

Lower Charlotte Harbor Reconnaissance Report



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1. Introduction

Purpose

On February 13, 2003, the South Florida Water Management District (SFWMD) Governing Board designated Lower Charlotte Harbor a priority Surface Water Improvement and Management (SWIM) waterbody pursuant to Florida Statutes section 373.453. The purpose of the SWIM designation is to prioritize water bodies of regional or statewide significance. The SFWMD defines Lower Charlotte Harbor (LCH) as the watersheds of Pine Island Sound, Matlacha Pass, East and West Caloosahatchee, Estero Bay, and lower portion of Charlotte Harbor proper. This Reconnaissance Report will be the primary data source document used in preparing the SWIM Plan for Lower Charlotte Harbor.

The Florida Legislature enacted the Surface Water Improvement and Management (SWIM) Act (Sections 373.451-373.4595, Florida Statutes) in 1987. The legislature recognized through F.S. 373.451(2) “that the water quality of many of the surface waters of the state has been degraded, or is in danger of becoming degraded, and that the natural systems associated with many surface waters have been altered so that these surface waters no longer perform the important functions that they once performed. These functions include:

- (a) Providing aesthetic and recreational pleasure for the people of the state;
- (b) Providing habitat for native plants, fish, and wildlife, including endangered and threatened species;
- (c) Providing safe drinking water to the growing population of the state; and
- (d) Attracting visitors and accruing other economic benefits.”

The Act required each water management district to identify and maintain a priority list of water bodies of regional or statewide significance, and develop plans and programs for the improvement of those water bodies.

Per F.S. 373.453, the water management district may develop SWIM Plans and Programs which describe the actions to be implemented to maintain or improve the water body and the natural systems associated with the water body. A completed SWIM Plan is also critical in planning state financial support for the identified actions.

Criteria used by the SFWMD Governing Board in designating Lower Charlotte Harbor as a SWIM water body included consideration of violations of water quality standards occurring in the water body; the amounts of nutrients entering the water body; the Department of Environmental Protection (FDEP) list of impaired waters; the existence of or need for a continuous aquatic weed control program; the biological condition of the water body; reduced fish and wildlife values; threats to agricultural and urban water supplies; threats to public recreational opportunities; the management of the water body through federal, state, or local water quality programs or plans; and public input.

The entire Charlotte Harbor through acceptance into the National Estuary Program is also recognized by the U.S. Environmental Protection Agency (US EPA) as an estuary of national significance. The LCH area of Charlotte Harbor is part of the Comprehensive Everglades Restoration Plan (CERP) and the Southwest Florida Feasibility Study (SWFFS).

The purpose of this SWIM Reconnaissance report is to review and summarize existing information about area basins, also referred to as planning units, to identify the body of knowledge of current water quality, water quantity, and ecological features of the basins in the Lower Charlotte Harbor watershed.

This report identifies and presents in summary form the existing sources of data, information, and related programs for Lower Charlotte Harbor. The Reconnaissance Report also serves as a compendium of information resources and will be the primary reference document for the SWIM Plan.

The Calusa Restoration Coordination Team (CRCT) served as the technical advisory committee for the development of the Reconnaissance Report. The CRCT is a geographic sub-team of the Southwest Florida Regional Restoration Coordination Team (SWFRRCT) which was chartered by the Everglades Restoration Working Group. The membership is identified on page iii.

Project Description

The SWIM Act delineates the required components of SWIM Plans in FS 373.453:

- (a) A description of the water body system, its historical and current uses, its hydrology, and the conditions that have led to the need for restoration or protection;
- (b) An identification of all governmental units that have jurisdiction over the water body and its drainage basin within the approved surface water improvement and management plan area, including local, regional, state, and federal units;
- (c) A description of land uses within the drainage basin of the priority water body and those of important tributaries;
- (d) Identification of point and non-point sources of water pollution that are discharged into the water body and its important tributaries;
- (e) A description of strategies and a schedule for related management actions for restoring or protecting the water body to Class III or better, including those needed to help achieve state-adopted total maximum daily loads for the water body;
- (f) A description of the management actions needed to maintain the water body once it has been restored and to prevent future degradation; and
- (g) An estimate of the funding needed to carry out the restoration or protection strategies and a listing of available and potential funding sources and amounts.

This reconnaissance report presents information on issues (a) through (e) above.

Other topics covered in this reconnaissance report include:

- Water quality status and trends
- Impaired waters listing
- Aquatic weed control programs
- Biological conditions of the water body
- Threats to Fish and Wildlife Values
- Threats to agricultural and urban water supplies
- Existing water quality programs and plans

This Report uses the entire Charlotte Harbor Proper Planning Unit which allows for overlap with the Southwest Florida Water Management District's (SWFWMD) Charlotte Harbor SWIM Plan that was updated in 2000. This overlap will facilitate coordination between the two plans.

2. Lower Charlotte Harbor Water Body System

General Overview

LCH is located on the lower west coast of Florida, on the Gulf of Mexico. LCH extends 60 miles along the Gulf coast. It is 75 miles at its widest point, from the mouth of San Carlos Bay along the Caloosahatchee to Lake Okeechobee. The area includes the Cape Coral-Fort Myers Metropolitan Statistical Area.

The entire area is over 2,400 square miles and the land area is 2,000 square miles. Numerous creeks and rivers drain to form a series of bays, sounds, passes, and a natural harbor. These are separated from the Gulf by a series of barrier islands and passes. Major passes along the 45 mile stretch from Gasparilla Sound to San Carlos Bay include Little Gasparilla Pass, Boca Grande Pass, Captiva Pass, and Blind Pass. The major passes on Estero Bay include Matanzas Pass, Big Carlos Pass, Big Hickory Pass, Little Hickory Pass, and Wiggins Pass. (Antonini, et. al. 2002).

The LCH area is composed of a variety of landscapes with urban development comprising approximately 15% of the total LCH area. The urban development is primarily concentrated at the mouth of the Caloosahatchee River in the southeaster section of the Charlotte Harbor basin, the southeastern and southwestern section of the Caloosahatchee Estuary basin, and in the western portion of the Estero Bay basin. Other smaller urbanized areas include the City of LaBelle, Moore Haven, and Clewiston in the Freshwater Caloosahatchee basin in Hendry and Glades Counties. Interspersed between these urbanized areas are sections of public conservation land, agricultural land, other native land habitats, uplands, floodplain and riverine wetlands, tidal marsh and open water.

LCH includes almost 190,000 acres of managed public conservation areas, or 15% of the LCH land area, including the Babcock-Webb Wildlife Management Area, the Charlotte Harbor Buffer Preserve State Park, and the western part of the Corkscrew Regional Ecosystem Watershed (CREW). Agriculture covers approximately 25%, native land habitats 37%, and open water 22%.

The natural hydrology has been altered by man-made canals, water control structures, drainage ditches, berms, and roads. In 1881, a hydraulic connection was dredged between the Caloosahatchee and Lake Okeechobee, which is now called C-43 or the Okeechobee Waterway. The Intracoastal Waterway (ICW) runs from Lemon Bay in the north, through Pine Island Sound, and along the Caloosahatchee to Lake Okeechobee.

The basins comprising LCH include Charlotte Harbor/Pine Island Sound, Tidal Caloosahatchee, Freshwater Caloosahatchee, and Estero Bay (Table 1 and Figure 1). The basins are also represented by the FDEP Plan Units which are further defined by water body identification (WBID) areas (Table 2 and Figure 3). For the purposes of the analysis by basins, the Orange River plan unit and the Telegraph Swamp plan unit will be considered with the Caloosahatchee Estuary plan unit. The Charlotte Harbor Proper plan unit and the Pine Island plan unit will be considered together. The East Caloosahatchee plan unit and West Caloosahatchee plan unit represent the Freshwater Caloosahatchee basin.

Table 1: FDEP Basins of Lower Charlotte Harbor (LCH)

Basin	Area (acres)	Area (square miles)
Caloosahatchee Estuary	289,982.4	453.1
Charlotte Harbor/Pine Island	458,246.6	716.0
Freshwater Caloosahatchee	610,481.8	953.9
Estero Bay	221,019.8	345.3
Total	1,579,730.6	2,468.3

Figure 1: FDEP Basins of Lower Charlotte Harbor (LCH)

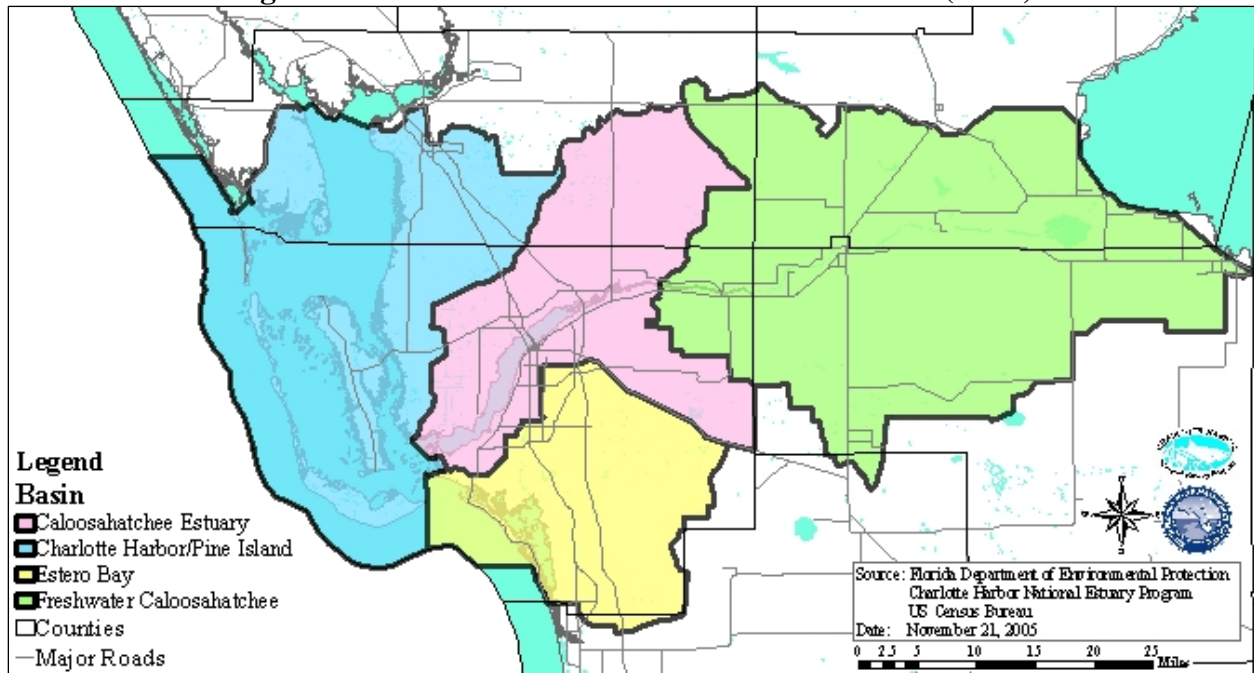
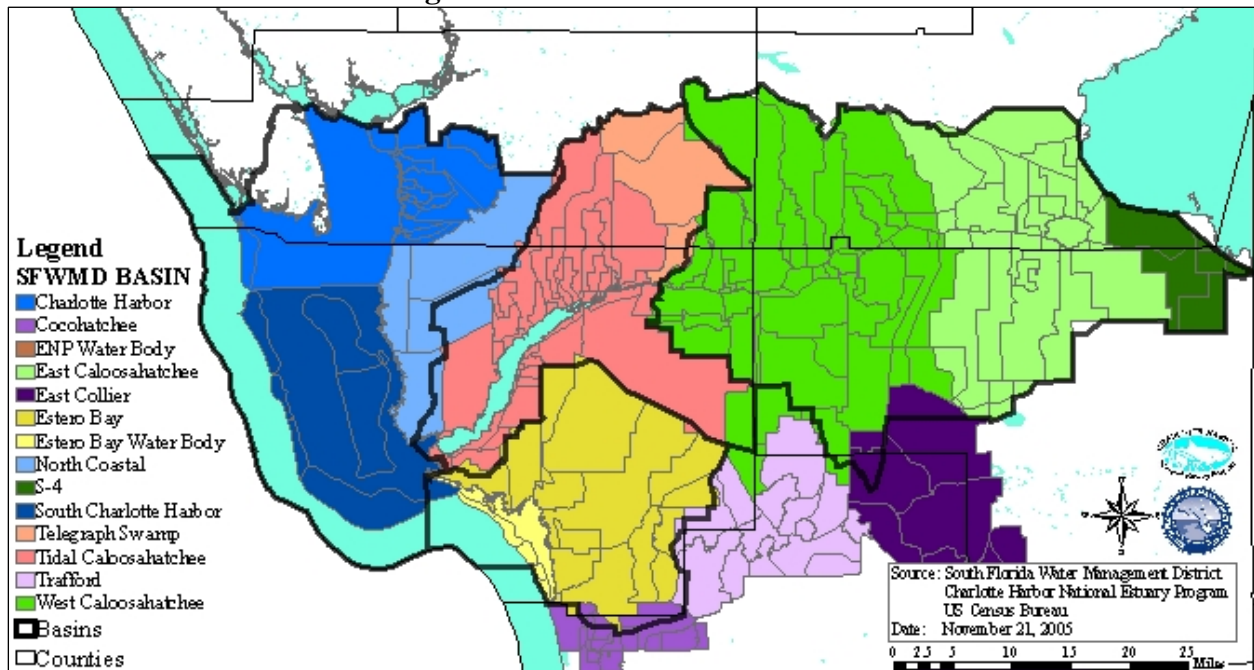


Figure 2: SFWMD Basins of LCH

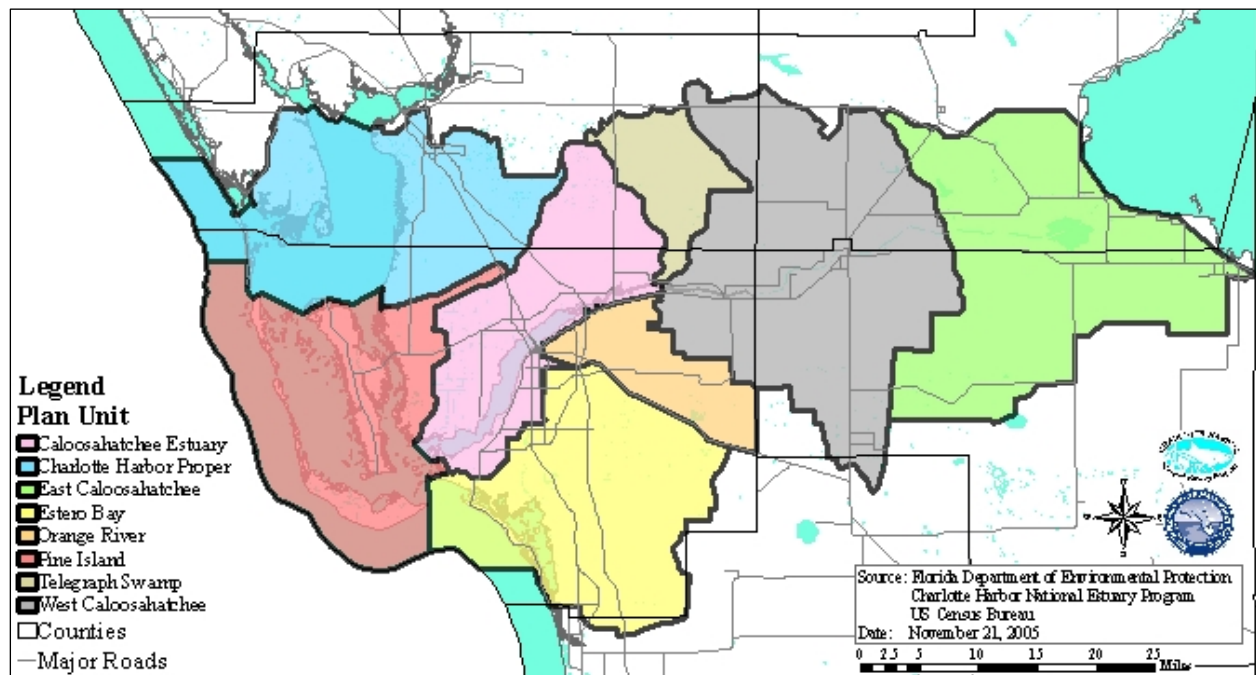


SFWMD has delineated basins in LCH differently than FDEP (See Figure 2 above). Compared to FDEP's Plan Units below, Charlotte Harbor does not include Cape Haze, most of North Coastal is in the Pine Island Plan Unit except for a small area attributed to the Caloosahatchee Estuary, the southern headwaters of West Caloosahatchee extends into the Trafford and Orange River Plan Units, S-4 is identified separately from the East Caloosahatchee, and the northern headwaters of the Cocohatchee are in the Estero Bay Plan Unit. As a result of flooding in 1995, SFWMD determined that Trafford basin flows west to the Estero Bay or south depending on the amount of rainfall.

Table 2: FDEP Plan Units of LCH

Plan Unit Name	Basin	Area (acres)	Area (square miles)
Caloosahatchee Estuary	Caloosahatchee Estuary	165,725.6	258.9
Orange River	Caloosahatchee Estuary	66,633.4	104.1
Telegraph Swamp	Caloosahatchee Estuary	57,623.4	90.0
Charlotte Harbor Proper	Charlotte Harbor/Pine Island	233,013.0	364.1
Pine Island	Charlotte Harbor/Pine Island	225,233.6	351.9
Estero Bay	Estero Bay	221,019.8	345.3
East Caloosahatchee	Freshwater Caloosahatchee	285,502.5	446.1
West Caloosahatchee	Freshwater Caloosahatchee	324,979.3	507.8
	Total	1,579,730.6	2,468.3

Figure 3: FDEP Plan Units of LCH



Physiographic Areas

Charlotte Harbor/Pine Island Sound Basin

Much of the Charlotte Harbor basin emerged from a shallow sea during the Miocene and Pleistocene epochs. Only the immediate coastal areas remained inundated until about one million years ago. Most of this area lies within the Gulf Coast Lowlands or DeSoto Plains physiographic regions, both of which are composed primarily of marine sands and sediments (SWFRPC 1995). These soils are all deep, nearly flat, and poorly drained. Northern portions of the Charlotte Harbor subregion, primarily within the Peace River drainage, are characterized by cypress and hardwood hammocks and extensive areas of poorly drained marshes. Central and southern areas include marsh, dry and wet prairies, pine flatwoods, and estuaries (FDEP 1995). Mesic flatwoods support a wide diversity of animals and represent the third highest species richness of vegetative communities in Florida (Beever and Dryden 1998). Dry prairie is one of the most widespread upland vegetative communities in the Charlotte Harbor basin. Coastal areas, including Charlotte Harbor proper, contain expanses of seagrass beds, mangrove, and coastal strand communities. There are roughly 23,675 ha (58,500 acres) of seagrass in Charlotte Harbor (CHNEP 1996); this community provides important ecological functions that benefit many threatened and endangered species as well as migratory birds. Mangroves provide a variety of habitats and food resources for a diversity of animals, serve to hold and stabilize intertidal sediments, and provide erosion protection for adjacent uplands (FWS, 1999).

The Gator Slough portion of the Charlotte Harbor/Pine Island Sound basin encompasses approximately 55 square miles. The watershed runs from Matlacha Pass in Lee County, northeasterly, to the vicinity of Tuckers Grade in the Cecil Webb Wildlife Management Area in Charlotte County. During the late 1950's early 1960's, GAC constructed a development which included creation of 400 miles of canals to provide waterfront property for what has today become the City of Cape Coral. Running diagonally through the City is a canal known today as the Gator Slough Canal. Prior to the construction of the GAC, development surface water flowed in a southwest direction into the Pine Island Sound. With the advent of the GAC canal construction, Gator Slough was altered from a natural slough to a large canal. Stormwater is now delivered from the north eastern reaches of the watershed to an outfall located in Matlacha Pass, associated with Pine Island Sound. Drainage systems along US 41 in Charlotte County also tie into Gator Slough Canal.

Caloosahatchee Basins

In pre-development times, the Caloosahatchee River was a smaller, meandering river originating at the west end of Lake Flirt and extending to Beautiful Island in Ft. Myers. East of Lake Flirt, there was only sawgrass marsh extending to Lake Okeechobee with evidence of Indian canoe trails. The area was subject to prolonged flooding, and cattle ranching was the primary human land use in the basin. Intensive agriculture was not a major land use in the watershed until large scale drainage projects were constructed beginning with the Disston Canal in the 1880's; additional channelization and construction of the combination lock and dam structures at Moore Haven (S-77) and Ortona (S-78) in 1937; and continuing with final widening and construction of the C-43 Canal in the 1950's and completion of the Franklin Lock and Dam (S-79) in 1966 (Flaig and Capece 1998).

The Caloosahatchee River (C-43 Canal) currently extends about 68 kilometers [km] (42 miles) from Lake Okeechobee to S-79. The final downstream structure on C-43, S-79, defines the beginning of the Caloosahatchee Estuary. The Caloosahatchee Estuary extends for about 42 km

(26 miles) to Shell Point, adjacent to San Carlos Bay, Pine Island Sound, Charlotte Harbor to the northwest, and Estero Bay to the southeast. The open waters of the Gulf of Mexico are located just outside of San Carlos Bay south and west of Sanibel Island. Construction of the C-43 Canal, agricultural development of the watershed enhanced by the availability of irrigation water from the C-43 Canal, urban development in the Ft. Myers/Cape Coral area, and regulatory releases of freshwater from Lake Okeechobee have been linked to significant water quality changes in the Caloosahatchee Estuary (Flaig and Capece 1998; Chamberlain and Doering 1998; Barnes *et al.* 2004; ERD 2003; FDEP 2003). Water quality parameters of concern in the Caloosahatchee Estuary include salinity, nutrients, turbidity, trace organics, and metals (SFWMD 2005).

The freshwater Caloosahatchee River (C-43 Canal) can be functionally divided into East and West segments. The East Caloosahatchee Basin includes 982 km² (379 mi²) and extends from Moore Haven (S-77) upstream to Ortona (S-78) downstream. This area includes the 160-km² S-4 Basin (62 mi²) and the 43 km² S-236 Basin (16.5 mi²). The West Caloosahatchee Basin includes 1,445 km² (558 mi²) and extends from Ortona (S-78) to the Franklin Lock and Dam structure (S-79) downstream. The Telegraph Swamp Basin includes an additional 228 km² (88 mi²), its outfall just downstream of S-79. The freshwater portion of the Caloosahatchee River (C-43 Canal) ranges from about 50 to 130 m in width and 6 to 9 m deep. Many of the original oxbows still exist outside the footprint of the C-43 Canal (SFWMD 2005).

The major physiographic provinces of the Caloosahatchee River subregion are the Caloosahatchee Valley, Gulf Coast Lowlands, DeSoto Plain and the Immokalee Rise (Southwest Florida Regional Planning Council 1995). Within this subregion, the Immokalee Rise includes most of Hendry County and eastern Lee County. It is about 8 m (25 ft) in elevation, but can peak at 11 m (36 ft) and 13 m (43 ft) in some areas. All soils are deep, nearly level, and poorly drained, with a water table less than 25 cm (10 in) from the surface during at least part of the year (SWFRPC 1995). Historically, the Caloosahatchee River was a shallow, meandering 80 km (50 mi) long system, with headwaters near Lake Hicpochee (Science Subgroup 1996). Today, however, it extends approximately 114 km (71 mi) from Lake Okeechobee to San Carlos Bay, as a channelized flood control and navigational waterway. The river is supplied by inflows from Lake Okeechobee and runoff within its own basin. It was extended to Lake Okeechobee by dredging in 1884, and was subsequently channelized to improve navigation and flood control.

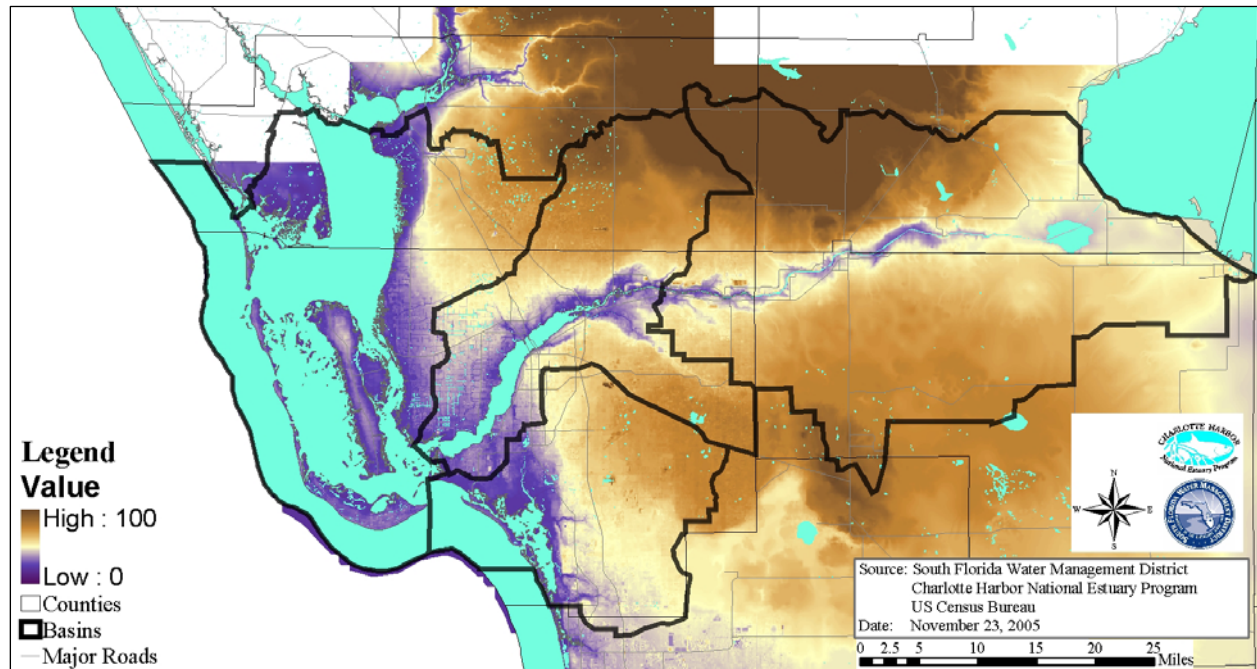
Rainfall averages about 52 in/yr (132 cm/yr) in the Caloosahatchee Basin. Yearly rainfall was highly variable, ranging from about 30 to 80 in/yr (75 to 200 cm/yr) during the period of record from 1931 to 2001. Rainfall is also seasonal with a dry season typically extending from November through April and a wet season extending from May through October. Tropical storms and hurricanes may contribute record rainfall amounts during late summer and early fall periods (SFWMD 2005).

Annual runoff from the Caloosahatchee Basin was estimated as about 20% of average annual rainfall over a 10-year period from 1970 to 1979 (USGS 1983). Average flows increase with travel distance downstream from S-77 at Moore Haven (734 cfs or 20.8 m³/s) to S-79 just upstream of Ft. Myers (1,730 cfs or 49.0 m³/s) primarily in response to non-point source inputs from the surrounding watershed. Annual flow variation at these stations is great in response to rainfall within the watershed and due to regulatory releases from Lake Okeechobee at S-77. Peak annual average discharges range from about 2,600 cfs (74 m³/s) at S-77 to about 4,700 cfs (133 m³/s) at S-79. Maximum daily discharges at the three structures ranged from 8,816 cfs (250 m³/s) at S-77 to 21,400 cfs (606 m³/s) at S-79 (SFWMD 2005).

Estero Basin

The Estero Bay estuary and watershed in southwestern Lee County, consists of Estero Bay and associated barrier islands, the Estero Bay basin, including the Imperial and Estero rivers, and the Six-Mile Cypress Slough Watershed (Science Subgroup 1996). Estero Bay is a shallow, subtropical estuarine lagoon, approximately 4,580 hectare (ha, ~11,317 acres) in area. Five creeks and rivers drain into the bay including Hendry Creek, Mullock Creek, Estero River, Spring Creek, and Imperial River. The Six-Mile Cypress Slough subbasin (830 ha or 2,051 acres) is in central Lee County. Estero Bay is separated from the Gulf of Mexico by several barrier islands: Estero Island, the Lovers Key complex (Long Key, Lovers Key, Black Island), Big Hickory Island, Little Hickory Island, and Bonita Beach Island (CHNEP 1996).

Figure 4: Topography of LCH



The meandering Caloosahatchee floodplain, Gulf Coast Lowlands, DeSoto Plain and the Immokalee Rise are apparent in the topographic maps shown in Figure 4. The topographic assessment was developed as a component of the Southwest Florida Feasibility Study using Lidar technology.

Geologic and Human History of Lower Charlotte Harbor

The basement rock of Florida is on a separate plate from most of the rest of North America. The plate underlying what is now Florida is technically called the Tallahassee-Suwanee Terrane and is a fragment from the Gondwana plate. This Gondwana plate fragment was adjacent to present-day West Africa and South America during the Devonian, 390 million years ago (mya). This was also the time of the first amphibians and jawed fishes.

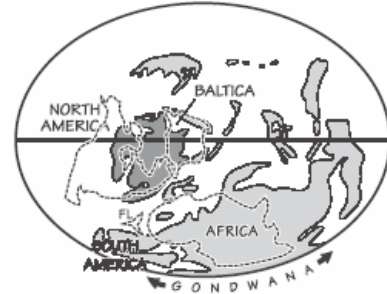
In the period including the Mississippian, Pennsylvanian, and Permian 354-250 million years ago, Gondwana collided with proto-North America, forming the super-continent, Pangea. The collision also formed the central south Appalachian Mountains. This period represents the late Paleozoic and the emergence of scale trees, seed ferns, and the first reptiles. The Permian had major extinctions of many marine forms of life.

During the Triassic and Jurassic periods, 250-142 million years ago, Pangea began to split and rifts are created in the crust. With the formation of the rift basins, the Atlantic Ocean and Gulf of Mexico began opening. During the Triassic, the first dinosaurs and mammals emerged. Dinosaurs dominated the Jurassic and the first birds evolved.

It was during the period including the Cretaceous, Tertiary, and Quaternary that Florida drifted to its present location and emerged from the sea. Common fossils found in Lower Charlotte Harbor include marine fossils such as sharks teeth and manatees and also land mammals such as giant sloth.

The surface geology of the Lower Charlotte Harbor area is characterized by Quaternary (Holocene-10 tya and Pleistocene-1.8 mya) and Tertiary (Pliocene- 2 mya and Miocene- 2.4 mya) deposits. The basement rock from Gondwana is now thousands of feet below the surface. The resulting aquifer systems of significance in the Lower Charlotte Harbor Area (and in fact for all of Florida) are from the Quaternary and Tertiary periods. The deepest of the aquifer systems is the Floridan, followed by the Intermediate, with the Surficial Aquifer System at the surface.

Devonian (417-354 mya)



Mississippian-Permian (354-250 mya)



Triassic-Jurassic (250-142 mya)



Cretaceous-Quaternary (142 mya-Present)

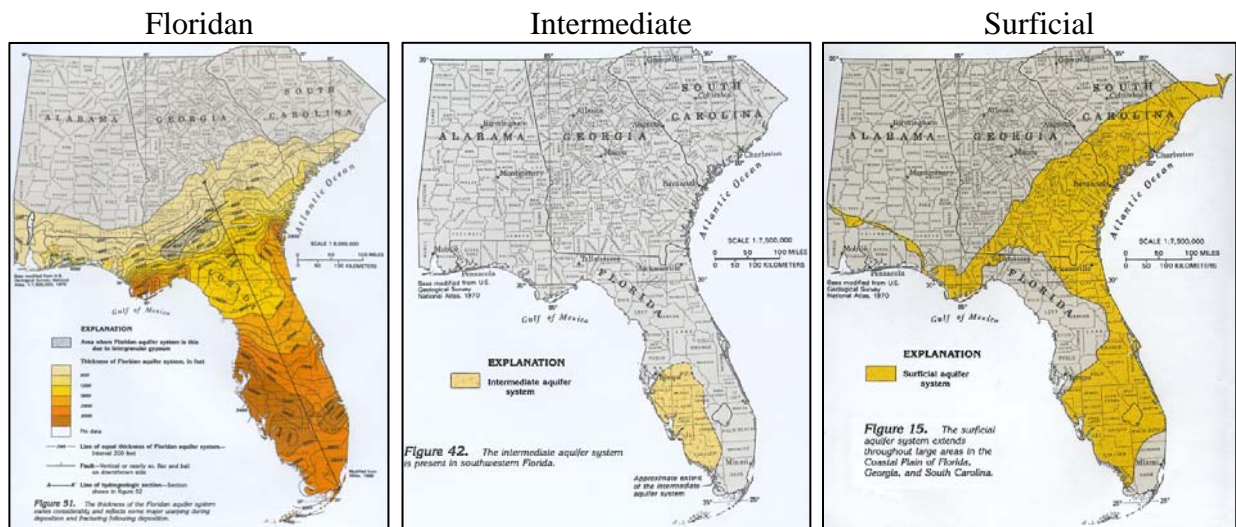


Dark areas above the water. Figures by J. Houghton, after C. Scotese, Paleomap Project, 2000 (www.scorcese.com). From www.priweb.org/ed/TFGuide/SE/se_geohist/se_geohist_pdfs/geo_history_se.pdf.

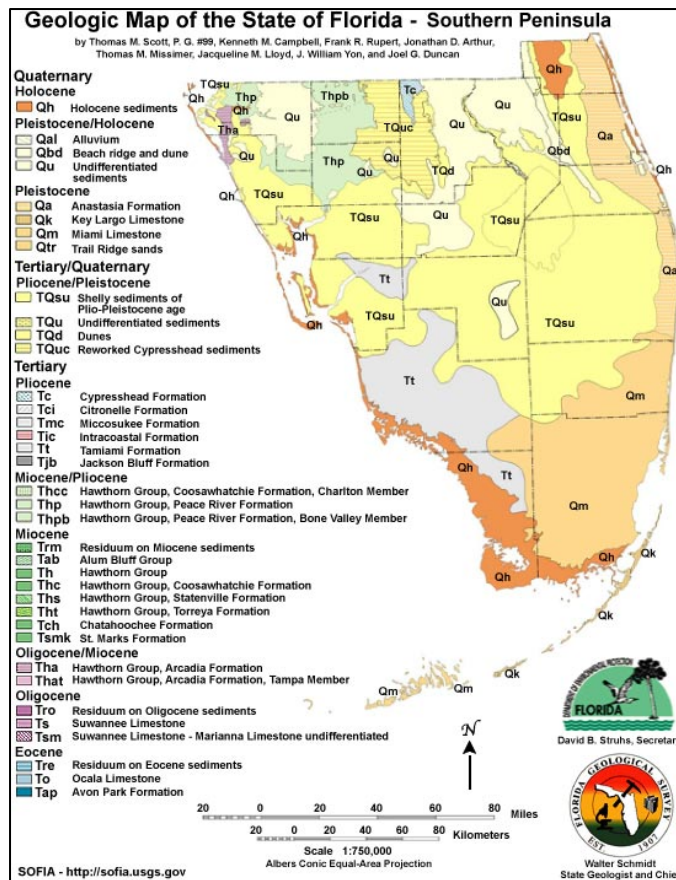
Period	Series	Surface Geology	Stratigraphic and Hydrologic Units		Thickness (in Feet)	Lithology	
Quaternary	Holocene	Qh/Qu	Undifferentiated alluvium and terrace deposits	Surficial Aquifer System	20-75	Sand with local shell beds	
	Pleistocene	TQsu	Caloosahatchee Marl		20-75	Marl with minor shell and silt, Shelly sediments	
Tertiary	Pliocene	Tt	Tamiami Formation	Confining Unit	20-75	Sand, limestone, and shell beds. Thick clay near top.	
				Tamiami Unit			
	Miocene	No Surface Exposures	Hawthorn Unit	Upper Hawthorn Confining Unit	Intermediate Aquifer System	300-500	Mostly limestone, sandy limestone, and sand. Phosphatic in part. Dolomite beds common. Clayey in middle part.
				Sandstone Aquifer			
				Confining Unit			
				Mid-Hawthorn Unit			
				Lower Hawthorn Confining Unit			
				Insufficient Data			
	Oligocene	No Surface Exposures	Floridan Unit	Upper Floridan	Floridan Aquifer System	3000-3400	Thick sequence of carbonate rocks (limestone and dolomite).
	Confining Unit						
Lower Floridan							
Confining Unit							

(Stratigraphy assembled from Miller 1990 and SFWMD 2004)

All three aquifer systems are characterized by calcareous sedimentary rock with clayey confining layers of lower permeability. Each aquifer system has different extents in the southeastern United States. The Floridan underlies all of Florida and the southern extents of Alabama, Georgia and South Carolina. The Lower Charlotte Harbor area is the area where the unit is at its thickest. The Intermediate aquifer is restricted to Southwest Florida. Finally, the Surficial Aquifer covers all of the Lower Charlotte Harbor Area, the Atlantic Coast north of Palm Beach, and Apalachicola.



(Maps from Miller 1990)



According to the “Geologic Map of the State of Florida – Southern Peninsula,” the surface geology for Lower Charlotte Harbor is comprised of Holocene sediments (Qh), undifferentiated sediments (Qu), shelly sediments of Plio-Pleistocene age (TQsu), and the Tamiami Formation (Tt). These exposures represent the Surficial Aquifer.

The Holocene sediments (Qh and Qu) are probably from an interglacial period of rising sea levels and coastal marshes advancing inland. A period of erosion predated the deposition of these sediments during the low sea level stages in the late Pleistocene. The Caloosahatchee formation (TQsu) was deposited in the Pleistocene and late Pliocene ages. In this epoch, there were both glacial and interglacial periods (Gleason and Stone 1994).

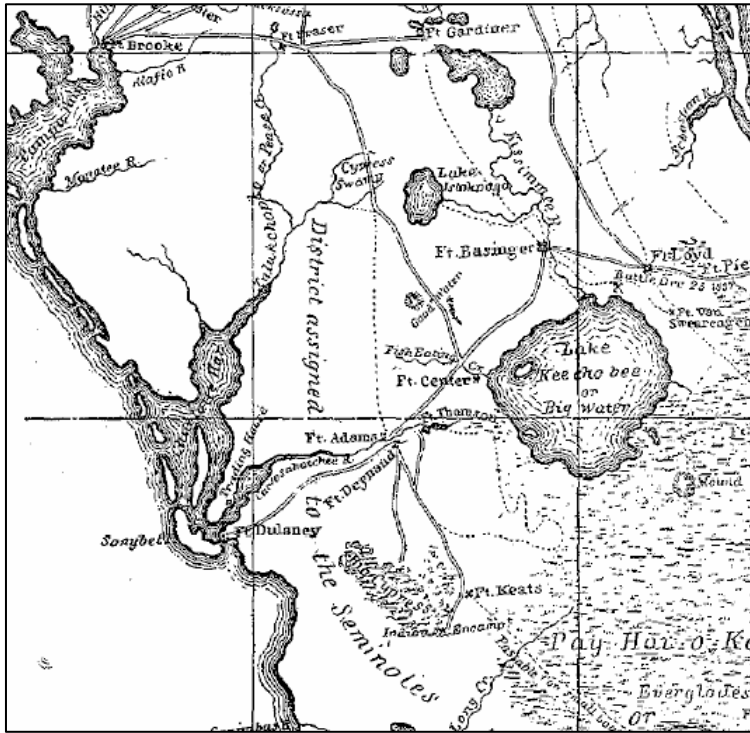
Calusa Period

The Calusa Period spanned from 4000 BC to 1710 AD. As new archeological data are analyzed the date of the first human habitation of Florida is pushed earlier and earlier. It is currently estimated that the first human habitation of Lower Charlotte Harbor was approximately 10,000 years ago. These first inhabitants were nomadic people who used flint tools. Villages developed as fishing skills increased. Farming, pottery skills, and trade with people outside of Florida developed between 3,000 and 500 years ago. Archeological records indicate that copper, iron ore and maize seeds were prized imports, while pearls, shells, and fish bones were the primary exports. During this period, mound building began and ceramic pottery was used to store goods.

The Lower Charlotte Harbor area was the center of the Kingdom of the Calusa. It is thought that this tribe came from the Caribbean Islands around 2,000 years ago. As other Indian civilizations had in the Americas, the Calusa built large mounds on which important buildings were constructed. Structures on the mounds ranged from the residence of Chief to temple-like buildings. Recent discoveries indicate that the Calusa built small canals that served as access to Lake Okeechobee and the Kissimmee River from the Caloosahatchee (Jones, 1996). The first documented European to visit Lower Charlotte Harbor was Ponce de León on June 4, 1513. At the time, the area was controlled by the Calusa, a tribe led by a “strong, centralized chiefdom.” The Calusa attacked the Spaniards’ ships after they entered into Charlotte Harbor. After two attacks, the Spanish retreated. A tenuous alliance was later formed between the Calusa and the Spanish in 1567. However, the Spanish did not want to help the Calusa against their enemy the Tocobaga and the Calusa were disinterested in Christianity, so the alliance dissolved. As with many Native American tribes, the Calusa succumbed to disease. There is evidence that the last remnants of the tribe settled in Cuba in the late 1800’s (Jones, 1996).

Cuban Period

The Cuban Period spanned from 1710 to 1836. Southwest Florida, while it was under Spanish control, was not a center for major settlement. However, fishing camps were established by people of direct Spanish and Cuban descent. Beyond fishing camps, the settlement history of



1840 Map of East Florida Reduced from the map compiled by Capt. John MacKay and Leut. J.E. Blake.

http://fulltext6.fcla.edu/DLData/SN/SN00154113/0005_003/5no3.pdf

southwest Florida was driven by military decisions associated with the Seminole Wars. The name Seminole is from the Creek word 'semino le', meaning 'runaway.'¹ The term was first applied to the tribe about 1778. There were three Seminole Wars in Florida; first Seminole War started in 1817 and shortly, thereafter, Spain ceded Florida to the United States. The Treaty of Camp Moultrie was signed in 1823, legally establishing large parts of Lower Charlotte Harbor as the promised Seminole territory. The Seminole War ended in 1842 with an agreement that the Seminoles could remain in Florida but forced further south. By 1840, the Lower Charlotte Harbor area had several forts: Fort Dulany, Fort Denaud, Fort Adams, and Fort Thompson.

American Period

The American Period spans from 1836 to the present.

Tidal Caloosahatchee

Fort Myers was established after a hurricane destroyed Fort Dulany in October 1841. Originally named Fort Harvie, Fort Myers was renamed after Colonel Abraham C. Myers. Fort Myers was abandoned by the military after its occupation by federal troops during the Civil War from 1863-1865. After the war, the economy of the area was built on lumber, cattle, and the Cuban gold used to pay for the cattle. In 1876, the plat for Fort Myers was recorded in Key West, county seat for Monroe County, which then included all of what is now Lee County. In the late 1800's, pineapple plantations were created along the Caloosahatchee River. Lee County was established in 1884, just one year after Henry Disston dredged a small channel connecting the Caloosahatchee to Lake Okechobee.

The 1900 census documented that there were 943 residents of Fort Myers and over 3,000 residents in Lee County. In the early 20th century, a building boom was fueled by the arrival of

A better description of the meaning can be "emigrants who left the main body and settled elsewhere."¹

the Coast Railroad. Several hotels and residential developments were built during this time, including Edgewood, Wardwood Grove, and what is now known as Dean Park. By 1919, the streets in downtown Fort Myers were paved. The Tamiami Trail linking Tampa to Miami through Fort Myers was built in the early 1920's.



Comprehensive 1920's Plan of Development: Fort Myers

By the late 1920's, Fort Myers adopted a City Plan, prepared by Herbert S. Swan, which documented the concerns and priorities of the residents. Notable aspects include the presence of Lofton Island, plans for the Edison Bridge at the end of Freemont Street², and the presence of a canal parallel with Canal Street (draining the headwaters of Manuel's Branch). Industries in the city included five citrus packing houses, two produce packing houses, wood-working mills, cigar factories, machine shops, and a marine railway. The Plan incorporated recommendations to "[p]revent pollution of the Caloosahatchee River, by

passing an ordinance forbidding the dumping of refuse therein, and by sanitary inspection" and "[u]rge upon Congress the improvement of the river approach at Fort Myers and aid so far as practicable the projected waterway across the state via the Caloosahatchee River." Both of these recommendations were implemented. Furthermore, the plan recommended that "[s]anitary sewage should be settled and screened before discharge into the river, with outlet in the thread of the stream where sewage would be least likely to return to the shore." Recommendations for establishing parkland buffers along the Caloosahatchee River, Billy's Creek, Manuel's Branch (from the river to Canal Street), and Whiskey Creek were not implemented. Water drainage was also a concern. "Nature offers very little assistance in drainage owing to the low elevations, the very flat surface, and the somewhat impervious soil... Many artificial canals have been opened to



Water hyacinths in Caloosahatchee River.

aid nature in disposing surface water." (Fort Myers Florida Planning Board, estimated to be 1926) Water hyacinth (*Piaropus crassipes*), now *Eichhornia crassipes*, was reported in the plan to have escaped 35 years previously. The Federal government funded "its removal as an obstacle to navigation by any means necessary except chemical processes injurious to cattle" (Fort Myers Florida Planning Board, estimated to be 1926).

The Caloosahatchee River was described as undesirable for swimming "not only on account

² The Edison bridge, which now has two spans, was built at the foot of Fowler Street.

of marine life in these waters, which is disturbing to bathers, but also on account of the pollution in the river.” The source of drinking water at the time was not the Caloosahatchee but rather artesian wells. The City maintained 5 wells drilled to a depth of approximately 1,000 feet, all giving a pressure head of about 45 feet. “The principal supply came from a level of 875 feet with a volume of 650 gallons per minute.” The water was retained in concrete tanks and reported to be somewhat hard. “Rain water collected from the roof in wooden tanks is preferred by some people” (Fort Myers Florida Planning Board, estimated to be 1926).

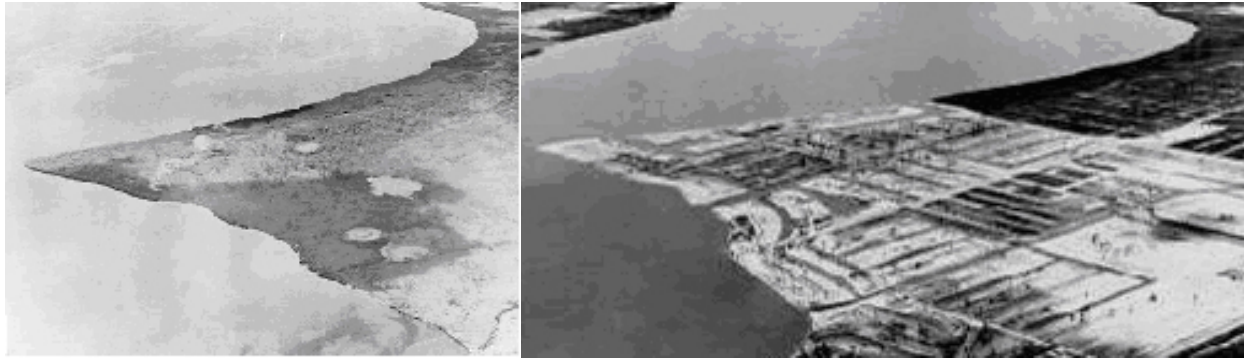
From the 1930s to 1950s, development outside the cities was scattered, consisting mainly of homesteading families that either cattle ranches or farmed. However, the presence of the Air Force training base at Buckingham during World War II introduced many to the area.

The development of Cape Coral began in 1957, when Leonard and Jack Rosen, land speculators from Baltimore, purchased over 100 square miles of undeveloped land between the Caloosahatchee River and Matlacha Pass for \$678,000. The Rosen brothers’ company, the Gulf American Corporation (GAC), began by developing the land around Redfish Point, which today is the location of the Cape Coral Yacht Club. By 1958, the first resident had moved in and development progressed rapidly with extensive dredge and fill operations. The peninsula that had



Cape Coral from 1940 era Aerials

been known only to hunters, fisherman, and a few homesteaders was eventually converted from its original pine flatwoods, freshwater wetlands, and mangrove forest/salt marsh fringe, into the second largest city by land area in Florida. The development actions created over 400 miles of canals (300 miles freshwater and 100 miles saltwater), 1,700 miles of roads, and about 350,000 platted lots - many of which were not large enough for a house. GAC launched an aggressive marketing campaign that reached people throughout the country and beyond. Prospective buyers were brought down by the plane-load and pitched the good life in a Florida waterfront wonderland. Although Cape Coral has become a successful city, it is cited as one of the infamous Florida land scams of the 1950’s and 1960’s, complete with unethical and illegal sales tactics, and shady political connections.



Redfish Point Before and After 1959

The Cape Coral Bridge across the Caloosahatchee River connecting Cape Coral to Fort Myers via College Parkway and Cape Coral Parkway was opened in 1964, making the area much more accessible to potential buyers. The Rosen Brothers sold the company to GAC in 1968, but remained consultants for the company. The City of Cape Coral was incorporated in 1970 with a population of 11,470. By 1976, GAC had filed for bankruptcy and been formally warned by the Florida Department of Environmental Regulation (DER) for ongoing, unpermitted dredge and fill violations. In 1977, a Consent Order was signed by GAC and the DER to resolve these violations and to attempt to buffer and/or improve water quality within the Cape Coral development before it reached Matlacha Pass or the Caloosahatchee River. Covenants of the Order included: deeding of remaining undeveloped lands to the state of Florida (predominately tidal wetlands along western boundary of Cape Coral bordering Matlacha Pass); construction of a perimeter spreader waterway on the western edge of development to improve water quality entering into Matlacha Pass; cessation of further dredge and fill operations beyond the spreader waterway; construction of swales and weirs within the development to increase upland stormwater retention; blockage of direct hydrologic connections between internal canals and waters of the state; and a Pollution Recover Fund (totaling \$1 million) to fund water quality and quantity studies and projects in Cape Coral.³

Freshwater Caloosahatchee

Historically, the Caloosahatchee River was a shallow, meandering 80 km (50 mi) long system, flowing east to west. The river originated at the west end of Lake Flirt. Marsh systems extend from Lake Flirt to Lake Hicpochee and east to Lake Okeechobee. There is evidence of canoe trails connecting the Caloosahatchee to Lake Okeechobee. Today, the river extends approximately 114 km (71 mi) from Lake Okeechobee to San Carlos Bay, as a channelized flood control and navigational waterway (FWS, 1999). Hamilton Disston began the first recorded dredging of the Caloosahatchee in 1881, finishing a connection to Lake Okeechobee from the Gulf in 1888. The original dimensions of the channel were 4'x35' at the most narrow. Navigation improvements were a driving force for changes made throughout the length of the river, with projects in 1910, 1915, and 1935, deepening the channel to the current dimensions.

Additional navigation improvements occurred in what was called the Okeechobee Waterway in conjunction with the Central and Southern Flood Control District's authorization by Congress in 1948. These improvements included the installation of the Franklin Lock and the current dimensions of the River east of the lock. The Caloosahatchee east of the Franklin Lock was designated canal 43 or C-43, while the Franklin Lock is known as S-79. C- 43 is part of the

³ The Consent Order included provisions concerning Golden Gate Estates in Collier County which was also a GAC project.

cross-state Lake Okeechobee Waterway that provides navigation between the east and west coasts of Florida. The Franklin Lock serves as a salinity barrier between the fresh water of the Caloosahatchee and its estuary (FWS, 1999). Two additional locks were installed along the Caloosahatchee east of S-79: the Moore Haven Lock and the Ortona. West of the Franklin Lock, from Olga to the Gulf, the river broadens into a tidally influenced estuarine system (FWS, 1999).

Clewiston is located on Lake Okeechobee. Its economy was originally based on commercial fishing and farming produced from several Japanese families who emigrated from California in 1914. In 1923, the original property owners of the underlying land, John and Marian O'Brien, hired John Nolen, one of the most famous city planners of the period. Nolen proposed the concept of a lake-front resort town in conjunction with an economy based on sugar and building materials made from sugar-milling by-product (celotex). The resulting general plan was augmented by a landscape plan designed by the firm built by the "Father of landscape architecture," Fredrick Law Olmstead. In addition to the city proper, an experimental farm was established outside the city to serve as a prototype for farming in the region.



The first drainage districts within the Lower Charlotte Harbor study area were created in 1924, the Clewiston Drainage District and the Sugarland Drainage District. "Enormous amounts of dynamite" were necessary to excavate the underlying rock. The Southern Sugar Company completed the job with the equipment that was left behind by the original engineering firm. A levee was completed next to Lake Okeechobee in late 1925 to prevent flooding in Clewiston. In 1928, the "West Indian Hurricane" struck and although the

dike and pump system generally protected Clewiston, federal and state funds were authorized funding to conduct major dredging, build locks and extend the dike around Lake Okeechobee. The authorized project was known as the Caloosahatchee River and Lake Okeechobee Drainage Areas Project (CR&LODA) and the funding authority came from the 1930 Rivers and Harbors Act. This act essentially resulted in construction of the levees to completely surround the lake and enlarging the capacity of both major outlets to tide: the St. Lucie River to the East and the Caloosahatchee River to the West. This provided an economic boost to Clewiston in the midst of the depression. With the passage of the Flood Control Act of 1948 (Public Law 858, 80th Congress, 2nd Session) the CR&LODA was expanded and enlarged into what is known today as the Central and Southern Florida (C&SF) Flood Control Project. (USACOE, 1999).

During World War II, a flight school was established at the unfinished Clewiston Riddle McKay Field. The largest German Prisoner of War Camp on U.S. soil was established 6 miles out of town, which provided labor to the cane fields and canning factory.

Estero Bay

Historically, the Estero Bay basin was approximately 1,275 ha (3,150 ac) smaller than today. The boundaries were increased when 10-mile Canal was dredged in the 1920's. The dredging began as a source of fill to create a dike to protect Fort Myers from flooding from sheetflow from the east of the city. The canal was extended over the course of the next several decades.

Between 1969 and 1975, conservationists struggled with developers to protect wetlands of the Estero Bay Aquatic Preserve (EBAP). In 1969, a boundary line agreement between the State of Florida and property owners allowed the sale of more than two thousand acres of aquatic preserve to private ownership. In 1972, Robert B. Troutman, Jr. (an Atlanta attorney) attempted to develop a five hundred million dollar condominium development on a 5,240 acre tract of marshland and mangroves on Estero Bay. Conservationists filed suit against the state to have the boundary line nullified. By 1975, the Florida Aquatic Preserve Act was passed and the existing preserves were brought under a standard set of management criteria.

In the 1990's, a settlement agreement between the Responsible Growth Management Coalition and the State of Florida over the siting of Florida Gulf Coast University led to creation of the Estero Bay Agency on Bay Management.

Charlotte Harbor/Pine Island Sound

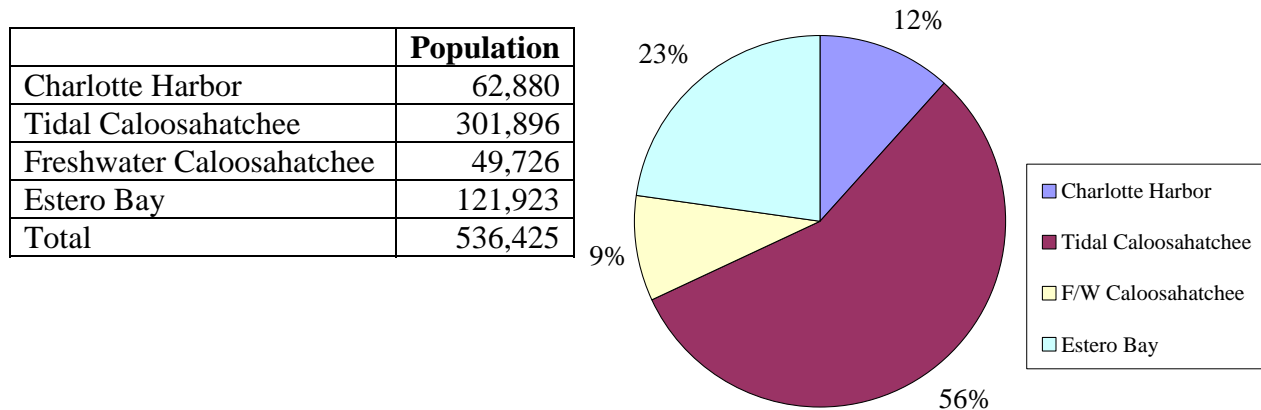
During the last century, tropical fruit farming and fish houses provided an economy for the larger islands of the Charlotte Harbor/Pine Island basin, particularly Sanibel and Pine Island. The largely interconnecting freshwater sloughs on Sanibel created distinctive wildlife habitat and allowed early farming because of their freshwater availability. Prior to 1963, all access to Sanibel was by water. In 1963, the Sanibel Causeway was built opening vehicular access to the island. Sanibel incorporated as a City in 1974.

Charlotte Harbor benefited from the passage of Florida's 1972 Environmentally Endangered Lands program. This program purchased large portions of the Charlotte Harbor and Matlacha buffer preserves. The 1977 Consent Order between GAC and DER discussed above further augmented one of the nation's largest protected mangrove systems.

Population and Urbanized Area Growth

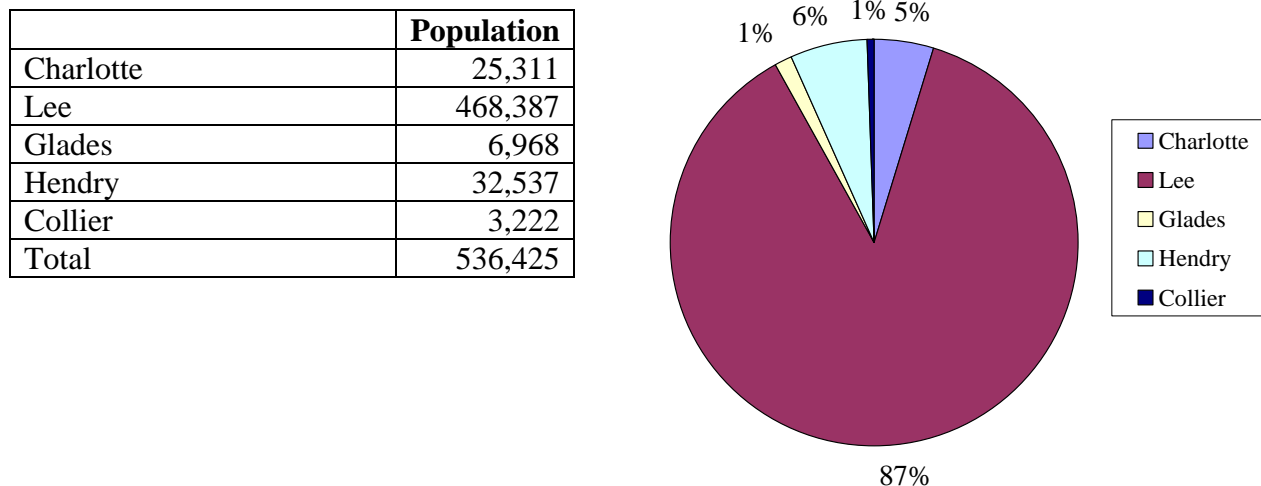
The latest decennial Census of the population was performed in the year 2000. GIS techniques were used to analyze study area population. There is double-counting where census blocks cross basin boundaries. The greatest portion of the population exists in the Tidal Caloosahatchee basin, followed by the Estero Bay basin.

Figure 5: Year 2000 Population by Basin



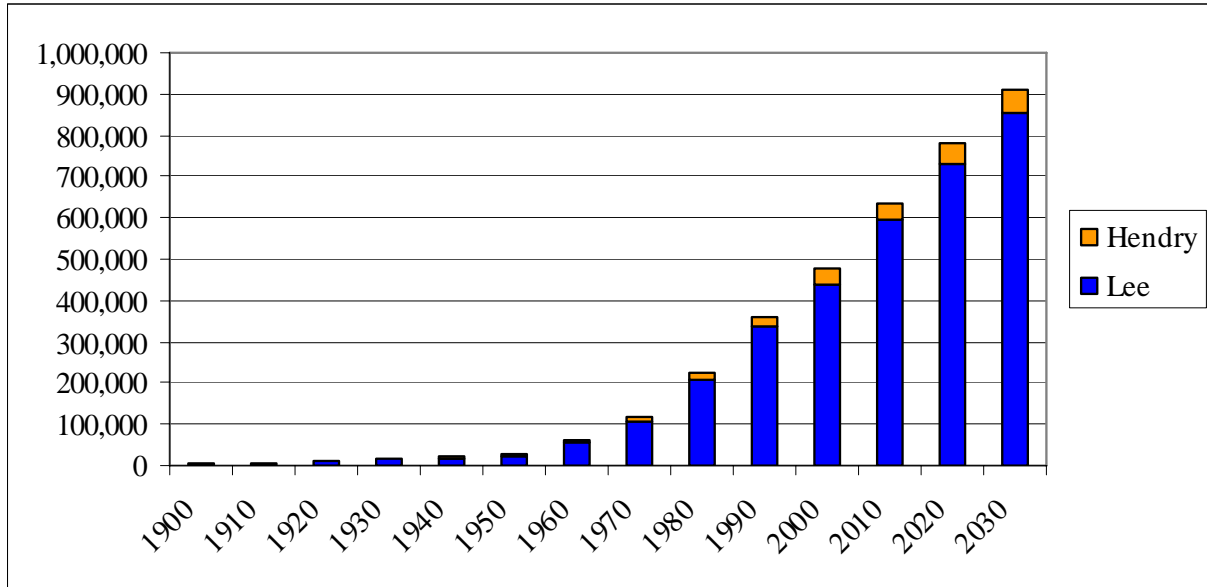
Given the dominance of the Tidal Caloosahatchee and Estero Bay basins for population, it follows that Lee County has the greatest total population within the Lower Charlotte Harbor study area, 87%.

Figure 6: Year 2000 Population by County within LCH



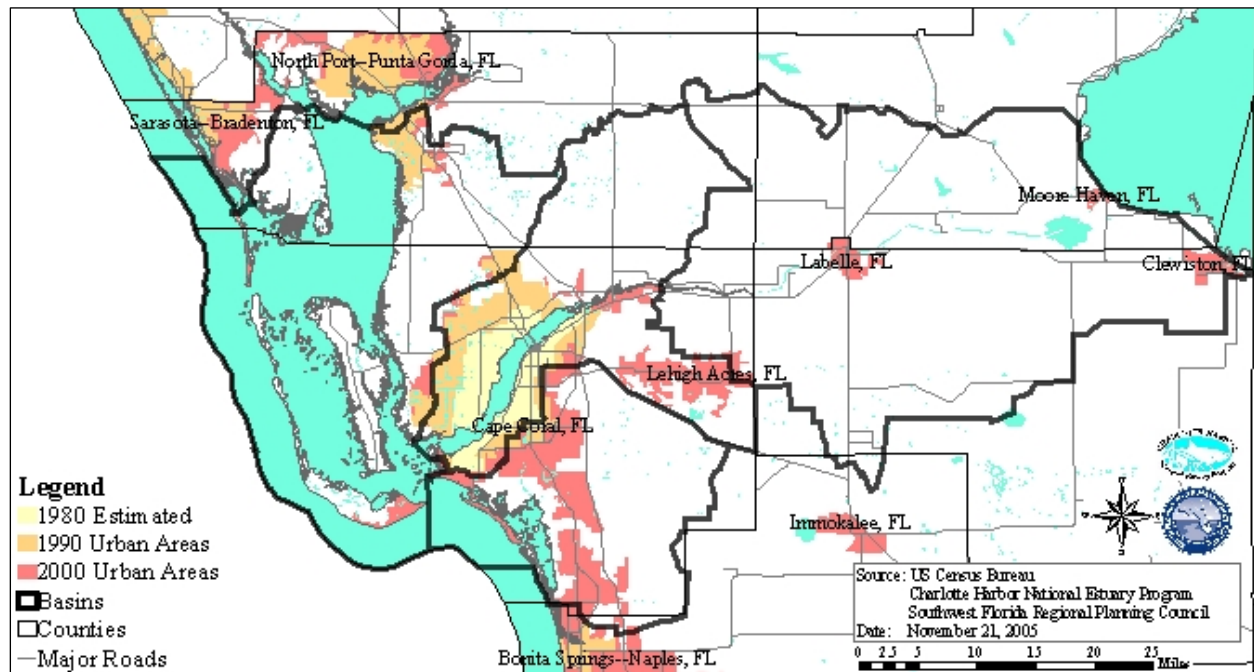
The historical population growth is based on Lee and Hendry County population because these counties represent 93% of the study area population and most of the population of the two counties resides in the study area. As you can see from the Figure 7, the study area has been experiencing exponential growth. The population is currently over 500,000 residents and is projected to be over 900,000 by 2030 (BEBR, 2003).

Figure 7: Historic and Projected Population Growth in Lee and Hendry Counties



The Census Bureau defines an urbanized area as continuous areas of over 1000 people per square mile. The first urbanized area in Lower Charlotte Harbor was defined for Fort Myers/Cape Coral as a result of the 1970 census. The increase of the 1980 urbanized area was not much greater geographically than the 1970. The most geographically significant increase of urbanized area for 1990 was in Cape Coral and Punta Gorda. By the year 2000 the urbanized area had greatly expanded in the Estero Bay basin, Lehigh Acres and in the rural communities of LaBelle, Moore Haven, and Clewiston (See Figure 8). The year 2000 urbanized areas reflect the population distribution by basin shown above, with Tidal Caloosahatchee at 56%, Estero Bay at 23%, Charlotte Harbor at 12%, and Freshwater Caloosahatchee at 9% of the total LCH population.

Figure 8: Urbanized Area Growth

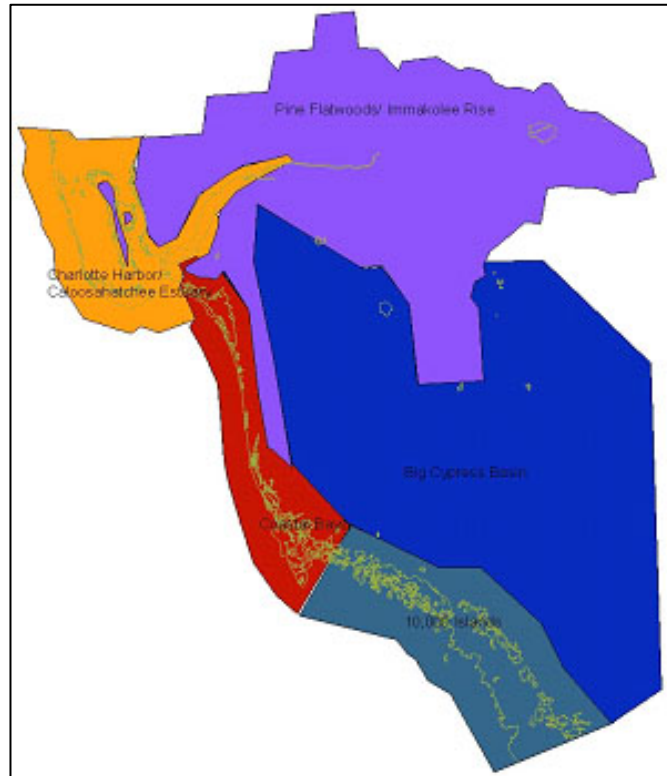


Conditions that Have Led to the Need for Restoration

The conditions that have led to the need for restoration or protection have been documented through the development of the SWFFS and by FDEP's Impaired Waters Rule (IWR; see following "Impaired Waters" section). The four Conceptual Ecological Models (CEMs) developed through the SWFFS that summarize these conditions for the Lower Charlotte Harbor study area include the Charlotte Harbor/Caloosahatchee Estuary CEM, the Pine Flatwoods /Immokolee Rise CEM, the Coastal Bays and Barrier Islands CEM, and the Big Cypress Basin CEM. The major stressors in the Lower Charlotte Harbor study area include:

- Altered hydrology and freshwater flow,
- Changes in water quality and increased sediment and water column contaminants,
- Habitat alteration, loss, and fragmentation,
- Exotic plant and animal invasion,
- Boating and fishing pressure,
- Human Use, and
- Altered Fire Regime.

Figure 9: Conceptual Ecological Model Coverage



The CEMs for the SWFFS will be posted at www.evergladesplan.org.

Figure 10: Caloosahatchee/Charlotte Harbor Conceptual Ecological Model

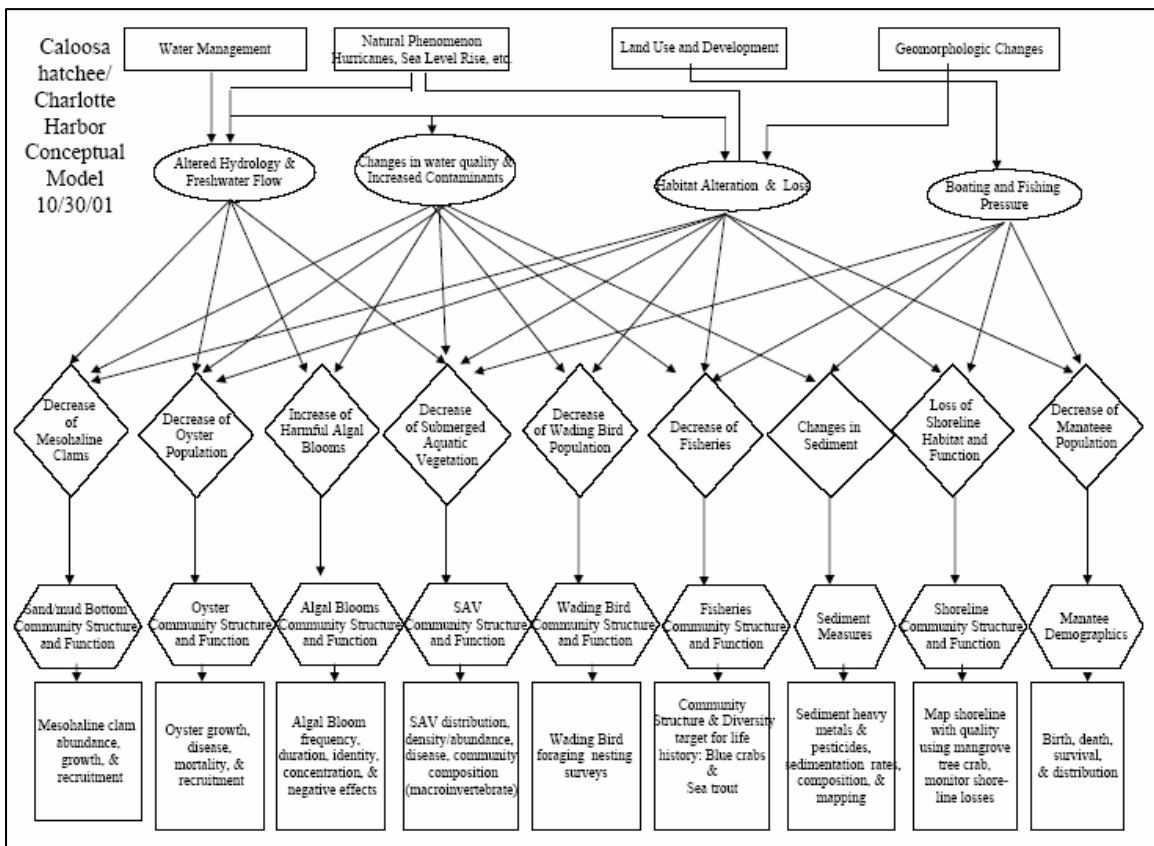


Figure 11: Pine Flatwoods/Immokalee Rise Conceptual Ecological Model

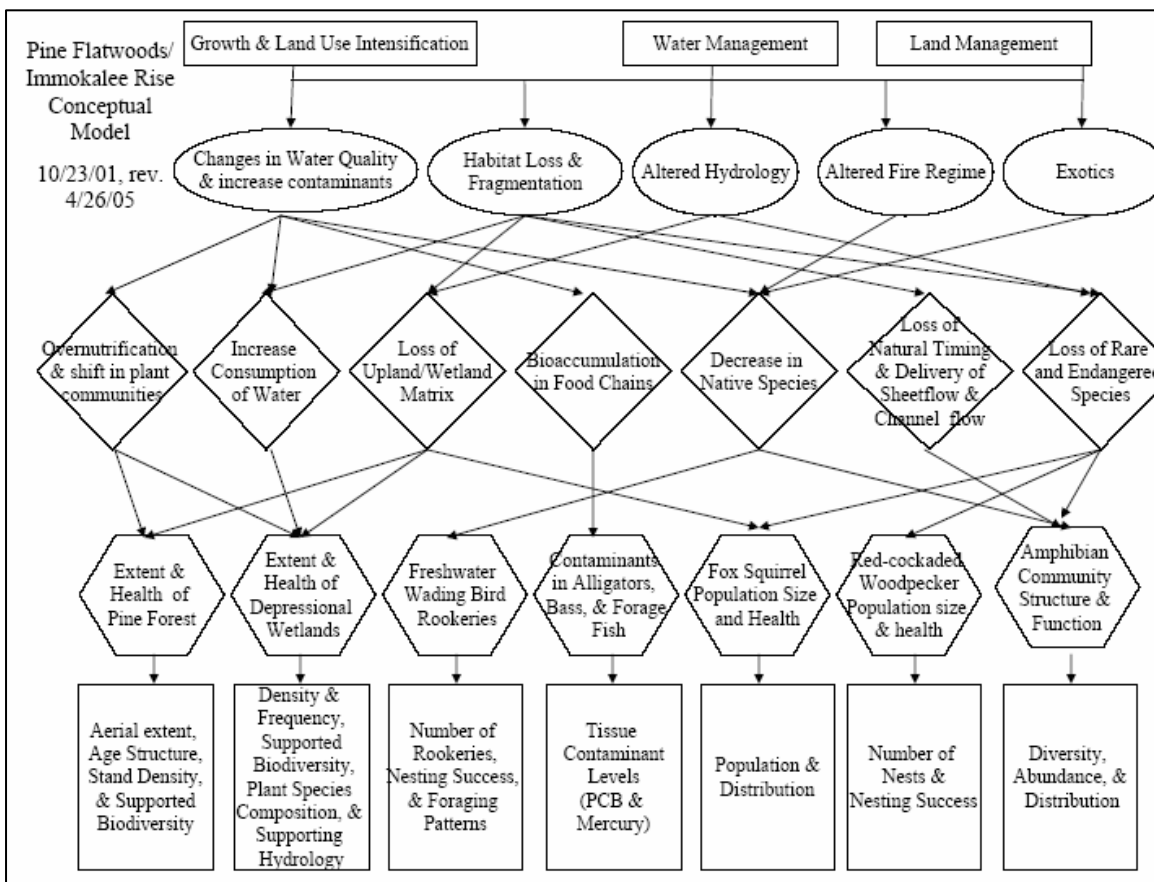


Figure 12: Coastal Bays and Barrier Islands Conceptual Ecological Model

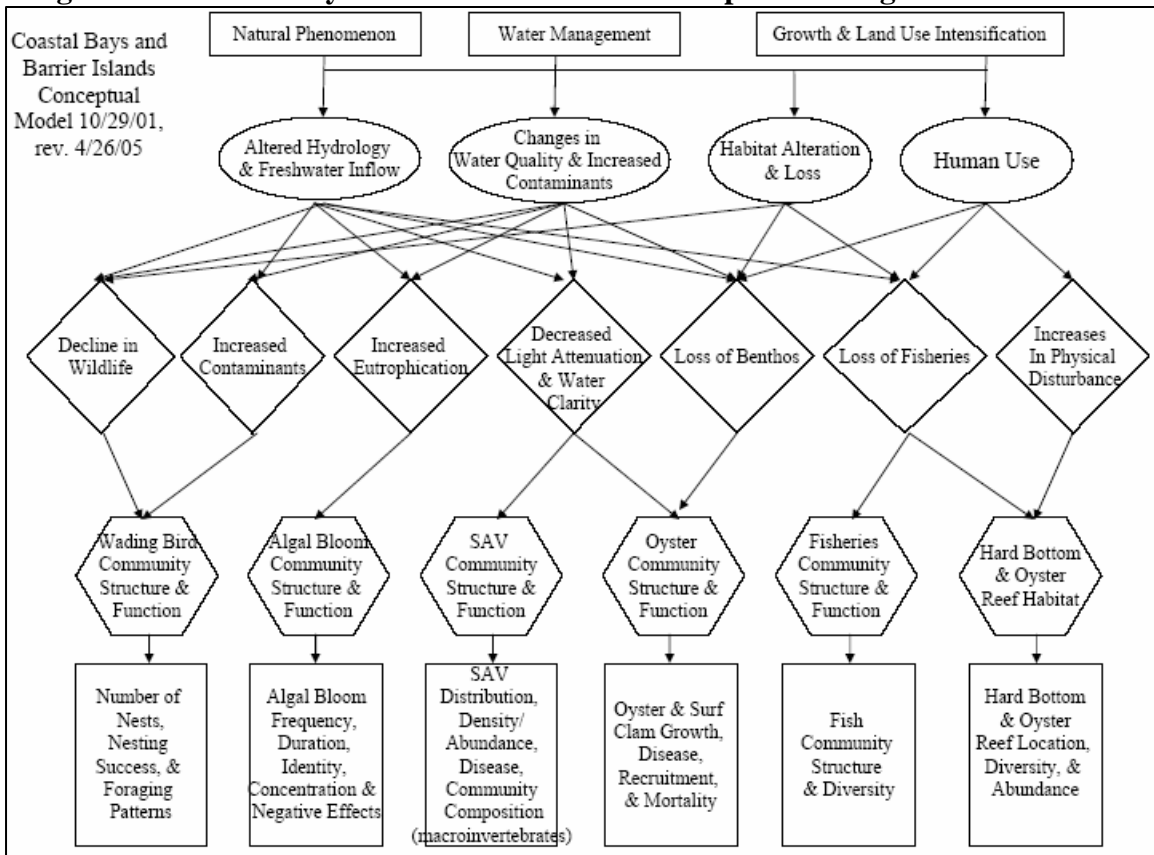
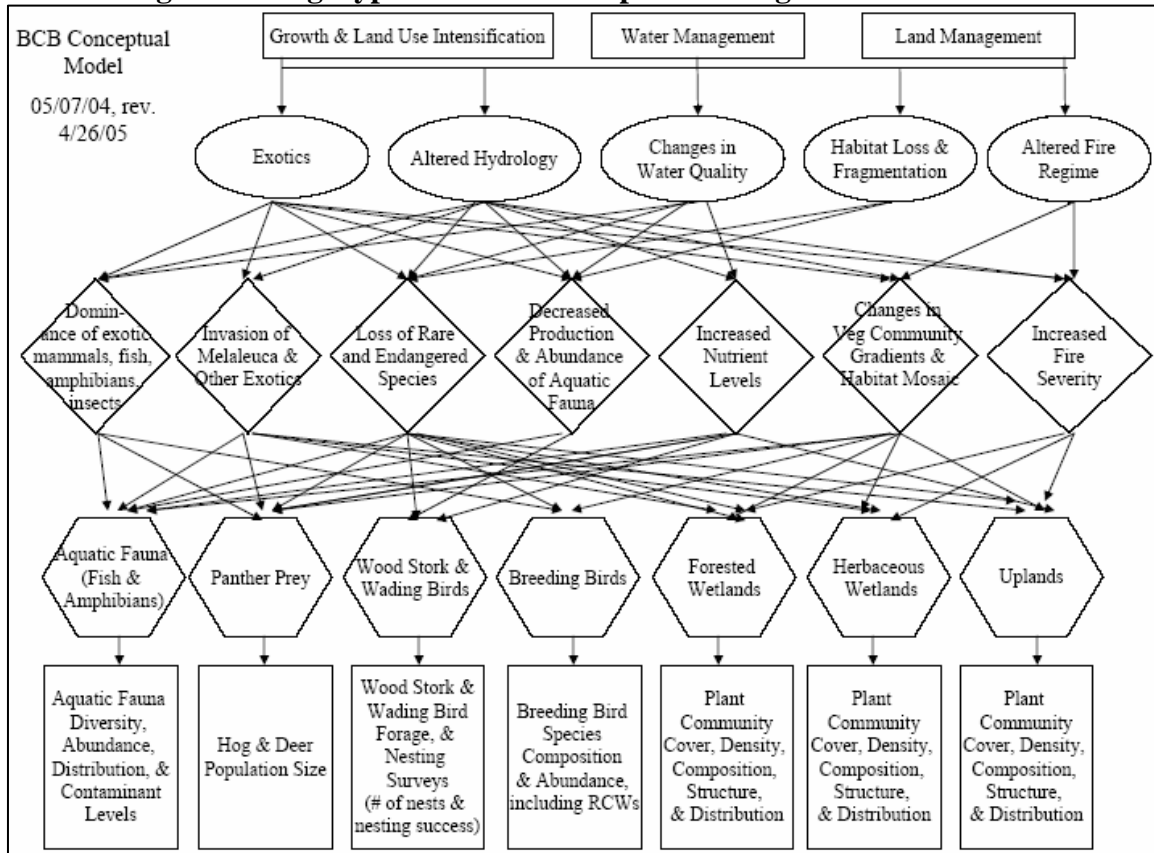


Figure 13: Big Cypress Basin Conceptual Ecological Model



Agricultural and Urban Water Supplies

The SFWMD has published a series of document to address agricultural and urban water supplies. The 2000 Lower West Coast Water Supply Plan (LWCWSP) covers the entire LCH area plus the Big Cypress Basin. The 2000 Caloosahatchee Water Supply Plan (CWSP) and the Caloosahatchee Water Management Plan (CWMP) provides more detailed analysis for the Caloosahatchee watershed.

The LWCWSP states the projected 2020 water demands in the LWC Planning Area can be met during a 1-in-10 year drought condition while not causing harm to the water resources and natural systems, but not relying solely on historically used sources of water. In the western portions of the LWC Planning Area, several sources, primarily the Surficial Aquifer System (SAS) and the Intermediate Aquifer System (IAS), in the urban coastal areas are not adequate to meet the growing needs of the LWC Planning Area during a 1-in-10 year drought condition due to potential impacts on wetlands and the potential for saltwater intrusion. The plan points to diversifying supply sources such as developing brackish supplies from the Floridan aquifer, increased use of reclaimed water and surface water, and Aquifer Storage and Recovery (ASR) as alternatives. “The use of reclaimed water and supplemental sources was emphasized to meet the projected irrigation demands in the urban areas, especially along the coast. Additional work is necessary to identify the most effective method to make these sources available for use at the local level, including storage.” A distribution system was discussed in the 2000 LWCWSP and is now being implemented.

The CWSP determined that the surface water availability in the C-43 Canal during a 1-in-10 year drought condition is not currently adequate “to support the projected water supply demands and environmental needs.” However, the CWSP identified that these current and future needs could be met through implementation of a combination of projects involving basin storage including regional and distribution reservoirs and delivery of water from Lake Okeechobee. The Southwest Florida Feasibility Study would further analyze opportunities to meet future water needs in the Caloosahatchee Basin and Estuary.

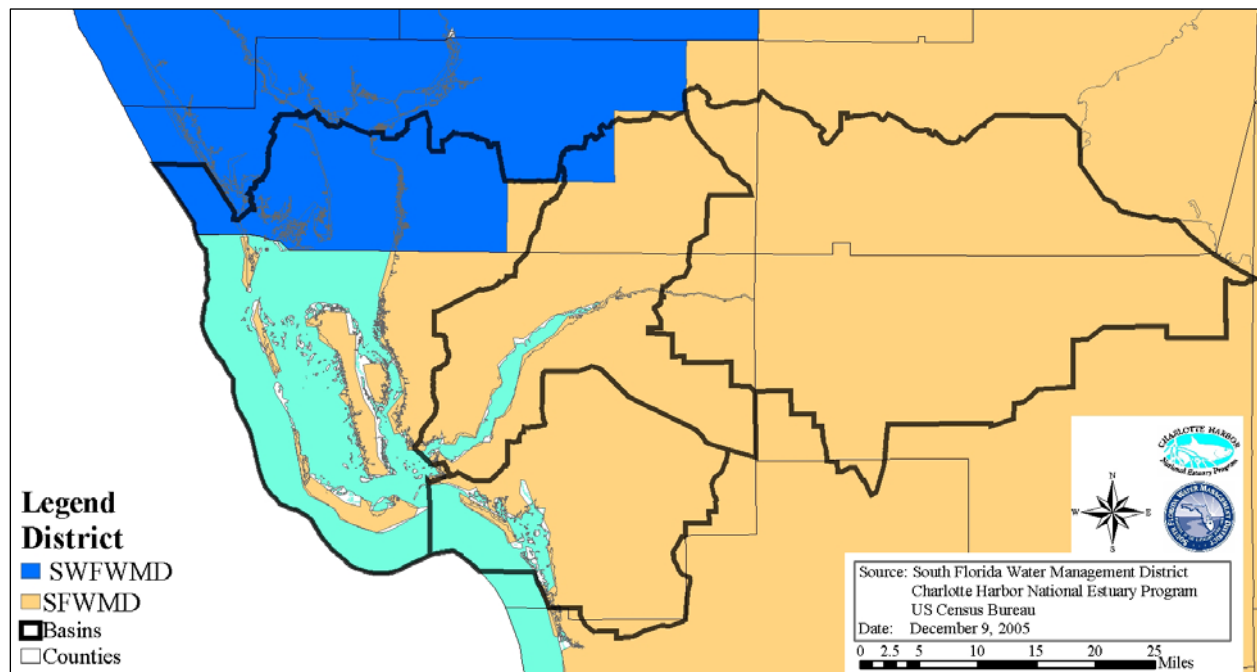
Governmental Units with Jurisdiction

General governmental units with jurisdiction within the Lower Charlotte Harbor SWIM area include the Federal government, the State of Florida, water management districts, the SWFRPC, counties, cities, and special districts.

Water Management Districts

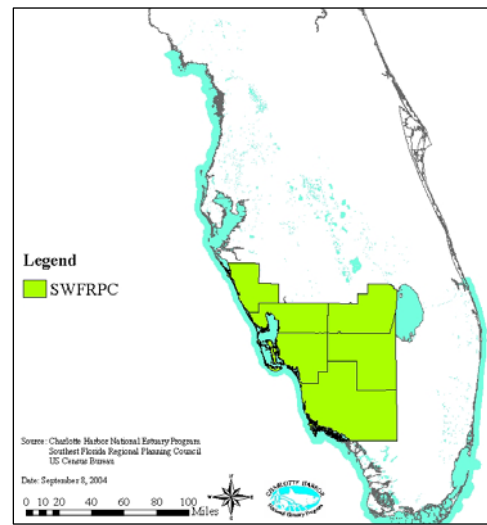
Both the SFWMD and the SWFWMD have jurisdiction in the area (Figure 14). The great majority of the study area is within the SFWMD. That portion of the study area within SWFWMD is addressed in the Charlotte Harbor SWIM Plan which includes the northern portion of the Charlotte Harbor. In order to provide consistency between the two SWIM Plans and enable review of the entire Charlotte Harbor basin, the SWFWMD portion of the basin is included in this report. The SFWMD portion is entirely within the Lower West Coast planning region. Each Water Management District updated its District Water Management Plan (DWMP) in year 2000. These plans include long-term goals, issues, objectives, strategies, schedules, and performance measures and are linked with the Districts' *Strategic Plan*, the *Five-Year Capital Improvement Plan*, and the annual budgeting process. The Website locations for the DWMPs are: <http://www.sfwmd.gov/org/wrm/index.html> and <http://www.swfwmd.state.fl.us/about/watermanagementplan/>.

Figure 14: Water Management District Jurisdictions



Southwest Florida Regional Planning Council
 All areas of Lower Charlotte Harbor are within the SWFRPC’s jurisdiction. The SWFRPC consists of elected city and county officials, regional and state representatives, and Governor appointees. The SWFRPC “acts as a regional information clearinghouse, conducts research to develop and maintain area wide goals, objectives, and policies, and assists in implementing a number of local, state, and federal programs. The Council serves as an advocate for the Region with State and Federal agencies, including the Legislature and Congress” (SWFRPC 2004). The SWFRPC adopts a Strategic Policy Plan to guide its actions and decisions. The SWFRPC Strategic Policy Plan can be found at: <http://www.swfrpc.org/srpp.htm>.

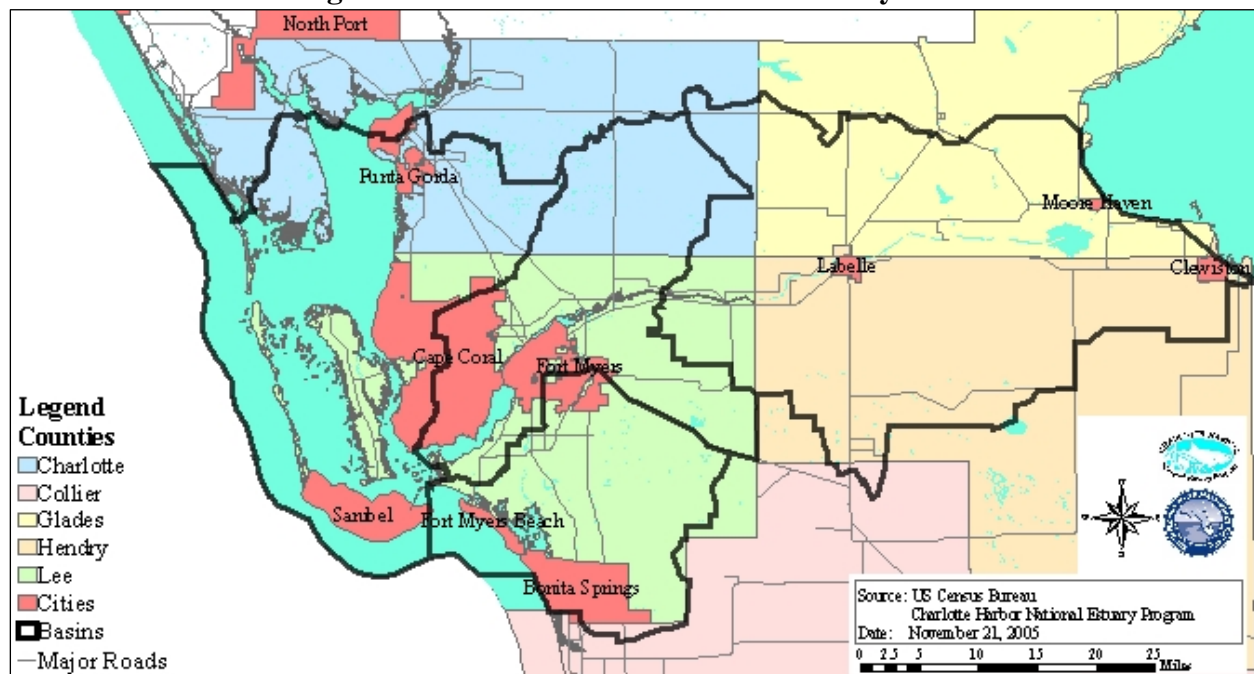
Figure 15: Southwest Florida Regional Planning Council



Counties and Cities

The Lower Charlotte Harbor Study area includes large portions of four counties: Charlotte, Glades, Hendry, and Lee (See Figure 16). It also includes a small portion of Collier County. Charlotte County’s only city, Punta Gorda, is partially located in the study area. All five of Lee County’s incorporated cities are located in the study area: Fort Myers, Cape Coral, Sanibel, Fort Myers Beach, and Bonita Springs. Hendry County’s two cities, La Belle and Clewiston, are in the study area. Glades County has one city, Moore Haven, which is in the study area.

Figure 16: Counties and Cities of the Study Area



Each county and city adopts a comprehensive plan and an annual budget. Many also adopt a 5-year Capital Improvements Program (CIP). Some local jurisdictions have dependent drainage districts to fund works, commonly known as Municipal Service Taxing Units (MSTU) or Municipal Service Benefit Units (MSBU). In addition, the coastal counties and their cities are National Pollutant Discharge Elimination System (NPDES) permittees.

Special Districts

All the districts listed in the Florida Department of Communities Affairs “Official List of Special Districts On-Line,” are local units of special-purpose government. They have a governing board with policy-making powers, are operating within a limited geographical boundary, performing a governmental function, and were created by general law, special act, local ordinance, or by rule of the Governor and Cabinet. On the other hand, a MSBU or MSTU is not a unit of local special-purpose government (see s. 189.403(1), F.S.) and is under the authority of a City or County. A special district is dependent if a single county or single municipality has some control over its budget or governing body membership (see s. 189.403(2)(a)-(d), F.S.). For the purposes of identifying governmental units with jurisdiction, both dependent and independent districts are included in this report. The types of special districts found in Lower Charlotte Harbor that have relevance to surface water improvement and management include:

- Aquatic Plant Control,
- Community Development,
- Conservation and Erosion,
- Soil and Water Conservation,
- Water Control, and
- Water and Sewer.

Water Control Districts

Chapter 298, Florida Statutes is dedicated to drainage and water control and provides for the formation of water control districts (WCD) (See Figure 17). Each WCD created through FS 298 is governed by an elected Board of Supervisors. Landowners vote for this board based on acreage owned within the respective WCD. Each WCD adopts a water control plan that directs infrastructure and works. They all have the ability to issue bonds and assess property owners.

Figure 17: Section 298 Water Control Districts

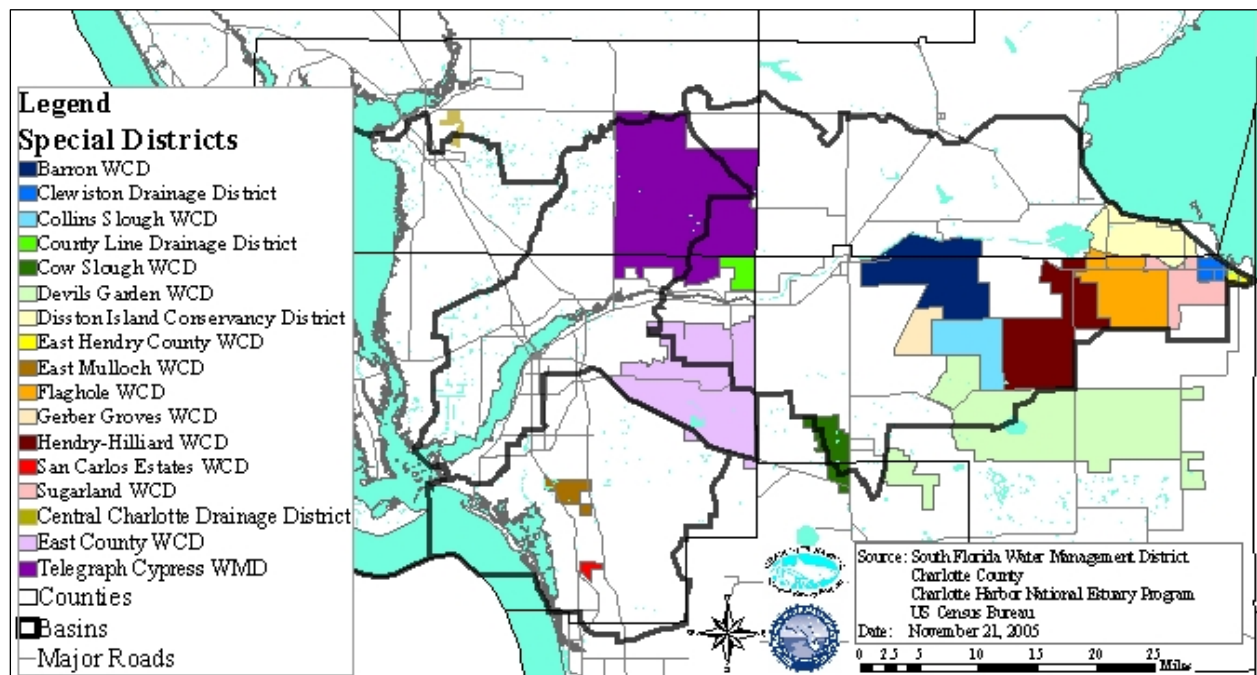


Table 3: Section 298 Water Control Districts

District	County	Year Est.	Independent
Barron Water Control District	Multi - Glades, Hendry	1975	Yes
Central Charlotte Drainage District	Charlotte	1969	Yes
Clewiston Drainage District	Hendry	1924	Yes
Collins Slough Water Control District	Hendry	1986	Yes
County Line Drainage District	Lee	1967	Yes
Cow Slough Water Control District	Multi - Collier, Hendry	1989	Yes
Devils Garden Water Control District	Hendry	1971	Yes
Disston Island Conservancy District	Multi - Glades, Hendry	1923	Yes
East County Water Control District	Multi - Hendry, Lee	1958	Yes
East Hendry County Drainage District	Hendry	1984	No
East Mulloch Water Control District	Lee	1963	Yes
Flaghole Drainage District	Multi - Glades, Hendry	1953	Yes
Gerber Groves Water Control District	Hendry	1965	Yes
Hendry-Hilliard Water Control District	Hendry	1986	Yes
San Carlos Estates Drainage District	Lee	1969	Yes
Sugarland Drainage District	Multi - Glades, Hendry	1924	Yes
Telegraph Cypress Water Management District	Multi - Charlotte, Lee	1971	Yes

Related Districts

There are 4 related types of districts in the area: Aquatic Plant Control, Erosion, Soil & Water Conservation, and Water & Sewer. The Lee County Hyacinth Control District (LCHCD) was established pursuant to FS 189.404 in 1961. The Captiva Erosion Prevention District was established in 1959, prior to the adoption of FS 161 Part II which establishes beach and shores preservation districts. It operates under the authority of FS 161.32 which provides for existing beach and shores preservation districts. The Lee Soil & Water Conservation District is the only independent Soil & Water District of the four in Lower Charlotte Harbor. All soil and water conservation districts were established under FS 582.

Table 4: Related Districts

District	County	Function	Year Est.	Independent
Lee County Hyacinth Control District	Lee	Aquatic Plant	1961	Yes
Captiva Erosion Prevention District	Lee	Erosion	1959	Yes
Charlotte Soil & Water Conservation District	Charlotte	Soil and Water	1944	No
Glades Soil & Water Conservation District	Glades	Soil and Water	1947	No
Hendry Soil & Water Conservation District	Hendry	Soil and Water	1944	No
Lee Soil & Water Conservation District	Lee	Soil and Water	1947	Yes
City-County Public Works Authority	Glades	Water and Sewer	1995	Yes

Community Development Districts

Community Development Districts (CDD) are established under the statutory authority of FS 190 and FAC Chapter 42. FS 190.013 provides the CDDs with the ability to assume responsibility for flood control and water quality. The CDDs identified in Table 5 are responsible for providing flood control and have master stormwater management plans for the lands located within the district. All CDDs listed below are independent.

Table 5: Section 190 Community Development Districts

District	County	Year Est.
Arborwood Community Development District	Lee	2004
Bay Creek Community Development District	Lee	1993
Bayside Improvement Community Development District	Lee	1991
Brooks of Bonita Springs Community Development District	Lee	1998
Brooks of Bonita Springs II Community Development District	Lee	1999
CFM Community Development District	Lee	2002
Colonial Country Club Community Development District	Lee	2002
Gateway Services Community Development District	Lee	1986
Habitat Community Development District	Lee	2003
Heritage Oak Park Community Development District	Charlotte	1998
Heritage Palms Community Development District	Lee	1998
Laguna Lakes Community Development District	Lee	2002
Mediterra North Community Development District	Lee	2001
Miromar Lakes Community Development District	Lee	2000
Parklands Lee Community Development District	Lee	2004
Parklands West Community Development District	Lee	2000
Renaissance Community Development District	Lee	2001
River Ridge Community Development District	Lee	1996
Stoneybrook Community Development District	Lee	1998
University Square Community Development District	Lee	1998
Vasari Community Development District	Lee	2001
Verandah West Community Development District	Lee	2002

Summary of Implementation Partners

The District recognizes the importance of coordination with as many government agencies and other stakeholders that may be affected by, or have some jurisdiction over resources within the LCH area. A list of those entities is provided below.

Table 6: Summary of Implementation Partners

Agencies	
Federal	
U.S. Army Corps of Engineers	U.S. Fish and Wildlife Service
U.S. Environmental protection Agency	National Oceanic and Atmospheric Administration
U.S. Geological Survey	Charlotte Harbor National Estuary Program
State	
Department of Environmental Protection	Department of Community Affairs
Public Service Commission	Department of Health
Department of Transportation	Department of Agriculture and Consumer Services
Fish and Wildlife Conservation Commission	Florida Gulf Coast University
Regional	
Estero Bay Agency on Bay Management	Southwest Florida Regional Planning Council
South Florida Water Management District	West Coast Inland Navigation District
Southwest Florida Water Management District	
Counties	
Charlotte	Hendry
Glades	Lee
Cities and Towns	
Bonita Springs	LaBelle
Cape Coral	Moore Haven
Clewiston	Fort Myers Beach
Fort Myers	Sanibel
Taxing Districts	
Community Development Districts	Special Topic Districts
Public Works Authority	Water Control Districts
Soil and Water Conservation Districts	
Stakeholders	
Unincorporated Communities	
Estero	San Carlos Park
Lehigh Acres	South Fort Myers
North Fort Myers	
Non-Governmental Organizations	
Audubon	Corkscrew Regional Ecosystem Watershed Trust
Calusa Land Trust	Sanibel-Captiva Conservation Foundation
Charlotte Harbor Environmental Center	Southwest Florida Watershed Council
Conservancy of Southwest Florida	Water Enhancement and Restoration Coalition

3. Programmatic Context

There are many coordinated restoration planning processes and projects in the Lower Charlotte Harbor area that are a targeted area within a unit of government or are partnership program involving one or more units of government. Summaries of these are provided in this section with the major categories of Programs with Federal Involvement, State Initiated Programs, and Local Efforts.

Programs with Federal Involvement

Programs with Federal Involvement include the Comprehensive Everglades Restoration Plan, the Southwest Florida Feasibility Study, the Southwest Florida Regional Restoration Team, the Charlotte Harbor National Estuary Program, the South Florida Multi-Species Recovery Plan, and the Southwest Florida Environmental Impact Statement.

Comprehensive Everglades Restoration Plan

The [Comprehensive Everglades Restoration Plan \(CERP\)](#) is a framework and guide to restore, protect, and preserve the water resources of central and southern Florida. It includes the everglades and centers on the update of the Central and Southern Florida (C&SF) Project. The goals of the plan are to restore the ecosystem, ensure clean and reliable water supplies, and provide flood protection. The organizational structure for Everglades Restoration is complex, however, the South Florida Ecosystem Restoration Task Force (www.sfrestore.org) facilitates coordination of the program while the U.S. Corps of Engineers (COE) and SFWMD implement the program.

The Task Force has adopted 3 strategic goals:

1. Get the water right (both quantity and quality)
2. Restore, preserve, and protect natural habitats and species
3. Foster compatibility of the built and natural systems.⁴

Each goal is supported by sub-goals and measurable objectives. More information may be found in the biennial report of the Task Force to Congress at:

<http://www.sfrestore.org/documents/index.html>.

CERP was approved by Congress in the Water Resources Development Act of 2000 (WRDA 2000). CERP includes more than 60 elements, will take more than 30 years to construct, and will cost an estimated \$7.8 billion (revised to \$10.2 billion). Major CERP components are:

- 1) Surface Water Storage Reservoirs
- 2) Water Preserve Areas
- 3) Resource Management of Lake Okeechobee
- 4) Improved Water Deliveries to the Estuaries
- 5) Underground Water Storage
- 6) Treatment Wetlands
- 7) Improved Water Deliveries to the Everglades
- 8) Removal of Barriers to Sheetflow
- 9) Storage of Water in Existing Quarries



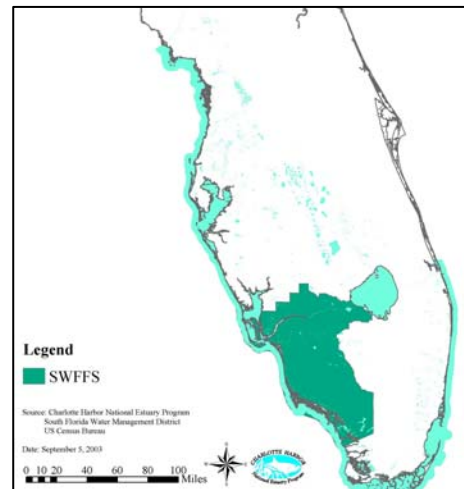
⁴ FY 2002-2004 Strategic Plan and Biennial Report, Volume I, page xiv, Executive Summary

- 10) Reuse of Wastewater
- 11) Pilot Projects
- 12) Improved Water Conservation
- 13) Additional Feasibility Studies

Website information can be found at <http://www.evergladesplan.org/>. New and summary information regarding Everglades Restoration projects can be found at the South Regional Project Delivery Team site at: http://www.evergladesplan.org/pm/rpdds_docs_south.cfm.

Southwest Florida Feasibility Study

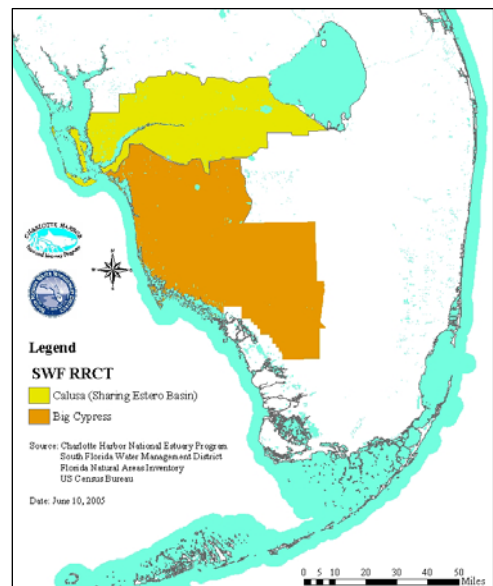
The SWFFS is one of a series of feasibility studies recommended in CERP and was funded through WRDA 2000. “The end-product of the SWFFS will be an integrated Feasibility Report and *National Environmental Policy Act (NEPA)* document that will serve as the basis for obtaining Congressional authorization of the plan components determined to be feasible and cost-effective (SFWMD and COE, 2002).” Alternative measures to be considered include surface water storage, improve water delivery to estuaries, aquifer storage and recovery, stormwater treatment areas, reestablish sheetflow, reuse wastewater, water conservation, and land acquisition. The SWFFS includes several conceptual ecological models that will drive restoration planning in the area. Website information can be found at: <http://www.evergladesplan.org/pm/studies/swfl.cfm>.



Southwest Florida Restoration Coordination Team

The Southwest Florida Restoration Coordination Team (SWFRRCT) was created by the Everglades Restoration Working Group in 2002 to receive recommendations regarding restoration and restoration science in southwest Florida. It inherited and expanded the responsibilities of the Big Cypress Basin Project Coordination Team.

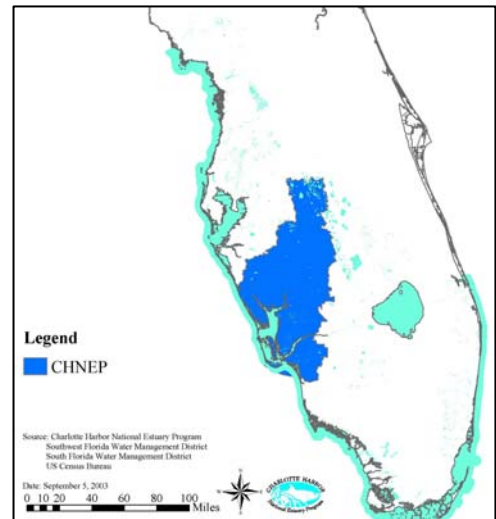
The duties of the SWFRRCT have expanded to include the rest of the Lower Charlotte Harbor study area. In addition, two geographic subteams have been created to support the RRCT's efforts: the Calusa Restoration Coordination Team (CRCT) and the Big Cypress Restoration Coordination Team (BC RCT). The CRCT represents Charlotte Harbor, Caloosahatchee, and Estero watershed basins in Southwest Florida within the Greater Everglades. The CRCT is tasked with the integration, coordination, and evaluation of the region's environmental restoration activities and to make recommendations to the SWFRRCT. Its principal activities include the identification and prioritization of restoration science gaps and restoration projects. The CRCT is composed of representatives from environmental agencies, academic institutions, not-for-profit environmental groups, and other environmental consortia. As defined in the by-laws, all members of the CRCT and its sister group, the BC RCT, are members of the SWFRRCT. The SWFRRCT functions with a representational structure.



Website information can be found at: <http://www.swfrpc.org/RCT/about.htm> and <http://ocean.floridamarine.org/bcb/>.

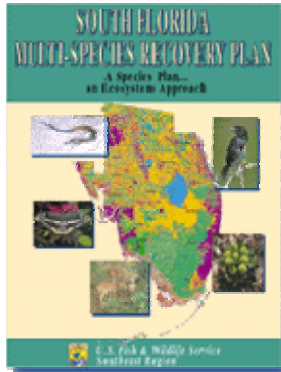
Charlotte Harbor National Estuary Program

The Charlotte Harbor National Estuary Program (CHNEP) was established in 1995 pursuant to section 320 of the Clean Water Act. It is one of 28 NEPs in the U.S. and one of four in Florida. NEPs are organized and funded through the Environmental Protection Agency (EPA). Information on the NEP nation-wide can be found at: <http://www.epa.gov/owow/estuaries/>. EPA's National Estuary Program was established by Congress in 1987 to improve the quality of estuaries of national importance. The [Clean Water Act Section 320](#) directs EPA to develop plans for attaining or maintaining water quality in an estuary. This includes protection of public water supplies and the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife, and allows recreational activities, in and on water, requires that control of point and nonpoint sources of pollution to supplement existing controls of pollution.



All basins, with the exception of the Freshwater Caloosahatchee, are within the CHNEP area. The entire 4,400 square-mile CHNEP area encompasses all or part of Lee, Charlotte, Polk, Manatee, Sarasota, Hardee, and DeSoto counties. Invited participants of the NEP management conference include Federal, state, and local governments and agencies as well as citizens and organizations within the study area. The CHNEP maintains a Comprehensive Conservation and Management Plan (CCMP) which is implemented through the partnership of member organizations. It details the actions needed to protect and improve the watershed by finding the balance between meeting human needs and maintaining a healthy natural system. The plan identifies common, priority issues for the region. The priority issues are hydrologic alterations, water quality degradation, fish and wildlife habitat loss, along with land use and land use management impacts. The plan outlines the goals and objectives for the CHNEP study area and identifies the priority actions that are needed to meet those goals and objectives as well as the parties responsible for completing them. The CHNEP prepares Research Needs Inventories and Restoration Needs through a geographic information system. The CCMP and other publications of the CHNEP can be found at www.charlotteharbornep.org.

South Florida Multi-Species Recovery Plan

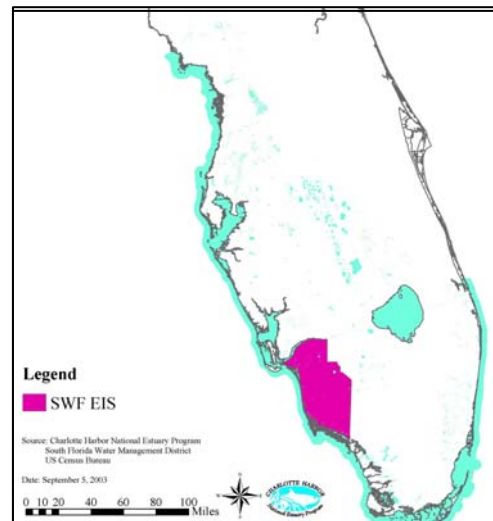


The South Florida Multi-Species Recovery Plan (MSRP) was published by the U.S. Fish and Wildlife Service, Southwest Region, in May 1999. The Multi-Species Recovery Plan was prepared to help fulfill major objectives of the South Florida Ecosystem Restoration Initiative and to support the recovery of species identified in the plan. The plan includes recovery objectives for the 68 species. In addition, actions needed for each of the 68 species are identified. These actions include: species-level recovery actions and habitat-level recovery actions. A total estimated cost of the recovery in 1999 was \$7.8 billion. The plan can be found at: <http://www.fws.gov/verobeach/Programs/Recovery/vbms5.html>.

Southwest Florida Environmental Impact Statement

The Southwest Florida Environmental Impact Statement (EIS) was prepared “to improve the U.S. Army Corps of Engineers' reviews of permit applications under Section 404 of the Clean Water Act.” The final “Environmental Impact Statement on Improving the Regulatory Process in Southwest Florida, Lee and Collier Counties, Florida” was issued on August 1, 2000. The purpose of the EIS is to introduce better information into this process, not to change the process itself. In addition, the EIS disclosed potential cumulative impacts and compared the cumulative environmental and other effects resulting from five alternative predictions of future conditions. Finally, the EIS described proposed "Permit Review Criteria" for use in staff's day-to-day review of incoming applications. The record of decision, released August 18, 2003, described revisions to and implementation of the "Permit Review Criteria". The documentation related to the EIS can be found at:

http://www.saj.usace.army.mil/permit/hot_topics/SFLAEIS/contents.htm.



State Initiated Programs

There are several programs that have been initiated by the state including the Charlotte Harbor Aquatic Preserves Plan, the Estero Bay Aquatic Preserves Plan, and Outstanding Florida Waters Program.

Aquatic Preserves Program

In 1975, the Florida Legislature enacted the Aquatic Preserve Act. This ensured that aquatic preserves' natural condition ... "their aesthetic, biological, and scientific values may endure for the enjoyment of future generations." The overall goals of resource management within the aquatic preserves areas are:

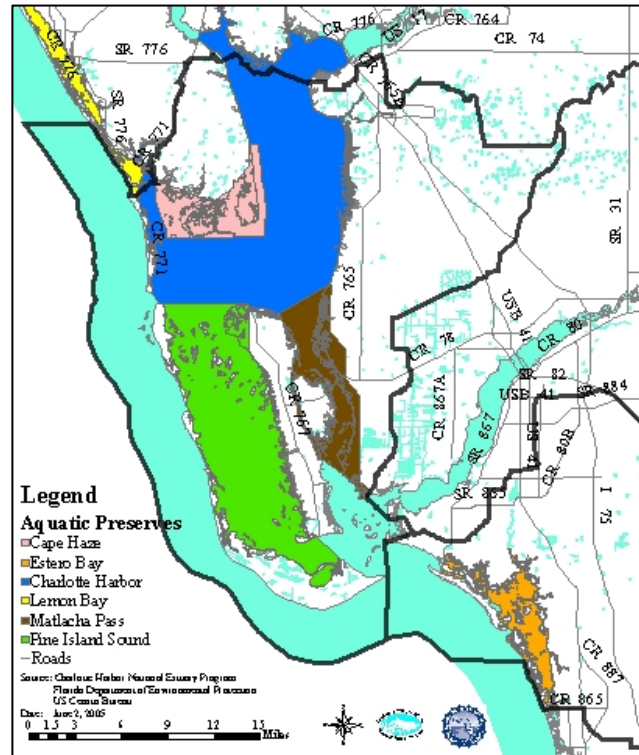
1. maintaining current, detailed resource inventories,
2. maintaining an up-to-date inventory of physical alterations from human activities,
3. restoring and enhancing littoral zone habitats,
4. improving water quality, and
5. encouraging uses of adjacent uplands which protect and enhance the resources in the aquatic preserves.

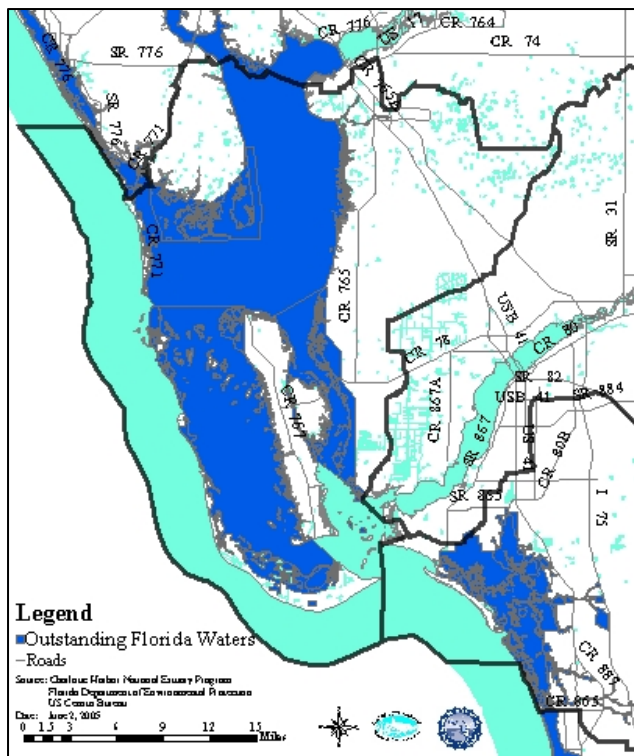
Within LCH, there are 5 designated aquatic preserves and 2 Aquatic Preserves Plans. The Florida Department of Environmental Protection (FDEP) Office of Coastal and Aquatic Managed Areas (CAMA) is currently preparing a state-wide aquatic preserves plan. Over the next three years, CAMA will update each aquatic preserve plan, including those in LCH.

The Charlotte Harbor Aquatic Preserves (CHAP) are five contiguous aquatic preserves within the greater Charlotte Harbor estuary complex designated by the State Legislature for inclusion in the aquatic preserve system under the Florida Aquatic Preserve Act of 1975. The preserves are (from north to south): Lemon Bay Aquatic Preserve (outside of the study area), Cape Haze Aquatic Preserve; Gasparilla Sound - Charlotte Harbor Aquatic Preserve, Matlacha Pass Aquatic Preserve; and Pine Island Sound Aquatic Preserve. All of these areas are included in the Charlotte Harbor Aquatic Preserves Plan. Additional information can be found at: <http://www.dep.state.fl.us/coastal/sites/charlotte/info.htm>.

The Estero Bay Aquatic Preserve (EBAP) was dedicated in December 1966 – Florida's first aquatic preserve. Estero Bay is bordered on the west by a chain of barrier islands, which include: Estero Island, Long Key, Lovers Key, Black Island, Big Hickory Island, and Little Hickory Island, from north to south respectively. The EBAP is designated as a wilderness preserve wherein the primary management objective will be the maintenance of these ecosystems in an essentially natural state. Additional information can be found at:

<http://www.dep.state.fl.us/coastal/sites/estero/info.htm>.





Outstanding Florida Waters

Per Section 403.061 FS, an Outstanding Florida Water (OFW), is a water designated worthy of special protection because of its natural attributes. This special designation is applied to certain waters, and is intended to protect existing good water quality; all aquatic preserves are “Outstanding Florida Waters.” In addition to the six Aquatic preserves within this report’s study area, all of the Estero Bay tributaries have the OFW designation. In addition, all the waters within the “Ding” Darling National Wildlife Refuge and all the waters within the State Parks and Preserves within Lower Charlotte Harbor are OFW by statute. The OFW designation restricts FDEP from issuing permits for direct pollutant discharges to OFWs which would lower ambient (existing) water quality or indirect discharges which would significantly degrade the Outstanding Florida Water. Also,

permits for new dredging and filling must be clearly in the public interest. Additional information can be found at: <http://www.dep.state.fl.us/water/wqssp/ofwfs.htm>.

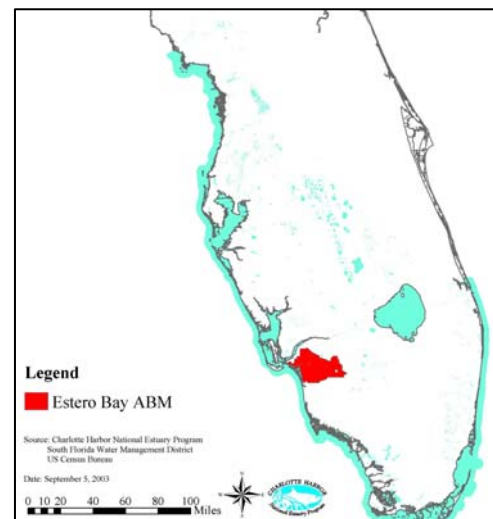
Charlotte Harbor Management Plan

In 1979, the Charlotte Harbor Resource Planning and Management Committee was established by the Governor to develop the Charlotte Harbor Management Plan. The plan was subsequently adopted on June 5, 1981. The plan provides goals, objectives, and implementation actions to guide governmental decision making pertaining to coastal management issues. It addresses intergovernmental coordination, research, stormwater management, flood plains, wastewater, wetlands, beaches and barrier islands, water supply, land development, site alternatives, dredge and fill restoration, coastal floodplains, and monitoring implementation. Goals and objectives of the plan can be found at:

<http://www.mysanibel.com/Planning/SanibelPlan-VisionStatement/Article3-4.htm>.

Estero Bay Agency on Bay Management

Negotiations over the permit issuance for the Florida Gulf Coast University led to a Settlement Agreement that called for the creation of the "Arnold Committee" and an assessment of overall land uses and natural systems, environmental protection and mitigation tools in the Estero Bay watershed. Upon completion of the Assessment and its adoption by the Arnold Committee in October of 1996, the SWFRPC established and began providing Staff support to the Estero Bay Agency on Bay Management (ABM). The ABM is a non-regulatory advisory committee to the SWFRPC. Its directive is to make comments and recommendations regarding the management of Estero Bay and its watershed. The ABM collects and maintains data and it reviews and comments



to regulatory agencies on issues affecting the watershed. Its members include Lee County legislative delegates and representatives of the Council, local chambers of commerce, citizen and civic associations, the Responsible Growth Management Coalition, Lee County, Collier County, City of Fort Myers, Town of Fort Myers Beach, SFWMD, FDEP, FFWCC, Florida Gulf Coast University, Federal agencies involved in natural resource management, commercial and recreational fishing interests, environmental and conservation organizations, scientists, affected property owners, and the land development community. Determinations and recommendations issued by the ABM are based on the adopted “Estero Bay Agency on Bay Management Principles.” ABM materials can be found at: <http://www.swfrpc.org/ABM/EBABM.htm>. The EBNMP has been established to begin addressing the nutrient and other water quality problems within the Estero Bay basin. More information on this organization can be found at: <http://www.swfwc.org/EBNMP/default.htm>.

District Plans and Programs

Because of the flat topography of the southern peninsula of Florida, basin boundaries are not pronounced. South Florida geomorphology, water management district boundaries, and some dredging projects that have connected water bodies, result in the need for overlapping watershed-based planning and protection. There are three protection plans which overlap the Lower Charlotte Harbor area yet extend beyond its boundaries. These include the Lake Okeechobee Protection Plan (LOPP), the Charlotte Harbor SWIM Plan, and the Estero Bay and Watershed Assessment. In addition, the District maintains overlapping water supply plans and prepared a South Lee County Watershed Plan that also overlap with the LCH study area. These plans are described below.

Lake Okeechobee Protection Plan (LOPP)

The Lake Okeechobee SWIM Plan was superseded by the LOPP which was required by the Lake Okeechobee Protection Act (Sec. 373.4595, F.S.), passed in 2000. The Act required that the SFWMD, in cooperation with FDEP and DACS, complete a Lake Okeechobee Protection Plan by January 1, 2004. The LOPP specifically addresses issues of phosphorous loading, water quality, and exotic species control. The LOPP geographically overlaps with other projects and initiatives, specifically: the Lower Charlotte Harbor SWIM area, the L-8 structure, Nicodemus Slough, and the East Beach basins. The LOPP can be found at: http://www.sfwmd.gov/org/wrp/wrp_okee/projects/protction_plan.html. A number of projects have been funded for in-lake and watershed locations in conjunction with the LOPP. These projects can be found at:

http://www.sfwmd.gov/org/wrp/wrp_okee/projects/2_wrp_okee_projects.html. In addition, status reports on

the operational relationships between Lake Okeechobee and the Caloosahatchee can be found at: <http://www.sfwmd.gov/site/> or <http://www.sfwmd.gov/site/index.php?id=16>.

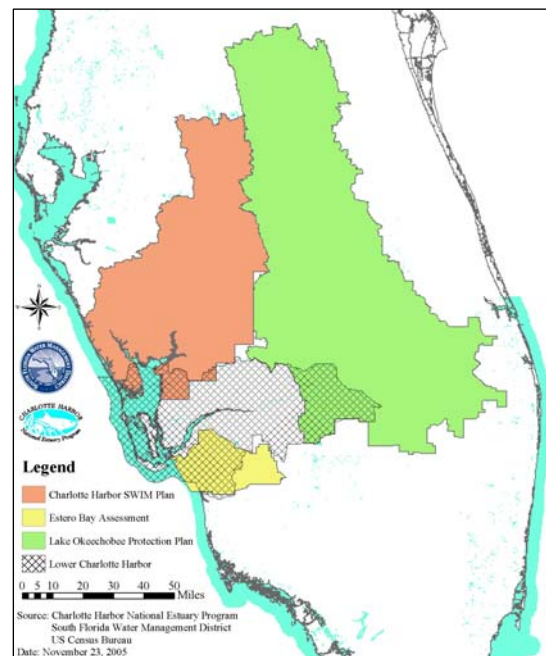
Charlotte Harbor SWIM Plan

Charlotte Harbor within the SFWMD service area was designated a SWIM waterbody in 1990. With the establishment of the Charlotte Harbor National Estuary Program in 1996, the waterbody boundaries were expanded in 2000 to include Lemon Bay and coastal Venice watersheds. The plan includes priority projects, some of which are in the Lower Charlotte Harbor SWIM boundaries. These include water quality monitoring, Alligator Creek Restoration, development of a Pollutant Load Reduction Goal (PLRG) for Charlotte Harbor Proper, continued seagrass mapping, and Charlotte Harbor educational efforts. The SWIM Plan can be found at: <http://www.sfwmd.state.fl.us/documents/>.

Estero Bay and Watershed Assessment

The flooding events of 1995 showed that as water levels rise, the direction of water flow changed and the Estero Bay basin is enlarged to include Lake Trafford and environs. This finding as well as other pressures within the Estero Bay basin prompted the SFWMD to prepare the Estero Bay

Overlapping SWIM Protection Plans



and Watershed Assessment. This assessment was prepared within the same timeframe as the South Lee County Watershed Plan; both were completed in 1999. This assessment was designed to establish a foundation for future management strategies and a framework for the future identification and evaluation of management options. The assessment, completed in 1991, is comprised of six reports presented in separate volumes, which together comprise the completed findings of the study. The Estero Bay and Watershed Assessment can be found at:

<http://www.sfwmd.gov/org/exo/ftmyers/report-text/>

The Assessment has been used to inform such projects as the Estero Bay Management and Improvement Plan and the Estero Bay Nutrient Management Partnership (EBNMP). It also provides background information for the Estero Bay Agency on Bay Management.

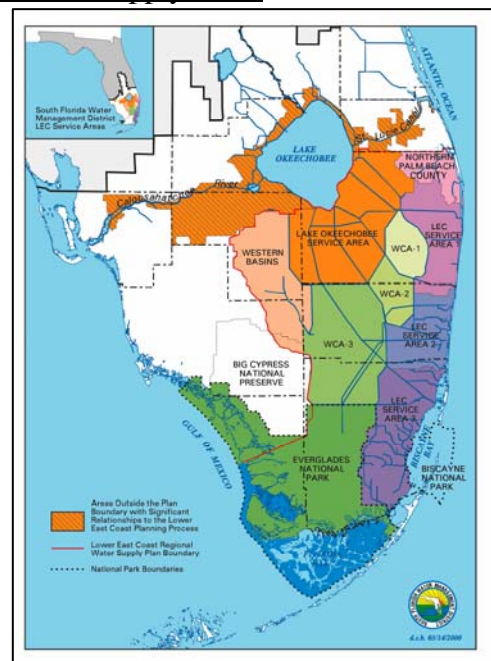
It is important to note that the watershed for Estero Bay in this assessment extends farther east than that in the Lower Charlotte Harbor study area. The FDEP watershed definitions were used for the study. However, after the 1995 flooding events, SFWMD discovered that the watershed boundary changes depended on amount of rain and water. The assessment uses the maximum area the watershed constitutes.

Lower West Coast, Lower East Coast, and Caloosahatchee Water Supply Plans

The SFWMD maintains four Water Supply Plans for its jurisdiction, which can be reviewed at :

<http://www.sfwmd.gov/org/wsd/wsp/>. Two Water Supply Plans affect the Lower Charlotte Harbor area: The Lower West Coast Water Supply Plan (LWCWSP) and the Lower East Coast Water Supply Plan. Although the LWCWSP covers the entire study area, the Lower East Coast Water Supply Plan (LECWSP) includes some areas of the freshwater Caloosahatchee. This area of overlap, and its associated complexities necessitated the development of the CWMP, found at:

<http://www.sfwmd.gov/org/exo/cwmp/index.html>. The CWMP was adopted April 2000 and will be included as a component of both of the lower coast water supply plan updates, as well as the SWFFS. Three documents comprise the 2000 LWCWSP: Planning Document (Volume I), Support Document (Volume II), and Appendices (Volume III). These documents provide a common set of data such as present and future water demands, assumptions, and potential water source options. The LWCWSP will be used by local governments, water users, and utilities to modify and update their local comprehensive plans, ordinances, and individual or utility plans.



South Lee County Watershed Plan

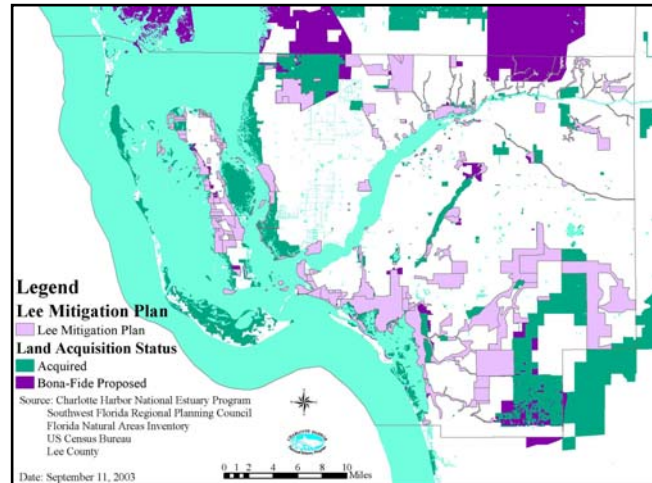
The South Lee County Watershed Plan, completed in 1999, was developed as a response to serious flooding that occurred in the region in 1995. The plan identified the improvements that could be implemented to mitigate flooding while improving water quality and included an analysis of improvements to re-establish historic flows. Flow-way restoration and enhancement projects were completed, initiated or funded during the development of the plan. Projects such as Bonita Bay's The Brooks, reconstruction of the Kehl Canal weir on the Imperial River, clean and snag removals from the Imperial and Estero Rivers have resulted from the plan. A summary of the plan can be found at: <http://www.sfwmd.gov/org/exo/ftmyers/proj/slee.html>.

Local Plans and Programs

Lee County Master Mitigation Plan

Lee County has embarked in preparing the Lee County Master Mitigation Plan (LMMP). The Mitigation Plan has three main purposes:

1. to provide a master strategy by which critical environmental features continue to be preserved,
2. to provide “safe harbor” approaches for mitigation projects that are required for the infrastructure needed to accommodate growth, which in turn will enable the budgeting process to be reliable, and
3. to restore degraded resources that are important for the health, safety, and welfare of the public.



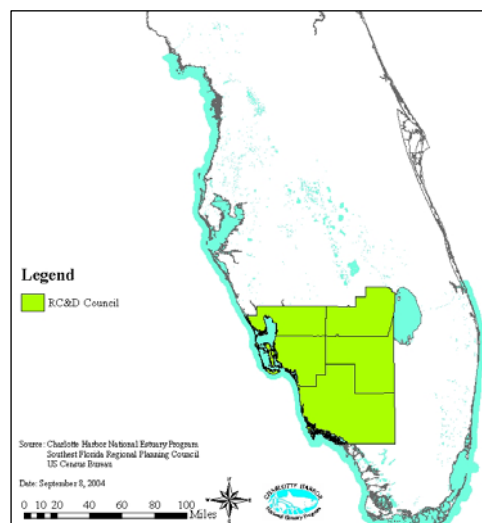
The plan is a component of the implementation of the Lee County Comprehensive Plan. In addition, the plan is being incorporated into other efforts including the CHNEP Restoration Plan, the SWFFS restoration alternatives, and the SWFRRCT Restoration Plan. The plan can be found at: <http://www.swfrpc.org/LMMP.htm>.

Non-Profit Programs

Southwest Florida Resource Conservation and Development Council, Inc.

The Southwest Florida Resource Conservation and Development Council, Inc. (SWFRC&D) is a regional 501(c)3 non-profit organization dedicated to helping local communities protect and conserve their natural resources, improve social conditions and provide opportunities for economic development. The SWFRC&D was created September 2002. Charlotte, Collier, Hendry, Glades and Lee County comprise the regional area. The SWFRC&D council consists of 15 board members, three from each county. To ensure the representation by each of these areas, the SWFRC&D has assigned members to maintain, contact and facilitate the implementation of projects serving all areas. The role of the SWFRC&D is to cooperate and assist with the implementation of local and regional plans of organizations and agencies beneficial to resource conservation and sustainable development in the 5-county area. Information on the SWFRC&D can be found at:

<http://www.swfrpc.org/RCDC.htm>.



Corkscrew Regional Ecosystem Watershed Trust

The Corkscrew Regional Ecosystem Watershed (CREW) Land & Water Trust was established in 1989 as a nonprofit organization to coordinate the land acquisition, land management, and public use of the 60,000-acre CREW. This watershed straddles Lee and Collier Counties and provides aquifer recharge, natural flood protection, water purification, preservation of wildlife habitat, and public recreation. Since 1990, CREW has coordinated the purchase of nearly 27,500 acres. The CREW Land & Water Trust was the first public/private partnership approach to an ecosystem-based acquisition project in Southwest Florida. CREW is a Florida Forever project and the SFWMD continues to acquire land within the designated boundary of CREW and restore the natural habitat. <http://www.crewtrust.org/>.

4. Geographic Analysis

Soils

Soils in the LCH area are typically hydric or partially hydric (see Figure 18). Non-hydric areas are associated with natural drainage courses such as the Orange River or with fill area such as Cape Coral. Soils in the area are most typically poorly drained (see Figure 19). Tables 7 and 8 present more detailed information about the soils in the LCH area.

Figure 18: Hydric Characteristics of Soils

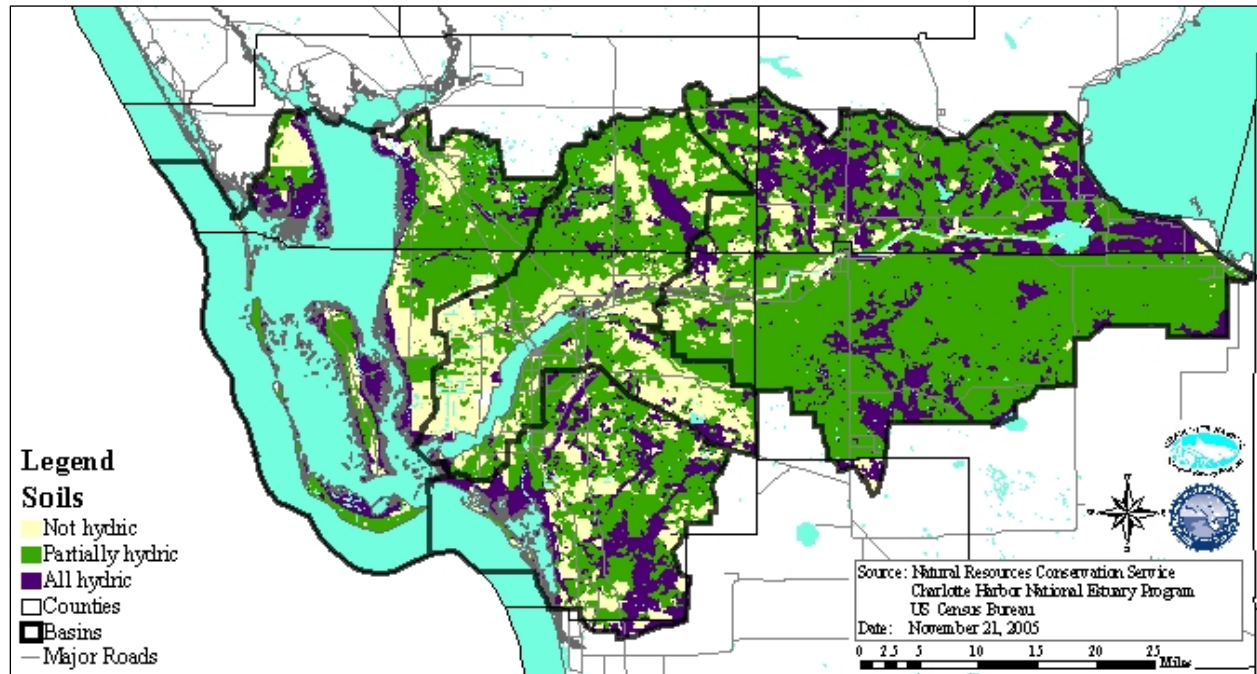
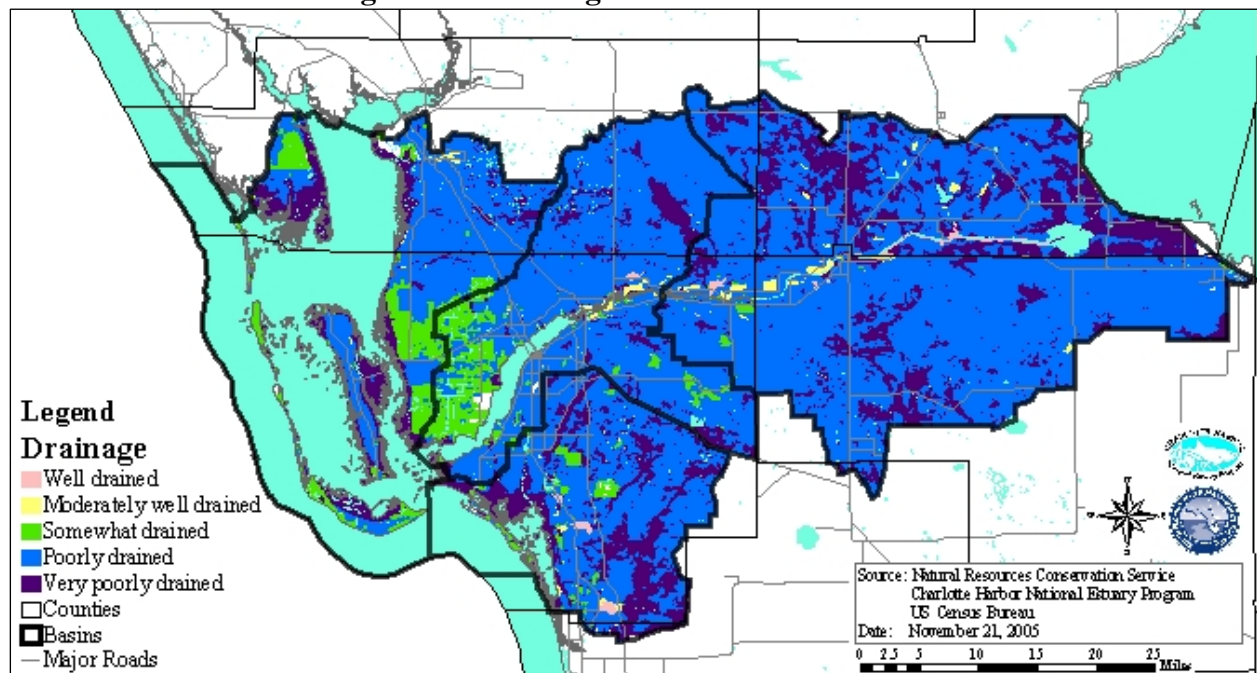


Figure 19: Drainage Characteristics of Soils



**Table 7: Most Common Soil Types by Area
(Top 82%)**

Map Unit Name	Charlotte Harbor	Caloosahatchee Estuary	Freshwater Caloosahatchee	Estero Bay	Total	Percentage
Immokalee sand	8,415	24,189	99,184	20,504	152,292	12%
Oldsmar sand	7,498	30,765	62,618	9,089	109,971	9%
Pineda fine sand	10,481	18,710	18,348	13,124	60,662	5%
Boca fine sand	12,785	15,072	13,071	11,022	51,950	4%
Wabasso sand, limestone substratum	7,559	15,859	19,993	2,107	45,518	4%
Wabasso sand	13,882	18,756	10,412	634	43,684	3%
Malabar fine sand	2,079	11,883	15,141	11,146	40,249	3%
Myakka fine sand	8,438	10,087	19,003	2,679	40,207	3%
Malabar fine sand, high	1,513	17,285	18,211	362	37,371	3%
Matlacha gravelly fine sand	15,537	11,069	492	3,014	30,113	2%
Hallandale fine sand	3,406	6,701	2,069	15,258	27,434	2%
Wulfert muck	13,460	2,489		5,657	21,606	2%
Basinger fine sand			21,129		21,129	2%
Oldsmar sand, limestone substratum			20,258		20,258	2%
Peckish mucky fine sand	15,388	577		3,625	19,589	2%
Boca sand		1	19,178		19,179	2%
Felda fine sand, depressional	3,864	4,787	784	8,736	18,171	1%
Valkaria fine sand	265	1,944	8,968	6,242	17,419	1%
Pineda fine sand, depressional	2,061	6,908	1,276	5,841	16,086	1%
Margate sand			15,941		15,941	1%
Malabar sand			15,251		15,251	1%
Water	4,945	2,726	4,738	2,544	14,952	1%
Smyrna fine sand	4,941	949	8,234	772	14,896	1%
Pompano fine sand, depressional	270	3,248	177	10,169	13,864	1%
Felda fine sand	3,253	1,222	6,333	1,951	12,759	1%
Matlacha gravelly fine sand, limesto	4,627	7,283	168	6	12,083	1%
Pineda sand, limestone substratum			11,949		11,949	1%
Winder sand, depressional	3,227	5,075	2,424	899	11,625	1%
Pompano fine sand	954	748	144	9,378	11,223	1%
Isles fine sand, depressional	1,119	958	121	8,351	10,548	1%
Riviera sand, depressional		0	10,533		10,533	1%
Estero muck	7,935	149		1,749	9,833	1%
Basinger sand			9,112		9,112	1%
Pineda fine sand, limestone	3,053	1,895	2,814	1,185	8,947	1%
Boca fine sand, slough	1,049	2,674	1,211	3,664	8,598	1%
Myakka sand			8,558		8,558	1%
Matlacha-Urban land complex	712	5,476	599	1,610	8,396	1%
Copeland sandy loam, depressional	203	3,124	1,338	2,624	7,289	1%
Holopaw sand			7,243		7,243	1%
Heights fine sand	4,216	2,178	782		7,177	1%
Riviera sand, limestone substratum			7,122		7,122	1%
Immokalee-Urban land complex	31	6,843	28	188	7,091	1%

Table 8: Soil Types by Total Percent within LCH Area

Map Unit Name	Percentage	Drainage Class	Hydrography	Hydrography
Immokalee sand	12%	Poorly drained	B/D	Partially hydric
Oldsmar sand	9%	Poorly drained	B/D	Partially hydric
Pineda fine sand	5%	Poorly drained	B/D	Partially hydric
Boca fine sand	4%	Very poorly drained	D	All hydric
Wabasso sand, limestone substratum	4%	Poorly drained	B/D	Partially hydric
Wabasso sand	3%	Poorly drained	B/D	Partially hydric
Malabar fine sand	3%	Very poorly drained	B/D	All hydric
Myakka fine sand	3%	Poorly drained	B/D	Partially hydric
Malabar fine sand, high	3%	Poorly drained	B/D	Partially hydric
Matlacha gravelly fine sand	2%	Somewhat drained	C	Not hydric
Hallandale fine sand	2%	Poorly drained	B/D	All hydric
Wulfert muck	2%	Very poorly drained	D	All hydric
Basinger fine sand	2%	Very poorly drained	B/D	All hydric
Oldsmar sand, limestone substratum	2%	Poorly drained	B/D	Partially hydric
Peckish mucky fine sand	2%	Very poorly drained	D	All hydric
Boca sand	2%	Poorly drained	B/D	Partially hydric
Felda fine sand, depressional	1%	Very poorly drained	D	All hydric
Valkaria fine sand	1%	Poorly drained	B/D	Partially hydric
Pineda fine sand, depressional	1%	Very poorly drained	D	All hydric
Margate sand	1%	Poorly drained	B/D	Partially hydric
Smyrna fine sand	1%	Very poorly drained	D	All hydric
Pompano fine sand, depressional	1%	Very poorly drained	D	All hydric
Felda fine sand	1%	Poorly drained	B/D	Partially hydric
Pineda sand, limestone substratum	1%	Poorly drained	B/D	Partially hydric
Winder sand, depressional	1%	Very poorly drained	D	All hydric
Pompano fine sand	1%	Poorly drained	B/D	Partially hydric
Isles fine sand, depressional	1%	Very poorly drained	D	All hydric
Riviera sand, depressional	1%	Very poorly drained	B/D	All hydric
Estero muck	1%	Very poorly drained	D	All hydric
Basinger sand	1%	Poorly drained	B/D	Partially hydric
Pineda fine sand, limestone substratum	1%	Poorly drained	B/D	Partially hydric
Boca fine sand, slough	1%	Poorly drained	B/D	Partially hydric
Myakka sand	1%	Poorly drained	B/D	Partially hydric
Matlacha-Urban land complex	1%	Somewhat drained	C	Not hydric
Copeland sandy loam, depressional	1%	Very poorly drained	D	All hydric
Holopaw sand	1%	Poorly drained	B/D	Partially hydric
Heights fine sand	1%	Poorly drained	B/D	Partially hydric
Riviera sand, limestone substratum	1%	Poorly drained	B/D	Partially hydric
Immokalee-Urban land complex	1%	Poorly drained	B/D	Partially hydric

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately

fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, and soils that have a clay hardpan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Soils in the study area are dominated by soil group B/D. The infiltration rate varies in this area depending upon the presence of a clay-rich hardpan near the surface. Mapped areas of wetlands generally coincide with the areas dominated by soil group B/D. The group D soils are poorly drained due to the clay hardpan beneath them, which gives rise to areas of standing water that promote wetland development. (URS, 2005)

Pre-Development and 2003 Land Cover

As part of the SWFFS, a pre-development vegetation map was prepared for the hydrologic modeling effort. The mapping effort began with the soils map. For disturbed soils, archival information was used to identify the likely pre-development vegetative communities (See Figure 20). Mesic flatwoods comprised over 50% of the land area before development, with hydric flatwoods making up another 20%.

Figure 20: Pre-Development Vegetation Map

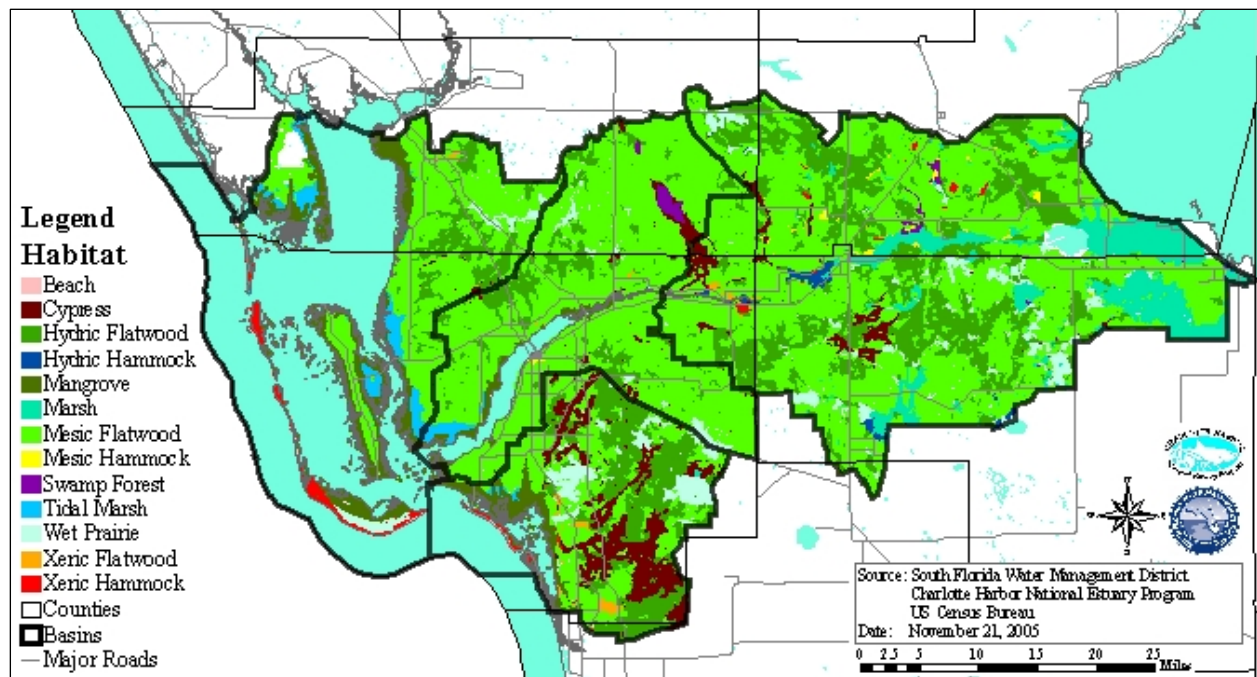
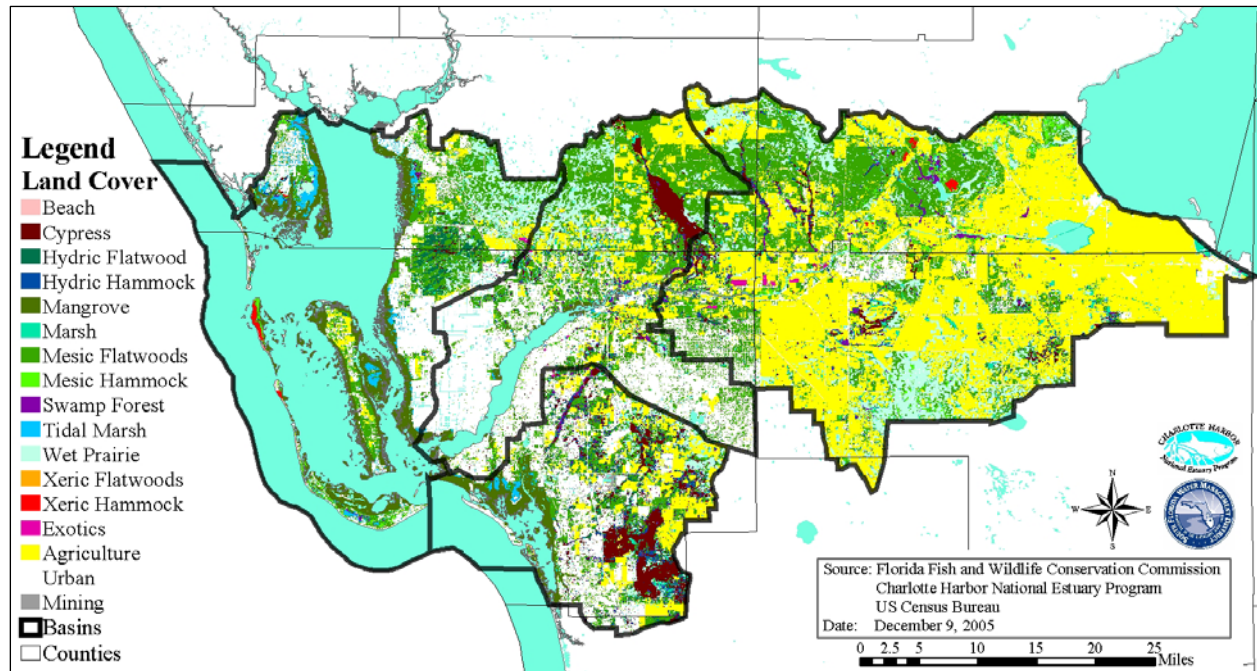


Table 9: Pre-Development Vegetation Acreage by Basin

	Charlotte Harbor	Caloosahatchee Estuary	Freshwater Caloosahatchee	Estero Bay	Total	Percentage
Beach	566			252	819	0%
Cypress	2,607	15,635	12,550	31,989	62,782	4%
Hydric Flatwood	23,326	46,934	121,728	48,500	240,489	15%
Hydric Hammock	55	304	6,276		6,636	0%
Mangrove	42,730	8,206		13,311	64,247	4%
Marsh	212	540	87,460	350	88,561	6%
Mesic Flatwood	85,073	175,981	316,578	64,577	642,209	41%
Mesic Hammock	159	612	6,572		7,343	0%
Swamp Forest	65	2,830	4,419	129	7,443	0%
Tidal Marsh	15,903	3,617		2,024	21,545	1%
Water	260,690	17,579	7,454	34,861	320,583	20%
Wet Prairie	13,995	16,757	41,220	19,504	91,476	6%
Xeric Flatwood	900	952	1,235	2,945	6,032	0%
Xeric Hammock	6,111	34	4,989	2,577	13,712	1%
Unknown	4,336		0		4,336	0%
Total	456,729	289,982	610,482	221,020	1,578,213	

The FFWCC prepares land cover maps from Landsat Imagery. The latest version is from 2003 (See Figure 21). Land cover can be different from land use. For example, the land cover for unimproved pasture can be Mesic Flatwoods.

Figure 21: 2003 Land Cover



For the purposes of this analysis, Land Cover categories were converted to SFWMD Pre-Development Vegetation classifications as well as possible. FFWCC did not make the distinction between xeric, mesic, and hydric in the same manner that SFWMD did. Therefore, the following table includes some combining of categories. Beach may have increased because of renourishment and compaction of coastal strand. Mesic/Xeric Hammock may have increased because of fire suppression and drainage. Overall, native habitats have decreased by 53% from Pre-Development conditions.

Table 10: 2003 Land Cover Compared to Pre-Development Vegetation (in acres)

	Charlotte Harbor	Caloosahatchee Estuary	Freshwater Caloosahatchee	Estero Bay	Total	PDV Total	Percentage Change
Beach	1,832	9	0	231	2,072	819	153%
Cypress	2,431	9,008	7,667	16,353	35,459	62,782	-44%
Flatwood	56,347	81,705	134,821	37,754	310,627	888,730	-65%
Hydric Hammock	1,507	1,250	3,414	584	6,756	6,636	2%
Mangrove	41,492	3,286	1	11,969	56,747	64,247	-12%
Mesic/Xeric Hammock	3,900	4,540	14,866	2,444	25,749	7,343	251%
Swamp/Marsh	22,495	22,189	76,771	18,909	140,365	209,025	-33%
Open Water	269,846	26,262	7,349	42,450	345,907	320,583	8%
Exotics	170	131	1,014	41	1,355	N/A	N/A
Agriculture	10,931	35,156	320,126	30,396	396,609	N/A	N/A
Urban	46,970	104,613	42,058	51,301	244,942	N/A	N/A
Mining	72	324	184	820	1,400	N/A	N/A
Total	457,992	288,474	608,270	213,252	1,567,988	1,560,165	
Native Land Habitats	130,003	121,988	237,539	88,244	577,774	1,239,582	-53%

Existing and Future Land Use

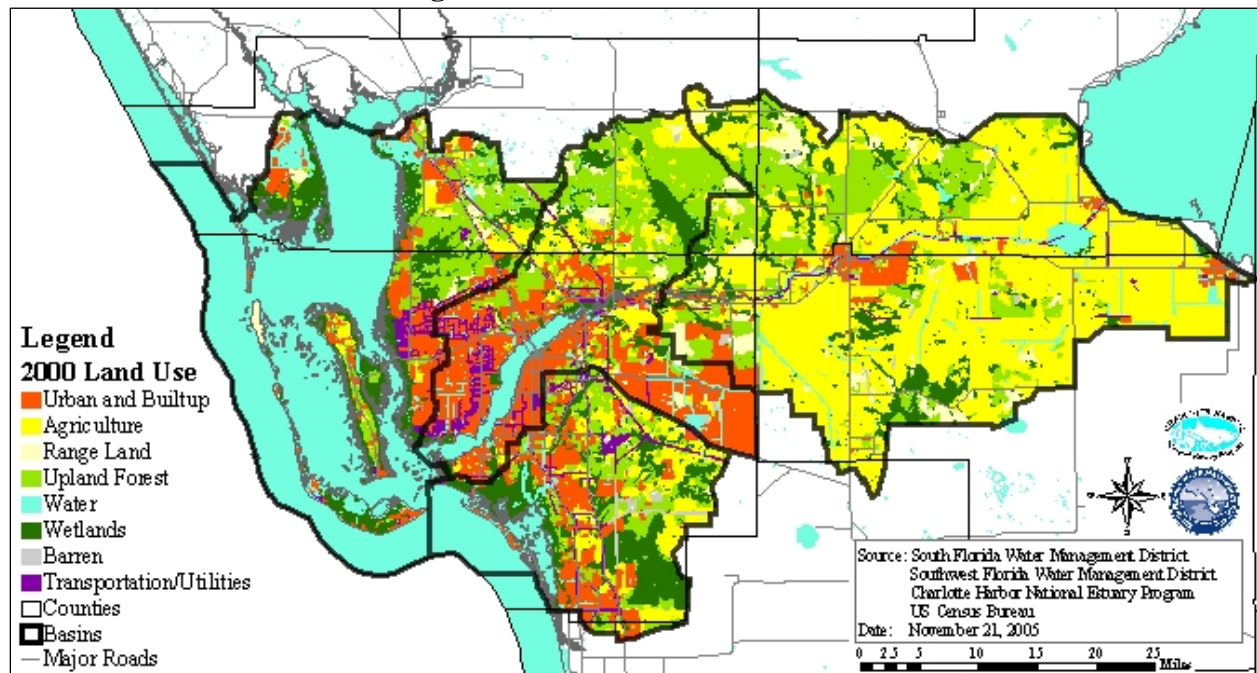
2000 Land Use

Both the SFWMD and SWFWMD maintain Existing Land Use information using the Florida Land Use and Cover Classification System (FLUCCS). Typically these are updated every 5 years. FLUCCS is the state standard and was developed by the Florida Department of Transportation (FDOT) in cooperation with state agencies. The manual which details the classification system is available at:

<http://www.dot.state.fl.us/surveyingandmapping/geographic.htm>.

Land designated as urban land use or urban purpose, depicted in red in the figure below are concentrated along the Tidal Caloosahatchee and the Orange River (Lehigh Acres) (See Figure 22). Pockets of urbanization have expanded in the Estero Bay Basin. Distinct Community areas still exist in the tidal Caloosahatchee and in Charlotte Harbor basins. Agricultural Uses are concentrated within the Freshwater Caloosahatchee watershed. Upland Forest is found predominately as a band across the northern third of the study area. Wetlands are found as a mangrove fringe surrounding the estuarine waters of the study area and large cypress systems such as the Flint Pen Strand and Telegraph Swamp.

Figure 22: 2000 Level 1 Land Use



The following table details the land acreages at the FLUCCS level 2.

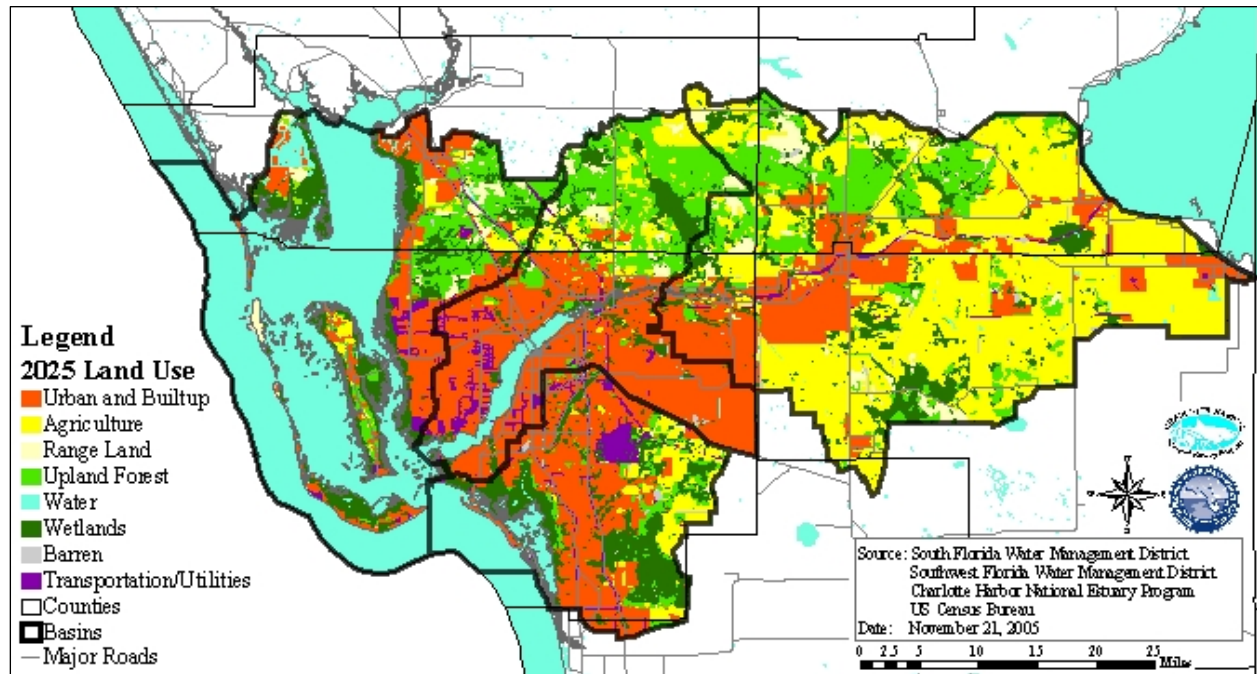
Table 11: 2000 Land Uses at Level 2 (in acres)

Land Use Code	Description	Charlotte Harbor/ Pine Island	Caloosa-hatchee Estuary	Freshwater Caloosa-hatchee	Estero Bay	Cape Haze	Total
100	Urban/Builtup	1,601	4,720	826	2,001	0	9,148
110	Residential, Low Density <Less than two dwelling units per acre>	6,969	22,818	13,479	5,720	828	49,814
120	Residential, Medium Density <Two-five dwelling units per acre>	11,275	32,406	4,628	12,607	0	60,916
130	Residential, High Density	1,930	5,163	174	3,194	199	10,660
140	Commercial and Services	1,131	5,129	703	2,237	21	9,221
150	Industrial	319	2,393	528	2,138	0	5,377
160	Extractive	771	1,125	442	4,200	8	6,547
170	Institutional	476	1,316	507	461	0	2,761
180	Recreational	2,276	3,377	828	6,467	8	12,957
190	Open Land	17,096	28,525	11,661	4,097	6,077	67,455
210	Pastures/Row Crop	8,196	32,119	231,362	31,254	46	302,977
220	Tree Crops	2,159	2,429	94,506	2,249	0	101,344
230	Feeding Operations	0	0	8	0	0	8
240	Nurseries and Vineyards	146	863	853	248	0	2,109
250	Specialty Farms	20	509	1,717	86	0	2,332
260	Other Open Lands <Rural>	614	821	3,686	1,071	16	6,208
310	Herbaceous (Dry Prairie)	369	445	275	80	137	1,306
320	Shrub and Brushland	2,187	4,261	13,173	981	1,336	21,939
330	Mixed Rangeland	8,665	9,367	19,359	1,143	48	38,582
410	Upland Coniferous Forests	36,211	52,731	50,872	31,609	1,463	172,886
420	Upland Hardwood Forests	1,153	1,917	10,648	2,559	0	16,277
430	Upland Hardwood Forests Cont.	2,115	1,281	7,241	975	94	11,705
440	Tree Plantations	0	4,540	29,461	107	53	34,161
510	Streams and Waterways	914	16,290	2,303	589	1,106	21,201
520	Lakes	389	30	146	157	12	733
530	Reservoirs	1,739	1,651	2,790	1,988	533	8,701
540	Bays and Estuaries	231,645	1,367	0	34,229	26,344	293,585
560	Slough Waters	127	108	3	387	0	625
610	Wetland Hardwood Forests	36,351	14,086	27,004	16,867	8,626	102,932
620	Wetland Coniferous Forests	6,503	9,113	10,454	24,972	335	51,378
630	Wetland Forested Mixed	415	1,594	6,922	5,403	157	14,492
640	Vegetated Non-Forested Wetlands	14,103	15,672	53,398	10,437	3,890	97,501
650	Non-Vegetated/Tidal Flats	582	33	0	656	744	2,016
710	Beaches Other Than Swimming Beaches	344	0	0	123	11	478
720	Sand Other Than Beaches	18	0	0	10	0	28
740	Disturbed Lands	1,333	3,883	5,632	4,241	46	15,135
810	Transportation	4,343	6,368	3,771	4,006	8	18,497
820	Communications	0	32	0	20	0	52
830	Utilities	488	1,500	1,122	1,443	32	4,585
	Total Area	404,976	289,982	610,482	221,012	52,177	1,578,630
	Land Area	170,162	270,537	605,241	183,663	24,183	1,253,785

2025 Future Land Use

SFWMD predicted likely changes in land use for 2025 using the City and County Comprehensive Plan Future Land Use Maps (FLUMs) and University of Florida Bureau of Economic and Business Research (BEBR) population forecasts. Urban infill is predicted by 2025 but also significant growth in rural communities along the Caloosahatchee (Figure 23).

Figure 23: 2025 Future Land Use



2050 Future Land Use

Similar projections have been made by SFWMD for 2050 future land uses. If no amendments to comprehensive plan FLUMs are made before 2050, most of the population growth is predicted to be accommodated by urban infill (Figure 24).

Figure 24: 2050 Future Land Use

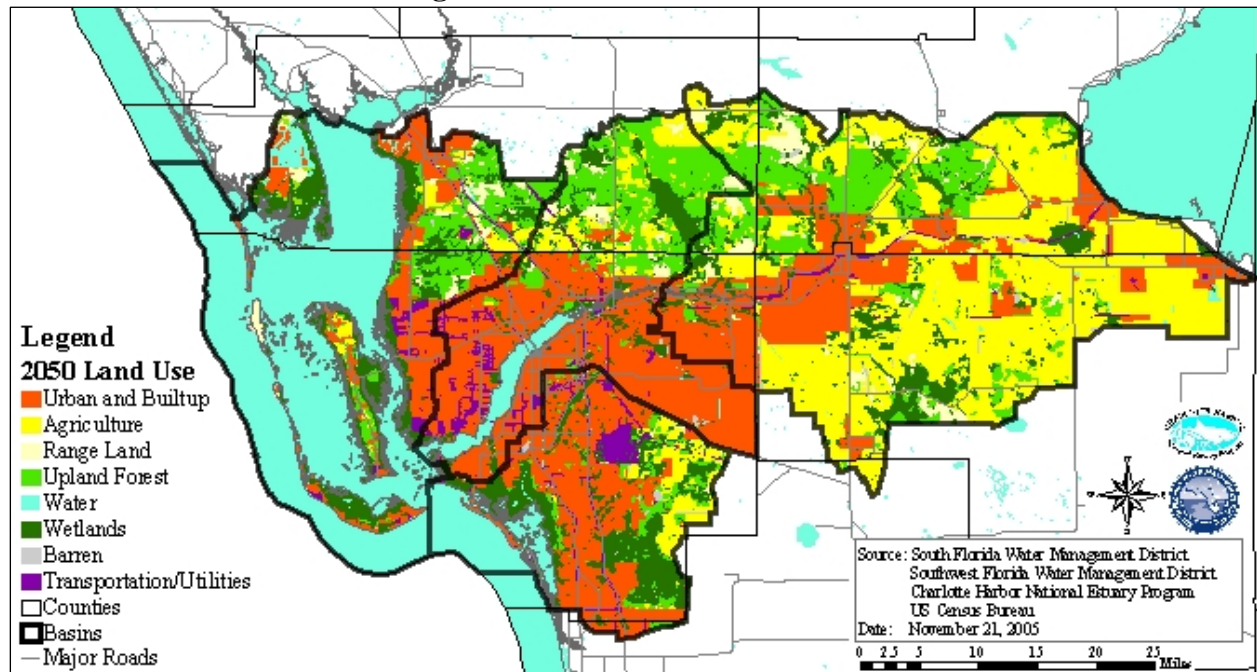


Table 12: Projected Land Use Changes by Basin (in acres)

Charlotte Harbor/Pine Island		2000	2025	2050	Total	%change
1	Urban/Builtup	43,846	53,932	54,122	10,277	23%
2	Agriculture	11,136	9,200	9,009	-2,126	-19%
3	Range Land	11,221	10,249	10,249	-972	-9%
4	Upland Forest	39,479	32,249	32,249	-7,229	-18%
5	Water	234,815	234,815	234,815	0	0%
6	Wetlands	57,955	57,955	57,955	0	0%
7	Barren	1,696	1,123	1,123	-573	-34%
8	Transportation/Utilities	4,831	5,455	5,455	624	13%
	Total	404,976	404,976	404,976	0	0%

Caloosahatchee Estuary		2000	2025	2050	Total Change	%change
1	Urban/Builtup	106,973	137,991	139,156	32,183	30%
2	Agriculture	36,740	25,476	24,312	-12,428	-34%
3	Range Land	14,073	10,622	10,622	-3,451	-25%
4	Upland Forest	60,469	46,934	46,934	-13,535	-22%
5	Water	19,446	19,446	19,446	0	0%
6	Wetlands	40,499	40,499	40,499	0	0%
7	Barren	3,883	1,154	1,154	-2,729	-70%
8	Transportation/Utilities	7,900	7,861	7,861	-39	0%
	Total	289,982	289,982	289,982	0	0%

Freshwater Caloosahatchee		2000	2025	2050	Total Change	%change
1	Urban/Builtup	33,776	110,136	123,678	89,902	266%
2	Agriculture	332,132	288,314	274,772	-57,360	-17%
3	Range Land	32,808	21,708	21,708	-11,100	-34%
4	Upland Forest	98,221	78,471	78,471	-19,750	-20%
5	Water	5,241	5,125	5,125	-116	-2%
6	Wetlands	97,778	98,021	98,021	243	0%
7	Barren	5,632	3,809	3,809	-1,823	-32%
8	Transportation/Utilities	4,893	4,898	4,898	5	0%
	Total	610,482	610,482	610,482	0	0%

Estero Bay		2000	2025	2050	Total Change	%change
1	Urban/Builtup	43,121	78,067	82,064	38,944	90%
2	Agriculture	34,909	20,465	16,468	-18,441	-53%
3	Range Land	2,205	909	909	-1,295	-59%
4	Upland Forest	35,250	15,404	15,404	-19,846	-56%
5	Water	37,349	37,349	37,349	0	0%
6	Wetlands	58,336	58,336	58,336	0	0%
7	Barren	4,373	1,594	1,594	-2,779	-64%
8	Transportation/Utilities	5,470	8,887	8,887	3,418	62%
	Total	221,012	221,012	221,012	0	0%

Change Analysis

Between year 2000 and 2050, urbanization is projected to be highest in the rural areas within the Freshwater Caloosahatchee basin, both by percentage and by total acreage. Agriculture, rangeland, and upland forests are anticipated to be reduced by a quarter as a result of projected urban expansion.

Figure 25: 2000-2050 Density/Intensity Increase Projections

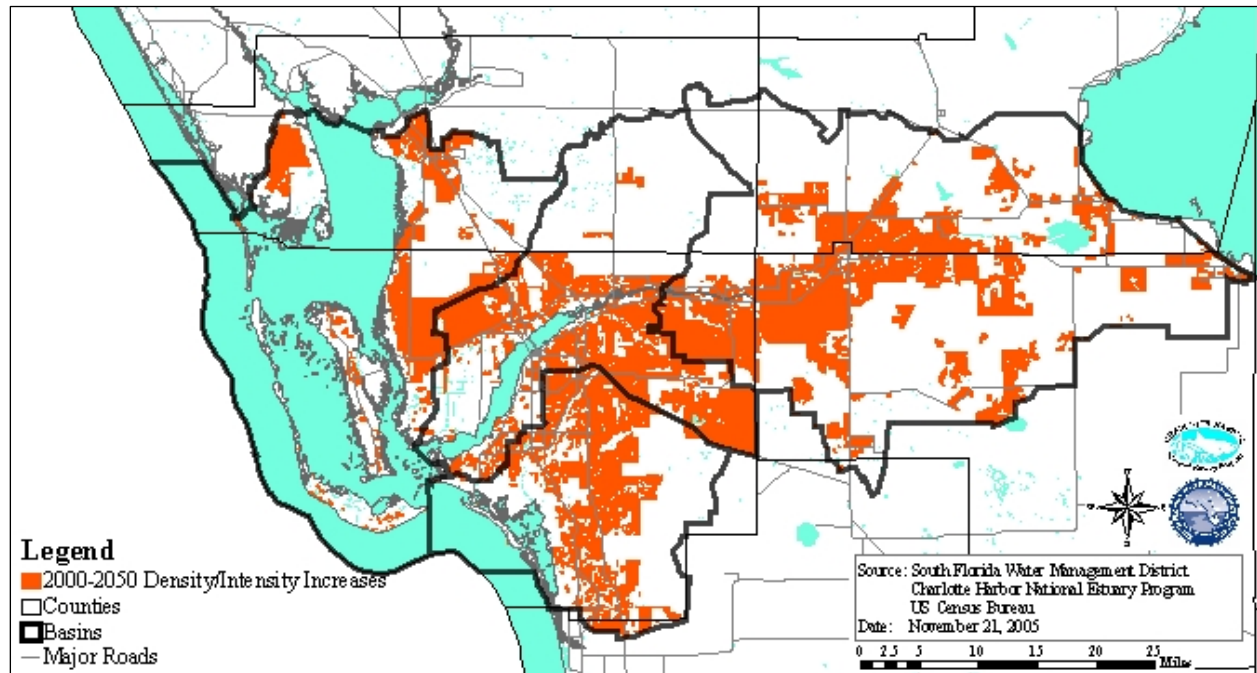


Table 13: Projected Land Use Change Summary (in acres)

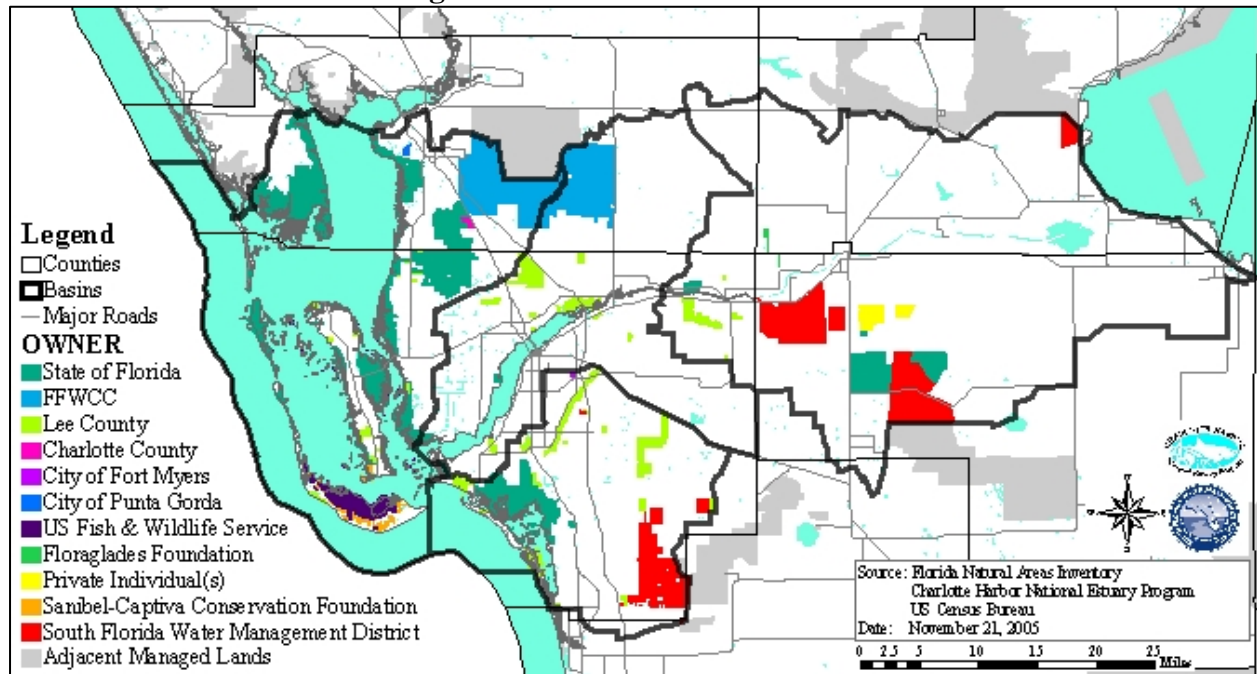
LCH Study Area	2000	2025	2050	Total	% change
1 Urban/Builtup	227,715	380,126	399,020	171,305	75%
2 Agriculture	414,917	343,456	324,561	-90,356	-22%
3 Range Land	60,306	43,488	43,488	-16,818	-28%
4 Upland Forest	233,419	173,058	173,058	-60,361	-26%
5 Water	296,851	296,734	296,734	-116	0%
6 Wetlands	254,567	254,810	254,810	243	0%
7 Barren	15,584	7,679	7,679	-7,905	-51%
8 Transportation/Utilities	23,094	27,101	27,101	4,007	17%
Total	1,526,453	1,526,453	1,526,453	0	0%

Public Conservation Lands

Existing Lands under Public or Private Stewardship

The Florida Natural Areas Inventory (FNAI) maintains an inventory and GIS coverage of lands under public and private non-profit management for conservation purposes. The coverage includes contact information and descriptions of the property. Nearly 190,000 acres are publicly managed within the LCH area, as shown in Figure 26 below.

Figure 26: Lands in Conservation



Numerous agencies have acquired and managed lands for conservation purposes. The State of Florida, through the Trustees of the Internal Improvement Trust Fund owns and manages the most acreage at almost 77,000 acres. These purchases have been by-and-large for buffers to the State Aquatic Preserves. The SFWMD is steward for nearly 42,000 acres which includes the 12,400 acre C-43 West Reservoir site. An additional 40,000 acres is under FFWCC ownership and management.

A summary of existing conservation lands compiled through the Florida Natural Areas Inventory, Florida Managed Lands shape file, issued March 2005, is presented below.

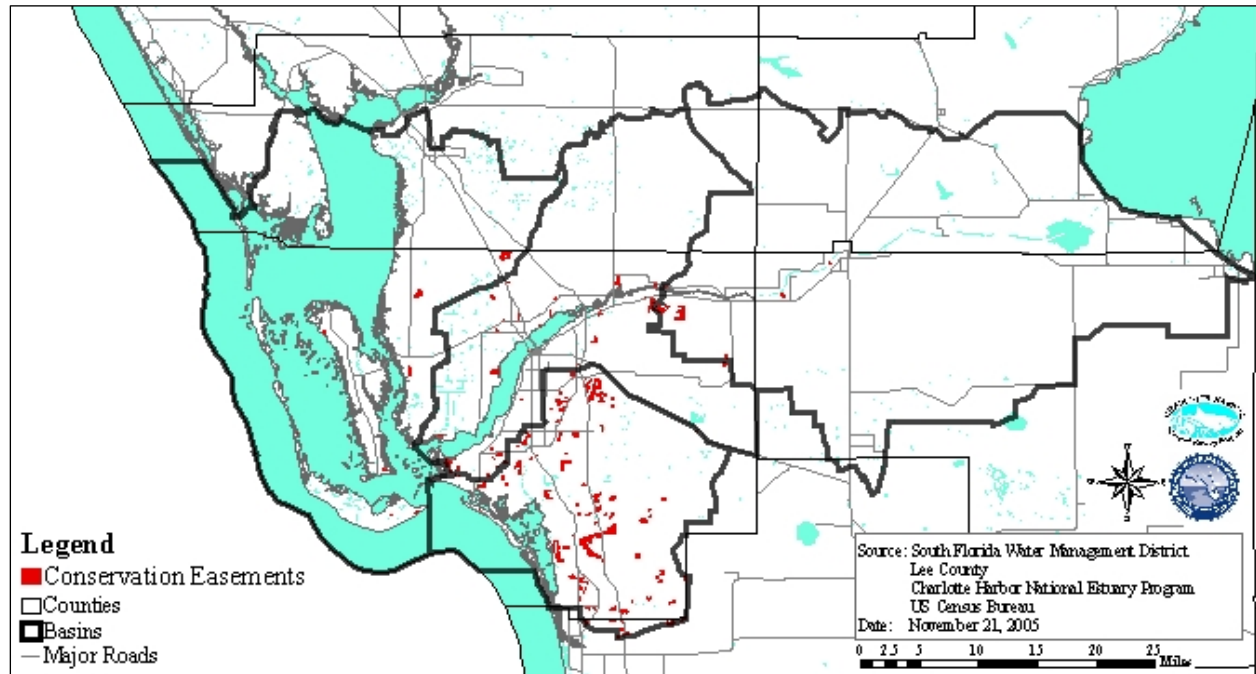
Table 14: Acreage in Conservation

OWNER	Charlotte Harbor/Pine Island	Caloosahatchee Estuary	Freshwater Caloosahatchee	Estero Bay	Total
Charlotte County	504				504
City of Fort Myers				101	101
City of Punta Gorda	146				146
FFWCC	21,643	18,424			40,067
Floraglates Foundation			193		193
Lee County	2,044	5,022	1,746	8,457	17,269
Private/Easements	7		3,016		3,023
SCCF	1,701				1,701
SFWMD			29,689	12,239	41,928
State of Florida	53,497	941	11,347	11,151	76,936
US Fish & Wildlife Service	7,384	9			7,394
Total	86,925	24,397	45,992	31,948	189,262
Total Land Area	194,345	270,537	605,241	183,663	1,253,785
Percentage in conservation	45%	9%	8%	17%	15%

Conservation Easements under Private Management

An extra 4,200 acres are privately managed and are within a conservation easement. These easements are nearly all associated with private development permit requirements. Both Lee County and SFWMD track conservation easements which are transferred to them as a result of development permitting regardless of size using GIS, from which the Figure 27 was derived.

Figure 27: Conservation Easements



	Charlotte Harbor/Pine Island	Caloosahatchee Estuary	Freshwater Caloosahatchee	Estero Bay	Total
SFWMD	290	727	359	2,688	4,064
Lee	38	72		99	209
Total	327	800	359	2,786	4,273

Strategic Habitat Conservation Areas and Greenways

Using LandSat imagery, habitat use, and listed species sightings, the FFWCC identified Strategic Habitat Conservation Areas (SHCAs). SHCAs have many areas in common with native lands.

Figure 28: Strategic Habitat Conservation Areas

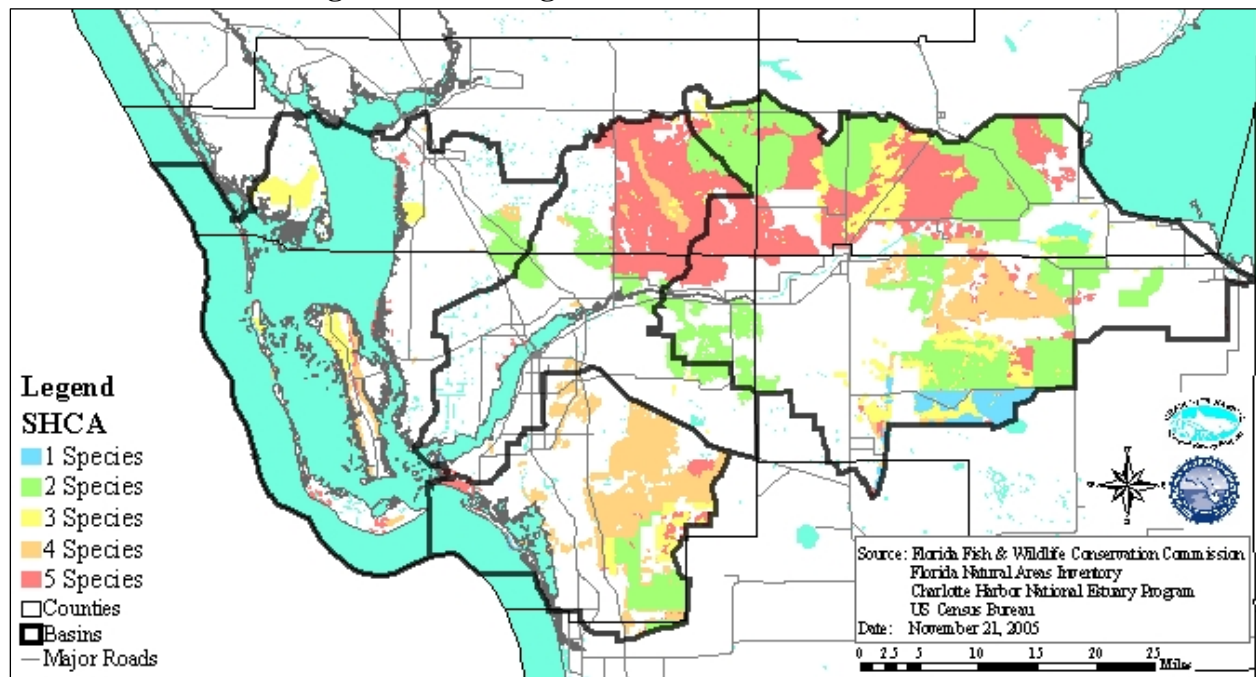


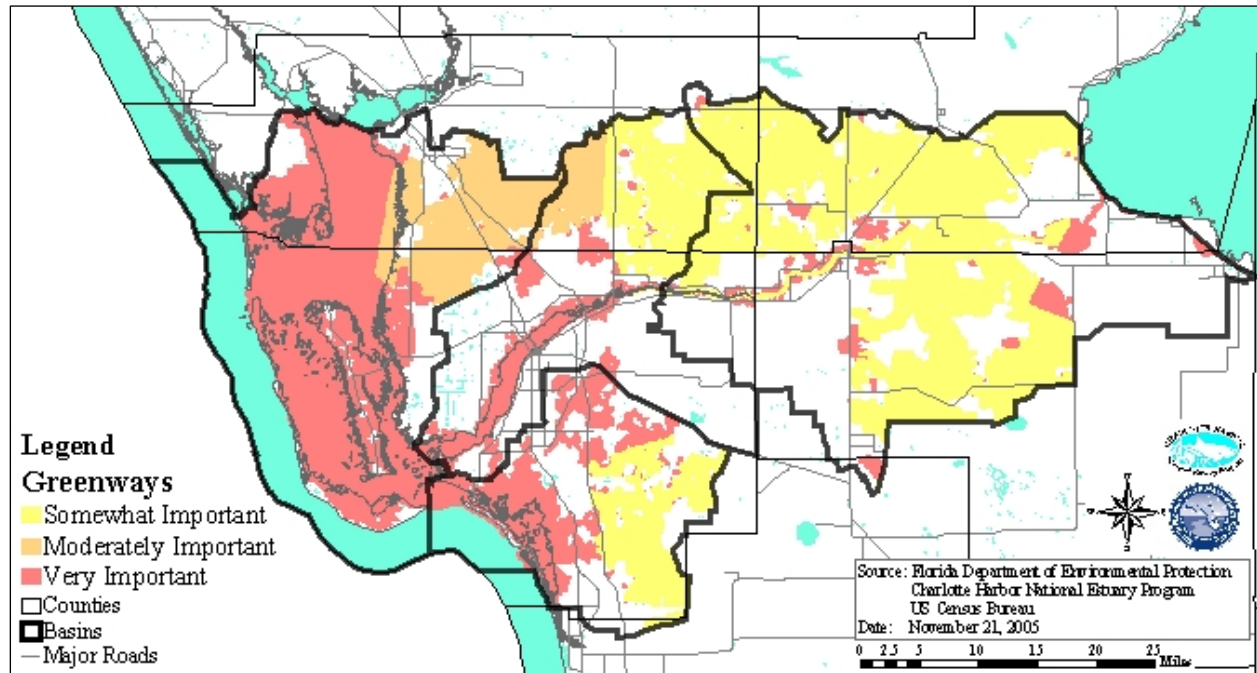
Table 15: SHCA Species

<p><i>Amphibians and Reptiles</i> American crocodile Bog frog Salt marsh snake <ul style="list-style-type: none"> • Atlantic • Gulf <i>Mammals</i> Beach mice <ul style="list-style-type: none"> • Anastasia Island • Choctawhatchee • Southeastern Florida black bear Florida panther Fox squirrel Mangrove fox squirrel</p>	<p><i>Birds</i> American swallow-tailed kite Audubon's crested caracara Black-whiskered vireo Cuban snowy plover Florida grasshopper sparrow Florida sandhill crane Florida scrub jay Limpkin Mangrove cuckoo Mottled duck Red-cockaded woodpecker Seaside sparrows <ul style="list-style-type: none"> • Louisiana • Smyrna • Scott's • Wakulla Short-tailed hawk Snail kite Southeastern American kestrel Southern bald eagle White-crowned pigeon</p>	<p>OTHER COMPONENTS OF BIOLOGICAL DIVERSITY Analysis of 105 globally rare plant species Bat maternity and winter roosting caves Southeastern bat Gray bat Pine rocklands Sandhill communities Scrub communities Tropical hardwood hammock communities Wetlands important to wading birds <ul style="list-style-type: none"> • Common egret • Little blue heron • Reddish egret • Roseate spoonbill • Snowy egret • Tricolored heron • White ibis • Wood stork </p>
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As part of Florida's statewide system of greenways and trails, a series of maps were completed to define opportunities for establishing the Trails and Ecological Greenways Networks. These maps assist in guiding planning and determining appropriate lands for acquisition. They were originally completed during creation of the 1998 Implementation Plan for the Florida Greenways and Trails System and have gone through an update since that time. Figure 29 shows the

conservation/ecological opportunities product. More information can be found at: <http://www.dep.state.fl.us/gwt/network/network.htm>.

Figure 29: Florida Greenways and Trails Program Conservation/Ecological Opportunities



Identified Lands for Potential Future Acquisition

Potential future acquisition sites are identified through the State's Florida Forever program and through the Lee County Master Mitigation Plan, SWF RRCT Restoration Needs, and SWFFS Alternatives Development Group. The predecessor to the Florida Forever program is the Conservation and Recreation Lands (CARL) program.

Figure 30: Identified Lands for Potential Future Acquisition

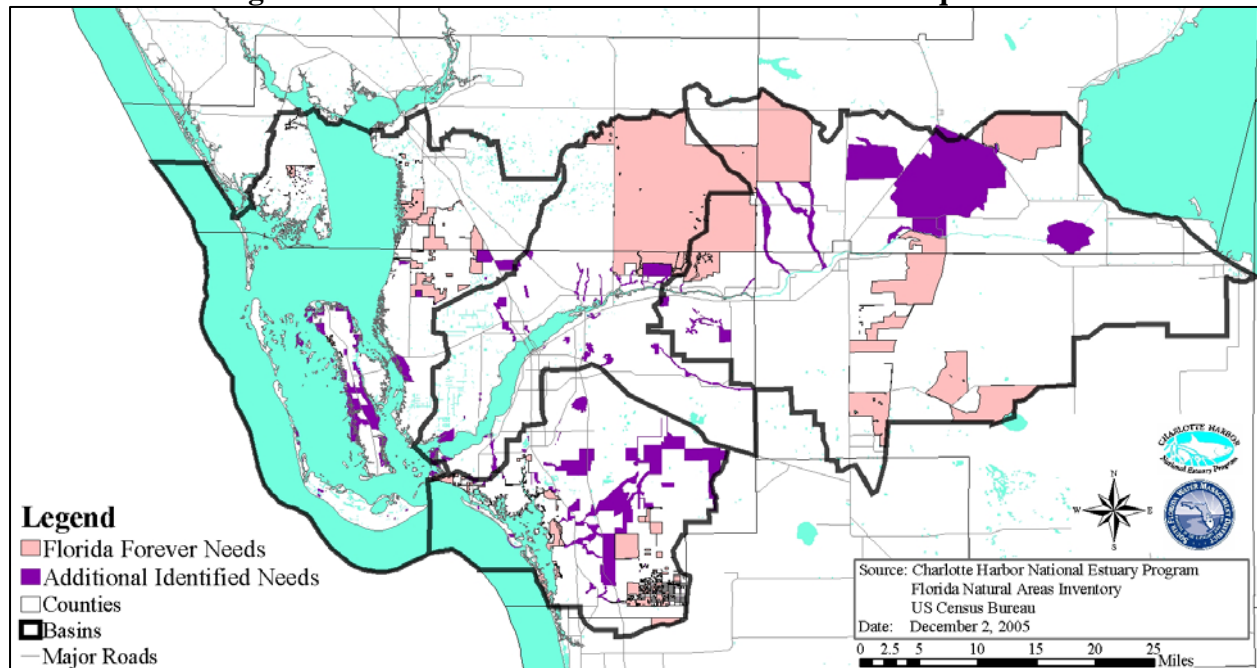


Table 16 compares acreage of existing managed lands to potential future acquisitions. Nearly 64% of identified land acquisition needs are included in the Florida Forever program.

Table 16: Future Managed Lands Needs Analysis (in acres)

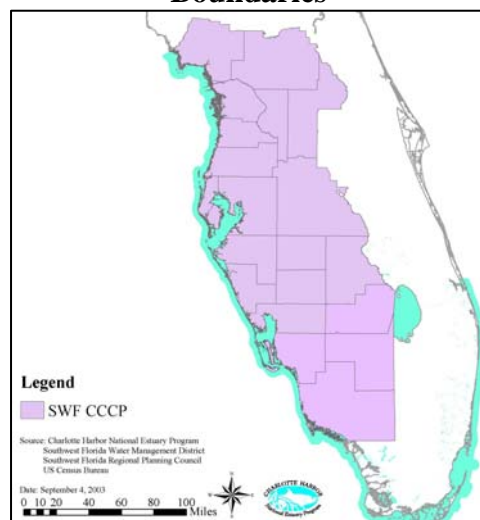
	Charlotte Harbor/Pine Island	Caloosahatchee Estuary	Freshwater Caloosahatchee	Estero Bay	Total
All Identified Future Acquisition Needs	22,456	74,690	148,748	35,057	280,950
Florida Forever Needs Only	13,512	65,668	87,132	12,721	179,033
Existing Managed Lands	86,925	24,397	45,992	31,948	189,262
Total Identified Future Managed Lands	109,381	99,087	194,740	67,005	470,212
Percent Increase Managed Lands ID'd	26%	306%	323%	110%	148%
Total Land Area	194,345	270,537	605,241	183,663	1,253,785
Percent Managed Lands ID'd of Total Land Area	56%	37%	32%	36%	38%

Sources: Florida Natural Areas Inventory and Charlotte Harbor National Estuary Program (Lee County Master Mitigation Plan Mapping).

Coastal Conservation Corridor Plan

The Southwest Florida Coastal Conservation Corridor Plan (CCCCP) was developed by The Nature Conservancy (TNC) with funding from the US Fish and Wildlife Service. The mission of the plan is to create wildlife corridors from Crystal River to Florida Bay. Protected greenways will enable creatures such as the Florida black bear to travel from Charlotte Harbor east to Lake Okeechobee and south into the Big Cypress Swamp. The master planning and mapping exercise brought together all super-regional entities working on conservation, restoration and land acquisition to coordinate priorities and plan for conservation. The end result is a GIS database and map for decision-makers identifying all lands already acquired or slated for protection, as well as future priorities. Agency partners contributing to the development of the CCCC include TNC, FFWCC, FDEP, ABM, and FWS, along with 21 counties, three water management districts and three national estuary programs. The GIS database and plan will be posted on TNC's website in 2005 and can be reviewed at: <http://nature.org/wherewework/northamerica/states/florida/preserves/art14124.html> and <http://nature.org/wherewework/northamerica/states/florida/>.

Figure 31: Coastal Conservation Corridor Plan Boundaries



5. Water Quality Status and Trends

This section presents information on water quality monitoring performed and the water quality status and trends for the four basins. Terms defining the different water quality parameters can be found at: www.epa.gov/trs/.

Water Quality Monitoring

In Southwest Florida, water quality data are collected by numerous agencies and volunteer organizations. All of these entities have water quality monitoring programs that sample at varying frequencies for various core analytes. Each is presented below. These samples are normally placed into a central database that is maintained by the State of Florida. The database STORAGE and RETrieval (STORET) is a structure used nation-wide and used for water quality analysis. Most large area analysis of water quality begins with the use of STORET.

The Charlotte Harbor Environmental Center (CHEC), Watershed Resources Center, with funding from the SWFWMD and CHNEP develops up-to-date maps of water quality for Charlotte Harbor estuarine waters and maintains a water quality monitoring website. CHEC works directly with the agencies that collect and analyze water quality samples on a routine basis. CHEC receives the data as soon as it is available, normally 1-2 months after collection. The tabular data are drawn into a GIS environment and values are interpolated spatially. The user of the Internet site may compare monthly water quality maps with medians from the 1993-2000 time frame. CHNEP is working with CHEC to develop methods to expand the mapping to include the LCH area. The site is: <http://www.checflorida.org/chec/waterquality.htm>.

U.S. Geological Service

The U.S. Geological Service (USGS) collects water quality data based on special projects. One such project funded by SFWMD is a study and mapping of salinity for 2001 through 2006. Data are captured continuously as the equipment is drawn through estuarine and Gulf waters on a boat. Salinity maps are presented using spatial analyst techniques. Additional continuous monitoring stations are funded to augment this information. Information on the project can be found at: <http://sofia.usgs.gov/projects/ebap/>.

The Charlotte Harbor Estuaries Volunteer Water Quality Monitoring Network

(CHEVWQMN)—This program is managed by FDEP Charlotte Harbor Aquatic Preserve Office in Punta Gorda. There are over 100 volunteers that take monthly, synoptic water quality samples at approximately 44 fixed stations from Lemon Bay, Charlotte Harbor and southward to Estero Bay. Water samples are tested for:

- dissolved oxygen
- pH
- salinity
- water color
- water temperature
- air temperature
- water clarity
- water depth
- wind speed & direction
- precipitation
- weather & water surface conditions
- tide stage

This program started in 1996 and the data are available at:

<http://www.dep.state.fl.us/coastal/sites/charlotte/volunteer/waterquality.htm>.

FDEP monitoring programs

FDEP is responsible for identification of impaired waters pursuant to the Impaired Waters Rule (see the next section concerning Impaired Waters). FDEP completes compliance monitoring, algal bloom complaints, and studies as required including TMDL data gaps, lake (wet season) and stream (wet and dry season) condition indexes. Benthic, habitat condition, pesticides and periphyton studies can be included. Water samples are tested for:

- dissolved oxygen
- pH
- water temperature
- conductivity
- color
- Total Phosphorus
- Ortho Phosphate
- Total Nitrogen
- NO₂-NO₃
- TKN
- Chlorophyll A (corrected)
- Heavy Metals
- Alkalinity
- BOD
- turbidity

Florida Fish and Wildlife Conservation Commission

The Florida Fish and Wildlife Conservation Commission (FWC) Fish and Wildlife Research Institute (FWRI) collects and compiles information related to red tide levels and shell fish closures. This information is available for Southwest Florida at:

http://www.floridamarine.org/features/view_article.asp?id=12373.

South Florida Water Management District

SFWMD maintains a monitoring program of 4 fixed stations within the Caloosahatchee River that was established in April 1999. Originally, SFWMD sampled 8 sites but this was changed in 2002 when the Coastal Charlotte Harbor Monitoring Network started sampling the river (see below). Water quality data are taken on a monthly frequency and used to produce annual technical reports on the current status and trends of several nutrients and physical attributes of the system, provide supporting data for water supply modeling, and contribute to a growing body of regional data made available to all interested parties. Analytes collected under this program are below. Lee County Environmental Lab collects and analyzes the samples for the SFWMD and has added several additional analytes to the SFWMD effort. Water samples are tested for:

- Chlorophyll A (corrected)
- Color
- Conductivity
- dissolved oxygen
- NH₃
- NO₂-NO₃
- Ortho Phosphate
- PAR (4 pi Licor)
- pH
- salinity
- secchi disk depth
- silica
- water temperature
- TKN
- TN
- TOC
- Total Phosphorus
- Turbidity

In addition, SFWMD maintains a central database, similar to STORET named DBHYDRO. DBHYDRO is the SFWMD's corporate environmental database, storing hydrologic, meteorologic, hydrogeologic, and water quality data. It contains data collected by the SFWMD and other agencies and organizations. To assess water quality within 16 South Florida counties, the SFWMD monitors surface water in a variety of locations, including canals, pumping stations, agricultural discharges, and many other types of aquatic environments. The District also monitors sediments and fish for a variety of pollutants, including nutrients, trace metals and pesticides, which can be conveyed by water.

Southwest Florida Feasibility Study (SWFFS) developed by the SFWMD jointly with the US Army Corps of Engineers includes a Water Quality analysis completed June 2004, entitled

“Compilation, Evaluation, and Archiving of Existing Water Quality Data for Southwest Florida.” The work was completed by TetraTech with the assistance of Janicki Environmental, Inc. This report is an extensive listing of water quality data available as of early 2004 throughout the entire lower southwest Florida region. Each set of data is evaluated for quality and the times and parameters tested are detailed. The location of the data is also provided, with a large percentage in the DBHYDRO database. The data were used to identify areas for potential concern and gaps in important information. The analysis and database of water quality readings is available from the District on CD.

Lee County

Lee County’s water quality monitoring program, managed by the County’s Environmental Lab, samples 14 sites on a monthly basis at fixed stations in Pine Island Sound and Matlacha Pass, 14 fixed sites in Estero Bay, and approximately 90 stations throughout the County at freshwater sites such as 10-Mile and 6-Mile. The water samples are analyzed for core analytes including:

- Chlorophyll A (corrected)
- Color
- Conductivity
- dissolved oxygen
- NH₃
- NO₂-NO₃
- Ortho Phosphate
- PAR (4 pi Licor)
- pH
- salinity
- Secchi disk depth
- silica
- water temperature
- TKN
- TN
- TOC
- Total Phosphorus
- Turbidity
- BOD
- COD
- Enterococci
- Fecal coliform
- Aluminum
- Arsenic
- Cadmium
- Chlorine
- Chromium
- Copper
- Mercury
- Nickel
- Lead
- Selenium
- Total alkalinity
- Zinc
- Flow and stage

Data from this program are maintained at the Environmental Lab and uploaded into STORET and can be viewed at a new website maintained by the County at: <http://lcems.edats.com/>. The County also runs a new atmospheric deposition monitoring station on Lover’s Key that collects both wet and dry nitrogen deposition rates.

Lee County Hyacinth Control District

The Lee County Hyacinth Control District (LCHCD) manages a program called Pondwatch. Pondwatch is a volunteer monitoring program created in 1993 by the LCHCD to help residents manage ponds and lakes and to answer their concerns about problems related to aquatic weeds in Lee County. Both seasonal and permanent residents participate in the program, averaging 10 – 15 per month. Water samples are collected monthly and brought to the LCHCD’s water quality laboratory for chemical analysis of total phosphorus, orthophosphate, ammonia, nitrites-nitrates, and chlorophyll-a. Some of the benefits experienced by some participating groups have been a reduction of the chemical control required to maintain the ponds. Other communities have followed recommendations for aeration systems minimizing the potential for stratification and dissolved oxygen problems.

City of Cape Coral

The City of Cape Coral Environmental Resources Division samples 33 sites on a monthly basis for total nitrogen, total phosphorous and clarity (via Secchi disk). Samples are also collected twice annually for metals and yearly for pesticides. In addition, the City manages a Canalwatch program which was initiated in May 1995. The program is a proactive component of the Cape Coral's canal management program and is a volunteer effort that screens large portions of the City for potential canal problems on a monthly basis. Currently there are forty-three sampling sites. Nine are located on freshwater canals and the remainder on saltwater canals. Volunteer-collected samples are brought to the City's lab and analyzed for nitrites, nitrates, ammonia, and phosphates. Volunteers also record Secchi depth (water clarity), weather conditions, and site conditions. During the month they are asked to collect rainfall data and to note any wildlife activity or other activity on the canal.

Charlotte Harbor National Estuary Program

The Charlotte Harbor National Estuary Program (CHNEP) coordinates the Coastal Charlotte Harbor Monitoring Network. In support of its long-term monitoring strategy, an inter-agency, collaborative program was initiated in April 2001 for the coastal Charlotte Harbor region, including the tidal Caloosahatchee, Peace and Myakka Rivers, and Estero and southern Lemon Bays. SWFWMD, SFWMD, Charlotte and Lee Counties, FWC-FWRI, the Cities of Sanibel and Cape Coral, and FDEP Charlotte Harbor Aquatic Preserve monitor the region using a stratified, random sampling design for the core analytes listed in the CHNEP CCMP, including biological, nutrient and field parameters. The Charlotte Harbor and Lemon and Estero Bay region is broken into 12 strata with five monitoring stations randomly chosen every month for each. The Lower Charlotte Harbor strata are listed below:

1. Lower Charlotte Harbor within Charlotte County
2. Matlacha Pass
3. Bokeelia region of Charlotte Harbor
4. San Carlos Bay
5. Tidal Caloosahatchee River
6. Pine Island Sound
7. Estero Bay

This program comprehensively monitors the ambient water quality conditions of the coastal Charlotte Harbor region and will allow resource managers to determine if conditions for this large area are improving or degrading over time. The analytes collected by the Network are as follows, although some members may collect additional such as bacteria, BOD and silica, depending on resources and interests:

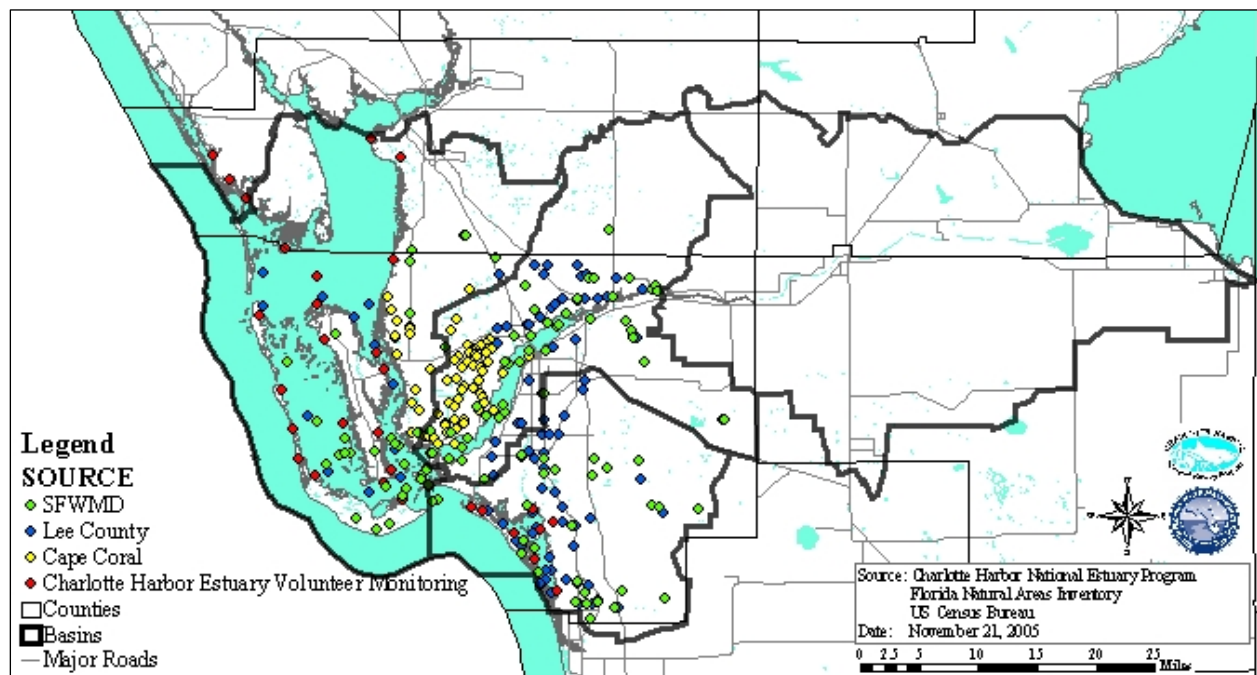
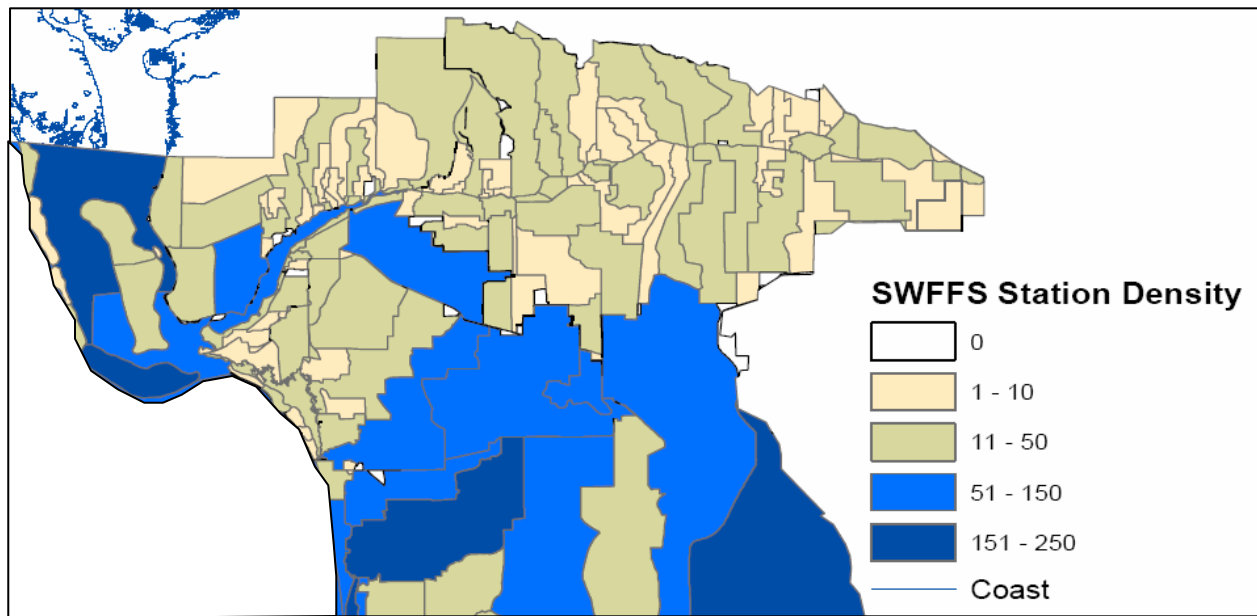
- Chlorophyll A (corrected)
- Ortho Phosphate
- TKN
- Color
- PAR (4 pi Licor)
- TN
- Conductivity
- pH
- TOC
- dissolved oxygen
- salinity
- Total Phosphorus
- NH₃
- Secchi disk depth
- Turbidity
- NO₂-NO₃
- water temperature
- TSS

In 2003, the CHNEP published its Water Quality Status and Trends Report. The report was completed by Janicki Environmental, Inc. and developed methods which were later used for the SWFFS study discussed above. Findings were consistent between the two studies where the geographic area coincided.

Water Quality Monitoring Locations

The most up-to-date compilation of water quality monitoring is the 2004 SWFFS water quality study discussed above. The study report included the map shown as Figure 32 below. Fixed station locations in Charlotte Harbor, Caloosahatchee Estuary, and Estero Basins are shown as Figure 33.

Figure 32: 2004 SWFFS Monitoring Station Density⁵



⁵ Source: TetraTech, Inc and Janicki Environmental, Inc. 2004. Compilation, Evaluation, and Archiving of Existing Water Quality Data for Southwest Florida. Department of Army, Jacksonville District Corps of Engineers.

Impaired Waters

Section 303(d) of the Clean Water Act (CWA) requires states to list waters that do not meet applicable quality standards and establish Total Maximum Daily Loads (TMDLs) for those waters on a prioritized schedule. TMDLs establish the maximum amount of pollutants a water body can assimilate without exceeding water quality standards. In 1998, EPA approved Florida's 1998 303(d) Impaired Waters list, which was based either on existing, readily available data or best professional judgment. State waterbodies were on the 1998 303(d) list. However, in 1999, the Florida Watershed Restoration Act, Section 403.067, FS was enacted by the Florida Legislature. This law requires FDEP to adopt, by rule, a scientific methodology for analyzing environmental data and determining whether a waterbody is impaired or healthy. All waterbodies on the 1998 303(d) list are required to be either 1) verified as impaired, 2) de-listed as they are meeting water quality standards, or 3) placed on a planning list if insufficient data exist (Category 3).

FDEP's 2002 update to Florida's 1998 303(d) Impaired Waters List for Group 1 Basins with sufficient data (Category 5) was amended August 2002 by Secretarial order and submitted to EPA October 2002. The verified list was amended March 11, 2003 by Secretarial order. The 2002 update was developed in accordance with EPA guidelines for Integrated Water Quality monitoring and Assessment Reports. Group 1 included Everglades West, a portion of which is Estero Bay.

FDEP's 2004 update to Florida's 1998 303(d) Impaired Waters List for Group 2 Basins with sufficient data (Category 5) was adopted May 27, 2004 by Secretarial order, including Charlotte Harbor, a portion of which is Charlotte Harbor, Pine Island Sound, and Matlacha Pass.

FDEP's 2005 update to Florida's 1998 303(d) Impaired Waters List for Group 3 Basins with sufficient data (Category 5) was adopted June 20, 2005 by Secretarial order, including the Caloosahatchee basin.

The Florida Watershed Restoration Act addresses processes for refining the list for calculating and allocating TMDLs. According to EPA guidelines, waters expected to attain and maintain applicable water quality standards through other Federal, State, or Local requirements do not need to be included on the 303(d) list pursuant to approval of "Reasonable Assurance."

In Florida, the Clean Water Act (CWA) is implemented through the Watershed Restoration Act of 1999 (FS 403.067). The state's Impaired Waters Rule (IWR) was adopted in 2001 as Chapter 62-303, Florida Administrative Code. The IWR establishes a methodology to identify surface waters of the state that will be included on the state's planning list of waterbodies. It also establishes a methodology to identify impaired waters that will be included on the state's verified list of impaired waters, for which the FDEP will calculate Total Maximum Daily Loads (TMDLs).

Water bodies were divided into five groups, and a five-year rotation of assessment, analysis, and implementation was established. In 2000, FDEP began addressing the first group of basins (Group 1) and continues to initiate activities in a new group (Groups 2 through 5) each year over a five-year cycle to cover the entire state.

The general sequence of the five-year cycle is:

Phase 1- Basin Assessment

Preliminary basin assessment focusing on existing data.

Phase 2 –Verified List

Strategic water quality monitoring to obtain additional detailed scientific evidence of water quality conditions and adoption of basin-specific verified lists of impaired waters.

Phase 3 – Total Maximum Daily Loads (TMDL)

Data analysis and TMDL development and adoption where impairment exists.

Phase 4 – Basin Management Action Plans (B-MAP) Development

Development of a Basin Management Action Plan, in conjunction with local stakeholders, to allocate, among the local sources of pollution, reductions necessary to meet the TMDL.

Phase 5 - B-MAP Implementation

Implementation of the TMDL.

In Lower Charlotte Harbor, Everglades West (including Estero Bay) is in Group 1. Charlotte Harbor (including Pine Island Sound) is in Group 2. Caloosahatchee (both fresh and tidal portions) are in Group 3.

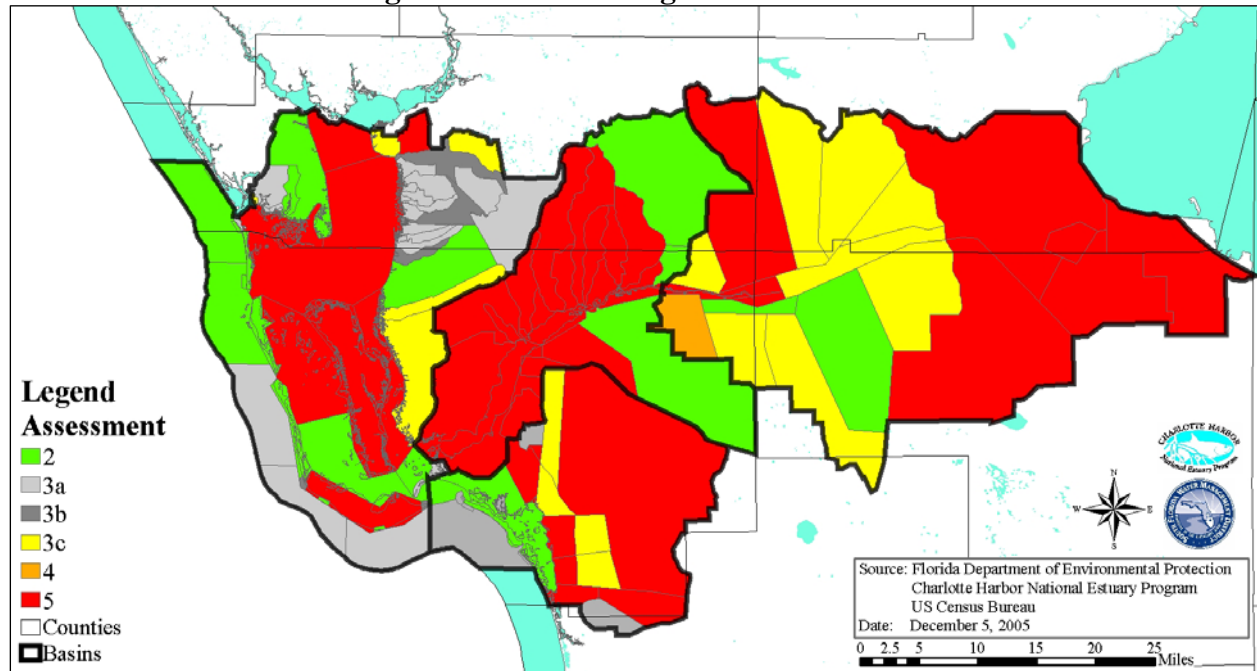
Table 17: Impaired Waters Phases and Year

Year	00	01	01	02	02	03	03	04	04	05	05	06	06	07	07	08	08	09	09	10
Estero	1		2		3		4		5		1		2		3		4		5	
Charlotte Harbor			1		2		3		4		5		1		2		3		4	
Caloosahatchee					1		2		3		4		5		1		2		3	

Integrated Assessment

FDEP's integrated assessment identifies areas of no or insufficient data (grey), areas attaining some designated uses (green), areas that are potentially impaired (yellow), and areas where water quality is not attained (red).

Figure 34: FDEP Integrated Assessment



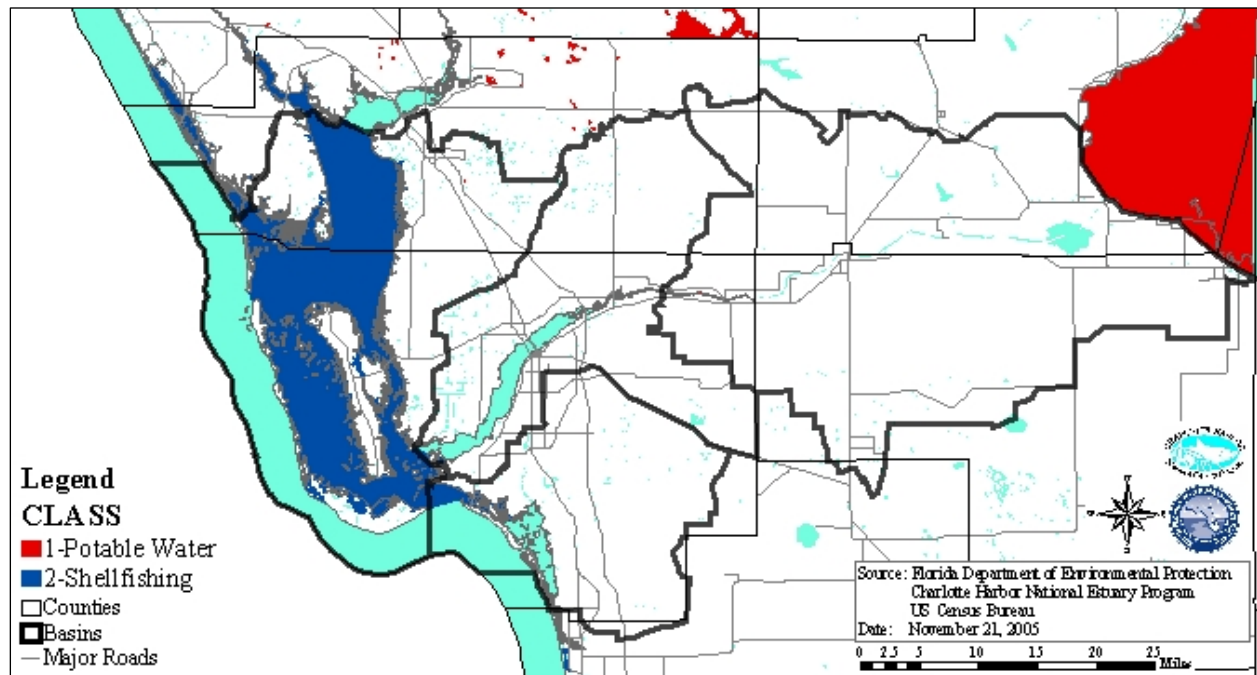
- Category 1-** Attaining all designated uses.
- Category 2-** Attaining some designated uses.
- Category 3a-** No data or information to determine if any designated use is attained.
- Category 3b-** Insufficient data to determine if any designated use is attained.
- Category 3c-** Waterbody meets Planning List criteria and is Potentially Impaired for one or more designated uses.
- Category 3d-** Waterbody meets Verified List criteria and is Potentially Impaired for one or more designated uses.
- Category 4-** Impaired for one or more designated uses, but does not require a TMDL because a pollutant control measure will restore a designated use, TMDL has been completed, the impairment was not caused by pollutant.
- Category 5-** Water quality standard not attained; water impaired and requires TMDL; Verified List and 303(d) List.

Within LCH, a total of 40 out of 113 waterbodies are impaired for at least one parameter. Within the 40 impaired water bodies, there are a total of 74 impairments (See Appendix A for all listed waterbodies and their impairments).

Designated Uses

When FDEP considers water quality impairments, the impairment assessment is based on the use of the waterbody. For example, Class 1 waters are designated for drinking water and must be held to a higher standard than other class designations. Class 2 waters are for shellfishing and must have lower bacteria levels than other classes. Therefore, Pine Island Sound may have an impairment for bacteria but may have lower bacteria levels than Class 3 waters designated for fishing and swimming that may not be shown to have an impairment. More information about the Clean Water Act is available at: <http://www.cleanwateract.org/>.

Figure 35: Designated Uses

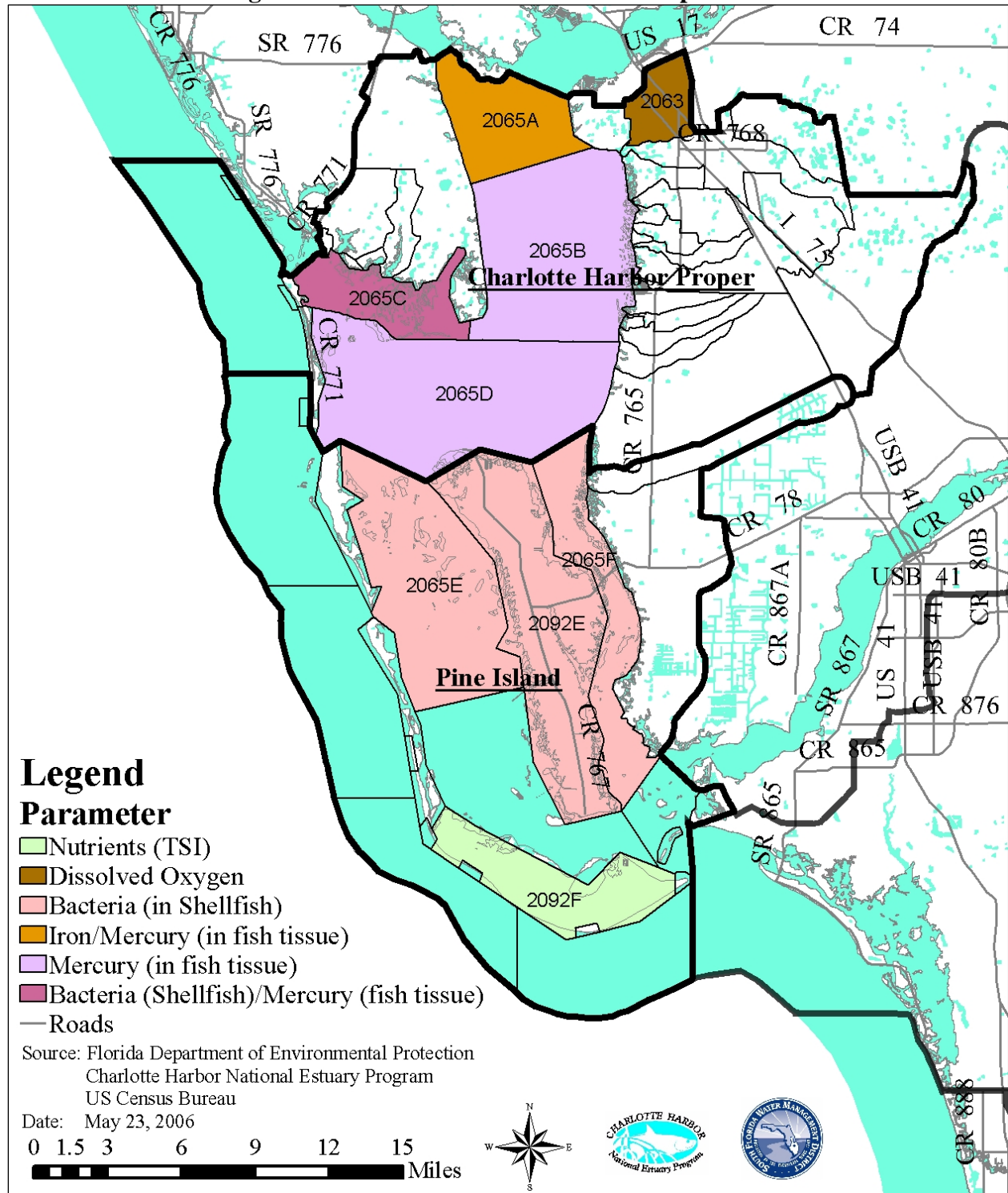


Waters not belonging to Class 1 or Class 2 are designated Class 3. Class 3 designated uses include fishing and swimming.

Charlotte Harbor Basin

Charlotte Harbor is in Group 2 (see schedule below) and has a verified list of impairments. Charlotte Harbor is divided into two planning units: Charlotte Harbor Proper and Pine Island. The impaired waterbodies by name, WBID and impairment(s) are presented in Appendix A.

Figure 36: Charlotte Harbor Verified Impairments



Mercury in fish tissue is an impairment in waters that are heavily influenced by the Gulf of Mexico through Boca Grand Pass. Within the Charlotte Harbor Proper planning unit, all the estuarine waters are impaired for mercury in fish tissue. Upper Charlotte Harbor (WBID 2065A) is also impaired for **Iron**. **Bacteria** in shellfish is an identified impairment within the Gasparilla Sound area of Mid-Charlotte Harbor (WBID 2065C) and within the Pine Island planning unit (WBIDs 2065E, 2065F, and 2092E). The North Fork of Alligator Creek (WBID 2063) has been listed for **low dissolved oxygen**. Biochemical oxygen demand (BOD) is the causative pollutant. Finally, Sanibel Island (WBID 2092F), a lake waterbody type, has been listed as impaired for **Nutrients**. Potential sources include residential lawn fertilizers.

TMDL Development for Charlotte Harbor is planned for 2008 for all of the parameters, except for Mercury which is planned for 2011.

Table 18: Charlotte Harbor TMDL Schedule and Impairments

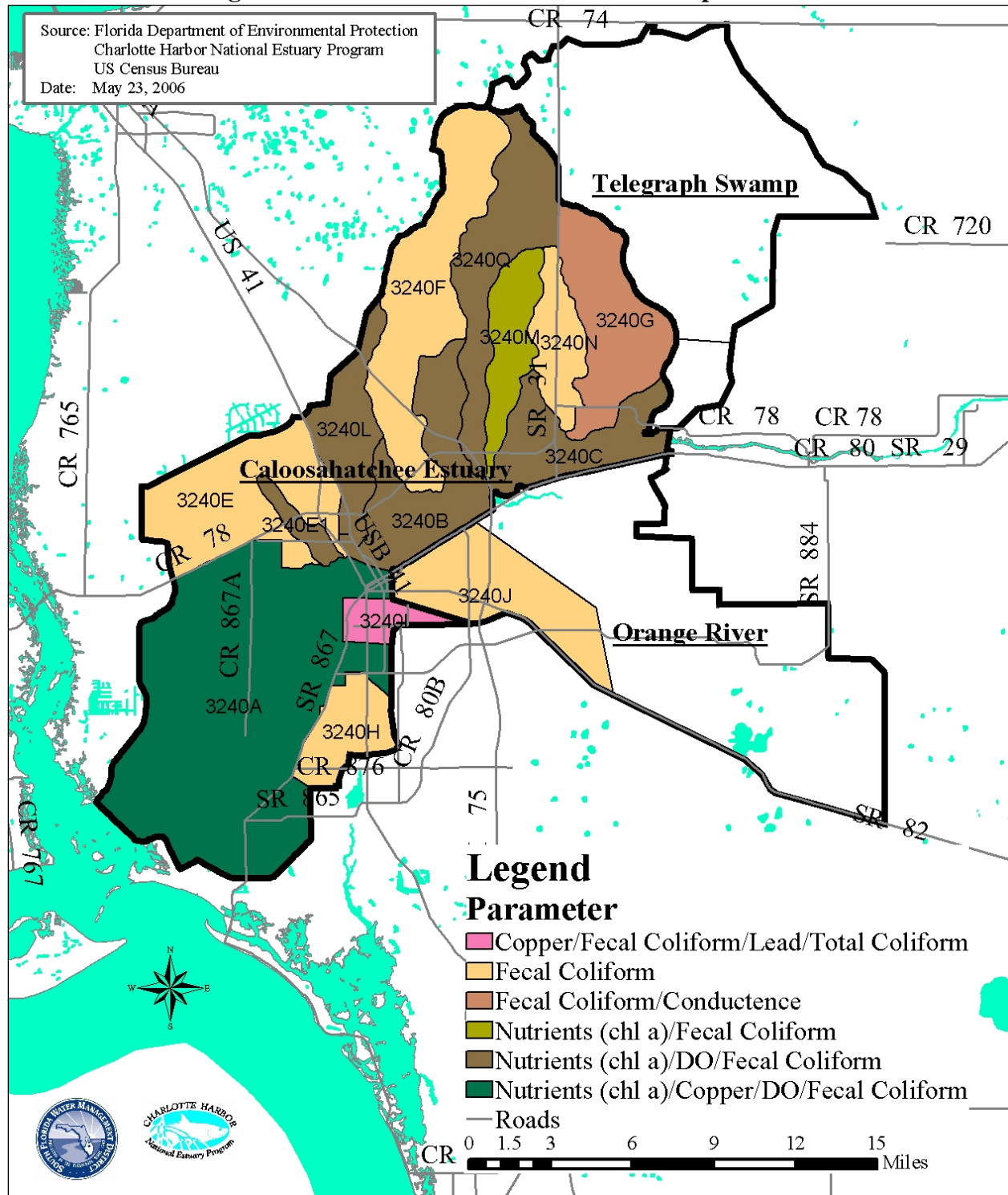
Original Year	Group 2 Phase
2002	Basin Assessment
2003	Verified List
2004	TMDLs
2005	B-MAP Development
2006	B-MAP Implementation

WBID	WATER SEGMENT NAME	PARAMETERS IDENTIFIED USING THE IMPAIRED WATERS RULE
2063	N FORK ALLIGATOR CREEK	DISSOLVED OXYGEN
2065A	CHARLOTTE HARBOR UPPER	IRON, MERCURY (IN FISH TISSUE)
2065B	CHARLOTTE HARBOR MID	MERCURY (IN FISH TISSUE)
2065C	CHARLOTTE HARBOR MID	BACTERIA (SHELLFISH)/ MERCURY (IN FISH TISSUE)
2065D	CHARLOTTE HARBOR LOWER	MERCURY (IN FISH TISSUE)
2065E	PINE ISLAND SOUND	BACTERIA (SHELLFISH)
2065F	MATALACHA PASS	BACTERIA (SHELLFISH)
2092E	PINE ISLAND	BACTERIA (SHELLFISH)
2092F	SANIBEL ISLAND	NUTRIENTS (TSI)
8999	FLORIDA GULF COAST	MERCURY (IN FISH TISSUE)

Tidal Caloosahatchee Basin

The Tidal Caloosahatchee basin is in Group 3 (see schedule below) and has a list of verified impairments. The basin is divided into 3 planning units: Caloosahatchee Estuary, Telegraph Swamp, and Orange River. There are 13 waterbodies in the Caloosahatchee Estuary planning unit that are impaired, none in the Telegraph Swamp planning unit, and one in the Orange River planning unit. The impaired waterbodies by name, WBID and impairment(s) are presented in Appendix A.

Figure 37: Tidal Caloosahatchee Verified Impairments



All 13 waterbodies in the Caloosahatchee Estuary planning unit are impaired for **fecal coliform** levels, including the Tidal Caloosahatchee (WBID 3240A, 3240B, 3240C), Yellow Fever Creek (WBID 3240E), Hancock Creek (WBID 3240E1), Daughtery Creek (WBID 3240F), Trout Creek (WBID 3240G), Whiskey Creek (WBID 3240H), Manuel Branch (WBID 3240I), Gilcrest Drainage/Powell Creek (WBID 3240L), Stroud Creek (WBID 3240M), Owl Creek (WBID 3240N), and Popash Creek (WBID 3240Q). **Cholophyll a** caused by nutrients is the second most common impairment in the tidal Caloosahatchee basin associated with 7 waterbodies including the Tidal Caloosahatchee (WBID 3240A, 3240B, 3240C), Hancock Creek (WBID 3240E1), Gilcrest Drainage/Powell Creek (WBID 3240L), Stroud Creek (WBID 3240M), and Popash Creek (WBID 3240Q). **Low dissolved oxygen** is an impairment in 6 waterbodies including the Tidal Caloosahatchee (WBID 3240A, 3240B, 3240C), Hancock Creek (WBID 3240E1), Gilcrest Drainage/Powell Creek (WBID 3240L), and Popash Creek (WBID 3240Q). **Conductance** is listed for Trout Creek (WBID 3240G). **Copper** is a problem in Tidal Caloosahatchee (WBID 3240A) and Manuel Branch (WBID 3240I). Manuel Branch (WBID 3240I) has the most impairments of any water body in the study area. **Lead, copper, fecal coliform, and total coliform** are impairments within this relatively small water body.

TMDL Development is planned for 2008 for all of the parameters, except for Mercury which is planned for 2009.

Table 19: Tidal Caloosahatchee TMDL Schedule and Impairments

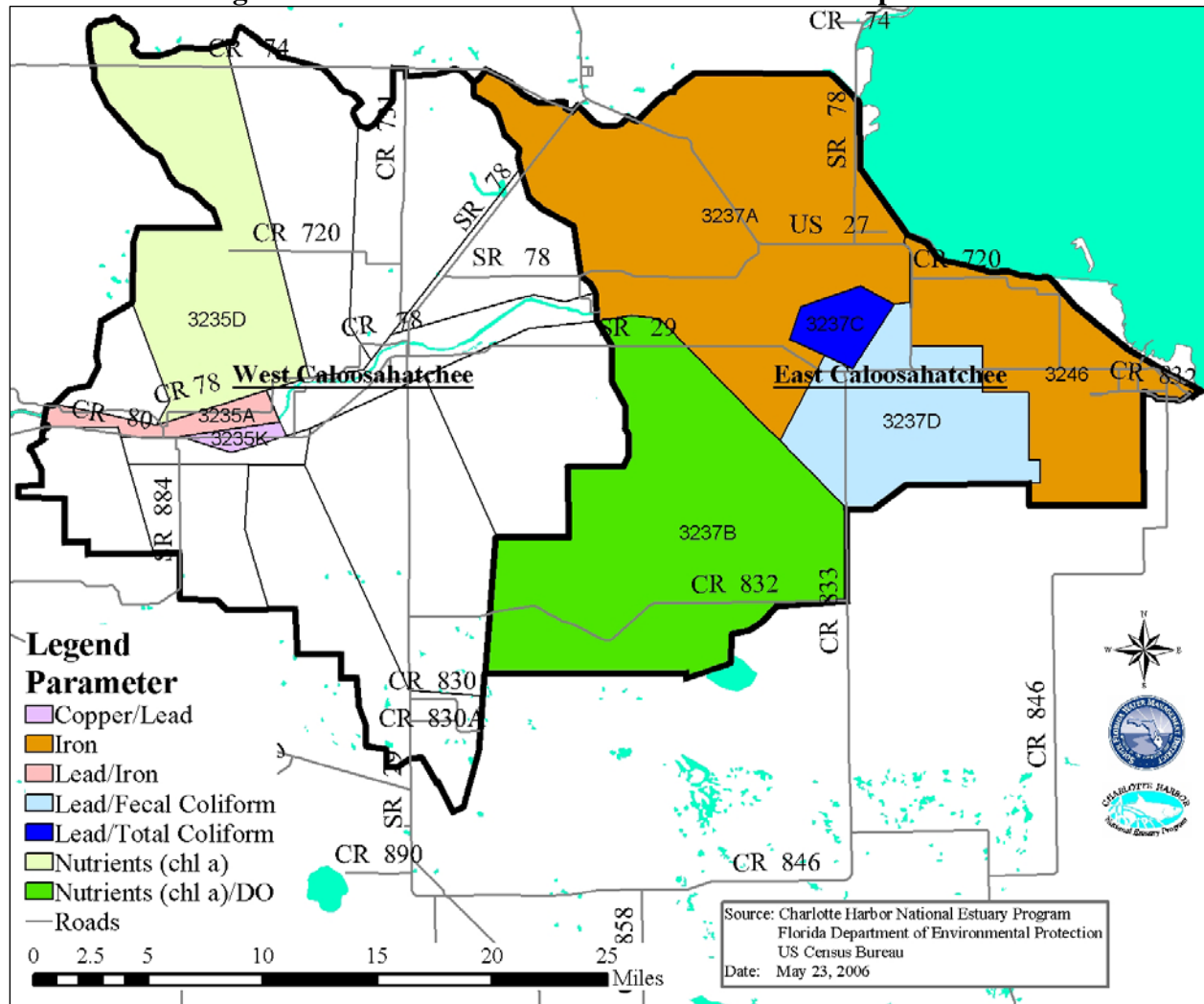
Original Year	Group 3 Phase
2003	Basin Assessment
2004	Verified List
2005	TMDLs
2006	B-MAP Development
2007	B-MAP Implementation

WBID	WATER SEGMENT NAME	PARAMETERS IDENTIFIED USING THE IMPAIRED WATERS RULE
3240A	TIDAL CALOOSAHATCHEE	Copper, Dissolved Oxygen, Fecal Coliform, Nutrients (Chl a)
3240B	TIDAL CALOOSAHATCHEE	Dissolved Oxygen , Fecal Coliform, Nutrients (Chl a)
3240C	TIDAL CALOOSAHATCHEE	Dissolved Oxygen , Fecal Coliform, Nutrients (Chl a)
3240E	YELLOW FEVER CREEK	Fecal Coliform
3240E 1	HANCOCK CREEK	Dissolved Oxygen , Fecal Coliform, Nutrients (Chl a)
3240F	DAUGHTREY CREEK	Fecal Coliform
3240G	TROUT CREEK	Conductance, Fecal Coliform
3240H	WHISKY CREEK (WYOUA CREEK)	Fecal Coliform
3240I	MANUEL BRANCH	Copper, Fecal Coliform, Lead, Total Coliform
3240L	GILCHREST DRAIN--POWELL	Dissolved Oxygen , Fecal Coliform, Nutrients (Chl a)
3240M	STROUD CREEK	Fecal Coliform, Nutrients (Chl a)
3240N	OWL CREEK	Fecal Coliform
3240Q	POPASH CREEK	Dissolved Oxygen , Fecal Coliform, Nutrients (Chl a)

Freshwater Caloosahatchee Basin

The Freshwater Caloosahatchee basin is in Group 3 (see schedule below) and has a list of verified impairments. The basin is divided into 2 planning units: West Caloosahatchee and East Caloosahatchee. Five of the 8 impaired waterbodies are found in the East Caloosahatchee planning unit. The impaired waterbodies by name, WBID and impairment(s) are presented in Appendix A.

Figure 38: Freshwater Caloosahatchee Verified Impairments



Lead is an impairment in 4 of the 8 impaired waterbodies, including Lake Hicpochee (WBID 3237C), Nine-Mile Canal (WBID 3237D), West Caloosahatchee (WBID 3235A), and Townsend Canal (WBID 3235K). **Iron** impairs East Caloosahatchee (WBID 3237A), C-21 (WBID 3246), and West Caloosahatchee (WBID 3235A). **Copper** is the third metal impairments within the basin and affects Townsend Canal (WBID 3235K). The two **nutrient** impairments are not contiguous to one another. The impairments are for Long Hammock Creek (WBID 3237B) and Jacks Branch (WBID 3235D). **Low dissolved oxygen** impairs Long Hammock Creek (WBID 3237B) also. **Fecal coliform** bacteria impair Ninemile Canal (WBID 3237D) and **total coliform** bacteria impair Lake Hicpochee (WBID 3237C).

TMDL Development is currently planned for 2009 for all of the parameters, except for Ninemile Canal fecal coliform for which there is a draft TMDL as of September 1, 2005. See http://www.dep.state.fl.us/water/tmdl/docs/tmdls/draft/NinemileCanal_3237.pdf.

Table 20: Freshwater Caloosahatchee TMDL Schedule and Impairments

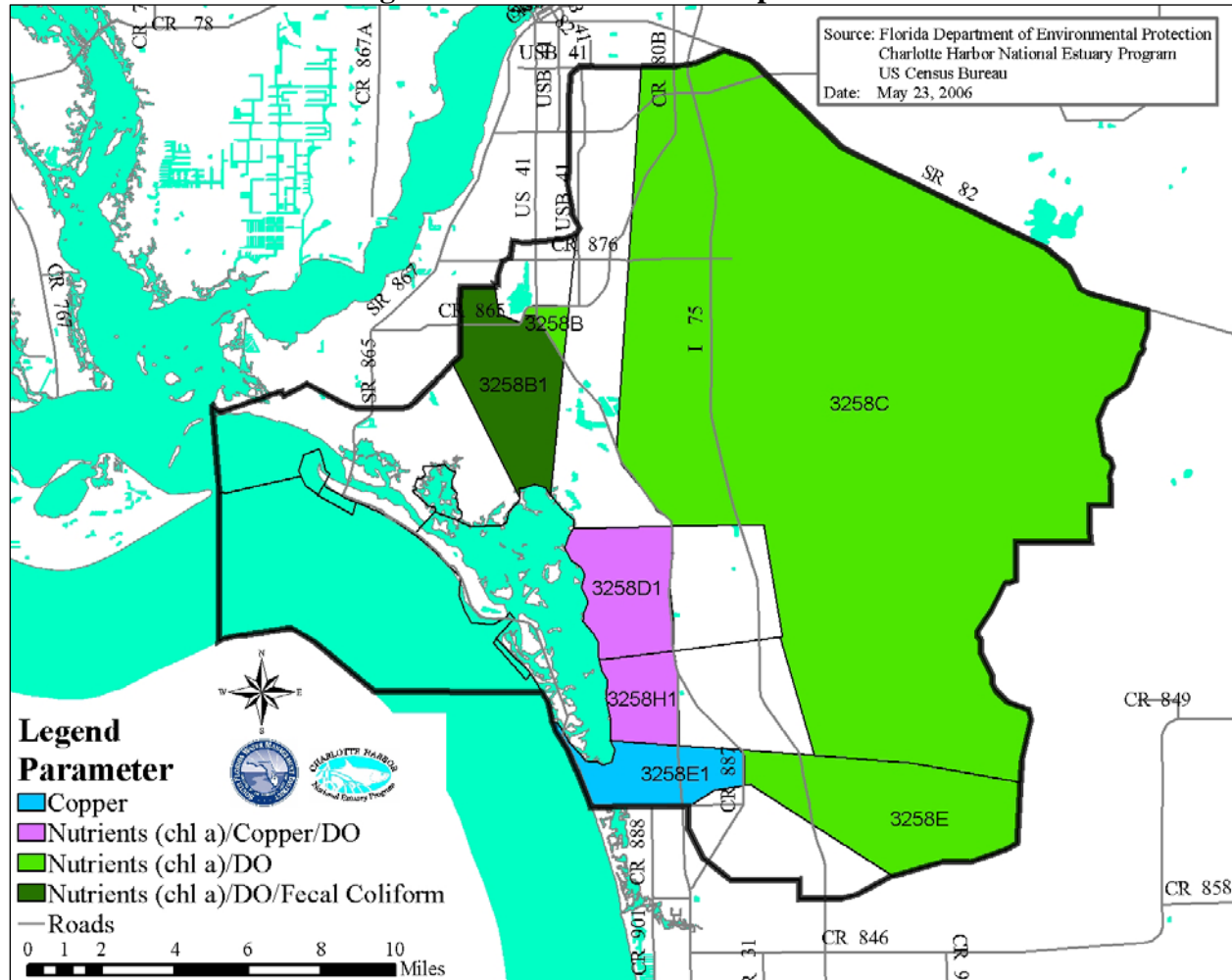
Original Year	Group 3 Phase
2003	Basin Assessment
2004	Verified List
2005	TMDLs
2006	B-MAP Development
2007	B-MAP Implementation

WBID	WATER SEGMENT NAME	PARAMETERS IDENTIFIED USING THE IMPAIRED WATERS RULE
3237A	EAST CALOOSAHATCHEE	Iron
3237B	LONG HAMMOCK CREEK	Dissolved Oxygen, Nutrients (Chl a)
3237C	LAKE HICPOCHEE	Lead, Total Coliform
3237D	NINEMILE CANAL	Fecal Coliform, Lead
3246	C-21	Iron
3240J	BILLY CREEK	Fecal Coliform
3235A	WEST CALOOSAHATCHEE	Iron, Lead
3235D	JACKS BRANCH	Nutrients (Chl a)
3235K	TOWNSEND CANAL	Copper, Lead

Estero Bay Basin

The Estero Bay planning unit is in Group 1 (see schedule below) as part of the Everglades West group. Estero Bay has seven waterbodies that are impaired. The impaired waterbodies by name, WBID and impairment(s) are presented in Appendix A.

Figure 39: Estero Verified Impairments



Chlorophyll a caused by **nutrients** and **low dissolved oxygen** impair 5 water bodies in Estero Bay basin. Hendry Creek fresh and marine (WBIDs 3258B and 3258B1), the Estero Bay drainage (Mullock Creek, WBID 3258C), Estero River marine (WBID 3258D1), Spring Creek marine (WBID 3258H1), and Imperial River fresh (WBID 3258E) have verified nutrient impairments. **Copper** impairments affect the marine sections of Imperial River (WBID 3258E1), Estero River marine (WBID 3258D1), and Spring Creek (WBID 3258H1). The one water body impaired for **fecal coliform** is Hendry Creek marine (WBID 3258B1).

TMDL Development is currently planned for 2007 for all of the parameters.

Table 21: Estero Bay TMDL Schedule and Impairments

Original Year	Group 1 Phase
2001	Basin Assessment
2002	Verified List
2003	TMDLs
2004	B-MAP Development
2005	B-MAP Implementation

WBID	WATER SEGMENT NAME	PARAMETERS IDENTIFIED USING THE IMPAIRED WATERS RULE
3258B	HENDRY CREEK (FRESH)	DO, NUTRIENTS (CHL A)
3258B1	HENDRY CREEK MARINE	DO, NUTRIENTS (CHL A), FECAL COLIFORMS
3258C	ESTERO BAY DRAINAGE (MULLOCK CREEK)	DO, NUTRIENTS (CHL A)
3258D1	ESTERO RIVER MARINE	DO , NUTRIENTS (CHL A), COPPER
3258E	IMPERIAL RIVER (FRESH)	DO, NUTRIENTS (CHL A),
3258E1	IMPERIAL RIVER (MARINE)	COPPER
3258H1	SPRING CREEK MARINE	DO, NUTRIENTS (CHL A), COPPER
8065	SW COAST GULF 5	BACTERIA (SHELLFISH)
8999	FLORIDA GULF COAST	MERCURY (IN FISH TISSUE)

Caloosahatchee Basin Nutrient Loads

In 2005, SFWMD published a white paper entitled “Caloosahatchee River/Estuary Nutrient Issues.”

Total nitrogen (TN) in the freshwater portion of the Caloosahatchee River decreased slightly from east to west from an average of 1.8 to 1.7 mg/L. This nitrogen was primarily in the organic form (likely associated with dissolved organic matter in the colored water). Average concentrations of ammonium nitrogen (NH₄-N) decreased from about 0.077 mg/L at S-77 to about 0.045 mg/L at S-79. Oxidized nitrogen (nitrite + nitrate nitrogen or NO_x-N) average concentrations increased from east to west from about 0.129 to 0.396 mg/L. Average concentrations of total phosphorus (TP) increased slightly from east to west from about 94 to 138 µg/L. Maximum recorded TP concentrations are generally less than 1 mg/L. Average concentrations of trace metals in the freshwater portion of the Caloosahatchee River are typical of south Florida surface waters.

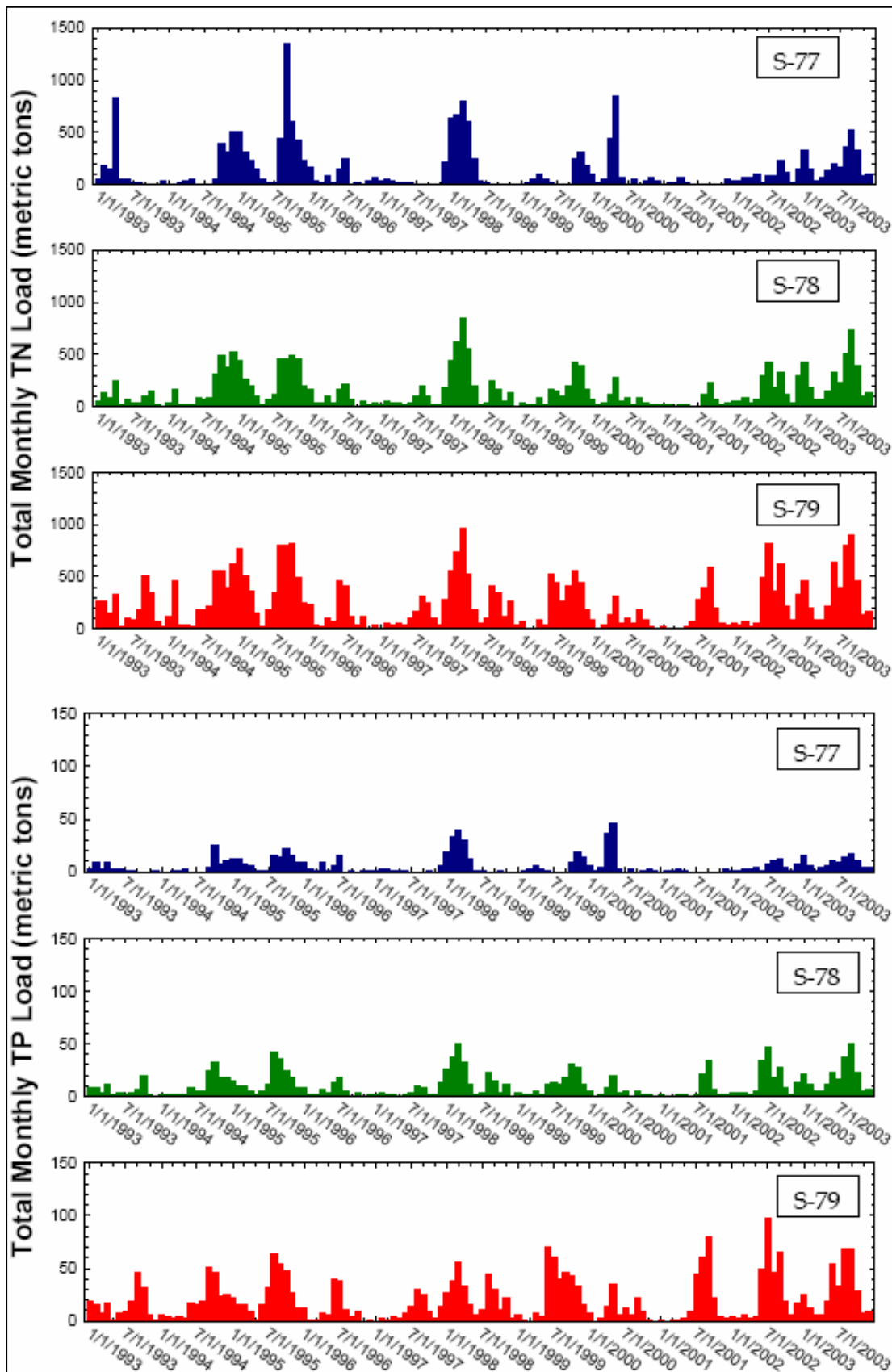
Average TN concentrations declined from 1.26 mg N/L in the Upper Caloosahatchee Estuary to 1.01 mg N/L in the Lower Estuary. Organic N accounted for the majority of this TN (about 90%). The average concentration of NH₄-N decreased downstream through the estuary from about 0.09 mg/L in the Upper Estuary to about 0.04 mg/L in the Lower Estuary. The average concentration of NO_x-N also generally decreased downstream from 0.174 mg/L in the Upper Estuary to 0.084 mg/L in the Lower Estuary. The average TP concentration was highest in the Middle Estuary with a concentration of 107 µg/L. Preliminary analysis of estuary nutrient conditions were summarized by Doering (2005).

Table 22 is a synthesis of Doering’s analysis. No concentration trends for TN or TP are apparent in the Caloosahatchee Estuary, partly due to the relative absence of historic data at key stations. Median values for water quality parameters during three time periods in four regions of the Caloosahatchee estuarine system are presented below. Letters indicate statistical significances between periods at the 95% confidence level. Medians with the same letter are not significantly different.

Table 22: Median values for Caloosahatchee Estuary water quality parameters (SFWMD, 2005)

Region	Period	Water Quality Parameter						
		Salinity		TN		TP		Chlorophyll a
		Parts per 1000		mg/L		mg/L		ug/L
Upper Estuary	1985 - 1989	4.1	a	1.43	a	0.14	a	10.3
(6-14 km from S-79)	1994 - 1996	0.3	b	1.31	a	0.09	b	3.5
	1999 - 2003	1.0	a	1.13	b	0.13	a	8.6
Mid Estuary	1985 - 1989	13.9	a	1.30	a	0.12	a	8.1
(14-28 km from S-79)	1994 - 1996	1.0	b	1.29	a	0.08	b	7.3
	1999 - 2003	8.8	a	0.91	b	0.13	a	10.5
Lower Estuary	1985 - 1989	25.3	a	0.95	a	0.07	a	4.7
(28-41 km from S-79)	1994 - 1996	15.3	b	0.99	a	0.06	b	5.5
	1999 - 2003	26.8	a	0.33	b	0.09	a	3.6
San Carlos Bay	1985 - 1989	30.7		0.83	a	0.05		3.1
(41 – 49 km from S-79)	1994 - 1996	27.9		0.83	a	0.05		3.4
	1999 - 2003	31.8		0.25	b	0.04		3.4

Figure 40: Temporal trends in Total Nitrogen and Total Phosphorous Monthly Mass Loads



Source: SFWMD, 2005

The above figure provides an historical summary of estimated monthly TN and TP nutrient loads with distance in the main channel of the Caloosahatchee River (C-43 Canal) during the most recent decade of data (1993 – 2003). No apparent increasing or decreasing trend in these loading rates is evident for this most recent period (SFWMD, 2005).

The following table summarizes the period-of-record (SFWMD DBHYDRO) average nutrient loads at the S-77, S-78, and S-79 structures. Nutrient loads increased in the downstream direction. Annual average TN loads increased from about 1,090 metric tons per year (mT/yr) at S-77 to 2,640 mT/yr at S-79. Annual average TP loads increased from about 45 mT/yr at S-77 to 236 mT/yr at S-79.

Table 23: Average Nutrient Loads
(from USACE and SFWMD 2005)

Parameter	S-77	S-78	Increase (metric tons/yr)	Loading rate (kg/km ² /yr)	S-79	Increase (metric tons/yr)	Loading rate (kg/km ² /yr)
Ammonia	38.5	86			95.3		
Nitrate-Nitrite	56.8	133			435		
TKN	1,031	1,164			2,199		
TN	1,087	1,297	210	214	2,635	1,338	926
TP	44.8	91.6	46.8	47.7	236	144.4	99.9
Period-of-Record	1973-2003	1998-2003			1981-2003		

Table 24 summarizes the estimated year 2000 average basin nutrient loads for the entire Caloosahatchee River/Estuary basin as assessed in the C-43 Basin Storage Reservoir CERP plan (USACE and SFWMD 2005). These loads are estimated based on actual existing land use conditions and typical nutrient mass loading rates for southwest Florida land use conditions. Of the total annual flow of 2.2 million m³ in the basin, Lake Okeechobee contributes about 31%, the freshwater Caloosahatchee River basin contributes 46%, and the estuary basin contributes 23%. Lake Okeechobee discharges contribute about 28% of the annual average TN loads (3,965 mt/yr), while the remainder of the annual TN load is contributed from the freshwater basin (50%) and the estuarine basin (21%). Of the estimated average total load of TP to the watershed (448 mt/yr), Lake Okeechobee contributes 11%, the freshwater basin contributes 63%, and the estuarine basin contributes 26%. Estimated water and nutrient loads are summarized further in the following table by subbasin for the freshwater and estuarine portions of the watershed. Agricultural land uses contribute the greatest share of water and nutrients in the freshwater Caloosahatchee River while urban and built-up land uses predominate in the Caloosahatchee Estuary basin.

Table 24: Estimated 2000 Existing Water and Nutrient Loads in the Caloosahatchee Basin
(from USACE and SFWMD 2005)

Watershed Source	Flow (hm ³ /yr)	Load (MT/yr)	
		TN	TP
Lake Okeechobee	680	1,127	48
Caloosahatchee - Fresh	998	2,002	284
Agriculture	640	1,469	218
Urban/Disturbed	129	260	39
Upland Forest	89	97	4
Wetland/Water	130	176	23
Caloosahatchee - Brackish	493	836	116
Agriculture	101	187	25
Urban/Disturbed	270	503	77
Upland Forest	57	63	3
Wetland/Water	65	83	11
Total Watershed	2,161	3,965	448

Doering and Chamberlain (2004) reported that 88-92% of TN loading into the downstream estuary from surface waters was from the discharge at S-79. CERP suggests marked changes in the volume and timing of delivery of freshwater at S-79, as nutrient loading is primarily a function of discharge rather than concentration (Doering and Chamberlain, 2004).

Doering and Chamberlain (1999) also found that when the river basin was the major source of water in the discharges, the concentrations of nutrients and color in the estuary were relatively higher than when the lake was the major source. Their analysis indicated that water quality in the downstream estuary changes as a function of both the total discharge and the source of discharge.

Environmental Research and Design, Inc. (2003) presented a summary of years 1 – 3 of the Caloosahatchee Water Quality Data Collection Program. This study was a three-year project funded by the South Florida Water Management District (District) to quantify external loadings entering the Caloosahatchee Estuary from the Caloosahatchee River, Orange River, wastewater treatment facilities, and eight major rivers and creeks. Field monitoring and sampling were performed at 15 estuary sites and 14 nutrient monitoring sites during both wet season and dry season conditions over a three-year period from 2000–2002. Eight of the 14 monitoring sites are located in significant tributaries, based on the magnitude of freshwater discharge, which discharge directly into the Caloosahatchee Estuary between the S-79 structure and Shell Point. These eight tributaries include Trout Creek, Telegraph Creek, Popash Creek, Daughtrey Creek, Powell Creek, Hancock Creek, Billy Creek, and Whiskey Creek. Monitoring sites were also established upstream of the S-79 structure and in the Orange River. Four wastewater treatment facilities that discharge directly into the Caloosahatchee Estuary were monitored, including: Waterway Estates STP; Ft. Myers South STP; Fiesta Village STP; and Ft Myers Central STP.

The most dominant impact on the estuary is clearly inflow from the S-79 Structure followed by the Orange River, Telegraph Creek, Daughtrey Creek, Trout Creek, Popash Creek, and the Ft. Myers South STP. A graphical comparison of dry season and wet season inflow to the Caloosahatchee Estuary is given in Figure 41. Under dry season conditions, inflow from the S-79 Structure, Orange River, FT. Myers South STP, Ft. Myers Central STP, and Telegraph Creek represent the most significant volumetric inputs to the system. However, under wet season

conditions, inflow from the Orange River becomes more significant, though discharges through S-79 still represent the vast majority of the inflow into the estuary system.

Figure 41: Comparison of Wet Season and Dry Season Inflow to the Caloosahatchee Estuary

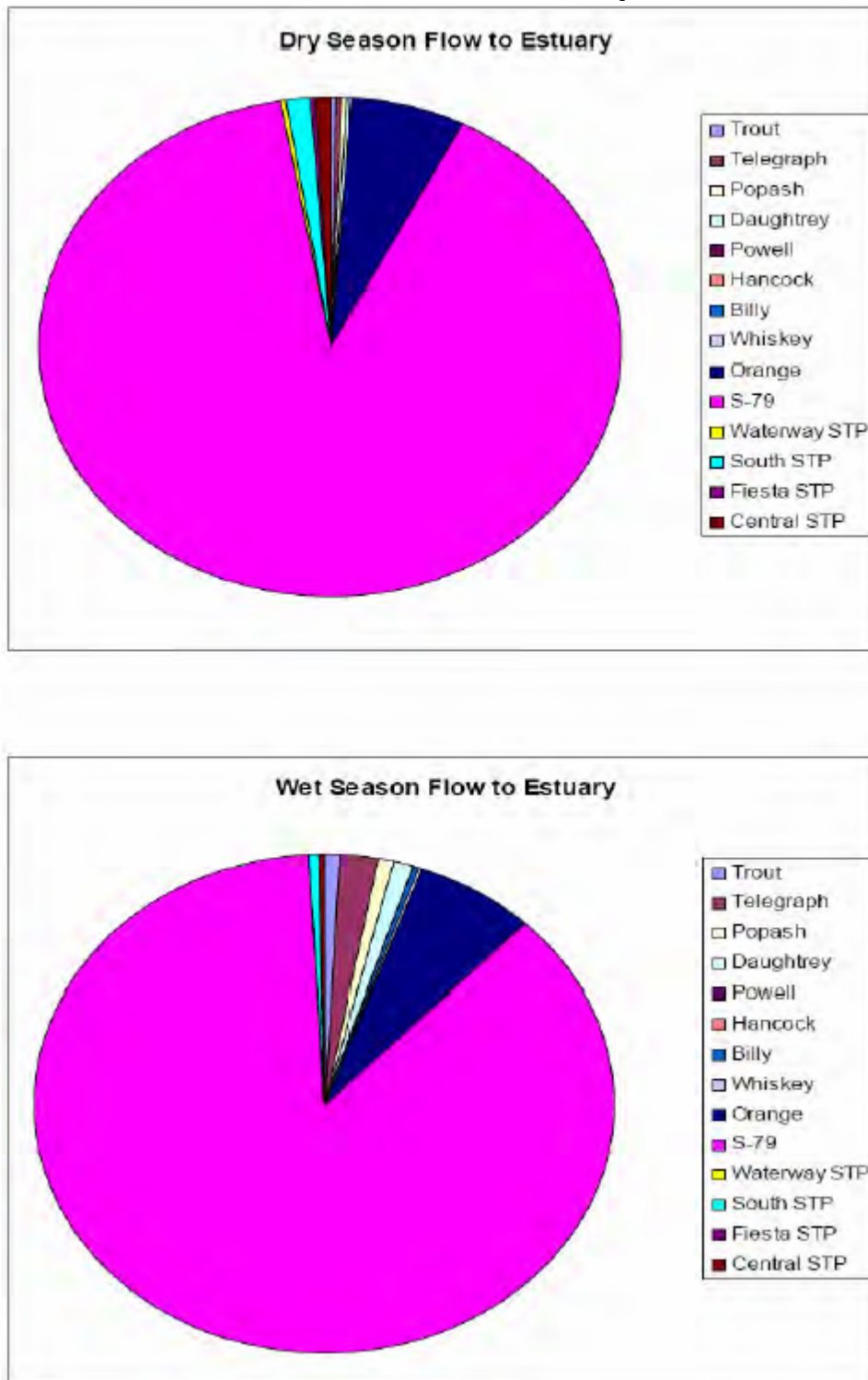
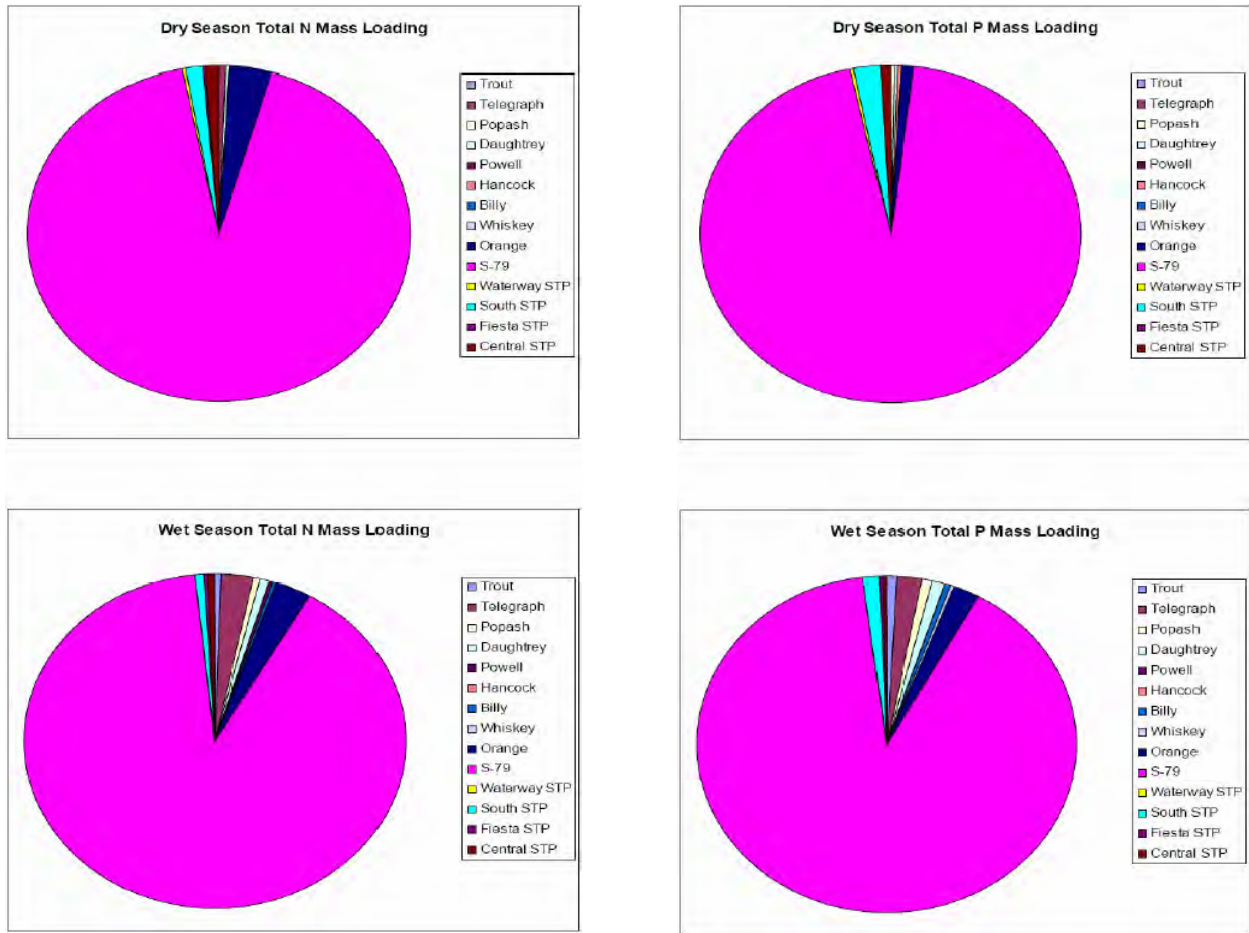


Figure 42 shows the estimated seasonal mass inputs of TN and TP into the Caloosahatchee Estuary.

Figure 42: Comparison of Seasonal Mass Inputs of Total Nitrogen and Phosphorous



Trends

The report entitled “Compilation, Evaluation, and Archiving of Existing Water Quality Data for Southwest Florida” is discussed in Section 5 of this report. The report included a discussion of water quality trends for the LCH area plus Big Cypress basin. The report:

- Evaluates data quality and details it,
- Evaluates and identifies trends;
- Identifies water quality parameters of concern; and
- Identifies data gaps.

For the purposes of the study, “shallow trends” were defined as statistically significant trends with a rate of change less than 5% per year of the median value for the period of record for the waterbody, and “steep trends” were defined as statistically significant trends with a rate of change greater than or equal to 5% of the median value per year. Thus, “shallow trends” represent water quality conditions that are changing (either decreasing or increasing) at a lesser rate of change than the rate of change for “steep trends”. These are relative terms, and the actual estimated rates of change are presented for each station in the statistical summary tables as described in the report. The terms “steep” and “shallow” do not imply ecological significance or lack of ecological significance.

The following figures show trends of dissolved oxygen, bio-chemical oxygen demand, turbidity, total suspended solids, Kjeldahl nitrogen, total phosphorous, and chlorophyll a trends

Figure 43: Dissolved Oxygen and Bio-Chemical Oxygen Demand Trends

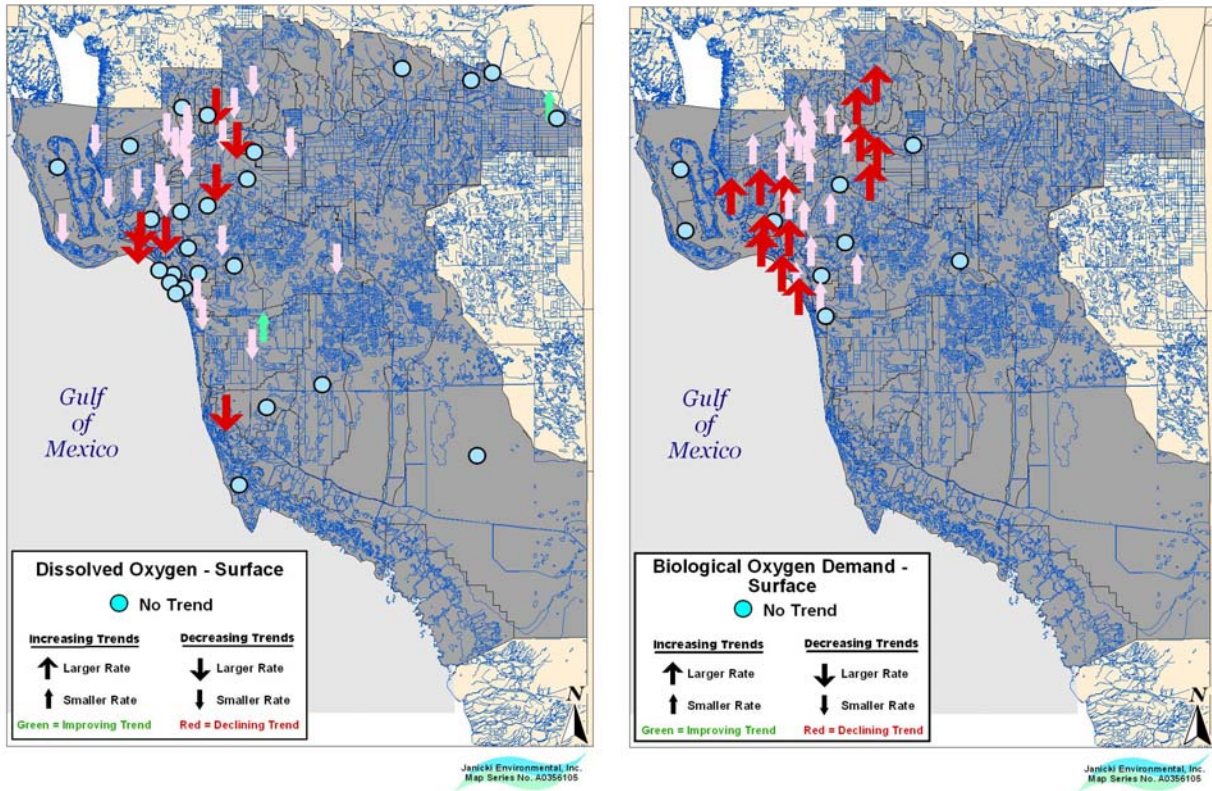


Figure 44: Turbidity and Total Suspended Solids Trends

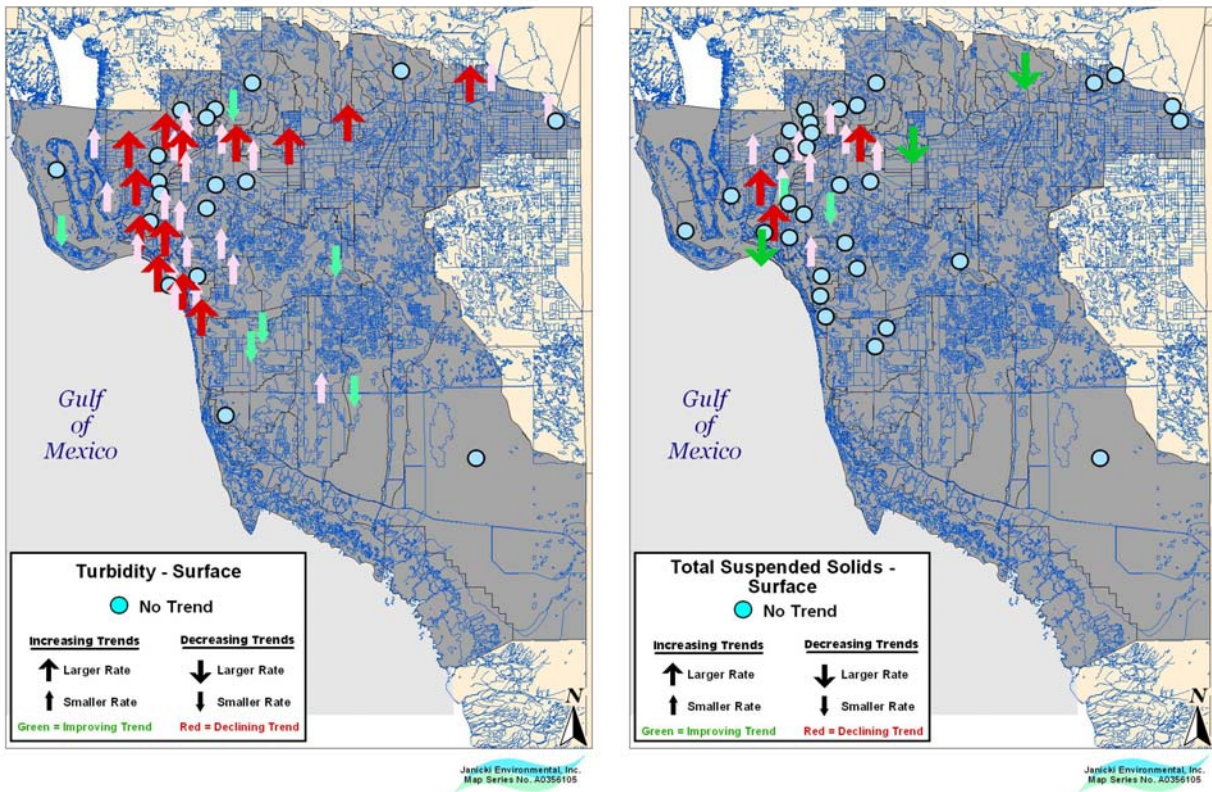
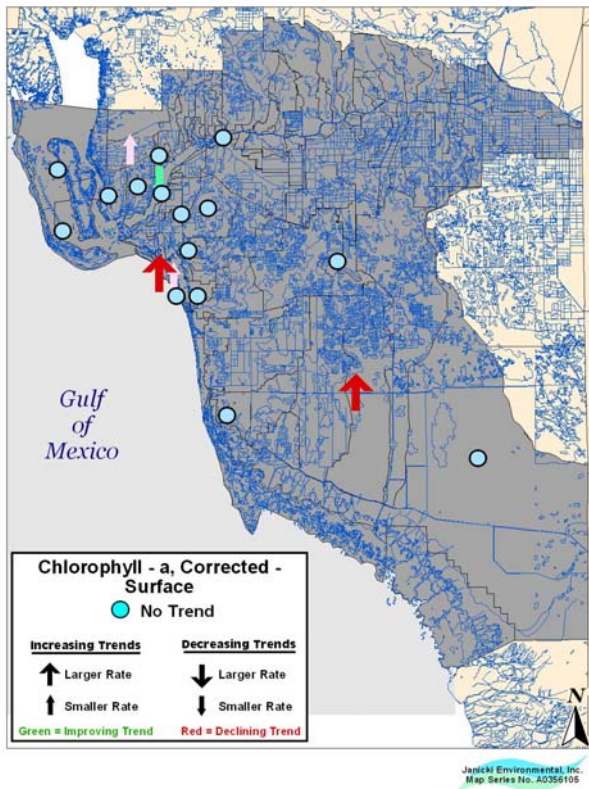
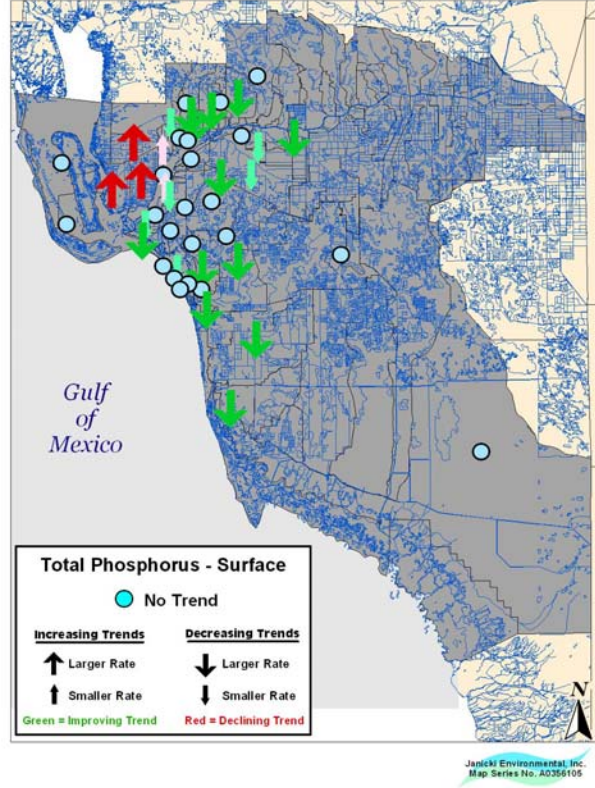
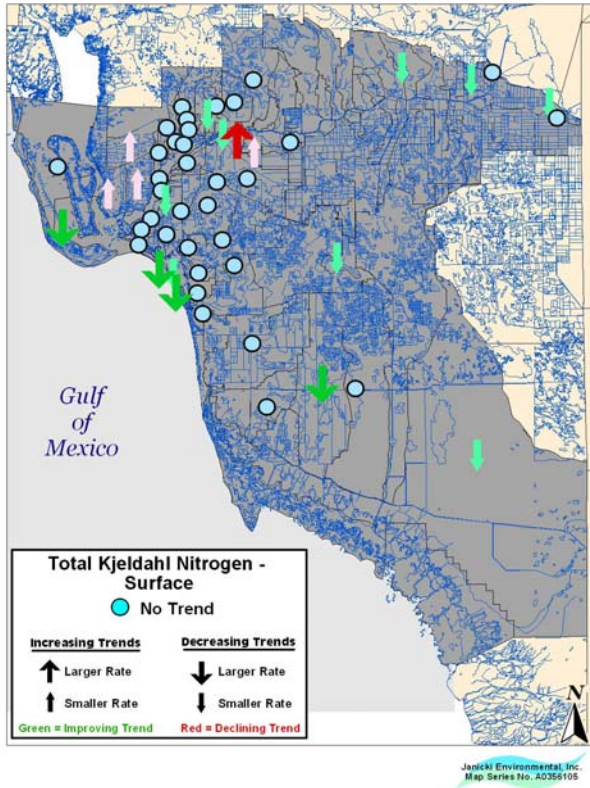


Figure 45: Nutrient Trends



Identified Sources of Pollution

National Pollution Discharge Elimination System (NPDES)

In 1972, the Federal Water Pollution Control Act, also referred to as the CWA was amended to provide that discharge of any pollutant to waters of the United States from any point source is unlawful without a NPDES permit. Phase I of the NPDES Stormwater Regulations required “medium” and “large” municipalities to obtain permit coverage for their respective regulated small municipal separate storm sewer system (MS4). A medium municipality has been defined as any local government with a population greater than 100,000 and less than 250,000. A large municipality is defined as any local government with a population greater than 250,000. Those municipalities with less than 100,000 residents were not regulated under Phase I unless specifically designated by the EPA. Phase II of the NPDES Stormwater Regulations is intended to further reduce adverse impacts to water quality by incorporating new thresholds for construction generic permitting, and new MS4 generic permitting for Phase II communities that include Urbanized Areas. Lee County and Charlotte County have been designated an MS4 by EPA.

Lee County

Lee County received an NPDES permit for its MS4 in October 1997. The permit conditionally authorizes Lee County and the 13 original co-permittees to discharge stormwater to “the Waters of the United States.” Agreements signed between all co-permittees assure cooperation in boundary related issues. Additionally, the County is required to inspect and monitor industrial and construction activities for permit compliance. Lee County [Ordinance 98-11](#) was adopted in June, 1998 providing legal authority for enforcement of the CWA mandate.

Under the NPDES General Permit for Storm Water Discharges Associated with Industrial and Construction Activities, EPA requires the development and implementation of a Storm Water Pollution Prevention Plan (SWP3) designed to reduce pollution at the source. A notice of intent has been issued with Lee County’s SWP3 for all construction work greater than 1 acre per Lee County Development Code 14-477.

Cities within Lee County are co-permittees for the NPDES program. Lee County maintains NPDES information online at: <http://www.lee-county.com/npdes/>.

Charlotte County

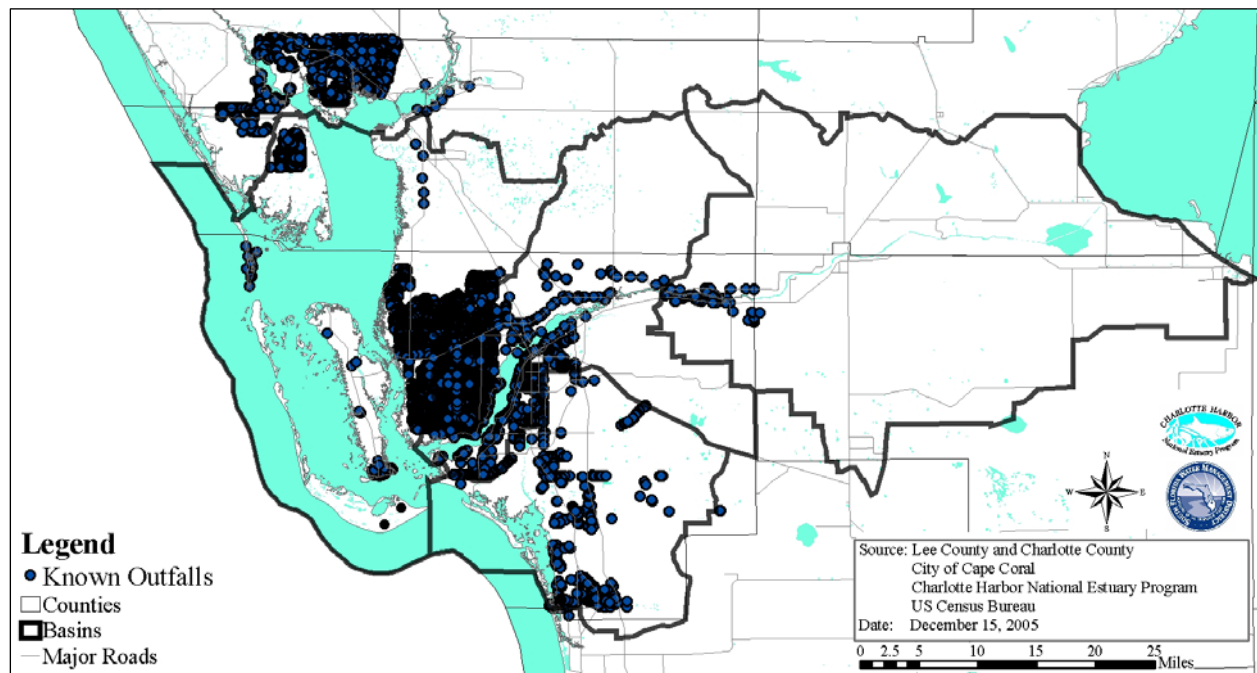
On June 1, 2003, Charlotte County submitted an application to obtain an NPDES permit. The City of Punta Gorda is a co-permittee with Charlotte County for the NPDES program. Charlotte County maintains an NPDES site at: <http://www.charlottecountyfl.com/publicworks/stormwater.htm>.

Hendry and Glades Counties

Hendry and Glades Counties and their cities are not required to obtain NPDES permits.

As part of the NPDES process, stormwater outfalls are mapped. Some permittees currently have the information in a GIS format. The following map depicts outfalls in unincorporated Lee County, City of Cape Coral, City of Bonita Springs, City of Sanibel, City of Fort Myers, and Charlotte County. Data are not available for Glades and Hendry Counties.

Figure 46: Known Outfalls

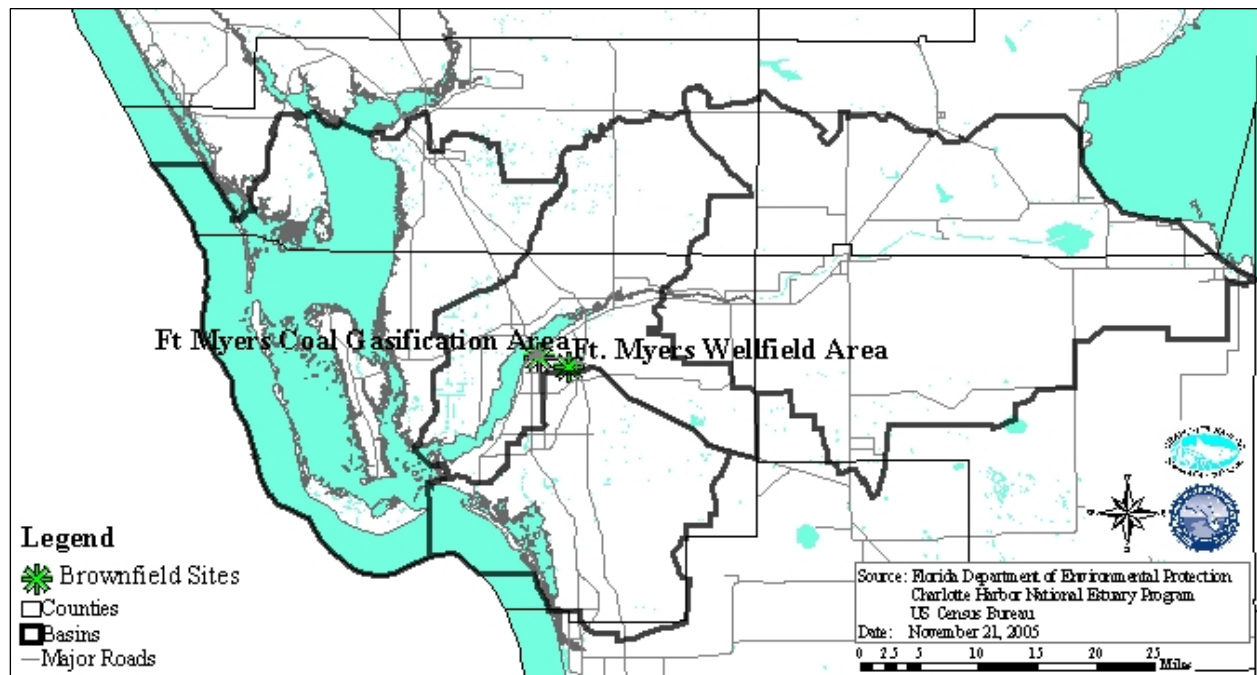


Designated Brownfields

Two brownfield sites have been designated within the study area per the Brownfield Redevelopment Act (Sections 376.77-376.875, FS). Both of the sites are in the City of Fort Myers. In 2004, the City established its Brownfields Redevelopment Program, with a Brownfield Assessment Demonstration Community grant awarded by the EPA. One of the identified brownfields is the City of Fort Myers wellfield, which is in Phase II of its assessment. The City of Fort Myers resolution 2003-52 designated the site at 2485/2665 Ortiz Avenue, Fort Myers Florida 33905 a brownfield site. The resolution can be found at:

http://www.dep.state.fl.us/waste/quick_topics/publications/wc/brownfields/resolutions/BF360301000_RES.pdf. The second site, the City of Ft. Myers Coal Gasification Site entered into a Brownfield Site Rehabilitation Agreement on March 9, 2001. The City of Ft. Myers Coal Gasification Site is at 2000 Cranford Avenue, Fort Myers, Florida 33916. The Rehabilitation Agreement can be found at: http://www.dep.state.fl.us/waste/quick_topics/publications/wc/brownfields/BSRAs/BF369901001_BSRA.pdf.

Figure 47: Brownfield Sites

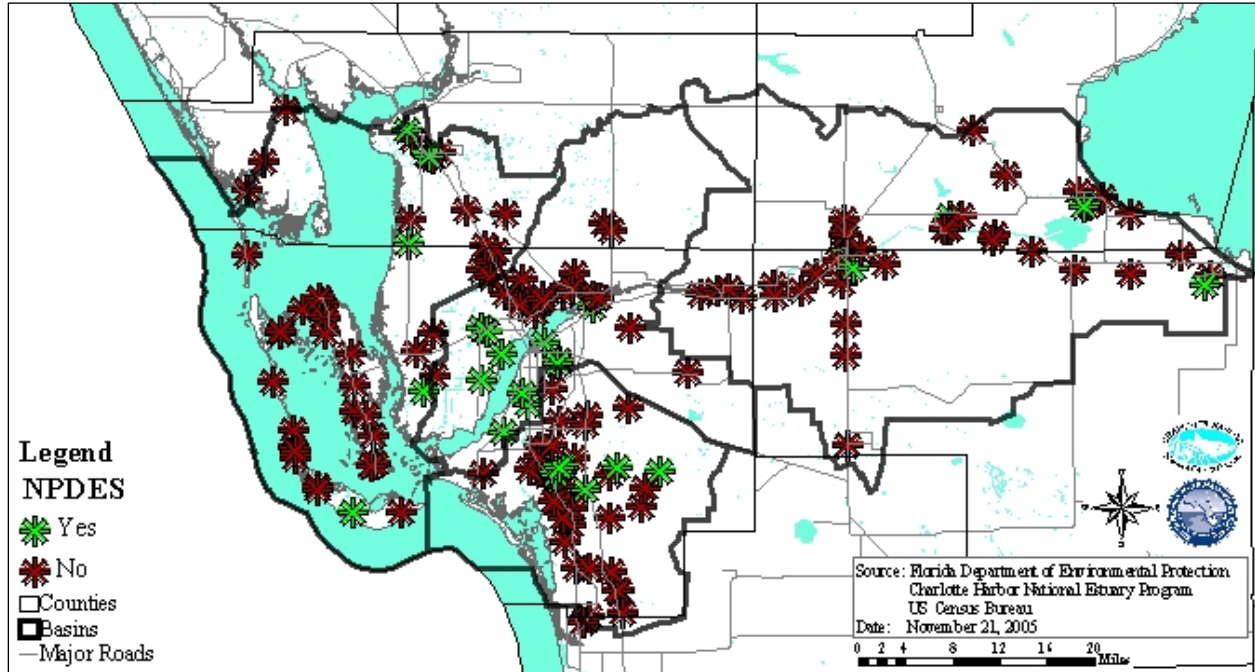


The primary goals of the Brownfield Redevelopment Act are to reduce public health and environmental hazards on existing commercial and industrial sites that are abandoned or underused due to these hazards; create financial and regulatory incentives to encourage voluntary cleanup and redevelopment of sites; derive cleanup target levels and a process for obtaining a "No Further Action" letter using Risk-Based Corrective Action principles; and provide the opportunity for Environmental Equity and Justice.

There are no groundwater issues with the Fort Myers Wellfield Area. The site includes lime sludge piles that have arsenic concentrations above a residential cleanup target level based on direct exposure.

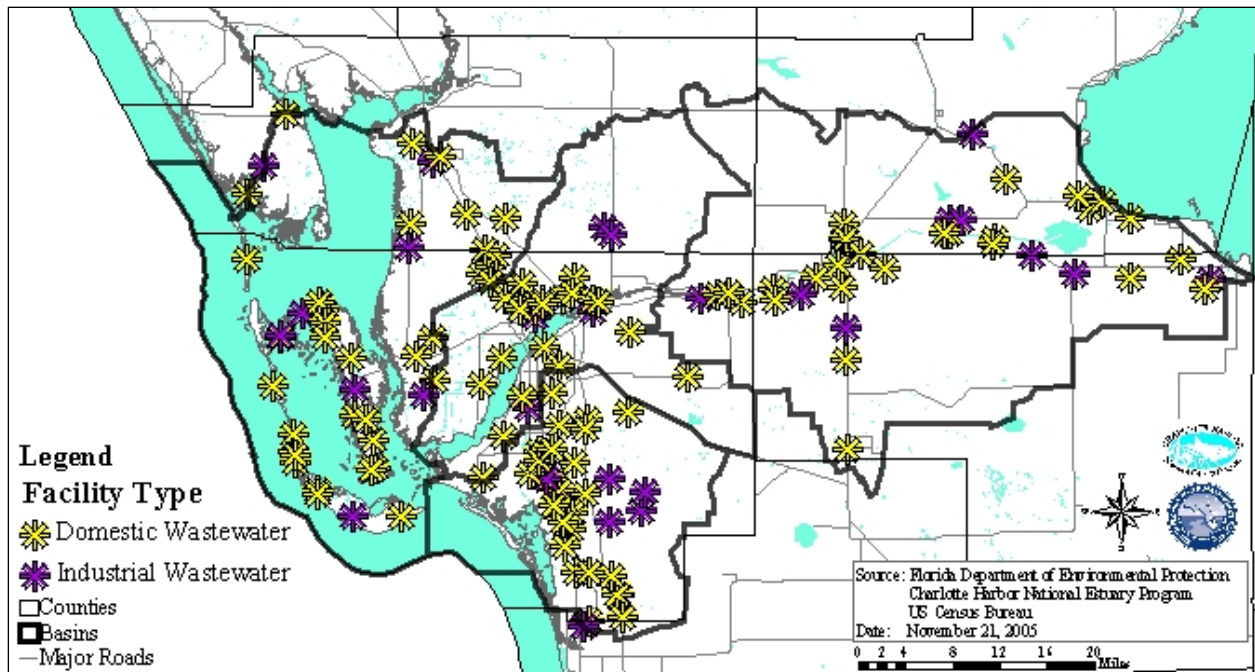
The Fort Myers Gasification Area has been remediated. However, groundwater contamination still exists within the property boundaries.

Figure 48: Wastewater Generating Facilities NPDES Status



Within the study area, there are currently 162 wastewater generating facilities permitted by the Florida Department of Environmental Protection including domestic wastewater treatment facilities and industrial wastewater facilities shown in Figure 48. A number of these facilities shown in Figure 49 are required to obtain a NPDES permit, administered through FDEP, while some are not and are regulated solely under state law (FS 403). Out of 162 wastewater facilities in the study area, 29 possess NPDES permits. The wastewater facilities included 117 domestic wastewater facilities and 45 industrial wastewater facilities.

Figure 49: Domestic and Industrial Wastewater Generating Facilities



The domestic wastewater treatment plants generate secondarily treated wastewater that may be permitted to be disposed of in many ways including: surface water discharge; deep well injection; land application; re-use (treated to a higher standard); intermittent surface water discharge; or a combination of these. Intermittent surface water discharge generally means the wastewater is contained within an isolated pond and only reaches surface waters of the state through ground water seepage and transmission, or during a significant storm event.

The industrial wastewater permits in the study area serve facilities such as, concrete batch plants (TSS – primarily from site runoff), reverse osmosis plants (typically high in TDS), agricultural processing operations (sugar, citrus, tomatoes), and primarily discharge to groundwater through percolation ponds. Other types of discharge that occur to a lesser extent are: surface water discharge, land application, deep well injection, and re-use.

The main volume contributors of secondarily treated wastewater to surface waters in the study area include: Fort Myers Central advanced wastewater treatment plant, with surface water discharge to the Caloosahatchee River near Billy's Creek (approximately 4-5 mgd avg); Fort Myers South advanced wastewater treatment plant, with surface water discharge to the Caloosahatchee River South of Colonial (approximately 8 mgd avg.); City of Cape Coral reverse osmosis water treatment plant, with surface water discharge to the canal system, which then discharges to the Caloosahatchee River (approximately 3 mgd avg.). Other significant facilities with smaller permitted discharge volumes than those above are as follows:

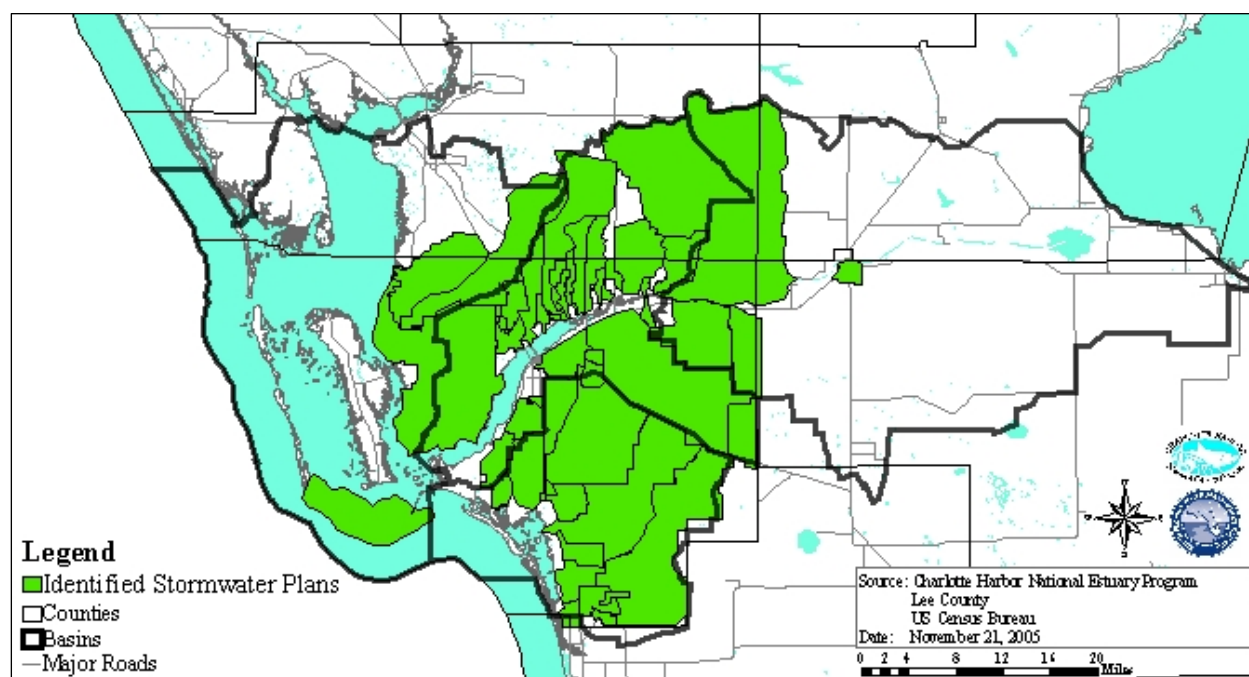
- City of Clewiston WWTP– Land application of treated wastewater, which then underdrains to a canal system and is indirectly discharged to the Caloosahatchee River through canals.
- City of Cape Coral Southwest Reclamation Facility – Reuse and Surface water discharge. (discharge point is combined with Everest Parkway facility below)
- City of Cape Coral (Everest Parkway) Reuse and Surface water discharge. Combined discharge outlet to the Caloosahatchee River. (near Everest Pkwy)
- Fiesta Village WWTP– Reuse and Surface water discharge. Discharge to the Caloosahatchee River - upstream of Cape Coral Parkway Bridge.
- Waterway Estates AWWTP– Surface water discharge to the Caloosahatchee River.

6. Existing Hydrology and Hydraulics Plans

Existing hydrology and hydraulics plans within the LCH study area were identified. Regional hydrologic and hydraulic studies and models have been developed. Most recently, the regional efforts have been a component of the Comprehensive Everglades Restoration Plan (CERP) and the Southwest Florida Feasibility Study (SWFFS). The SWFFS will investigate water resources problems and opportunities in all or parts of Lee, Collier, Hendry, Glades, Charlotte, and Monroe counties. The purpose of the study is to determine the feasibility of making structural, non-structural, and operational modifications and improvements in the region in the interest of environmental quality, water supply, and other purposes. The SWFFS will develop a comprehensive regional plan of action to address the health of aquatic and upland ecosystems; the quantity, quality, timing, and distribution of water flows; agricultural, environmental, and urban water supply; the sustainability of economic and natural resources; flood protection; fish and wildlife; biological diversity; and natural habitat. Modeling will be used for detailed design and environmental output evaluation purposes. Hydrologic model development, environmental model development, water quality analyses, and water supply analyses will be required to refine alternative plan formulation. Cost-effectiveness and incremental cost analysis will be used to compare different outputs resulting from the various levels of expenditures.

Four hydrologic and hydraulic models are used to support decision-making through the Southwest Florida Feasibility Study. They include the SWFFS Regional Model, MIKE SHE, MIKE 11, and CH3D (Hydrodynamic Model). The 2003 Strategic Model Plan lists these models as a part of an overall model strategy for SFWMD. The plan can be viewed at: http://gwmftp.jacobs.com/Peer_Review/strategic_plan_final_2%2000.pdf.

Figure 50: Identified Stormwater Plans



Hydrology and hydraulic studies and plans also include stormwater and drainage planning efforts and a discussion of the identified problems that need to be addressed. The spatial relationship of these plans within the watershed, the time period that they were developed, and the

implementation extent are presented. Forty-five separate active Stormwater Master Plans (SMP) have been identified and collected. These are presented below.

Lee County

Lee County has pursued SMP development and implementation. The web page devoted to stormwater planning is <http://www.lee-county.com/STORMWATER/MasterPlanpage.htm>. According to the website: “One of the main purposes of the Plan was to identify the existing flowways, streams and runoff rates for each basin and provide recommendation for protection and improvement of each flowway and stream. This is being done to protect upstream lands from additional flooding which might be caused from downstream developments. The first portion of the Surface Water Management Plan was an inventory of existing facilities on the major streams and a detailed study of Six Mile Cypress watershed. The Six Mile Cypress Watershed Plan was finished in February, 1990. This plan was adopted by the Board of County Commissioners on April 18, 1990.” Eleven more watersheds were studied and the report was completed in June, 1991. In December 1992, nineteen additional watersheds were completed. Four watersheds (Halls Creek, Telegraph Creek, Fichters Creek and Cypress Creek) were completed as part of Four Corners study sponsored by the South Florida Water Management District and the County. In the most recent effort, Lee County published the Northwest Lee County Surface Water Management Plan in March 2005 and is currently updating the Six Mile Cypress Plan.

Table 25: Lee County Water Management Plans

AUTHOR	DATE	PUBLICATION	GEOGRAPHIC AREA
USGS	1984	GATOR SLOUGH & SPREADER CANAL SYSTEM - DATA RELEASE	Gator Slough
MONTGOMERY	1988	LEE COUNTY WATER RESOURCES MANAGEMENT PROJECT	Lee County
JOHNSON	1988	CANAL "L" WATERSHED WATER MANAGEMENT STUDY	Canal "L"
BENDER	1990	MANAGING THE QUALITY, QUANTITY, AND TIMING OF SURFACE WATER DISCHARGE INTO THE ESTERO BAY STATE AQUATIC PRESERVE	Estero Bay
GREINER	1991	LEE COUNTY SURFACE WATER MANAGEMENT MASTER PLAN EVALUATION OF EXISTING SURFACE WATER PLANS & STUDIES	Yellow Fever, Marsh Point, Daughtery, Chapel Branch, Bayshore, Popash, Stroud Creek, Thompson Cutoff.
JOHNSON ENGINEERING	1991	VOL I & IIA, IIB, III, MASTER PLAN JUNE 1991	Gator Slough, Yellow Fever, Powell, Billy Creek
JOHNSON ENGINEERING	1992	VOL I & IIA, IIB, III MASTER PLAN DECEMBER 1992	Lee County
USDA	1992	FLOOD PRONE AREAS OF LEE COUNTY FLORIDA FLOOD PLAIN MANAGEMENT STUDY PHASE I ESTERO BAY AREA	Estero Bay
JOHNSON ENGINEERING, HOLE MONTES, & DEX BENDER ASSOC.	1997	6 WATERSHEDS MASTER PLAN VOL I, II AND III)	Palm Creek, Kickapoo Creek, Owl Creek, Olga, Leitner Creek, Oak Creek
JOHNSON & HM	1998	SURFACE WATER MANAGEMENT PLAN VOL 1-3 CONVEYANCE INVENTORY REGIONAL MSTU/GIS MAPPING	Lee County
POST BUCKLEY	1998	SOUTH LEE COUNTY WATERSHED PLAN VOL I	Estero Bay
LEE COUNTY PUBLIC SAFETY	1999	LEE COUNTY FLOODPLAIN MANAGEMENT HAZARD MITIGATION PLAN 1999	Lee County
PSI	2001	LEE COUNTY ENVIRONMENTAL SERVICES NATURAL RESOURCES DIVISION FLOW MEASUREMENT PROJECT	Lee County
LEE COUNTY PARKS & REC	2002	SIX MILE CYPRESS SLOUGH PRESERVE LAND STEWARDSHIP PLAN 2002	Six Mile Cypress Slough
BOYLE ENGINEERING	2005	NORTHWEST LEE COUNTY SURFACE WATER MANAGEMENT PLAN	Gator Slough

Gator Slough

The Gator Slough watershed encompasses approximately 55 square miles. The watershed runs from Matlacha Pass in Lee County, northeasterly, to the vicinity of Tuckers Grade in the Cecil Webb Wildlife Management Area in Charlotte County.

The Lee County Gator Slough Watershed Study recommends the removal of the blockage and caprock west of U.S. 41; removal of the vegetation obstructing the existing canal and weir system; and repair of the zigzag weir to allow the flow of fresh water through a control structure into the canal system for storage and eventual use in the City of Cape Coral irrigation system.

Both the SFWMD and the City of Cape Coral are contributing to the restoration of Gator Slough. The Southwest Florida Feasibility Study is exploring water resources development potential along the existing Gator Slough and Gator Slough Canal including the current efforts by Lee County and the City of Cape Coral.

City of Bonita Springs

In 2002, the City of Bonita Springs completed a Stormwater Master Plan (SMP). The SMP presented the history of flooding in Bonita Springs, prepared 2 foot contour maps of the City, delineated drainage basins, and identified thirteen of the most seriously flood prone areas. General cost estimates were prepared for improvements in these areas, with detailed estimates for remedial measures within the three more serious problem areas. The improvements in the thirteen areas were estimated to cost approximately \$4 million in 2002. The SMP also estimated annual Stormwater system maintenance costs and projected this to a cost per household. The total value of the annual O & M (operation & maintenance) costs was expected to total approximately \$0.5 million per year. The City initiated a feasibility study for a Stormwater Utility. The report for the Feasibility Study of a Stormwater Utility is now being completed. Over the past two years the City has undertaken many "small" projects to improve both storm water quantity and quality. Several of these have implemented a portion of some of the thirteen areas addressed in the Stormwater Master Plan. The City has also been able to obtain two grants from SFWMD to assist in these improvements. Currently, the City is developing a 5-year Financial Plan which is expected to show the City funding the recommended CIP improvements over a 10-year period, along with the necessary O & M.

Table 26: Bonita Springs Stormwater Management Plans

AUTHOR	DATE	PUBLICATION	GEOGRAPHIC AREA
HARTMAN & ASSOC	2002	STORMWATER MASTER PLAN VOLUME I FOR THE CITY OF BONITA SPRINGS	Bonita Springs

City of Cape Coral

The City of Cape Coral adopted its Surface Water Master Plan in 1993, and is continuing to implement projects and perform retrofits such as replacing and upgrading storm pipes.

Table 27: Cape Coral Stormwater Management Plans

AUTHOR	DATE	PUBLICATION	GEOGRAPHIC AREA
CONNELL, METCALF	1979	A WATER MANAGEMENT STUDY OF THE CAPE CORAL CANAL NETWORKS	Cape Coral
MISSIMER	1989	CITY OF CAPE CORAL MASTER WATER SUPPLY PLAN PHASE I REPORT	Cape Coral
HAVENS AND EMERSON INC & AVALON ENGINEERING INC	1993	CAPE CORAL SURFACE WATER MASTER PLAN	Cape Coral

City of Fort Myers

The City of Fort Myers latest SMPs were developed in 1987 and are still in use

Table 28: Fort Myers Stormwater Management Plans

AUTHOR	DATE	PUBLICATION	GEOGRAPHIC AREA
JOHNSON ENG	1987	SURFACE WATER MANAGEMENT FORT MYERS PLANNING AREA ADDITION I; A REPORT FOR THE CITY OF FORT MYERS	Billy's Creek SE, Six Mile Cypress North
JOHNSON ENG	1987	SURFACE WATER MANAGEMENT	Fort Myers
JOHNSON ENG	1987	SURFACE WATER MANAGEMENT PLAN, GALLOWAY AREA WATERSHED A REPORT FOR THE CITY OF FORT MYERS	Galloway Area (Fort Myers)

City of Sanibel

The City of Sanibel adopted its SMP April 1995 and reports that Plan has been fully funded and all the recommended capital improvements have been implemented.

Table 29: Sanibel Stormwater Management Plans

AUTHOR	DATE	PUBLICATION	GEOGRAPHIC AREA
JOHNSON ENG	1995	SURFACE WATER MANAGEMENT MASTER PLAN	Sanibel Island

Town of Fort Myers Beach

The Town of Fort Myers Beach has adopted no SMP with hydrologic analysis and recommended projects with costs. Retrofits are being implemented in association with road projects. However, the Town cites Chapter 9 of its Comprehensive Plan as the current guiding document. The objectives include stormwater pollutant reduction, increasing recharge rates, reducing erosion, maintaining interim levels of flood protection, and stormwater master planning and implementation. The chapter can be found at:

http://www.fmbeach.org/comp_plan/Stormwater.pdf.

East County Water Control District

The East County Water Control District (ECWCD) maintains a stormwater master plan and has funded restoration of waterways as recently as FY04. The ECWCD has received funding for its projects from the SFWMD through the Caloosahatchee Initiative.

Table 30: ECWCD Stormwater Management Plans

AUTHOR	DATE	PUBLICATION	GEOGRAPHIC AREA
AIM ENGINEERING & SURVEYING, INC.	1978	ORANGE RIVER STUDY FOR THE ECWCD	ECWCD
GEE & JENSON	1978	PROPOSED RESERVOIR AND STRUCTURES S-OR-I DESIGN	ECWCD
GEE & JENSON	1980	ECWCD HARN'S MARSH CONCEPTUAL DESIGN	ECWCD
GEE & JENSON	1986	ECWCD CHARLIE DIVERSION STRUCTURE	ECWCD
JOHNSON ENGINEERING	1997	ADDITIONAL ORANGE RIVR INFORMATION	ECWCD
GEE & JENSON	1972	CONSOLIDATED PLAN OF WATER MANAGEMENT VOLUME II APPENDICES PART I & PART II EAST COUNTY WATER CONTROL DISTRICT	ECWCD
GEE & JENSON	1975	WATER RESOURCES REPORT EAST COUNTY WATER CONTROL DISTRICT	ECWCD
AIM ENGINEERING & SURVEYING, INC.	2005	ORANGE RIVER FLOOD RELIEF DUE DILIGENCE STUDY	ECWCD
DHI	2005	EXTENSION OF TIDAL CALOOSAHATCHEE INTEGRATED SURFACE AND GROUNDWATER MODEL TO INCLUDE ECWCD AREAS FOR STORMWATER MANAGEMENT -PHASE 1	ECWMD

Charlotte County

The Master Stormwater Management Plan (MSMP) was developed in two phases. Phase 1, completed by the consulting firm of Carter Burgess, included development, mapping, and delineation of the drainage basins in Charlotte County, ranking and prioritizing basins based on needs, and a pilot study. The pilot study affected two basins in western Charlotte County, outside the LCH study area.

The three basins in South Charlotte County, which were determined to be less dependent on structural controls, were identified as basins which conveyed overland flow to primary drainage ditches, creeks, or rivers, and therefore, any flooding associated within these basins were directly related to the need for a maintenance program. Maintenance of these primary drainage ditches in south Charlotte County can now be addressed and funded through the South Charlotte Stormwater MSBU. The County has identified major ditches that need to be cleaned out and has budgeted to complete a few projects per year with the available funding.

City of Punta Gorda

The City has requested funding from the Federal Emergency Management Agency (FEMA) to complete a stormwater master plan.

Hendry County

Hendry County participated in the Four Corners Surface Water Master Plan with funding assistance from SFWMD. The Four Corners Studies are identified in Table 32. A master plan for the county is being developed also with \$250,000 of funding assistance from SFWMD.

City of LaBelle

The City of LaBelle recently completed its first stormwater master plan. The plan recommends establishing retention areas throughout the City for peak flow attenuation and water quality treatment. The City has received funding from the SFWMD to commence design and implementation of the first few sub-basins.

Table 31: LaBelle Stormwater Management Plans

AUTHOR	DATE	PUBLICATION	GEOGRAPHIC AREA
Sterling L. Carroll, PE	2004	CITY OF LABELLE IDENTIFICATION OF STORMWATER ISSUES AND RECOMMENDED IMPROVEMENTS	City of LaBelle

City of Clewiston

The City of Clewiston has no stormwater master plan. SFWMD and the City participated in obtaining a state appropriation for a stormwater retrofit of the Royal Palm Boulevard area in 2004 and construction is underway.

Glades County and City of Moore Haven

Glades County reports that it has no stormwater master plans. City of Moore Haven has no SMP but received a federal grant to install improvements (See section on under Capital Improvement Programs).

SFWMD

To assist local governments in the LCH area, SFWMD has developed and implemented various stormwater plans.

Table 32: SFWMD Stormwater Management Plans

AUTHOR	DATE	PUBLICATION	GEOGRAPHIC AREA
SMITH	1996	SURFACE WATER MANAGEMENT PLAN FOUR CORNERS AREA EXECUTIVE SUMMARY VOLUME II	Four Corners
JOHNSON ENG	1999	SOUTH LEE COUNTY WATERSHED PLAN	Estero Bay
SFWMD	2000	CALOOSAHATCHEE WATER MANAGEMENT PLAN - PLANNING DOCUMENT	Caloosahatchee Basin
POST BUCKLEY	2002	ESTERO BAY & WATERSHED ASSESSMENT	Estero Bay
DHI, INC	2005	FOUR COUNTY CORNERS FLOOD CONTROL STUDY	Four Corners

Table 33 presents a summary of projects recommended in the Various SMPs.

Table 33: Stormwater Plans Recommendations

Watershed	Recommendation Summary	Cost ⁶ Estimate	DATE	Agency
Gator Slough	Deepen, widen, and lengthen channel, construct 2 weirs.	\$5,250,000	1972	Lee County
Gator Slough	The Lee County Gator Slough Watershed Study recommends the removal of the blockage and caprock west of U.S. 41; removal of the vegetation obstructing the existing canal and weir system; and repair of the zigzag weir to allow the flow of fresh water through a control structure into the canal system for storage and eventual use in the City of Cape Coral irrigation system.	N/A	2005	Lee County
Fort Myers	Enlarge culverts, Replace bridge, remove silt, interconnect with pumps, extend canals.	\$6,600,000	1987	City of Fort Myers
Six Mile Cypress North	Develop controlled outfalls	\$227,000	1987	City of Fort Myers
Billy's Creek S.E.	Build new conveyance	\$332,000	1987	City of Fort Myers
Galloway	Invert existing channels, build shelf detention, reslope channel banks, exchange box culvert, build detention lakes, new box culvert, interconnect with 10-mile canal.	\$750,000	1987	City of Fort Myers
Yellow Fever Creek	Construct 1 weir, remove 1 road	N/A	1991	Lee County
Ten Mile Canal	Excavate 3 sections of channel, build littoral shelf, diversion to borrow pit, detention facility, replace crossings, construct pump facility.	\$9,070,718.00	1991	Lee County
Whiskey Creek	Excavate 3 sections of channel, replace 2 culverts, install 1 water control structure	\$1,875,720	1991	Lee County
Powell	Clean and snag creek, install 2 weirs	\$1,066,500	1991	Lee County
Imperial River	Clean and snag river, install 1 weir	\$1,960,000	1991	Lee County
Deep Lagoon	Initial Vegetation/Siltation Removal and replace 1 culvert.	\$1,344,000	1991	Lee County
Billy Creek	Remove silt, widen/deepen channel, build 2 weirs (1 with 2.5 acre detention), replace 3 bridges	\$3,763,200	1991	Lee County
Hendry Creek	Initial vegetation removal and right-of-way acquisition.	\$500,000	1991	Lee County
Cow Slough	None.	\$0	1991	Lee County
Yellow Fever Creek (E. Branch)	Replace 4 structures, install 3 weirs, enlarge 3 sections, harden 1 section	\$3,603,000	1991	Lee County

⁶ The Cost Estimates are from the Master Plans developed over many years and may not be considered current or reliable at this time.

Table 33: Stormwater Plans Recommendations

Watershed	Recommendation Summary	Cost ⁶ Estimate	DATE	Agency
Halfway Creek	Initial vegetation removal, acquire floodplain wetlands west of 41	\$802,300	1992	Lee County
Spring Creek	Initial vegetation removal, 1 culvert, 335 acres of sensitive land	\$987,000	1992	Lee County
Stroud Creek	Initial Vegetation Removal, 2 culverts	\$1,051,000	1992	Lee County
Telegraph Creek	Replace 2 bridges	\$1,928,000	1992	Lee County
Trout Creek	None	\$0	1992	Lee County
Bayshore Creek	Initial vegetation removal, improve 3 culverts, acquire 60 acres	\$1,048,000	1992	Lee County
Bedman Creek	1 3-acre STA, 1 bridge	\$106,500	1992	Lee County
Chapel Branch	Initial vegetation removal, improve 3 culverts, acquire 53-acre easement	\$833,000	1992	Lee County
Cohn Branch	Initial vegetation removal, clean 5 culverts, excavate 2 sections of channel, 3.4-acre STA	\$581,000	1992	Lee County
Orange River	45 acre Water Quality Off-Line Detention Facility	\$1,734,000	1992	Lee County
Daughtrey Creek East Branch	Initial vegetation removal, replace 4 culverts, acquire 113 acres sensitive land, build 5 acre STA.	\$1,450,000	1992	Lee County
Otter Creek	1 culvert	\$21,000	1992	Lee County
Popash Creek	Initial vegetation removal, 4 culverts	\$1,316,000	1992	Lee County
Mullock Creek	5 culverts, 155 acres sensitive land, 37 acre STA, 1 weir	\$2,724,000	1992	Lee County
Marsh Point	Initial vegetation removal, 4 culverts, 1 section channel excavation, 22 acres sensitive land, 55 acre STA	\$2,868,000	1992	Lee County
Hickey Creek	None	\$0	1992	Lee County
Hancock Creek	Initial vegetation removal, 1 culvert, 1 weir, 67 acres sensitive land, 55 acre STA.	\$3,125,000	1992	Lee County
Estero River	Initial vegetation removal, acquire tidal wetlands, install 2 culverts, reconstruct 1 bridge	\$2,830,800	1992	Lee County
Daughtrey Creek	Initial vegetation removal, replace 1 bridge and 1 culvert, excavate channel, acquire 8 acre easement, build 35 acre STA and 1 weir	\$3,510,000	1992	Lee County
Owl Creek	2 box culverts, 2 RCPs	\$500,877.00	1997	Lee County
Oak Creek	2 bridges, 3 box culverts	\$1,354,200	1997	Lee County
Palm Creek	8 box culverts, 37 acres wetlands	\$2,825,473	1997	Lee County
Kickapoo	5 box culverts, acquire 28 acres wetlands	\$1,703,198	1997	Lee County
Olga Creek	None	\$0	1997	Lee County
Leitner Creek	2 box culverts	\$219,200	1997	Lee County
Bonita Springs	13 flood control projects	\$3,928,787	2002	City of Bonita Springs
LaBelle	Build 9 STAs and reestablish swales	\$3,762,400	2004	City of LaBelle
4-Corners	Expanded conveyance, restore flows to Spanish Creek, bridge.	\$0	2005	Lee County
Orange River	Diversion of flows from Able Canal, stormwater storage.	\$33,000,000	2005	ECWCD

Many of these projects have been implemented in the years since the preparation of the stormwater plans. Each agency has evaluated their SMPs in association with current needs and techniques. Current stormwater project needs identified as of the writing of this report are in the following table. This table was based on the input received from representatives of Lee County, Fort Myers, Bonita Springs, and more recent SMPs and is not believed to be all inclusive.

Table 34: Identified Project Needs in Lower Charlotte Harbor

Type Of Improvement	Location/ Extent	Watershed	\$	DATE	Jurisdiction
Bridge	A 100-foot bridge in Jacks Branch that will replace the 34 foot wooden bridge	Jack's Branch	N/A	2005	Hendry
Bridge	Acquire easement and reconstruct Telegraph Creek Lane bridge; Current structure is undersized.	Telegraph Creek	667,000.00	1992	Lee County
Bridge	Nalle Grade Road: 98' length across the stream. The width of this structure across the stream needs to be increased as does the depth under the structure to meet bridge criteria.	Daughtrey Creek	403,000.00	1992	Lee County
Bridge	First Street (SR 80) near Billy's Creek is constructed to an elevation which allows tidal flooding on more frequent basis than once every 5years. Improvement of this area is within the scope of work for the State as they redesign this road in the near future.	Billy's Creek	N/A	1987	Ft. Myers
Bridge	Sandy Lane Bridge Reconstruction; Downstream from Three Oaks Parkway, along main conveyance channel. This bridge has low chords less than the recommend 3 foot clearance from the 25 year peak stage elevation.	Estero River	650,000.00	1992	Lee County
Bridge	CR 78 124 feet across the stream; Current structure is undersized.	Telegraph Creek	710,000.00	1992	Lee County
Bypass System	Imperial Gates Subdivision (Quinn St. Area). A bypass system for the Imperial Gates Subdivision and the Pincrest Subdivision with a 72-inch RCP option, with pipes from the Imperial River to Oak Creek.	Imperial River	832,166.00	2002	Bonita Springs
Channel Excavation	The channel downstream of Cleveland Avenue needs to be excavated to provide a better hydraulic capacity and remove excessive vegetation from the channel.	L-3/Galloway Canals	160,000.00	1987	Ft. Myers
Channel Excavation	Canal "L-3" to U.S. 41 (1,220 LF). Also excavate upstream and downstream from 3rd Street footbridge.	Whiskey Creek	118,000.00	1991	Lee County
Channel Excavation	Upstream of Danley Drive 800 LF on both sides of the 3rd Street footbridge for a distance of 500 feet each way. This will enhance channel expansion capability in this constricted area.	Whiskey Creek	59,000.00	1991	Lee County
Channel Excavation	Tamiami Trail (US 41) to Six Mile Cypress Parkway (140,000 CY). South of Railroad Bridge to Hanson Street (60,000 CY). Park Road area (60,000 CY)	Ten Mile	2,828,000.00	1991	Lee County
Channel Excavation	Adjacent to I-75, along the north side with easement 1,000 LF between two triple barrel box culverts that cross the Interstate, reconstruct connections to allow for a flow balance through these two culverts.	Daughtrey Creek	238,000.00	1992	Lee County
Channel Excavation	E. Gardenia Circle to Donald Road with easement, 1,000 LF; conveyance is too small.	Cohn Branch	71,000.00	1992	Lee County
Channel Excavation	South of Gish Lane 1,300 LF with easement. A portion of Bakers Canal needs to be slightly enlarged approximately 1/4 mile long to slightly expand the width of the channel and lower the invert of the channel.	Marsh Point	135,000.00	1992	Lee County
Channel Excavation	Donald Road to downstream side of SR-78 with easement, 1,800 LF; conveyance is too small.	Cohn Branch	107,000.00	1992	Lee County

Table 34: Identified Project Needs in Lower Charlotte Harbor

Type Of Improvement	Location/ Extent	Watershed	\$	DATE	Jurisdiction
Conveyance Improvement	An expanded flow-way through the County Line Drainage District that will restore flows to Spanish Creek	Spanish Creek	N/A	2005	Lee County
Conveyance Improvement	An expanded Conveyance from Cypress Creek to the County Line Ditch via the North Line Slough across the north side of the County Line Drainage District.	Cypress Creek	N/A	2005	Lee County
Culvert Replacement	Bright Road: 3-12' wide by 11' high box culverts, 64 LF; to enlarge capacity of conveyance.	Daughtrey Creek	219,000.00	1992	Lee County
Culvert Replacement	Duke Highway 2-42" RCP, 64 LF; The existing culvert is a single 72" by 44" corrugate metal pipe that needs to be replaced.	Otter Creek	15,000.00	1992	Lee County
Culvert Replacement	Wood Street 3-9' wide 6' high box culverts, 64 LF The current culvert crossing is undersized.	Mullock Creek	130,000.00	1992	Lee County
Culvert Replacement	Donald Road 2-36" RCP, 40 LF Headwalls and appropriate soding should also be placed at this location as it is currently at 5-year event level of service.	Cohn Branch	28,000.00	1992	Lee County
Culvert Replacement	Sean Lane 2-12' wide by 5' high box culverts, 64 LF; The current culvert crossing is undersized.	Daughtrey Creek - East Branch	130,000.00	1992	Lee County
Culvert Replacement	Pine Echo Road 3-12' wide by 6' high box culverts (with easement)	Popash Creek	170,000.00	1992	Lee County
Culvert Replacement	Slater Pines Road 3-9' wide by 4' high box culverts, 32 LF; The current culvert crossing is undersized.	Daughtrey Creek - East Branch	110,000.00	1992	Lee County
Culvert Replacement	Zoysia Lane 2-8'x4' box culvert, 64 LF with a concrete culvert in the form of round or rectangular box culvert to replace the undersized metal culvert and provide better flow characteristics.	Marsh Point	84,000.00	1992	Lee County
Culvert Replacement	Rich Road 2-8' wide by 4' high box culverts; The current culvert crossing is undersized.	Daughtrey Creek - East Branch	72,000.00	1992	Lee County
Culvert Replacement	Samville Road 1-10' wide by 4' high box culverts, 64 LF; The current culvert crossing is undersized.	Chapel Branch	128,000.00	1992	Lee County
Culvert Replacement	College Parkway 2 - 8'x7' box culverts - 140 LF - Existing structure inadequate to convey 25-year, 3-day storm event flows.	Whiskey Creek	298,000.00	1991	Lee County
Culvert Replacement	McGregor Boulevard culvert needs replacement. Replace with a double 12'x6' concrete box culvert @ elevation 3.0' NGVD.	Deep Lagoon	260,000.00	1991	Lee County
Culvert Replacement	Riverwalk Boulevard 2 - 8'x7' box culverts 60 LF - Existing structure inadequate to convey 25-year, 3-day storm event flows.	Whiskey Creek	104,400.00	1991	Lee County
Culvert Replacement	CR 887 2-11' wide by 6' high box culverts, 64 LF; The current culvert crossing is undersized.	Spring Creek	104,000.00	1992	Lee County
Culvert Replacement	Lady Bird Lane 2-78" RCP, 64 LF with a concrete culvert in the form of round or rectangular box culvert to replace the undersized metal culvert and provide better flow characteristics.	Marsh Point	68,000.00	1992	Lee County
Culvert Replacement	W. Gardenia Circle 2-36" RCP, 40 LF Headwalls and appropriate soding should also be placed at this location as it is currently at 5-year event level of service (LOS).	Cohn Branch	17,000.00	1992	Lee County
Culvert	Laurel Drive 2-60" RCP, 64 LF with a concrete	Marsh Point	73,000.00	1992	Lee County

Table 34: Identified Project Needs in Lower Charlotte Harbor

Type Of Improvement	Location/ Extent	Watershed	\$	DATE	Jurisdiction
Replacement	culvert in the form of round or rectangular box culvert to replace the undersized metal culvert and provide better flow characteristics.				
Culvert Replacement	Gish Lane 2-54" RCP, 64 LF. Replace with a concrete culvert in the form of round or rectangular box culvert to replace the undersized metal culvert and provide better flow characteristics.	Marsh Point	48,000.00	1992	Lee County
Culvert Replacement	Leetana Road 2-6' wide by 5' high box culverts, 64 LF; The current culvert crossing is undersized.	Bayshore Creek	75,000.00	1992	Lee County
Culvert Replacement	Cohn Road 2-36" RCP, 40 LF Headwalls and appropriate soding should also be placed at this location as it is currently at 5-year event LOS.	Cohn Branch	17,000.00	1992	Lee County
Culvert Replacement	Jones Road 2-36" RCP, 40 LF Headwalls and appropriate soding should also be placed at this location as it is currently at 5-year event LOS.	Cohn Branch	17,000.00	1992	Lee County
Culvert Replacement	E. Gardenia Circle 2-36" RCP, 40 LF Headwalls and appropriate soding should also be placed at this location as it is currently at 5-year event LOS.	Cohn Branch	17,000.00	1992	Lee County
Culvert Replacement	Barrett Road - 2- 60" RCP-64 LF at Barrette Road and a private drive immediately upstream. A culvert also needs to be enlarged within Hancock Creek Park along the Diplomat Extension.	Hancock Creek	54,000.00	1992	Lee County
Culvert Replacement	Some of the present outfalls to the river need to be replaced or refurbished as the culvert joints are deteriorating and causing infiltration of soil from above. One of these locations is just east of Tarpon Street between Riverside Drive and the river.	East Fort Myers	60,000.00	1987	Ft. Myers
Culvert Replacement	Constitution Circle 5-10' wide by 4' high box culverts, 64 LF	Mullock Creek	165,000.00	1992	Lee County
Culvert Replacement	Wood Street 3-9' wide by 6' high box culverts, 64 LF	Mullock Creek	130,000.00	1992	Lee County
Culvert Replacement	Phlox Drive 3-48" RCP, 64 LF The current culvert crossing is undersized.	Mullock Creek	39,000.00	1992	Lee County
Culvert Replacement	Lee Boulevard 3-48" RCP, 64 LF The current culvert crossing is undersized.	Mullock Creek	39,000.00	1992	Lee County
Culvert Replacement	Add 2-72" RCP at Metro Parkway for the North Colonial Waterway, as part of road reconstruction.	North Colonial Waterway		1987	Ft. Myers
Culvert Replacement	Oriole Road 3-48" RCP, 64 LF The current culvert crossing is undersized.	Mullock Creek	39,000.00	1992	Lee County
Culvert Replacement	Enlarge box culvert under Fowler.	L-3/Galloway Canals	170,000.00	1987	Ft. Myers
Initial Vegetation Removal	US 41 to CR 887, upstream of US 41. There is excessive vegetation growing along the bank.	Spring Creek	200,000.00	1992	Lee County
Initial Siltation Removal	Clear Brush, remove silt in existing channels. Consider temporarily store more runoff onsite prior to discharge to existing channels. This would involve the construction of stormwater facilities such as swales and ponds.	Imperial River	27,000.00	2002	Bonita Springs
Initial Vegetation	South of SR 78, 1,300 LF; There is excess vegetation for approximately 1/4 mile.	Marsh Point	100,000.00	1992	Lee County

Table 34: Identified Project Needs in Lower Charlotte Harbor

Type Of Improvement	Location/ Extent	Watershed	\$	DATE	Jurisdiction
Removal					
Initial Vegetation Removal	Donald Road to SR 78; excess vegetation needs to be removed.	Cohn Branch	50,000.00	1992	Lee County
Initial Vegetation Removal	Removal of excessive vegetation from the canal cross-section and periodic maintenance is recommended for both canals in Lake Amelia area.	Imperial River	20,000.00	2002	Bonita Springs
Initial Vegetation Removal	Along most of the length of the Daughtrey Creek - East Branch channel; vegetation is detrimental to the hydraulic capacity of the channel and needs to be removed.	Daughtrey Creek - East Branch	450,000.00	1992	Lee County
Initial Siltation Removal	Remove silt downstream (west) of the Veronica S. Shoemaker Avenue bridge.	Billy's Creek	90,000.00	1987	Ft. Myers
Initial Vegetation/ Removal	Station 90+00 to 162+30. Upstream from the intersection of the Caloosahatchee and Yellow Fever Creek to SR 78 is heavily overgrown on both banks in most locations, with Brazilian Pepper.	Hancock Creek	400,000.00	1992	Lee County
Initial Siltation Removal	Station 100+00 to 392+00: Siltation of some culverts located along the conveyance exceed 75% of the flow area.	Hendry Creek	400,000.00	1991	Lee County
Initial Vegetation/ Removal	Caloosahatchee to Samville Road requires maintenance of vegetation along the channel and its banks.	Chapel Branch	80,000.00	1992	Lee County
Purchase Access	Maintenance of Canal L to Calloway Channel to Cleveland is only partially complete because of limited access	L-3/Galloway Canals	80,000.00	1987	Ft. Myers
Sensitive Lands	22 acres adjacent to tract owned by the State of Florida. The Brazilian Pepper should be removed from the wetland and the wetlands acquired preferably through purchase.	Marsh Point	70,400.00	1992	Lee County
Sensitive Lands	53 acres (with easements); The small cypresshead just south of the railroad grade is in very good condition with a well developed understory.	Chapel Branch	5,400.00	1992	Lee County
Sensitive Lands	8 acre Easement: A burrow pit should be connected with main flow-way by cutting the berm at 2 points to maintain hydrologic characteristics for interior wetlands.	Daughtrey Creek	6,500.00	1992	Lee County
Sensitive Lands	60 acre Easements; The small wetland in Section 16 should be partially reconnected to the creek by lowering the berm.	Bayshore Creek	75,300.00	1992	Lee County
Sensitive Lands	67 acres of wetlands are suggested for some form of acquisition. At the minimum, Brazilian Pepper needs to be removed. No mangrove planting is anticipated due to natural source present.	Hancock Creek	89,400.00	1992	Lee County
Sensitive Lands	155 acres (with easement); Tidal wetlands along the southern side of Mullock Creek should be purchased to compliment the nearby State lands.	Mullock Creek	186,000.00	1992	Lee County
Storm Drain	Enlarge culverts within the cemetery downstream of Michigan Avenue to decrease the probability of overtopping of the cemetery road and the possibility of damage to the road during large storm events.	Ford Street Canal	40,000.00	1987	Ft. Myers
Storm Drain	Extend Storm Drain for Ford Street Canal from	Ford Street Canal	210,000.00	1987	Ft. Myers

Table 34: Identified Project Needs in Lower Charlotte Harbor

Type Of Improvement	Location/ Extent	Watershed	\$	DATE	Jurisdiction
	Jeffcott to Hanson.				
Storm Drain	Modify McGregor Boulevard storm drainage	Carrell Canal	N/A	1987	Ft. Myers
Stormwater System	Stormwater System from Arroyal Pond to Bridge at County Park, with the 48-inch RCP option, to address flooding at US 41 and Bonita Beach Road.	Imperial River	453,621.00	2002	Bonita Springs
Stormwater Treatment Area	Construct stormwater treatment area in basin D1 (Subdivision west of Dr. Martin Luther King road, draining into major city ditch).	Freshwater Caloosahatchee	184,500.00	2004	LaBelle
Stormwater Treatment Area	Construct stormwater treatment area in basin D4 (east of SR 29 around Seminole Road).	Freshwater Caloosahatchee	593,600.00	2004	LaBelle
Stormwater Treatment Area	Construct stormwater treatment area in basin E3 (Subdivision including Maddox, Tropicana, Helen, and Sable Palm Roads).	Freshwater Caloosahatchee	525,800.00	2004	LaBelle
Stormwater Treatment Area	Construct stormwater treatment area in basin C4 (east of SR 29 around Broward Road, south of SR 80).	Freshwater Caloosahatchee	498,600.00	2004	LaBelle
Stormwater Treatment Area	Construct stormwater treatment area in basin A5 (east part of City near Davis Road draining directly into the Caloosahatchee).	Freshwater Caloosahatchee	311,600.00	2004	LaBelle
Stormwater Treatment Area	Construct stormwater treatment area in basin C5 (Broward Road area in east part of City draining into City Ditch).	Freshwater Caloosahatchee	546,500.00	2004	LaBelle
Stormwater Treatment Area	Construct stormwater treatment area in basin A3 (east of SR 29 near Hickory and river-front park draining directly into the Caloosahatchee).	Freshwater Caloosahatchee	340,800.00	2004	LaBelle
Stormwater Treatment Area	Construct stormwater treatment area in basin D5 (Seminole Road area in east part of City draining into City Ditch).	Freshwater Caloosahatchee	761,000.00	2004	LaBelle
Swale/treatment pond system	The Bonita Drive Area may require storage, treatment and conveyance system upgrades to meet the City's goals for reduced flooding and improved water quality.	Imperial River	350,000.00	2002	Bonita Sptings
Swale/treatment pond system	Localized flooding within Imperial Bonita Estates would be reduced by construction of a swale/treatment pond system that outfalls south to the Imperial River.	Imperial River	15,000.00	2002	Bonita Springs
Swale/treatment pond system	Consider upgrade and expansion of the minimal conveyance system with storage swales or ponds depending upon available land in the Wagon and Torchfire Trails area.	Imperial River	450,000.00	2002	Bonita Springs
Swales	Ragsdale Street Area addition of shallow roadside swales with outfall to the Imperial River or Oak Creek. The stormwater swales should have check dams to reduce the inflow of pollutants into the receiving surface water system.	Imperial River	640,000.00	2002	Bonita Springs
Swales	Matheson Avenue has poor roadside drainage south of Longfellow Lane that needs to be addressed.	Imperial River	575,000.00	2002	Bonita Springs
Swales	The improvements in Tangelo and Matheson area (Orangewood Subdivision) involve recutting the swales and cleaning the storm sewer system.	Imperial River	100,000.00	2002	Bonita Springs
Swales	An existing canal north of this area could function as an outfall for future stormwater infrastructure for the Rosemary Road area. Roadside swales should be	Imperial River	391,000.00	2002	Bonita Springs

Table 34: Identified Project Needs in Lower Charlotte Harbor

Type Of Improvement	Location/ Extent	Watershed	\$	DATE	Jurisdiction
	included as part of the improvements for water quality.				
Swales/Cross Drains	Construct drainage swales and periodic cross drains in Imperial Harbor area.	Imperial River	75,000.00	2002	Bonita Springs
Water Quality Improvements	3.4 acre facility between Donald Road and SR 78. This will provide 1" of detention for upstream areas that were constructed prior to water quality detention requirements for developments.	Cohn Branch	91,000.00	1992	Lee County
Water Quality Improvements	Littoral Shelf - 20 acres Diversion to Burrow Pit - with 2 control structures In-Line Wet Detention - 70' crest @ 12.5' NGVD	Ten Mile	5,901,718.00	1991	Lee County
Water Quality Improvements	55 acre Detention Facility to improve water quality runoff from existing developed areas north of Pondella Road.	Hancock Creek	1,470,000.00	1992	Lee County
Water Quality Improvements	55 acre facility, including 39 acre water quality detention area near the crossings of the main stream and its tributaries in the vicinity of SR 78 to provide 1 inch detention.	Marsh Point	1,470,000.00	1992	Lee County
Water Quality Improvements	35 acre facility in the vicinity of SR 78 to provide 1" of detention for upstream areas that were constructed prior to water quality detention requirements for developments.	Daughtrey Creek	941,000.00	1992	Lee County
Water Quality Improvements	37 acre facility; Detention basins needed to improve water quality runoff from the existing developed area.	Mullock Creek	993,000.00	1992	Lee County
Water Quality Improvements	Water Quality Off-line Detention Facility 45 acres with Land Purchase	Orange River	1,734,000.00	1992	Lee County
Water Quality Improvements	5 acre facility; A detention area is needed in the vicinity of I-75 to provide 1" of detention for upstream areas that were constructed prior to water quality detention requirements for developments.	Daughtrey Creek - East Branch	117,000.00	1992	Lee County
Water Quality Improvements	3 acre facility; A detention area is suggested in the vicinity of SR 80 which would provide 1" of detention for upstream areas that were constructed prior to water quality detention requirements for developments.	Bedman Creek	76,000.00	1992	Lee County
Weir Installation	60' crest, 4-6' wide by 5' high gates approximately 1,000 feet upstream from SR 78. This will replace an existing privet weir, the gates will provide a much greater drawdown capability before and after a large storm event.	Daughtrey Creek	300,000.00	1992	Lee County
Weir Installation	(with easement) Northwest of Barrett Road 60' Crest with 2- 5'x4' Gates to replace a privately constructed spillway approximately 1/4 mile upstream of Barrett Road, providing a more stable, less erosive condition.	Hancock Creek	210,000.00	1992	Lee County
Weir Installation	Waltzing Water 100' length 4-6'x5' gates (with easement); immediately east of US 41.	Mullock Creek	355,000.00	1992	Lee County
Weir Installation	Downstream of Canal "L"/"L-3" intersection 100' weir with a crest @ elev. 6.0' to be installed which will provide a higher groundwater table in the dry season and improve water quality.	Whiskey Creek	50,000.00	1991	Lee County

In addition to the identified projects, the Lee County Gator Slough Watershed Study recommends the removal of the blockage and caprock west of U.S. 41; removal of the vegetation obstructing the existing canal and weir system; and repair of the zigzag weir to allow the flow of fresh water through a control structure into the canal system for storage and eventual use in the City of Cape Coral irrigation system.

On November 15, 2005, the Southwest Florida Watershed Council (SWFWC) published the Estero Bay Water Quality Improvement Project, prepared by Johnson Engineering. Lee County is in the process of developing a funding strategy to implement the recommended projects.

Recommendations include:

- Ten Mile Canal Pumps– The construction of Ten Mile Canal diverted a large portion of the Hendry Creek Watershed to Mullock Creek. The proposed pumps would re-direct some flow back to Hendry Creek. This will reduce flows in Mullock Creek, allowing more residence time. It will also take advantage of the filtering capabilities of Hendry Creek wetlands that are currently under utilized. Quantifying improvements could be a challenge.
- Briarcliff Filter Marshes A & B. There is vacant land located adjacent to the SWFIA airport south outfall and Briarcliff Canal. This land could be used to construct filter marshes. Existing weirs or pumps could be used to force water into the filter marsh.
- Briarcliff Mine Detention – An existing mine located southwest of Fiddlesticks could be used to detain runoff from SFWIA south outfall and Briarcliff Ditch.
- Alico Rd. / SR 739 Filter Marsh– There is some land located near the future intersection of Alico Road and SR 739. This land could be used for a filter marsh.
- Island Park Road Canal Pumps– Construct pumps in the dead end canals at the end of Island Park Road. This would reduce the dead ends in the canals and remove some runoff from Mullock Creek.
- Island Park Road Pump and Filter Marsh– Construct a filter marsh on the west side of Island Park Road and pump water from Ten Mile Canal through the filter marsh and into Hendry Creek.
- Mullock Creek Filter Marsh A & B– Construct a filter marsh at the outfall of San Carlos Park.
- San Carlos Park Filter Marsh– Construct filter marshes on islands located in San Carlos Park Conveyances.
- San Carlos Park Ditch Blocks– Place ditch blocks in swales within San Carlos Park to detail runoff.
- Estero River N. Restoration / Filter Marsh– Purchase lands to the north of the Estero River and create a filter marsh within a restoration area.
- Estero River Filter Marsh north & south– Construct filter marshes adjacent to the Estero River.
- Spring Creek Filter Marsh– Construct a filter marsh along Spring Creek.
- Bonita Golf Course Park / BMP– Purchase the Bonita Golf Course and create a park with lakes and wetlands to provide treatment.
- San Carlos Estates Filter Marsh– Construct a filter marsh for San Carlos Estates to discharge into.
- Liberty Youth Ranch Storage– pump water into the existing lake on the Liberty Youth Ranch property.
- BSU Filter Marsh– Construct a filter marsh at the south end of the BSU east water treatment plant site.
- Tesone Property flow-way– Modify the existing preserve through Tesone to provide additional water treatment.
- Imperial River Filter Marsh A&B– Construct filter marshes along the Imperial River.
- Harbourage Lake Storage– Pump water from Ten Mile Canal into the Harbourage lakes for treatment.
- Alico Road Mine Storage– Pump water from the Alico Road ditch into the mines located south of Alico Road.
- Forest Filter Marsh Pump Station – Construct a pump station to convey water from the Ten Mile Canal to the Filter Marsh constructed by Lee County.
- Daniels Parkway – Six Mile Cypress Pump – Construct a pump to convey water from the Daniels Road ditch to Six Mile Cypress Slough.

7. Existing Management Actions

Everglades Restoration

The overview of Everglades Restoration is described in Section 3: Programmatic Context. Projects funded through the Everglades Restoration Process in the LCH area include:

- Lakes Park Restoration,
- C-43 Basin Storage Reservoir, and
- Caloosahatchee River Aquifer Storage and Recovery (ASR), Part 2.

These projects are described below. CERP also called for back-pumping Caloosahatchee River water into Lake Okeechobee. Planning for the back-pumping alternative has been put on hold but continues to be shown as a component to be developed after the C-43 Reservoir planning is completed.

Lakes Park Restoration

The project is expected to enhance surface water runoff quality by creating a meandering flowway with shallow littoral zones and removing aquatic and upland exotic vegetation. The littoral zone will be harvested periodically to remove excess nutrients from the system. Exotic vegetation will be removed and replaced with native vegetation on 11 acres of upland.

Additional information can be found at:

http://www.evergladesplan.org/pm/projects/proj_94_lakes_park.cfm.

C-43 Basin Storage Reservoir Part 1

This project is a component of the C-43 Basin Storage Reservoir and will comprise a significant portion of the overall water storage requirement for the C-43 basin. The *Acceler8* C-43 West Storage Reservoir project consists of an above-ground reservoir located along the Caloosahatchee River. Maximum storage capacity is 170,000 acre-feet. Depending on storage needs, water depth will vary from 12-16 feet. The reservoir will be constructed on an 11,000-acre parcel owned by SFWMD in Hendry County, west of LaBelle. Project information can be found at:

http://xlr8.sfwmd.gov/portal/page?_pageid=35,226338&_dad=portal&_schema=PORTAL.

Caloosahatchee River ASR Pilot Study

The Caloosahatchee River ASR pilot project consists of hydrogeologic and engineering evaluations followed by construction and testing of a Class V, Group 7 ASR well and new surface water treatment, conveyance and monitoring systems. The ASR well will be constructed to recharge, store and recover water from the upper Floridan Aquifer System (FAS), a confined aquifer ranging in depths between 700 to 1,200 feet. The ASR system will be designed to provide a capacity to inject and recover approximately 5 million gallons of treated water per day. The ASR system will withdraw on-site surface water through construction of a proposed new inlet/outlet structure, pump and piping. The raw surface water will be treated to meet primary drinking water standards via sedimentation, filtration and ultraviolet disinfection prior to recharge into the FAS. During later recovery, the water will be treated via aeration prior to discharge. This project will be permitted through the Underground Injection Control and

National Pollutant Discharge Elimination System (NPDES) programs. Once constructed, the SFWMD will cycle test the system for period of approximately two years. After cycle testing is complete, a report will be prepared with recommendations for future expansion of the system (if warranted) and integration with the C-43 West Storage Reservoir.

Caloosahatchee River ASR, Part 2

This project is the second part of the C-43 Basin Storage Reservoir and ASR component. This project includes aquifer storage and recovery wells with a total capacity of approximately 220 million gallons per day and associated pre- and post- water quality treatment located in the C-43 Basin in Hendry, Glades, or Lee Counties. The initial design of the wells assumed 44 wells, each with the capacity of 5 million gallons per day with chlorination for pre-treatment and aeration for post-treatment. The level and extent of treatment and number of the aquifer storage and recovery wells may be modified based on findings from a proposed aquifer storage and recovery pilot project (EPA, 1999). The purpose of this project is to capture C-43 Basin runoff and releases from Lake Okeechobee. The wells will be designed for water supply benefits, some flood attenuation, water quality benefits to reduce salinity and nutrient impacts of runoff to the estuary, and to provide environmental water supply deliveries to the Caloosahatchee Estuary. Excess runoff from the C-43 Basin and Lake Okeechobee flood control discharges will be pumped into the C-43 Basin Reservoir. Water from the reservoir will be injected into the aquifer storage and recovery wellfield for long-term (multi-season) storage. Additional project information can be found at:

http://www.evergladesplan.org/pm/projects/proj_05_c43_asr_2.cfm.

Lower Charlotte Harbor, Caloosahatchee and Estero Bay Initiatives

In FY 2004, the SFWMD funded 5 basin initiatives including ones for Lower Charlotte Harbor, Caloosahatchee, and Estero Bay. For FY 2005, the State of Florida provided additional funding for the program. During the 2005 Legislative session, a specific appropriation was approved for Lower Charlotte Harbor for \$450,000. Also, SB 444 was passed providing a source of funding for implementation of priority waterbody SWIM Plans throughout the State. Funding amounts for each waterbody will be included in the SFWMD's final budget each year.

Descriptions of the SFWMD FY04 and FY05 Lower West Coast projects, including initiative-funded projects are found in Appendix B: Lower West Coast Project Descriptions.

County Capital Improvements Programs (CIP)

Lee County

As discussed in Section 3: Programmatic Context, Lee County has developed the Lee County Master Mitigation Plan. The plan catalogs potential restoration projects, identifies capital projects that will require mitigation, and then programs the restoration projects that will result in the most improvement in the capital projects area for advanced mitigation. The first of these projects have been programmed into the CIP as depicted in Table 35 below.

In 1998, citizens of Lee County voted in favor of a non-binding resolution to fund acquisition, restoration and management of environmentally sensitive land. The resulting program - Conservation 2020 - has successfully acquired sensitive land for environmental conservation, and the Board of County Commissioners has approved continued funding of the program. Funding for the Conservation 2020 program is also reflected in Table 35 below.

Table 35: Lee County Master Mitigation Plan and Conservation 2020 Water Quality Capital Projects

Project	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	Year 6-10	Total
Alico Road Drainage Improvements	\$498,312							\$498,312
Babcock Land Acquisition	\$15,000,000	\$9,415,353	\$10,215,658	\$11,083,989	\$12,026,129	\$13,048,349	\$40,000	\$70,829,478
Blind Pass Ecozone (partnership with City of Sanibel)	\$2,408,801	\$475,000	\$20,876	\$21,794			\$786,250	\$3,712,721
Briarcliff Ditch Filter Marsh and Weirs	\$592,700							\$592,700
Boca Grande Drainage (Storm Interceptor BMP)	\$286,689	\$202,000	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	\$1,488,689
Caloosahatchee River Tributaries, remove exotics	\$220,000	\$220,000	\$220,000					\$660,000
Conservation 2020 Land Acquisition	\$33,537,729	\$14,123,030	\$15,323,488	\$16,625,984	\$18,039,193	\$19,572,524		\$117,221,948
Eagle Ridge/Legends Interconnect, stormwater			\$450,000					\$450,000
Gator Slough Channel improvements	\$3,456,148							\$3,456,148
Island Park Filter Marsh	\$268,000	\$2,000,000						\$2,268,000
Lakes Park CERP Project	\$2,151,886							\$2,151,886
Neighborhood Improvement Program	\$350,000	\$350,000	\$350,000	\$350,000	\$350,000			\$1,750,000
Orange River Outfall		\$250,000	\$250,000					\$500,000
Powell Creek Restoration, remove pollutant laden silt/filter marsh	\$475,000	\$300,000						\$775,000
Spanish Creek Restoration (Flowway waiting on 4-corners)	\$433,578							\$433,578
Stroud Creek Restoration	\$300,000							\$300,000
Sunniland/Nine Mile Run Drainage Study (Buckingham)			\$350,000					\$350,000
Ten Mile Filter Marsh	\$3,185,862		\$500,000					\$3,685,862
Three Oaks Parkway Filter Marsh	\$994,954	\$3,000,000	\$1,800,000					\$5,794,954
Water Quality Mitigation					\$1,000,000	\$1,000,000	\$5,000,000	\$7,000,000
TOTAL	\$64,159,659	\$30,335,383	\$29,680,022	\$28,281,767	\$31,615,322	\$33,820,873	\$6,026,250	\$223,919,276

Additional CIP projects include roadway improvements. The following road widenings are planned:

- Burnt Store 4-laning
- Business 41 (SR 78-US 41) 4-laning
- Cypress Lake Drive Widening
- Gladiolus Widening
- Gunnery Road (SR 82 to Lee Blvd) Widening
- I-75 Widening
- Imperial Street

- Lee Boulevard (Homestead to Leeland Heights)
- Ortiz Avenue (SR 80 to SR 82) 4-landing
- Pondella Road Widening
- Six Mile Cypress parkway 4-laning
- Three Oaks Parkway Widening.

County road projects require water quality treatment systems to be installed as per SFWMD permit requirements. Any treatment over and above that which is required by rule will be handled on a case-by-case basis and may be used to improve water quality of runoff going to verified impaired waters.

Hendry County

Hendry County is investing \$600,000 toward the acquisition (and some development) of two new parks. The County-Wide Surface Water Master Plan is near completion, with implementation of the master plan at Airport Sears and Mid-County for an estimated \$4,235,000 scheduled for completion in 2006. A drainage and water quality improvement project is scheduled for the Four Corners area. Expansion of the sanitary sewer system is funded for the Port LaBelle and Banyan Village areas and should be completed by 2008.

Table 36: Hendry County CIP Projects

Project	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	Year 6-10	Total
Clewiston East Park	\$300,000							\$300,000
Fort Denaud Park	\$300,000							\$300,000
County Wide Surface Water Mgmt. Plan	\$300,000							\$300,000
Airport Sears	\$1,140,000	\$1,140,000						\$2,280,000
Four Corners Drainage Improvement-Phase II	\$1,500,000							\$1,500,000
Port LaBelle	\$200,000	\$200,000	\$200,000	\$200,000				\$800,000
Banyan Village	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000				\$4,000,000
TOTAL	\$4,740,000	\$2,340,000	\$1,200,000	\$1,200,000	\$0	\$0	\$0	\$9,480,000

Additional CIP projects include roadway improvements to CR 832, CR 835, and Bonneville Road which typically include stormwater improvements.

Charlotte County

The following table includes only those projects that are in the Lower Charlotte Harbor study area that are identified in the Charlotte County CIP. Central sewer upgrades within unincorporated Charlotte County are outside the study area.

Table 37: Charlotte County CIP Projects

Project	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	Year 6-10	Total
Burnt Store AWWTP Upgrades/Reuse	\$2,560,000							\$2,560,000
Charlotte Harbor Flatwoods restoration/interpretation	\$127,000							\$127,000
County-wide Environmental Land Acquisition	\$248,000	\$571,000	\$713,000	\$748,000	\$784,000			\$3,064,000
County-wide Park Expansion Funds		\$300,000	\$100,000	\$100,000	\$100,000			\$600,000
Horse Arena, including stormwater	\$200,000							\$200,000
TOTAL	\$3,135,000	\$871,000	\$813,000	\$848,000	\$884,000	\$0	\$0	\$6,551,000

In addition, the South Gulf Cove sewer expansion is funded and required for development of the vacant lots. Roadway improvements which may include stormwater upgrades include Aquí Esta (US 41 to Bal Harbor) widening.

Glades County

Glades County reports no capital improvements funding that affects surface water improvement or management issues.

City Capital Improvements Programs (CIP)

City of Bonita Springs

The City of Bonita Springs CIP projects are presented below.

Table 38: City of Bonita Springs CIP Projects

Project	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	Year 6-10	Total
Canal/Drainage Improvements	\$475,000	\$150,000	\$150,000	\$150,000	\$150,000			\$1,075,000
Southeast Bonita Drainage	\$150,000							\$150,000
Nevada St. Stormwater Retrofit Phase 3		\$170,000						\$170,000
Imperial Bonita Estates	\$209,000	\$85,000						\$294,000
Riverside Depot & Deport Park Water Quality Improvements		\$677,000	\$992,000	\$851,000	\$1,497,000			\$3,997,000
TOTAL	\$834,000	\$1,082,000	\$1,142,000	\$1,001,000	\$1,647,000	\$0	\$0	\$5,686,000

Road improvements planned include:

- Old US 41 Widening (Rosemary to US 41)
- East Terry Street (Old US 41 to Imperial) Improvements
- Imperial Street Widening
- West Terry Street Improvements

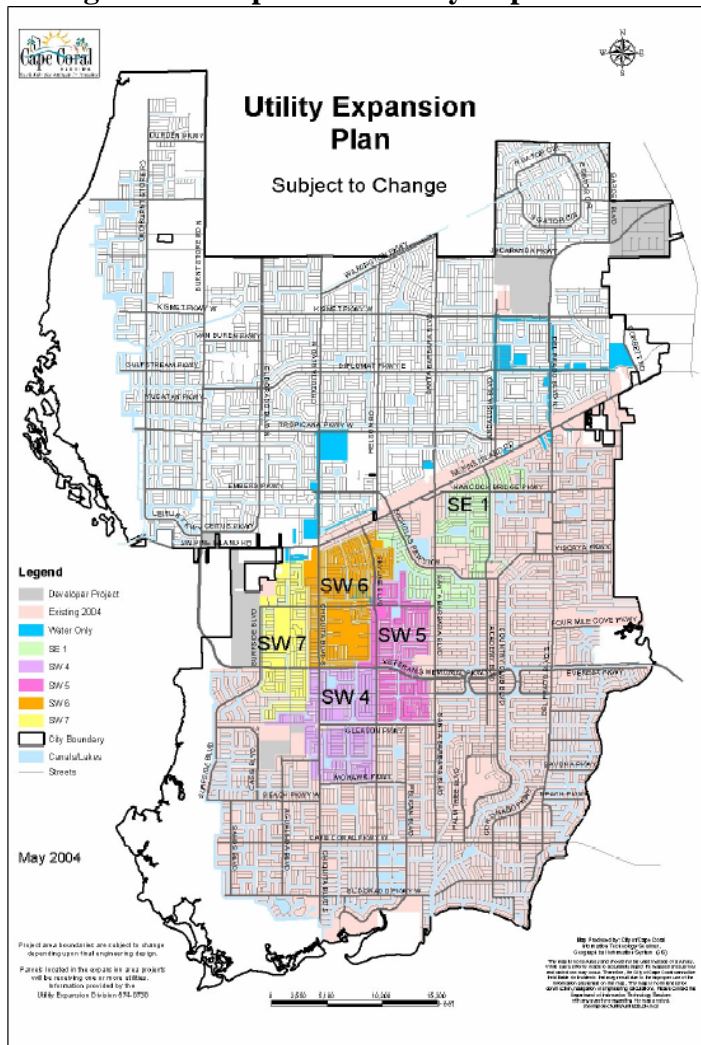
City of Cape Coral

The City of Cape Coral’s CIP includes an on-going storm pipe replacement and upgrade program. Between FY 2002/03 and 2004/05, \$1,975,437 has been budgeted toward this program.

Table 39: City of Cape Coral CIP Projects

Project	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	Total
Storm Pipe Replacement and Upgrade Program	\$500,000						\$500,000
Wastewater Treatment Plan Expansions		\$38,600,000	\$50,000,000	\$35,000,000	\$15,000,000	\$15,000,000	\$123,600,000
Central Sewer Expan.		\$46,000,000	\$32,200,000	\$36,400,000	\$40,000,000	\$38,800,000	\$193,000,000
Total	\$500,000	\$84,600,000	\$82,200,000	\$71,400,000	\$55,000,000	\$53,800,000	\$227,100,000

Figure 51: Cape Coral Utility Expansion



In addition, the City of Cape Coral is undergoing an accelerated central sewer expansion that is being funded through property assessments. (See Figure 51.) Roadway improvements which may include stormwater improvements include Del Prado Widening, Cape Coral Parkway 6-laning, and SE 47th Terrace Improvements.

City of Clewiston

The City of Clewiston does not maintain a CIP. However, the City has a sewer expansion project near Lake Okeechobee currently underway. The City provides sanitary sewer service to nearly its entire jurisdiction with the exception of an area called “The Ridge.” The expansion project will increase the capacity of the sewage treatment plant.

City of Fort Myers

Appendix 7 of the City of Fort Myers Evaluation and Appraisal Report includes several drainage and water quality projects.

Table 40: City of Fort Myers CIP Drainage and Water Quality Projects

Project Description	04/05	05/06	06/07	08/09	09/10	Year 6-10	10 Year TOTAL
Vacuum Trash Collector						70,000	70,000
Sidewalk Sweeper						80,000	80,000
Drainage Improvement Study	9,150						9,150
Drainage Phase III, IV and Downtown	526,792						526,792
Drainage Phase III, IV and Downtown	444,000	720,000	480,773				1,644,773
Ford St. Canal Drainage Imp.			475,334	1,467,945			1,943,279
Palmetto Canal Drainage Imp.			488,029	1,507,149			1,995,178
Manuals Branch Drainage Imp			290,074	895,818			1,185,892
Carrell Canal Drainage Imp.		1,045,866	3,229,881				4,275,747
Evans Ave Ditch						677,653	677,653
Citywide Trunk System Improvements						900,000	900,000
Billy's Creek Trunk System						593,000	593,000
Belmont & Pearl Sts New Detention Area			20,000				20,000
Retention Lake at Marsh Ave		64,000	136,000				200,000
Storm Water Master Plan	292,864						292,864
South Ditch Piping (Matthew Dr.)						278,000	278,000
Drainage Pipe Rehabilitation						2,000,000	2,000,000
McGregor Blvd Line Drainage Rehab						650,000	650,000
Street Sweeper		140,000		150,000		300,000	590,000
Gradall		270,000				300,000	570,000
Dump Trucks						290,000	290,000
Veronica Shoemaker Blvd. Drainage						60,000	60,000
Palm Ave. Drainage						60,000	60,000
Vactor Truck			180,000			180,000	360,000
Campbell Acres Drainage						200,000	200,000
Generator for Pump Station # 19						60,000	60,000
TOTAL	1,677,098	2,239,866	5,300,091	4,020,912	0	7,798,653	21,036,620

The City of Fort Myers provides central sewer service to the majority of City residents.

Town of Fort Myers Beach

The Town of Fort Myers Beach identified 11 drainage projects that are now in various stages of development or have been completed. They are Santos Drive, Primo Drive, Lanark & Lauder, Bayland Area, Matanzas Street, Miramar Drive, Pearl Street, St. Peter’s Drive, Andre Mar Drive, Gulfview/Bayview/Strandview Area and Mid-Island Drive. The Town plans to have at least 5 more streets ready for construction in FY 05/06, including Laguna Shores, Sabal, Coconut, Pearl and Miramar. These projects include adding swales to all the side streets and a grit chamber system to keep the sand and sediment from washing into Estero Bay. They also have committed funds each year for cleaning these structures out.

The Town also budgeted for the beginning of a canal improvement initiative in FY 04/05 that includes dredging. The Town allocated \$700,000 toward these projects in FY2005.

The Town has also budgeted \$300,000 in grant money for the implementation of the Matanzas Harbor Action Plan which will provide improved sewage disposal for anchored vessels. The Town expects the Harbor improvements to be completed Fall 2005.

At the direction of the Council, Town staff has been pursuing the possibility of the Town obtaining title to, or a conservation easement upon, real property located at or near an entrance to the Matanzas Pass Preserve at Donora Street as well as other areas. It is envisioned that if suitable property can be obtained, it could provide an additional entrance and parking area for the Preserve.

Table 41: Town of Fort Myers Beach CIP Projects

Project	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	Year 6-10	Total
Drainage/Canal Projects	\$700,000							\$700,000
Matanzas Harbor Plan	\$300,000		Annual CIP					\$300,000
Side Street Stormwater		\$500,000	\$500,000	\$500,000	\$500,000	\$500,000		\$2,500,000
TOTAL	\$1,000,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$0	\$3,500,000

City of LaBelle

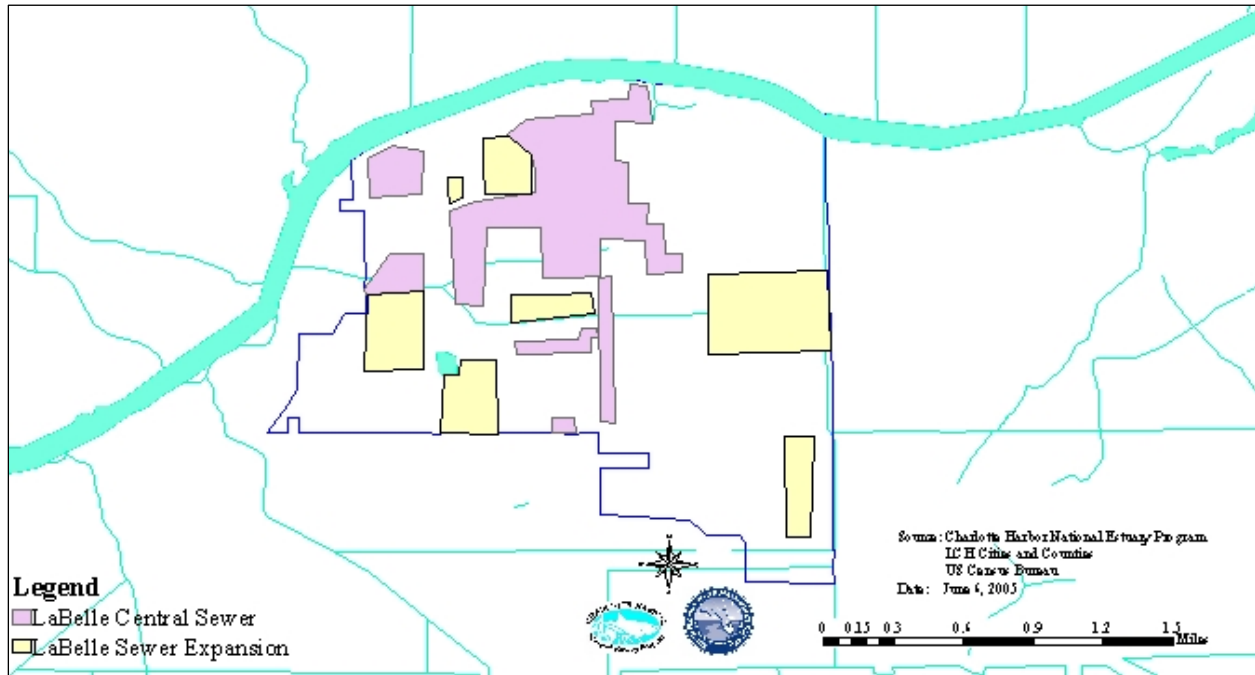
The City of LaBelle has funded expansion of its central sewer service area. Street reconstruction and paving is part of the central sewer expansion project. No additional environmental land/parkland has been funded. Road projects are geared to resurfacing only. The City is pursuing stormwater detention areas for its subbasins with the assistance of SFWMD as discussed in Section 6: Existing Hydrology and Hydraulics Plans.

Table 42: City of LaBelle CIP Projects

Project	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	Year 6-10	Total
Wastewater Collection System Phase II	\$3,119,670	\$100,000						\$3,219,670

The map below was rendered from hand-drawn maps provided by the City of LaBelle. The image illustrates that the central sewer service area will approximately double from pre-2004 service area coverage in LaBelle.

Figure 52: City of LaBelle Sewer Expansion



City of Moore Haven

The City of Moore Haven reports that they do not maintain a CIP.

City of Sanibel

The City of Sanibel CIP water quality projects are depicted below.

Table 43: City of Sanibel CIP Water Quality Projects

Project	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	Year 6-10	Total
Culvert between Dinkins & Clam Bayous	\$511,225							\$511,225
Reuse Storage		\$500,000	\$500,000					\$1,000,000
Sanibel River Clearing	\$60,000	\$20,000	\$70,000	\$70,000	\$60,000			\$280,000
Sewer System Expansion Projects	\$195,000	\$590,000						\$785,000
TOTAL	\$766,225	\$1,110,000	\$570,000	\$70,000	\$60,000	\$0	\$0	\$2,576,225

2004 Restoration Projects

Each year, land acquisition and restoration projects are tracked by the CHNEP as a requirement of Federal Government Performance and Review Act (GPRA) as implemented by the EPA. Annually, a database is prepared that details the accomplishments within the CHNEP study area, including Lower Charlotte Harbor, Tidal Caloosahatchee, and Estero Bay basins. As an example, the following table details the restoration projects undertaken during 2004. In addition, nearly 450 acres were acquired at a cost of \$6,400,000 in 2004 and within the CHNEP area of LCH.

Table 44: CHNEP Lower Charlotte Harbor 2004 Restoration Projects

project name	project description	partners	acreage	linear miles	project cost
Clam Bayou/Dinkins Bayou Restoration	Reconnect channel under Sanibel-Captiva Road, remove exotic species.	City Of Sanibel, SFWMD	340.00		\$325,000.00
Caloosahatchee Creeks Preserve	Exotic plant removal and plant hammock species	Lee County, SFWMD	65.00		\$108,790.00
Lee County Flow way Exotics Removal	removal of exotic invasive plants from creeks and flow ways	SFWMD, Lee County		55.00	\$2,762,000.00
Sanibel Exotics Removal	Removal of Australian pines	FWS, City of Sanibel, FEMA	700.00		\$26,000.00
Daughtrey's Creek Exotic Removal	Restoration of flow way through exotics removal	Lee County		2.00	\$162,014.00
Popash Creek Exotics Removal	Restoration of flow way through exotics removal	Lee County		1.00	\$109,500.00
San Carlos Bay-Bunch Beach Preserve	Remove invasive exotic plants	Lee County, FDEP		1.00	\$44,990.00
Imperial Marsh Preserve	Removal of invasive exotic Brazilian pepper	Lee County, Department of Corrections	5.00		\$0.00
San Carlos Bay-Bunch Beach Preserve	Remove invasive exotic plants	Lee County, FWS	103.00		\$25,000.00
Big Hickory Island Preserve	exotic plant removal	Lee County, FDEP	7.00		\$49,500.00
Deep Lagoon Preserve	Removal of exotic plants	Lee County, Taylor Woodrow	10.00		\$10,000.00
J.N."Ding" Darling Removal	Removal of invasive exotic Brazilian pepper	Lee County Tourist Development Council (TDC), USFWS	20.00		\$295,000.00
Caloosahatchee Regional Park Wetland Improvement Program	Removing exotics and replanting to restore wildlife habitat	Lee County, USDA	60.00		\$19,998.00
Southwest Florida Regional Airport	Remove exotic invasive species, restore hydrology-net gain of wetlands	Lee County Port Authority	540.00		\$1,080,000.00
Gator Slough Watershed	Reduce stormwater runoff to Matlacha Pass, improve surface water quality	Lee County, FDEP, City of Cape Coral	35,200.00		\$2,460,000.00
Estero Bay Watershed Initiative	water quality improvements to the riparian area of Imperial River	SFWMD, City of Bonita Springs		2.00	\$172,232.00

Table 44: CHNEP Lower Charlotte Harbor 2004 Restoration Projects

project name	project description	partners	acreage	linear miles	project cost
Caloosahatchee Creek Preserve restoration	Restoration of spoil areas to native habitat	SFWMD	20.00		\$185,000.00
Lakes Park Master Plan	Exotic removal, planting of native vegetation	Lee County, Lakes Park Enrichment, Inc.	121.00		\$451,497.00
City of Sanibel	Eradication of invasive exotic plants	City of Sanibel	100.00		\$300,000.00
Alligator Creek Restoration Project 16	Remove exotic vegetation and restore hydrology	FDEP, SWFWMD, COE	350.00		\$306,381.00
Charlotte Harbor Buffer Preserve	Removal of Australian pine, melaluca, Brazilian pepper	FDEP	420.00		\$520,000.00
Slough and Marsh Restoration	Remove invasive exotic plants	SFWMD, East County Water Control District		9.00	\$455,000.00
Cape Coral Brazilian Pepper Eradication	Eradication of Brazilian pepper trees	City of Cape Coral	50.00		\$136,718.00
Sanibel City Beach Parks	Removal of invasive Brazilian pepper	Lee County TDC, City of Sanibel	25.00		\$330,000.00
South Yucca Pens & South Matlacha Pass & Spreader Waterway	Eradication of Brazilian pepper through spraying and hand removal	FDEP, SFWMD	25.00	25.00	\$100,000.00
Sanibel City Beach Parks Dune Plantings	Restoration of beach dunes with native plants	Lee County TDC, City of Sanibel	10.00		\$185,000.00
			38,171	95	\$10,100,140

The CHNEP CCMP calls for a 25% increase in land under stewardship over 1998 levels. This objective was accomplished NEP-wide by 2000 but also in the LCH area. In the 6 fiscal years since 1998, over 40,000 acres have been placed under stewardship in the Charlotte Harbor, Tidal Caloosahatchee, and Estero basins.

Table 45: Lands in Stewardship

	Base (1998)	1999	2000	2001	2002	2003	2004	Total	Percent over Base
Charlotte Harbor	41,796	7,364	13,318	519	52	152	258	63,459	52%
Pine Island Sound	12,196	0	1,909	522	247	473	16	15,363	26%
Caloosahatchee	17,662	207	52	2,466	351	1,821	1	22,560	28%
Estero	22,502	122	3,032	1,491	2,429	3,887	167	33,630	49%
Total	94,156	7,693	18,312	4,998	3,079	6,332	442	135,012	43%
Cumulative	94,156	101,849	120,161	125,159	128,238	134,570	135,012		
% over 1998 base		8%	28%	33%	36%	43%	43%		

The following table provides the individual land acquisitions for the LCH area for 2004.

Table 46: 2004 Lower Charlotte Harbor Acquisitions for Stewardship					
project name	project description	partners	acreage	linear miles	cost
Critical CREW/Imperial Flow way	Acquisition to preserve historic sheet flow through the Corkscrew Regional Ecosystem	SFWMD	20.58		\$116,096.08
Charlotte Harbor Flatwoods	Acquisition to preserve and protect natural uplands communities	FDEP	20.15		\$40,400.00
Cayo Costa/North Captiva	Acquisition to preserve barrier island ecosystem	FDEP	0.92		\$146,000.00
Newton Beach Park	Acquisition to preserve beach and dune, loggerhead turtle nesting habitat	Trust for Public Land, Town of Fort Myers Beach, Florida Community Trust, Lee County	1.00		\$2,700,000.00
Addition to Caloosahatchee Creeks Preserve #225	Acquisition for protection	Lee County Conservation 2020	1.21		\$13,500.00
Six Mile Cypress Preserve	Extension of a cypress arm flow-way corridor which also serves as a corridor for wildlife	Lee County Department of Parks and Recreation	2.00		\$15.20
Pineland Site Complex	Protection of sensitive habitats on Pine Island, and preserving natural land links to Charlotte Harbor Buffer State park	FDEP	7.19		\$250,000.00
Cayo Costa Florida Forever Project	Acquisition of property for preservation	FDEP	9.41		\$1,927,200.00
Critical CREW-Evans	Acquisition for preservation and restoration of historic flow way	SFWMD	10.00		\$43,905.00
Critical CREW-Baumert	Acquisition to preserve and restore historic flow way	SFWMD	5.00		\$75,974.25
Critical CREW project	Acquisition to protect and restore historic flow way	SFWMD	4.50		\$106,000.00
Critical Crew	Acquisition to maintain and restore historic flow way, 2 parcels, 2.5 and 5 acres	SFWMD	7.50		\$294,717.00
Cape Haze/Charlotte Harbor Florida Forever	Acquisition of net 258 acres through land exchange	Florida Board of Trustees, SWFWMD	258.00		\$0.00
Critical CREW - Holton parcel	Acquisition for habitat preservation and preservation of sheet flow	SFWMD	10.00		\$185,735.00
Critical CREW Zimmerman Acquisition	Acquisition of land for permanent preservation, and preserve sheet flow through Corkscrew swamp	Florida Department of Forestry	0.98		\$268,750.00
Babcock-Webb WMA-Yucca Pens	Acquisition to preserve and protect native flora and fauna	FFWCC	86.75		\$204,600.00
Total			445.19	0	\$6,372,893

8. Water Resource Management Issues of Concern

Water resource management issues of concern include needed research and restoration.

Research

The following research issues of concern have been identified through the reconnaissance report process that includes input from the Calusa Restoration Coordination Team (CRCT).

Assimilative Capacities within each Basin

Since impaired waters have been identified in basins in the LCH area, the next step is identifying the assimilative capacities in conjunction with adopting TMDLs and preparing B-MAPs. According to FDEP, because a TMDL represents the assimilative capacity of a surface water body to withstand pollutants, it must identify how many pounds of specific pollutants can be “discharged” while still allowing the water body to meet its designated uses. The reasonable and equitable allocation of the pollutant load reductions required to meet the TMDL is part of its implementation phase. FDEP is working to establish TMDLs and preliminary allocations with strategies to reduce pollutant loads through the development of a local Basin Management Action Plan for each impaired waterbody.

Fill data gaps for TMDLs

Several waterbodies had insufficient data to determine whether or not they are impaired. These waterbodies are illustrated below in Figure 53. Most data needs (Table 47) within the SFWMD jurisdictional boundaries are associated with parks (Lakes Park, Lynn Hall Park, Lovers Key State Park, and Bowditch Park) and other public land (Sanibel Causeway, Gulf of Mexico, and Hell Peckney Bay). FDEP has identified a need to obtain data for any water body listed on the master lists as categories 3a, 3d, 3c, and 3b prioritized in that order (See Figure 33.) FDEP is working to resolve this data gap through its TMDL program. For additional information about the FDEP TMDL program see: www.dep.state.fl.us/water/tmdl/index.htm.

Figure 53: Water Quality Data Needs for Impaired Waters Rule

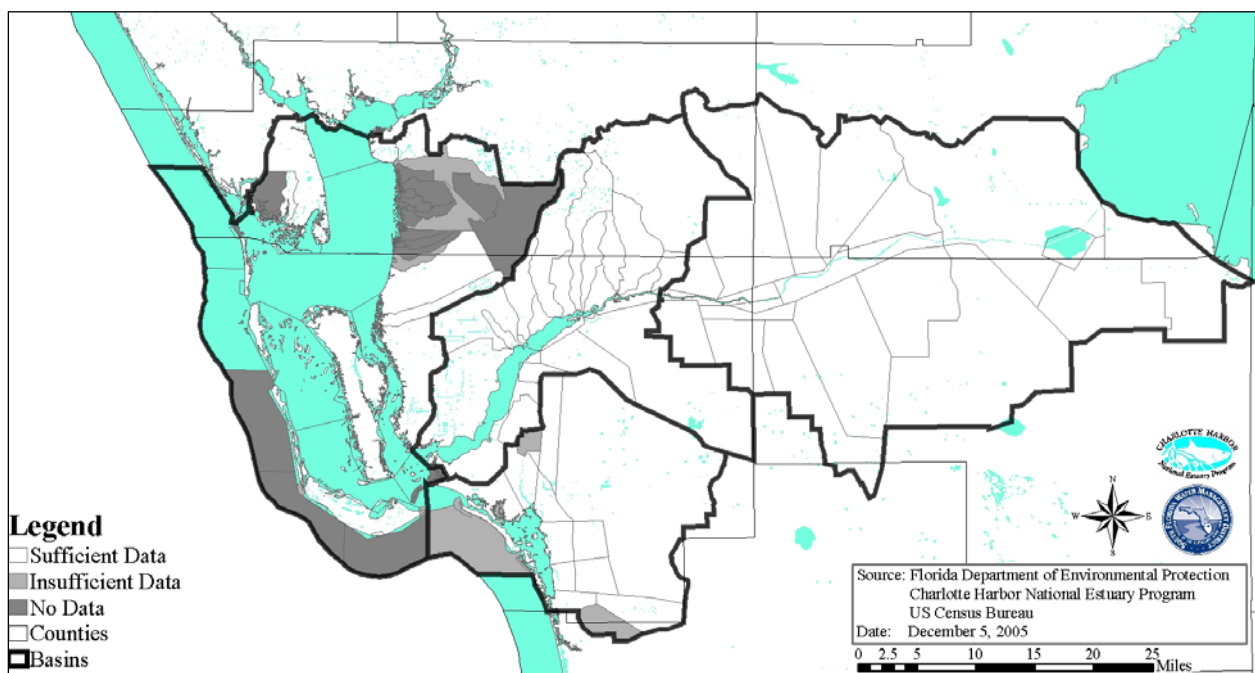


Table 47: Data Needs to Determine Water Quality Impairments

WBID	District	Plan unit	Group	Basin	Assessment
8057	SW	Pine Island	2	PINE ISLAND GULF 2	3a
8058	SW	Pine Island	2	PINE ISLAND GULF 3	3a
8059	SW	Pine Island	2	PINE ISLAND GULF 4	3a
3240O	SO	Pine Island	2	PUNTA RASA COVE	3a
2065HA	SO	Pine Island	2	SANIBEL CAUSEWAY	3a
8060A	SO	Estero Bay	1	BOWDITCH PARK	3a
8060	SO	Estero Bay	1	Estero Bay Gulf	3a
3258J	SO	Estero Bay	1	HELL PECKNEY BAY	3a
8060C	SO	Estero Bay	1	Lovers Key State Park	3a
8060B	SO	Estero Bay	1	LYNN HALL PARK	3a
3258F	SO	Estero Bay	1	OAK CREEK	3a
3258X	SO	Estero Bay	1	THE LAKES PARK	3a
2074A	SW	Charlotte Harbor Proper	2	ALLIGATOR CREEK	3a
2081	SW	Charlotte Harbor Proper	2	ALLIGATOR CREEK	3a
2074	SW	Charlotte Harbor Proper	2	ALLIGATOR CREEK	3b
2094	SW	Charlotte Harbor Proper	2	BEAR BRANCH	3a
2089	SW	Charlotte Harbor Proper	2	BOGESS HOLE OUTFLOW	3a
2080	SW	Charlotte Harbor Proper	2	CATFISH CREEK BAYOU	3a
2077	SW	Charlotte Harbor Proper	2	DIRECT RUNOFF TO BAY	3a
2083	SW	Charlotte Harbor Proper	2	DIRECT RUNOFF TO BAY	3a
2085	SW	Charlotte Harbor Proper	2	DIRECT RUNOFF TO BAY	3a
2088	SW	Charlotte Harbor Proper	2	DIRECT RUNOFF TO BAY	3a
2090	SW	Charlotte Harbor Proper	2	DIRECT RUNOFF TO BAY	3a
2091	SW	Charlotte Harbor Proper	2	DIRECT RUNOFF TO BAY	3a
2092A	SW	Charlotte Harbor Proper	2	DIRECT RUNOFF TO BAY	3a
2093	SW	Charlotte Harbor Proper	2	DIRECT RUNOFF TO BAY	3a
3240T	SO	Charlotte Harbor Proper	2	GILCHREST DRAIN	3a
2093A	SW	Charlotte Harbor Proper	2	HOG BRANCH	3a
2084	SW	Charlotte Harbor Proper	2	MOUND CREEK	3a
2082A	SW	Charlotte Harbor Proper	2	PIRATE CANAL	3b
2086	SW	Charlotte Harbor Proper	2	WINEGOURD CREEK	3a
2082B	SW	Charlotte Harbor Proper	2	YUCCA PEN CREEK	3b

Stormwater Infrastructure Mapping

Lee County, Charlotte County, Cape Coral, and Bonita Springs have prepared GIS maps of outfall locations for their NPDES permits. The Town of Fort Myers Beach has begun mapping them but the work is not completed yet. Glades and Hendry Counties and their cities have not applied for NPDES permits yet and their outfalls mapping is a need. The City of Fort Myers reports the mapping of outfalls to be a need. The City of Sanibel has two outfalls that are in need of mapping.

Infrastructure such as catch basins and piping has been mapped in only a few places. Such information is available for Northwest Lee County and the City of Cape Coral. Otherwise, a comprehensive inventory and map of catch basins and piping are needed.

Stormwater Master Plans

The Cities of Clewiston, Moore Haven, and the Town of Fort Myers Beach could benefit from the development of detailed stormwater master plans, focusing on opportunities to address water quality issues. Master plans other than those for Southwest Lee County, Bonita Springs, Six-Mile Cypress, LaBelle, 4-Corners, ECWCD, and Northwest Lee Counties are now over 15 years old and could be updated, especially to address water quality improvement techniques.

Estuarine Mixing Model

As the SWFFS is developed, mixing models to address the LCH area are planned.

Lake Okeechobee Sediments

The effects of Lake Okeechobee discharges to the Caloosahatchee River need to be evaluated for specific impacts to seagrasses and biological resources. Recently, due in part to the active 2004 hurricane season, the current management scheme (Water Supply/Environmental) has been undergoing evaluation by the SFWMD and Corps of Engineers to determine whether alternate levels of water in the Lake may be appropriate. Additionally, the Lake Okeechobee/Estuary Restoration (LOER) program has identified that outfall structures from the lake will be changed in order to reduce the sediment load going to the C-43 canal.

Restoration

Area-wide Restoration Needs

The Lee County Master Mitigation Plan, Draft Charlotte Harbor NEP Restoration Plan and the Southwest Florida Regional Restoration Coordination Team (SWF RRCT) Restoration Plan are all coordinated and tracked together. The projects for the LCH area consist of those used for the Lee County Master Mitigation Plan because Glades and Hendry County projects have not been inventoried to date. These projects are estimated to cost about \$1 billion. This includes acquisition of 142,880 acres of land needed to restore hydrology and water quality. It also includes culvert replacement at certain roadways and restoration of 108,307 acres. These projects are listed in Table 48 below.

Table 48: Lee County Master Mitigation Plan Water Quality Projects

PROJECT	BASIN	Habitat	Water Quantity	Water Quality	Unfunded Remainder	Needed Acq Acreage	Needed Restore Acreage
Able Canal	Tidal Caloosahatchee	Yes	Yes	Yes	\$2,500,000.00	200	500
Alliance of Casa La Linda	Tidal Caloosahatchee	Yes	Yes	Yes	\$2,500,000.00	100	100
Babcock Ranch	Tidal Caloosahatchee	Yes	No	Yes	\$475,000,000.00	91600	10000
Bonita Springs Utilities	Estero	Yes	Yes	Yes	\$1,920,000.00	320	320
City Golf Course Filter Marsh	Tidal Caloosahatchee	No	No	Yes	\$2,000,000.00	0	10
County-line Unnamed Creek	Tidal Caloosahatchee	Yes	Yes	Yes	\$1,000,000.00	60	60
East Estero Bay Buffer	Estero	Yes	Yes	Yes	\$5,120,000.00	0	5120
Estero River North	Estero	Yes	Yes	Yes	\$5,324,000.00	484	484
FPL North Transmission Line Filter Marsh	Tidal Caloosahatchee	No	No	Yes	\$2,000,000.00	60	60
Hancock Creek Riverine Corridor	Tidal Caloosahatchee	Yes	Yes	Yes	\$8,400,000.00	640	1000
Harnes Marsh Expansion	Tidal Caloosahatchee	No	Yes	Yes	\$5,000,000.00	320	320

Table 48: Lee County Master Mitigation Plan Water Quality Projects

PROJECT	BASIN	Habitat	Water Quantity	Water Quality	Unfunded Remainder	Needed Acq Acreage	Needed Restore Acreage
Hickey Creek Canal	Tidal Caloosahatchee	Yes	Yes	Yes	\$0.00	0	0
Hickey Creek Headwaters	Tidal Caloosahatchee	Yes	Yes	Yes	\$9,000,000.00	700	700
Island Park Road/Hendry Creek Filter Marsh	Estero	Yes	Yes	Yes	\$693,000.00	63	63
John Hancock Mutual Life Insurance Parcel	Pine Island Sound	Yes	Yes	Yes	\$1,000,000.00	110	110
Lakes Park CERP Expansion	Estero	Yes	Yes	Yes	\$500,000.00	100	100
Lakes Park-Hendry Creek Connector	Estero	Yes	Yes	Yes	\$186,000.00	31	31
Little Estero Island Critical Wildlife Area	Estero	Yes	No	Yes	\$0.00	1	40
Manual's Branch Shoreline Planting	Tidal Caloosahatchee	Yes	No	Yes	\$500,000.00	0	10
Metro and Alico Junction Filter Marsh	Estero	No	No	Yes	\$420,000.00	65	65
Mullock Creek Preserve	Estero	Yes	Yes	Yes	\$250,000.00	0	250
North Estero Bay Buffer	Estero	Yes	Yes	Yes	\$10,000,000.00	0	10000
North Side of Section 25 in T47R25.	Estero	No	No	Yes	\$3,840,000.00	320	320
Old Bridge Point	Tidal Caloosahatchee	Yes	No	Yes	\$2,050,000.00	0	45
Owl Creek	Tidal Caloosahatchee	Yes	Yes	Yes	\$3,500,000.00	600	600
SFWMD 4-Corners Property	Tidal Caloosahatchee	Yes	Yes	Yes	\$3,000,000.00	0	500
Southwest Unacquired Yucca Pens	Charlotte Harbor	Yes	Yes	Yes	\$28,600,000.00	2600	2600
Spring Creek Flow-way	Estero	Yes	Yes	Yes	\$3,000,000.00	0	2000
State Botanical Site	Pine Island Sound	Yes	Yes	Yes	\$400,000.00	0	400
Tesone Property	Estero	No	Yes	Yes	\$150,000.00	0	30
Thompson Cutoff Northeast	Tidal Caloosahatchee	Yes	Yes	Yes	\$513,000.00	103	103
Trout Creek/Strickler Gulley Corridor	Tidal Caloosahatchee	Yes	Yes	Yes	\$3,500,000.00	250	300
Yucca Pens (Charlotte Harbor Flatwoods)	Charlotte Harbor	Yes	Yes	Yes	\$0.00	0	0
Zemel Grade-Lee	Tidal Caloosahatchee	Yes	Yes	Yes	\$2,254,000.00	114	114

CHNEP Identified Restoration Needs

In 2005, the Charlotte Harbor National Estuary Program (CHNEP) conducted a survey of its members to prioritize restoration activities. The following are the water quality (WQ) related activities which received the greatest favorable responses.

Table 49: CHNEP Identified Water Quality Restoration Needs

Question	Total
Install or retrofit agricultural Best Management Practices (BMPs) to maintain or improve water quality and flows associated with citrus, cattle, vegetable, and container grown plant operations.	34
Reduce non-point source pollutants associated with stormwater runoff.	30
Install or retrofit urban Best Management Practices (BMPs) to maintain or improve water quality and flows in residential, commercial, and industrial areas.	30
Install or retrofit mining Best Management Practices (BMPs) to maintain or improve water quality and flows for phosphate mines and sand/rock mines.	25
Encourage, expand, and develop incentives for the use of reclaimed water.	20
Provide central sanitary sewers or other alternative technology to residential areas (parcels of land one acre or less) and all commercial and industrial development within 900 feet of waters (canals, streams, etc)	20
Install filtration marshes Lake Hancock, Buffer zone around Lake Hancock, Remove Lake Hancock muck	18
Install filter marshes to improve water quality.	17
Reduce contaminants from marina and dock operations.	12

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Glossary

Acronym/Abbreviation	Long Form
ABM	Estero Bay Agency for Bay Management
ASR	Aquifer storage and recovery
AWWTP	Advanced Wastewater Treatment Plant
BC RCT	Big Cypress Regional Coordination Team
BEBR	Bureau of Economic and Business Research
BMAP	Basin Management Action Plans
BOD	Bio-chemical oxygen demand
CARL	Conservation and Recreational Lands
CCCP	Southwest Florida Coastal Conservation Corridor Plan
CCMP	Comprehensive Conservation and Management Plan
CDD	Community Development Districts
CEMs	Conceptual Ecological Models
CERP	Comprehensive Everglades Restoration Plan
CHAP	Charlotte Harbor Aquatic Preserves
CHEC	Charlotte Harbor Environmental Center
CHNEP	Charlotte Harbor National Estuary Program
CIP	Capital Improvements Program
COE	U.S Army Corps of Engineers
CREW	Corkscrew Regional Ecosystem Watershed
CRCT	Caloosa Restoration Coordination Team
CWA	Clean Water Act
CWSP	Caloosahatchee Water Supply Plan
CY	Cubic Yards
DER	Florida Department of Environmental Regulation
DERM	Miami-Dade Department of Environmental Resource Management
DO	dissolved oxygen
DRGR	Density Reduction Groundwater Recharge
DWMP	District Water Management Plan
EAR	Evaluation and Appraisal Report
EBAP	Estero Bay Aquatic Preserve
EBNMP	Estero Bay Nutrient Management Partnership
EIS	Southwest Florida Environmental impact statement
EPA	Environmental Protection Agency
FDEP	Florida Department of Environmental Protection
FDOT	Florida Department of Transportation
FEMA	Federal Emergency Management Agency
FFWCC	Florida Fish and Wildlife Conservation Commission
FGCU	Florida Gulf Coast University

Acronym/Abbreviation	Long Form
FLUCCS	Florida Land Use, Cover and Forms Classification System"
FLUMs	Future Land Use Map
FMRI	Florida Marine Research Institute
FNAI	Florida Natural Areas Inventory
FS	Florida Statutes
FSUTMS	Florida Standard Urban Transportation Model Structure
FWRI	Florida Wildlife Research Institute
FWS	U.S. Fish and Wildlife Service
FY	fiscal year
GAC	Gulf American Corporation
GICIA	Gasparilla Island Community Improvement Association
GIS	Geographic Information System
GPRA	Government Performance and Review Act
Ha	hectare
IWR	Impaired Waters Rule
kg	kilogram
LCH	Lower Charlotte Harbor
LCHCD	Lee County Hyacinth Control District
LOPP	Lake Okeechobee Protection Plan
LOS	Level of Service
LRTPs	Long Range Transportation Plans
LWCWSP	Lower west coast water supply plan
Mgd	Million gallons per day
MPOs	Metropolitan Planning Organizations
MS4	Municipal Separate Storm Sewer Systems
MSBU	Municipal Service Benefit Units
MSMP	Master Stormwater Management Plan
MSRP	South Florida Multi-Species Recovery Plan
MSTU	Municipal Service Taxing Unit
mya	million years ago
NEPA	National Environmental Policy Act
NPDES	National Pollutant Discharge Elimination System
OFW	Outstanding Florida Water
O&M	Operation and maintenance
PALMM	Publication of Archival, Library and Museum Materials
PLRG	Pollution load reduction goal
PRMRWSA	Peace River/Manasota Regional Water Supply Authority
RCP	Reinforced Concrete Pipe
RRCT	Regional Restoration Coordination Team
SAS	Surficial Aquifer System
SCCF	Sanibel-Captiva Conservation Foundation
SFWMD	South Florida Water Management District

Acronym/Abbreviation	Long Form
SHCAs	Strategic Habitat Conservation Areas
SMP	Stormwater Master Plan
SR	State Road
STAs	Stormwater Treatment Area
STORET	STorage and RETrieval
SWFFS	SouthWest Florida Feasibility Study
SWFRC&D	Southwest Florida Resource Conservation and Development Council, Inc
SWFRPC	Southwest Florida Regional Planning Council
SWFRRCT	Southwest Florida Regional Restoration Coordination Team
SWFWMD	Southwest Florida Water Management District
SWIM	Surface Water Improvement Management
SWP3	storm water pollution prevention plan
TDC	Tourist Development Council
TDS	total dissolved solids
TMDL	total maximum daily limits
TNC	The Nature Conservancy
TSS	total suspended solids
TYA	Thousand years ago
UF IFAS	University of Florida Institute of Food and Agricultural Sciences
USDA	U.S. Department of Agriculture
US EPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
UZAs	urbanized areas
WBID	Water Body Identification Code
WERC	Water Enhancement and Restoration Coalition, Inc.
WRDA 2000	Water Resources Development Act of 2000
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant

Appendix A- Verified Lists for LCH Area

GROUP 1: EVERGLADES WEST COAST (Estero Bay basin Only) – 3/11/03						
WBID	WATER SEGMENT NAME	PARAMETERS IDENTIFIED USING THE IMPAIRED WATERS RULE	CONCENTRATIONS CAUSING IMPAIRMENT ²	PRIORITY FOR TMDL DEVELOPMENT ³	PROJECTED YEAR FOR TMDL DEVELOPMENT	COMMENTS
3258B	HENDRY CREEK	DO	< 4.0 MG/L MINIMUM, AND 5.0 AS DAILY AVERAGE	LOW	2007	DO MET VERIFICATION THRESHOLD PER IWR. BOD IS THE CAUSATIVE POLLUTANT.
3258B	HENDRY CREEK (FRESH)	NUTRIENTS (CHL A)	TN = 0.825 MG/L TP = 0.06 MG/L	MEDIUM	2007	THIS WBID IS BEING ADDED AS A RESULT OF DISCUSSIONS WITH THE RESPONSIBLE GROWTH MANAGEMENT COALITION (RGMC), WHO FILED A PETITION CHALLENGING THE AUGUST 28, 2002, SECRETARIAL ORDER ADOPTING THE INITIAL GROUP 1 LIST. THIS TIDAL TRIBUTARY WAS DIVIDED INTO A FRESHWATER SECTION (THIS WBID) AND A MARINE SECTION (WBID 3258B1), AND THE RE-ASSESSMENT INDICATES THAT CHOLORPHYLL MET THE VERIFICATION THRESHOLD PER THE IWR INDICATING A NUTRIENT IMPAIRMENT. BOTH NITROGEN AND PHOSPHORUS ARE IDENTIFIED AS CAUSATIVE POLLUTANTS.
3258B1	HENDRY CREEK MARINE	NUTRIENTS (CHL A)	TN = 0.82 MG/L TP = 0.07 MG/L	MEDIUM	2007	THIS WBID IS BEING ADDED AS A RESULT OF DISCUSSIONS WITH THE RGMC, WHO FILED A PETITION CHALLENGING THE AUGUST 28, 2002, SECRETARIAL ORDER ADOPTING THE INITIAL GROUP 1 LIST. THIS TIDAL TRIBUTARY WAS DIVIDED INTO A FRESHWATER SECTION (WBID 3258B) AND THIS MARINE SECTION, AND THE RE-ASSESSMENT INDICATES THAT CHOLORPHYLL MET THE VERIFICATION THRESHOLD PER THE IWR INDICATING A NUTRIENT IMPAIRMENT. BOTH NITROGEN AND PHOSPHORUS ARE IDENTIFIED AS CAUSATIVE POLLUTANTS.
3258B1	HENDRY CREEK MARINE	DO	< 5.0 MG/L	MEDIUM	2007	THIS WBID IS BEING ADDED AS A RESULT OF DISCUSSIONS WITH THE RGMC, WHO FILED A PETITION CHALLENGING THE AUGUST 28, 2002, SECRETARIAL ORDER ADOPTING THE INITIAL GROUP 1 LIST. THIS TIDAL TRIBUTARY WAS DIVIDED INTO A FRESHWATER SECTION (WBID 3258B) AND THIS MARINE SECTION, AND THE RE-ASSESSMENT INDICATES THAT DO MET THE VERIFICATION THRESHOLD PER THE IWR. NUTRIENTS ARE INDICATED AS CAUSATIVE POLLUTANTS.
3258B1	HENDRY CREEK MARINE	FECAL COLIFORMS	> 800 PER 100 ML	MEDIUM	2007	THIS WBID IS BEING ADDED AS A RESULT OF DISCUSSIONS WITH THE RGMC, WHO FILED A PETITION CHALLENGING THE AUGUST 28, 2002, SECRETARIAL ORDER ADOPTING THE INITIAL GROUP 1 LIST. THIS TIDAL TRIBUTARY WAS DIVIDED INTO A FRESHWATER SECTION (WBID 3258B) AND THISAND THE RE-ASSESSMENT INDICATES THAT FECAL COLIFORM SAMPLES ARE ABOVE THE LISTING THRESHOLD. 11 OF 69 SAMPLES EXCEED THE CRITERION.
3258C	ESTERO BAY DRAINAGE (MULLOCK CREEK)	DO	< 5.0 MG/L	MEDIUM	2007	DO MET VERIFICATION THRESHOLD PER IWR. BOD IS THE CAUSATIVE POLLUTANT.
3258C	ESTERO BAY DRAINAGE (MULLOCK CREEK)	NUTRIENTS (CHL A)	TN = 0.88 MG/L TP = 0.05 MG/L	MEDIUM	2007	THIS WBID IS BEING ADDED AS A RESULT OF DISCUSSIONS WITH THE RGMC, WHO FILED A PETITION CHALLENGING THE AUGUST 28, 2002, SECRETARIAL ORDER ADOPTING THE INITIAL GROUP 1 LIST. THIS TIDAL TRIBUTARY WAS DIVIDED INTO A FRESHWATER SECTION (THIS WBID) AND A MARINE SECTION, AND THE RE-ASSESSMENT INDICATES THAT CHOLORPHYLL MET THE VERIFICATION THRESHOLD PER THE IWR INDICATING A NUTRIENT IMPAIRMENT. BOTH NITROGEN AND PHOSPHORUS ARE IDENTIFIED AS CAUSATIVE POLLUTANTS.
3258D1	ESTERO RIVER MARINE	NUTRIENTS (CHL A)	TN = 0.65 MG/L TP = 0.05 MG/L	MEDIUM	2007	THIS WBID IS BEING ADDED AS A RESULT OF DISCUSSIONS WITH THE RGMC, WHO FILED A PETITION CHALLENGING THE AUGUST 28, 2002, SECRETARIAL ORDER ADOPTING THE INITIAL GROUP 1 LIST. THIS TIDAL RIVER WAS DIVIDED INTO A FRESHWATER SECTION AND THIS MARINE SECTION, AND THE RE-ASSESSMENT INDICATES THAT CHOLORPHYLL MET THE VERIFICATION THRESHOLD PER THE IWR INDICATING A NUTRIENT IMPAIRMENT.

						BOTH NITROGEN AND PHOSPHORUS ARE IDENTIFIED AS CAUSATIVE POLLUTANTS.
3258D1	ESTERO RIVER MARINE	COPPER	> 2.9 UG/L	MEDIUM	2007	THIS WBID IS BEING ADDED AS A RESULT OF DISCUSSIONS WITH THE RGMC, WHO FILED A PETITION CHALLENGING THE AUGUST 28, 2002, SECRETARIAL ORDER ADOPTING THE INITIAL GROUP 1 LIST. THIS TIDAL RIVER WAS DIVIDED INTO A FRESHWATER SECTION AND THIS MARINE SECTION, AND THE RE-ASSESSMENT INDICATES COPPER SAMPLES ARE ABOVE THE LISTING THRESHOLD. 8 OF 23 SAMPLES EXCEED THE CRITERION.
3258D1	ESTERO RIVER MARINE	DO	< 4.0 MG/L	MEDIUM	2007	THIS WBID IS BEING ADDED AS A RESULT OF DISCUSSIONS WITH THE RGMC, WHO FILED A PETITION CHALLENGING THE AUGUST 28, 2002, SECRETARIAL ORDER ADOPTING THE INITIAL GROUP 1 LIST. THIS TIDAL RIVER WAS DIVIDED INTO A FRESHWATER SECTION AND THIS MARINE SECTION, AND THE RE-ASSESSMENT INDICATES THAT DO MET THE VERIFICATION THRESHOLD PER THE IWR. NUTRIENTS ARE INDICATED AS CAUSATIVE POLLUTANTS.
3258E	IMPERIAL RIVER (FRESH)	DO	< 5.0 MG/L	LOW	2007	THIS WBID IS BEING ADDED AS A RESULT OF DISCUSSIONS WITH THE RGMC, WHO FILED A PETITION CHALLENGING THE AUGUST 28, 2002, SECRETARIAL ORDER ADOPTING THE INITIAL GROUP 1 LIST. THIS TIDAL RIVER WAS DIVIDED INTO THIS FRESHWATER SECTION AND A MARINE SECTION, AND THE RE-ASSESSMENT INDICATES THAT DO MET THE VERIFICATION THRESHOLD PER THE IWR. NUTRIENTS ARE INDICATED AS CAUSATIVE POLLUTANTS.
3258E	IMPERIAL RIVER (FRESH)	NUTRIENTS (CHL A)	TN = 0.77 MG/L TP = 0.07 MG/L	LOW	2007	THIS WBID IS BEING ADDED AS A RESULT OF DISCUSSIONS WITH THE RGMC, WHO FILED A PETITION CHALLENGING THE AUGUST 28, 2002, SECRETARIAL ORDER ADOPTING THE INITIAL GROUP 1 LIST. THIS TIDAL RIVER WAS DIVIDED INTO THIS FRESHWATER SECTION AND A MARINE SECTION, AND THE RE-ASSESSMENT INDICATES THAT CHOLORPHYLL MET THE VERIFICATION THRESHOLD PER THE IWR INDICATING A NUTRIENT IMPAIRMENT. BOTH NITROGEN AND PHOSPHORUS ARE IDENTIFIED AS CAUSATIVE POLLUTANTS.
3258E1	IMPERIAL RIVER (MARINE)	COPPER	>2.9 UG/L	MEDIUM	2007	THIS WBID IS BEING ADDED AS A RESULT OF DISCUSSIONS WITH THE RGMC, WHO FILED A PETITION CHALLENGING THE AUGUST 28, 2002, SECRETARIAL ORDER ADOPTING THE INITIAL GROUP 1 LIST. THIS TIDAL RIVER WAS DIVIDED INTO THIS FRESHWATER SECTION AND A MARINE SECTION, AND THE RE-ASSESSMENT INDICATES COPPER SAMPLES ARE ABOVE THE LISTING THRESHOLD. 10 OF 25 SAMPLES EXCEED THE CRITERION.
3258H1	SPRING CREEK MARINE	NUTRIENTS (CHL A)	TN = 0.675 MG/L TP = 0.05 MG/L	MEDIUM	2007	THIS WBID IS BEING ADDED AS A RESULT OF DISCUSSIONS WITH THE RGMC, WHO FILED A PETITION CHALLENGING THE AUGUST 28, 2002, SECRETARIAL ORDER ADOPTING THE INITIAL GROUP 1 LIST. THIS TIDAL CREEK WAS DIVIDED INTO A FRESHWATER SECTION AND THIS MARINE SECTION, AND THE RE-ASSESSMENT INDICATES THAT CHOLORPHYLL MET THE VERIFICATION THRESHOLD PER THE IWR INDICATING A NUTRIENT IMPAIRMENT. BOTH NITROGEN AND PHOSPHORUS ARE IDENTIFIED AS CAUSATIVE POLLUTANTS.
3258H1	SPRING CREEK MARINE	COPPER	> 2.9 UG/L	MEDIUM	2007	THIS WBID IS BEING ADDED AS A RESULT OF DISCUSSIONS WITH THE RGMC, WHO FILED A PETITION CHALLENGING THE AUGUST 28, 2002, SECRETARIAL ORDER ADOPTING THE INITIAL GROUP 1 LIST. THIS TIDAL RIVER WAS DIVIDED INTO A FRESHWATER SECTION AND THIS MARINE SECTION, AND THE RE-ASSESSMENT INDICATES COPPER SAMPLES ARE ABOVE THE LISTING THRESHOLD. 29 OF 60 SAMPLES EXCEED THE CRITERION.
3258H1	SPRING CREEK MARINE	DO	< 4.0 MG/L	MEDIUM	2007	THIS WBID IS BEING ADDED AS A RESULT OF DISCUSSIONS WITH THE RGMC, WHO FILED A PETITION CHALLENGING THE AUGUST 28, 2002, SECRETARIAL ORDER ADOPTING THE INITIAL GROUP 1 LIST. THIS TIDAL CREEK WAS DIVIDED INTO A FRESHWATER SECTION AND THIS MARINE SECTION, AND THE RE-ASSESSMENT INDICATES THAT DO MET THE VERIFICATION THRESHOLD PER THE IWR. NUTRIENTS ARE INDICATED AS CAUSATIVE POLLUTANTS.
8065	SW COAST GULF 5	BACTERIA (SHELLFISH)	EXCEEDS SEAS THRESHOLDS	MEDIUM	2007	LISTED BASED ON CHANGE IN SHELLFISH HARVESTING CLASSIFICATION (DOWNGRADED FROM APPROVED TO CONDITIONAL).
8999	FLORIDA GULF COAST	MERCURY (IN FISH TISSUE)	LESS THAN CURRENT CRITERION (0.025 MG/L)	MEDIUM	2011	AGE OF DATA VERIFIED TO BE WITHIN LAST 7.5 YEARS. NUMERIC CRITERION IS INADEQUATE BECAUSE MERCURY IS ACCUMULATING IN THE FOOD CHAIN SUCH THAT FISH TISSUE MERCURY LEVELS EXCEED RECOMMENDED LEVELS FOR CONSUMPTION. CONFIRMED RECENT DATA FOR COASTAL FISH ADVISORY FOR MACKEREL. INCLUDES NEARSHORE AREAS IN WBIDS 8060, 8061, 8062, 8063, 8064, AND 8065.

GROUP 2: CHARLOTTE HARBOR (Charlotte Harbor, Pine Island Sound, and Matlacha Pass basins Only) – 5/27/04

WBID	Waterbody Segment Name	Parameters Assessed Using the Impaired Waters Rule	Concentration Causing Impairment	Priority for TMDL Development ¹	Projected Year for TMDL Development ¹	COMMENTS ² (# Exceedances/# Samples) PP=Planning Period VP=Verified Period
2065C	CHARLOTTE HARBOR MID	BACTERIA (SHELLFISH)	Exceeds Shellfish Evaluation & Assessment Section (SEAS) thresholds.	Medium	2008	Listed based on change in shellfish harvesting classification (downgraded from approved to conditional).
2065E	PINE ISLAND SOUND	BACTERIA (SHELLFISH)	Exceeds Shellfish Evaluation & Assessment Section (SEAS) thresholds.	Medium	2008	Listed based on change in shellfish harvesting classification (downgraded from approved to conditional).
2065F	MATALACHA PASS	BACTERIA (SHELLFISH)	Exceeds Shellfish Evaluation & Assessment Section (SEAS) thresholds.	Medium	2008	Listed based on change in shellfish harvesting classification (downgraded from conditional to prohibited).
2092E	PINE ISLAND	BACTERIA (SHELLFISH)	Exceeds Shellfish Evaluation & Assessment Section (SEAS) thresholds.	Medium	2008	Listed based on change in shellfish harvesting classification (downgraded from conditional to prohibited).
2063	N FORK ALLIGATOR CREEK	DISSOLVED OXYGEN	< 5.0 mg/L	Medium	2008	PP - 24/35; VP - 24/34 BOD is identified as a causative pollutant (mean = 4.6 mg/l).
2065A	CHARLOTTE HARBOR UPPER	IRON	> 0.3 mg/L	Medium	2008	PP - 5/11; VP - 21/36
2065A	CHARLOTTE HARBOR UPPER	MERCURY (IN FISH TISSUE)	> 0.5 ppm	Low	2011	Data verified to be within the last 7.5 years. Confirmed consumption advisory in Charlotte Harbor for Spanish Mackerel. Includes WBIDs 2065A, 2065B, 2065C, and 2065D.
2065B	CHARLOTTE HARBOR MID	MERCURY (IN FISH TISSUE)	> 0.5 ppm	Low	2011	Data verified to be within the last 7.5 years. Confirmed consumption advisory in Charlotte Harbor for Spanish Mackerel. Includes WBIDs 2065A, 2065B, 2065C, and 2065D.
2065C	CHARLOTTE HARBOR MID	MERCURY (IN FISH TISSUE)	> 0.5 ppm	Low	2011	Data verified to be within the last 7.5 years. Confirmed consumption advisory in Charlotte Harbor for Spanish Mackerel. Includes WBIDs 2065A, 2065B, 2065C, and 2065D.
2065D	CHARLOTTE HARBOR LOWER	MERCURY (IN FISH TISSUE)	> 0.5 ppm	Low	2011	Data verified to be within the last 7.5 years. Confirmed consumption advisory in Charlotte Harbor for Spanish Mackerel. Includes WBIDs 2065A, 2065B, 2065C, and 2065D.
8999	FLORIDA GULF COAST	MERCURY (IN FISH TISSUE)	> 0.5 ppm	Low	2011	Data verified to be within the last 7.5 years. Confirmed recent data for coastal fish advisory for Shark, King Mackerel, Spotted Seatrout, Little Tunny, Greater Amberjack, Bluefish, and Crevalle Jack. Includes WBIDs 8054, 8054 A-F, 8055, 8055A, 8055B, 8056, 8056A, 8057A, 8058A, 8058B, 8059A, and 8059B.
2092F	SANIBEL ISLAND	NUTRIENTS (TSI)	TN = 1.67 mg/L TP = 0.07 mg/L	Medium	2008	PP - TSI potentially impaired; VP - TSI verified. Annual average TSI exceeded 60 in 1996 and 1999 - 2002. Colimitation of N and P based on median TN/TP ratios of 32.81 (1044 values) during the PP and 28.28 (778 values) during the VP.

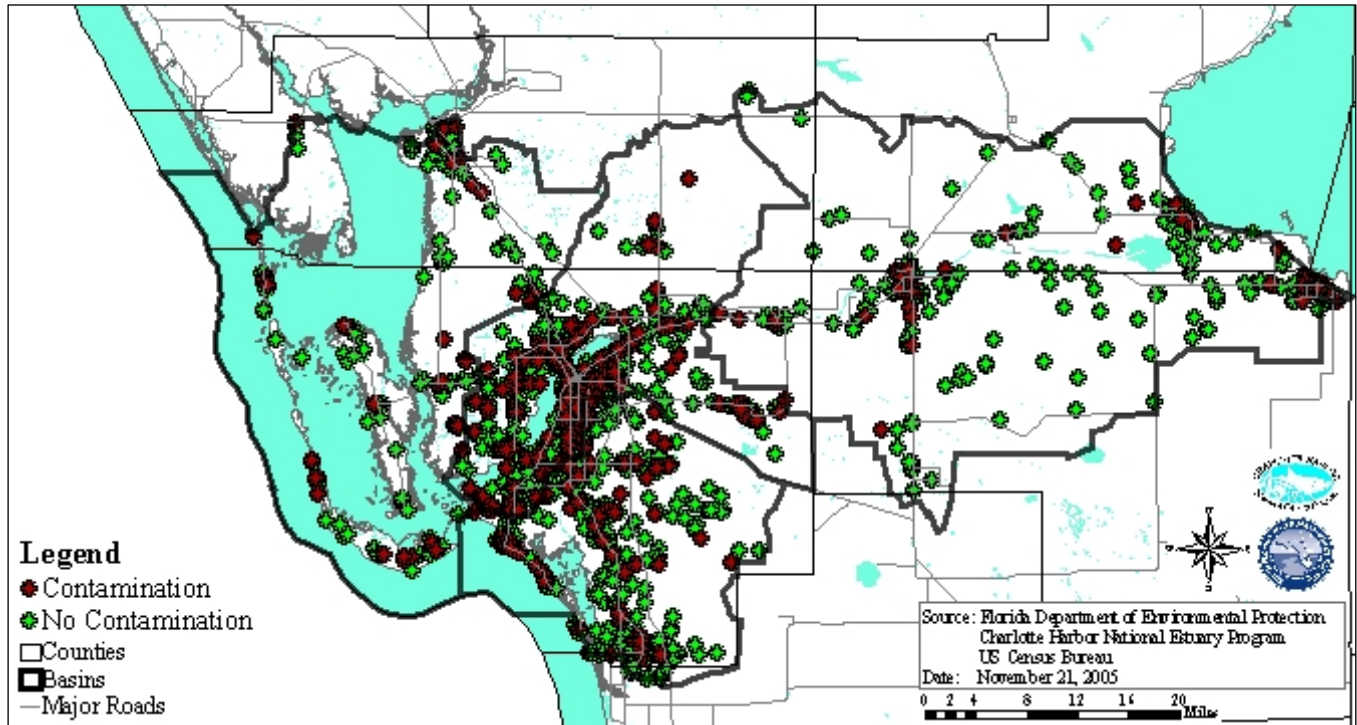
GROUP 3: CALOOSAHATCHEE – 6/20/05

WBID	Waterbody Segment Name	Parameters Identified Under the Impaired Surface Waters Rule	Concentration Causing Impairment ²	Priority for TMDL Development ³	Projected Year for TMDL Development ³	Comments (# Exceedances/# Samples) PP=Planning Period; VP=Verified Period ⁴
3240A	TIDAL CALOOSAHATCHEE	Copper	> 3.7 ug/L	Medium	2009	PP - 66/317; VP - 34/228
3240A	TIDAL CALOOSAHATCHEE	Dissolved Oxygen	< 4.0 mg/l	Medium	2009	PP - 282/851; VP - 203/583. Verified Impaired. BOD (median of 2.4 mg/L) and nutrients (based on chlorophyll data) were identified as the possible causative pollutants.
3240A	TIDAL CALOOSAHATCHEE	Fecal Coliform	> 400 colonies/100 ml	Medium	2009	PP - 147/516; VP - 134/521
3240A	TIDAL CALOOSAHATCHEE	Nutrients (Chl a)	Median TN = 0.83 mg/L	Medium	2009	Annual average chl(a) values exceeded IWR threshold of 11 ug/l in 1999 (12.21ug/L), 2000 (17.21ug/L), 2001 (17.51ug/L), and 2002 (19.22ug/L) in 2002. Data indicate that the WBID is nitrogen limited (TN/TP ratio median = 7.75 with a standard deviation of 12.81, range 0.09 - 150, 469 observations).
3240B	TIDAL CALOOSAHATCHEE	Dissolved Oxygen	< 4.0 mg/l	Medium	2009	PP - 82/300; VP - 57/150. Verified Impaired. Nutrients (based on chlorophyll data) were identified as the possible causative pollutant.
3240B	TIDAL CALOOSAHATCHEE	Fecal Coliform	> 400 colonies/100 ml	Medium	2009	PP - 36/115; VP - 32/111
3240B	TIDAL CALOOSAHATCHEE	Nutrients (Chl a)	Median TN = 0.85 mg/L	Medium	2009	Annual average chl(a) values exceeded IWR threshold of 11 ug/l in 2000 (21.42ug/L). Data indicate that the WBID is nitrogen limited (TN/TP ratio median = 7.5 with a standard deviation of 13.27, range 0.67 - 141, 191 observations).
3240C	TIDAL CALOOSAHATCHEE	Dissolved Oxygen	< 5.0 mg/l	Medium	2009	PP - 259/331; VP - 216/282. Verified impaired. Nutrients (based on chlorophyll data) were identified as the possible causative pollutant.
3240C	TIDAL CALOOSAHATCHEE	Fecal Coliform	> 400 colonies/100 ml	Medium	2009	PP - 83/198; VP - 84/194
3240C	TIDAL CALOOSAHATCHEE	Nutrients (Chl a)	Median TN = 1.105 mg/L	Medium	2009	Annual average chl(a) values exceeded IWR threshold of 20 ug/L in 2000 (24.77ug/L). Data indicate that the WBID is nitrogen limited (TN/TP ratio median = 8.77 with a standard deviation of 14.485, range 0.182 - 119, 359 observations).
3240E	YELLOW FEVER CREEK	Fecal Coliform	> 400 colonies/100 ml	Medium	2009	PP - 13/56; VP - 20/66
3240E 1	HANCOCK CREEK	Dissolved Oxygen	< 4.0 mg/l	Medium	2009	PP - 111/225; VP - 64/119. Verified impaired. BOD (median value of 2.5 mg/L), and nutrients (based on chlorophyll data) were identified as the possible causative pollutants.
3240E 1	HANCOCK CREEK	Fecal Coliform	> 400 colonies/100 ml	Medium	2009	PP - 30/130; VP - 27/130
3240E 1	HANCOCK CREEK	Nutrients (Chl a)	Median TN = 0.83 mg/L	Medium	2009	Annual average chl(a) values exceeded IWR threshold of 11 ug/l in 2000 (11.73 ug/L). Data indicate that the WBID is nitrogen limited (TN/TP ratio median = 5.34 with a standard deviation of 11.27, range 0.13 - 95, 144 observations).
3240F	DAUGHTREY CREEK	Fecal Coliform	> 400 colonies/100 ml	Medium	2009	PP - 41/275; VP - 43/274
3240G	TROUT CREEK	Conductance	> 1275 umhos/cm	Medium	2009	PP - 16/124; VP - 14/72. Conductance is believed to be elevated due to agricultural land use.
3240G	TROUT CREEK	Fecal Coliform	> 400 colonies/100 ml	Medium	2009	PP - 20/70; VP - 22/70
3240H	WHISKY CREEK (WYUOA CREEK)	Fecal Coliform	> 400 colonies/100 ml	Medium	2009	PP - 25/142; VP - 28/148
3240I	MANUEL BRANCH	Copper	> 3.7 ug/L	Medium	2009	PP - 8/102; VP - 6/23. VP data based on IWR Run 20.
3240I	MANUEL BRANCH	Fecal Coliform	> 400 colonies/100 ml	Medium	2009	PP - 28/91; VP - 8/47. VP data based on IWR Run 20.

3240I	MANUEL BRANCH	Lead	> 8.5 ug/L	Medium	2009	PP - 9/127 VP - 6/25. VP data based on IWR Run 20.
3240I	MANUEL BRANCH	Total Coliform	> 2400 colonies/100 ml	Medium	2009	PP - 10/16; VP - 13/22. VP data based on IWR Run 20.
3240L	GILCHREST DRAIN-- POWEL	Dissolved Oxygen	< 5.0 mg/l	Medium	2009	PP - 172/232; VP - 147/204. VP Data based on IWR Run 20. Verified impaired. Nutrients (based on chlorophyll data) were identified as the possible causative pollutant.
3240L	GILCHREST DRAIN-- POWEL	Fecal Coliform	> 400 colonies/100 ml	Medium	2009	PP - 31/136; VP - 40/206. VP data based on IWR Run 20.
3240L	GILCHREST DRAIN-- POWEL	Nutrients (Chl a)	Median TN = 0.65 mg/L	Medium	2009	Annual average chl(a) values exceeded IWR threshold of 20 ug/L in 2002 (20.02 ug/L). Data indicate that the WBID is nitrogen limited (TN/TP ratio median = 5.15 with a standard deviation of 15.41, range 0.14 - 123, 143 observations).
3240M	STROUD CREEK	Fecal Coliform	> 400 colonies/100 ml	Medium	2009	PP - 23/13; VP - 25/135
3240M	STROUD CREEK	Nutrients (Chl a)	Median TN = 0.80 mg/L Median = 0.05 mg/L	Medium	2009	Annual average chl(a) values exceeded IWR threshold of 20 ug/L in 2000 (33.64 ug/L). Data indicate that the WBID is co-limited for nitrogen and phosphorus (TN/TP ratio median = 14.6 with a standard deviation of 30.87, range 0.29 - 219, 139 observations).
3240N	OWL CREEK	Fecal Coliform	> 400 colonies/100 ml	Medium	2009	PP - 25/68; VP - 29/70
3240Q	POPASH CREEK	Dissolved Oxygen	< 5.0 mg/l	Medium	2009	PP - 246/312; VP - 130/163. Verified impaired. Nutrient impairment is identified as the causative pollutant based on chlorophyll data/nutrient impairment verification.
3240Q	POPASH CREEK	Fecal Coliform	> 400 colonies/100 ml	Medium	2009	PP - 29/175; VP - 38/174
3240Q	POPASH CREEK	Nutrients (Chl a)	Median TN = 0.75 mg/L Median TP = 0.05 mg/L	Medium	2009	Annual average chl(a) values exceeded IWR threshold of 20 ug/L in 2000 (88.13 ug/L), 2002 (32.90 ug/L). Data indicate that the WBID is co-limited for nitrogen and phosphorus (TN/TP ratio median = 14.2 with a standard deviation of 23.78, range 0.17 - 263, 181 observations).
3237A	EAST CALOOSAHATCHEE	Iron	> 1.0 mg/L	Medium	2009	PP - 69/106; VP - 23/60
3237B	LONG HAMMOCK CREEK	Dissolved Oxygen	< 5.0 mg/l	Medium	2009	PP - 4/17; VP - 6/24. Verified impaired. Nutrients were identified as a causative pollutant based on chlorophyll data/nutrient impairment verification.
3237B	LONG HAMMOCK CREEK	Nutrients (Chl a)	TN = 1.5 mg/L TP = 0.071 mg/L	Medium	2009	Annual average chl(a) values exceeded IWR threshold of 20 ug/L in 2000 (38.68ug/L) and 2002 (40.08ug/L). No TP data in the verified period. TP median represents the planning period. Limiting nutrient has not been identified, and the water is assumed to be co-limited.
3237C	LAKE HICPOCHEE	Lead	> e^(1.273[lnH]- 4.705)	Medium	2009	PP - 20/24; VP - 40/56
3237C	LAKE HICPOCHEE	Total Coliform	> 2400 colonies/100 ml	Medium	2009	PP - 9/28; VP - 12/51
3237D	NINEMILE CANAL	Fecal Coliform	> 400 colonies/100 ml	High	2004	PP - 4/34; VP - 9/49
3237D	NINEMILE CANAL	Lead	> e^(1.273[lnH]- 4.705)	Medium	2009	PP - 6/12; VP - 14/28
3246	C-21	Iron	> 1.0 mg/L	Medium	2009	PP - 83/107; VP - 21/51
3240J	BILLY CREEK	Fecal Coliform	> 400 colonies/100 ml	Medium	2009	PP - 49/149; VP - 46/145
3235A	WEST CALOOSAHATCHEE	Iron	> 0.3 mg/L	Medium	2009	PP - 49/76; VP - 25/50
3235A	WEST CALOOSAHATCHEE	Lead	> e^(1.273[lnH]- 4.705)	Medium	2009	PP - 1/29; VP - 11/45
3235D	JACKS BRANCH	Nutrients (Chl a)	TN = 1.32 mg/L TP = 0.051 mg/L	Medium	2009	Annual average chl(a) values exceeded IWR threshold of 20 ug/L in 1999 (28.63ug/L) and 2000 (29.87ug/L). Limited TP data in the verified period (1 observation). Limiting nutrient has not been identified, and the water is assumed to be co-limited.
3235K	TOWNSEND CANAL	Copper	> e^(0.8545[lnH] - 1.702) ug/L	Medium	2009	PP - 0/6; VP - 6/27
3235K	TOWNSEND CANAL	Lead	> e^(1.273[lnH]- 4.705)	Medium	2009	PP - 4/6; VP - 13/28

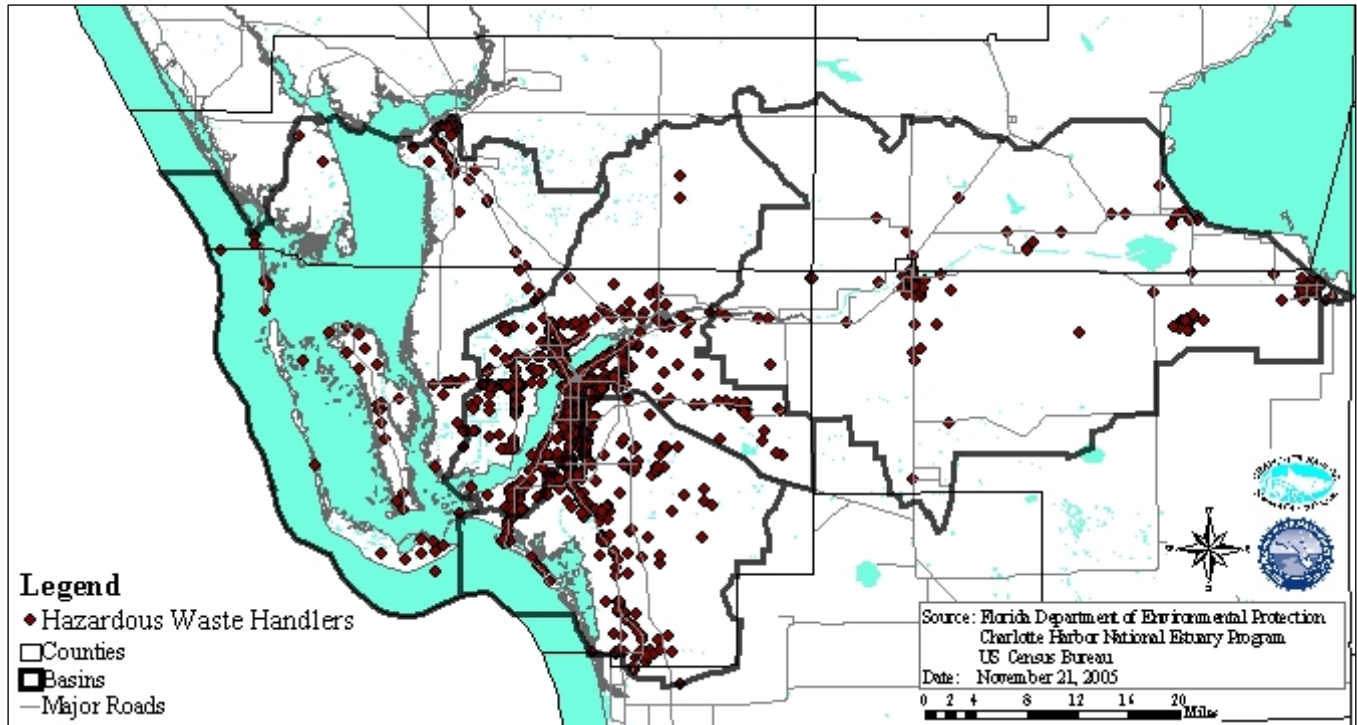
Appendix B- Petroleum Storage Tanks and Hazardous Waste Handlers

Petroleum Storage Tanks



Petroleum storage tank facilities within the LCH study area are regulated by FDEP due to the potential for groundwater contamination. The facilities identified on the map shown above are regulated petroleum storage tank facilities, which include above ground storage tanks greater than 550 gallons in volume, and underground storage tanks greater than 110 gallons in volume. There are 1689 petroleum tanks on record in the study area. The facilities identified in dark red are petroleum storage tank facilities that have experienced confirmed discharges and total 932. These confirmed discharges may be caused by leaks or corrosion in the tank system, equipment failure, operator error (i.e. overfilling of tank), etc. Cleanup of contamination is required to be completed by the property owner under the supervision of FDEP. Of the 932 total sites, 481 sites have open FDEP petroleum tracking status.

Hazardous Waste Handlers



There are 1391 hazardous waste handlers in the study area. Hazardous waste generators within the LCH study area are regulated by the FDEP due to the potential threat they pose to human health and natural resources. The facilities identified on the map shown above include small quantity generators, conditionally exempt small quantity generators of hazardous waste, and non-handlers (used oil generator). The designation of small quantity generator includes facilities that generate between 100 kg and 1000 kg of hazardous waste per month. Conditionally exempt small quantity generators of hazardous waste generate up to 100 kg of hazardous waste per month or less than 1 kg of acute hazardous waste. Acute hazardous wastes are substances that have been found to pose significant, irreversible harm to human health, such as arsenic and cyanide compounds. All small quantity and conditionally exempt small quantity generators of hazardous waste, as well as non-handlers (used oil generating facilities) are required to ensure proper disposal of their wastes through pick up by a licensed hauler for its eventual proper disposal or storage. The LCH study area has no large quantity generators, nor any treatment, disposal, or storage sites.

Appendix C- Lower West Coast Project Descriptions

Acceler8 Projects		
Project Title	Partner	Description
C-43 West Reservoir	USACOE	The C-43 West Reservoir will improve water deliveries to the estuary, provide for dry season flows, restore downstream salinity levels and ensure the availability of water for the natural system needs of the Caloosahatchee Estuarine System. Improvements in the distribution of water should result in improvements to the timing, quality and quantity of water deliveries to the inland ecosystems. Once the demands of the estuary are met, additional water resource benefits could be achieved by providing supplemental water resources for agriculture and urban users resulting in a redirection of demands placed on existing surface and ground water resources such as the C-43 Canal and Lake Okeechobee.
Picayune Strand (SGGE) Hydrologic Restoration	USACOE	The project will remove the infrastructure of a 55,247 acre subdivision and restore its pre-drainage hydrology and ecology.
CERP Projects		
Project Title	Partner	Description
Southwest Florida Feasibility Study	USACOE	The study will provide a framework to address the health of aquatic ecosystems; water flows; water supply; wildlife, biological diversity and natural habitat; the region's economic viability; and property rights. The study is also designed to investigate non-structural alternatives; maximize regional benefits through multi-purpose land use; ensuring consistency with local planning initiatives; improving water quality; and protection of the Big Cypress National Preserve. The study area encompasses all of Lee, and part of Glades, Hendry, Charlotte, Collier and Monroe counties.
Lake Trafford Restoration	Collier County, Florida Wildlife Commission	The project will restore Lake Trafford through dredging of 4,000,000 cubic feet of accumulated organic matter from the bottom of the Lake.

C-43 Basin Storage Reservoir-Part 1	USACOE	The purpose of the C-43 Basin Storage Reservoir Project (C-43 BSRP) is to improve water deliveries to the estuary, provide for dry season flows, restore downstream salinity levels and ensure the availability of water for the natural system needs of the Caloosahatchee Estuarine System. Improvements in the distribution of water should result in improvements to the timing, quality and quantity of water deliveries to the inland ecosystems. Once the demands of the estuary are met, additional water resource benefits could be achieved by providing supplemental water resources for agriculture and urban users resulting in a reduction of demands placed on existing surface and ground water resources such as the C-43 canal and Lake Okeechobee.
Southern Crew	Lee County & City of Bonita Springs	Purchase and restore environmentally sensitive land by removing roadways, berms, and house pads to unblock sheet-flow impediments.
Western Tamiami Trail Culverts (Phase 1)	FDOT	The project will improve sheet flow to the Ten Thousand Islands National Wildlife Refuge and Aquatic Preserve and Fakahatchee Strand State Preserve. The project is installing 17 new culverts and 4 canal plugs along the Tamiami Trail (US 41) from State Road 29 west to County Road 92 in Collier County.

Watershed Initiatives

Lower Charlotte Harbor

Project Title	Partner	Description
Charlotte Harbor National Estuary Program (CHNEP) Support	CHNEP	Implement CHNEP annual work plan with emphasis on the CHNEP Technical Advisory Committee goals and including CHNEP work with the Science Coordination Team of the South Florida Ecosystem Task Force.
Burnt Store Road Drainage Improvements	Lee County	Develop regional best management practices for water quality improvement and flood reduction by the re-establishment of area sheetflow.
Lower Charlotte Harbor SWIM Reconnaissance Report	CHNEP/ Caloosahatchee Restoration Coordination Team	Issue reconnaissance report for the Lower Charlotte Harbor area for use in developing a Lower Charlotte Harbor SWIM plan.
Charlotte Harbor Buffer Preserve Restoration	Dept. of Environmental Protection	Perform initial eradication of Melaleuca and Brazilian Pepper to improve environmental integrity of the area.

Dinkens Bayou Culvert and Hydrologic Restoration	City of Sanibel, Lee County, & Sanibel-Captiva Conservation Foundation	Installation of culvert under Sanibel-Captiva Road to restore tidal circulation, improve water quality, and connect habitats.
Sanibel Island Wetland Restoration	City of Sanibel, Lee County, & Sanibel-Captiva Conservation Foundation	Restore wetlands by removing exotic species, removing fill roads, building a weir to re-hydrate wetlands, and replanting native species.
Caloosahatchee		
Project Title	Partner	Description
Shellfish, SAV, Mangroves, Fisheries Monitoring	Florida Gulf Coast University, Sanibel Captiva Conservation Foundation	Examine submerged aquatic vegetation (SAV), aligning life history requirements with environmental conditions.
Fisheries Restoration Study	Sanibel Captiva Conservation Foundation, Florida Seagrass	Evaluate changes in salinity and its effects on the restocking potential for Red Drum.
Blue Crab Salinity Assessment	Sanibel Captiva Conservation Foundation	Evaluate Blue Crabs as indicator of health of the estuary system.
Lee County Water Quality Monitoring-Caloosahatchee Estuary	CHNEP, Lee County Environmental Laboratory	Provide support to Charlotte Harbor National Estuary Program (CHNEP) water quality monitoring network.
Powell Creek Stormwater Restoration	Lee County	Restore natural water-flow, increase base-flows, increase storage capacity, and improve water quality.
Tape Grass Temperature Tolerance Study	SFWMD	Evaluating the tolerance of Tape Grass habitat and of temperatures changes.

Caloosahatchee Tributaries Environmental Restoration (Lee)	Lee County	Restore natural outfalls by removing exotic vegetation from river and creek systems.
Caloosahatchee Tributaries Environmental Restoration (Lee)	Hendry County	Restore natural outfalls by removing exotic vegetation from river and creek systems.
Caloosahatchee Creek Preserve Restoration	Lee County	Restore the habitat diversity and productivity of spoil areas by controlling exotic plants interfering with natural ecosystem.
Four Corners Stormwater Management System Improvements	Hendry County	Alleviate flooding in the four county area and restore the hydro-period of the natural system.
Caloosahatchee Oxbow Restoration	Hendry County	Design and construct model oxbow restoration to facilitate sediment deposition, nutrient adsorption, and provide habitat.
Hendry County Oxbow Restoration	Hendry County	Design and construct model oxbow restoration to facilitate sediment deposition, nutrient adsorption, and provide habitat.
Labelle Water Quality Park	City of LaBelle & Hendry County	Design and construct water quality park to attenuate surface water run-off and improve water quality.
Labelle Drainage Improvements	City of LaBelle	Model, design, permit, and construct detention areas and shallow storm water treatment areas in order to improve the basins hydraulics, water quality, and existing wetlands; reduce sediment and nutrient loading, and provide for aquifer recharge.
Hendry County Stormwater Master Plan	Hendry County	Prepare Stormwater Master Plan for Hendry County.
Clewiston Stormwater Improvements	City of Clewiston	Provide storm water treatment area for entire city using detention and water quality improvement through plant uptake.
Hickey Creek-Harns Marsh Restoration	East County Water Control District & Lee County	Complete comprehensive hydrologic study to construct maximum flood storage and re-hydrate the natural system.

Lehigh Acres Restoration	East County Water Control District & Lee County	Complete comprehensive hydrologic study to construct maximum flood storage and re-hydrate the natural system.
Orange River Hydrologic Restoration	East County Water Control District & Lee County	Complete comprehensive hydrologic study to construct maximum flood storage and re-hydrate the natural system.
Caloosahatchee Water Release Monitoring	SFWMD	Monitor water quality during regulatory and environmental releases from Lake Okeechobee that concentrates on nutrient loading at S-79, detection phytoplankton blooms and dissolved Oxygen concentrations.
IFAS-Irrigation Study	University of Florida	Quantify water and nutrient balances in agricultural fields in South Florida.
Estero		
Project Title	Partner	Description
Estero Bay Agency on Bay Management	Estero Bay Agency on Bay Management	Implement the Estero Bay Agency on Bay Management's Work Plan.
Estero Bay Oyster Restoration	Florida Gulf Coast University	Restore oyster habitat by providing substrate for reef formation.
Juvenile Fish Community	Florida Fish and Wildlife Commission Marine Lab	Develop minimum and maximum inflow rates for Estero Bay Tributaries.
Response to Oyster/Fauna to Tributary Flows	Florida Gulf Coast University	Define relationship between tributary discharge and oyster bed use by adult fish.
Freshwater Inflow and Tributary Fauna	Florida Gulf Coast University	Evaluate the effect of inflow on fish nursery functions in Estero Bay.
Estero Bay Tributary Ecology	Florida Gulf Coast University	Evaluation of the Ecology of Estero Bay Tributaries.
Halfway Creek Flow-way Restoration	Lee County	Restore natural outfalls by removing exotic vegetation from river and creek systems.

Estero Bay Nutrient Loading Assessment	SFWMD	Develop computerized hydrologic and water quality monitoring to aid in establishing both the relative levels of impacts in predicting the effectiveness for potential improvements.
Imperial Estates Stormwater Retrofit	City of Bonita Springs	Construct storm water retrofit to reduce flooding and improve water quality before discharge to the Imperial River.
Pine Lake Preserve Restoration	Lee County	Restore the habitat diversity and productivity of Lee County's Conservation 2020 lands by controlling exotic plants interfering with natural ecosystem.
Lee County Mitigation Plan	Lee County	Develop comprehensive wetland mitigation plan for Lee County transportation projects.
Water Table Monitoring Improvements	Lee County	Improve water-table aquifer monitoring network in Lee County upgrading the existing water-table aquifer monitoring network.
Estero Bay Watershed Assessment	SFWMD	Perform comprehensive monitoring of specific land uses in Estero Bay Basin to develop event mean concentrations for use in pollutant loading model.
Black Hawk Stormwater Retrofit	Lee County	Storm water retrofit to resolve drainage and water quality problems.
Six Mile Cypress Hydrologic Report	Lee County	Provide insight into the hydrology of Lee County's Six Mile Cypress Preserve as an integrated system and produce information useful in enhancing the Six Mile Cypress Watershed Plan.