-Matanzas River estuary and the Pellicer Creek watershed and waterways in northern Flagler County. It also contains data collected between 1991 and 1999 in the Halifax River estuary and its tributaries in Volusia County.

SJRWMD, as well as Palm Coast Community Service Corporation, Volusia County Environmental Management Division, and the GTMNERR, maintain sampling programs in the NCB that expand on the sampling conducted by FDEP. Figure 3 shows the SJRWMD and local agency water quality monitoring locations in the NCB.

A.2.2. Hydrology, Hydraulics, and Water Quality

The hydrologic boundaries of the NCB are the water divides along the boundaries of the watersheds that discharge to the NCB estuaries. The watersheds consist of the uplands and marshes to the west of the estuary and the marshes and barrier island to the east. Rainfall on the uplands collects in tributaries or runs off directly into the marshes and the estuary.

The NCB is a series of tidal lagoons interconnected by narrow, maintained dredged channels (the ICW), with inlet connections to the sea and extensive marsh areas. Circulation and transport of suspended and dissolved substances in the estuaries and channels are driven primarily by tides and winds. The amplitudes of inlet tides range from 1.8 feet at Pablo Creek to 2.1 feet at St. Augustine to 1.5 feet at Ponce de Leon Inlet. Tides from adjacent inlets meet in the areas between inlets, causing tidal “null zones” that move back and forth in concert with the inlet tides. The tidal amplitude at Ormond Beach, for example, is only 0.2 feet. Flushing in these null zone areas

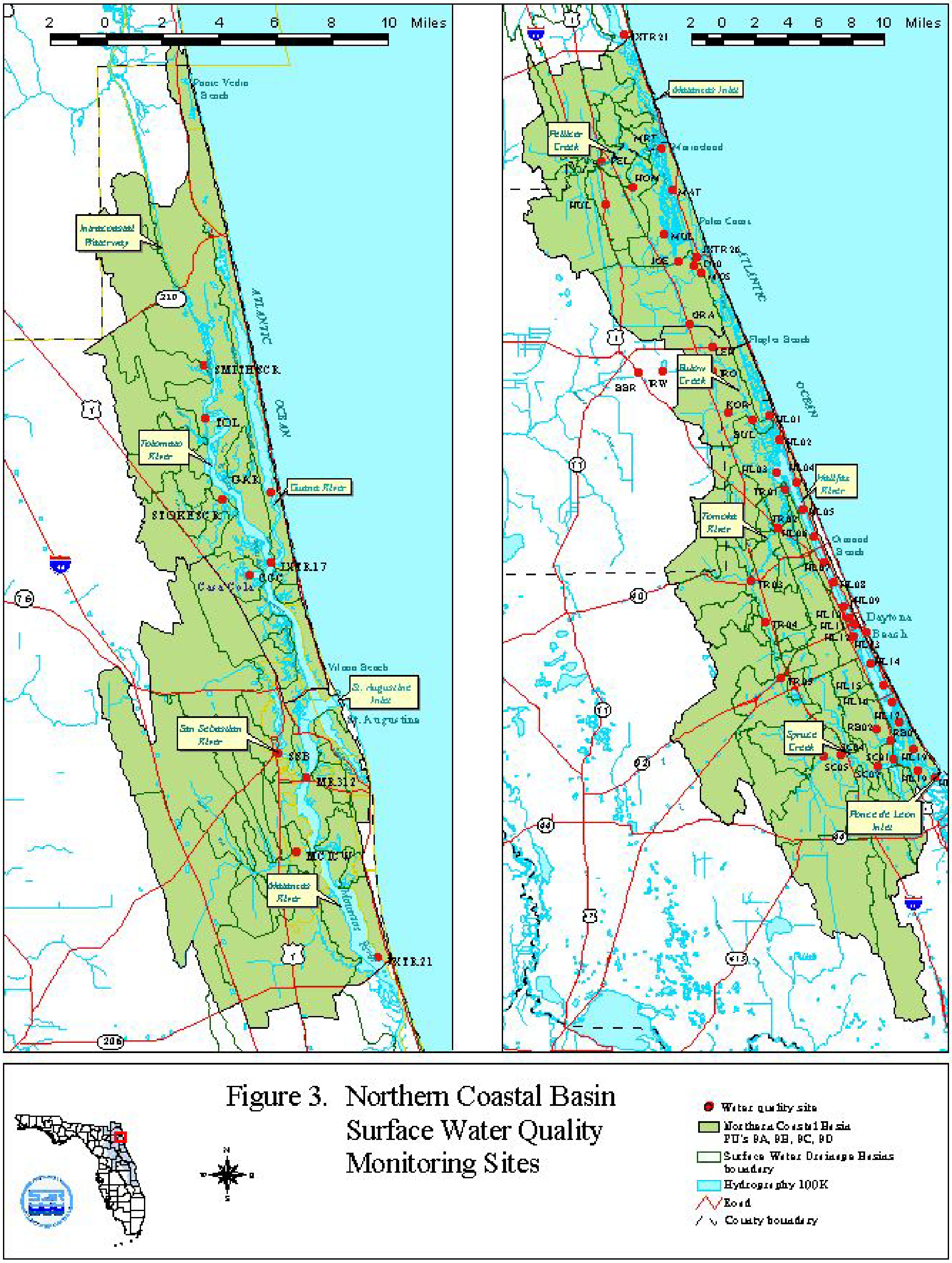


Figure 3. Northern Coastal Basin Surface Water Quality Monitoring Sites

is reduced, resulting in longer residence times for pollutants. However, models of the system developed so far have not been completely calibrated and therefore circulation and flushing have not been fully quantified.

The northern tidal boundary of the NCB, south of Pablo Creek, receives tidal energy from Mayport, the inlet at the mouth of the St. Johns River. A water divide between north and south, defining the northern boundary of the NCB, crosses the ICW at a location west of Palm Valley. Measurements of water levels at Pablo Creek have established tidal characteristics at this location, which are used as the northern boundary of the NCB for modeling purposes even though it is outside the management boundary of the NCB. The southern boundary of the NCB is located at Ponce de Leon Inlet. Tidal characteristics one-half mile south of the inlet, at the U.S. Coast Guard station, have been measured for modeling purposes.

Circulation and water quality in the NCB are driven by ocean water levels, rainfall, wind events, boat wakes, runoff, evaporation, groundwater seepage, and inputs of substances from the surrounding environment. Eventually, for a useful description of the system to be developed, all significant inputs need to be measured simultaneously over a suitably long period of time. Current NCB physical monitoring sites are shown in Figure 4.

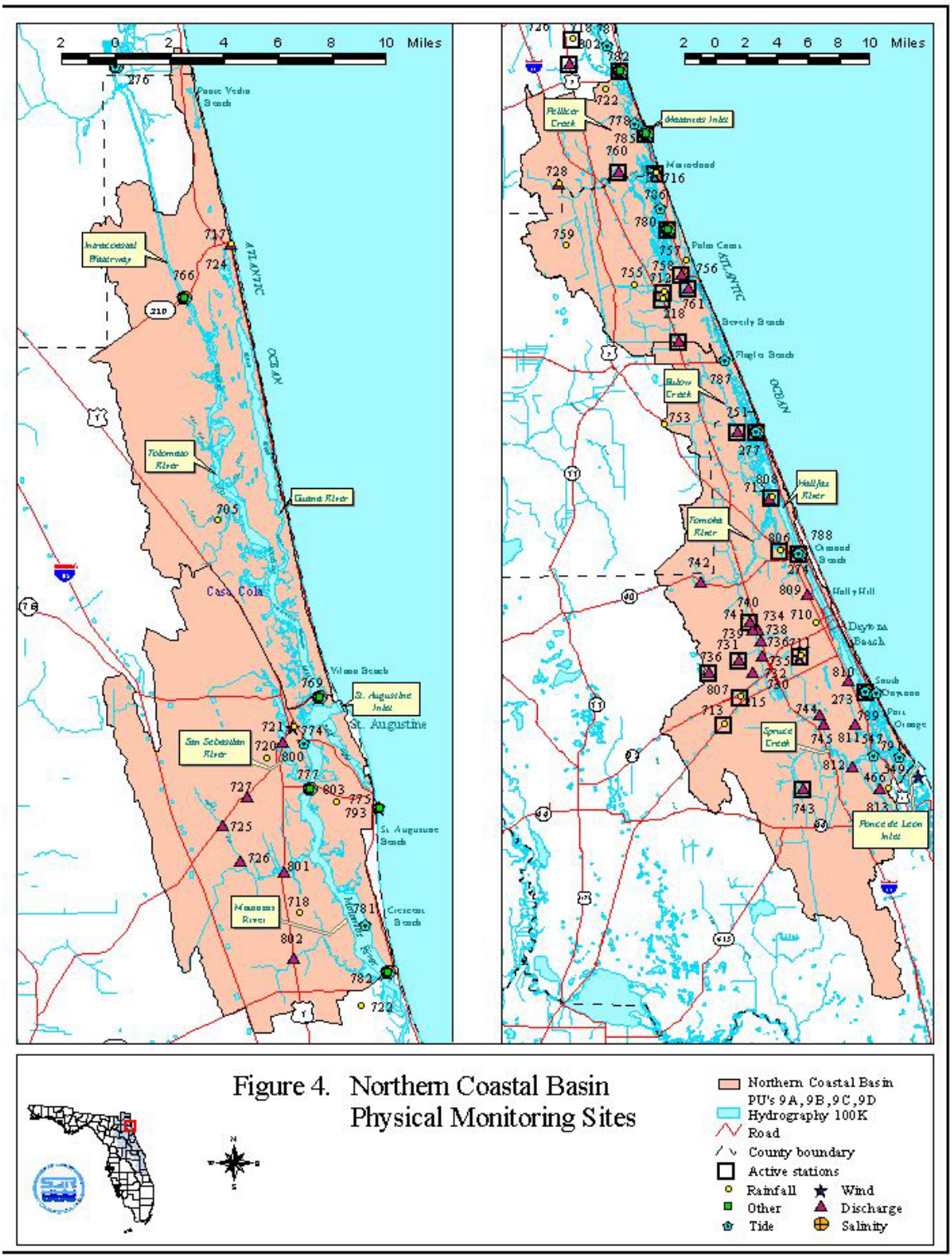
A.3. Planning Unit Descriptions

A detailed description of each planning unit is provided in Sections A.3.1–A.3.3. A map of the planning unit accompanies each section. Note that the dimensional scales may vary from map to map.

A.3.1. Tolomato/Matanzas River Planning Unit

The Tolomato/Matanzas River planning unit — planning unit 9D/C — is located within northeast Florida, in portions of Duval, St. Johns, and Flagler counties (Figure 5). Local municipalities and residential areas in this unit include Ponte Vedra, Vilano Beach, St. Augustine, St. Augustine Beach, St. Augustine Shores, and Crescent Beach. The Tolomato/Matanzas River planning unit is composed of the Tolomato, Guana, and Matanzas River watersheds and has a contributing drainage area of approximately 127,000 acres, within 37 basins.

Within the Tolomato River watershed, major freshwater drainage from the west arrives to the Tolomato River through Smith Creek, Sweetwater Creek, Deep Creek, Marshall Creek, Stokes Creek, and Casa Cola Creek. Capo Creek, Jones Creek, and Sombrero Creek drain west from the Guana peninsula on the barrier island to the Tolomato River. Ximanies Creek, Pancho Creek, and Robinson Creek also drain into the Tolomato River. The Guana River converges with the Tolomato River, the Matanzas River, and Salt Run from the south before flowing into the Atlantic Ocean at the St. Augustine Inlet. Tidal effects are observed throughout this waterway, converging between the two inlets to a tidal minimum just north of Palm Valley Bridge.


2 0 2 4 6 8 10 Miles
ATLANTIC OCEAN
Intracoastal Waterway
Tolomato River
Guana River
Pellicer Creek
Matanzas Inlet
Palm Coast
Flagler Beach
Bulow Creek
Halifax River
Tomoka River
Ormond Beach
Daytona Beach
Holly Hill
South Daytona
Port Orange
Spruce Creek
Ponce de Leon Inlet
Vilano Beach
St. Augustine Inlet
St. Augustine
San Sebastian River
St. Augustine Beach
Matanzas River
Crescent Beach
Figure 4. Northern Coastal Basin
Physical Monitoring Sites
Northern Coastal Basin
PU's 9A,9B,9C,9D
Hydrography 100K
Road
County boundary
Active stations
Rainfall
Wind
Other
Discharge
Tide
Salinity

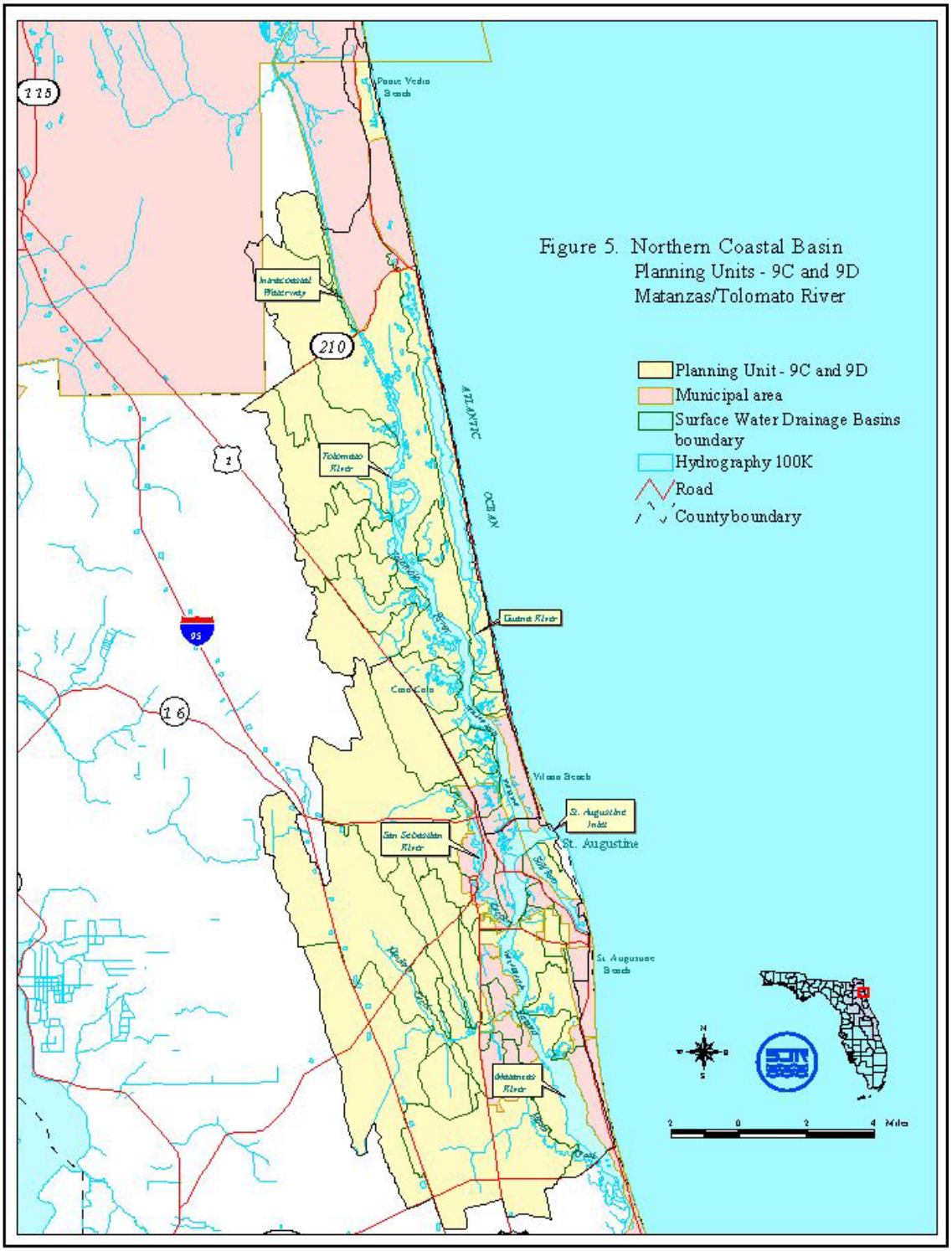


Figure 5. Northern Coastal Basin
Planning Units - 9C and 9D
Matanzas/Tolomato River
Planning Unit - 9C and 9D
Municipal area
Surface Water Drainage Basins boundary
Hydrography 100K
Road
Countyboundary
ATLANTIC
OCEAN
Tolomato River
Guana River
Matanzas River
St. Augustine
St. Augustine Inlet
Intracoastal Waterway
210
1
95
16
Miles

Major freshwater drainage to the Matanzas River estuary comes from the San Sebastian River, Moultrie Creek, and Moses Creek, as well as inflow from overland urban runoff, and Pellicer Creek contributes with flows east to the Matanzas River lagoon. Both the St. Augustine Inlet in the north and the Matanzas Inlet, located 14 miles south, tidally influence the estuary. The Matanzas Inlet is a natural tidal inlet that, with the exception of the State Road A1A bridge over the inlet, has been unaltered and is not actively maintained for navigation.

Regionally significant habitat areas include the Guana River corridor, including the Guana and Tolomato estuaries; the Guana Marsh watershed; the ICW, Fish Swamp, and wetlands, flatwoods, and hardwood forest in between.

A.3.1.1. Historical Uses

St. Augustine, settled in 1565, is America's oldest continually occupied city, with more than 400 years of continuous settlement. The last several decades have seen an increase in coastal residential development in Ponte Vedra, Vilano Beach, St. Augustine, and St. Augustine Beach. Uplands on the western edge of the Tolomato/Matanzas River planning unit have traditionally been used for agriculture and silviculture.

The waterways within this unit have been altered, beginning with the digging of a series of canals connecting the Matanzas and Halifax rivers in 1881. The canal system was eventually continued north through the Tolomato River to provide a safe inland channel for small vessels. These canals now comprise portions of the ICW.

Commercial shellfishing for oysters and clams has historically occurred in the northern St. Johns County portion of the planning unit (Figure 6).

A.3.1.2. Current Uses

The expansion of urban areas into former agricultural and silvicultural lands in the northern and western Tolomato/Matanzas River watersheds is occurring at an increasing pace, although the watersheds are currently still only moderately developed. Residential and commercial uses are clustered predominantly in the Ponte Vedra area, Vilano Beach, and along U.S. 1 and SR A1A near St. Augustine.

According to the 2000 census, St. Johns County is the second-fastest growing county in the state of Florida. Much of the new development will increase stormwater discharges into the ICW.

There are a number of domestic and industrial wastewater facilities with National Pollutant Discharge Elimination System (NPDES) permits to discharge to surface waters. Most of the facilities are domestic wastewater treatment plants.

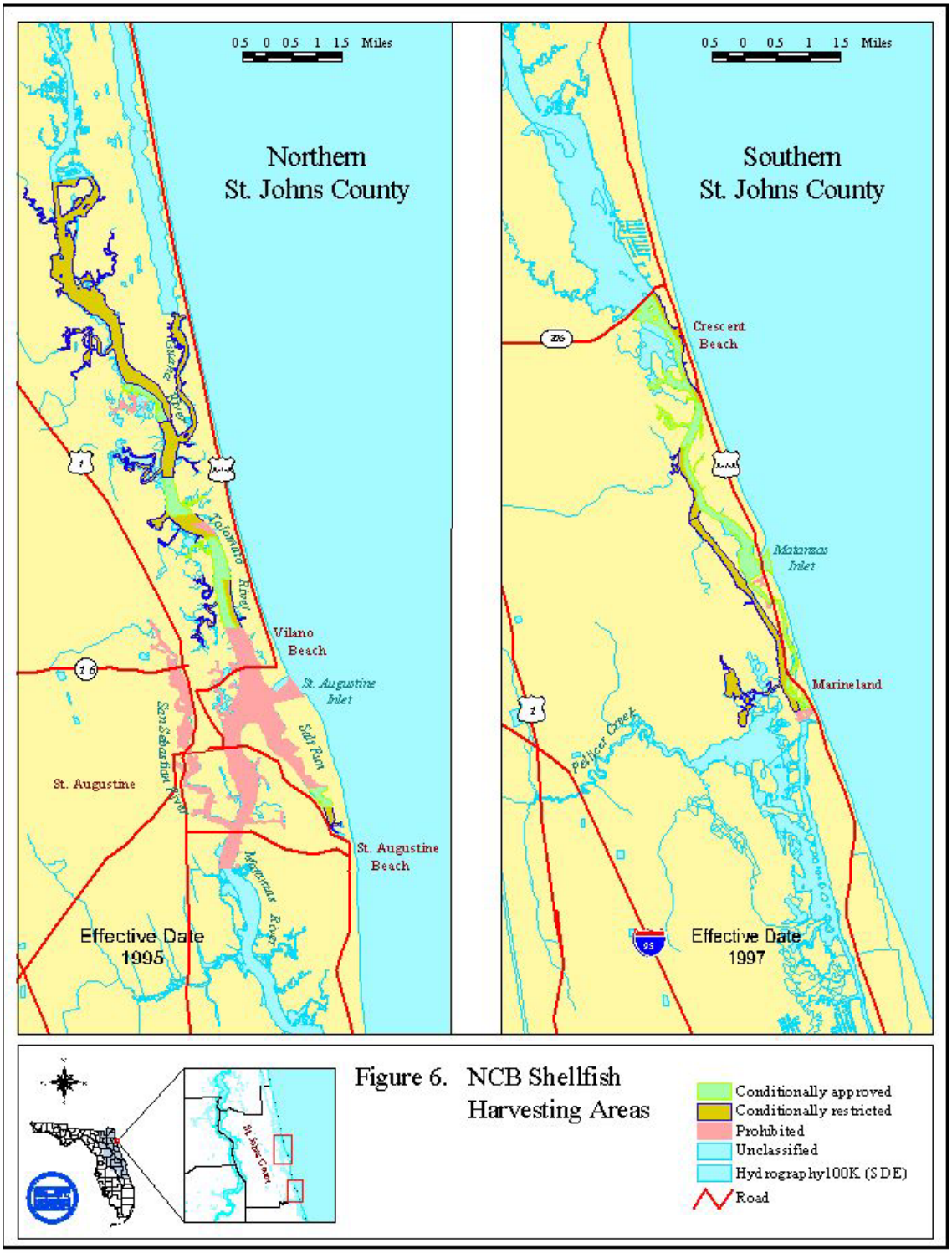


Figure 6. NCB Shellfish Harvesting Areas

A.3.1.3. Conditions Leading to the Need for Restoration and Protection

Portions of the Tolomato/Matanzas River planning unit are designated as Class II waters, which is the standard for commercial and recreational shellfish harvesting. In 1995, extensive shellfish harvesting areas were re-classified from "conditionally approved" to "conditionally restricted" for shellfish harvesting due to elevated coliform bacteria levels. The net result was a closure of virtually all the primary shellfish harvesting areas north of St. Augustine.

The Tolomato River north of St. Augustine has good but degrading water quality (FDEP 1998). The Matanzas River has degraded water quality.

Urban runoff and other sources of sediment load impact the Tolomato/Matanzas River planning unit. The system as a whole has high average total suspended solids and somewhat elevated turbidity. This likely reflects both natural and man-made tributary loading and/or scouring and resuspension due to strong tidal current velocities, wind-generated waves, and boat wakes.

Overall development in the planning unit and the corresponding increase in human-related activities may be the causes of increased fecal coliform bacteria levels and other water quality parameters in the receiving waters. An increased density of septic systems associated with continued development may also have an impact on water quality.

A.3.2. Pellicer Creek Planning Unit

The Pellicer Creek planning unit — planning unit 9B — is located south of St. Augustine and includes southern St. Johns County and northern Flagler County (Figure 7). Pellicer Creek, which forms the boundary between St. Johns and Flagler counties, is the only natural watershed drainage feature in this planning unit. It cuts through the marine terraces and ridges as it flows east into the Matanzas River. Local municipalities and residential areas in this unit include the towns of Marineland and Beverly Beach, the city of Palm Coast, and the northern portions of Flagler Beach. The Pellicer Creek planning unit has a contributing drainage area of approximately 102,000 acres, within 13 basins. Connection to the Halifax River to the south and to the Matanzas River estuary to the north is through the ICW.

Major freshwater drainage to the Pellicer Creek planning unit comes from Pellicer Creek, inflow from overland urban runoff, and drainage from the network of man-made stormwater drainage canals in the Palm Coast area. The natural streams and creeks include Long Creek, Hulett Branch, Mulberry Branch, Hominy Branch, Black Branch, and the Iroquois Waterway. The man-made drainage canals include the Lehigh Canal, Ditch 10, and the St. Joe Canal.

Pellicer Creek is designated by the state of Florida as an Outstanding Florida Water (OFW). At a program level, an OFW designation is applied to waters that are deemed worthy of a special protection because of their natural attributes. While nearly 90% of OFWs are within state or federally managed areas such as parks, national seashores, national wildlife refuges, marine


Figure 7. Northern Coastal Basin
Planning Unit - 9B
Pellicer Creek
Planning Unit - 9B
Municipal area
Surface Water Drainage Basins boundary
Hydrography 100K
Road
County boundary
Crescent Beach
Marineland
Pellicer Creek
ATLANTIC
OCEAN
Palm Coast
Beverly Beach
Flagler Beach
ST. JOHNS
FLAGLER
95
1
206
100

sanctuaries, wild and scenic rivers, or aquatic preserves, water not under state or federal management may also be designated as an OFW. These are called "Special Water" OFWs.

For a water to be designated as a Special Water OFW, the Environmental Regulation Commission (ERC) must make two "findings." The ERC must find "that the waters are of exceptional recreational or ecological significance and that the environmental, social, and economic benefits of the designation outweigh the environmental, social, and economic costs" (Section 62-302.700(5), *Florida Administrative Code* [*F.A.C.*]). The ERC concurred that Pellicer Creek met the findings necessary for a Special Water OFW designation, which then became effective June 18, 1992.

Other regionally significant habitat areas in this planning unit include the Graham Swamp corridor: Matanzas River estuary marshes, wetlands, flatwoods, and hardwood forest west of the Matanzas River; Hulett Branch and Swamp; and silviculture and wetlands west of U.S. 1, including the Pringle Branch and Swamp.

A.3.2.1. Historical Uses

The Pellicer Creek unit consists of vast wetlands, many miles of which were drained for pine plantations and real estate development and to reduce mosquito breeding sites. Pellicer Creek itself is maintained as a preserve and has been left largely undisturbed.

Commercial shellfishing for oysters and clams has historically occurred in the southern St. Johns County portion of this planning unit (see Figure 6).

A.3.2.2. Current Uses

Commercial and residential uses currently take up only about 7% of the Pellicer Unit, with Palm Coast being the major residential development. Based on current growth and the future land use plan for Pellicer Creek, residential areas could potentially increase to 22% of the total area by the year 2020. Most of the western portions of the unit remain under silvicultural use.

A.3.2.3. Conditions Leading to the Need for Restoration and Protection

Pellicer Creek is a 303(d) listed water body with a variety of water quality constituents exceeding limits, including lead, nutrients, coliform bacteria, dissolved oxygen, and iron. Recent analyses by SJRWMD showed high coliform counts, well above both the Class II shellfish harvesting criteria and the Class III marine recreational criteria. The source of these bacteria is not yet clear (Miller and Sigua 2003).

The man-made canals of Palm Coast are also collectively identified as a potential 303(d) impaired water body. The water quality parameters of concern at Palm Coast are cadmium, lead, selenium, nutrients, coliforms, dissolved oxygen, silver, and thallium.

High densities of onsite sewage treatment and disposal systems (OSTDS) along the barrier island in north Flagler County may contribute bacteria and nutrient input to the water of the Pellicer Creek planning unit.

Shoreline erosion is a significant concern in the narrow, channelized (ICW) portion of the southern Pellicer Creek unit. Wave energy due to boat traffic causes continuous resuspension of sediments and resulting increases in total suspended solids.

A.3.3. Halifax River Planning Unit

The Halifax River planning unit — planning unit 9A — includes portions of Flagler and Volusia counties along the northeast Florida coast (Figure 8). Local municipalities and residential areas in this unit include southern portions of Flagler Beach, Holly Hill, Ormond Beach, Port Orange, Daytona Beach, South Daytona, and Ponce Inlet. The Halifax River drainage basin encompasses an area of nearly 208,000 acres, within 33 basins.

Major drainage into the estuary comes from Bulow Creek, the Tomoka River, Spruce Creek, and their natural tributaries. Rose Bay, which is a large embayment partially isolated from the main part of the Halifax River by an abandoned causeway and the present U.S. 1 causeway, also contributes drainage to the Halifax River. Tidal flow primarily originates through the Ponce de Leon Inlet to the south. There is also tidal exchange of water through the ICW to the north, connecting with the Matanzas Inlet through the Matanzas River.

Important habitat areas include the Spruce Creek and Tomoka River/Bulow Creek corridors, including the estuarine marshes around Ponce Inlet; Tiger Bay, and Bennett Swamp; silviculture, wetlands, and flatwoods west of Interstate 95; and wetlands, flatwoods, and hardwood forest north of the Tomoka and Halifax rivers.

Both the Tomoka River and Spruce Creek basins are listed as OFWs and fall under more-stringent SJRWMD surface water and environmental resource permitting rules. The rules were promulgated in 1998.

A.3.3.1. Historical Uses

Mosquito impoundments, residential development, or silviculture has altered a majority of the estuary's historic watershed drainage. A 1,100-acre mosquito impoundment is still located west of the ICW and north of the Tomoka River Basin, though the dike wall has been breached in several places and active management of the impoundment ended in the early 1980s.

A.3.3.2. Current Uses

Ormond Beach, Holly Hill, Daytona Beach, and Bethune Point are all relatively densely populated residential areas. All of these municipalities discharge treated wastewater effluent into

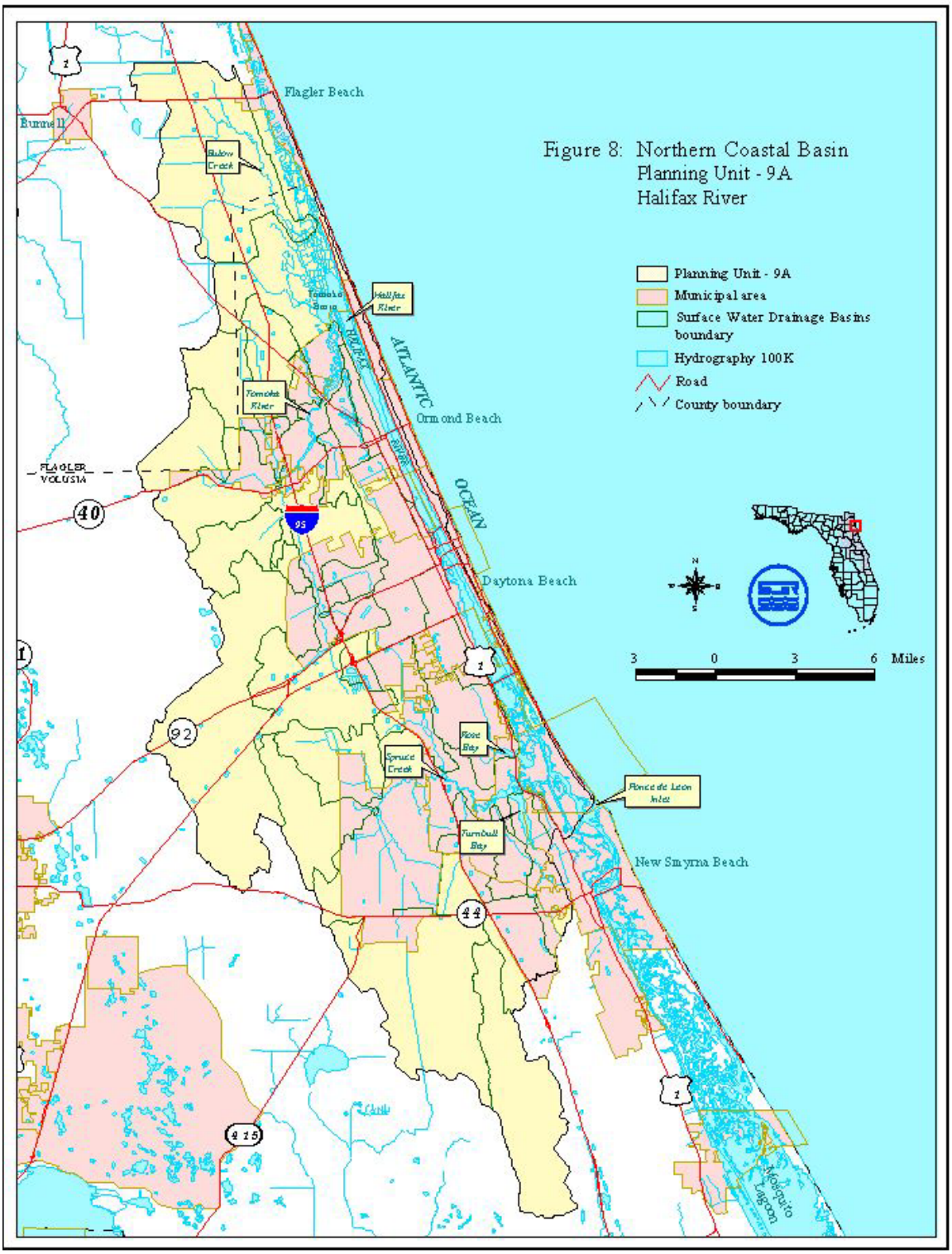


Figure 8: Northern Coastal Basin
Planning Unit - 9A
Halifax River
Planning Unit - 9A
Municipal area
Surface Water Drainage Basins boundary
Hydrography 100K
Road
County boundary
Flagler Beach
Bunnell
Bulow Creek
Halifax River
Tomoka River
ATLANTIC OCEAN
Ormond Beach
FLAGLER
VOLUSIA
Daytona Beach
Spruce Creek
Ponce de Leon Inlet
Turnbull Bay
New Smyrna Beach
Mosquito Lagoon
3 0 3 6 Miles

the Halifax River; however, discharge volumes have been, and continue to be, reduced due to local water conservation and wastewater effluent reuse and diversion programs.

A.3.3.3. Conditions Leading to the Need for Restoration and Protection

The Halifax River unit has several 303(d) listed water bodies. These include the Halifax River for nutrients, coliform bacteria, copper, lead, and iron; Rose Bay for nutrients, coliform bacteria, and dissolved oxygen; the Tomoka River for nutrients and iron; the B-19 Canal network for nutrients and dissolved oxygen; and Spruce Creek, with a variety of constituents exceeding limits, including lead, nutrients, coliform bacteria, dissolved oxygen, and iron.

SJRWMD sampling found varying degrees of coliform bacteria concentration at Halifax River sites, generally well within Class III standards, whereas samples from sites within the tributaries often failed to meet Class III standards.

SECTION B

LAND USES AND REGULATED ACTIVITIES WITHIN THE NORTHERN COASTAL BASIN

B.1. Land Use and Land Cover

Current

Based on 1995 land use data, the predominant land uses in the NCB are silviculture and agriculture, comprising 41% of the basin. Wetlands and wetland forests comprise 29% of the basin. Urban and suburban land uses have become more predominant, with continued expansion along both the ICW and coastal areas at 23% of the land area. Table 3 shows the percentages of land use and land cover, based on 1995 land use data. Detailed geographic information system (GIS) overlay maps of land cover, wetland vegetation cover, future land uses in the 100-year floodplain, and others are found in the NCB Reconnaissance Report (Bonnie Holub & Associates, Inc. 1998).

Future

Urban development is expected to continue expanding westward from the coast. Sizeable areas designated for silviculture, agriculture, and conservation remain in each of the three counties in the basin but may be subject to development pressure. Currently, nearly 29% of the NCB is wetlands. Under the future land use plans for the overall NCB, only 18% of the wetlands would be preserved in conservation or recreation/open space.

Table 3. Major categories of land use and land cover in the Northern Coastal Basin

Land Use/Land Cover Category	1995 Estimates	
	Acreage	Percentage
Urban and suburban	90,760	20.8
Public facilities/industrial	9,130	2.1
Agriculture	8,710	2.0
Barren land	2,380	0.5
Rangeland	18,240	4.2
Upland forest	151,410	34.8
Wetland forest	82,560	19.0
Other wetlands	42,560	9.8
Open water	29,830	6.8
Total	435,580	100

B.2. Point Sources of Pollution

Prior to 1983, the major point sources of pollution in the NCB were from sewage treatment plants. Currently, point-source dischargers include domestic and industrial wastewater facilities that are regulated through the NPDES program described in Section B.5.

B.3. Nonpoint Sources of Pollution

Nonpoint sources of pollution in the basin, which can degrade ground as well as surface water quality, include stormwater runoff or leaching of pollutants into groundwater from agriculture, silviculture, and urban/suburban land uses; atmospheric deposition; sediment loading and turbidity from shoreline erosion; and septic tanks. Septic tanks (OSTDS) are prevalent in some areas of the basin and have been identified as a potential source of nutrients (nitrogen and phosphorus), pathogens, and other pollutants that can pose a threat to public health. Surface waters can be adversely affected directly by system drainfields washed away by floodwaters or via runoff from areas where system failures result in ponding of untreated or inadequately treated wastewater on the ground. Surface waters can be adversely affected indirectly through seepage of groundwater contaminated by system discharges.

There are known septic tank problems in the Ponte Vedra area, on Anastasia Island, on the barrier island east of Palm Coast. Areas in the Halifax River watershed that have been identified by the Volusia County Health Department as having potential septic tank problems include the barrier island Ormond by the Sea, neighborhoods around Ormond Beach along the Tomoka River, Port Orange, Rose Bay, and along Spruce Creek. OSTDS failure rates in Flagler, St. Johns, and Volusia counties exceed state failure rates (SJRWMD 2000).

B.4. Permitted Discharge Facilities

There are a number of domestic and industrial wastewater facilities in the NCB with NPDES permits to discharge to surface waters. The volume of discharges to surface waters from these facilities compared to their permitted capacities varies, with some facilities discharging to surface water only during wet weather conditions and others discharging to surface waters exclusively (SJRWMD 2000).

B.5. Surface Water Discharge Facilities Operating With a Permit

The Clean Water Act requires wastewater dischargers to have a permit establishing pollution limits and specifying monitoring and reporting requirements. Appendix II lists surface water discharge facilities currently operating with a permit. There are 20 domestic and eight industrial wastewater facilities within the NCB that are permitted through the NPDES program that discharge into the surface waters of the state. The industrial discharges consist of five concrete batch plants, two unspecified industrial wastewater producers, and one petroleum cleanup discharge.

The NPDES program for wastewater discharges has been in existence at EPA since the 1970s and was delegated to Florida in 1995. Phase I of the NPDES stormwater permitting program began at EPA in 1990 and was delegated to the state of Florida in October 2000. The pretreatment program governs industrial wastewater discharges to municipal wastewater plants. Industrial facilities may also qualify for NPDES permits for discharge to surface waters.

B.6. Surface Water Discharge Facilities Operating Without a Permit

According to information provided by FDEP, no point-source surface water discharge facilities in the NCB are currently operating without a permit.

B.7. Multi-sector General Permit Facilities

Industrial facilities not covered by an NPDES permit are currently covered under the federal multi-sector general permit (MSGP) for stormwater discharge associated with industrial activity. The MSGP divides the regulated industrial activities into 30 sectors of related activity and specifies both general and sector-specific requirements for each. The permit, developed by EPA and then adopted and renamed by FDEP in October 2000, consists of the original 1995 issuance and the subsequent modifications and corrections. There are currently 72 MSGP permittees in the NCB (Appendix III).

B.8. Municipal Separate Storm Sewer Systems

The NPDES stormwater program regulates point-source discharges of storm water from certain municipal and industrial sources, including certain construction activities. Designated large and medium municipal separate storm sewer systems, or MS4s, are a publicly owned conveyance or system of conveyances (e.g., ditches, curbs, catch basins, underground pipes) that are designed for the discharge of storm water to surface waters of the state. An MS4 can drain, and be operated by, municipalities, counties, drainage districts, colleges, military bases, or prisons, to name a few examples. These facilities were previously required by EPA to obtain NPDES permits. In the state of Florida, Phase II permitting must be completed in 2003 and the permitted program should be implemented by 2008. According to FDEP (Fred Noble, pers. comm.), there are currently no municipalities within the NCB that are listed as Phase II permitting candidates.

B.9. Compliance Schedules and Recommendations for Point and Nonpoint Sources of Pollution Adversely Affecting the Public Interest

FDEP takes short-term enforcement actions against facilities when necessary and reports these actions on a monthly basis to EPA. Currently, none of the facilities within the NCB is under any ongoing enforcement action for which a compliance schedule has been established.

SECTION C

GOALS, INITIATIVES, AND STRATEGIES FOR RESTORATION OR PROTECTION

The Water Resource Implementation Rule (Chapter 62-40, *F.A.C.*) calls for SJRWMD to play a major role in the development of watershed-specific water quality targets and PLRGs.

Specifically, Section 62-40.432, *F.A.C.* (Surface Water Protection and Management), states:

> (2) Watershed management goals shall be developed by the District for all watersheds within the boundaries of each District and shall be consistent with the Surface Water Improvement and Management (SWIM) program and the EPA National Pollutant Discharge Elimination System (NPDES) program. Watershed management goals shall be included in the District Water Management Plans.

And further:

1. Each District shall develop water body specific pollutant load reduction goals for non-SWIM water bodies on a priority basis according to a schedule provided in the District Water Management Plan.
2. The list of water bodies and the schedule shall be developed by each District, giving priority consideration to water bodies that receive discharges from stormwater management systems that are required to obtain a NPDES municipal stormwater discharge permit.
3. The Districts shall consider economic, environmental, and technical factors in implementing programs to achieve pollutant load reduction goals. These goals shall be considered in local comprehensive plans submitted or updated in accordance with Section 403.0891(3)(a), *F.S.*

   Specific Authority 373.026, 373.043, 373.418, 403.061, 403.087, *F.S.*

Surface water management goals of SJRWMD that apply to the NCB SWIM Plan include the following:

- To preserve natural and functional components of the ecosystem while restoring, where feasible, those conditions and components of the degraded portions of the system
- To preserve or restore the quantity and quality of water necessary to support thriving biological communities containing appropriate diversities of native species within the estuarine systems of the NCB
- To pursue the development and implementation of stormwater management plans for each of the tributaries within the NCB (SJRWMD 2000)

The mission of the NCB SWIM Plan is thus to preserve and protect the estuarine ecosystems in the NCB consistent with the goals of SJRWMD. The mission will be accomplished through the

use of a prioritized, objective, sustainable ecosystem or watershed approach with periodic public review and input. Through prioritization, projects will be chosen which are most in need of protection and/or restoration. Sustainable restoration and enhancement techniques alone or in combination will minimize the public's financial and material liability toward the management and operation of these systems. An ecosystem-watershed approach will take into consideration the cause and effect of the problem within its land-based context and establish successful applications for enhancement or restoration.

The NCB SWIM Plan is organized around a project delivery system of goals, initiatives, strategies, and action steps. In this system, *goals* are broad-based and identify objectives of SJRWMD. *Initiatives* are general categories that have been used to divide the plan into distinct subject areas developed by SJRWMD staff in conjunction with the NCB Advisory Group. *Strategies* are more-detailed descriptions of the underlying work proposed to achieve results. They identify the approaches and methods that will be used to implement the initiatives. *Action steps* represent specific activities under each strategy suggested to reach project delivery. Each action step includes a schedule for completion and an estimate of the funding requirements needed to accomplish the action step. These action steps, as well as the strategies and initiatives referenced above, are not mutually exclusive and may be undertaken concurrently and/or sequentially.

The consensus of the NCB SWIM Plan team is that the plan should focus on the following five primary initiatives:

Initiative 1 — Water Quality

This initiative consists of three distinct but interrelated strategies: water quality and flow monitoring; hydrodynamics and water quality modeling; and a prioritization process based on water quality enhancement opportunities for improving both 303(d) listed surface waters and degraded waters identified by SJRWMD so that they will meet and maintain their designated classification (e.g., OFW; Class II, Class III water quality standards).

Initiative 2 — Watershed Master Planning

Watershed master planning is an evaluation of stormwater management in the geographic area and identification of problem areas, with detailed remedial actions derived using hydrologic models simulating water volumes and flows under a range of climatic conditions. For SJRWMD, implementation often includes assisting local governments in coordinating their plan implementation through buying the land and providing funds for constructing the project. (Details of the land acquisition program are described separately in Section D.)

Initiative 3 — Stormwater Retrofit and Master Plan Implementation

This initiative consists of development and implementation of a prioritized stormwater retrofit program focusing on areas built prior to 1983; support for the development of local government land acquisition programs for buying land to site

facility construction; and evaluation of available federal and state funding sources and other partnering opportunities.

Initiative 4 — Compliance and Rules Enforcement

This initiative consists of strategies to collect and evaluate compliance information from existing permitted stormwater quality treatment systems. Information gained from a compliance monitoring program to evaluate proper system operation can be compared with water quality monitoring results to specify where in-place treatment devices are providing the necessary pollutant reductions and where additional treatment is needed to maintain the water resource.

Initiative 5 — Resource Assessment, Protection, and Restoration

This initiative consists of strategies to evaluate existing data on NCB habitats and implement additional data collection efforts, if necessary, to identify and provide habitat protection and restoration in the NCB.

In its mandate to address broad ecosystem needs, the NCB SWIM Plan attempts to accomplish comprehensive protection strategies in the less-developed portions of the NCB and to accomplish sustainable restoration strategies for resources or resource areas that are proven to be degraded. The intent is to also provide cooperative funding for projects addressing long-term water body protection and restoration.

C.1. Water Quality Initiative

C.1.1. Strategy: Examine the existing water quality monitoring network and, if necessary, design and implement a more integrated network

The purpose of this strategy is to examine the existing water quality monitoring program within the NCB and determine whether gaps in data collection and synthesis exist. The aim is to ensure the provision of useful information for assessing water quality relative to state water quality standards and shellfish consumer health standards, developing water quality objectives, documenting resource problems and problem areas such as bacterial contamination in shellfish harvesting areas, and verifying remedial actions.

The existing water quality monitoring program consists of two tiers, ambient monitoring and event-specific monitoring. The purpose of the ambient monitoring is to generally characterize water quality in the NCB and identify water quality problems and trends. The event-specific monitoring, in conjunction with the ambient monitoring, is aimed at pollution source identification and the development of PLRGs and, if necessary, other resource-based water quality targets.

Implementation of this strategy will include the participation of and input from a variety of stakeholders and agencies that have water quality responsibilities in the basin. In particular, both the Jacksonville and the Orlando FDEP district offices will be providing input to this process as

they complete monitoring associated with Phase II of the watershed cycle during calendar year 2005.

C.1.1.1. Action Steps

1. Assemble and evaluate existing water quality data pertaining to the NCB, including shellfish harvesting areas. Query federal, state, and local agencies for all available data.

    a. Using the data, determine water quality trends in the NCB and document trends to provide a quantitative basis for recommendations on continuation or termination of specific monitoring stations. Recommendations should be based on the health of each specific area, the directions of trends in specific parameters, and the likelihood that water quality can be improved.
    b. Review current water quality collection efforts by these agencies.

2. Based on the analysis and synthesis of existing data and current sampling programs by the queried agencies, establish a long-term collaborative water quality monitoring effort. The program will be capable of providing the data needed to support analyses of spatial and temporal trends, calibration of water quality models, and characterization of potential or current water quality problems. Care will be taken to ensure that water quality sampling will not be duplicative of existing efforts by other agencies and that the monitoring program will be compatible with existing sampling networks of other agencies.

    Special consideration will be given to the collection of event-specific monitoring data, as necessary to calibrate water quality models. Specific bacteria event sampling will be considered in shellfish harvesting areas since the highest concentrations of bacteria occur in association with high runoff and stream flows caused by rainfall. Also as part of cooperative sampling efforts, consideration will be given to common field and laboratory analytical methods, split sampling, etc., so that there is a high degree of confidence in the combined dataset. Information that is collected will be entered into the STORET database in a timely manner to allow access by other agencies and programs.

    Part of the planning for the monitoring network will be the identification of water quality targets needed to meet project goals. This will include a clear statement of the monitoring network objectives (the multiple uses of the data), the costs for establishing and operating the network, and a methodology for justifying and scheduling periodic modifications to procedures (e.g., station locations and termination of activities).

3. Once the monitoring plan is finalized and coordinated with other agencies, implement water quality sampling according to the plan design. Coordinate sampling among responsible agencies, as appropriate. Coordinate resources and include a volunteer component, where applicable.

The data derived from the water quality monitoring network will be used to monitor trends in water quality and to develop statistical or mechanistic models used to assess pollutant levels and sources and the effectiveness of remediation strategies. These data and models will also be useful in helping to determine PLRGs. In particular, a plan with goals and PLRGs for improving water quality in shellfish harvesting areas will be developed.

4. Assemble and assess existing data on tributaries, determine further data needs, and develop a monitoring plan to determine tributary loadings. Prioritize the tributaries and establish a monitoring schedule, coordinating with management initiatives to maximize data value and usefulness for trend analyses and water quality modeling purposes.

C.1.2. Strategy: Develop and assess water quality and habitat protection targets using hydrologic and hydrodynamic water quality models and/or water quality and biological indices, where appropriate

The purpose of this strategy is to develop a basinwide set of water quality and habitat protection targets that utilize land use, water quality, water quantity, and other data to estimate, quantify, and compare sources of pollution in the basin and their impact on the estuary.

Used together, these models and other indices will be capable of characterizing pollution nonpoint loads from the tributary basins discharging to the NCB and their transport and fate in the estuarine system. The magnitudes of point-source discharges from tributary pollution sources will also be estimated. Output from these analyses will assist in describing interrelationships between physical, chemical, and biological processes in the estuary; determining the nutrient and pollutant assimilative capacity of the estuary; prioritizing areas for water quality remediation; verifying impairments of waters; testing PLRGs; and predicting the effects of various management and conservation protection strategies.

Model development should be carefully scheduled with long-term and short-term data collection so that all of the necessary data are available when needed for the models. In addition, basic models (rainfall/runoff and hydrodynamics) need to be completed before advanced models (water quality). This NCB SWIM Plan envisions at least 8 years of closely coordinated work to complete the development of water quality (e.g., eutrophication and bacteria) models for use in analyzing cause-and-effect relationships on watersheds and in the estuary.

C.1.2.1. Action Steps

1. Review the objectives of proposed modeling and the applicability of existing and proposed support data and prepare a planning document for chartering under the SJRWMD Project Delivery Initiative. This document and the chartering effort should clarify the purpose of various modeling components (watershed and hydrodynamic; physical, chemical, and biological), the deliverables, time schedules, and budgets.

2. Next, select the most appropriate modeling package and environmental indicators. Include a review of the hydrologic, hydrodynamic, and water quality models partially completed in 2002 and 2003. The acquisition and/or review of other water quality/quantity modeling efforts and water quality and biological indicators may be included.

3. Once the appropriate models and tools have been selected for SJRWMD application, identify data that are not currently available and develop a plan for the acquisition of the data, including the associated costs. This further data collection and monitoring will be in addition to current ongoing monitoring activities.

4. Following acquisition of a suitable database, calibrate and validate the models and tools. Once confidence has been established, review output results and use the results to describe the operating characteristics of the water body, such as changes in water levels and flows, salinity, local flushing, nitrogen and phosphorus cycles, algal bloom development and die-off, the effects of null zones on flushing, wave-induced erosion (boat wakes), bacteria distribution in shellfish harvesting areas, and other features necessary to understand problems and alternative solutions.

5. Finally, use models and tools to run various scenarios. Review output results and quantify both point and nonpoint pollution sources (e.g., wastewater effluent, septic leachate) and effects in particular areas of the NCB, such as shellfish harvesting areas. Update the management plan with recommendations for specific actions to solve problems and meet basin goals. Identify areas of good-to-excellent water quality and recommend for conservation purposes, as appropriate.

C.1.3. Strategy: Enhance and maintain surface waters

Many areas in the NCB require protection and/or enhancement. These include water bodies designated as impaired by FDEP, Class II shellfish waters, and Outstanding Florida Waters. Some are recognized for possible TMDL allocations. Still others are identified to be in decline based on SJRWMD or FDEP water quality data but are not yet "listed" by FDEP. Those water bodies will qualify for special consideration and evaluation. Where appropriate, enhancements will be encouraged and projects will be proposed to avoid the necessity of the TMDL process.

As a result of the modeling process and subsequent evaluations (described in Section C.1.2), pollution sources will be reviewed and prioritized from a basinwide perspective to identify areas for remediation or restoration to improve water quality. PLRGs will be estimated for highest priority basins according to a schedule developed along with the modeling, with emphasis on stormwater management and shellfish harvesting areas.

Maintenance of the many drainage canals and tributaries in the NCB is generally focused more on flood protection than on water quality. As a result, the continual erosion of the sidebanks of these canals is a likely source of turbidity and suspended solids delivered to the major surface waters of the basin. Following best management practices (BMPs) and carefully regulated

maintenance schedules and procedures is a cost-effective way for municipalities to reduce sediment scour and transport and to minimize water quality impacts to receiving water bodies.

C.1.3.1. Action Steps

1. Develop criteria for assigning relative priorities to surface water bodies.

2. Use a decision-making, matrix approach to assign priorities to surface water bodies.

3. Develop adaptive management projects, using the most current methods to create interventions, enhancements, and restoration projects.

4. Coordinate with appropriate agencies to investigate Class II designated waters and problems with septic tank leachate, sewage treatment effluent, fertilizer reduction, and other nonpoint pollution sources associated with urbanization.

5. Coordinate with appropriate agencies to develop and implement BMPs for water bodies identified to be in steady decline.

6. Facilitate development of a BMP manual or guidelines for regional drainage network maintenance programs. Focus drainage network maintenance documents on resolving downstream impacts to water quality and reducing sediment loading.

7. Encourage the maintenance of drainage conveyances consistent with BMPs that maximize water quality benefits to receiving waters. This can be accomplished through technical assistance and cost-sharing with appropriate entities.

C.2. Watershed Master Planning Initiative

C.2.1. Strategy: Evaluate and refine existing watershed master plans

This strategy is essentially the evaluation of stormwater management of local watershed master planning initiatives. Stormwater master planning is primarily a local government responsibility, yet many local governments have neither the manpower nor the funding mechanisms available to adequately update, develop, or implement the water quality aspects of these master plans. By assuming a watershed approach to master planning, a more comprehensive hydrological rather than political boundary assessment can be accomplished. This work falls within the regional purview of SJRWMD. It is thus appropriate for SJRWMD to provide for independent reviews of existing plans and identify areas for improvement.

C.2.1.1. Action Steps

1. Examine coverage of stormwater plans. Prepare a comprehensive listing of completed and pending watershed master plans, along with the status of completion or implementation of

each study. Identify capital improvement plans and existing stormwater network maintenance programs.

2. Evaluate and refine existing stormwater plans for flood abatement, water quality improvement, and regional adequacy.

3. Develop a standardized master plan outline as an aid for local government use in subsequent planning efforts.

C.2.2. Strategy: Assist in the development and endorsement of local master stormwater plans and implementation schedules

Local plans will serve as the implementation schedule for retrofit and maintenance initiatives. SJRWMD models may be used to assess and predict the effects of proposed management strategies.

C.2.2.1. Action Step

1. Assist local governments in the development of master plans that will address water quality improvements. This assistance may include activities such as facilitation, planning, cost-sharing, and technical design or review.

C.3. Stormwater Retrofit and Master Plan Implementation Initiative

C.3.1. Strategy: Prioritize stormwater retrofit programs

The purpose of this strategy is to design and implement a Northern Coastal Basin-wide stormwater retrofit plan focusing on pre-1983 development, prior to stormwater regulations. Evaluation of existing stormwater coverages and management plans will be used to establish clear targets for stormwater treatment in developed watersheds. A ranking matrix based on these targets will be utilized to prioritize the areas for retrofitting. The variables in the matrix will include, but not be limited to, existing nutrient loading; expected retrofit system removal efficiency; design, construction, and operation and maintenance costs; and receiving water body priority ranking (such as PLRGs, shellfish harvesting areas, and TMDLs/303d list). Due to the fast-paced development occurring within most of the NCB area, a supporting land acquisition program and assessment of available federal and state funding sources will be developed.

C.3.1.1. Action Steps

1. Develop a ranking matrix to assist in prioritizing areas for optimal retrofit potential using existing maps of developed watershed areas that receive some level of stormwater treatment.

2. Coordinate with local government land acquisition plans for stormwater retrofit opportunities that encourage recharge and reuse of stormwater runoff, where appropriate.

3. Assist local governments seeking federal and state funding for land acquisition, design, and construction of regional stormwater retrofit projects.

4. Where feasible, encourage and cost-share with local governments to proactively install alternative stormwater treatment mechanisms, especially where land availability is limited. Give priority to local governments that consider broad-based, rather than individual, retrofit opportunities.

C.3.2. Strategy: Partner with local governments to implement stormwater plans

The purpose of this strategy is to provide assistance and incentives to local governments to implement stormwater plans through such means as cost-share funding, technical assistance, legislative initiatives, mapping, and other services provided directly by or contracted through SJRWMD.

C.3.2.1. Action Steps

1. Establish and coordinate an interagency NCB Stormwater Management Group.

2. Provide assistance to local governments based on a prioritized schedule developed by the NCB Stormwater Management Group.

C.4. Compliance and Rules Enforcement Initiative

C.4.1. Strategy: Implement existing compliance monitoring programs

The purpose of this strategy is to collect compliance monitoring information for permitted stormwater management systems with regard to flood protection and water quality controls to ensure they are operating properly. The effectiveness of the regulatory programs is measured, in part, through a compliance monitoring program. Compliance monitoring to verify the proper construction of new systems and the appropriate maintenance of established systems is necessary to ensure that the systems are constructed and maintained to allow for their proper function. Enforcement action may be necessary to require responsible parties to bring noncompliant systems into conformance.

C.4.1.1. Action Steps

1. Assess existing permitted nonpoint sources of water pollution (e.g., stormwater ponds) and provide compliance or additional treatment alternatives to reduce the impact from these sources, where warranted. Give priority to stormwater treatment systems in OFWs.

2. In order to develop a streamlined system and prioritize the activities in compliance and enforcement for permitted stormwater management systems, establish a protocol based upon

system size and type, watershed land use and density, and proximity and degree of impairment of the receiving surface water. Implement programs using information from all available sources, monitor the programs, and adjust the programs to develop an efficient system for compliance monitoring.

C.4.2. Strategy: Assess and manage resources and funding to support the requirements of current and emerging NPDES regulations, PLRGs, and TMDL regulations

The NCB Impaired Water Bodies candidates have been identified, per the FDEP 303(d) list, which must be verified before proceeding with the development of TMDLs. Chapter 99-223, *Laws of Florida* (the Florida Watershed Restoration Act), provides FDEP with the authority to develop and implement TMDLs. The process (methodology) for determining impairments is set out in Chapter 62-303, *F.A.C.* (Identification of Impaired Surface Waters).

Water management districts are responsible for nonagricultural storm water (unless FDEP maintains that responsibility), and the Department of Agriculture and Consumer Affairs is responsible for working with farm interests and managing agricultural stormwater runoff. Of particular importance in the watershed management plan will be the focus on innovative and incentive-based voluntary approaches to address nonpoint sources.

The identification of management activities being implemented or scheduled that would address the parameters of concern is part of the process in the FDEP Integrated Water Resource Management Program. If there is reasonable assurance that water quality standards would be attained following implementation of the management activities, the water is not placed on the verified list.

FDEP uses the Watershed Management Program, an iterative five-phase cycle, to develop and implement TMDLs. The 5-year cycle provides the structure for focusing resources on specific basins, verifying impaired waters, conducting targeted monitoring that will provide the data needed for model calibration and verification, and developing TMDLs for impaired waters. Basin management plans are a critical product of the Watershed Management Program because they provide the roadmap for implementation of the TMDLs and will serve as the basin-specific, consensus-driven implementation plan.

C.4.2.1. Action Steps

1. Investigate the need for a re-evaluation of SJRWMD rules to increase the protection of watersheds potentially targeted for drinking water supply, areas surrounding receiving waters that are designated as impaired waters, and high recharge areas.

   Water resource restoration efforts, including development and implementation of BMPs, retrofitting, habitat protection and restoration activities, environmental infrastructure improvements, and issuance of permits, provide increased protection. Specific rule revisions may not be required. However, more-stringent criteria reflective of waters not meeting

specific standards may be necessary. SJRWMD may recommend appropriate BMPs for agriculture and storm water.

2. Coordinate with FDEP to define the role of each agency in the TMDL, Watershed Management Program process. Details of this coordination effort are discussed in Section F of this document.

C.5. Resource Assessment, Protection, and Restoration Initiative

C.5.1. Strategy: Complete habitat mapping and resource assessment

To protect and preserve unique or significant habitats and resources, it is essential to first inventory both natural and disturbed habitats in the watershed. Once a baseline assessment has been made, impacts to the system will be quantified and specific biological targets will be set.

C.5.1.1. Action Steps

1. Establish a habitat mapping and classification program for the NCB which includes shorelines, marshes, intertidal and submerged/benthic areas, and disturbed habitats. Coordinate this step with the GTMNERR and other management agencies, using analytical methods and innovative technologies, including remote sensing, to assess conditions of these habitats.

2. Evaluate sediment deposition and quality and implement sediment management plans, as required. Place particular emphasis on shellfish harvesting areas since sediment re-suspension and sediment transport can smother shellfish beds.

3. Describe and assess floral and faunal species of concern, including fisheries resources. The aim is to link the locations of species of concern to habitat maps and water quality patterns.

4. Establish functional habitat and biological targets for estuarine ecosystems.

C.5.2. Strategy: Protect and manage important estuarine habitats

The purpose of this strategy is to protect important estuarine habitats within the NCB. Coordinated and sustained acquisition efforts are the key to protecting these sensitive watersheds.

C.5.2.1. Action Steps

1. Identify land protection and acquisition needs.

2. Coordinate and support land acquisition initiatives both within SJRWMD and in collaboration with outside agencies.

3. Support the coordination of land management initiatives with appropriate land managers, agencies, or stakeholders.

C.5.3. Strategy: Provide habitat enhancement and restoration

Coastal estuarine habitats have been impacted through such anthropogenic activities as dredge and fill for development; dredging of boat basins, inlets, and navigation channels; mosquito control; and recreational boating activities. The purpose of this strategy is to enhance or restore the function of the degraded areas through selective habitat enhancement programs and projects.

C.5.3.1. Action Steps

1. In coordination with the GTMNERR and other management agencies, support efforts to develop effective strategies with clear targets for habitat protection and, where appropriate, enhancement and restoration.

2. Facilitate habitat restoration initiatives in cooperation with and through cost-sharing with local governments and other agencies. Projects may include disturbed habitat enhancement, exotic vegetation control, shoreline revegetation and stabilization, and salt marsh and benthic habitat restoration and enhancement.

   In particular, coordinate with the Florida Inland Navigation District on the management of the many dredge spoil areas located throughout the ICW portions of the Northern Coastal Basin to maximize cooperative management goals.

3. Coordinate with mosquito control authorities to implement source reduction programs that maximize natural resource functions.

4. Develop and implement programs to restore natural hydrologic patterns.

SECTION D

COMPLETED OR PENDING STUDIES AND PROGRAMS RELEVANT TO THE NORTHERN COASTAL BASIN

D.1. SJRWMD Northern Coastal Basin Program

The current NCB Program operated by SJRWMD coordinates with 15 local governments and several regional, state, and federal management agencies to monitor and assess estuary health, respond to current issues, and address future management needs. Since fiscal year (FY) 2001, SJRWMD has provided either material or technical assistance to a number of active management plans and projects throughout the NCB. The projects are listed below.

- Graham Swamp Reconnection
- Flagler Beach Master Stormwater Plan
- Bulow Creek/Korona Canal Stabilization Project
- Tomoka Salt Marsh Restoration Project
- Riviera Oaks Stormwater Project
- Downtown Daytona Beach Stormwater Management Plan
- 11th Street Stormwater Park
- Colonial Lakes Stormceptor
- South Street Watershed Project
- B5/B6 Stormwater Park
- Reed Canal Watershed Project
- Southwind Stormwater Park
- Memorial Stormwater Park
- Rose Bay Sewer/Septic Removal Program
- Buschman Stormwater Park
- Halifax Canal Stormwater Project
- Rose Bay Watershed Restoration Project
- Harbour Oaks Canal Stormwater Project
- Marineland Acres Stormwater Improvements
- Daytona Beach B3 Stormwater Park
- Ken Burns Stormwater Park
- Daytona Beach Bay Street Stormwater Improvements
- Port Orange Depot Stormwater Park
- Port Orange Reuse Augmentation Project
- Matanzas Marsh Acquisition Project

D.2. SJRWMD Stormwater Management Cost-Share Program

Since the initiation of the Stormwater Management Projects Cooperative Cost-Share Program in FY 1995–96, SJRWMD has provided $2.8 million to cost-share 126 stormwater management projects with local governments. Local governments and other nonprofit organizations may apply for assistance to promote flood control, demonstrate BMPs, or implement stormwater utilities. Applications are ranked according to a list of criteria which includes support of SJRWMD's mission, cost-sharing ability, financial need, severity of the problem, ecosystem impacts, availability of a dedicated funding source, regulatory impacts, and community benefit. Following are details of current cost-share projects for municipalities within the NCB.

City of Flagler Beach Water Quantity and Quality Abatement Program
Funding amount: $35,000
Projected completion date: October 2003
Description: This water quality and quantity program will involve the design of BMP measures to abate the flooding problem at localized areas of the city (Mirror Lake watershed), as well as to increase stormwater storage and improve treatment of stormwater prior to its entering the ICW.

Maria Sanchez Stormwater Conveyance System (City of St. Augustine)
Funding amount: $50,000
Projected completion date: October 2003
Description: The project includes upgrading the existing eight outfall pipes that empty into Maria Sanchez Lake. This lake has served as a stormwater treatment facility for the surrounding 82 acres. This improvement will ultimately reduce pollutants present in the surface water that flows into the Matanzas River.

Marineland Acres Stormwater Management Program (Flagler County)
Funding amount: $50,000
Projected completion date: October 2003
Description: Phase I includes pretreatment of nuisance storm water into a multilevel system that includes collection of rainwater in a system of retention ponds. The collected storm water will then be transmitted to an existing drainage ditch north of Washington State Park to an outfall to the ICW.

West St. Augustine Drainage Improvements System (St. Johns County)
Funding amount: $50,000
Projected completion date: September 2003
Description: This project is to provide flood relief and water quality improvements to West St. Augustine and the Oyster Creek drainage basin. Oyster Creek is a tributary of the San Sebastian River and the Matanzas River.

Wild Olive Stormwater Improvements (City of Daytona)
Funding amount: $50,000
Projected completion date: October 2004
Description: This project consists of roadway improvements to an existing public street, Wild Olive Avenue. The project will provide drainage, flood prevention, treatment, and recharge. Currently, the storm water flows untreated into the Halifax River.

Holly Hill SRF Stormwater Improvements — Phase II
Funding amount: $50,000
Projected completion date: October 2004
Description: This project is the second phase of a two-phase program that will help in solving several flooding problems in the city. Phase II will provide drainage improvements and/or stormwater quality improvements to eight separate areas of the city.

Standish Drive and Royal Palm Avenue Baffle Boxes (Ormond Beach)
Funding amount: $40,000
Projected completion date: October 2004
Description: The project is part of a 10-year program of drainage and infrastructure upgrades and retrofit. Specifically, solids separators will be installed just upstream of major outfalls to the Halifax River.

D.3. SJRWMD Bathymetric Survey Project

A bathymetric survey of the NCB was performed to meet the hydrodynamic and water quality model requirements of the NCB program (John and Morris 2003). The survey was conducted between July 20, 1999, and October 20, 2001. The survey area extended from the SR 202 bridge (Oak Landing) in the north to the SR 44 causeway in New Smyrna Beach in the south, near Ponce de Leon Inlet. The survey also included the Guana River to the Guana Dam, the tidal part of Deep Creek, San Sebastian Creek upstream to the narrows north of the SR 16 bridge, Pellicer Creek to Faver-Dykes Park, the Tomoka River to Priest Bridge, Rose Bay, Strickland Bay, and Spruce Creek.

D.4. SJRWMD Tidal Model Development Projects

The NCB is a complex water body with inlet connections to the sea, extensive wetting and drying areas (marshes), and a narrow maintained channel (the ICW) running along its entire length. Ultimately, a numerical model of salinity, water quality, bacteria, eutrophication, and sediment for the entire NCB will be needed to assist in answering management questions.

As a first step in the process, a two-dimensional finite element model (RMA-2) (John and Morris 1999) was developed to improve understanding estuarywide water movement and the impact of pollution load sources in response to concerns about the adverse effects of stormwater/wastewater discharges on coastal water resources, particularly shellfish harvesting areas. This initial modeling revealed that tide- and wind-driven flows are the predominant transport mechanism in the Tolomato and Guana rivers. In addition, model tracer studies confirmed the suspected presence of a tidal null zone located between Oak Landing and Palm Valley Bridge.

In 2002, an orthogonal curvilinear finite-difference computational grid was developed for the entire area of the NCB for the purpose of accurately describing the geometry while minimizing the number of cells required for model testing (Driscoll et al. 2002). This tidal model was tested with respect to accurate propagation of tidal harmonics through the system, using the curvilinear hydrodynamic model MIKE 21C. Tidal calibration comparisons versus targets were found to be satisfactory.

D.5. U.S. Geological Survey Fisheries Resources Survey

This cooperative project being conducted by USGS will establish baseline fish occurrence and distribution estimates for the NCB. Seasonal variation in fish occurrence will be estimated from samples collected monthly over several years. Habitat will be assessed at sampling stations, and an attempt will be made to relate these results to the entire study area.

The project study area includes the estuaries from Ponte Vedra south to Ponce Inlet. The project will occur during fiscal years 2001–2006. Required tasks for this project include a literature review of comparable work conducted in other estuaries; monthly collection, identification, and measurement of fish using standardized techniques developed by the Florida Marine Research Institute habitat characterization at fish sampling locations; analysis of resulting data using multivariate statistical techniques; development of a reference collection of NCB fish species; and preparation of semi-annual progress reports, journal articles, and a USGS final report.

D.6. Guana-Tolomato-Matanzas National Estuarine Research Reserve

The GTMNERR was established on August 19, 1999, under Section 315 of the Coastal Zone Management Act. This act established the National Estuarine Research Reserve System, where healthy estuarine ecosystems that typify different regions of the United States can be designated and managed as sites for long-term research and used as a base for estuarine education and interpretation programs. The GTMNERR is the 25th National Estuarine Research Reserve in the country and the third in Florida.

Within the reserve area are two aquatic preserves, two state parks, a state garden, and two water management preserves. Waters within the Guana portion are designated as Class III recreational waters and within the Matanzas portion as Class II shellfish waters. Additionally, waters within the two aquatic preserves are designated as OFWs. The following are priority resource management issues within the GTMNERR:

- Increased scientific understanding of natural systems and human interactions
- Lack of public understanding of estuarine ecosystems and values
- Altered land use within the watershed
- Degradation of water quality and system health
- Increased and conflicting uses of estuarine resources

D.7. Florida Inland Navigation District

The Florida Inland Navigation District (FIND) performs the functions of the “local sponsor” of the ICW project in Florida, a state/federal navigation project. In this capacity, FIND provides all lands required for the navigation project, including rights-of-way and lands for the management of dredged materials removed from the waterway channel during dredging activities.

Funding assistance is provided to other governments within FIND through the Waterways Assistance Program. The purpose of the Waterways Assistance Program is to develop waterway improvement projects, including navigation channel dredging, channel markers, navigation signs or buoys, boat ramps, docking facilities, fishing and viewing piers, waterfront boardwalks, inlet management, environmental education, law enforcement equipment, boating safety programs, beach re-nourishment, dredge material management, environmental mitigation, and shoreline stabilization.

FIND also provides dredged material management to control sediment inflow into the waterways. Each long-range dredged-material management plan includes a general identification of the source of the sediments entering the waterway channel. This sediment inflow is being addressed by FIND and other government agencies through cooperative projects involving inlet management, stormwater control, and shoreline stabilization. If successful, sediment inflow reductions will save local and federal maintenance dredging funds, increase the length of time to fill the upland sites to capacity, reduce the impact of suspended sediments on the environment of Florida's waterways, and increase retainage of these sediments in beach and upland systems.

In the past, dredged material was deposited on spoil islands located all along the ICW. Many of those spoil islands have now become ecologically important habitats, and FIND has a role in how the spoil islands will be managed.

D.8. Rose Bay Restoration

SJRWMD has worked with the local citizens and governments to form a coalition of agencies to seek solutions to pollution problems and to restore Rose Bay. The coalition has developed a five-point restoration plan that is currently being implemented. The five strategies, and the activities accomplished to date for each strategy are as follows:

1. Control stormwater runoff pollution

Working with SJRWMD, Volusia County, and the Florida Department of Transportation (FDOT), the city of Port Orange has addressed stormwater discharges into Rose Bay. By combining projects with road improvements and sewer installation, the city has provided stormwater treatment throughout the bay's watershed.

Projects to retrofit (upgrade) stormwater swales (also known as shallow ditches) in the communities of Harbour Oaks and Allendale have provided the neighborhoods with improved drainage and water quality treatment. Port Orange, Volusia County, and SJRWMD have formed partnerships to buy and develop land where storm water is being stored and treated before it is discharged into Rose Bay.

The city of Port Orange, with SJRWMD assistance, has completed a project that allows water from four stormwater ponds to be diverted to the city's reuse irrigation program. The project reduces the volume of storm water going into Rose Bay by up to 1.2 million gallons of storm

water per day, increases the city's reuse water supply, and provides additional floodwater storage capacity.

2. Eliminate leaking septic systems from discharging into Rose Bay

The communities of Harbour Oaks and Allendale have been annexed into the city of Port Orange. Through the Port Orange Water Utilities and with state legislative assistance, city-supplied sewer service will be provided to residences and businesses in the Rose Bay region. Sewage treatment service access to all residents was completed in 2002.

3. Replace the existing U.S. 1 bridge and remove the current causeway to re-establish natural water exchange

FDOT completed construction of the Rose Bay bridge replacement in March 2001. SJRWMD coordinated with FDOT to design the removal of a causeway and a replacement bridge span to maximize restoration of water flow and circulation in the bay. Construction of a causeway replacement bridge began in May 2001 and was completed in 2002.

4. Remove accumulated sediment to restore estuary habitat

SJRWMD is coordinating with USACE and Volusia County to develop and implement a dredging and habitat restoration plan that accomplishes regional resource management goals. USACE is developing a Section 206 environmental restoration project to restore estuary habitat by removing accumulated sediments in Rose Bay. Construction is scheduled to begin in the summer of 2004.

5. Remove the old causeway that is east of U.S. 1

SJRWMD and USACE are coordinating with the Halifax/Indian River Task Force to remove an abandoned causeway that currently restricts water circulation and flow in the bay. Removing the old remnant causeway is the final component of the Rose Bay Restoration Plan, and construction is scheduled to be completed in 2005.

D.9. Local Environmental Programs

Guana-Tolomato-Matanzas Shellfish and Water Quality Task Force

The mission of the Guana-Tolomato-Matanzas (GTM) Shellfish and Water Quality Task Force is to restore and maintain water quality in the GTM rivers for safe harvesting of shellfish in compliance with FDA requirements and state of Florida Class II water standards (NOAA 1998).

The GTM Task Force has developed a three-phase action plan outline to address shellfish and water quality issues. The three phases are immediate response, comprehensive analysis, and remediation and implementation. In 1997, the task force presented the results of Phase I and suggested initial directions for Phases II and III (SJRWMD 1997).

Volusia County Conservation Programs
In 2000, Volusia County established, by a voter referendum, a conservation lands acquisition program entitled Volusia Forever. This is a 20-year, ad valorem tax-based program the mission of which is to finance the acquisition and improvement of environmentally sensitive, water resource-protected, and outdoor recreation lands, and to manage those lands as conservation stewards in perpetuity. The program is expected to generate $99 million over its lifetime.

The county, in partnership with SJRWMD, identified an area of roughly 55,000 acres that became the county's overriding conservation land acquisition priority. The Volusia Conservation Corridor, as it has been named, sits essentially in the middle of the county and connects lands north of the city of Deltona and east to the city of Edgewater. These lands include habitat needed for federal- and state-listed endangered and threatened species. Preliminary groundwater modeling and natural resource assessments have indicated the potential for additional water supply development; thus, it provides for water resource development. The land is also critical in providing flood protection for existing and future populations, protecting surface and groundwater quality, and providing resource-based recreation for both residents and visitors.

A subprogram of the Volusia Forever Program is the Small Lot Acquisition Program. This long-term program acquires parcels in old, platted subdivisions, sometimes called "ghost subdivisions," that have ecological value. The program was initiated several years ago to utilize funds received from developers who negatively impacted wetlands to acquire lands that provided wetlands enhancement, floodplain restoration, and habitat preservation. Volusia Forever monies now supplement the existing monies received from developers.

The Halifax River Task Force is an advisory board to the Volusia County Council and has existed for 14 years. Members of the task force collaborate on an annual river cleanup subcommittee, a stormwater subcommittee, and a restoration subcommittee.

D.10. Land Acquisition and Management

The acquisition of environmentally sensitive land to preserve and protect water resources is an important ongoing initiative of SJRWMD. The development of land management practices that maximize multiple uses in order to provide the greatest public benefit is undertaken at appropriate sites. Some urban lands have been acquired for water resource protection and enhancement purposes.

The NCB is a physically and biologically diverse region. However, rapid urbanization continues to threaten the natural ecosystem and to increase the extent of habitat fragmentation. SJRWMD strives to improve and protect wetlands and estuarine areas by preserving habitats needed by wetland- and estuarine-dependent species and protecting recharge and runoff areas. This is accomplished by identifying environmentally sensitive areas, then submitting them for review to the state's Conservation and Recreation Lands (CARL) Program, the Florida Fish and Wildlife Conservation Commission, and other appropriate entities. These areas are prioritized according

to their ecological importance and availability for purchase or the development of other types of protection, such as conservation easements. Any of the identified areas in need of restoration will be reviewed at this time. Finally, SJRWMD supports ongoing acquisition programs in the purchase of identified lands and, where appropriate, adds these identified areas to the Florida Forever Work Plan (SJRWMD 2001).

SJRWMD's ongoing development of land management practices to maximize multiple uses is provided where recreation, education, water quality improvement, and preservation are all important land uses that are not necessarily mutually exclusive. SJRWMD reviews the land uses on existing public land and makes recommendations to public agencies concerning appropriate land management practices to maximize public use without causing environmental damage. SJRWMD also supports public agencies in their efforts to provide appropriate public access to the lakes, wetlands, and streams in the NCB.

D.11. Northeast Florida Blueways (Duval, St. Johns, and Flagler Counties)

The Blueways project consists of two phases that, combined, represent the Northeast Florida Blueway. The intent of the Blueway is to bridge the protection gaps to help secure the ecological character of the region and ensure recreation opportunities for both residents and visitors.

The initial phase of the Northeast Florida Blueway, Phase I — Pablo Creek, was approved by the Acquisition and Restoration Council in 2000. The Phase II proposal, which is within the boundaries of the NCB, includes the undeveloped lands on the east and west sides of the ICW in St. Johns County. The Tolomato and Matanzas rivers make up the majority of this stretch. The proposal includes about 18,170 acres of private lands and 9,985 acres in public ownership in St. Johns County. A significant part of this area, the 8,500-acre Matanzas Marsh, was purchased by SJRWMD in 2003.

A proposal for extending the Blueway through Flagler County is currently being actively pursued by SJRWMD, the GTMNERR, and Flagler County.

D.12. Public Education

The SJRWMD Office of Communications and Governmental Affairs provides education to the public through the following:

1. Support of Florida Yards, Neighborhoods and Ponds activities
2. Brochures and fact sheets provided in coordination with utilities
3. Storm drain marking and educational presentations
4. Stormwater pond education
5. Environmental Landscaping distance learning classes (community colleges)
6. Green Building seminars and CEU programs for contractors, builders, and home buyers
7. The Watershed Action Volunteer program

8. Community water festivals coordinated with interested organizations
9. Support of youth education programs
10. Support of the University of Florida Sea Grant extension program in Flagler and St. Johns counties

In addition to these activities, SJRWMD, in coordination with the GTMNERR, is constantly seeking to improve public awareness by initiating and expanding communication opportunities, including working groups and outreach programs. SJRWMD also develops and maintains intergovernmental partnerships through the stormwater cost-share program, the *WaterWatch* government monthly mailer, coordination with legislative delegations and local elected officials.

D.13. Water Supply

Water supply is generally outside the scope of the NCB Program; however, there are concerns about the cumulative impacts of groundwater withdrawals on the western borders of the NCB. Other opportunities to resolve water supply issues involve coordination of efforts to greatly reduce or eliminate treated freshwater effluent from being discharged to, and adversely impacting, the more brackish estuaries. In the event of water use issues in the NCB, the program manager will coordinate with SJRWMD's Department of Resource Management, which is responsible for consumptive use permitting and water use regulation.

SECTION E

RESEARCH AND FEASIBILITY STUDIES NEEDED TO REACH RECOMMENDED STRATEGIES

Contained within the action steps listed below are the research and feasibility studies that are needed to reach the recommended strategies outlined in Section C. The action steps briefly describe the research and feasibility studies and associated tasks to reach the targeted strategy.

Water Quality Initiative

Strategy: Examine the existing water quality monitoring network and, if necessary, design and implement a more integrated network (C.1.1)

The purpose of this strategy is to examine the existing water quality monitoring program within the NCB and determine whether gaps in data collection and synthesis exist. The aim is to ensure the provision of useful information for assessing water quality relative to state water quality standards and shellfish consumer health standards, developing water quality objectives, documenting resource problems and problem areas such as bacterial contamination in shellfish harvesting areas, and verifying remedial actions.

The existing water quality monitoring program consists of two tiers, ambient monitoring and event-specific monitoring. The purpose of the ambient monitoring is to generally characterize water quality in the NCB and identify water quality problems and trends. The event-specific monitoring, in conjunction with the ambient monitoring, is aimed at pollution source identification and the development of PLRGs and, if necessary, other resource-based water quality targets.

Implementation of this strategy will include the participation of and input from a variety of stakeholders and agencies that have water quality responsibilities in the basin.

Action Steps (C.1.1.1)

1. Assemble and evaluate existing water quality data pertaining to the NCB, including shellfish harvesting areas. Query federal, state, and local agencies for availability of data.
   a. Using the data, determine water quality trends in the NCB and document trends to provide a quantitative basis for recommendations on continuation or termination of specific monitoring stations. Recommendations should be based on the health of each specific area, the directions of trends in specific parameters, and the likelihood that water quality can be improved.
   b. Review current water quality collection efforts by these agencies.

2. Based on the analysis and synthesis of existing data and current sampling programs by the queried agencies, establish a long-term collaborative water quality monitoring effort. The program will be capable of providing the data needed to support analyses of spatial and temporal trends, calibration of water quality models, and characterization of potential or current water quality problems. Care will be taken to ensure that water quality sampling will not be duplicative of existing efforts by agencies and that the monitoring program will be compatible with existing sampling networks of other agencies.

   Special consideration will be given to the collection of event-specific monitoring data, as necessary to calibrate water quality models. Specific bacteria event sampling will be considered in shellfish harvesting areas since the highest concentrations of bacteria occur in association with high runoff and stream flows caused by rainfall. Also as part of cooperative sampling efforts, consideration will be given to common field and laboratory analytical methods, split sampling, etc., so that there is a high degree of confidence in the combined dataset. Information that is collected will be entered into the STORET database in a timely manner to allow access by other agencies and programs.

   Part of the planning for the monitoring network will be the identification of water quality targets needed to meet project goals. This will include a clear statement of the monitoring network objectives (the multiple uses of the data), the costs for establishing and operating the network, and a methodology for justifying and scheduling periodic modifications to procedures(e.g., station locations and termination of activities).

3. Once the monitoring plan is finalized and coordinated with other agencies, implement water quality sampling according to the plan design. Coordinate sampling among responsible agencies, as appropriate. Coordinate resources and include a volunteer component, where applicable.

   The data derived from the water quality monitoring network will be used to monitor trends in water quality and to develop statistical or mechanistic models used to assess pollutant levels and sources and the effectiveness of remediation strategies. These data and models will also be useful in helping to determine PLRGs. In particular, a plan with goals and PLRGs for improving water quality in shellfish harvesting areas will be developed.

4. Assemble and assess existing data on tributaries, determine further data needs, and develop a monitoring plan to determine tributary loadings. Prioritize the tributaries and establish a monitoring schedule, coordinating with management initiatives to maximize data value and usefulness for trend analyses and water quality modeling purposes.

Strategy: Develop and assess water quality and habitat protection targets using hydrologic and hydrodynamic water quality models and/or water quality and biological indices, where appropriate (C.1.2)

The purpose of this strategy is to develop a basinwide set of water quality and habitat protection targets that utilize land use, water quality, water quantity, and other data to estimate, quantify, and compare sources of pollution in the basin and their impact on the estuary.

Used together, these models and other indices will be capable of characterizing pollution nonpoint loads from the tributary basins discharging to the NCB and their transport and fate in the estuarine system. The magnitudes of point-source discharges from tributary pollution sources will also be estimated. Output from these analyses will assist in describing interrelationships between physical, chemical, and biological processes in the estuary; determining the nutrient and pollutant assimilative capacity of the estuary; prioritizing areas for water quality remediation; verifying impairments of waters; testing PLRGs; and predicting the effects of various management and conservation protection strategies.

Model development should be carefully scheduled with long-term and short-term data collection so that all of the necessary data are available when needed for the models. In addition, basic models (rainfall/runoff and hydrodynamics) need to be completed before advanced models (water quality). This NCB SWIM Plan envisions at least 8 years of closely coordinated work to complete the development of water quality (e.g., eutrophication and bacteria) models for use in analyzing cause-and-effect relationships on watersheds and in the estuary.

Action Steps (C.1.2.1)

1. Review the objectives of proposed modeling and the applicability of existing and proposed support data and prepare a planning document for chartering under the SJRWMD Project Delivery Initiative. This document and the chartering effort should clarify the purpose of various modeling components (watershed and hydrodynamic; physical, chemical, and biological), the deliverables, time schedules, and budgets.

2. Next, select the most appropriate modeling package and environmental indicators. Include a review of the hydrologic, hydrodynamic, and water quality models partially completed in 2002 and 2003. The acquisition and/or review of other water quality/quantity modeling efforts, and water quality and biological indicators may be included.

3. Once the appropriate models and tools have been selected for SJRWMD application, identify data that are not currently available and develop a plan for the acquisition of the data, including the associated costs. This further data collection and monitoring will be in addition to current ongoing monitoring activities.

4. Following acquisition of a suitable database, calibrate and validate the models and tools. Once confidence has been established, review output results and use the results to describe the operating characteristics of the water body, such as changes in water levels and flows, salinity, local flushing, nitrogen and phosphorus cycles, algal bloom development and die-off, the effects of null zones on flushing, wave-induced erosion (boat wakes), bacteria

distribution in shellfish harvesting areas, and other features necessary to understand problems and alternative solutions.

5. Finally, use models and tools to run various scenarios. Review output results and quantify both point and nonpoint pollution sources (e.g., wastewater effluent, septic leachate) and effects in particular areas of the NCB, such as shellfish harvesting areas. Update the management plan with recommendations for specific actions to solve problems and meet basin goals. Identify areas of good-to-excellent water quality and recommend for conservation purposes, as appropriate.

Strategy: Enhance and maintain surface waters (C.1.3)

Many areas in the NCB require protection and/or enhancement. These include water bodies designated as impaired by FDEP, Class II shellfish waters, and Outstanding Florida Waters. Some are recognized for possible TMDL allocations. Still others are identified to be in decline based on SJRWMD or FDEP water quality data but are not yet "listed" by FDEP. Those water bodies will qualify for special consideration and evaluation. Where appropriate, enhancements will be encouraged and projects will be proposed to avoid the necessity of the TMDL process.

As a result of the modeling process and subsequent evaluations (described in Section C.1.2), pollution sources will be reviewed and prioritized from a basinwide perspective to identify areas for remediation or restoration to improve water quality. PLRGs will be estimated for highest priority basins according to a schedule developed along with the modeling, with emphasis on stormwater management and shellfish harvesting areas.

Maintenance of the many drainage canals and tributaries in the NCB is generally focused more on flood protection than on water quality. As a result, the continual erosion of the sidebanks of these canals is a likely source of turbidity and suspended solids delivered to the major surface waters of the basin. Following BMPs and carefully regulated maintenance schedules and procedures is a cost-effective way for municipalities to reduce sediment scour and transport and to minimize water quality impacts to receiving water bodies.

Action Steps (C.1.3.1)

1. Develop criteria for assigning relative priorities to surface water bodies.

2. Use a decision-making, matrix approach to assign priorities to surface water bodies.

3. Develop adaptive management projects, using the most current methods to create interventions, enhancements, and restoration projects.

4. Coordinate with appropriate agencies to investigate Class II designated waters and problems with septic tank leachate, sewage treatment effluent, fertilizer reduction, and other nonpoint sources associated with urbanization.

5. Coordinate with appropriate agencies to develop and implement BMPs for water bodies identified to be in steady decline.

6. Facilitate development of a BMP manual or guidelines for regional drainage network maintenance programs. Focus drainage network maintenance documents on resolving downstream impacts to water quality and reducing sediment loading.

7. Encourage the maintenance of drainage conveyances consistent with BMPs that maximize water quality benefits to receiving waters. This can be accomplished through technical assistance and cost-sharing with appropriate entities.

Watershed Master Planning Initiative

Strategy: Evaluate and refine existing watershed master plans (C.2.1)

This strategy is essentially the evaluation of stormwater management of local watershed master planning initiatives. Stormwater master planning is primarily a local government responsibility, yet many local governments have neither the manpower nor the funding mechanisms available to adequately update, develop, or implement the water quality aspects of these master plans. By assuming a watershed approach to master planning, a more comprehensive hydrological rather than political boundary assessment can be accomplished. This work falls within the regional purview of SJRWMD. It is thus appropriate for SJRWMD to provide for independent reviews of existing plans and identify areas for improvement.

Action Steps (C.2.1.1)

1. Examine coverage of stormwater plans. Prepare a comprehensive listing of completed and pending watershed master plans, along with the status of completion or implementation of each study. Identify capital improvement plans and existing stormwater network maintenance programs.

2. Evaluate and refine existing stormwater plans for flood abatement, water quality improvement, and regional adequacy.

3. Develop a standardized master plan outline as an aid for local government use in subsequent planning efforts.

Strategy: Assist in the development and endorsement of local master stormwater plans and implementation schedules (C.2.2)

Local plans will serve as the implementation schedule for retrofit and maintenance initiatives. SJRWMD models may be used to assess and predict the effects of proposed management strategies.

Action Step (C.2.2.1)

1. Assist local governments in the development of master plans that will address water quality improvements. This assistance may include activities such as facilitation, planning, cost-sharing, and technical design or review.

Stormwater Retrofit and Master Plan Implementation Initiative

Strategy: Prioritize stormwater retrofit programs (C.3.1)

The purpose of this strategy is to design and implement a Northern Coastal Basin-wide stormwater retrofit plan focusing on pre-1983 development, prior to stormwater regulations. Evaluation of existing stormwater coverages and management plans will be used to establish clear targets for stormwater treatment in developed watersheds. A ranking matrix based on these targets will be utilized to prioritize the areas for retrofitting. The variables in the matrix will include, but not be limited to, existing nutrient loading; expected retrofit system removal efficiency; design, construction, and operation and maintenance costs; and receiving water body priority ranking (such as PLRGs, shellfish harvesting areas, and TMDLs/303d list). Due to the fast-paced development occurring within most of the NCB area, a supporting land acquisition program and assessment of available federal and state funding sources will be developed.

Action Steps (C.3.1.1)

1. Develop a ranking matrix to assist in prioritizing areas for optimal retrofit potential using existing maps of developed watershed areas that receive some level of stormwater treatment.

2. Coordinate with local government land acquisition plans for stormwater retrofit opportunities that encourage recharge and reuse of stormwater runoff, where appropriate.

3. Assist local governments seeking federal and state funding for land acquisition, design, and construction of regional stormwater retrofit projects.

4. Where feasible, encourage and cost-share with local governments to proactively install alternative stormwater treatment mechanisms, especially where land availability is limited. Give priority to local governments that consider broad-based, rather than individual, retrofit opportunities.

Strategy: Partner with local governments to implement stormwater plans (C.3.2)

The purpose of this strategy is to provide assistance and incentives to local governments to implement stormwater plans through such means as cost-share funding, technical assistance, legislative initiatives, mapping, and other services provided directly by or contracted through SJRWMD.

Action Steps (C.3.2.1)

1. Establish and coordinate an interagency NCB Stormwater Management Group.

2. Provide assistance to local governments based on a prioritized schedule developed by the NCB Stormwater Management Group.

Compliance and Rules Enforcement Initiative

Strategy: Implement existing compliance monitoring programs (C.4.1)

The purpose of this strategy is to collect compliance monitoring information for permitted stormwater management systems with regard to flood protection and water quality controls to ensure that they are operating properly. The effectiveness of the regulatory programs is measured, in part, through a compliance monitoring program. Compliance monitoring to verify the proper construction of new systems and the appropriate maintenance of established systems is necessary to ensure that the systems are constructed and maintained to allow for their proper function. Enforcement action may be necessary to require responsible parties to bring noncompliant systems into conformance.

Action Steps (C.4.1.1)

1. Assess existing permitted nonpoint sources of water pollution (e.g., stormwater ponds) and provide compliance or additional treatment alternatives to reduce the impact from these sources, where warranted. Give priority to stormwater treatment systems in OFWs.

2. In order to develop a streamlined system and prioritize the activities in compliance and enforcement for permitted stormwater management systems, establish a protocol based upon system size and type, watershed land use and density, and proximity and degree of impairment of the receiving surface water. Implement programs using information from all available sources, monitor the programs, and adjust the programs to develop an efficient system for compliance monitoring.

Strategy: Assess and manage resources and funding to support the requirements of current and emerging National Pollutant Discharge Elimination System regulations, pollutant load reduction goals, and total maximum daily load regulations (C.4.2)

The NCB Impaired Water Bodies candidates have been identified, per the FDEP 303(d) list, which must be verified before proceeding with the development of TMDLs. Chapter 99-223, *Laws of Florida* (the Florida Watershed Restoration Act), provides FDEP with the authority to develop and implement TMDLs. The process (methodology) for determining impairments is set out in Chapter 62-303, *F.A.C.* (Identification of Impaired Surface Waters).

Water management districts are responsible for nonagricultural storm water (unless FDEP maintains that responsibility), and the Department of Agriculture and Consumer Affairs is responsible for working with farm interests and managing agricultural stormwater runoff. Of particular importance in the watershed management plan will be the focus on innovative and incentive-based voluntary approaches to address nonpoint sources.

The identification of management activities being implemented or scheduled that would address the parameters of concern is part of the process in the FDEP Integrated Water Resource Management Program. If there is reasonable assurance that water quality standards would be attained following implementation of the management activities, the water is not placed on the verified list.

FDEP uses the Watershed Management Program, an iterative five-phase cycle, to develop and implement TMDLs. The 5-year cycle provides the structure for focusing resources on specific basins, verifying impaired waters, conducting targeted monitoring that will provide the data needed for model calibration and verification, and developing TMDLs for impaired waters. Basin management plans are a critical product of the Watershed Management Program because they provide the roadmap for implementation of the TMDLs and will serve as the basin-specific, consensus-driven implementation plan.

Action Steps (C.4.2.1)

1. Investigate the need for a re-evaluation of SJRWMD rules to increase the protection of watersheds potentially targeted for drinking water supply, areas surrounding receiving waters that are designated as impaired waters, and high recharge areas.

   Water resource restoration efforts, including development and implementation of BMPs, retrofitting, habitat protection and restoration activities, environmental infrastructure improvements, and issuance of permits, provide increased protection. Specific rule revisions may not be required. However, more-stringent criteria reflective of waters not meeting specific standards may be invoked as necessary. SJRWMD may recommend appropriate BMPs for agriculture and storm water.

2. Coordinate with FDEP to define the role of each agency in the TMDL, Watershed Management Program process. Details of this proposed coordination effort are discussed in Section F of this document.

Resource Assessment, Protection, and Restoration Initiative

Strategy: Complete habitat mapping and resource assessments (C.5.1)

To protect and preserve unique or significant habitats and resources, it is essential to first inventory both natural and disturbed habitats in the watershed. Once a baseline assessment has been made, impacts to the system will be quantified and specific biological targets will be set.

Action Steps (C.5.1.1)

1. Establish a habitat mapping and classification program for the NCB which includes shorelines, marshes, intertidal and submerged/benthic areas, and disturbed habitats. Coordinate this step with the GTMNERR and other management agencies, using analytical methods and innovative technologies, including remote sensing, to assess conditions of these habitats.

2. Evaluate sediment deposition and quality and implement sediment management plans, as required. Place particular emphasis on shellfish harvesting areas since sediment re-suspension and sediment transport can smother shellfish beds.

3. Describe and assess floral and faunal species of concern, including fisheries resources. The aim is to link the locations of species of concern to habitat maps and water quality patterns.

4. Establish functional habitat and biological targets for estuarine ecosystems.

Strategy: Protect and manage important estuarine habitats (C.5.2)

The purpose of this strategy is to protect important estuarine habitats within the NCB. Coordinated and sustained acquisition efforts are the key to protecting these sensitive watersheds.

Action Steps (C.5.2.1)

1. Identify land protection and acquisition needs.

2. Coordinate and support land acquisition initiatives both within SJRWMD and in collaboration with outside agencies.

3. Support the coordination of land management initiatives with appropriate land managers, agencies, or stakeholders.

Strategy: Provide habitat enhancement and restoration (C.5.3)

Coastal estuarine habitats have been impacted through such anthropogenic activities as dredge and fill for development; dredging of boat basins, inlets, and navigation channels; mosquito control; and recreational boating activities. The purpose of this strategy is to enhance or restore the function of the degraded areas through selective habitat enhancement programs and projects.

Action Steps (C.5.3.1)

1. In coordination with the GTMNERR and other management agencies, support efforts to develop effective strategies with clear targets for habitat protection and, where appropriate, enhancement and restoration.

2. Facilitate habitat restoration initiatives in cooperation with and through cost-sharing with local governments and other agencies. Projects may include disturbed habitat enhancement, exotic vegetation control, shoreline revegetation and stabilization, and salt marsh and benthic habitat restoration and enhancement.

   In particular, coordinate with FIND on the management of the many dredge spoil areas located throughout the ICW portions of the Northern Coastal Basin to maximize cooperative management goals.

3. Coordinate with mosquito control authorities to implement source reduction programs that maximize natural resource functions.

4. Develop and implement programs to restore natural hydrologic patterns.

SECTION F

MEASURES NEEDED TO MANAGE AND MAINTAIN THE NORTHERN COASTAL BASIN

This section describes the process by which SJRWMD will support FDEP in the establishment of TMDLs in the NCB by establishing PLRGs as required by Chapter 62-40.432, *F.A.C.*

F.1. Background

The NCB spans parts of three counties (St. Johns, Flagler, and Volusia; see Figure 1) and contains some relatively densely populated areas.

Section 303(d) of the Clean Water Act requires states to develop a list of waters not meeting water quality standards or not supporting their designated uses. Chapter 62-303, *F.A.C.*, sets forth the process for verifying impairments and developing the list of impaired waters. The state submits these impaired waters as its 303(d) list to EPA. Verified impaired waters will only be kept off the 303(d) list if "reasonable assurance" can be provided to demonstrate that existing and proposed management actions and/or regulatory requirements can be expected to attain designated uses. Both FDEP and EPA must approve the documentation of reasonable assurance. EPA guidelines specify that waters need not be included, or listed as verified impaired, if other federal, state, or local requirements have or are expected to result in the attainment and maintenance of applicable water quality standards.

The 15 water bodies referenced in this section are on the state's current 303(d) list as impaired waters (see Table 2, Section A). As part of the watershed cycle, these waters will be assessed by FDEP through the methodology established in Chapter 62-303, *F.A.C.* If these waters are verified as impaired through this process, or if there are insufficient data to fully assess these waters, FDEP will maintain them on the updated 303(d) list that will be submitted to EPA.

If the assessment results indicate that any of these previously listed waters meet designated uses, then FDEP will delist those waters. Any waters that are verified as impaired but for which FDEP cannot identify the pollutant source will be moved to the planning list until additional data can be collected in the next cycle.

F.2. Impaired Waters List

As required by the 1999 Florida Watershed Restoration Act, the planning list will be submitted to EPA for informational purposes only and will not be used in the administration or implementation of any regulatory program. The list is extremely important, however, as it drives monitoring in the watershed and is the precursor to the verified list.

The planning list is the first step of a two-step process to develop the state's 303(d) list of impaired waters. As part of the watershed management approach, these potentially impaired waters will be further assessed to verify whether they are impaired. This verification process will involve FDEP with local stakeholders to collect additional data as needed to complete the assessment. Initially, monitoring will be focused on verification of any impairment.

Once the additional monitoring is completed, the data will be assessed and FDEP will develop a verified list of impaired waters. This list of waters for which FDEP will develop TMDLs will be adopted by Secretarial Order. Once adopted, the list will be submitted to EPA as the state's 303(d) list for the basin.

F.3. Watershed Management Program

The Watershed Management Program (WMP), within the context of Chapter 99-223, *Laws of Florida*, is based on a five-phase cycle that rotates through the state's basins every 5 years. The WMP is the vehicle by which FDEP is organizing the task of administering the TMDL process statewide. The five phases of the WMP cycle are as follows:

Phase 1 — Initial basin assessment
Phase 2 — Coordinated monitoring
Phase 3 — Data analysis and TMDL development
Phase 4 — Basin management plan development
Phase 5 — Initiation of implementation of plan

All of the NCB is within the WMP's fifth rotational grouping. The fifth rotation of the WMP begins in the state's FY 2004 and continues until the end of FY 2008.

FDEP is the lead agency responsible for the establishment of TMDLs and has organized the process into 12 steps:

1. Develop a planning list of surface waters or segments for which TMDL assessments will be calculated.
2. Develop a priority ranking and schedule for analyzing the list.
3. Adopt by rule a methodology for determining impaired water bodies based upon objective, quantitative, and credible data, studies, and reports, including water management districts.
4. Develop a list of those water bodies or segments for which TMDLs will be calculated and submit the list to EPA.
5. Conduct a TMDL assessment using verified criteria in coordination with the water management districts and other agencies.
6. Develop TMDL calculations after first coordinating with applicable local governments and water management districts. Some TMDLs may be based on PLRGs.
7. Develop allocations based on TMDL calculations (the maximum amount of water pollutant from a given source or category that may be discharged in combination with other discharges).

8. Adopt TMDLs by rule and submit to EPA.
9. Serve as the lead agency in coordinating the implementation of the TMDLs.
10. In cooperation with the water management districts and other interested parties, develop BMPs to reduce pollutant loads from nonpoint sources into the affected water body and adopt by rule. The Department of Agriculture and Consumer Services will develop BMPs for agricultural nonpoint sources. (This effort will include routine tracking of the effectiveness of the BMPs, record keeping, and water quality monitoring.)
11. Re-evaluate established TMDLs and implementation plans on subsequent cycles of the rotating basin program and revise as needed.
12. Report to the Governor and the Legislature and make recommendations for statutory changes to implement the TMDLs more effectively, if needed.

Some of the above steps have been completed. Throughout the process, FDEP recognizes the need to coordinate with local governments, water management districts, the Department of Agriculture and Consumer Services, and other interested parties.

F.4. SJRWMD's Role in PLRG Development and the TMDL Verification Process

Based on EPA guidelines, certain waters may not be included, or listed as verified impaired, if regional or local remedial or restorative programs have or are expected to result in the attainment and maintenance of applicable water quality standards. In accordance with the Florida Watershed Restoration Act, FDEP will not place waters on the verified list if proposed or existing pollution control mechanisms are expected to result in the attainment of water quality standards.

SJRWMD has the primary role of developing PLRGs, presumably providing the technical basis for the state's development of TMDLs for constituents of concern. The data and information obtained on completion of the action steps described in Section C will form the basis for SJRWMD's development of PLRGs.

Figure 9 is provided to show SJRWMD's commitment to assist FDEP with upholding any applicable legislative, administrative, and court-decreed time frames.

Strategy. SJRWMD's primary strategy for meeting the goals of the TMDL and the WMP is to initiate new and/or continue existing programs aimed at reducing the discharge of stormwater pollutants to potentially impaired surface waters.

SJRWMD is conducting a stormwater treatment assessment in developed watersheds, and in select subbasins will prepare descriptions of retrofit opportunities and other potential enhancement activities. This work will be completed the in first year of the NCB SWIM Plan implementation.

Priorities for remediation will be set based on the highest pollutant-contributing basins, or basins having no stormwater treatment. Once these remedial programs are in place (over the span of several years), monitoring will be continued to measure the effect of the pollutant load reduction strategy.

If planning and feasibility of retrofit systems for a particular listed water body result in low expectations for the success of the retrofit project, SJRWMD will report these findings to FDEP so that the process for the calculation of the TMDL can commence.

GIS-based models will be used as appropriate to identify source basins and to prioritize remedial treatment schedules.

Monitoring. SJRWMD will review the planning list of potentially impaired water bodies in the NCB, review the data used to produce the list, and add new data into STORET or provide it to FDEP so that this new information can be used in the full assessment in the verification process. If FDEP needs additional data and/or additional sites to be monitored (over and above those SJRWMD is currently monitoring) for its verification process, it can enter into a contractual agreement with SJRWMD to provide those data. Prior to implementing such a monitoring effort, SJRWMD will coordinate sampling strategies of FDEP and other agencies to ensure that the information and approach are consistent with existing requirements or policies regarding the verification of BMPs.

SJRWMD will encourage local governments and other stakeholders through its existing outreach programs to participate in the strategic monitoring, including the development of the strategic monitoring plan, and to conduct some of the monitoring as well. SJRWMD is aware that monitoring will be long term in the verification process and accepts the responsibility to continue monitoring water quality in the NCB.

SJRWMD will monitor sites that have received stormwater retrofits by SJRWMD to determine the effectiveness of the BMP, or pollution control strategy, employed. SJRWMD understands that long-term remedial action verification is a part of the WMP and will maintain and monitor its own projects.

Land purchase. SJRWMD will expand its urban land acquisition activities to correspond to the needs of the listed water bodies, as possible, by purchasing lands for stormwater retrofit systems. Innovative treatment systems and in-line treatment devices will be encouraged if no lands are available or land costs are prohibitive. Funding for land acquisition will be pursued through the Florida Forever program and appropriate state and federal agencies.

Retrofitting. Projects within the NCB will be prioritized as described above for candidacy for retrofit where no treatment exists. Stormwater retrofits will rely on standard BMPs as stand-alone or in treatment-train configurations. Innovative stormwater treatment devices or strategies will be considered and encouraged, where appropriate.

Local government assistance and partnering. Local governments have completed comprehensive stormwater master plans in many basins. SJRWMD will continue to assist these efforts to develop, refine, and implement the plans through cooperative funding and legislative initiatives.

SJRWMD has already embarked on many cooperative agreements to implement water quality projects in the NCB, as listed in Section D.

Funding. SJRWMD will continue its existing funding strategy, which involves obtaining assistance through the following sources:

- Legislative initiatives
- Ad valorem
- Grants
- Federal funding
- SWIM funding
- Partnerships

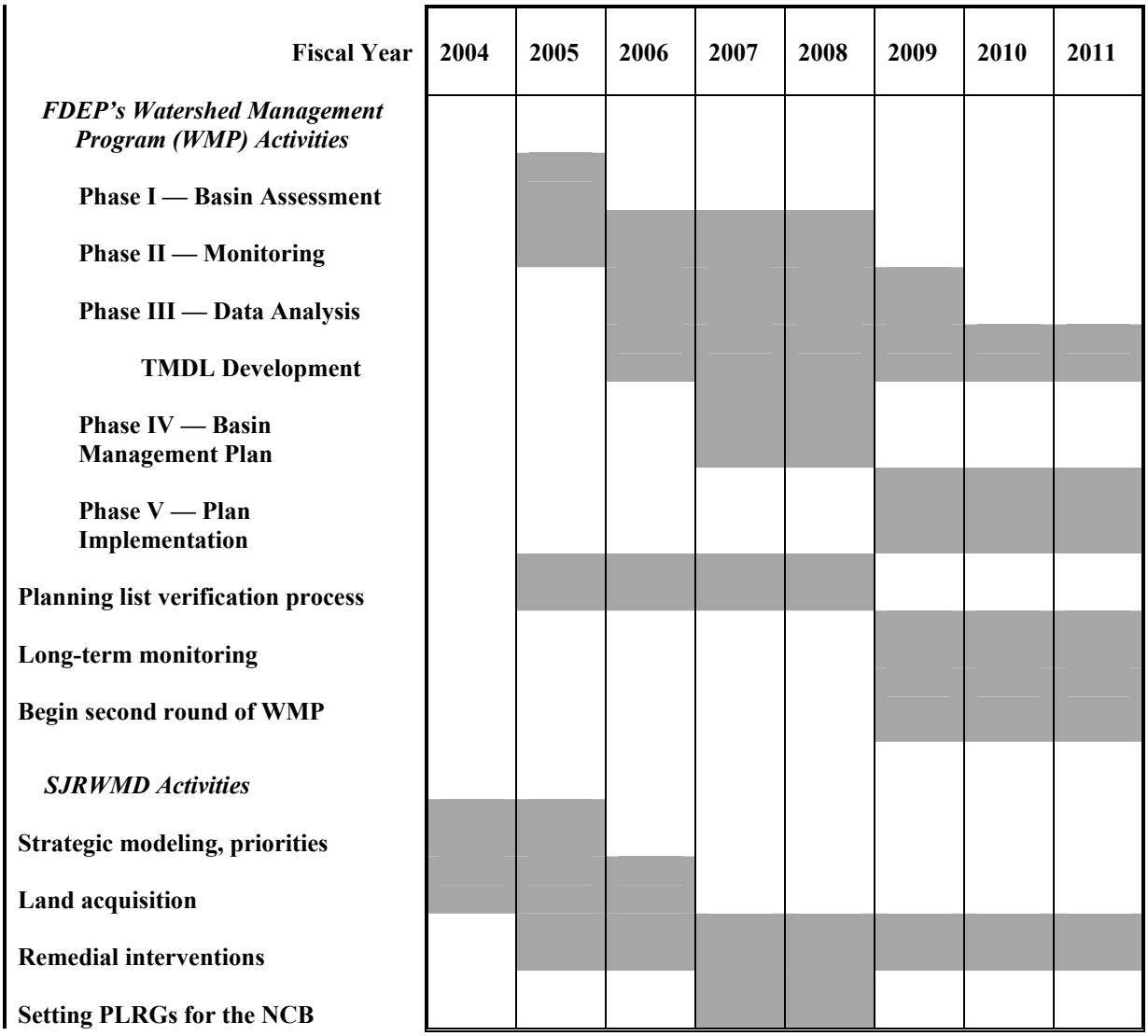


Figure 9. Total maximum daily load and pollutant load reduction goal components and process milestones

SECTION G

SCHEDULE AND FUNDING REQUIREMENTS FOR RESTORATION AND PROTECTION

Using the research and feasibility studies from Section E to accomplish the initiatives and strategies set forth in Section C, the following schedule and funding requirements have been devised. At current funding levels, SJRWMD will provide $3 million over the 5-year planning period. The remaining funds to complete the proposed implementation schedule will have to be appropriated from other sources. In the event that full funding does not become available, the timeline for completion will be extended according to the levels of funding provided.

The NCB SWIM Plan also calls for a re-evaluation every 3 years, at which time appropriate adjustments will be made to both the budget and the schedule. The diagnostic studies previously outlined and an evaluation of management options must be completed before a more accurate total program cost can be set.

In addition to this schedule and the re-evaluation, a yearly work plan will be developed and refined according to the final SJRWMD budget and approved funding from project partners. The yearly work plan will also include an evaluation of the outcome of ongoing and completed projects and action steps within each initiative.

Water Quality Initiative (C.1)

Strategy: Examine the existing water quality monitoring network and, if necessary, design and implement a more integrated network (C.1.1)

Schedule and Funding

Action Step	Time Frame (months)	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
1 — Assemble and evaluate existing water quality data	6	$30K	$50K			
2 — Set watershed water quality targets and design enhanced monitoring program	6	$15K				
3 — Implement new sampling plan	24–60		$125K	$175K	$175K	$175K
4 — Assemble and assess existing data on tributaries	12		$50K			
Total		$45K	$225K	$175K	$175K	$175K

Strategy: Develop and assess water quality and habitat protection targets using hydrologic and hydrodynamic water quality models and/or water quality and biological indices, where appropriate (C.1.2)

Schedule and Funding

Action Step	Time Frame (months)	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
1 — Develop planning document for proposed modeling	6	$30K				
2 — Select appropriate modeling package	4	$30K				
3 — Identify unavailable data and develop an acquisition plan	60	$120K	$200K	$200K	$200K	$200K
4 — Calibrate and validate models	36		$100K	$100K	$100K	$100K
5 — Review model output; quantify pollution sources	36			$30K	30K	$30K
Total		$180K	$300K	$330K	$330K	$330K

Strategy: Enhance and maintain surface waters (C.1.3)

Schedule and Funding

Action Step	Time Frame (months)	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
1 — Develop prioritization criteria	4	$25K				
2 — Prioritize surface water bodies	1					
3 — Develop adaptive management projects	12	$20K				
4 — Coordinate with FDEP to evaluate Class II waters	8	$25K				
5 — Implement BMPs for “at risk” water bodies	60		$100K	$100K	$100K	$100K
6 — Facilitate development of BMP manual for drainage network maintenance	8		$30K			
7 — Encourage maintenance of drainage conveyances	36			$10K	$10K	$10K
Total		$70K	$130K	$110K	$110K	$110K

Watershed Master Planning Initiative (C.2)

Strategy: Evaluate and refine existing watershed master plans (C.2.1)

Schedule and Funding

Action Step	Time Frame (months)	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
1 — Examine coverage of stormwater plans	6	$30K				
2 — Evaluate and refine existing plans for flood abatement and water quality improvement	12	$60K				
3 — Develop a standardized master plan outline	6		$40K			
Total		$90K	$40K			

Strategy: Assist in the development and endorsement of local master stormwater plans and implementation schedules (C.2.2)

Schedule and Funding

Action Step	Time Frame (months)	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
1 — Assist in the development of master plans	36			$200K	$200K	$200K
Total				$200K	$200K	$200K

Stormwater Retrofit and Master Plan Implementation Initiative (C.3)

Strategy: Prioritize stormwater retrofit programs (C.3.1)

Schedule and Funding

Action Step	Time Frame (months)	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
1 — Set retrofit targets and prioritize areas for retrofit	6	$50K				
2 — Provide land acquisition assistance	12		$50K			
3 — Assist local governments seeking funding	48		$50K	$50K	$50K	$50K
4 — Encourage cost-sharing	60	$500K	$500K	$500K	$500K	$500K
Total		$550K	$600K	$550K	$550K	$550K

Strategy: Partner with local governments to implement stormwater plans (C.3.2)

Schedule and Funding

Action Step	Time Frame (months)	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
1 — Establish and coordinate an NCB stormwater management group	60	$15K	$15K	$15K	$15K	$15K
2 — Assist in the implementation of master plans	48		$500K	$500K	$500K	$500K
Total		$15K	$515K	$515K	$515K	$515K

Compliance and Rules Enforcement Initiative (C.4)

Strategy: Implement existing compliance monitoring programs (C.4.1)

Schedule and Funding

Action Step	Time Frame (months)	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
1 — Assess existing permitted nonpoint sources	6	$30K				
2 — Establish compliance protocol for priority watersheds	12	$50K				
Total		$80K				

Strategy: Assess and manage resources and funding to support the requirements of current and emerging National Pollutant Discharge Elimination System regulations, pollutant load reduction goals, and total maximum daily load regulations (C.4.2)

Schedule and Funding

Action Step	Time Frame (months)	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
1 — Review SJRWMD rules to ensure protection of watersheds	6	$25K				
2 — Implement special agreement with FDEP	36		$25K	$25K	$25K	$25K
Total		$25K	$25K	$25K	$25K	$25K

Resource Assessment, Protection, and Restoration Initiative (C.5)

Strategy: Complete habitat mapping and resource assessment (C.5.1)

Schedule and Funding

Action Step	Time Frame (months)	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
1 — Establish a habitat mapping and classification program	60	$50K	$50K	$50K	$50K	$50K
2 — Implement a sediment assessment plan	60	$20K	$50K	$50K	$50K	$50K
3 — Describe and assess species of concern	24	$100K	$100K			
4 — Establish functional biological targets for estuarine ecosystems	36			$20K	$20K	$20K
Total		$170K	$200K	$120K	$120K	$120K

Strategy: Protect and manage important estuarine habitats (C.5.2)

Schedule and Funding

Action Step	Time Frame (months)	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
1 — Identify land acquisition needs	60	$25K		$25K		$25K
2 — Coordinate and support land acquisition initiatives	60	$10K	$10K	$10K	$10K	$10K
3 — Coordinate land management initiatives	60	$10K	$10K	$10K	$10K	$10K
Total		$45K	$20K	$45K	$20K	$45K

Strategy: Provide habitat enhancement and restoration (C.5.3)

Schedule and Funding

Action Step	Time Frame (months)	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
1 — Support local habitat protection programs	60	$25K	$25K	$25K	$25K	$25K
2 — Conduct habitat restoration projects	60	$50K	$100K	$100K	$100K	$100K
3 — Coordinate source reduction programs with mosquito control	60	$25K	$25K	$25K	$25K	$25K
4 — Develop and implement programs to restore natural hydrologic patterns	60	$20K	$20K	$20K	$250K	$250K
Total		$120K	$170K	$170K	$400K	$400K

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APPENDIX I

IMPLEMENTATION PARTNERS

The St. Johns River Water Management District recognizes the importance of coordination with the many government agencies and other stakeholders that may be affected by, or have some jurisdiction over, resources within the Northern Coastal Basin Surface Water Improvement and Management planning area. A list of those entities is provided below. A description of the responsibilities for these governmental units is given in Chapter 8 of the Year 2000 District Water Management Plan (SJRWMD 2000).

Agencies	
Federal	
U.S. Army Corps of Engineers	U.S. Fish and Wildlife Service
U.S. Environmental Protection Agency	U.S. Forestry Service
U.S. Geological Survey	Guana-Tolomato-Matanzas National Estuarine Research Reserve
National Oceanic and Atmospheric Administration	
State	
Department of Environmental Protection	Department of Community Affairs
Public Service Commission	Department of Health
Department of Transportation	Department of Agriculture and Consumer Affairs
Fish and Wildlife Conservation Commission	
Regional	
St. Johns River Water Management District	East Central Florida Regional Planning Council
Northeast Florida Regional Planning Council	Florida Inland Navigation District
Counties	
St. Johns County	Volusia County
Flagler County	
Cities and Towns	
Beverly Beach	Palm Coast
Daytona Beach	Ponce Inlet
Daytona Beach Shores	Port Orange
Flagler Beach	South Daytona
Holly Hill	St. Augustine
Marineland	St. Augustine Beach
Ormond Beach	
Unincorporated Communities	
Crescent Beach	St. Augustine Shores
Ponte Vedra Beach	Vilano Beach
Ponte Vedra	
Stakeholders	
Guana, Tolomato, Matanzas Shellfish and Water Quality Task Force	Palm Coast Community Service Corporation
Special taxing districts	Mosquito control districts
University of Florida Whitney Laboratory	Florida Audubon Society
Sierra Club	Halifax and Indian River Task Force

APPENDIX II

SURFACE WATER DISCHARGE FACILITIES OPERATING WITH A PERMIT

Name	City	County	Planning Unit
Domestic Wastewater			
Beverly Beach WWTF	Beverly Beach	Flagler	Pellicer Creek
Flagler Beach WWTF	Flagler Beach	Flagler	Pellicer Creek
Palm Coast WWTF	Palm Coast	Flagler	Pellicer Creek
Inlet Beach WWTF	Inlet Beach	St. Johns	Tolomato/Matanzas
Marsh Landing WWTF	Ponte Vedra	St. Johns	Tolomato/Matanzas
Players Club WWTF	Ponte Vedra Beach	St. Johns	Tolomato/Matanzas
Ponte Vedra WWTF	Ponte Vedra Beach	St. Johns	Tolomato/Matanzas
Sawgrass WWTF	Ponte Vedra Beach	St. Johns	Tolomato/Matanzas
Blacks Ford WWTF	St. Augustine	St. Johns	Tolomato/Matanzas
Frog Hollow Mobile Home Park and Campground WWTF	St. Augustine	St. Johns	Tolomato/Matanzas
St. Augustine WWTF	St. Augustine	St. Johns	Tolomato/Matanzas
State Road 16 WWTF	St. Augustine	St. Johns	Tolomato/Matanzas
Anastasia Island WWTF	St. Augustine	St. Johns	Tolomato/Matanzas
Mill Creek Elementary School WWTF	St. Augustine	St. Johns	Tolomato/Matanzas
St. Augustine Island WWTF	St. Augustine	St. Johns	Tolomato/Matanzas
Daytona Beach/Bethune Point	Daytona Beach	Volusia	Halifax River
City of Holly Hill	Holly Hill	Volusia	Halifax River
City of Ormond Beach	Ormond Beach	Volusia	Halifax River
City of Port Orange	Port Orange	Volusia	Halifax River
Industrial Wastewater			
Concrete Batch (CB) Plants			
Florida Rock Industries, St. Augustine	St. Augustine	St. Johns	Tolomato/Matanzas
Rinker Materials, North St. Augustine Facility	St. Augustine	St. Johns	Tolomato/Matanzas
Tarmac, St. Augustine	St. Augustine	St. Johns	Tolomato/Matanzas
Cemex/Daytona Beach CB plant	Holly Hill	Volusia	Halifax River
Rinker Materials/Ormond Beach CB plant	Ormond Beach	Volusia	Halifax River
Other Industrial			
Palm Coast Membrane Softening Facility	Palm Coast	Flagler	Pellicer Creek
VCDSWM/Tomoka Farms Road landfill	Daytona Beach	Volusia	Halifax River
Petroleum Cleanup			
BP station 24650	Ormond Beach	Volusia	Halifax River

Note: WWTF = wastewater treatment facility

APPENDIX III

FACILITIES POSSESSING MULTI-SECTOR GENERAL PERMITS

Facility Name	City	County	Planning Unit
Kanthal Palm Coast	Palm Coast	Flagler	Pellicer Creek
Sea Ray Boats Inc.	Palm Coast	Flagler	Pellicer Creek
Sunbelt Chemicals	Palm Coast	Flagler	Pellicer Creek
Treworgy Yachts Inc.	Palm Coast	Flagler	Pellicer Creek
Anastasia Island Wastewater Treatment Plant	St. Augustine	St. Johns	Tolomato/Matanzas
Apac-Florida Inc., Jacksonville Division	St. Augustine	St. Johns	Tolomato/Matanzas
BFI Waste Systems	St. Augustine	St. Johns	Tolomato/Matanzas
BFI Waste Systems	St. Augustine	St. Johns	Tolomato/Matanzas
Camachee Cove Yacht Harbor Inc.	St. Augustine	St. Johns	Tolomato/Matanzas
Domestic Wastewater Treatment Facility	St. Augustine	St. Johns	Tolomato/Matanzas
Luhrs Corp.	St. Augustine	St. Johns	Tolomato/Matanzas
Nine Mile Road Inc.	St. Augustine	St. Johns	Tolomato/Matanzas
Nine Mile Road Inc.	St. Augustine	St. Johns	Tolomato/Matanzas
Northrop Grumman Corp.	St. Augustine	St. Johns	Tolomato/Matanzas
Potomac German Auto South	St. Augustine	St. Johns	Tolomato/Matanzas
Sawgrass Wastewater Treatment Facility	Ponte Vedra Beach	St. Johns	Tolomato/Matanzas
St. Augustine Marine	St. Augustine	St. Johns	Tolomato/Matanzas
St. Augustine Ready-Mix Plant	St. Augustine	St. Johns	Tolomato/Matanzas
St. Augustine-St. Johns County A/P	St. Augustine	St. Johns	Tolomato/Matanzas
State Road 16 Wastewater Treatment Plant	St. Augustine	St. Johns	Tolomato/Matanzas
VAW of America Inc.	St. Augustine	St. Johns	Tolomato/Matanzas
Xynides Boatyard Inc.	St. Augustine	St. Johns	Tolomato/Matanzas
Airborne Express	Daytona Beach	Volusia	Halifax River
Classic Painting	Ormond Beach	Volusia	Halifax River
Crane Cams Inc.	Daytona Beach	Volusia	Halifax River
Daytona Beach International Airport	Daytona Beach	Volusia	Halifax River
Daytona Beach International Airport	Daytona Beach	Volusia	Halifax River
Daytona Beach Jet Center	Daytona Beach	Volusia	Halifax River
Daytona Beach Public Works	Daytona Beach	Volusia	Halifax River
Daytona Beach Vmf	Daytona Beach	Volusia	Halifax River
Daytona Ready-Mix Plant	Daytona Beach	Volusia	Halifax River
Federal Express Corp.	Daytona Beach	Volusia	Halifax River
Federal Sign	Daytona Beach	Volusia	Halifax River
FRS Daytona Beach	Daytona Beach	Volusia	Halifax River
Holly Hill Salvage & Junk	Holly Hill	Volusia	Halifax River
Nascar Aviation Department	Daytona Beach	Volusia	Halifax River
Ormond Aviation Inc.	Ormond Beach	Volusia	Halifax River
Ormond Beach Airport	Ormond Beach	Volusia	Halifax River

Facility Name	City	County	Planning Unit
Ormond Beach Municipal Airport	Ormond Beach	Volusia	Halifax River
Rams Aviation/Ormond Beach Inc.	Ormond Beach	Volusia	Halifax River
River Bend Investment Group	Ormond Beach	Volusia	Halifax River
Roadway Express Inc. (T710)	Daytona Beach	Volusia	Halifax River
Seven Seas marina and boatyard	Daytona Beach	Volusia	Halifax River
Southside Auto Parts	South Daytona	Volusia	Halifax River
Speedway Auto Parts	Daytona Beach	Volusia	Halifax River
Sunrise Aviation/Mac Charter	Ormond Beach	Volusia	Halifax River
Tanning Research Laboratories	Ormond Beach	Volusia	Halifax River
Tomoka Farms Road landfill	Daytona Beach	Volusia	Halifax River
United Parcel Service Inc.	Daytona Beach	Volusia	Halifax River
Volusia County sheriff's aviation hangar	Daytona Beach	Volusia	Halifax River
Waste Management Inc. of Florida	Ormond Beach	Volusia	Halifax River

APPENDIX IV

LOCAL GOVERNMENT CAPITAL IMPROVEMENT PROJECTS

One of the important roles that local government plays in maintaining water quality in the Northern Coastal Basin (NCB) is through the improvement and maintenance of stormwater water facilities, drainage easements, catch basins, and other facilities under their jurisdiction. Ongoing capital improvement programs are costly, but necessary, and provide a good example of local governments' commitment to good water quality. Listed below, by SWIM Plan Initiative and responsible entity (in alphabetical order), are the tentative 5-year capital improvement projects of local governments in the NCB. Projects listed include those that have been identified as well as those that are actually scheduled to begin. The cost estimates for each project are a cumulative total for the 5 years, beginning with FY 2004. Projects preceded by an asterisk indicate priority projects within the Halifax River planning unit.

Project	Entity	Cost Estimate
Water Quality Initiative Projects		
Establish the present hydrodynamic station on the lower Tomoka River-USGS 02247598, as a permanent, real-time tidal monitoring station for use by the public (boating, recreational fishing, etc.) and park management (dragline ditch restoration, marsh-grass planting, etc.)	Tomoka Park	$50,000
Re-install a water level recorder on the Korona Canal at Old Kings Highway to monitor water stage and tributary discharge to Bulow Creek	Tomoka Park	$10,000
Increase water quality sampling to 12 events for six of the 34 sample locations in the Halifax River	Volusia County	$15,000 (annually)
Watershed Master Planning Initiative Projects		
Stormwater Master Plan update	Ormond Beach	$100,000
Develop Stormwater Master Plan	Palm Coast	$100,000
Stormwater Master Plan update	Port Orange	$100,000
Stormwater Master Plan update	South Daytona	$100,000
Stormwater Retrofit and Master Plan Implementation Initiative Projects		
*B-3 Pond and Wilder Boulevard outfall drainage improvements	Daytona Beach	$3,344,000
*Madison Avenue stormwater improvements	Daytona Beach	$2,495,000
*Stormwater Master Plan projects for downtown redevelopment	Daytona Beach	$1,931,300

Project	Entity	Cost Estimate
Bay Street/Palmetto Avenue/Charles Street drainage improvements	Daytona Beach	$8,198,000
Lenox/Grandview drainage and outfall improvements	Daytona Beach	4,799,423
Bel Aire/Waverly drainage improvements	Daytona Beach	1,635,100
Oleander/Riverview/Glenview drainage improvements	Daytona Beach	1,145,000
Hartford Avenue drainage and outfall improvements	Daytona Beach	1,550,000
Kennedy Street stormwater (4th and Flagg Street pond)	Daytona Beach	91,000
Fairview Avenue Stormwater Management Plan	Daytona Beach	655,300
Ocean Dunes drainage improvements	Daytona Beach	1,700,000
Fourth Street drainage improvements	Daytona Beach	1,800,000
Mirror Lake	Flagler Beach	235,000
South Flagler Avenue	Flagler Beach	177,000
Venice Park	Flagler Beach	185,000
Palm Circle	Flagler Beach	130,000
Joyce and Connecticut swale construction	Flagler Beach	75,000
11th Street swale construction	Flagler Beach	60,000
Marineland Acres stormwater improvements	Flagler County	2,000,000
Nova Canal watershed improvements	Holly Hill	350,000
*Lisa Lake sediment dredging	Ormond Beach	500,000
*John Anderson drainage improvements	Ormond Beach	2,000,000
*Rockefeller Drive outfall water quality structure	Ormond Beach	150,000
*Sanchez Avenue ditch piping and outfall improvement and Sanchez Park boat ramp parking grading and stormwater runoff control	Ormond Beach	360,000
South Ridgewood drainage improvements	Ormond Beach	800,000
Live Oak Avenue outfall water quality structure	Ormond Beach	100,000
Rockefeller Gardens drainage and outfall improvement	Ormond Beach	800,000
Melrose Avenue water quality structure	Ormond Beach	100,000
New Britain water quality structure	Ormond Beach	100,000
Alanwood, Ridgewood, and Sanchez drainage improvements	Ormond Beach	700,000
Alcazar, Buena Vista, and Seville drainage improvements	Ormond Beach	850,000
Roadside swale rehabilitation	Palm Coast	1,564,000
Aerial Photography/Lidar with contours	Palm Coast	350,000

Project	Entity	Cost Estimate
Drainage pipe replacement	Palm Coast	$750,000
Benchmark and Vertical Datum Project	Palm Coast	300,000
Drainage system inventory	Palm Coast	300,000
Street Valley gutter drainage improvements	Palm Coast	770,000
Culvert and mitered end rehabilitation	Palm Coast and Palm Coast Community Service Corp.	1,430,000
Canal control structure access and rehabilitation	Palm Coast Community Service Corp.	253,000
Lehigh Canal rehabilitation	Palm Coast Community Service Corp.	1,450,000
*Cambridge Canal, Rose Bay drainage basin	Port Orange	
*B-19 retention basin	Port Orange	750,000
*The Cove/White Acres regional retention	Port Orange	750,000
Land acquisitions	Port Orange	250,000
Storm sewer reconstruction	Port Orange	200,000
Installation of drainage pipe	Port Orange	16,827
Storm drainpipe lining	Port Orange	990,350
Drainage cost participation	Port Orange	250,000
Area A outfall, U.S. 1 baffle boxes	Port Orange	500,000
*Reed Canal stormwater management facility	South Daytona	150,000
*Boston Avenue stormwater improvements	South Daytona	200,000
*48” Palmetto Avenue (2283)	South Daytona	150,000
Sauls Road deep ditch piping	South Daytona	300,000
Palmetto improvements “F” and “E”	South Daytona	395,000
Violet “A”	South Daytona	420,000
Steele “A”	South Daytona	500,000
Anastasia “B”	South Daytona	660,000
Myrtle “A”	South Daytona	600,000
Greenacres/Palm View/Sheri storm water	South Daytona	600,000
Segrave Street 1600 and 1700 blocks	South Daytona	200,000

Project	Entity	Cost Estimate
36" Halifax Center	South Daytona	$100,000
36" Palmetto extension 2400 block	South Daytona	100,000
15" Sandusky Circle	South Daytona	30,000
24" Palmetto Avenue (2185)	South Daytona	80,000
18" Palmetto Avenue (2003)	South Daytona	60,000
Reef Road drainage outfall	South Daytona	10,440
North Vilano Beach stormwater drainage improvements	St. Johns County	500,000
St. Johns County stormwater retrofit improvements	St. Johns County	5,000,000
*North Peninsula swale project and stormwater improvement, Phase I	Volusia County	500,000
*Raleigh Drive, Atlanta Drive, Culverhouse Drive, Derbyshire Road, and Carmen Avenue flooding	Volusia County	310,000
*Reed Canal spoil disposal/sedimentation basin	Volusia County	225,000
*Tomoka Farms at Old Daytona Road culvert replacement	Volusia County	200,000
Airport Road retention area	Volusia County	225,000
Daytona High Ridge Estates	Volusia County	225,000
Village of Pine Run — Oak Lane box culvert/Pine Tree Drive culvert	Volusia County	330,000
Korona Canal, Phase II	Volusia County	200,000
Compliance and Rules Enforcement Initiative Projects		
Storm system cleaner vac truck	Ormond Beach	$200,000
Street sweeper vacuum system	South Daytona	180,000
Walking excavator and dump truck	Daytona Beach	330,000
Excavator and dump trucks	Palm Coast	274,000
Small vac truck	Palm Coast	142,000
Resource Assessment, Protection, and Restoration Initiative Projects		
*Saltmarsh habitat restoration	Tomoka Park	$600,000
*Inventory the flora and fauna of the estuarine marshes of Tomoka River and Bulow Creek	Tomoka Park	30,000
*Determine the taxonomic status (morphological and genetic analysis) and population distribution of the Atlantic saltmarsh snake in the estuarine marshes of the Tomoka River and Bulow Creek	Tomoka Park	30,000
*Restore the natural hydrology of Bulow Creek by the removal of the large sandbar obstruction in the channel at the mouth of the Korona Canal. Project includes installation of sediment control structures in the Korona Canal to prevent future sediment deposition	East Volusia Mosquito Control District	100,000

Project	Entity	Cost Estimate
*Shoreline stabilization within county parks along the Halifax River and exotic plant removal and native plant re-nourishment within county parks along the Halifax River	Volusia County	$40,000
Acquire the 1,100-acre impoundment and other wetlands and upland tracts identified for the optimum boundary of Bulow Creek State Park and Tomoka State Park in the Multi-Park Unit Management Plan	Tomoka Park	2,000,000
Spruce Creek Basin acquisition (10 parcels)	Volusia County	3,168,792
Tomoka River acquisition (1 parcel)	Volusia County	1,808,606
Halifax River Basin acquisition (4 parcels)	Volusia County	1,950,000
Central Park land acquisition	Ormond Beach	100,000
Habitat preservation of the Russell property	Ormond Beach	1,300,000
Habitat preservation of Alligator Island	Ormond Beach	—
Habitat preservation of Dodson Creek	Ormond Beach	320,000
Habitat preservation of parcel 4238-01-31-0010	Ormond Beach	500,000
Habitat preservation of the Goldy parcel	Ormond Beach	90,000
Habitat preservation of Sun Country	Ormond Beach	365,000
Habitat preservation of the Wolcott property	Ormond Beach	190,000
Moultrie Creek shoreline stabilization	St. Johns County	250,000
Summerhaven shoreline revegetation	St. Johns County	110,000
Fort Mose land acquisition	St. Johns County	407,000
Total		$77,121,138

Note: — = no information supplied