Indian River County
2030 Comprehensive Plan

Chapter 8

Conservation Element

Indian River County Community Development Department
Adopted: October 12, 2010

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PURPOSE

The purpose of the Conservation Element is to identify the natural resources in Indian River County, to analyze natural resource issues and problems, and to establish applicable goals, objectives, and policies.

INTRODUCTION

Indian River County is an area that is rich with a variety of natural treasures, from the Atlantic coastal beaches to Blue Cypress Lake and the Upper St. Johns River Basin, as well as the Indian River Lagoon, the waterbody from which the County derived its name. Within the county, natural upland areas are a diverse assemblage of plant and animal communities, ranging from the jungle-like hammocks of the barrier island and the coastal mainland to the scrubby sand pines of the sand ridge and the pine flatwoods and prairies to the west. Because of its geographic location, Indian River County has a mixture of subtropical and temperate flora unique to the Treasure Coast region.

When pioneers first came to Indian River County, many of the natural features of the area were considered obstacles to habitation. Consequently, extensive digging of drainage canals, dredging and filling of wetlands, and diking of salt marshes for mosquito control occurred in an effort to enhance the quality of life. Now, however, resources once considered hindrances are recognized as invaluable assets to be carefully managed and preserved.

Regional Context

Although this element focuses on natural resources within the political boundaries of Indian River County, it is important to note that such resources are part of larger ecological systems that extend into the region and the state well beyond county boundaries. For example, the Upper St. Johns River Basin in western Indian River County is the headwaters of the St. Johns River, which extends 310 miles north to Jacksonville. By the same token, the Indian River Lagoon extends 156 miles from Ponce De Leon Inlet in Volusia County, through Indian River County, south to the Jupiter Inlet in Palm Beach County. As such, the conservation of natural resources in Indian River County serves the interest of not only the County but of Florida as a whole.

The Existing Conditions section of this element describes the existing conditions of the county's natural resources, while the analysis section identifies natural resource issues and concerns that need to be addressed. Finally, the plan section of the element sets forth a goal, objectives, and policies to guide the county in specific actions to be taken to preserve, enhance, and appropriately use the county's natural resources in order to ensure the continued viability of these resources for the benefit of present and future generations.

EXISTING CONDITIONS

Abiotic Features

Geology

The land surface of Indian River County is underlain by nearly 10,000 feet of sedimentary rocks (carbonates, sands, and clays) which overlay a "basement" complex of igneous and metamorphic rocks. Within the upper 1,000 feet, sediments consist of limestone, dolomite, sand, clay, and shell beds. These sediments are comprised mainly of unconsolidated clastic material (sand and clay) termed the "clastic zone". This area is known as the Tamiami formation or the Fort Thompson formation. The Anastasia formation, found along the coastal area, consists of quartz sand and shell material (Coquina).

Within 200 feet of the surface lies the surficial aquifer system. Overlying sediments are predominantly composed of clastic material (sand and clay) and contain the surficial aquifer. Below the surficial aquifer lies the Hawthorn formation. This formation consists of inter bedded limestone, dolomite, sand, and clay, and is about 250 feet thick in Indian River County. The formation acts as a confining layer between the Floridan and surficial aquifers.

The Floridan aquifer system includes the Oldsmar, Lake City and Avon Park limestone formations, the Ocala Group, and the Undifferentiated Oligocene Rock layer. While the Lake City and Oldsmar limestone formations are found over 1,000 feet deep, the Avon Park formation consists of limestone and dolomite, and reaches a thickness of up to 250 feet. Immediately overlying the Avon Park formation is the Ocala Group, consisting of the Inglis, Williston, and Crystal River formations, all composed of limestone. The General Geologic Profile of Indian River County is depicted in Figures 8.1 and 8.2.

- Commercially valuable minerals

In Indian River County, minerals mined for commercial value are limited to sand and gravel. Historically, the primary location for sand mining in the county was the Atlantic Coastal Sand Ridge, generally found parallel and proximate to U.S. Highway #1. Figure 8.3 depicts the location of active mining operations in Indian River County as of July 2008.

Locally, the predominant use of sand has been for construction purposes, generally for fill related to building construction in low lying areas and locations where on-site disposal (septic) systems are installed. In the past, sand mined from the ridge has been used to renourish the beach area south of Sebastian Inlet. Due to past mining operations, most of the mining potential of the Atlantic Coastal Sand Ridge has been depleted. As a result, mining operations now occur in areas west of the U.S. Highway #1 corridor.

Figure 8.1

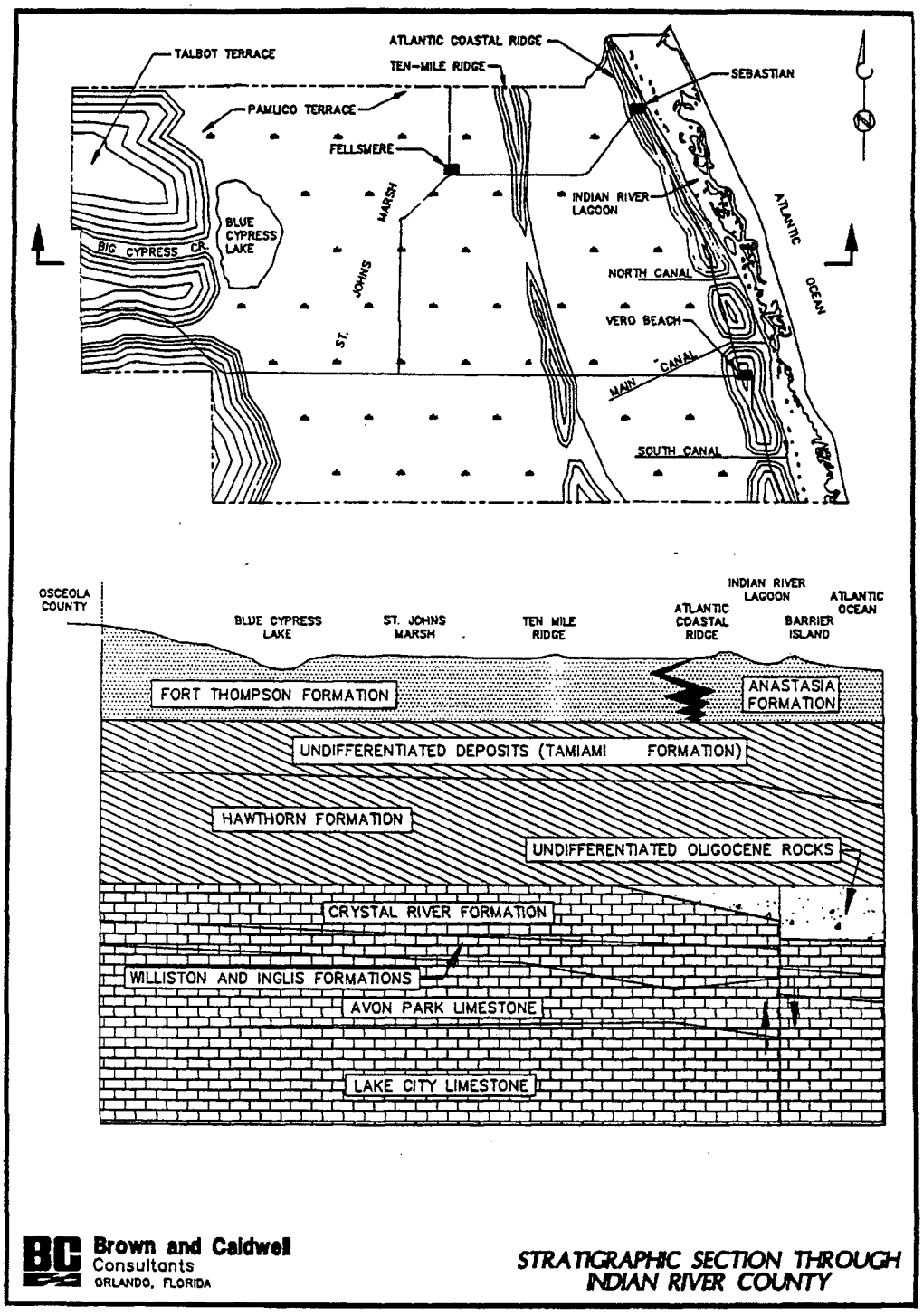

TALBOT TERRACE
ATLANTIC COASTAL RIDGE
TEN-MILE RIDGE
SEBASTIAN
PAMLICO TERRACE
FELLSMERE
INDIAN RIVER LAGOON
BLUE CYPRESS LAKE
MARSH
BIG CYPRESS CR.
ST. JOHNS
ATLANTIC OCEAN
NORTH CANAL
VERO BEACH
MAIN CANAL
SOUTH CANAL
OSCEOLA COUNTY
BLUE CYPRESS LAKE
ST. JOHNS MARSH
TEN MILE RIDGE
ATLANTIC COASTAL RIDGE
INDIAN RIVER LAGOON
BARRIER ISLAND
ATLANTIC OCEAN
FORT THOMPSON FORMATION
ANASTASIA FORMATION
UNDIFFERENTIATED DEPOSITS (TAMIAMI FORMATION)
HAWTHORN FORMATION
UNDIFFERENTIATED OLIGOCENE ROCKS
CRYSTAL RIVER FORMATION
WILLISTON AND INGLIS FORMATIONS
AVON PARK LIMESTONE
LAKE CITY LIMESTONE
Brown and Caldwell
Consultants
ORLANDO, FLORIDA
STRATIGRAPHIC SECTION THROUGH INDIAN RIVER COUNTY

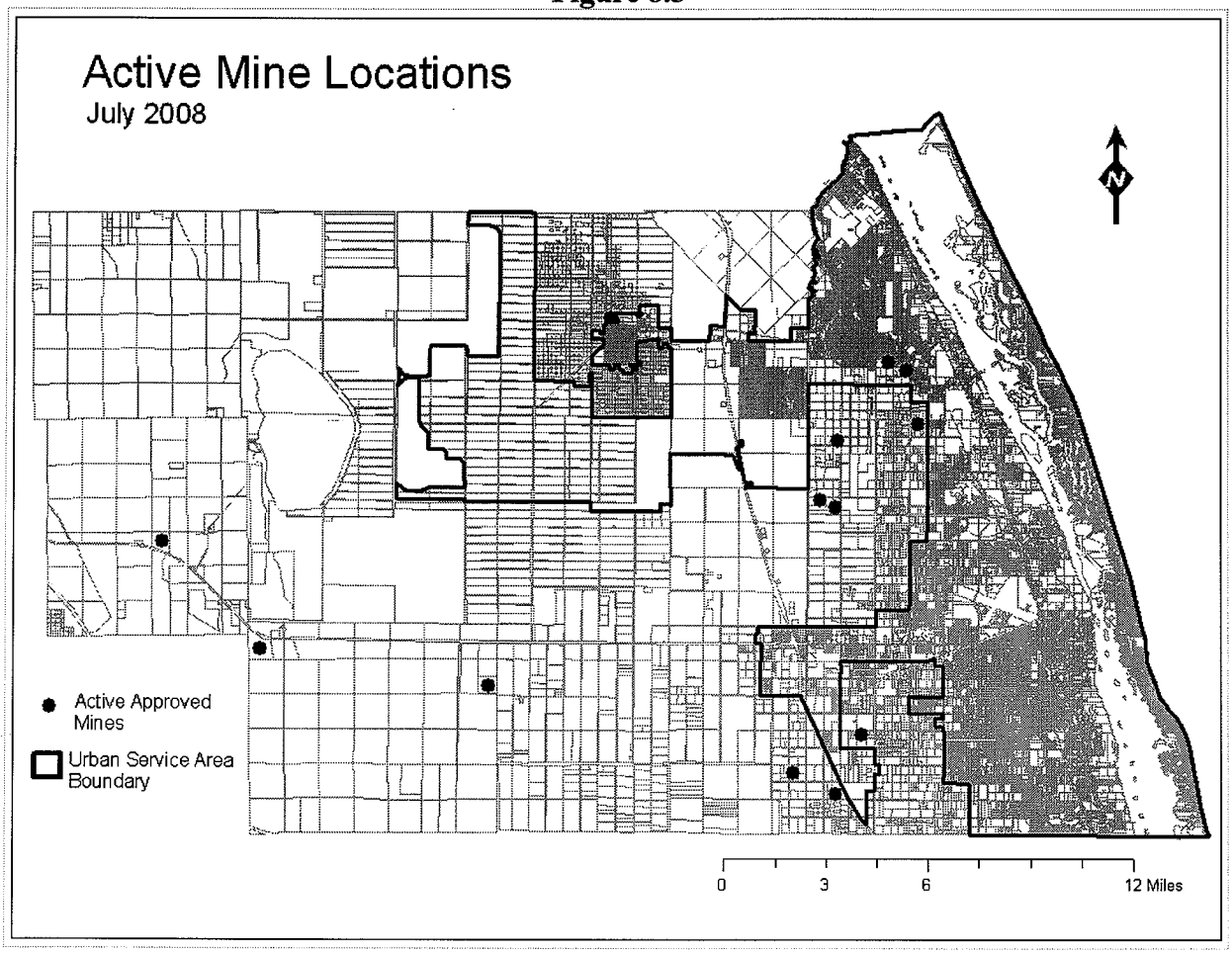
Figure 8.2
GENERALIZED STRATIGRAPHIC CROSS-SECTION

[gal/min = gallons per minute]

System	Series	Formation name	Thickness (feet)	Description	Yield of wells		Hydrogeologic unit
	Holocene	Undifferentiated deposits	0-25	Variable mixture of sand, clay, coquina, and organic material	Varies widely but mostly less than 100 gal/min	SURFICIAL AQUIFER SYSTEM	
	Pleistocene	Fort Thompson and Anastasia Formations	100-200	Coquina with variable amounts of sand, silt and organic material	Varies widely, from less than 100 to about 700 gal/min)		Clastic zone
	Pliocene	Tamiami Formation	0-60	Fragmented to cemented coquina and limestone	Generally 100 to 700 gal/min		Shallow rock zone
	Miocene	Hawthorn Formation	70-520	Silty to sandy clay, thin shell and limestone beds, phosphatic	Generally less than 100 gal/min		INTERMEDIATE CONFINING UNIT
	Oligocene	Suwannee Limestone	0-190	Chalky to crystalline limestone	Generally less than 100 gal/min	FLORIDAN AQUIFER SYSTEM	
	Eocene	Ocala Limestone	20-220	Limestone, dolomitic near base in places	Varies widely, from about 100 to more than 700 gal/min		Upper Floridan aquifer
			100-500	Limestone and dolomite	Generally more than 700 gal/min		
		Avon Park Formation	20-120	Dolomite, dolomitic limestone, limestone, and some gypsum	Probably much less than 100 gal/min		Middle semiconfining unit
		Oldsmar Formation	600-700	Limestone and dolomite	Generally 100 to more than 700 gal/min		Lower Floridan aquifer
			About 1,000	Limestone and dolomite	Boulder zone used as receiving unit for injection wells		

Water-bearing characteristics and descriptions of the geologic units in Indian River County

Figure 8.3



Soils

Soil is produced by forces of weathering acting on the "parent material," or the unconsolidated mass, from which a soil is formed. The kind of soil that is formed depends on five major factors: (1) type of parent material; (2) climatic conditions; (3) plant and animal life in and on the soil; (4) topographic relief; and (5) the length of time of soil formation.

The Soil Survey of Indian River County, Florida (1987) identifies 58 distinct soil types in Indian River County. These 58 soil types can be grouped into general associations that have distinctive patterns of soils, relief, and drainage. The associations or "general soil map units" range from the sandy, well drained soils of the sand ridges to the organic, very poorly drained soils of swamps and marshes. Figure 8.4 depicts the general location of soils with different drainage characteristics in Indian River County. The estimated acreage and proportional extent of each soil is contained in

Table 8.1. In the survey, each soil map unit is rated for various types of suitability, including cropland, pasture, woodland, on-site disposal (septic) systems, building sites, and recreation. Listed below is a general description of the soil series within Indian River County.

Soil Series

- Soils of the Sand Ridges

ASTATULA-ARCHBOLD-ST.LUCIE: Nearly level to gently sloping, excessively drained and moderately well drained soils that are sandy to a depth of 80 inches or more.

- Soils of the Barrier Island and Coastal Marshes

CANAVERAL-CAPTIVA-PALM BEACH: Nearly level to gently sloping, somewhat poorly drained to moderately well drained, and well drained to excessively well drained, sandy soils that contain shell fragments.

MCKEE-QUARTZIPSAMMENTS-ST.AUGUSTINE: Level, very poorly drained, loamy soils that have very low soil strength; some nearly level, somewhat poorly drained to moderately well drained soils, sand and shell fragments; and some level, somewhat poorly drained soils that are mixed sand and shell fragments.

- Soils of Flatwoods, Low Knolls and Ridges

IMMOKALEE-MYAKKA-SATELLITE: Nearly level, poorly drained and somewhat poorly drained soils; some are sandy throughout, and some have dark sandy subsoil.

EAUGALLIE-OLDSMAR-WABASSO: Nearly level, poorly drained soils that have a dark sandy subsoil; some have a subsoil that is underlain by loamy material at a depth of less than 40 inches, and some are sandy throughout and have a dark sandy subsoil at a depth of 20 to 30 inches.

MYAKKA-IMMOKALEE: Nearly level, poorly drained soils that have a dark sandy subsoil.

EAUGALLIE-MYAKKA-RIVIERA: Nearly level, poorly drained soils; some have a loamy subsoil at a depth of less than 40 inches, some have a dark sandy subsoil at a depth of 20 to 30 inches, and some are sandy throughout and have a dark sandy subsoil at a depth of 20 to 30 inches.

Figure 8.4

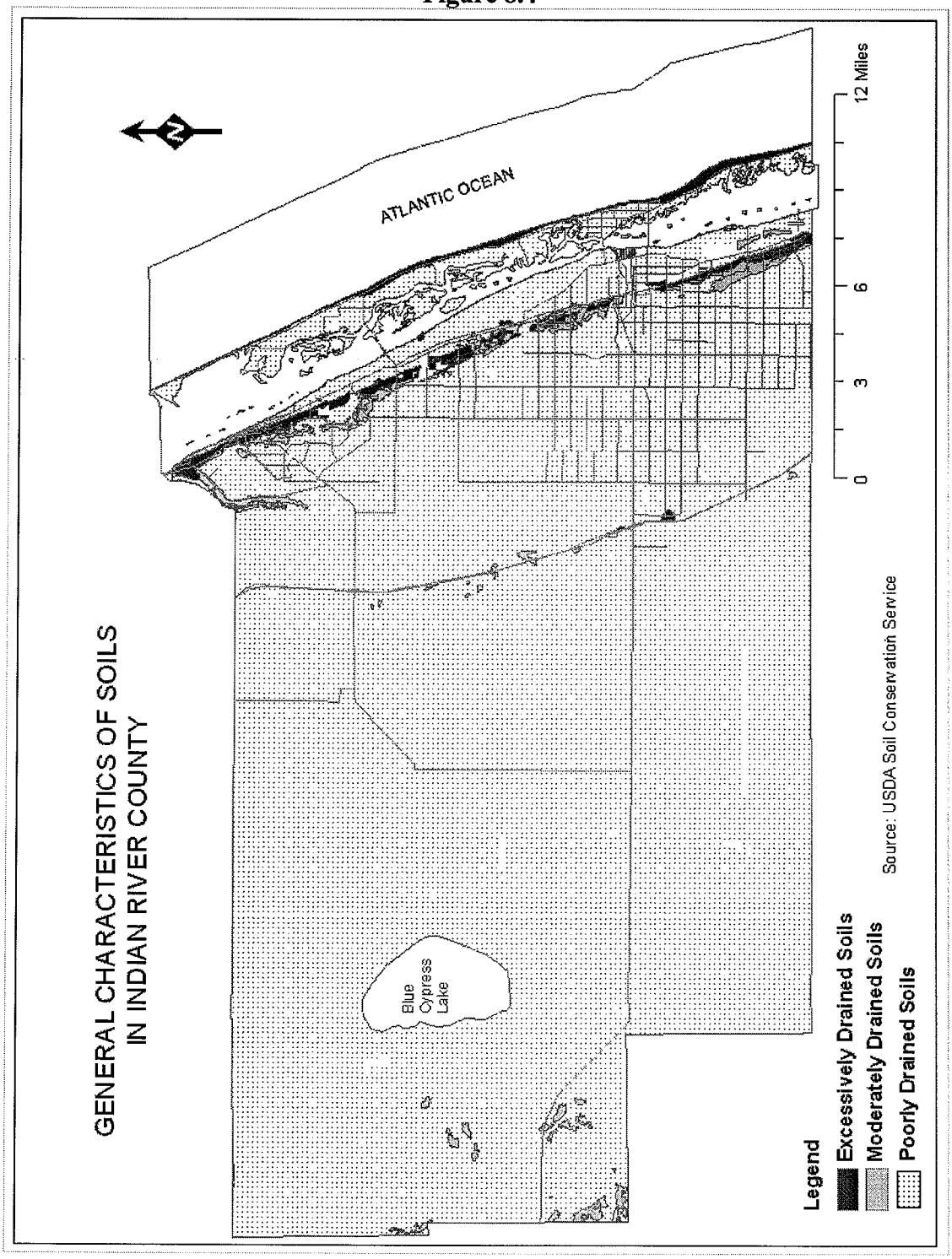

GENERAL CHARACTERISTICS OF SOILS
IN INDIAN RIVER COUNTY
ATLANTIC OCEAN
Blue Cypress Lake
0 3 6 12 Miles
Source: USDA Soil Conservation Service
Legend
Excessively Drained Soils
Moderately Drained Soils
Poorly Drained Soils

TABLE 8.1
ACREAGE AND EXTENT OF SOILS IN INDIAN RIVER COUNTY

COMMUNITY	SOIL NAME		ACRES	PERCENT
Sand Ridges	St. Lucie sand	(0 to 8% slopes)	865	0.3
	Archbold sand	(0 to 5% slopes)	815	0.2
	Astatula sand	(0 to 5% slopes)	1,596	0.5
	Paola sand	(0 to 5% slopes)	283	0.1
	Pomello sand	(0 to 5% slopes)	2,710	0.8
	Jonathan sand	(0 to 5% slopes)	206	0.1
	Orsino fine sand	(0 to 5% slopes)	408	0.1
Barrier Island & Coastal Marshes	Canaveral fine sand	(0 to 5% slopes)	2,533	0.7
	Palm Beach sand	(0 to 5% slopes)	1,599	0.5
	Quartzipsamments	(0 to 5% slopes)	2,558	0.7
	Captiva fine sand		1,739	0.5
	St. Augustine sand		724	0.2
	St. Augustine fine sand (organic substratum)		437	0.1
	Mckee mucky clay loam		3,773	1.1
	Beaches		487	0.1
	Perrine Variant loamy fine sand		285	0.1
	Riomar clay loam		515	0.1
	Kesson muck		324	0.1
Flatwoods, Low Knolls & Ridges	EauGallie fine sand		21,974	6.4
	EauGallie-Urban land complex		1,357	0.4
	Immokalee fine sand		16,494	4.8
	Immokalee-Urban land complex		454	0.1
	Myakka fine sand (1)		20,917	6.1
	Myakka fine sand (1)	(depressional)	5,134	1.5
	Oldsmar fine sand		11,342	3.3
	Oldsmar fine sand	(depressional)	841	0.2
	Riviera fine sand (1)		30,858	8.9
	Riviera fine sand (1)	(depressional)	8,364	2.4
	Wabasso fine sand (1)		23,971	6.9
	Satellite fine sand		2,451	0.7
	Pepper sand		1,004	0.3
	Electra sand	(0 to 5% slopes)	769	0.2

TABLE 8.1
ACREAGE AND EXTENT OF SOILS IN INDIAN RIVER COUNTY

COMMUNITY	SOIL NAME	ACRES	PERCENT
Sloughs, Poorly Defined Drainage & Hammocks	Riviera fine sand (1)	30,858	8.9
	Riviera fine sand (1) (depressional)	8,364	2.4
	Winder fine sand	20,616	6.0
	Pineda fine sand	22,004	6.4
	Pineda fine sand (1) (depressional)	4,312	1.2
	Boca fine sand	1,626	0.5
	Boca-Urban land complex	287	0.1
	Myakka fine sand (1)	20,917	6.1
	Myakka fine sand (1) (depressional)	5,134	1.5
	Holopaw fine sand (1)	5,718	1.7
	Holopaw fine sand (1) (depressional)	3,192	0.9
	Pompano fine sand	2,936	0.9
	Manatee mucky loamy fine sand, (depressional)	1,912	0.6
	Chobee loamy fine sand	2,024	0.6
	Manatee loamy fine sand	3,028	0.9
	Jupiter fine sand	1,001	0.3
	Malabar fine sand	4,032	1.2
	Lokosee fine sand	407	0.1
	Pompano fine sand (depressional)	2,754	0.8
Freshwater Swamps & Marshes	Gator muck	12,767	3.7
	Canova muck	11,156	3.2
	Terra Ceia muck	35,487	10.3
	Floridan sand	2,660	0.8
	Floridan mucky fine sand (depressional)	3,502	1.0
	Holopaw fine sand (1)	5,718	1.7
	Holopaw fine sand (1) (depressional)	3,192	0.9
	Delray muck	3,119	0.9
	Chobee mucky loamy fine sand (depressional)	410	0.1
	Samsula muck	2,396	0.7

* Less than 0.1 percent
(1) Located in more than one community.
SOURCE: Soil Conservation Service

- Soils of the Sloughs, Hammocks and Drainage-ways

RIVIERA-PINEDA-WABASSO: Nearly level, poorly drained soils; some have a loamy subsoil at a depth of 20 to 40 inches, and some have a dark sandy subsoil underlain by loamy material at a depth of less than 40 inches.

WINDER-RIVIERA-MANATEE: Nearly level, poorly drained and very poorly drained soils that have a loamy subsoil at a depth of 20 inches or at a depth of 20 to 40 inches; some are loamy throughout and have a dark surface layer.

BOCA-WABASSO-RIVIERA: Nearly level, poorly drained soils; some have a loamy subsoil underlain by hard limestone at a depth of 40 inches, some have a dark sandy subsoil underlain by loamy material at a depth of less than 40 inches, and some have a loamy subsoil at a depth of 20 to 40 inches.

MYAKKA-HOLOPAW-POMPANO: Nearly level, poorly drained soils that are sandy to a depth of more than 40 inches; some have a dark sandy subsoil at a depth of 20 to 30 inches, and some have a loamy subsoil at a depth of more than 40 inches.

- Soils of the Freshwater Swamps and Marshes

TERRA-CEIA-GATOR-CANOVA: Nearly level, very poorly drained soils; some are organic throughout, some have a moderately thick organic layer underlain by a sandy clay loam subsoil, and some have a thin organic surface layer underlain by a loamy subsoil at a depth of 20 to 40 inches.

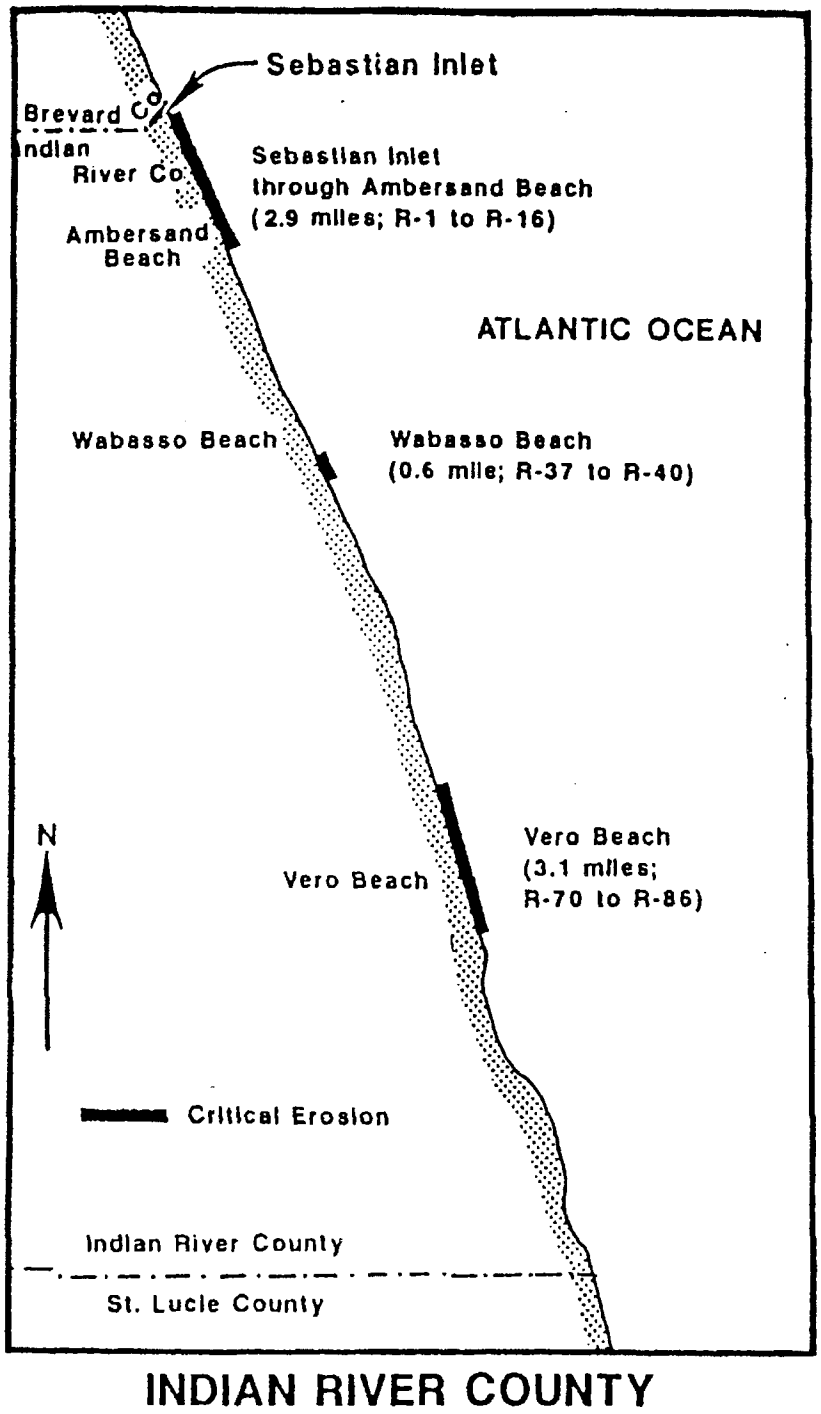
FLORIDAN-DELRAY-HOLOPAW: Nearly level, poorly drained to very poorly drained soils; some have a loamy subsoil at a depth of 20 to 40 inches, some have a loamy subsoil at a depth of more than 40 inches, and some have a dark surface layer that is 10 inches or more thick.

Source: U.S. Department of Agriculture - Soil Conservation Service; Soil Survey of Indian River County, Florida (1987).

Soil Erosion

Erosion is a natural process whereby the effects of water and/or wind displace and transport soil particles. When vegetative cover is removed for urban land development and agricultural operations, soil erosion is exacerbated. Sedimentation is the process where displaced soils are deposited in an undesirable location, such as a receiving body of water. The effects of soil erosion and sedimentation on the Indian River Lagoon (IRL) system are discussed in detail in the surface water quality section of this element.

Figure 8.5: Shoreline Critical Erosion Areas



- Shoreline Erosion

Within Indian River County, soil erosion by water occurs as a result of the natural processes of the Atlantic Ocean on the shoreline beaches and dunes. Along the county shoreline, the Sebastian Inlet impedes the natural southerly downdrift of sand. While the littoral process continues to remove sand from this area, the physical boundary of the inlet prohibits new deposits, resulting in net erosion.

Figure 8.5 depicts the FDEP-designated "Areas of Critical Beach Erosion" in Indian River County. One of these critically eroded areas is Ambersand Beach, a ±2.9 mile section of the unincorporated County that extends from permanent reference monument (PRM) R-1 to PRM R-16.

The two other areas of critical erosion include: Wabasso Beach, a ±0.6 mile segment in the unincorporated County extending from PRM R-37 to R-40, and the beachside central business district (CBD), a ±3.1 mile segment extending from PRM R-70 to R-86.

In the past few years, Indian River County completed two large-scale beach restoration projects. One project was undertaken in 2003 when 500,000 cubic yards of sand were placed along 2.2 miles of beach in the northern end of the county. The other project was undertaken in 2007 when 375,000 cubic yards of sand were distributed along 2 miles of beach in the southern end of the county.

- Erosion Control on Development Sites

In 2006, the Indian River County Public Works Department created a new stormwater division. The stormwater division participates in the design of stormwater systems, educates the public on relevant stormwater topics, educates individuals involved in the design/construction of stormwater control systems, and enforces stormwater and erosion control standards. The stormwater division's objective is to improve water quality in the Indian River Lagoon system by reducing the amount of pollution reaching the lagoon.

Water Resources

Water resources in Indian River County consist of both surface water and groundwater systems. While water is an essential resource for the sustenance of people (and other living communities), an abundance of water is at times considered an obstacle to human habitation. In Indian River County and throughout Florida, alteration is evident in a history of land drainage, mosquito impoundments, and shoreline modifications.

Water supplies in the form of surface water and groundwater have a common link as part of nature's overall hydrologic cycle. As precipitation occurs in the county, some water will evaporate directly back into the atmosphere. Other water is utilized by plants and returns to the atmosphere as result of

evapotranspiration. Also, water will flow over land surfaces as "surface runoff," flowing into surface water bodies. That portion of the water that falls on land and is absorbed directly into the soil recharges the underlying groundwater system.

The term "water table" refers to the minimum soil depth at which groundwater can be found at a given location, subject to seasonal fluctuation as a result of rainfall. Surface water bodies such as lakes, ponds, and palustrine (freshwater) wetlands represent areas where the water table is exposed at ground surface. As depicted in Figure 8.6, surface water and groundwater are integral parts of the hydrologic cycle.

Surface Water

Throughout Indian River County, surface water is found in the form of natural lakes, ponds, rivers, and associated palustrine (freshwater) and estuarine (brackish) wetlands, with some surface water bodies created or altered by man (i.e. canals, stormwater retention ponds and mosquito impoundments). Public benefits associated with surface waters include: floodwater control, groundwater recharge and pollutant removal; habitat for waterfowl, fish and other wildlife; and recreational, educational, commercial and aesthetic functions.

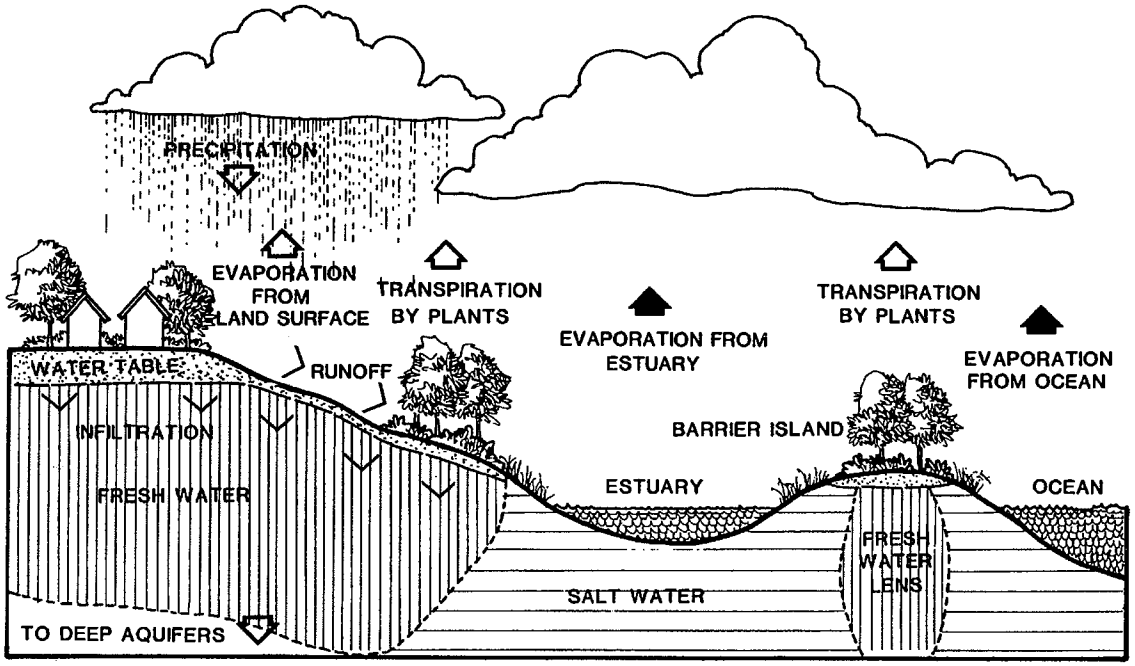
Surface water can be classified into two main categories: wetlands and deepwater habitats. Generally, wetlands are lands where saturation with water is the dominant factor determining the nature of soil development and the types of plant and animal communities living in the soil and on its surface. The U.S. Fish and Wildlife Service's Classification of Wetlands and Deepwater Habitats of the United States (1979) defines wetlands as follows:

> "Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For purposes of this classification, wetlands must have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes [plants adapted to growing in wet soils]; (2) the substrate is predominantly undrained hydric [saturated] soils; and (3) the substrate is non-soil and is saturated with water or covered by shallow water at some time during the growing season of each year."

Deepwater habitats are defined as permanently flooded lands lying below the deepwater boundary of wetlands. Deepwater habitats include environments where surface water is permanent and often deep, so that water, rather than air, is the principal medium within which anaerobic organisms live.

The three predominant surface water systems in Indian River County are: the Upper St. Johns River Basin, which includes Blue Cypress Lake and the St. Johns Marsh; the Indian River Lagoon (IRL) system and associated estuarine wetlands (including mosquito impoundments); and the St. Sebastian River, a tributary draining into the IRL. In addition, isolated freshwater wetlands are located throughout the county. Following is a description of the major surface water systems in Indian River County. A more detailed description of associated vegetation and wildlife is presented under the topic heading of "Flora and Fauna."

FIGURE 8.6



HYDROLOGIC CYCLE

- **Upper St. Johns River Basin**

Blue Cypress Lake is the major natural open water component of the Upper St. Johns River Basin, which serves as the headwaters of the St. Johns River. Besides the lake, the Upper St. Johns River Basin includes the St. Johns Marsh and the Fort Drum Marsh. Presently, the C-54 Canal serves as the major drainage canal to release marsh flood waters into the Indian River Lagoon during extreme storm events.

The area west of Interstate 95 is the natural drainage basin for the St. Johns River. While most of the water in the basin comes from rainfall that falls directly on the marsh, additional water enters the marsh via a number of small streams that flow into the Blue Cypress Lake system. It is estimated that the St. Johns Marsh is approximately one and a half (1½) feet in average depth, extending over an area of approximately 75,000 acres.

Blue Cypress Lake is located on the western edge of the St. Johns Marsh. The lake encompasses approximately 6,555 acres and is the only sizeable lake in Indian River County. The average depth is

approximately eight feet over much of its area. During prolonged dry spells, lake water is sometimes used as a source for agricultural irrigation.

The Upper St. Johns River Basin falls under the jurisdiction of the SJRWMD and is managed cooperatively by the SJRWMD and the Florida Fish and Wildlife Conservation Commission (FWC). The Basin serves a major function in floodwater control, and is of importance as a water source to a number of counties to the north of Indian River County.

Recently, the SJRWMD completed a major restoration project for the Upper St. Johns River Basin. This project involved construction of a number of water control structures and reversion of agricultural lands to wetlands. A benefit of the project is that it reduces the need for freshwater discharge into the IRL via the C-54 canal. By reducing the amount of freshwater flow from the C-54 canal to the IRL, the restoration project has improved water quality in the IRL.

From 1996 through 2006, the St. Johns River Water Management District (SJRWMD) acquired ±12,000 acres within the Upper St. Johns River Basin for water management purposes. In 2007, the SJRWMD acquired an additional 6,000 acres in the upper basin from Fellsmere Joint Venture as part of a 10,000 acre project called the Fellsmere Water Management Area (FWMA).

According to SJRWMD staff, the FWMA project, once constructed, will provide improved water quality in the upper St. Johns River, as well as provide treatment for agricultural runoff, while reducing the occurrence of freshwater releases through the C-54 canal to the Indian River Lagoon. SJRWMD staff estimates that the FWMA project will reduce freshwater discharge through the C-54 to the Lagoon from about one discharge in 25 years to one discharge in 50 years.

In addition to flood water control and irrigation uses, the Upper St. Johns River Basin is utilized for many recreational activities, such as hunting, fishing, camping, boating (which includes canoeing and airboating) hiking, and nature observation. The FWC manages the Upper St. Johns River Basin for wildlife and fisheries and is the principal regulator of recreational activities in the area.

- **Indian River Lagoon**

Combined with the Mosquito Lagoon and the Banana River, the Indian River Lagoon (IRL) is part of the longest estuarine system in the State of Florida, extending approximately 156 miles from the Ponce de Leon Inlet to Hobe Sound. Due to its geographic location, the IRL is the most ecologically diverse estuarine system on the North American continent. As such, the Indian River Lagoon has been given the distinction of being designated an "Estuary of National Significance".

Within Indian River County, the IRL extends roughly 22.4 miles, and covers approximately 16,300 acres at an estimated average depth of three feet. Originally, the Indian River Lagoon's natural drainage basin extended westward to the Atlantic Coastal Sand Ridge, which roughly parallels and is

proximate to U.S. Highway #1 in Indian River County. In the early-1920's, however, three F.S. 298 Special Water Control Districts operating in Indian River County began constructing a network of drainage canals that artificially expanded the IRL watershed.

Now, four major canals in Indian River County outfall into the IRL. These canals are: the North Relief Canal (located just north of the Gifford area); the Main Relief Canal (located just north of the Merrill-Barber Bridge); the South Relief Canal (located just south of 4th Street), and the C-54 Canal (located proximate to the Indian River-Brevard County line). Combined, these canals discharge approximately 188 million gallons per day (MGD) of freshwater to the IRL.

- Intracoastal Waterway

The deepest part of the IRL is a manmade channel, the Atlantic Intracoastal Waterway (ICW). The ICW was dredged to provide safe passage for watercraft along the east coast. In 1881, the original construction was started by the Florida East Coast Canal Company. Later, the project was adopted by the U.S. Army Corps of Engineers (ACOE). In the mid-1950s, the ICW in Indian River County was dredged to a depth of 14 feet, but has not been dredged since that time. Due to sedimentation, the current depth of the ICW is approximately nine feet.

When the ICW channel was dredged, 49 spoil islands were created within the Indian River County portion of the Indian River Lagoon. These artificially created islands are discussed under the heading "Spoil Islands".

- **St. Sebastian River**

Located in the northern portion of the county, the St. Sebastian River is a major source of freshwater inflow into the IRL. The South Prong of the St. Sebastian River extends from its headwaters near C.R. 510 (85th Street) to the Indian River-Brevard County Line, where it discharges into the Indian River Lagoon near the Sebastian Inlet. The deepwater portion of the South Prong covers approximately 500 acres.

According to U.S. Fish and Wildlife Service National Wetlands Inventory Maps, the St. Sebastian River is classified as a freshwater riverine system, which becomes an estuarine subtidal system as it approaches its confluence with the IRL. Similar to the IRL, the natural watershed boundaries of the St. Sebastian River have been extended by connecting drainage canals to the river. The major canal influence is the east-west C-54 canal, extending from the Upper St. Johns River Basin to the St. Sebastian River, just north of the Indian River County line.

Among its various functions, the St. Sebastian River plays host to transit fish normally associated with estuarine systems. While the upper part of the South Prong is freshwater, marine fish such as mullet, spot, lady fish, tarpon, and snook nurse as far up the river as the C.R. 512 over-pass. Four

species of tropical marine fish occurring in the St. Sebastian River are considered rare in Florida waters. These are the opossum pipefish, river goby, slashcheek goby, and the bigmouth sleeper. The presence of these fish represent just one important habitat-value aspect of the river; a more detailed look at this ecological community is presented under the "Flora and Fauna" heading of this element.

Approximately 500 acres of palustrine (freshwater) wetlands are present along the South Prong of the St. Sebastian River. These riverine wetlands are an integral part of the river and provide benefits such as pollution filtration, floodwater storage, and habitat diversity.

In addition to its biological value, the St. Sebastian River is a natural scenic corridor that is utilized for recreational activities, including powerboating, canoeing, fishing, and wildlife observation. Along the river, stormwater from adjacent land uses, canals, and drainage ditches has been identified as a concern regarding pollution loading impact. Water quality concerns are addressed in the following section and are discussed in detail in the Stormwater Management Sub-Element.

In 2006, the County adopted a conceptual management plan for the St. Sebastian River Greenway. The St. Sebastian River Greenway extends from approximately one mile south of CR 510 (85th Street), northward along the South Prong, to the river's intersection with the C-54 Canal at the north county line (approximately five miles). The purpose of the greenway plan is to conserve river resources while affording an opportunity for public access along the greenway's length. In implementing the greenway plan, the County has acquired conservation lands to provide a buffer to the St. Sebastian River and to enhance recreational access opportunities along the river.

Surface Water Quality

Surface waters of the State of Florida are classified according to designated uses. Class II waters are designated for "shellfish propagation or harvesting," while Class III waters are designated for "recreation, propagation and maintenance of a healthy, well-balanced population of fish and wildlife."

[*Note: In 2009, the FDEP began a comprehensive review of the state's surface water classification system. Relating to that review, the State has initiated rulemaking to adopt quantitative nutrient water quality standards ("numeric nutrient criteria") to facilitate the assessment of designated use attainment for its waters and to provide a better means to protect state waters from the adverse effects of nutrient over-enrichment. Until those criteria are formally adopted, however, the Class II and Class III designations remain in effect.*]

- Indian River Lagoon Water Quality

Figure 8.7 identifies Class II and Class III designated waters in the IRL, as well as areas conditionally approved for shellfish harvesting. Also, waters of the IRL in the unincorporated county have been

designated as Outstanding Florida Waters (OFW) and are afforded the highest levels of protection through the FDEP. The portions of the IRL with an OFW designation are depicted in Figure 8.8.

Overall, water quality throughout the IRL system in Indian River County is good. In certain areas, however, water quality is degraded. These areas include lagoon waters in the vicinity of Vero Beach and the St. Sebastian River.

According to the IRL National Estuary Program (IRLNEP), the overall lagoon experienced a net gain in seagrass coverage of nearly 4,000 acres from 1992 to 1999. In 2007, an EPA National Estuary Program Coastal Condition Report noted that areas with good seagrass coverage tend to be located adjacent to undeveloped watersheds or close to inlets, with sparse seagrass coverage located adjacent to developed areas, tributaries, and major drainage systems. Consistent with that finding, seagrass coverage in Indian River County is sparsest in the Vero Beach narrows area.

To lessen pollution impacts from stormwater entering the Lagoon from canal systems, the County, since 2000 has constructed sub-regional stormwater treatment facilities in Vero Lake Estates, Gifford and Roseland. The county has also approved the construction of two manmade treatment "marshes:" the Egret Marsh and the Spoonbill Marsh. While Egret Marsh will utilize natural biotic processes to treat stormwater, Spoonbill Marsh will treat brine effluent generated by county water treatment facilities.

In 2008, the County constructed a pollution control facility in the Main Relief Canal. This facility uses "series screening methodology" designed to remove litter and debris from up to 300 million gallons per day that outflow into the Indian River Lagoon.

Recently, a SJRWMD study found that one in 10 acres (10%) of the Indian River Lagoon bottom is covered in muck. In 22 of 72 sites tested (lagoon-wide), muck was found to be 39 inches or more in depth. According to the study, only one of these same 72 sites had muck 39 inches or deeper in 1989.

- St. Sebastian River Water Quality

In 2006 and 2007, approximately 800,000 cubic yards of muck were removed from the St. Sebastian River as part of a $20 million project conducted by the SJRWMD. The muck removal project is expected to be completed in 2009, at which time the muck removal will total approximately two million cubic yards. Despite the muck removal project, water quality in the St. Sebastian River, in 2007, failed to meet the designation of Class III (swimming and fishing).

In 2007, the SJRWMD finished construction of the 166 acre Sebastian Stormwater Park, located within the City of Sebastian along the Collier canal and the Elkam waterway, two canals which discharge into the South Prong of the St. Sebastian River. According to a U.S. Environmental Protection Agency (EPA) report, the Stormwater Park will reduce total suspended solids entering the South Prong by

173,280 pounds annually. The park is also projected to reduce annual nitrogen and phosphorous discharge into the South Prong by 3,749 pounds and 1,034 pounds, respectively.

- Man-made Ponds

According to county regulations, littoral zones, consisting of native vegetation planted on the edges of waterbodies, are required for ponds constructed on development project sites larger than 10 acres. Littoral zones contribute to water quality treatment as well as provide limited wildlife habitat.

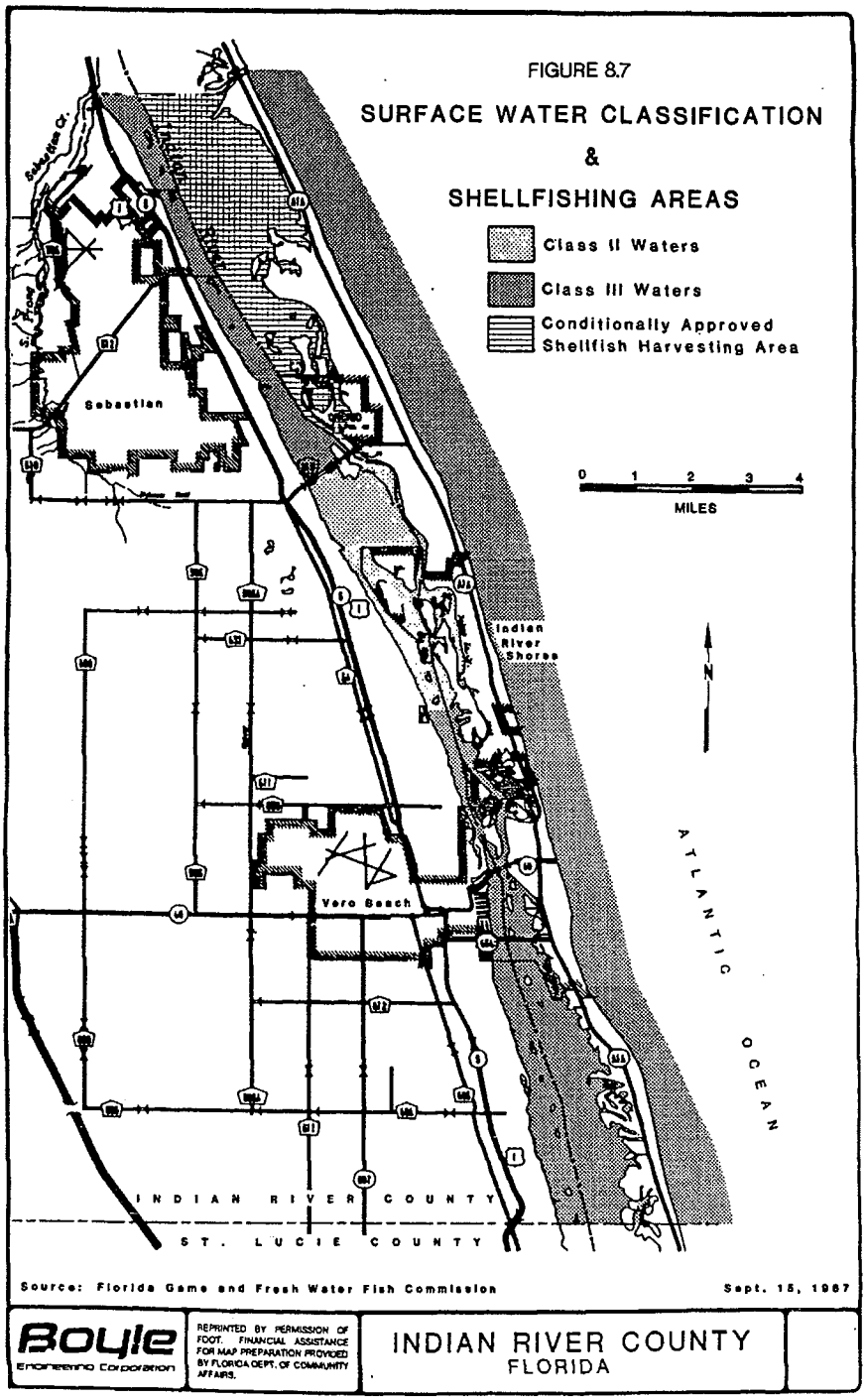


FIGURE 8.7
SURFACE WATER CLASSIFICATION
&
SHELLFISHING AREAS
Class II Waters
Class III Waters
Conditionally Approved Shellfish Harvesting Area
0 1 2 3 4
MILES
N
Sebastian
Indian River Shores
Vero Beach
ATLANTIC OCEAN
INDIAN RIVER COUNTY
ST. LUCIE COUNTY
Source: Florida Game and Fresh Water Fish Commission
Sept. 15, 1987
Boyle Engineering Corporation
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INDIAN RIVER COUNTY
FLORIDA

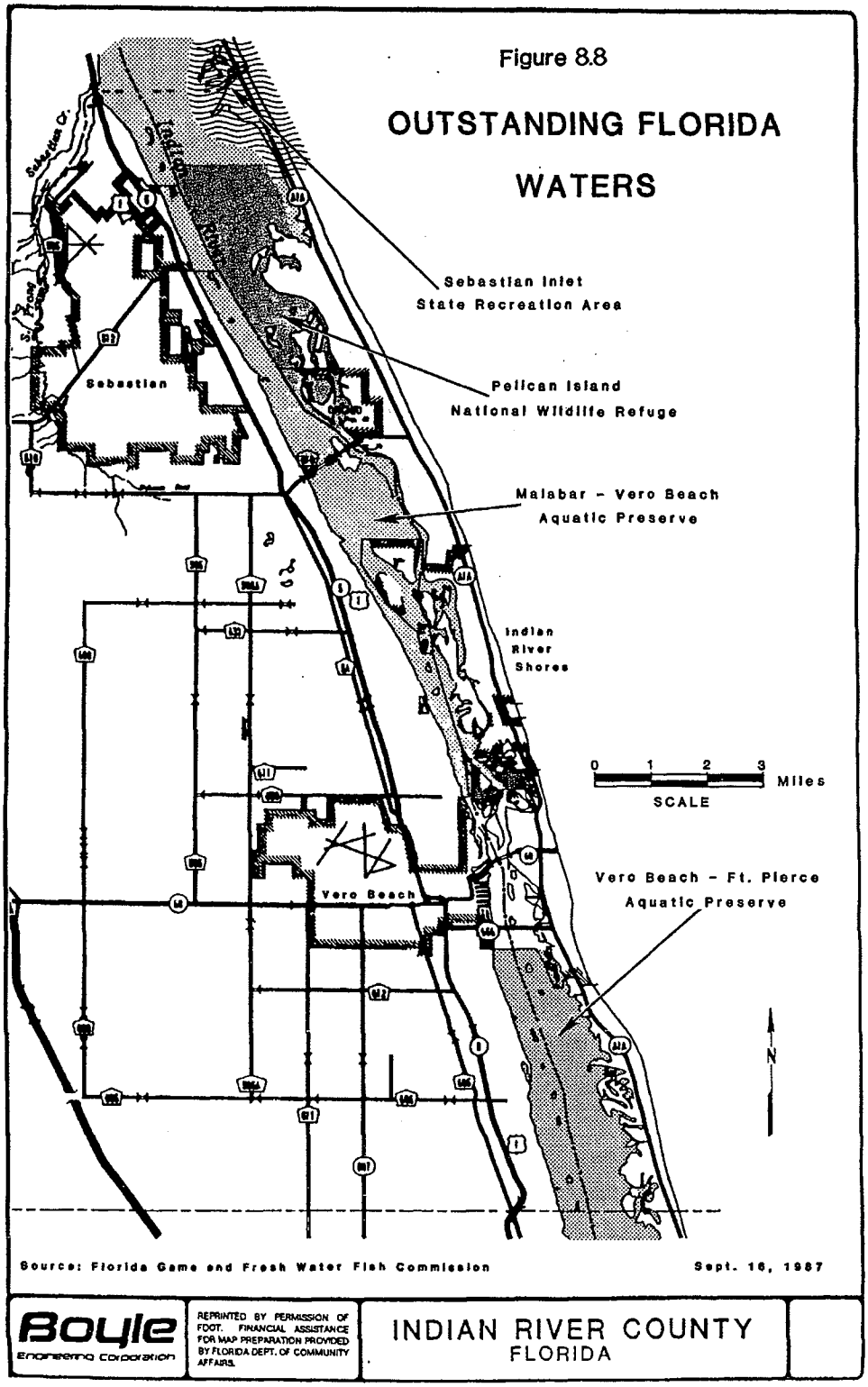
Figure 8.8
OUTSTANDING FLORIDA WATERS
Sebastian Inlet State Recreation Area
Pelican Island National Wildlife Refuge
Malabar - Vero Beach Aquatic Preserve
Indian River Shores
Vero Beach
Vero Beach - Ft. Pierce Aquatic Preserve
Sebastian
0 1 2 3 Miles
SCALE
N
Source: Florida Game and Fresh Water Fish Commission
Sept. 16, 1987
Boyle Engineering Corporation
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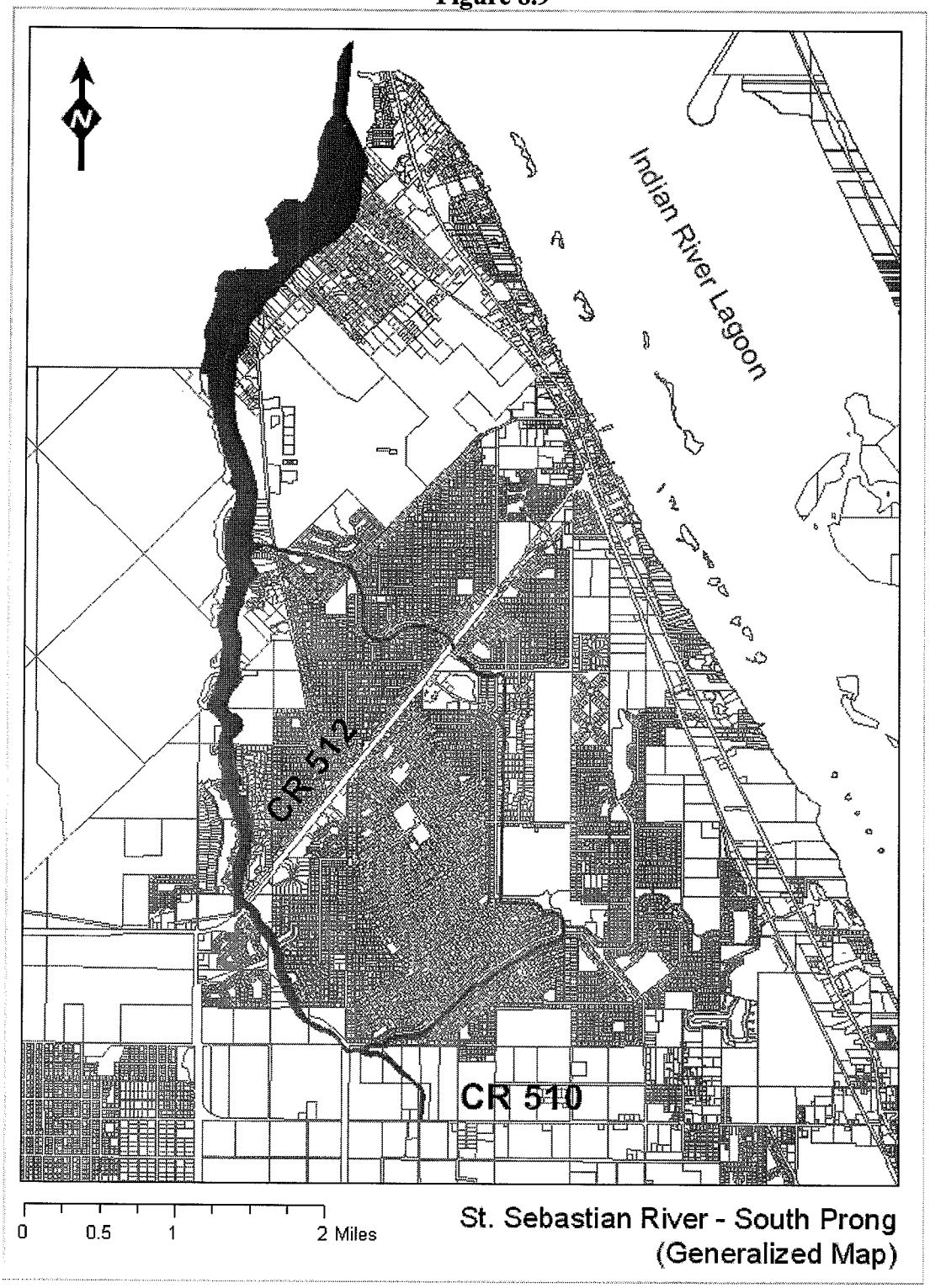
INDIAN RIVER COUNTY
FLORIDA

Figure 8.9


N
Indian River Lagoon
CR 512
CR 510
0
0.5
1
2 Miles
St. Sebastian River - South Prong
(Generalized Map)

- **Wetlands**

In addition to the County's three predominant surface water systems, isolated palustrine wetlands exist throughout Indian River County. The term "isolated" is used to refer to wetlands that are not hydrologically connected to waters of the state and that are hydrologically separated from other wetlands by upland areas.

Several types of wetlands are found within Indian River County. Brackish (estuarine) wetlands, commonly referred to as salt marshes and mangrove swamps, are apparent along the Indian River Lagoon. Interior to the county, a variety of freshwater (palustrine) wetlands occur; these include cypress domes, swamp hardwoods, bayheads, wet prairies, sloughs, and freshwater marshes. Each of these wetlands have vegetation and wildlife typically found in association with them, as described in detail under "flora and fauna." Table 8.2 presents an acreage estimate of wetland resources in Indian River County. The county's Comprehensive Wetlands Management Plan (CWMP) is discussed in the analysis section of this element.

Other surface waters include wet retention lakes and ponds created for stormwater control within development projects. In many cases, these are aesthetically pleasing, may be used for recreation, and add to the diversity of habitat for urban wildlife.

TABLE 8.2
WETLANDS AND DEEPWATER RESOURCES OF INDIAN RIVER COUNTY

Freshwater Wetlands	St. Johns Marsh	75,000
	Blue Cypress Lake	6,500
	Freshwater Marsh	6,300
	Wet prairie/pine Flatwood wetlands	4,700
	St. Sebastian River	500
	Openwater	500
	Total Acreage	93,500
Estuarine Wetlands	Indian River Lagoon	16,300
	Mangrove scrub-shrub wetland	2,400
	Salt Marsh	1,100
	Mixed mangrove/salt marsh	1,200
	Total Acreage	21,000
ESTIMATED TOTAL ACREAGE (rounded to nearest 100 acres)		114,500

SOURCE: FDEP Bureau of Geology

- **Wetland Regulations**

    - Federal Regulations

A number of agencies have regulatory jurisdiction pertaining to wetlands. At the federal level, Section 404 of the Clean Water Act (CWA) requires anyone proposing to drain, fill or otherwise alter a wetland to obtain a permit from the U.S. Army Corps of Engineers (ACOE). While enforcement of federal wetland regulations is the responsibility of the ACOE, the U.S. Environmental Protection Agency (EPA) may request to review Section 404 wetland permits issued by the ACOE. For its review, the EPA has adopted a policy which calls for "no overall net loss of the nation's remaining wetlands base, as defined by acreage and function, and to restore and create wetlands, where feasible, to increase the quantity of the nation's wetlands resource base". At the federal level, the U.S. Fish and Wildlife Service (USFWS), Natural Resource Conservation Service (NRCS), and U.S. Geological Survey (USGS) serve in an advisory capacity.

With respect to wetland losses that have been caused by agricultural drainage and related activities, the federal government has taken a tougher stance on wetland conversions to uplands. Known as the "swampbuster" provision, Section 1221 of the Food Security Act of 1985 denies federal farm benefits to farmers who convert wetlands to dry cropland. Also, the Tax Reform Act of 1986 altered previously favorable tax treatment afforded land clearing, drainage and filling of wetlands for farmlands. Moreover, the Act kept intact deductions for gifts of conservation easements. At the local level, Indian River Soil and Water Conservation District (IRSWCD) staff identifies areas of potential wetlands losses and assist farmers in developing soil conservation plans.

    - State Regulations

On the state level, the Warren S. Henderson Wetlands Act of 1984 enables the Florida Department of Environmental Protection (FDEP) to regulate impacts on tidal and non-tidal wetlands. Accepted mitigation measures at the state level that limit wetland losses include the protection, enhancement, or creation of a habitat similar to that expected to be affected by a proposed project. Within Indian River County, the FDEP - Melbourne District Office performs inspections, delineates jurisdictional wetland boundaries, and enforces state regulations on parcels of land less than five (5) acres in size. For parcels larger than five (5) acres, wetland delineations, inspections, and enforcement responsibility has been delegated by the FDEP to the St. Johns River Water Management District (SJRWMD). Other state agencies that are involved with the regulation and/or technical review of wetland values and functions include the Florida Fish and Wildlife Conservation Commission (FWC) and the Governor's Technical Subcommittee on Managed Marshes (SOMM).

In 2004, The FDEP adopted the Uniform Mitigation Assessment Method (UMAM). The UMAM is used to determine the amount of mitigation needed to offset adverse impacts to wetlands and other surface waters.

- Regional Policies

In its strategic regional policy plan, the Treasure Coast Regional Planning Council (TCRPC) has established policies to protect wetlands and deepwater habitats associated with Developments of Regional Impact (DRIs). These policies restrict the alteration, degradation, or destruction of wetlands and deepwater habitats, except in specific instances; call for mitigation through creation, restoration and/or enhancement of wetland functions and values; and require the establishment or maintenance of a buffer zone of natural upland edge vegetation around constructed or preserved wetlands or deepwater habitat on new development sites.

- Local Regulations

In September 1990, Indian River County adopted a wetlands protection ordinance to implement policies in the County's 1990 comprehensive plan. Because state law pre-empts local governments from requiring wetland mitigation inconsistent with or in addition to state regulation of wetlands, the County defers to state and federal agencies in determining mitigation for wetland impacts regulated through the county wetlands ordinance.

- **Floodplains**

Flooding is a temporary condition of partial or complete inundation of normally dry land areas. Generally, a floodplain is any land area that is susceptible to flooding from a 100-year or more storm event (i.e., a storm event producing an amount of rainfall that has a one (1) percent chance of being equaled or exceeded during a given year). The occurrence of flooding is a concern for communities located in low-lying areas, near a waterbody, or along the coast. As depicted in Figure 8.10, most of the land area of Indian River County lies within the 100 year floodplain.

Although flooding can occur throughout the Indian River County area anytime during the year, flooding is most frequent during the rainy season from May to October. In Indian River County, streams and canals in the "inter-ridge" area (between the Ten Mile Ridge near Interstate 95 and the Atlantic Coastal Sand Ridge near U.S. Highway #1), as well as those that discharge into the St. Johns River, are subject to flooding from prolonged heavy rainfall. Many low inland areas, areas proximate to palustrine wetlands, and areas having soils with poor drainage characteristics and/or a high water table are also subject to flooding during wet periods.

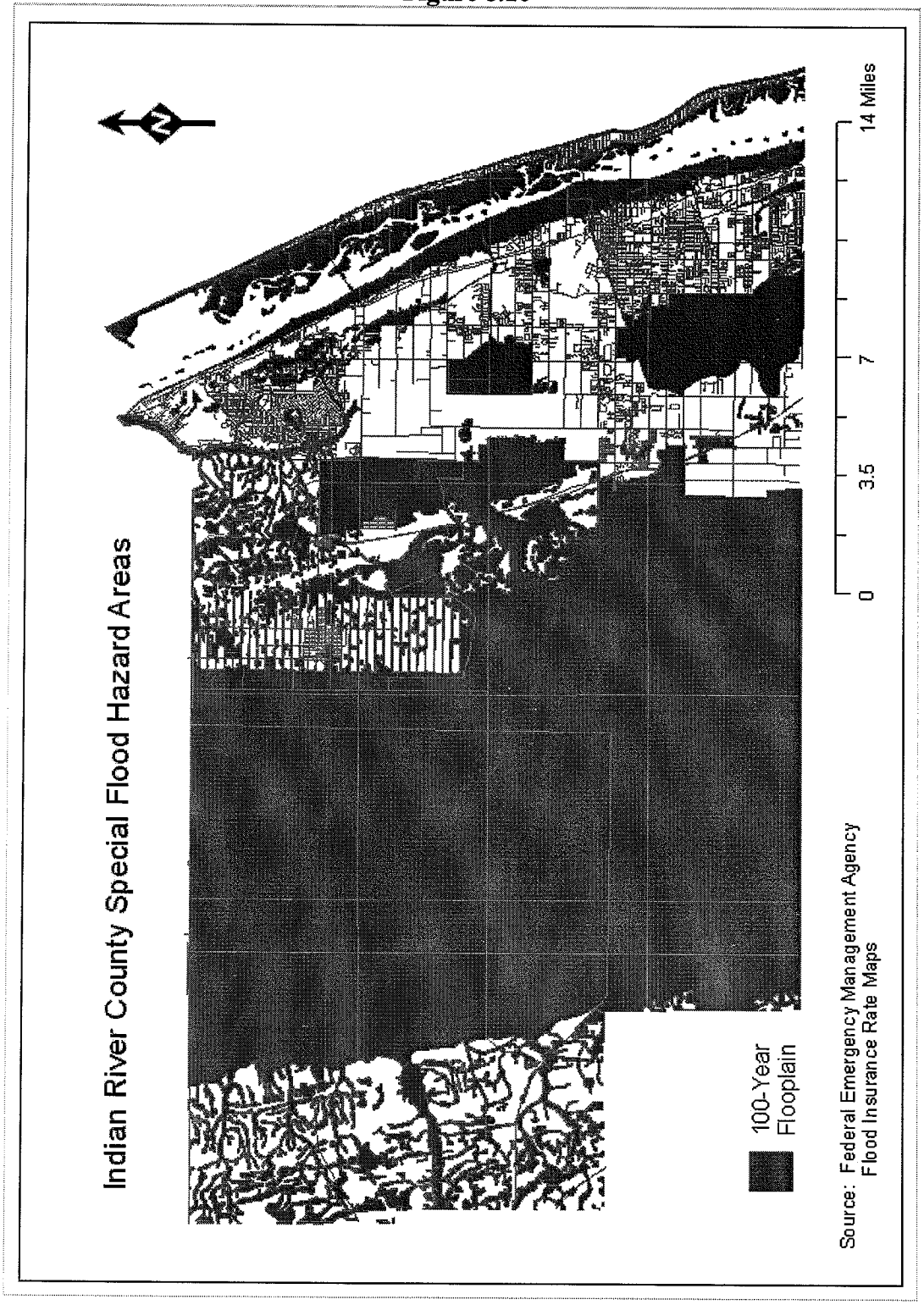
Generalized floodprone areas within the IRL watershed include:

- the Barrier Island, south of the City of Vero Beach;
- the Barrier Island, north of the City of Indian River Shores;

- the mainland, between the IRL and the Atlantic Coastal Sand Ridge (U.S. Highway #1);
- the mainland, proximate to the Ten Mile Ridge (Interstate 95); and,
- the St. Johns River watershed.

While coastal areas of the county on the ocean are subject to storm surge flooding in the event of hurricane or tropical storm activity, areas near the IRL may experience flooding from a storm surge caused by hurricane winds piling water against the shoreline and/or the heavy rainfall that accompanies storms. According to a flood insurance study by the Federal Emergency Management Agency (FEMA), storm surge levels as high as 4.5 feet above mean sea level (MSL) have been recorded along the IRL. On the open coast, storm surge levels in the Atlantic Ocean have been as high as 5 feet above MSL in Indian River County and 6 to 8 feet at the Ft. Pierce Inlet. In Indian River County, heavy northerly or northeasterly winds are of particular concern. These winds can result in water piling in the "Narrows" section of the IRL.

Figure 8.10


Indian River County Special Flood Hazard Areas
N
0
3.5
7
14 Miles
100-Year Flooplain
Source: Federal Emergency Management Agency
Flood Insurance Rate Maps

While floodplains provide for the natural overflow of waterbodies during flood events, wetland floodplains also are valuable in their support of plant and animal resources, and provide for open space and recreation opportunities. As such, preservation of floodplains is beneficial both from an environmental and economic standpoint. Due to the desirability of property overlooking the scenic waterbodies of the Atlantic Ocean and IRL, coupled with the county's growing population, development in the County's floodplains is inevitable. Floodplain management techniques and regulations are discussed in further detail in the Stormwater Management Sub-Element and the Coastal Management Element.

Groundwater

In Indian River County, groundwater is utilized for water supply. Throughout the county, groundwater is present beneath the surface of the ground in the "zone of saturation," where every pore space between soil particles is saturated with water. This zone of saturation is an aquifer. An aquifer is a geological formation which is capable of yielding a useful amount of water to a well or spring, and has at least one horizontal confining (impervious) layer. Two distinct groundwater aquifers, the surficial aquifer and the Floridan aquifer, underlie Indian River County. The Natural Groundwater Aquifer Recharge Sub-Element of the Comprehensive Plan describes these aquifers in detail.

- Surficial Aquifer

The surficial aquifer is located in the top stratum of soil, extending from the water table to the Hawthorn Formation (approximately 200 feet below the surface). Water quality in the surficial aquifer varies depending upon the location in the County. Although water from the surficial aquifer often contains high amounts of ingredients that produce "hard" water, water quality is generally considered good due to chloride concentrations that average less than 60 milligrams per liter (mg/L). Therefore, water from the surficial aquifer is suitable for drinking with minimal treatment and costs less to produce than water supplied by the Floridan aquifer. This aquifer serves as the principal water supply for the City of Vero Beach and for most of the domestic wells located throughout the County.

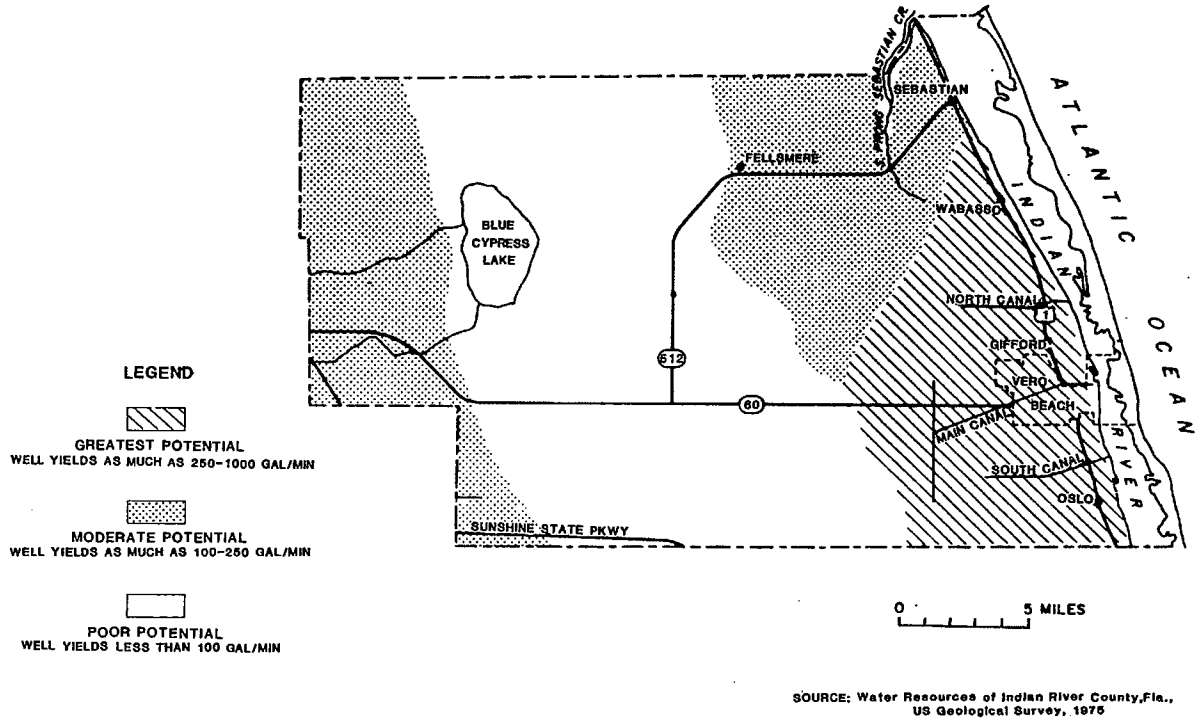
The surficial aquifer is directly replenished by rainfall that does not return to the atmosphere by evapotranspiration or surface runoff. Due to the relatively high chloride content of water withdrawn from the Floridan aquifer, recharge of the surficial aquifer resulting from agricultural irrigation runoff is a concern. Depending upon soil percolation, rainfall, and the amount of impervious surface area, the recharge rate of the surficial aquifer is approximately 12 to 16 inches per year within Indian River County.

In areas of the County having the greatest wellfield potential, the natural recharge rate averages 16 inches annually. Within the surficial aquifer, high yielding wells are located near the coast, south of

the City of Sebastian, while wells with moderate yields are located proximate to the Atlantic Coastal Sand Ridge, west of U.S. Highway #1 in the eastern portion of the county. The western portion of the county exhibits lower yields. Figure 8.11 depicts the locations of high, moderate and low wellfield potential.

FIGURE 8.11

POTENTIAL YIELDS OF WELLS TAPPING THE SHALLOW AQUIFER



SOURCE: Water Resources of Indian River County,Fla., US Geological Survey, 1975

According to the SJRWMD, extensive withdrawal of water from the surficial aquifer in the area of the Atlantic Coast Sand Ridge eastward to the IRL has resulted in salt water intrusion. Saltwater intrusion is evident in most sections of the county located east of U.S. Highway #1.

- Floridan Aquifer

The Floridan aquifer underlies the Hawthorn Formation at a depth from 250 to 2,700 feet below the surface. In contrast to the surficial aquifer, the Floridan aquifer is confined and generally uniform. Due to these characteristics, the potentiometric surface (the level to which water would rise if it were not confined) of the aquifer is above the land surface throughout most of Indian River County. While local recharge areas of the Floridan aquifer are limited to the extreme western portion of the

county, these recharge areas in the County contribute less than two inches annually. Prime aquifer recharge areas of the Floridan aquifer are located northwest of Indian River County.

For wells tapping the Floridan aquifer, the estimated yield averages approximately 650 gallons per minute (GPM). Except for the Sebastian Freshwater Lens, the water quality of the Floridan aquifer throughout most of the County is characterized by concentrations of chlorides and total suspended solids (TSS) in excess of FDEP standards for drinking water. As such, water must be treated before it is considered fit for human consumption. The preferred method of treatment in Indian River County is Reverse Osmosis (RO). A detailed discussion of the RO treatment process and the County's water treatment facilities is presented in the Potable Water Sub-Element of the Comprehensive Plan.

The Sebastian Freshwater Lens is a naturally occurring pocket of potable water. This pocket extends from Floridana Beach in southern Brevard County to Wabasso Beach in the east central portion of Indian River County. Due to increased human consumption and irrigation, the areal extent of this pocket has experienced an ongoing decline. The largest ongoing decrease in the potentiometric surface has been documented in the Wabasso Beach area. This is cause for concern, since this water cannot be replenished.

Throughout the county, discharges from the Floridan aquifer occur from abandoned flow wells. Since these discharges cause various detrimental effects, there is an emphasis on plugging abandoned flow wells and eliminating Floridan aquifer discharges. Plugging abandoned flow wells contributes to water conservation, reduces chloride contamination of the surficial aquifer, and in some cases reduces freshwater discharges to the IRL. Since 1989, Indian River County and the SJRWMD have jointly sponsored a cost-share program to plug or repair abandoned flow wells. During that time, over 375 abandoned flow wells have been plugged or repaired, saving millions of gallons per day in groundwater.

Water Use

Water use in Indian River County can be classified into the following categories: public supply, domestic self-supply (private residential wells), commercial/industrial self-supply, recreation, and agricultural irrigation.

In 2005, ±95.81 million gallons per day (MGD) of groundwater were consumed in Indian River County. Of that amount, 18.44 million gallons, or 19.3% of total daily groundwater consumption, were consumed domestically, while 0.56 million gallons per day, or 0.5% of total daily groundwater consumption, were used in commercial/industrial applications. A total of 2.58 million gallons per day, or 2.7% of total daily groundwater consumption, was used for recreation. The 2005 breakdown of daily water consumption in Indian River County is as follows:

TABLE 8.3: 2005
ESTIMATED WATER WITHDRAWALS BY USE CATEGORIES

	(MGD)
Public supply	**16.76**
Domestic self supply	**1.68**
Commercial/industrial	**0.56**
Recreation	**2.58**
Agricultural	**52.03**
Estimated Abandoned Flow Wells	**22.20**

In 2005, per capita domestic water consumption averaged 143 gallons per day. According to an estimate by the St. Johns River Water Management District, there are currently 33,587 private wells in the county.

Recently, the Indian River County Utility Services Department began work on an alternative water supply master plan to address future water demand. Besides currently utilized groundwater sources, alternative water sources, including desalination of seawater, surface sources, and alternative subsurface sources, are being studied.

Water Conservation

- St. Johns River Water Management District

The St. John River Water Management District (SJRWMD) is mandated by the Water Resources Act of 1972 to promote the conservation, development and proper utilization of surface and groundwater (Section 373.013, F.S.). For that reason, the District has incorporated water conservation in its policy development, and has public information available for water conservation techniques. Through its water conservation program, the SJRWMD actively promotes the use of xeriscape - drought-tolerant landscape - for residential and commercial developments. The SJRWMD also has the authority to declare water shortage warnings and to implement water use restrictions within the county during periods of water shortage.

As previously mentioned, the SJRWMD has an on-going program to identify and plug abandoned free-flowing artesian wells, as mandated by Section 373.207 of the Florida Statues. Since 1989, Indian River County has been a participant in the joint cost-share well-capping program. Under the well-capping program, the County and the SJRWMD each contribute 50 percent of the annual cost of the program.

As per Chapter 62-40.412, the SJRWMD restricts inefficient irrigation practices; requires the installation of water conserving domestic fixtures; and prohibits landscape irrigation between 10 a.m. and 4 p.m.

- Indian River County

The County's Landscape Ordinance (LDR Chapter 926) requires the use of water conserving landscape for new developments. These regulations require:

- A minimum of 50 percent of all new landscape material to be "moderately" to "very" drought tolerant.
- An underground irrigation system for all new development, unless specifically exempt.
- All new irrigation systems to connect to wastewater effluent lines when available. In the event that wastewater effluent lines are not available, new irrigation systems must be designed for connection to proposed wastewater effluent lines.

Presently, Indian River County does not have a water conservation program at the local level. Additional information regarding water conservation is contained in the Natural Groundwater Aquifer Recharge Sub-Element and the Potable Water Sub-Element.

Rare, Threatened and Endangered Species

Largely due to sub-tropical climatic conditions, Florida is host to many species of flora and fauna that are not found in other areas of the United States. The survival of these flora and fauna species depends on many factors and living needs that vary with individual species. For example, some species, such as numerous amphibian and reptile species, are habitat "specialists," where resident species have small home range sizes with resource requirements that may be provided within a single isolated wetland. At the other extreme, large, frequently wide-ranging species, such as bald eagles, mink, or the Florida panther, may be no less dependent on wetlands for specific life needs, but they cannot be restricted to, nor contained within, a small tract of wetland. Species such as these utilize two or more specific habitat types within a regional landscape in order to meet their life requirements.

As development continues and loss of natural areas and habitat fragmentation occurs, the survival of various species is threatened, with wide-ranging species becoming more vulnerable to automobile collisions or obstacles to migration. Area-sensitive or interior species that reproduce only in the interior of large tracts of wetlands or uplands are vulnerable to a reduction in the size of individual component wetlands/uplands as well as a reduction in total wetland/upland acreage. Some species, especially wide-ranging carnivores or raptors, have minimum areal needs to prevent loss of their population's genetic integrity. Fragmentation of ecological communities may also result in an increase of species common to disturbed environments (e.g. starlings, crows, raccoons, cowbirds).

These species often compete with or feed upon native species.

In Florida, official lists of endangered and potentially endangered flora and fauna have been developed by the Florida Fish and Wildlife Conservation Commission (FWC), the Florida Department of Agriculture and Consumer Services (FDA), and the U.S. Fish and Wildlife Service (USFWS). Tables 8.4A and 8.5B are inclusive lists of the endangered and potentially endangered species of fauna and flora present in Indian River County.

The Florida Natural Areas Inventory (FNAI) has developed maps of habitat priorities in Indian River County and throughout Florida. These priority areas are based on biodiversity of flora and fauna species, with the more diverse areas being of higher priority. FNAI habitat priority areas in Indian River County are depicted in Figure 8.12.

TABLE 8.4A
STATUS OF SPECIES OF FAUNA IN INDIAN RIVER COUNTY

SCIENTIFIC NAME	COMMON NAME	Designated Status		COMMUNITY
		FWC	USFWS	
REPTILES & AMPHIBIANS:				
Alligator missippippiensis	American alligator	SSC	T(S/A)	7,8,9,10,12
Caretta caretta	Atlantic loggerhead turtle	T	T	1,14,15
Chelonia mydas mydas	Atlantic green turtle	E	E	1,14,15
Dermochelys coriacea	Atlantic leatherback turtle	E	E	1,15
Drymarchon corais	Eastern indigo snake	T	T	2,3,4,5,6,10
Eretmocheyl imbricate	Atlantic hawksbill turtle (1)	E	E	1,15
Gopherus poluphemus	Gopher tortoise	T	T	1,2
Lepidochelys kempi	Atlantic Ridley turtle (1)	E	E	1,15
Neoseps reynoldsi	Sand skink	T	T	2
Nerodia fasciate taeniate	Atlantic salt marsh snake	T	T	8,9
Pituophis melanoleucus	Florida pine snake	SSC	-	2,6
BIRDS:				
Ajaia ajaia	Roseate spoonbill	SSC	-	8,9,14,16
Aphelocaoma coerulescens	Florida scrub jay	T	T	2
Aramus guarauna	Limpkin	SSC	-	10,12
Egretta caeruleau	Little blue heron	SSC	-	12
Egretta rufescens	Reddish egret	SSC	-	8,9
Egretta thula	Snowy egret	SSC	-	12
Egretta tricolor	Tricolored (Louisiana) heron	SSC	-	12
Falco peregrinus tundrius	Arctic peregrine falcon	E	-	1,3,8,9,12

TABLE 8.4A
STATUS OF SPECIES OF FAUNA IN INDIAN RIVER COUNTY

SCIENTIFIC NAME	COMMON NAME	Designated Status		COMMUNITY
		FWC	USFWS	
BIRDS:				
Falco sparverius paulus	Southeast American kestrel	T	-	3,4,5,6,7,8,9,10,11,12,13
Grus canadensis pratensis	Florida sandhill crane	T	-	3
Haematopus palliates	American oystercatcher	SSC	-	1,8,9
Haliaetus leucocephalus	Bald eagle	T	T	2,3,4,6,7,10,11,12,13
Mycteria americana	Wood stork	E	E	7,8,9,10,12
Pelecanus occidentalis	Brown pelican	SSC	-	9
Picoides borealis	Red-cockaded woodpecker	T	E	3
Polyborus plancus	Audubon's crested caracara	T	T	3
Speotyto Cunicularia	Burrowing owl	SSC	-	3,4,13
Sterna antillarum	Least tern	T	-	1
FISH:				
Acipenser oxyrhynchus	Atlantic sturgeon	SSC	T	14,15
Centropomus undecimalis	Common snook	SSC	-	9,14,15
Rivulus marmoratus	Mangrove rivulus; rivulus	SSC	-	14,15
MAMMALS:				
Balaena glacialis	Right whale (2)	E	E	15
Bahaenoptera borealis	Sei whale (2)	E	E	15
Bahaenoptera physalus	Finback whale (2)	E	E	15
Fells concolor coryi	Florida panther (1)	E	E	3,4,6,7,10,11,12,13
Megapter novaeangliae	Humpback whale (2)	E	E	15
Peromyscus polionontus niveiventris	Southern beach mouse	T	T	1
Physter catodon	Sperm whale; cachalot (2)	E	E	15
Trichechus manatus	West Indian (Florida) manatee	E	E	14,16
Ursus americanus	Black bear (1)	T	-	3,7,10,11

(1) The Florida black bear has not been documented in Indian River County in recent years, though some sources reference potential habitat in the western county. The Atlantic hawksbill turtle and the Atlantic Ridley turtle potentially utilize the coastal waters of Indian River County.

(2) The listed whales potentially utilize Atlantic waters off coastal Indian River County. The Atlantic right whale is the species most often reported in nearshore Florida waters.

TABLE 8.4B
STATUS OF SPECIES OF FLORA IN INDIAN RIVER COUNTY

SCIENTIFIC NAME	COMMON NAME	Designated Status		COMMUNITY
		DACS	USFWS	
Asclepias curtissii	Curtiss (sandhill) milkweed	E	-	2
Cereus eriophorus	Indian River prickly apple	E	E	2
Cereus gracilis	West coast Prickly apple	E	-	9
Dicerandra immaculata	Lakela's (Olga's) mint	E	E	2
Ernodea littoralis	Beach creeper	T	-	1
Myrcianthes fragrans	Simpson's stopper/ironwood	T	-	
Ophioglossum palmatum	Hand adder's tongue fern	E	-	4,5
Scaevola plumieri	Inkberry	T	-	
Tillandsia balbisiana	Inflated (reflexed) wild pine	T	-	4,5,6,7
Tillandsia fasciculate	Common (stiff-leaf) wild pine	E	-	5,6,7,10
Tillandsia flexuosa	Twisted/banded air plant	E	-	5
Tillandsia utriculata	Giant wild pine	E	-	5,6,7,10
Warea carteri	Carter's mustard	E	E	2
Zamia integrifolia	Florida arrowroot	C	-	2
Selaginella arenicola	Sand spikemoss	T	-	2
Lechea cernua	Nodding pinweed	T	-	2
Conradina grandiflora	Large-flowered-rosemary	E	-	2
Habenaria odontopetala	Rein Orchid	T	-	2

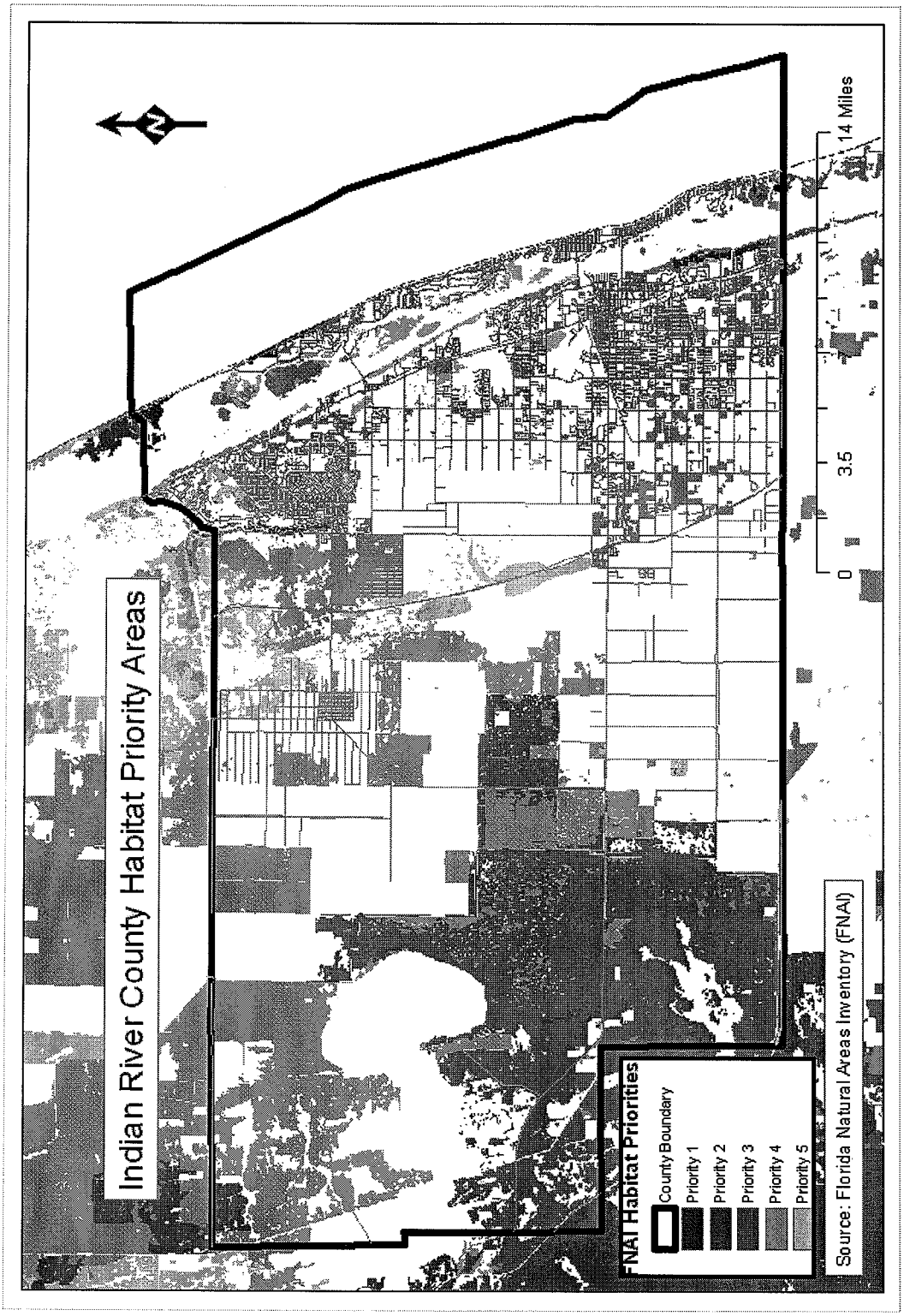
FWC -	Florida Fish and Wildlife Conservation Commission	SSC -	Species of Special Concern
USFWS -	United States Fish and Wildlife Service	C -	Commercially Exploited
FDACS -	Florida Department of Agriculture and Consumer Services	E -	Endangered
T(S/A) -	Threatened Due to Similarity of Appearance	T -	Threatened

Source: Florida's Endangered Species, Threatened Species and Species of Special Concern. Florida Game and Fresh Water Fish Commission; April 1996.

HABITATS

1 - South Florida Coastal Strand	9 - Mangrove Swamp
2 - Sand Pine Scrub	10 - Swamp Hardwoods
3 - Flatwoods Shrub Bogs/Bay Swamps	11 - Shrub Bogs/Swamps
4 - Cabbage Palm Hammocks	12- Freshwater Marsh
5 - Coastal/Tropical Hammock	13 - Freshwater Slough
6 - Oak Hammock	14 - Indian River Lagoon
7 - Cypress Swamp	15 - Nearshore Atlantic
8 - Salt Marsh	16 - St. Sebastian River

Figure 8.12


Indian River County Habitat Priority Areas
N
0
3.5
14 Miles
FNAI Habitat Priorities
County Boundary
Priority 1
Priority 2
Priority 3
Priority 4
Priority 5
Source: Florida Natural Areas Inventory (FNAI)

In 2007, the status of the American crocodile (*Crocodylus acutus*), was changed from endangered to threatened, while the gopher tortoise was upgraded from a state-listed species of special concern to a threatened species in 2008.

- Florida Scrub-Jay Habitat Conservation Plan (HCP)

In March 2000, Indian River County, in coordination with the City of Sebastian, adopted a *Sebastian Area-Wide Florida Scrub-Jay Habitat Conservation Plan (HCP)*. The HCP allows the construction of homes on platted single-family lots in the Sebastian Highlands; in exchange, Indian River County agreed to manage county-owned scrub conservation lands to maximize scrub-jay habitat. In 2006, 15 scrub jay families were documented within the HCP area.

- Manatee Protection Plan

Indian River County adopted the *Indian River County Manatee Protection and Boating Comprehensive Management Plan (MPP)* in 2000. The purpose of the MPP is to establish a strategy that equitably balances manatee protection, habitat protection, and boating safety with recreational and commercial marine interests.

The MPP identifies "high use" manatee areas within the Indian River Lagoon, taking such areas into account in regulating the location new boating facilities as well as the expansion of existing boating facilities. Based on the level of manatee use identified in the MPP, boating speed zones were established throughout the Indian River Lagoon. The speed zones range from "no maximum speed" in low manatee use areas to "no wake zones" in high use areas. To ensure that recreational and commercial watercraft are in compliance with speed zone regulations, the FWC regularly patrols the Indian River Lagoon. The MPP also establishes siting criteria for locating marinas and docks and protects habitats vital to manatee survival in the lagoon.

Since MPP adoption, the average manatee mortality rate has been 6.8. Prior to MPP adoption, the percentage of manatee deaths caused by watercraft collision, the greatest single cause of manatee mortality, averaged 1 per year, while watercraft mortality has averaged 2 per year post MPP adoption.

- Sea Turtle Habitat Conservation Plan

In 2005, Indian River County adopted a Habitat Conservation Plan (HCP) for sea turtles. The focus of the sea turtle HCP is to manage the impacts of sand renourishment and shoreline armoring on federally protected sea turtles nesting on County beaches.

Prior to adoption of the Sea Turtle HCP, there were no comprehensive data collected regarding sea turtle nesting on county beaches.

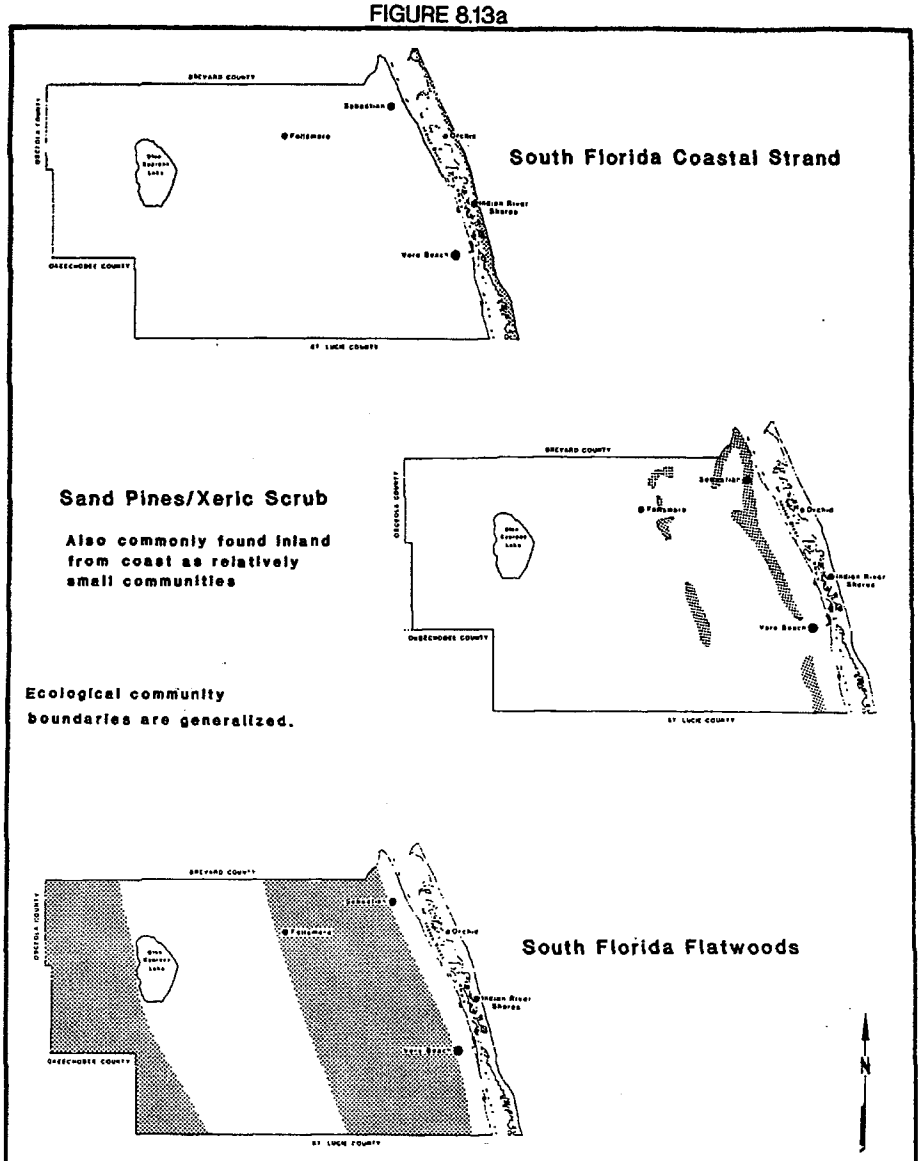
- Gopher Tortoise Protection

In 2007, the Florida Fish and Wildlife Conservation Commission's Gopher Tortoise Management Plan was revised. At that time, the gopher tortoise was upgraded from a species of special concern to a threatened species. As a result of the revised plan, gopher tortoises may no longer be entombed or buried on development sites. Now, gopher tortoises located in the path of proposed development are required to be relocated onsite or transported for relocation offsite under the guidance of the FWC.

Ecological Communities

Indian River County is enriched with a diversity of upland and wetland ecological communities, varying in composition as the county extends from the Atlantic Ocean and the IRL westward to the St. Johns Marsh and Blue Cypress Lake. A Soil Conservation Service (SCS) publication entitled "26 Ecological Communities of Florida" identifies at least 13 different ecological communities within the county, in addition to the IRL and the nearshore Atlantic Ocean. According to the SCS publication, 6 of the communities appear in significant concentrations, with approximately 7 other community categories appearing at sporadic intervals or in localized areas of the county. The ecological community concept utilized by the SCS is based on awareness that different soil types commonly support specific vegetative and wildlife species.

FIGURE 8.13a

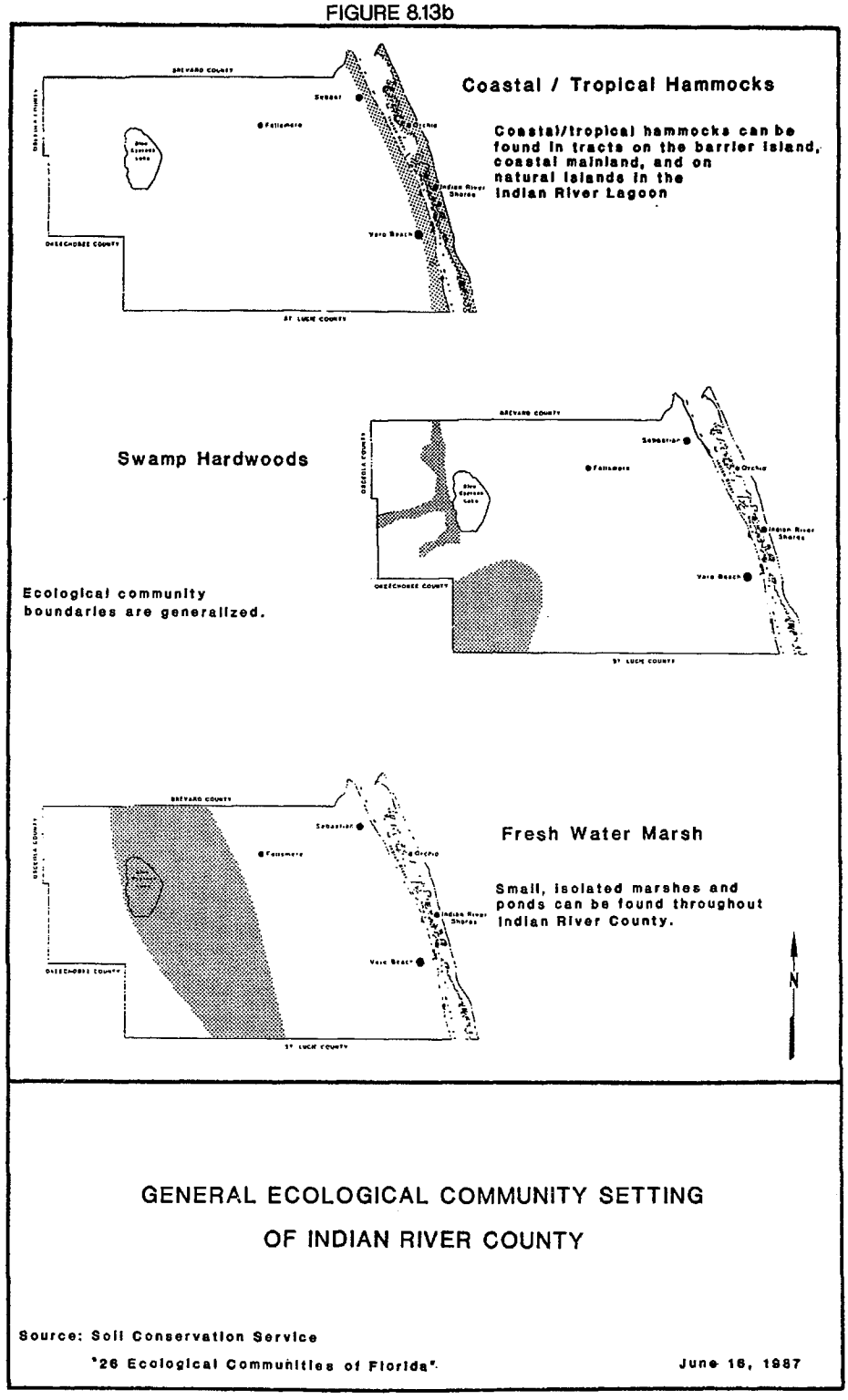


GENERAL ECOLOGICAL COMMUNITY SETTING
OF INDIAN RIVER COUNTY

Source: Soil Conservation Service
"26 Ecological Communities of Florida"

June 16, 1987

FIGURE 8.13b


Coastal / Tropical Hammocks
Coastal/tropical hammocks can be found in tracts on the barrier island, coastal mainland, and on natural islands in the Indian River Lagoon
Swamp Hardwoods
Ecological community boundaries are generalized.
Fresh Water Marsh
Small, isolated marshes and ponds can be found throughout Indian River County.
N
GENERAL ECOLOGICAL COMMUNITY SETTING
OF INDIAN RIVER COUNTY
Source: Soil Conservation Service
"26 Ecological Communities of Florida".
June 16, 1987

The major ecological communities in Indian River County are as follows:

- South Florida Coastal Strand
- Sand Pine Scrub/Xeric Scrub Communities
- South Florida Flatwoods
- Tropical (Maritime) Hammocks
- Hardwood Hammocks
- Freshwater Wetlands
- Indian River Lagoon and Associated Estuarine Wetlands
- Nearshore Atlantic

Of particular concern are those ecological communities located in the eastern portion of the county, where development-pressures conflict with the preservation of diminishing habitats. Tropical hammock communities and coastal scrub communities are examples of habitats found almost exclusively in Florida that are in danger of disappearing or being drastically reduced, along with their unique flora and fauna. The generalized locations of the above mentioned ecological communities are depicted in Figures 8.13 (A-B).

South Florida Coastal Strand

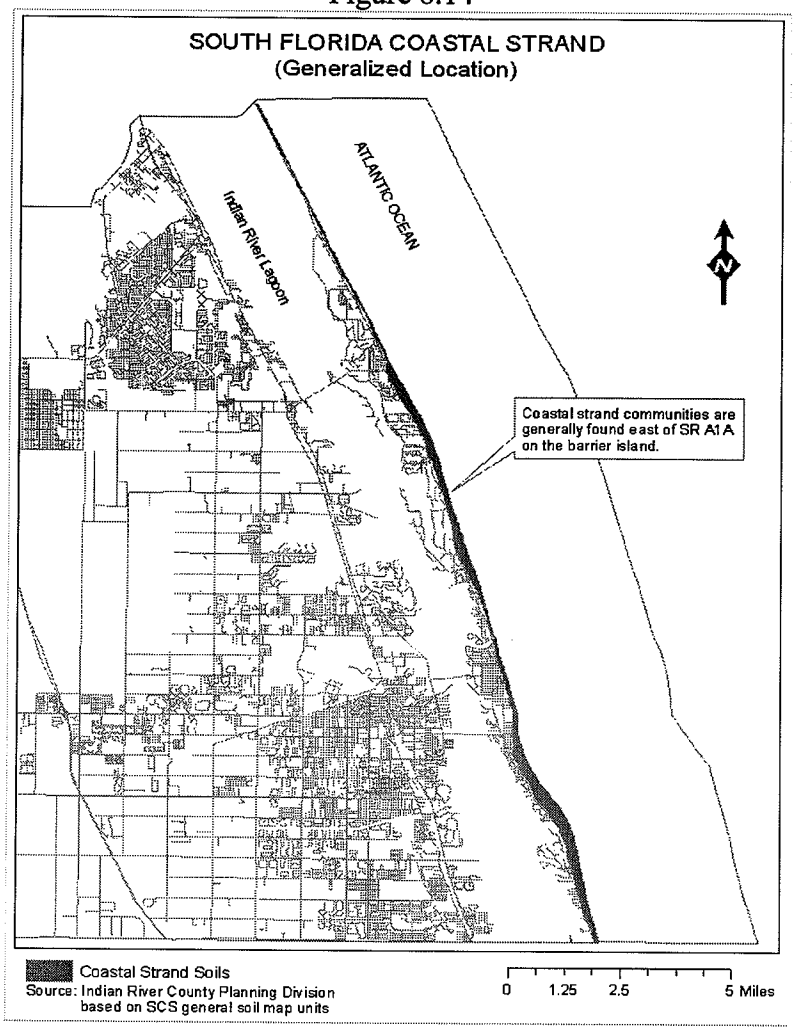
The South Florida Coastal Strand community occurs on nearly level to strongly sloping land and is easily identified in Indian River County by its proximity to the Atlantic Ocean. This community generally encompasses the area affected by ocean salt spray. Plants associated with the community are adapted to salt, intense sunlight, and strong winds.

The Soil Conservation Service identifies a Canaveral-Captiva-Palm Beach soil association with the coastal strand in Indian River County. That soil association is described as nearly level to gently sloping, mostly well to excessively drained areas; the soils are coarsely textured throughout, containing shell fragments. The Canaveral-Captiva-Palm Beach soil association makes up about 6,308 acres, or about two (2) percent of the total county.

The natural vegetation of the coastal strand consists of low growing grasses, vines, and herbaceous plants with a few trees or large shrubs. The trees and shrubs that do occur are often stunted due to wind action. While foredunes, the portion of the dune closest to the ocean, support flora with high salt and wind tolerance, backdunes often have vegetation similar to sand pine scrub or wetland hardwood communities.

In County River County, vegetation typical to the coastal strand includes saw palmetto (*serenoa repens*), sand live oak (*Quercus Virginiana var maritima*), cabbage palm (*Sabal palmetto*), inkberry (*Scaevola plumieri*), waxmyrtle (*Myrica cerifera*), beach bean (*Canavalia maritima*), Spanish-bayonet (*Yucca alorfolia*), seagrape (*Coccoloba uvifera*), and sea oats (*Uniola paniculata*).

Figure 8.14



Australian pine (*Casuarina equisetifolia*) and Brazilian pepper (*Schinus terebinthifolius*) are exotic "invaders" that are often times present. As exotics, they compete with desirable native species.

The coastal strand community provides nesting sites and an abundant food supply. As such, the community is utilized by a variety of wildlife. While small mammals can be found on the coastal dunes, larger mammals occur behind the foredunes. Mammals that may be found in the coastal strand include mice, rabbits, raccoons, skunks, foxes, and occasionally bobcats. Birds found in association with this habitat are the brown pelican (a species of special concern) as well as various species of gulls, terns, songbirds, and shorebirds. Several species of amphibians and reptiles also inhabit the coastal area. Species of sea turtles that regularly nest on Indian River County's beaches are the Atlantic loggerhead (*Caretta caretta*), the Florida green turtle (*Chelonia mydas mydas*), and

to a lesser extent the Atlantic leatherback turtle (*Dermochelys coriacea*). Crabs (i.e. ghost crabs) can be found burrowing into the sandy beach throughout the county.

Several species of flora and fauna found in the coastal strand are recognized as endangered or potentially endangered. The Atlantic loggerhead (threatened), the Florida green turtle (endangered) and the Atlantic leatherback (endangered) are three such species documented as nesting in the county.

In 1989, the Archie Carr National Wildlife Refuge (ACNWR) was established as a joint venture between the USFWS, the State of Florida, and local government agencies. Segment 4 of the refuge extends from Golden Sands Park north to the Sebastian Inlet S.R.A. and contains nearly 2.9 miles of the most prolific beaches for turtle nesting in the world. Approximately 1.2 miles, or 41 percent of the area, is currently under public ownership. Passive recreation is allowed within the refuge.

Studies of loggerheads in the ACNWR suggest that the density of female sea turtles that nest within or near the ACNWR is unsurpassed in the western hemisphere. Also, the beaches of the ACNWR are important habitat to green turtles, as they are more wary than loggerheads of nesting in developed coastal areas.

Other endangered or potentially endangered species associated with the coastal strand habitat in Indian River County include the gopher tortoise (*Gopherus poluphemus*), Eastern indigo snake (*Drymarchon corais*), the southeastern beach mouse (*Permoyscus polionontus niveiventris*), and the least tern (*Sterna antillarum*). Rare plant species such as Beach creeper (*Erondea littotalis*) and necklace pod are examples of threatened flora in the community.

Along the coastal strand, land use consists almost entirely of residential development. In the unincorporated county south of the city of Vero Beach, most of the area is developed with single-family residences adjacent to the dunes, with multi-family present in the Moorings development. In northern Indian River County, the coastal strand is considerably less developed. Of the County's ±22.4 miles shoreline, Indian River County, the Florida Department of Environmental Protection (FDEP), and the U.S. Fish and Wildlife Service (USFWS) own and manage approximately 23,054 linear feet (4.37 miles), most of which contains coastal strand. Further discussion of publicly acquired properties is contained in the section entitled "Conservation and Recreational Use of Natural Resources." The generalized location of the Coastal Strand community in Indian River County is depicted in Figure 8.14.

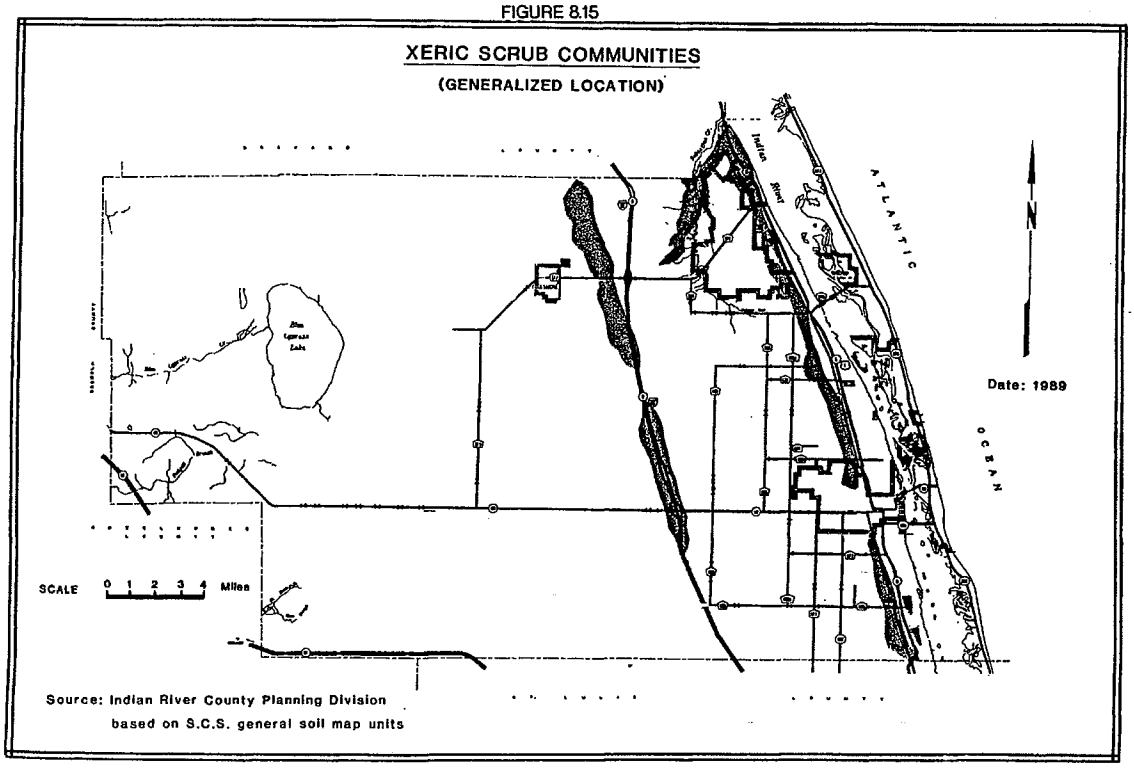
Sand Pine Scrub/Xeric Scrub

The Sand Pine Scrub ecological community is almost exclusively found on well-drained and infertile sands of relict dunes and bars. In Indian River County, the Astatula-Archbold-St. Lucie soil association is generally the soil association found in xeric (dry) scrub communities. This soil

association and scrub communities are found along the Atlantic Coastal Sand Ridge, proximate to the St. Sebastian River, and along the Ten Mile Ridge west of and adjacent to the Interstate 95 corridor. In the past, historic areas of scrub habitat have been drastically reduced by urban development, especially scrub along the Atlantic Coastal Sand Ridge, an area which is roughly parallel to and proximate to U.S. Highway #1.

According to site plan information and estimates derived from the Planning Division's database, there are approximately 2,860 acres of scrub communities remaining in Indian River County. Over half of this acreage is located along the Atlantic Coast Sand Ridge. Approximately 900 acres of scrub are located along the South Prong of the St. Sebastian River, 300 acres of which are along east bank. These 300 acres are dominated by xeric hammocks and are undergoing sporadic development. Another 600 acre tract is located along the west bank of the river. Most of the remaining acreage of scrub habitat can be found in the area of the Ten Mile Ridge.

FIGURE 8.15



In comparison to other habitats, scrub communities typically have fewer plant species. Scrub communities, however, have the greatest number of endemic species (i.e. species found only in a particular region). Generally, vegetation in the sand pine scrub community consists of sand pines occupying the canopy, and scrubby oaks and other shrubs, vines, and lichens comprising the understory. Little herbaceous understory exists, and large areas of bare sand can be commonly

found. Typical understory plants include myrtle staggerbush, hog plum, prickly-pear cactus, muscarine grape, sand spikemoss, and several lichens. Many scrub plant species are considered "Potentially Endangered" by state or federal agencies.

Scrubby flatwoods are comprised of predominantly the same species, but the sand pines are absent. Instead, they may be replaced by slash pine or southern longleaf pine. Scrubby pine flatwoods may also possess a greater complement of species, such as threeawn, fetterbush, tarflower, dwarf huckleberry, gallberry, and wax myrtle, more characteristic of typical pine flatwoods.

Delineation between these communities may be vague, as they are often intermixed. In fact, past timbering operations, drainage practices, land clearing activities, or fire frequency often determine which community occupies a site. In some cases, invasion by exotic species is common and may further complicate classification of an area as a scrub community or simply as a disturbed site possessing some vestiges of scrub vegetation.

The fauna of these habitats is diverse and varies greatly depending on site characteristics and the nature of adjoining communities. Characteristic animals include bobcat, raccoon, gray squirrel, Virginia opossum, rufous-sided towhee, white-eyed vireo, Carolina wren, great-crested flycatcher, red-bellied woodpecker, eastern screech-owl, eastern diamondback rattlesnake, southern black racer, eastern coachwhip, southeastern five-lined skunk, six-lined racerunner, green anole, gopher tortoise, southern toad, and oak toad. Of particular interest are animals, including the Florida mouse, Florida scrub jay, scrub lizard, red widow spider (*Latrodectus bishop*), and others, which are endemic to scrub and associated xeric habitats. A significant number of scrub species, including the Florida mouse, Florida scrub jay (*Aphelocaoma coerulescens*), gopher tortoise (*Gopherus poluphemus*), Eastern indigo snake (*Drymarchon corais*), Florida pine snake (*Pituophis melanoleucus*), and gopher frog, are officially listed as Threatened or of Special Concern.

Although ground vegetation is sparse and leaf fall is minimal, sand pine scrub is a fire-based community. Over time, mature sand pines retain most of their branches and build up a fire fuel supply. After a fire, sand pines reseed best, in that the associated heat helps to open and release the seeds of the cones. This fire-release method tends to create even-aged stands.

In the absence of fire, a senescent, unburned sand pine forest will succeed into xeric hammock under some conditions, or degenerate into a sparsely vegetated open scrub on other sites. In a natural setting, wildfires normally occur every 20 to 40 years. Where scrub areas in the county are developed or adjacent to development, however, wildfires are suppressed. Consequently, overgrowth in these areas leads to less species diversity, and the build-up of fire fuel may lead to a potentially uncontrollable wildfire.

In a study of xeric scrub communities, the FWC indicates that the minimum preserve size of scrub habitat for wildlife management purposes varies with the specific characteristics of a given tract.

Generally, though, a minimum of 10-15 acres should be set aside for areas intended as botanical preserves, 15-30 acres per territory for Florida scrub-jay preserves, and 50 acres for scrub community preserves to provide for rotational controlled burns. Prescribed burning, a controversial management issue, is discussed under the "Conservation and Recreational Use of Natural Resources" section of this Element.

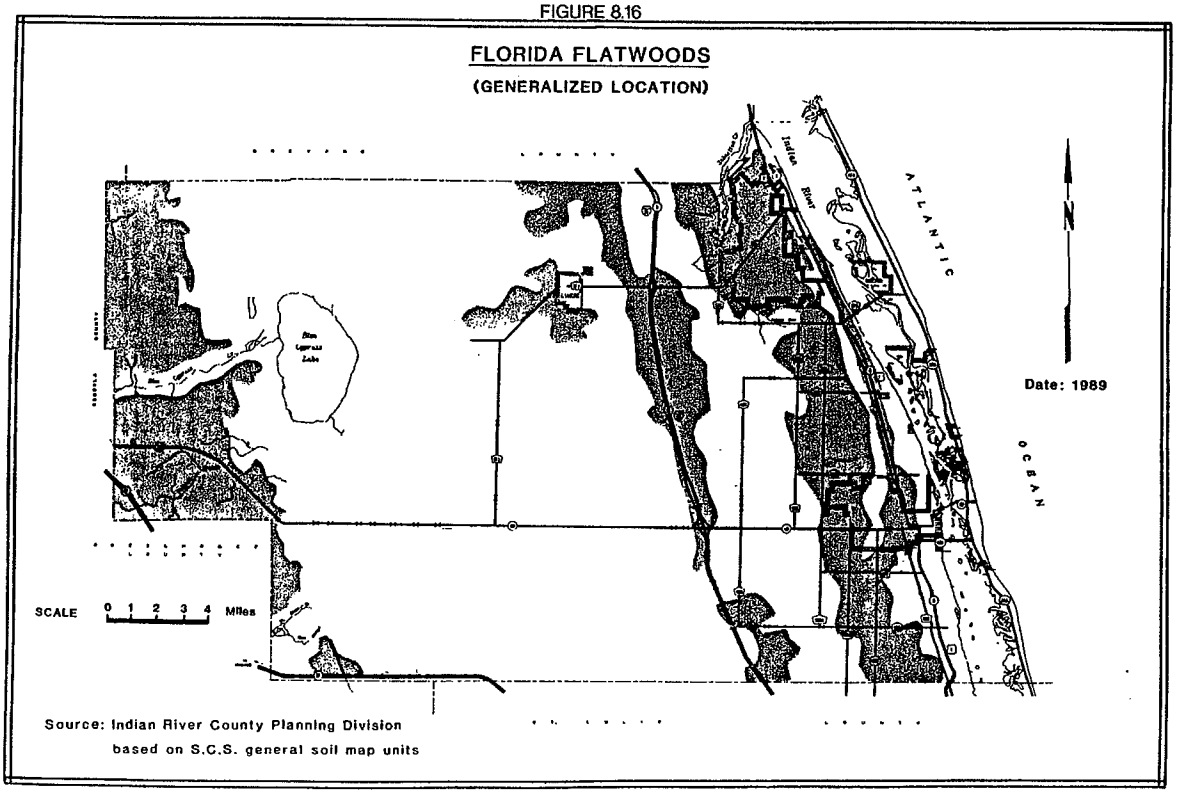
Since 1992, Indian River County, with funding assistance from the state's P2000 and Florida Forever land acquisition programs, has acquired or contributed to the acquisition of lands containing approximately 653 acres of xeric scrub. Large acquisitions include: The Carson Platt Estate quadrant of the St. Sebastian River Preserve State Park, the North Sebastian Conservation Area and the Wabasso Scrub Conservation Area.

Other publicly owned lands containing scrub communities include: the Sebastian Scrub Conservation Area; Donald McDonald Park; South County Park; the Sebastian Municipal Airport site; the Vero Beach Municipal Airport site; the Winter Beach landfill transfer station; and Sandridge Golf Course. Located on the St. Sebastian River, Boy Scout Camp Oklawaha, a privately-owned tract containing scrub habitat, is considered protected from immediate development. The generalized locations of Xeric Scrub communities in Indian River County are depicted in Figure 8.15.

South Florida Flatwoods

The South Florida flatwoods ecological community occurs throughout south and central Florida, and covers a substantial portion of Indian River County. Flatwoods, as the name suggests, occur on nearly level land. While individual communities may comprise several thousand acres, flatwoods are typically interspersed with smaller communities of other types, especially wetlands. Within flatwoods, water movement is gradual to the natural drainageways, swamps, marshes, and ponds associated with this community.

FIGURE 8.16



During the rainy season, south Florida flatwoods may have water on or near the surface. Consequently, soils of the community are generally deep, acidic, poorly to somewhat poorly drained, and moderately coarse textured. In Indian River County, soil types commonly associated with flatwoods are Boca, Eau Gallie, Electra, Immokalee, Myakka, Oldsmar, Pepper, and Wabasso.

Typically, the natural vegetation of south Florida flatwoods is scattered pine trees with an understory of saw palmetto and grasses. Trees and shrubs which characterize this community include slash pine, longleaf pine, live oak, dwarf huckleberry, gallberry, saw palmetto, tarflower, shining sumac, and waxmyrtle. Herbaceous plants and vines include chalky bluestem, creeping bluestem panicum grasses, lopsided indiangrass, and pineland threeawn.

In conjunction with the U.S. Soil Conservation Service, the State Division of Forestry has identified approximately 15,400 acres of longleaf-slash pine forest in Indian River County. This type of forest is most commonly associated with the south Florida flatwoods community. In this county, the longleaf-slash pine forest is in areas 2.5 to 3 miles wide; these areas are west of the Atlantic Coastal Ridge extending the length of the county. Other areas are in the most western part of the county, west of Blue Cypress Lake.

Another forest type associated with the flatwoods community is the oak-pine forest. In Indian River County, oak-pine forest is generally found in a broad band around Interstate 95, varying in width from three to four miles in the southern part of the county to eight (8) to ten (10) miles wide in the northern part of the county. The total amount of this forest type is estimated at about 9,000 acres. The oak-pine forest type is generally characterized by upland oaks, but pines make up 25 to 50 percent of the stocking.

Cabbage palm flatwoods, also found in association with the south Florida flatwood community, are similar to the pine flatwood community except for a higher percentage of herbaceous plants and the presence of cabbage palms. Throughout the western portion of the county, dry prairies occur in association with the South Florida flatwoods. These treeless plains, generally resembling pine flatwoods without the open overstory, are usually dominated by wiregrass, broomsege, and carpet grasses. Saw palmetto is the most abundant shrub. Hammocks, bayheads, and cypress domes are often scattered throughout this community.

The South Florida flatwoods community is host to a diverse wildlife population. Much of the fauna can be found along the "ecotone" or edge of flatwoods and adjacent communities. Typical species include whit-tailed deer, bobcat, raccoon, opossum, nine-banded armadillo, gray fox, gray squirrel, Sherman's fox squirrel, cotton rat, least shrew, great horned owl, red-tailed hawk, pine warbler, rufous-sided towhee, brown-headed nuthatch, pine woods treefrog, oak toad, eastern diamondback rattlesnake, black racer, pine woods snake, and box turtle. Introduced feral hogs and turkey are common in much of the community. Along rivers or estuaries, mature pine flatwoods provide nesting habitat for the bald eagle, and over- mature pine stands provide habitat for the endangered red-cockaded woodpecker.

Several species, including the Florida burrowing owl, crested caracara, and the Florida sandhill crane, prefer to inhabit dry prairies; the box turtle, black racer, turkey vulture, common nighthawk, eastern meadowlark, least shrew, hispid cotton rat, eastern harvest mouse, and eastern spotted skunk are also often encountered. The forested wetlands and other habitats that are often dispersed throughout dry prairies contribute significantly to habitat diversity and are partially responsible for the abundant wildlife populations.

Pine flatwoods are diverse, fairly resilient systems which can tolerate substantial use by man without significant endangerment. They are, however, sensitive to fire exclusion and water table fluctuations which can dramatically alter their vegetative composition and ecology. In the past, many acres of flatwoods were converted to cropland or improved pasture, grazed as native range, or supplanted by urban development.

Use of rangeland for cattle operations, if properly managed, has only a minor effect on the community. While chopping and similar range practices result in more grasses and fewer shrubs, the result is an increase in diversity that usually leads to increases in types and amounts of wildlife.

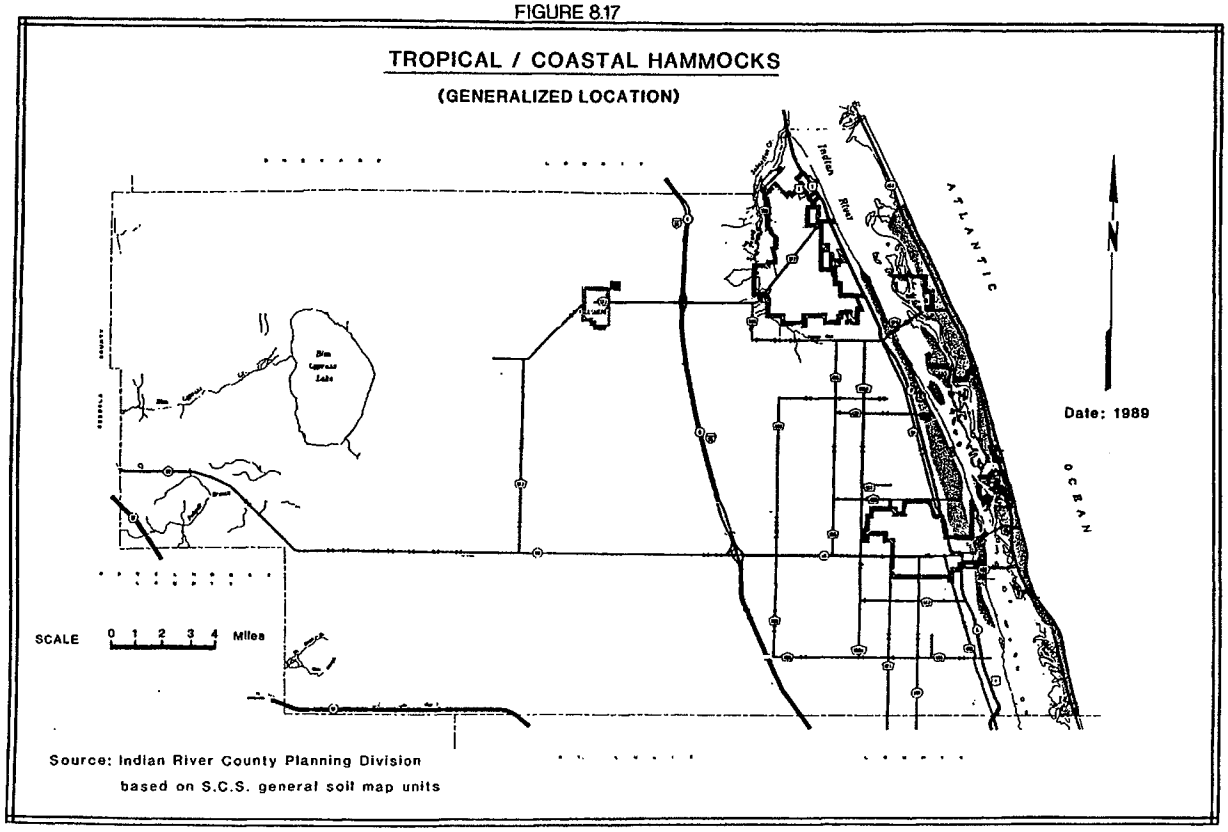
Conversely, overgrazing or trampling by livestock can destroy habitat. On the other hand, urban development of flatwoods often reduces the value of adjacent wetlands or other habitat through reductions in vegetative diversity, increased erosion and sedimentation, or subsequent pollution of surface waters. The generalized locations of South Florida Flatwoods communities in Indian River County are depicted in Figure 8.16.

Tropical/Coastal Hammocks

The tropical/coastal hammock ecological community is confined to south Florida, and communities within Indian River County represent the northern extent of the range. In that the county is at the northern boundary of the subtropical zone, coastal hammocks in this area possess a diverse assemblage of tropical and temperate species. In this county, remaining tropical/coastal hammocks are generally found in the area of the coastal mainland and on undeveloped upland areas of the barrier island. Hammock species are also found on the natural and spoil islands in the IRL. Individual communities typically range in size from less than an acre to several acres.

Tropical/coastal hammocks generally appear as thick clumps or strands of small to medium-sized trees. On sites where disturbance has not occurred for several years, a more jungle-like appearance is observed. The tropical/coastal hammock can vary from a mature canopy of live oaks and cabbage palms with a sparse understory of ferns and vines to a jungle-like community of tropical hardwoods, vines, and shrubs, with a fairly open canopy of oaks and cabbage palms.

FIGURE 8.17



Mature coastal hammocks within the county are dominated by large live oaks. While laurel oaks (*Quercus laurifolia*) and scrub oaks (*Quercus chapmanii*) are rare, these species are abundant west of the IRL. This may be due to the recent development of coastal hammocks and the relatively immature alkaline soils. In many hammocks, cabbage palms are codominant, while important canopy or understory plants include paradise tree, gumbo limbo, wild lime, Hercules club, wild mastic, myrsine, white stopper, Spanish stopper, twinberry, shore bay, though buckthorn, shining sumac, wild coffee, snowberry, poison ivy, greenbrier, wild grape, gopher apple, tread softly, ferns, and various grasses. Green pine, cypress rose pine, ball moss, golden polypod, shoestring fern, resurrection fern, and wild orchids are often found within the live oak-cabbage palm canopy. Within or adjacent to these hammocks, Brazilian pepper and Australian pine are commonly encountered, with Brazilian pepper often totally displacing the native understory.

Many mammals and other non-wetland dependent animals of the barrier island are inhabitants of the coastal hammock community. Its vegetative diversity, food resources, and escape cover provide suitable habitat for raccoons, opossums, nine-banded armadillos, hispid cotton rats, least shrews, eastern moles, red-shouldered hawks, warblers, vireos, woodpeckers, southern toads, tree frogs,

skinks, anoles, rat snakes, hognose snakes, and many additional species inhabiting the coastal strand community.

Fire, the major natural threat to coastal hammocks, can set succession back to the early coastal strand stage which may then require at least 70 years to develop into a mature hammock. In terms of man-related threats, these include clearing for residential and recreational development, understory removal associated with landscaping, and introduction of exotic species which may displace native plants, especially those at the periphery of their native range. The generalized locations of Tropical/Coastal Hammock communities in Indian River County are depicted in Figure 8.17.

Freshwater Wetlands

The identifying characteristics of a wetland are generally: (1) the land predominately supports plants adapted to growing in wet soils ("hydrophytes)"; (2) the soil is predominately hydric; and (3) the land is saturated with water or covered by shallow water at some time during the growing season each year.

Ranging from small isolated marshes to large systems of contiguous wetland communities, including wet prairies, sloughs, riverine marshes and forested swamps, freshwater wetlands exist throughout Indian River County. Following is a general description of freshwater wetland habitats found in the county. A map of Generalized Wetland Densities in Indian River County is depicted in Figure 8.18.

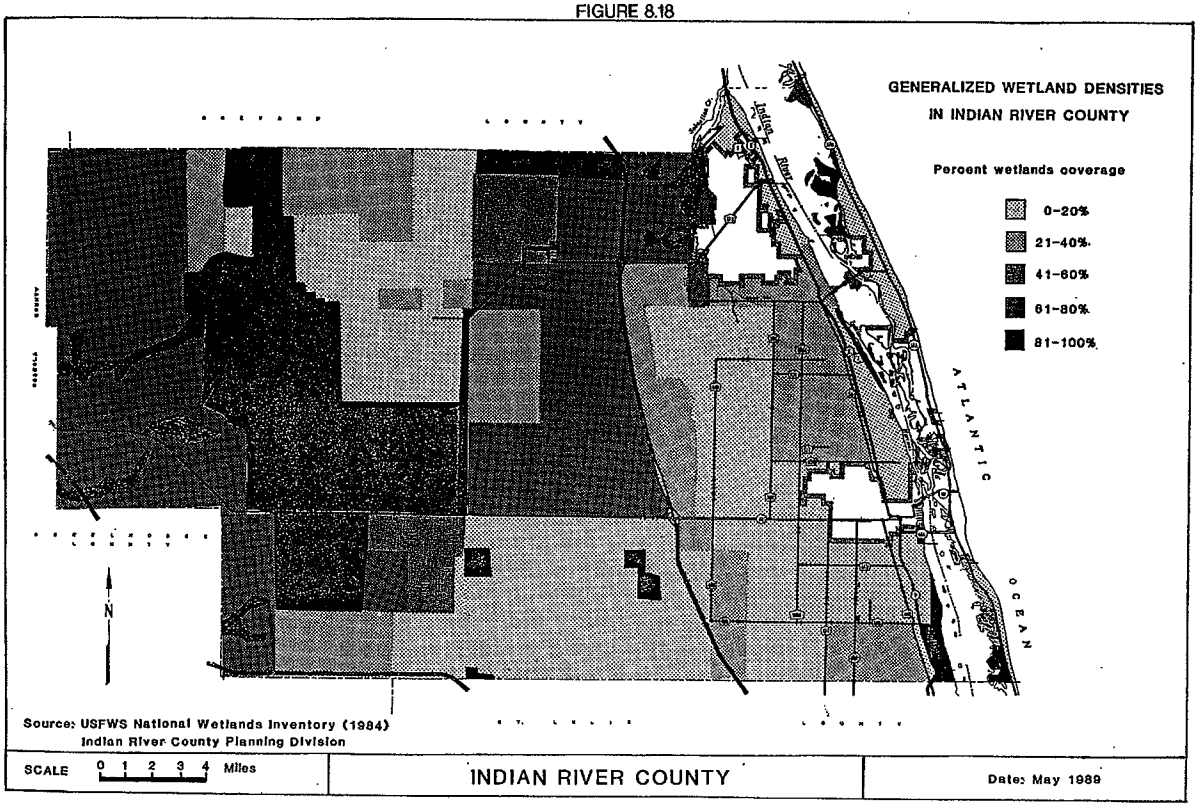
- Wet prairies

Wet prairies occur on low flatlands subject to periodic flooding and often grade imperceptibly into a freshwater marsh or dry prairie community. Wet prairies are generally dominated by shorter grasses and herbs such as maidencane, cordgrass, beakrushes, spikerushes, white-top rush, St. John's wort, and occasional patches of wax myrtle, coastal plain willow, or buttonbush.

- Freshwater marshes

Freshwater marshes include a number of vegetative associations composed of grasses, rushes, sedges or broad-leaved herbs, where the ground surface is inundated with water for at least a few months of the year. They are found bordering lakes or streams, in shallow natural depressions, and on lowlands with little topographic relief. Ranging in size from small pockets within flatwoods or other communities to vast, uninterrupted wetlands, marshes often integrate into wet prairies or possess hammocks, cypress domes or strands, and deep water habitats. Sawgrass, lizard's tail, pickerelweed, cattail, arrowhead, spikerush, smartweed, bulrush, fire flag, cordgrass, bacopa, pennywort and maidencane are common dominant species of particular marshes or patches within a marsh. Natural depressions and sloughs often contain vegetation associated with deeper waters, including fragrant water lily, spatterdock, cattail, stonewort, milfoil, bladderwort, and pondweeds.

FIGURE 8.18



Wet prairies, isolated marshes and ponds usually have concentric bands of vegetation, marking zones of different hydroperiods (amount of time underwater). From one isolated wetland to another, however, the character of the plant community can vary widely. While the outermost band is often composed of grasses and St. John's wort, the innermost bands are typically dominated by taller grasses and flags, notably pickerelweed and arrowhead. Sometimes, cow lilies and bladderworts grow in a central pond. Generally, the central portion of these wetlands has a longer hydroperiod and a greater organic content to its soil than do the outer portions. Soils characteristic of freshwater marshes and ponds in Indian River County include Canova, Delray, Floridan, Holopaw, Manatee, Myakka depressional, Oldsmar depressional, Pineda depressional, and Riviera depressional.

Freshwater marshes and ponds provide excellent habitats for many wildlife species. Among these species are numerous birds and waterfowl which use this community for wintering or on year-round basis. While animals that commonly occur in the freshwater marshes and ponds community include otter, mink, raccoon, white-tailed deer, and marsh-rabbit, birds frequenting the community are herons, egrets, bitterns, ibis, sandhill cranes, rails, limpkins, gallinules, snipe, killdeer, Florida duck, red-winged blackbirds, caracara, marsh hawk, red-shouldered hawk, and swallowed-tailed kite.

Reptiles found in association with freshwater marshes and ponds include salamanders, sirens, and a variety of frogs, turtles, snakes and the American alligator.

- Sloughs

Sloughs are wetlands that generally appear as open expanses of grasses, sedges, and rushes in an area where the soil is saturated during the rainy season. Most sloughs are relatively long and narrow and slightly lower in elevation than surrounding flatwoods or hammocks. Grasses are the most common plants found in sloughs. Sedges and rushes also occur, with beak rushes, maidencane, bottle brush threeawn, bluepoint panicum, soft rush, sand cordgrass, sundew, marsh pink, milkwort, yellow-eyed grass, meadow beauty, slough grass and low panicum.

The Soil Survey of Indian River County identifies four "map units" (soil associations) in Indian River County where sloughs and poorly defined drainageways occur. The four associations/units are Riviera-Pineda-Wabasso, Winder-Riviera Manatee, Boca-Wabasso-Riviera, and Myakka-Holopaw-Pompano. Generally, the soils of sloughs are classified as nearly level and "poorly" to "very poorly" drained. These soil associations are generally found in the central and eastern third of Indian River County. They extend from Brevard County to St. Lucie County and also extend east of the Atlantic Coastal Sand Ridge and are adjacent to the tidal marshes on the coastal mainland. Another area of these soils is immediately west of the St. Johns Marsh, extending from Brevard County to Okeechobee County.

Sloughs are host to a diverse wildlife population. Where sloughs join flatwoods and hammocks, large animals occur. The plants associated with sloughs provide food for such mammals and birds as bobwhite quail, deer, and wading birds. While the low growing vegetation of sloughs provides poor cover for most wildlife species, this is often offset by the "edge effect" of adjacent flatwoods and hammocks. Other animals characteristic of the sloughs community include bobcat, gray fox, marsh rabbit, cranes, egrets, herons, eastern diamondback rattlesnakes, and a variety of frogs and salamanders. In combination with other ecological community types, sloughs play an important role for species, such as the endangered Florida panther, whose range encompasses a multitude of communities.

From the standpoint of flood control, sloughs serve as natural drainageways during high water periods. As such, they have great value in improving water quality by natural processes. Fire and artificial water level fluctuations are the major factors affecting these areas, with variations in the natural sequences of either event changing the slough's diversity and productively. With exclusion of fire or permanent water level reduction, the plant succession would be to a wooded community.

- Forested wetlands

The generalized category of forested wetlands includes several major habitat types. The common denominators of this ecological community are seasonal or permanent inundation and predominance of woody vegetation. Their species composition, ecology, and wildlife benefits vary with soil conditions, hydrology, and topography. Cypress swamps and Bayhead swamps are forested wetland community types found in Indian River County.

The cypress swamp ecological community occurs along rivers and along the littoral shelf of lakes, sloughs and strands. This community may also be interspersed throughout other communities, such as flatwoods and sloughs. In Indian River County, cypress "domes" are found primarily west of Interstate 95, interspersed with flatwood and prairie communities in depressions and poorly defined drainageways. The diversity of trees is low in the cypress heads, with pond cypress being the dominant species. Other trees and plants that may be found in this community include red maple, coastal plain willow, black gum, buttonbush, wax myrtle, cinnamon fern, royal fern, Spanish moss, stiff-leafed wild pine, maidencane, and narrowleaf sawgrass.

The substrate condition of cypress swamps is poorly drained, with water at or above ground level most of the year. Within this community, the low diversity of plant species is generally due to fluctuating water levels and low nutrient availability. As such, the cypress swamp plant community is sensitive to long term changes in the water level due to channelization, drainage, stabilization or impounding. Because natural regeneration of cypress requires fluctuation of water levels, flooding during the dry season prevents cypress trees from reproducing. Normally, water levels are highest in summer, and peak reproductivity occurs in early spring. Water availability is required to germinate cypress seeds; however, when seedlings start to grow, their tops must be maintained above water.

The cypress swamp community plays an important role for wildlife, and is well suited for waterfowl and wading birds. Aquatic animals may also be found in large numbers. The permanent residents of cypress domes are few, but much of the wildlife of adjacent flatwoods and prairies depend on these ponds for breeding purposes. Species commonly associated with this community include deer, mink, raccoon, otter, barred owl, egrets, heron, pileated woodpecker, purple gallinule, prothonotary warbler, wood duck, wood stork, alligator, frogs, turtles, salamanders, and a variety of water snakes.

The swamp hardwood ecological community is characterized by hardwoods, a high percentage of which are deciduous. Species composition in these areas is largely determined by the kind of soils that occur. Trees commonly associated with swamp hardwoods are red maple, black gum, water tupelo and cypress. Many of these areas in Florida were originally dominated by cypress, but when large cypress trees were cut out, other hardwoods became predominant.

In conjunction with the Florida Division of Forestry, the USDA Natural Resource Conservation Service (NRCS) identifies approximately 6,500 acres of the oak-gum-cypress swamp hardwood

community in Indian River County, primarily around the creeks leading to Blue Cypress Lake (i.e. Blue Cypress Creek, Padgett Branch, and Fort Drum Creek). Soils commonly associated with this community in Indian River County belong to the Floridan-Delray-Holopaw soil map unit. These soils are described as being nearly level, "poorly" drained to "very poorly" drained soils, having loamy subsoil at a depth of 20 to 40 inches.

In addition to the referenced hardwood trees found in the swamp hardwoods community, other plants characterizing the system include wax myrtle, Carolina willow, buttonbush, dahoon holly, cinnamon fern, royal fern, lizard's tail, and wild pine.

The swamp hardwood community hosts a large variety of wildlife. It is especially well suited for waterfowl, reptiles, amphibians, and mammals. Gray squirrel, mink, raccoon, and river otter are the most commonly found mammals. Many birds, including titmice, wood duck, limpkin, owls, and woodpeckers, also inhabit this area. Swamp hardwood areas also afford good habitat for winter visitors such as warblers, vireos, thrushes, and woodcock, with hardwood vegetation providing good food and cover for these wildlife species.

Bay swamps, or "bayheads," are forested wetlands that are dominated by mixtures of loblolly, red bay, and sweet bay evergreen trees. The bay swamp is considered a "climax" community with mature trees. This community occurs on wet, acidic, highly organic soils which are often seasonally flooded. Though often classified as a swamp habitat, bayheads usually have shallower standing water, shorter inundation periods, and less dramatic water level fluctuations than other forested wetlands.

Bay swamps usually occur along the margin of flatwood ponds, or in shallow depressions in pine flatwoods, having succeeded from marshes, low pine flatwoods, and swamps through accumulation of organic matter. Usually, bay tree species form a dense canopy, with little sunlight penetration to promote understory or groundcover growth. For that reason, most understory tends to occur at the fringes of the forest, and consists of plants such as wax myrtle, gallberry and fetterbush.

In association with other ecological communities, bay swamps provide escape cover for such creatures such as deer, turkey, and quail (where thick growth occurs). Bay swamps also provide habitat for a variety of frogs, salamanders and crayfish, snakes and raccoons.

In Indian River County, small depressional pockets of bay heads exist in undeveloped areas between U.S. Highway #1 and the F.E.C. railroad. These small tracts of forested wetlands are isolated from other natural communities by the highway, railroad tracks, and urban development and may be sustained partially as a result of surface water runoff from these features. As such, wildlife utilizing these areas are limited to reptiles, amphibians, and urban wildlife (song birds, raccoons, squirrels, opossums, etc.)

- St. Sebastian River and Associated Wetlands

The South Prong of the St. Sebastian River, which extends from approximately C.R. 510 (85th Street) to the IRL at Sebastian Inlet, has deepwater covering approximately 500 acres. The river is a freshwater riverine system in its upper reaches and becomes an estuarine subtidal system as it approaches the IRL.

As briefly described in the "surface water" portion of this element, the St. Sebastian River plays host to transient fish normally associated with estuarine systems. While the upper reaches of the South Prong are freshwater, marine fish such as mullet, spot, lady fish, tarpon, and snook nurse in the river and have been found as far up the creek as the C.R. 512 over-pass. The four species of tropical marine fish that inhabit the St. Sebastian River that are considered rare in Florida waters include the opposum pipefish, river goby, slashcheek goby, and the bigmouth sleeper.

River otters, alligators, and a variety of wading birds are often present on the St. Sebastian River. The river also provides "ecotone" or edge between upland ecological communities, wetlands, and deepwater, resulting in a diversity of flora and fauna. Fauna, such as osprey, river otter, and bald eagle, that thrive on a balance of upland habitat and water access, benefit from the association. Also, manatees frequent the St. Sebastian River and can be found in substantial numbers year round. A report by the federal Marine Mammal Commission identifies the St. Sebastian River as an important manatee habitat for feeding, resting, cavorting, and freshwater access purposes.

The Indian River Lagoon and Associated Estuarine Wetlands

Unimpounded and impounded estuarine wetlands associated with the IRL are listed in Table 8.5 and graphically depicted in Figure 8.19. While the majority of unimpounded estuarine wetlands occur on the mainland side of the IRL, several large unimpounded wetlands exist on the barrier island near the Town of Orchid and near the Indian River-St. Lucie County line. Unimpounded estuarine wetlands also occur on islands located throughout the IRL. The largest areas of unimpounded estuarine marsh are located on Horseshoe Island (173 acres) and the southern portion of Pine Island (107 acres). The Winter Beach Marsh, the largest unimpounded estuarine wetland on the mainland, comprises 100 acres.

FIGURE 8.19a

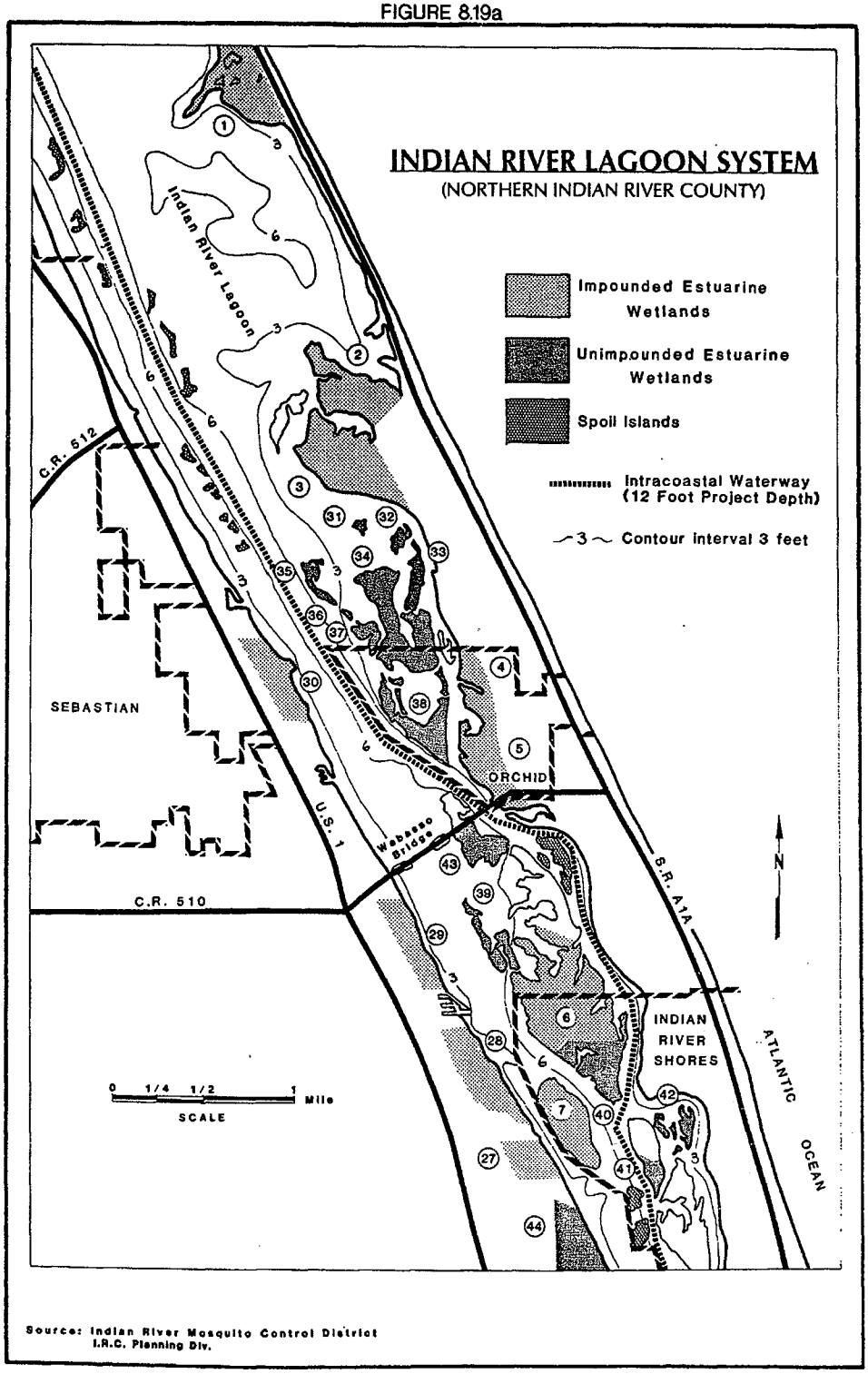

INDIAN RIVER LAGOON SYSTEM
(NORTHERN INDIAN RIVER COUNTY)
Impounded Estuarine Wetlands
Unimpounded Estuarine Wetlands
Spoil Islands
Intracoastal Waterway (12 Foot Project Depth)
3 Contour interval 3 feet
Indian River Lagoon
C.R. 512
SEBASTIAN
U.S. 1
Wabasso Bridge
C.R. 510
ORCHID
S.R. A1A
INDIAN RIVER SHORES
ATLANTIC OCEAN
N
0 1/4 1/2 1 Mile
SCALE
Source: Indian River Mosquito Control District
I.R.C. Planning Div.

FIGURE 8.19b

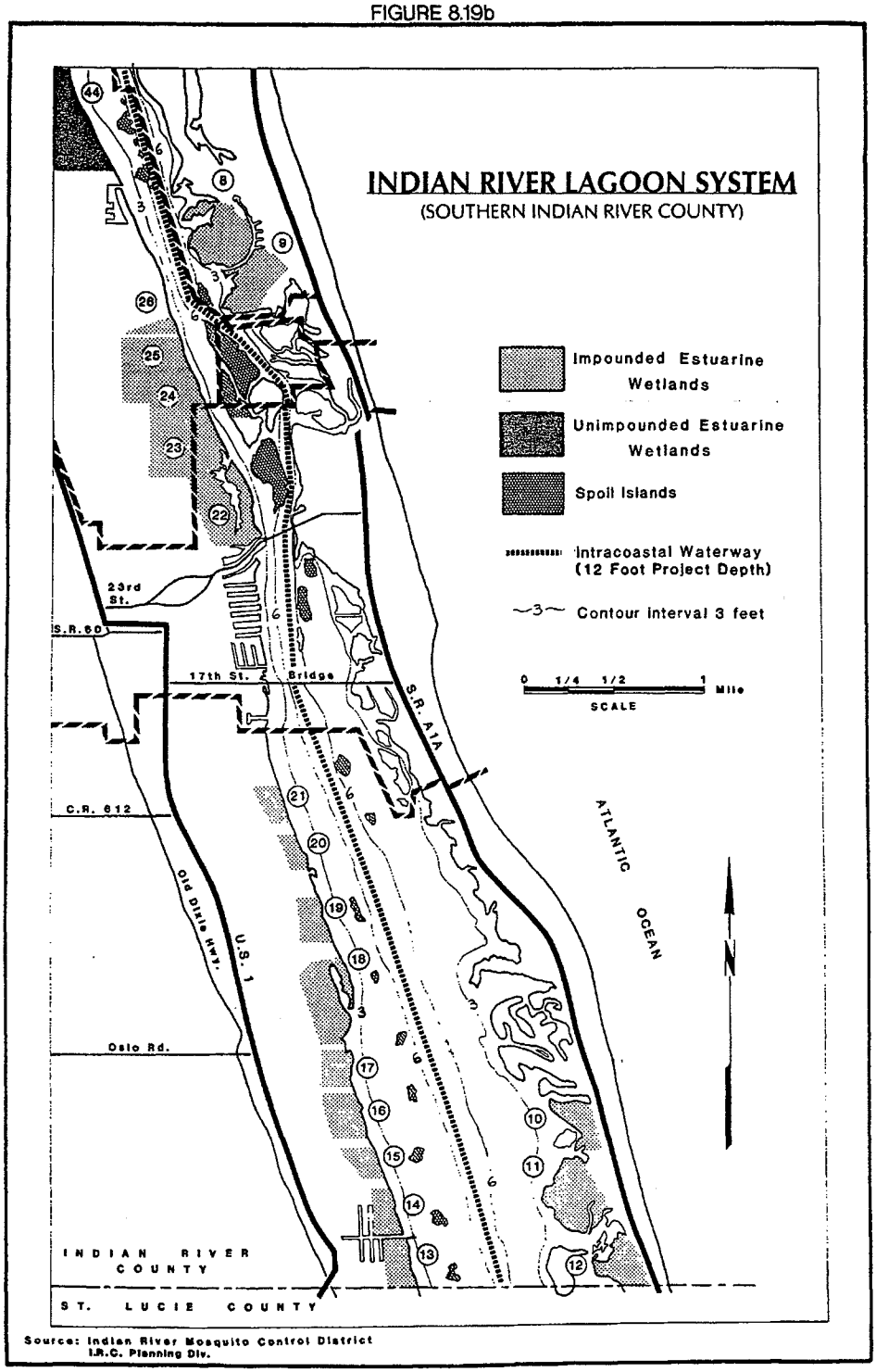

INDIAN RIVER LAGOON SYSTEM
(SOUTHERN INDIAN RIVER COUNTY)
Impounded Estuarine Wetlands
Unimpounded Estuarine Wetlands
Spoil Islands
Intracoastal Waterway (12 Foot Project Depth)
Contour Interval 3 feet
0 1/4 1/2 1 Mile
SCALE
23rd St.
S.R. 60
17th St. Bridge
S.R. A1A
C.R. 612
Old Dixie Hwy.
U.S. 1
Dale Rd.
ATLANTIC OCEAN
N
INDIAN RIVER COUNTY
ST. LUCIE COUNTY
Source: Indian River Mosquito Control District
I.R.C. Planning Div.

TABLE 8.5
WETLANDS IN INDIAN RIVER COUNTY

MAP NO.	IMPOUNDMENT NAME	APPROXIMATE ACREAGE
	Impounded Wetland Areas	
1.	Inlet	183
2.	Bird's	156
3.	Pete's	150
4.	North Deerfield	51
5.	South Deerfield	30
6.	Pine Island	380
7.	Hole in the Wall Island	130
8.	Water Tower	168
9.	Sand Point	149
10.	The Moorings	42
11.	Oyster Bar	164
12.	County Line	52
13.	Vero Shores	58
14.	South Bill's	30
15.	Middle Bill's	46
16.	North Bill's	40
17.	Lowenstein	65
18.	South Vista Royale	133
19.	North Vista Royale	52
20.	Jungle Gardens	87
21.	Schlitt's	35
22.	Golf Course	107
23.	South John Knights	44
24.	North John Knights	57
25.	Gifford Plots	76
26.	Triangle	16
27.	South Winter Beach	30
28.	North Winter Beach	72
29.	Morgan's	71
30.	Vicker's	61

Table 8.5
WETLANDS IN INDIAN RIVER COUNTY

MAP NO.	NAME	APPROXIMATE ACREAGE
	Unimpounded Wetland Areas	
31.	Pelican Island	3
32.	Roosevelt Island	15
33.	North Horseshoe Island	46
34.	Horseshoe Island	173
35.	Paul's Island	27
36.	Middle Island	2
37.	Nelson Island	23
38.	Preacher Island	97
39.	Pete's Island	56
40.	South end of Pine Island	107
41.	Barker Island	76
42.	Barker Island Chain	48
43.	Wabasso Island	45
44.	Winter Beach Marsh	100

SOURCE: Indian River County Planning Department; Indian River Mosquito Control District

In Indian River County, mosquito impoundments account for nearly 18 percent of the total acreage of wetlands throughout the IRL system. Although impounding estuarine wetlands is an effective method of controlling the mosquito population, impounding wetlands reduces the amount of potential habitat for fish and shellfish.

To manage the mosquito impoundments throughout the IRL system, the Indian River Mosquito Control District (IRMCD) utilizes five methods. These include: rotational impoundment management (RIM), seasonal flooding, permanent flooding, breached, and open marsh water management (OMWM). A detailed discussion of mosquito impoundment management techniques is contained in the Coastal Management Element.

Mosquito impoundments connected to the IRL provide important habitat for species of juvenile fish, including tarpon, common snook and mullet. Conversely, mosquito impoundments excluded from tidal exchange are generally characterized by only a few species of fish, most notably the sheepshead minnow, gulf killifish, mosquitofish, and sailfin molly. Most of these species are naturally carnivorous or omnivorous; however, due to reduced salinity levels, they tend to become herbivorous or detritivorous when contained in an impounded marsh (Woodward-Clyde, 1994).

The Indian River Lagoon and associated estuarine wetlands are part of a major ecological system that supports hundreds of species of fish, plants and animals. According to the Indian River Lagoon Comprehensive Conservation and Management Plan, the IRL has more species of fish, plants, and animals than any other estuary in the United States. Also, the IRL supports thirty-seven (37) rare and endangered species, including one quarter (1/4) to one third (1/3) of the Florida manatee (*Trichechus manatus*) population in the United States.

The natural ecological communities that comprise the IRL system are: high salt marshes, mangrove swamps, open water, exposed sand-shell bottoms, drift algae, and submerged aquatic vegetation. Mosquito impoundments and spoil islands are the anthropogenic features present in the IRL. Each of these communities has separate characteristics and functions; however, the boundaries of these communities overlap and are not clearly defined. Combined, these ecological communities form the basis for the most diverse estuary in North America.

- Exposed Sand-Shell Bottom

The exposed sand-shell bottom forms the most extensive area of the IRL system. Within this system, substrate firmness, stability and the percentages of silt, sand and shell material are extremely variable. Macroinvertebrate burrowing forms of life, such as segmented worms, brittle stars, bivalves, acorn worms, and gastropods, comprise the dominant species.

The exposed sand-shell bottom of the IRL lacks rooted plants; however, these areas often support algae communities attached to shell, rock, or other firm surfaces. Exposed sand-shell bottoms less than five feet in depth provide potential sites for colonization of submerged aquatic vegetation (SAV) as unconsolidated sediments stabilize.

Oyster flats and bars are exposed sand-shell bottoms where self-perpetuating oysters dominate. These areas provide attachment and protective cover sites for invertebrates and small cryptic fish such as gobies and blennies. The invertebrate community in turn provides a forage base for a variety of fish. Nearly half of all fish species in the IRL can be found on or over the exposed sand-shell bottom community (Woodward-Clyde, 1994). Fish species most often associated with this community include: sheephead, spade fish, grey snapper, tarpon, snook, and barracuda.

- Drift Algae Communities

As the term "drift algae" implies, this community is formed of unattached, free drifting algae, which aggregate in response to prevailing winds, water currents, and bottom topography. Due to their drifting characteristics, drift algae can be associated with exposed sand-shell bottoms or with seagrass bottoms. Drift algae occurs throughout the IRL, but particularly large and persistent aggregations occur south of Sebastian Inlet and north of Vero Beach.

The ecology of drift algae and its value to the productivity of the IRL have only recently come under review. These recent studies were limited to drift algae communities associated with SAV. Studies concerning drift algae communities not associated with SAV have yet to be published, but the drift algae habitat is believed to significantly contribute to the primary productivity, standing crop, and overall complexity of the IRL system.

- Submerged Aquatic Vegetation

Submerged aquatic vegetation (SAV) consists of submergent flowering plants (seagrasses) and algae that live underwater, produce oxygen and recycle nutrients. Seagrasses require sunlight to grow; therefore, the depth at which seagrasses are found is limited by water clarity. Within Indian River County, it is estimated that approximately 2,930 acres, or approximately 18 percent of the total ±16,300 acre IRL, are covered by SAV. Seagrasses in the Indian River Lagoon are important natural resources that perform many significant functions: 1) they help maintain water clarity by trapping fine sediments and particles with their leaves; 2) they stabilize the lagoon bottom with their roots; 3) they provide habitat for the fish, crustaceans and shellfish that thrive within the lagoon; 4) they provide a habitat for organisms that grow on them and serve as food sources for many marine animals; and, most importantly, 5) they are nursery areas for many species of marine life, over 80 of which are vital to the local fish and shellfish industries.

Within the IRL, moderate SAV coverage extends south of Sebastian Inlet to Johns Island. Due to reduced water quality, SAV communities are sparse north of the 17th Street Bridge and within the City limits of Vero Beach. In Indian River County, the most extensive and lush beds of seagrasses are found just north of the Indian River-St. Lucie County line. Figures 8.20 (A-G) identify the location and relative abundance of seagrasses within the IRL.

There are seven (7) species of seagrasses within the IRL. In relative order of abundance, these grasses are manatee grass (*Syringodium Filiforme*), shoal grass, (*Halodule wrightii*), Johnson's grass (*Halophila johnsonii*), turtle grass (*Thalassia testudinum*), paddle grass (*Halophila decipiens*), star grass, (*Halophila englemanni*) and widgeon grass, (*Ruppia maritima*). These seagrasses are depicted in Figure 8.21.

Syringodium is the most abundant seagrass, and is generally densest and most dominant in the mid-depth range of one foot to three feet. *Halodule* is the second most abundant seagrass, and generally dominates the shallowest zone - just below the intertidal region to a depth of approximately one foot. *Ruppia* occurs in scattered beds in the shallow regions of the IRL with *Halodule*. *Halophila decipiens* is also a relatively abundant SAV species. *Thalassia* is the most robust species, is supposedly the dominant species in a successional sense, is usually located in the mid-depth range, and is occasionally found at depths down to six (6) feet. The northern limit of *Thalassia* is the Sebastian Inlet. The species, however, is most often located near the Indian River County-St. Lucie County line. *Halophila johnsonni* is the rarest species of SAV.

Figure 8.20a

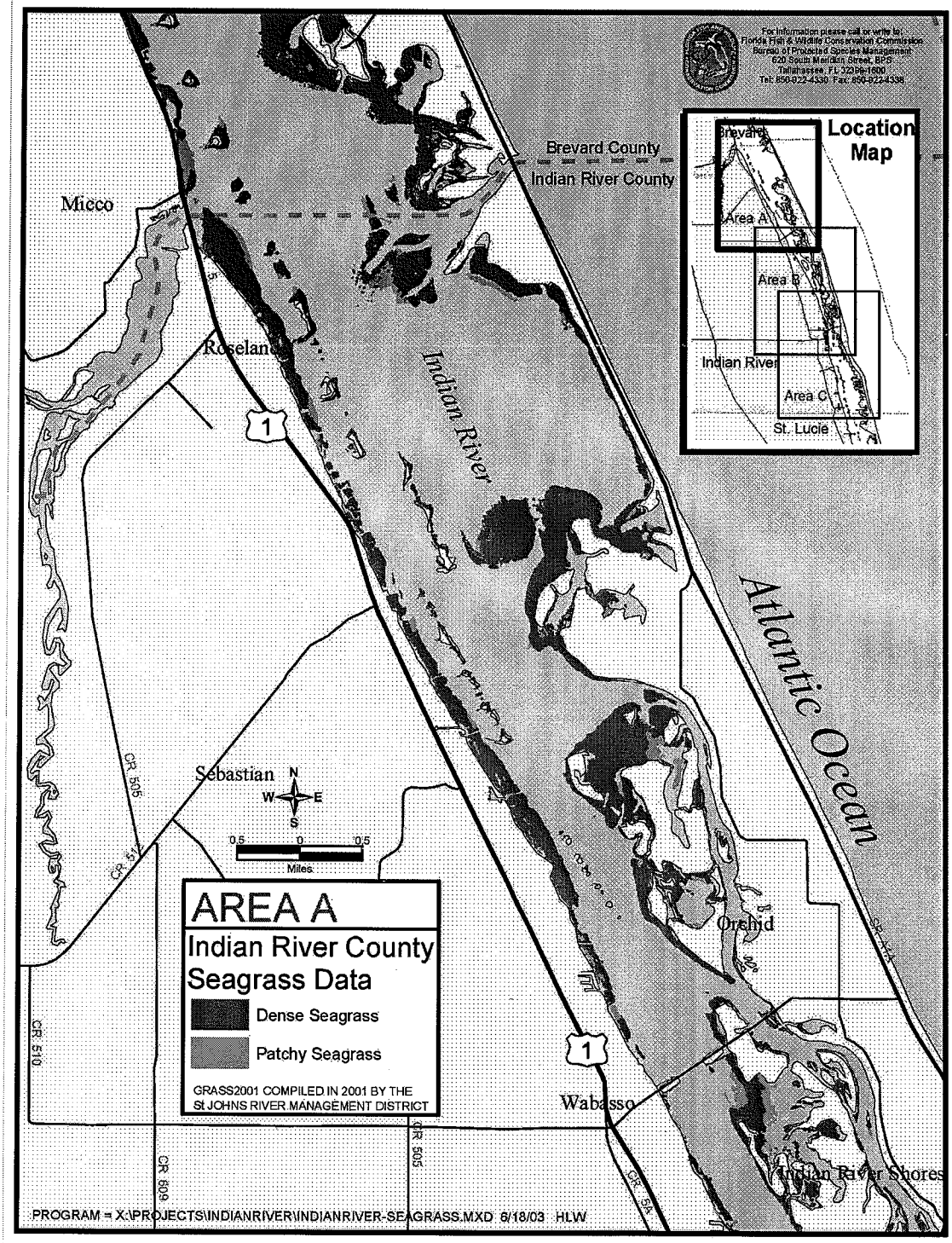

Brevard County
Indian River County
Micco
Roseland
Indian River
Atlantic Ocean
Sebastian
Orchid
Wabasso
Indian River Shores
CR 505
CR 510
CR 609
CR 512
CR 510A
1
N
W
E
S
0.5 0 0.5
Miles
Location Map
Area A
Area B
Area C
St. Lucie
AREA A
Indian River County
Seagrass Data
Dense Seagrass
Patchy Seagrass
GRASS2001 COMPILED IN 2001 BY THE
ST JOHNS RIVER MANAGEMENT DISTRICT
PROGRAM = X:\PROJECTS\INDIANRIVER\INDIANRIVER-SEAGRASS.MXD 6/18/03 HLW

Figure 8.20b

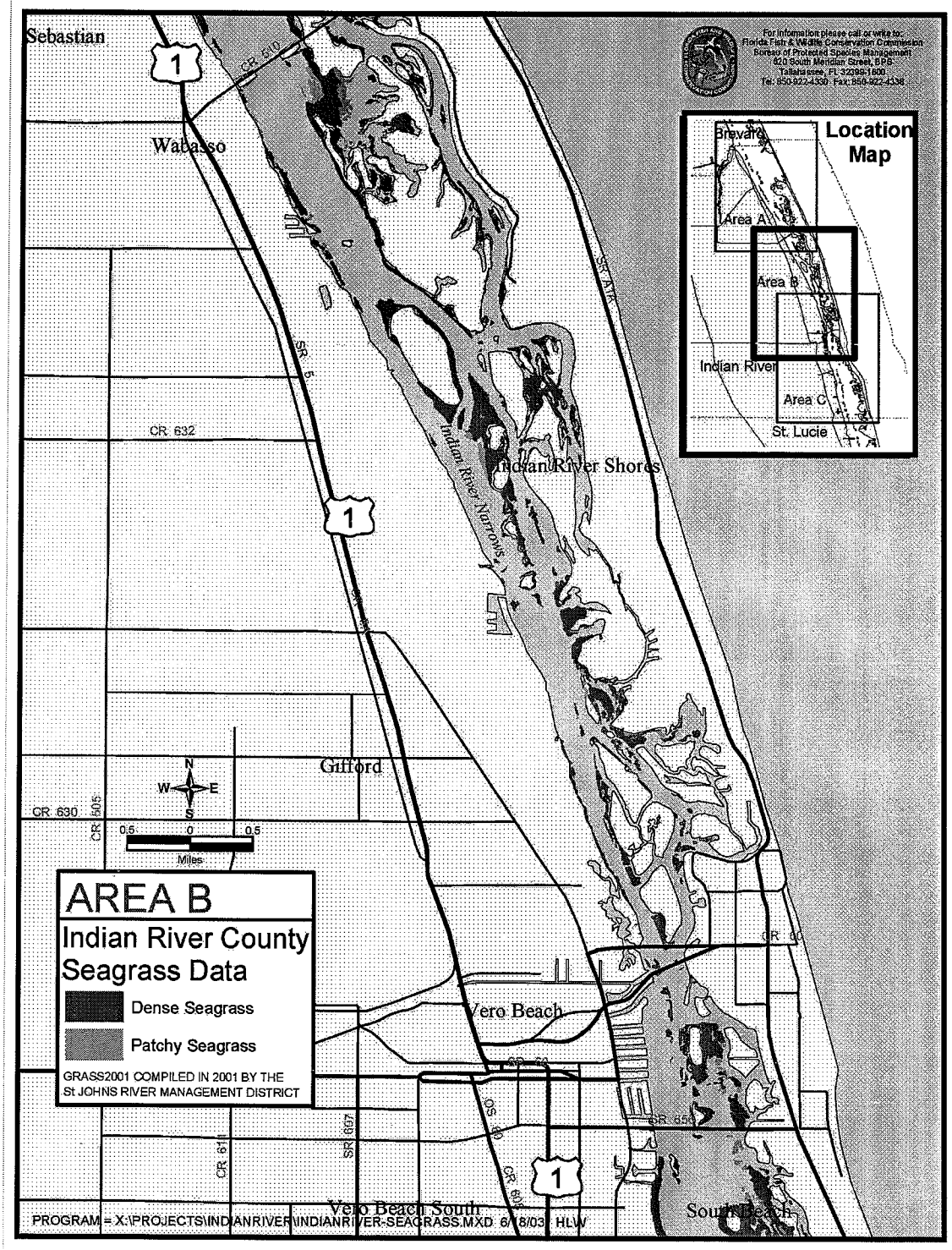

Sebastian
Wabasso
Gifford
Indian River Shores
Vero Beach
Vero Beach South
South Beach
Indian River Narrows
SR A1A
SR 5
CR 510
CR 632
CR 630
CR 505
CR 611
SR 607
CR 60
CR 65
1
N
W
E
S
0.5 0 0.5
Miles
AREA B
Indian River County
Seagrass Data
Dense Seagrass
Patchy Seagrass
GRASS2001 COMPILED IN 2001 BY THE
St JOHNS RIVER MANAGEMENT DISTRICT
PROGRAM = X:\PROJECTS\INDIANRIVER\INDIANRIVER-SEAGRASS.MXD 6/18/03 HLW
Location
Map
Brevard
Area A
Area B
Indian River
Area C
St. Lucie
For information please call or write to:
Florida Fish & Wildlife Conservation Commission
Bureau of Protected Species Management
620 South Meridian Street, 6PS
Tallahassee, FL 32399-1600
Tel: 850-922-4330 Fax: 850-922-4338

Figure 8.20c

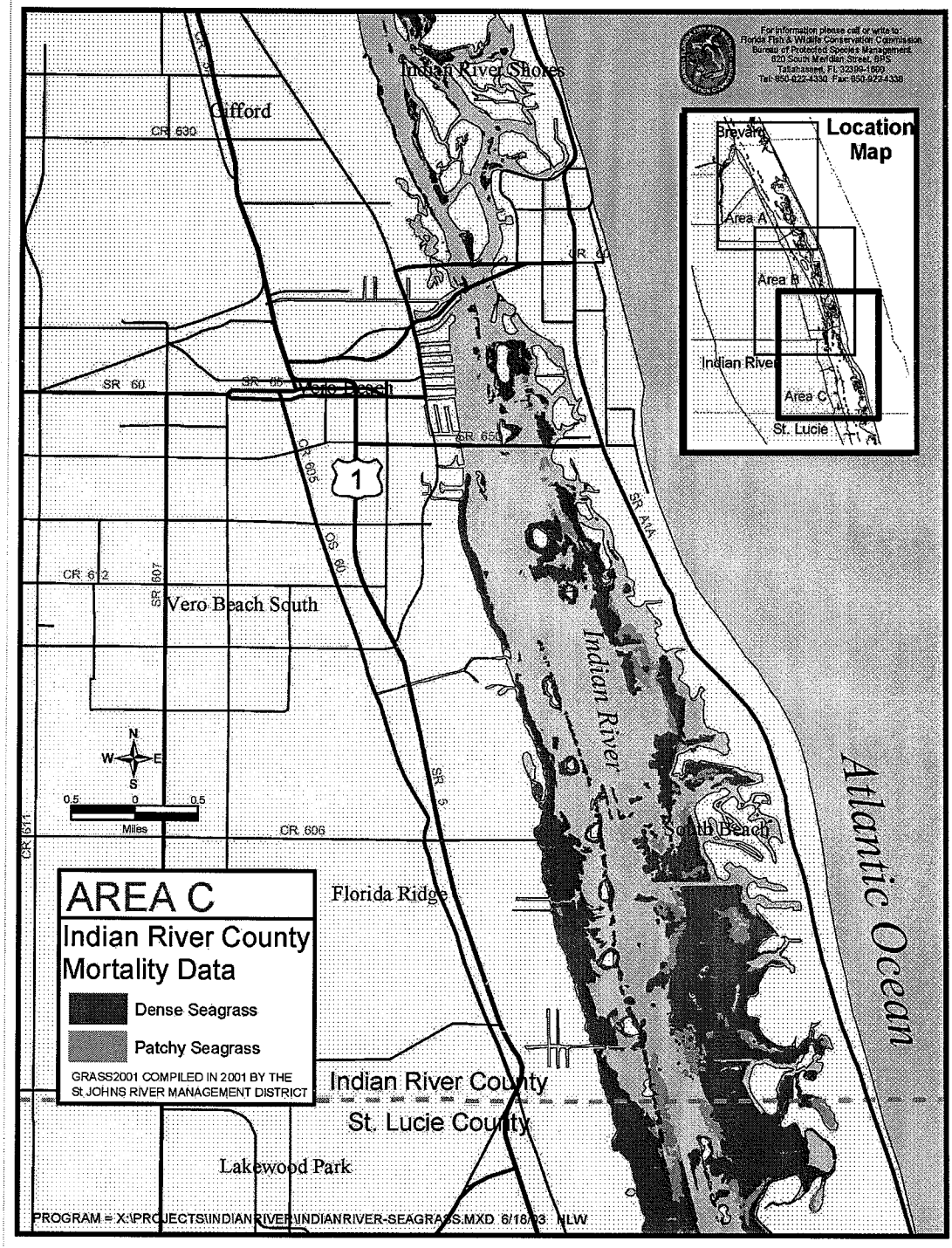
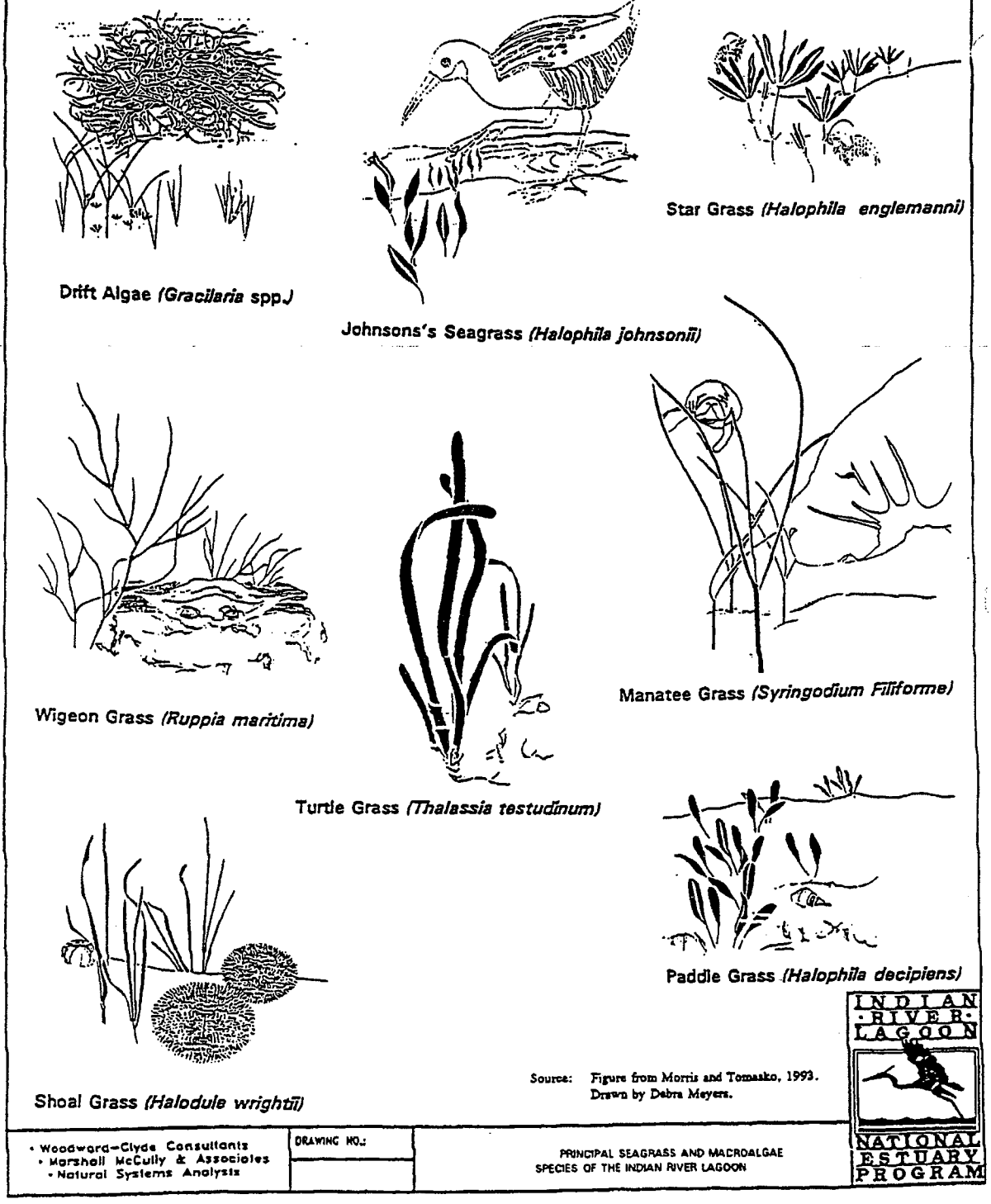

Indian River Shores
Gifford
CR 630
SR 60
Vero Beach
CR 605
CR 60
1
CR 612
SR 607
Vero Beach South
SR A1A
Indian River
South Beach
Atlantic Ocean
SR 5
CR 606
CR 611
Florida Ridge
Indian River County
St. Lucie County
Lakewood Park
AREA C
Indian River County
Mortality Data
Dense Seagrass
Patchy Seagrass
GRASS2001 COMPILED IN 2001 BY THE
St JOHNS RIVER MANAGEMENT DISTRICT
N
W
E
S
0.5 0 0.5
Miles
Location Map
Brevard
Area A
Area B
Indian River
Area C
St. Lucie
PROGRAM = X:\PROJECTS\INDIANRIVER\INDIANRIVER-SEAGRASS.MXD 6/18/03 HLW

FIGURE 8.21


Drift Algae (Gracilaria spp.)
Johnsons's Seagrass (Halophila johnsonii)
Star Grass (Halophila englemanni)
Wigeon Grass (Ruppia maritima)
Turtle Grass (Thalassia testudinum)
Manatee Grass (Syringodium Filiforme)
Paddle Grass (Halophila decipiens)
Shoal Grass (Halodule wrightii)
Source: Figure from Morris and Tomasko, 1993. Drawn by Debra Meyers.
• Woodward-Clyde Consultants
• Marshall McCully & Associates
• Natural Systems Analysis
DRAWING NO.:
PRINCIPAL SEAGRASS AND MACROALGAE SPECIES OF THE INDIAN RIVER LAGOON
INDIAN RIVER LAGOON
NATIONAL ESTUARY PROGRAM

In terms of both diversity and density, SAV communities support over 200 species of fish, making this community the richest fish habitat in the IRL. Pinfish is the species most commonly found in SAV communities. Other prominent species of fish associated with SAV communities include: sea bass, snapper, mojarras, porgies, silver jenny, code goby, grunts and drums. Studies indicate that the relative abundance of fish is positively correlated to the density of SAV. Conversely, reduced continuity of SAV beds (e.g. discontinuities caused by prop scars) has a negative impact on habitat value (Woodward-Clyde, 1994).

- High Salt Marsh

A high salt marsh is defined as the area of salt-tolerant wetland vegetation between the MHWL and the annual high tide line. During the fall season when the sea level is higher than the usual peak lunar level, salt marshes are tidally flooded for several weeks. Also, storm tides frequently inundate high salt marshes.

Within high salt marshes, typical ground cover species include: smooth cordgrass, saltwort, glasswort, salt grass, and sea daisy. Mangroves may also be present. Much of this salt marsh vegetation serves as a food source for a variety of fish and other marine organisms. While marine species living in the marsh are influenced by the frequency and range of tidal action, salinity, nutrients, soils, dissolved oxygen content, micro-relief, and anthropogenic influences, common species include: killifish, juvenile snook, tarpon, ladyfish, mullet, crabs and shrimp. A variety of wading birds, including herons, egrets, wood storks, and white ibis commonly feed in flooded portions of the high marsh.

- Mangrove Swamp

Generally, the high salt marsh transcends into intertidal mangrove swamps. Mangrove swamps contain three varieties of mangroves. Red mangroves are typically found below the MHWL of the IRL. Although the red mangrove is by far the most abundant species, occasionally some black and white mangroves may be found. A mangrove fringe is found along most of the undeveloped portions of the IRL shoreline. Rarely do the mangroves extend more than 100 feet landward of the MHWL.

In Florida, the critical importance of mangrove detritus or leaf litter as a source of estuarine productivity has been well documented, and the intertidal community is the principal contributor to this process. To some degree, many commercial and sport finfish and shellfish resources of the Indian River are dependent upon this nutrient base. Like all wetland communities which occupy the land-water transition, intertidal mangroves are extremely valuable fish and wildlife habitat. Over 100 species of crustaceans and fish have been found to be dependent on the high marsh and the mangrove swamp habitats within Indian River County. Mangroves also provide habitat for the endangered saltmarsh snake, river otters, raccoons, and bobcats, as well as roosting and nesting areas for many colonial waders, pelicans, and cormorants. Fish species associated with the mangrove

swamp community include ladyfish, sheepshead minnow, marsh killifish, mosquitofish, sailfish molly, highfin blenny, and frillfin goby.

One species, the Atlantic saltmarsh snake, is restricted to the brackish water environments of the high salt marshes and mangrove swamps of Volusia, Brevard, and Indian River Counties. The species is at risk from habitat destruction and the construction of freshwater ponds which become habitat for the "reproductively compatible" banded water snake.

Over time, mangroves have demonstrated the ability to trap, hold and, to some extent, stabilize intertidal sediments. The present view of mangroves is that they function not as "land builders" but as "stabilizers" of sediments. Such stabilization of sediment is possible only where strong waves and currents do not exist.

Although mangroves are susceptible to hurricane damage, they provide considerable protection to areas on their landward side. The degree of this protection is roughly proportional to the width of the mangrove zone. While narrow fringing forests offer minimal protection, extensive stands of mangroves not only prevent wave damage, but reduce flooding damage by damming and holding flood water.

- Spoil Islands

The 49 spoil islands present in Indian River County are the legacy of the dredging of the ICW that took place in the mid-1950's. These islands are owned by the State of Florida, administered by the Trustees of the Internal Improvement Trust Fund (TIITF), and managed by the Florida Inland Navigation District (FIND). In September 1989, a spoil island management plan was completed by the FDNR in conjunction with FIND. Besides exhibiting significant conservation (i.e. bird rookeries), environmental, and recreational qualities, these islands have strong aesthetic value.

Although upland vegetation associated with the spoil islands consists of both native and non-native plant species, the value of the islands to the natural environment is associated with providing relatively remote bird rookery sites. As a whole, the spoil islands have increased the surface area of the land-water interface of the intertidal zone. This increased interface has a direct effect on organisms that associate with the intertidal zone or shallow subtidal nearshore bottoms. Where spoil islands emerge from the bottom of the IRL, many species of aquatic animals (e.g. oyster, clams, shrimp, anchovies, sardines, morjarras, etc.), submerged aquatic vegetation (e.g. shoal grass *Halodule wrightii*), shoreline plants (e.g. cord grass *Spartina spp.*), and mangroves are provided with a far greater area for habitation and settlement. An inclusive list of the spoil islands within Indian River County is contained in Table 8.10.

- Lagoon "Reefs"

As gorgonian corals and invertebrate growth attach to hard surfaces such as exposed rock ledges carved from dredged channels, especially the along margins of the Intracoastal Waterway (ICW), artificial reefs are formed. Other hardened surfaces amenable to reef growth include shipwrecks, pilings, and submerged structures (Woodward-Clyde, 1994). Over 90 species of fish congregate near reefs. Most of these species, such as scorpionfish, cardinalfish, butterflyfish, angelfish, damselfish, wrass, and parrotfish, are considered primary reef fish and are generally not found near any of the other previously mentioned communities (Woodward-Clyde, 1994).

Nearshore Atlantic System

The nearshore system is comprised of two main components: the subtidal zone and the surf zone. The surf zone extends from depths of nine (9) feet below the mean low water line (MLWL) to the MLWL, while the subtidal zone extends from depths of approximately nine (9) feet to twenty-five (25) feet below the MLWL.

Off the coast of Indian River County, the surf and subtidal zones are characterized by rock/reef development. These nearshore outcrops/reefs function to stabilize the barrier island shoreline by moderating wave action and providing a hard bottom for marine plants and animals. The rock and reef areas have an abundance of marine life. Attached and encrusting algae are common, and many types of invertebrates such as bryozoans, gorgonians, sponges, and ascidians are present. Other invertebrates include polychaetes, mollusks, crustaceans and echinoderms. Sea turtles also forage the reefs. The Coastal Management Element of this plan provides a more detailed account of the nearshore Atlantic system.

At least 255 species of fish have been documented on the nearshore reefs of the County. Of these, more than 75 percent are Caribbean reef fish such as grunts, angelfishes, butterfishes, damselfishes, and wrasses. Fish with commercial and sportfish value, such as several species of snappers and groupers, are also found.

- Sebastian Inlet

Nearly half of all fish species frequenting the inlet are associated with nearshore Atlantic communities, especially reefs. Species found near the inlet include: sharks, moray eels, snake eels, surgeonfish, butterfish, filefish, and boxfish.

Commercial Uses of Natural Resources

Indian River County's terrestrial and marine resources are used for commercial purposes in a number of ways. While upland communities, such as rangelands, woodlands and prairies, are used to support

such activities as cattle grazing and tree farming, other lands have been cleared for citrus and vegetable crop production. Commercial use of marine resources includes shellfish and finfish harvesting. As mentioned in the Geology and Soils section of this element, sand mining is also a commercial activity that utilizes natural resources.

According to the most recent Agricultural Census, there were 47,539 acres of actively cultivated citrus groves in Indian River County in 2004. In that year, 17,263,000 boxes of citrus fruit were harvested, ranking Indian River County 7th in the state for overall citrus production.

In 2006, 2,998 commercial fishing trips resulted in a commercial finfish catch of 841,774 pounds, while 48 commercial fishing trips for invertebrates, such as shrimp and crabs, yielded 9,638 pounds of commercial catch.

Currently, aquaculture is permitted in waters of the Indian River Lagoon north of the Wabasso Bridge (C.R. 510) to the Sebastian Inlet, east of the Intracoastal Waterway (ICW), and the majority of the lagoon south of the City of Vero Beach extending past the south county line. In Indian River County, aquaculture focuses on the harvest of clams. While 8,400 acres of surface water are presently available for aquaculture in the County, there were 318 acres of active aquaculture leases in the tri-county (Volusia, Brevard, and Indian River counties) area of the Indian River Lagoon in 2006.

Figure 8.22a

SHELLFISH HARVESTING AREA CLASSIFICATION MAP #72 (Effective: June 18, 1997)
North Indian River (#72) Shellfish Harvesting Area in Indian River County

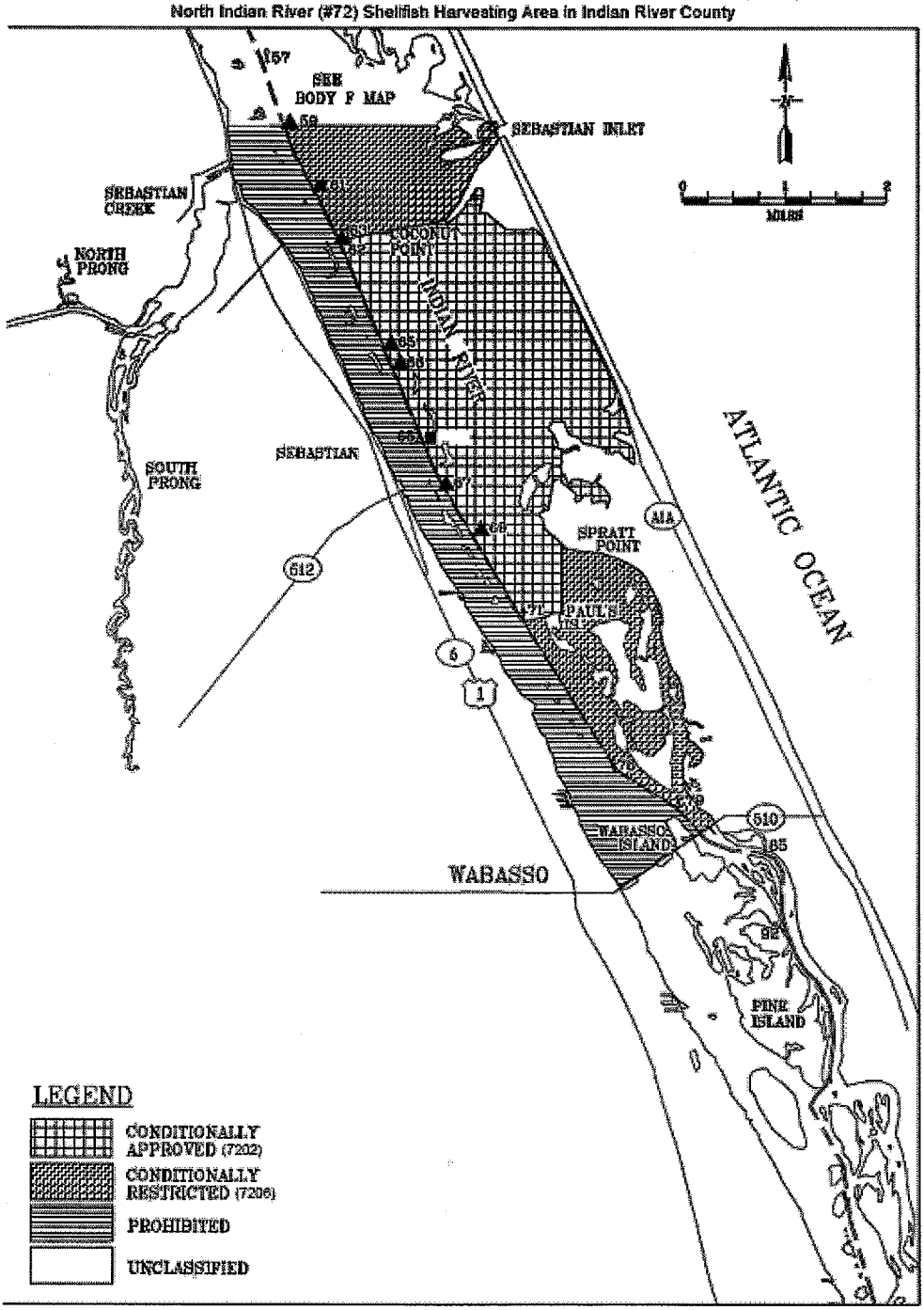
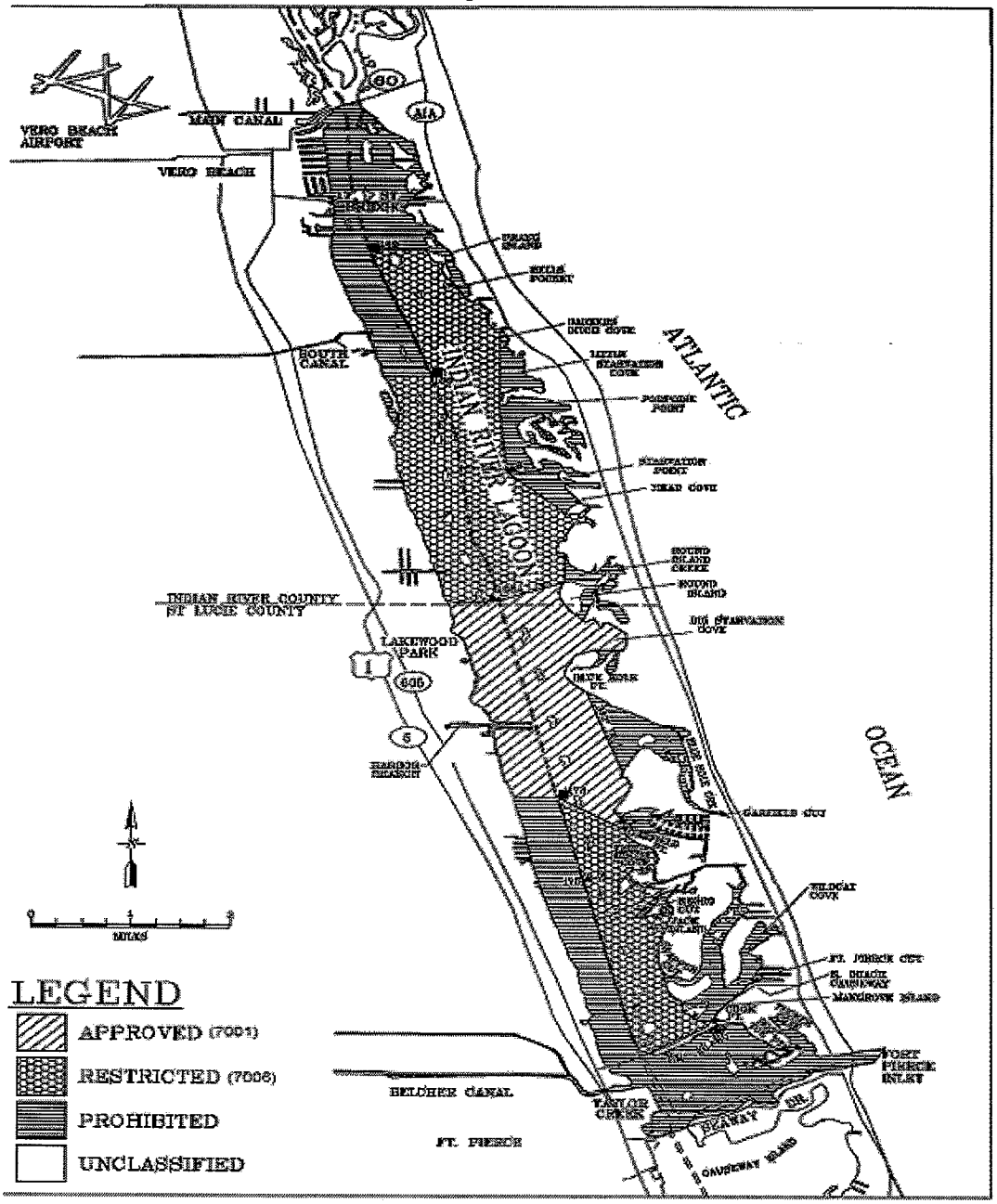


Figure 8.22b

SHELLFISH HARVESTING AREA CLASSIFICATION MAP #70 (Effective: June 18, 1997)
Indian River/St. Lucie (#70) Shellfish Harvesting Area in Indian River and St. Lucie Counties



Conservation and Recreational Uses of Natural Resources

At the present time, approximately 105,380 acres of conservation and recreational lands in Indian River County are under public ownership or public conservation easement. This land is distributed among federal, state, regional and local governments. Table 8.6 contains a list of such lands currently under public ownership or public conservation easements. In addition to the lands listed in Table 8.6, upland set-aside conservation areas, which have been required by the County since 1991 for new development projects, have been established in residential and non-residential developments throughout the county.

The Recreation and Open Space Element provides a detailed inventory of recreation and open space properties and uses in Indian River County. As identified in the Recreation and Open Space Element, "pastoral" open space is open space area set aside for conservation, natural resource protection, or passive use purposes. This includes the county's environmentally sensitive areas, resource based parks, and various conservation areas.

TABLE 8.6
PUBLICLY OWNED CONSERVATION AND RECREATIONAL LANDS IN INDIAN RIVER COUNTY

Name	Acreage	Owner
Ansin Tract /Canoe Launch Park	28	IRC
Archie Carr N.W.R.	75	FDEP/USFWS
Blue Cypress Conservation Area	49,890	SJRWMD
Captain Forster Hammock Preserve	112	FDEP
Cypress Bend Community Preserve (f.k.a. Russell Grove)	47	IRC
Corrigan 460 Tract (w/ easement)	458	SJRWMD/IRC
Dale Wimbrow/Donald MacDonald Park	74	IRC
Fellsmere Water Management Area	10,209	SJRWMD
Flinn Tract Conservation Area	37	IRC/SJRWMD/FIND
Fort Drum Marsh Conservation Area	20,862	SJRWMD
Golden Sands Beach Park	18	IRC
Green Salt Marsh	16	IRC
Hallstrom Farmstead	93	IRC
Harmony Oaks Conservation Area	90	IRC
Kiwanis-Hobart Park	654	IRC
Indian River Blvd. Mitigation Area	114	IRC/State
Kennedy PINWR Buffer	24	IRC
Korangy Tract	132	IRC
Lost Tree Islands Conservation Area	508*	IRC/VB/IRS
Mills Ranch Conservation Easement	960	Private/SJRWMD
North Sebastian Conservation Area	541	IRC/SJRWMD

Oslo Riverfront C. A. (including south of Oslo Rd)	419	IRC/SJRWMD
Oyster Bar Marsh C.A.	96	IRC
Padgett Branch Conservation Easements	1,585	Private/IRC
Pelican Island N.W.R.	4,860*	USFWS
Prange Island(s)	27	IRC/VB
Rodney Kroegel Homestead	3	IRC
Round Island South C.A.	59	IRC
Sand Lakes C.A.	1,321	SJRWMD/IRC
St. Sebastian River Preserve State Park	10,000	SJRWMD/FDEP
Sebastian Harbor Preserve C.A.	163	IRC
Sebastian Highlands Scrub C.A.	10	IRC
Sebastian Inlet State Recreation Area	457	FDEP
Sebastian Stormwater Park	176	SJRWMD
Sexton Ranch Conservation Easements	462	Private/IRC
South County Park C.A.	10	IRC
South Prong Preserve	37	IRC
Vero Beach Airport Conservation Area	800	VB
Wabasso Scrub	111	IRC
TOTAL	**105,382**	

* Includes submerged lands in the Indian River Lagoon.
Source: Florida Natural Areas Inventory (2009), Indian River County Environmental Planning Section

Upper St. Johns River Basin

The St. Johns River Water Management District (SJRWMD) owns approximately 174,121 acres in the Upper St. Johns River Basin, an area which extends north into Brevard County. Of the total acreage, approximately 80,960 acres are located in Indian River County. Located north of S.R. 60, the Blue Cypress Conservation Area and the Fellsmere Water Management Area contain approximately 60,100 acres (combined). South of S.R. 60, the SJRWMD owns approximately 20,860 acres known as the Fort Drum Marsh Conservation Area.

- Blue Cypress Conservation Area

The Blue Cypress Conservation Area is managed by the SJRWMD for conservation, recreation and water management purposes. This area contains the recently restored Stick Marsh and the Blue Cypress Water Management Area. Species present in the Blue Cypress Conservation Area include: snail kite, blue heron, white ibis, snowy egret, limpkin, wood storks, ospreys and bald eagles.

Within the Blue Cypress Conservation Area, recreational opportunities include: hunting, fishing, primitive camping, hiking, bird watching, canoeing, airboating, and powerboating (in designated areas).

- Fort Drum Marsh Conservation Area

The Fort Drum Marsh Conservation Area is managed by the SJRWMD for conservation, recreation, and flood control purposes. This area contains a variety of interspersed ecological communities that include: dry prairies, pine flatwoods, hardwood swamps and freshwater marshes. These communities support Florida sandhill cranes, wood storks, caracara, bald eagles, deer, wild turkeys, and feral hogs. Recreational opportunities include: hiking, bicycling, primitive camping, bird watching, canoeing, environmental education, and seasonal hunting.

Pelican Island National Wildlife Refuge

In 1903, President Theodore Roosevelt established Pelican Island as the first National Wildlife refuge. Subsequently, Pelican Island was designated a National Historic Landmark, and in 1970 it was declared part of the National Wilderness System. The boundaries of the refuge are (roughly) Sebastian Inlet to the north, C.R. 510 to the south, Jungle Trail and S.R. A1A to the east, and the ICW to the west. The refuge consists of submerged lands in the IRL lagoon, several mangrove islands, and an upland buffer area of several hundred acres of abandoned citrus groves that are being restored over time to native plant communities endemic to the coastal barrier island.

Due to the extensive year-round use by wading birds and pelicans, the island is off-limits to visitors, and boats are required to maintain a minimum distance of 75 feet. In addition to protecting pelican rookeries, the refuge also provides protection for lush submergent aquatic vegetation, shallow water habitat, mangrove fringe, and upland habitat for other colonial nesting birds.

Archie Carr National Wildlife Refuge

In 1989, the Archie Carr National Wildlife Refuge (ACNWR) was established as a joint venture between the USFWS, the State of Florida, and local government agencies. Segment 4 of the refuge extends from Golden Sands Park north to the Sebastian Inlet S.R.A. and contains nearly 2.9 miles of the most prolific beaches for turtle nesting in the world. Approximately 1.2 miles, or 41 percent, are currently under public ownership. Passive recreation is allowed within the refuge.

Within the refuge, natural communities are in good condition and include coastal strand and maritime hammock. The primary significance of the refuge is its habitat for loggerhead, green, and leatherback species of sea turtles. Overall, the refuge supports approximately eight percent of all loggerhead turtle nesting in Florida, and also supports several other rare plant and animal species such as the Florida beach mouse.

Conservation Lands Acquired By Indian River County

In 1990, Indian River County established an Environmental Lands Program for the acquisition and management of significant environmental lands. As part of that program, a Land Acquisition Advisory Committee (LAAC) was created to advise the Board of County Commissioners on environmental land acquisition matters. The LAAC consists of 18 members, representing diverse interests. To establish procedures for site evaluation and acquisition, the Board adopted an Environmental Lands Program Guide.

In November 1992, county voters approved a $26 million bond (ad valorem tax) referendum for the acquisition of environmental lands. An additional $50 million in bonding authority was approved in 2004. That action also expanded the program to include historic properties and agricultural protection/conservation easements. Since 1990, Indian River County has acquired or contributed to the acquisition of 37 sites, totaling approximately 12,000 acres. Table 8.6 identifies the properties acquired under the County Environmental Lands Program, including acres acquired by plant community type. Figure 8.23 shows the general location of lands acquired by Indian River County.

Recreational Parks

At the present time, there are 32 public parks and recreation areas located within unincorporated Indian River County. These parks and recreation areas are depicted in Figure 8.24. A more detailed description of the parks and recreational facilities within Indian River County is contained in the Recreation and Open Space Element.

Figure 8.23

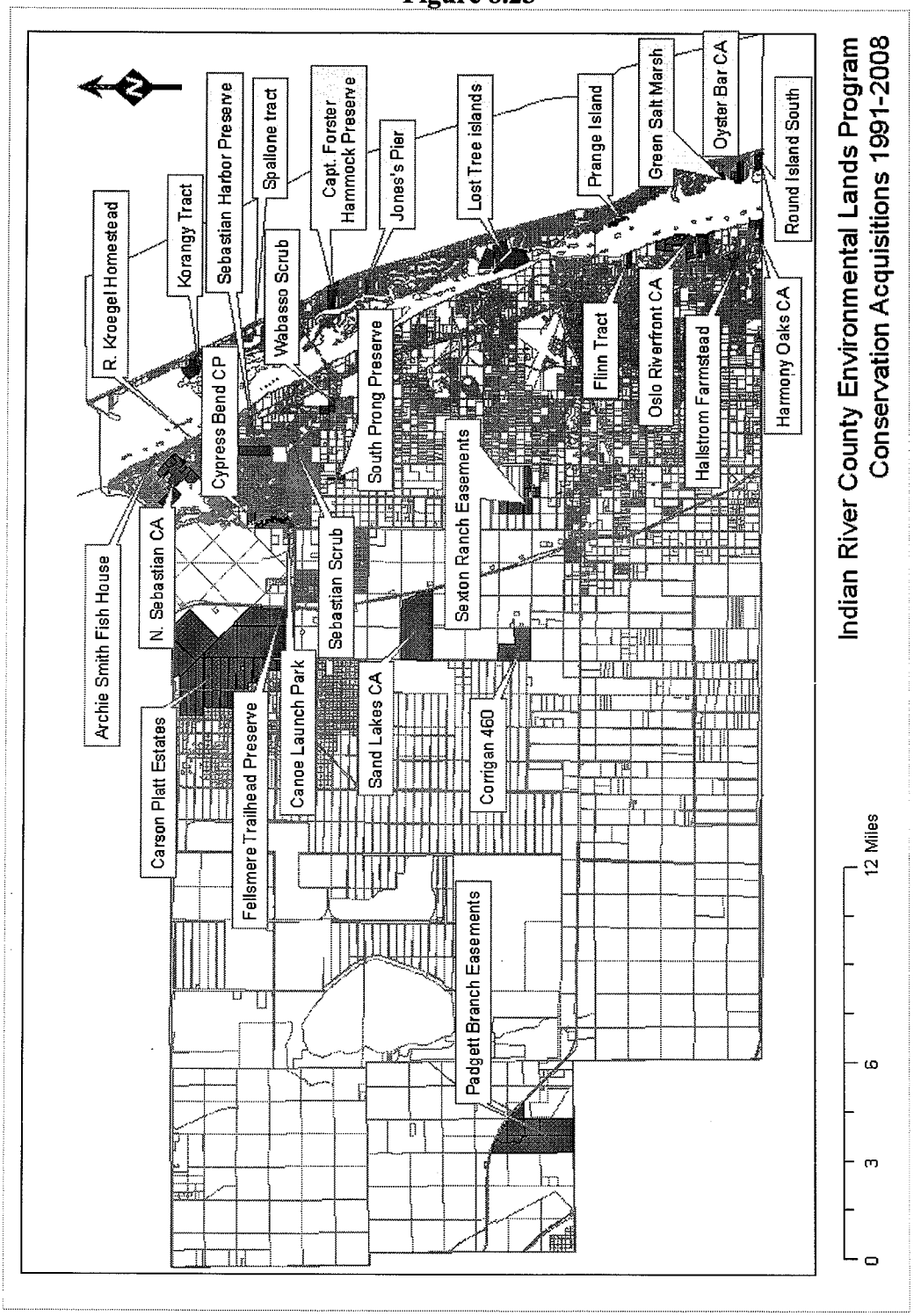
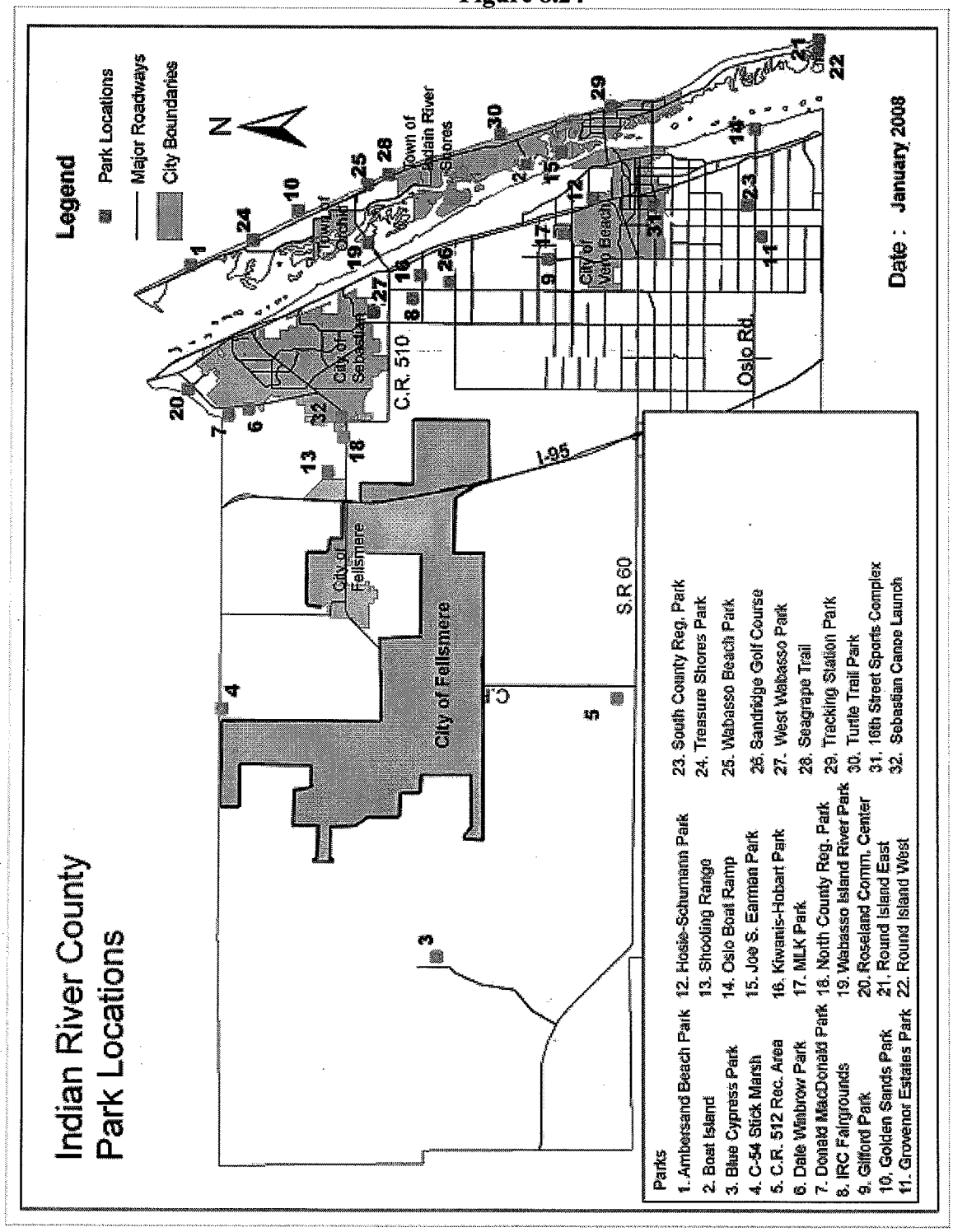

Indian River County Environmental Lands Program
Conservation Acquisitions 1991-2008
R. Kroegel Homestead
Korangy Tract
Sebastian Harbor Preserve
Spallone tract
Capt. Forster Hammock Preserve
Jones's Pier
Lost Tree islands
Prange Island
Green Salt Marsh
Oyster Bar CA
Round Island South
Wabasso Scrub
Cypress Bend CP
South Prong Preserve
Flinn Tract
Oslo Riverfront CA
Hallstrom Farmstead
Harmony Oaks CA
Sexton Ranch Easements
Archie Smith Fish House
N. Sebastian CA
Sebastian Scrub
Canoe Launch Park
Sand Lakes CA
Corrigan 460
Carson Platt Estates
Fellsmere Trailhead Preserve
Padgett Branch Easements
0
3
6
12 Miles

Figure 8.24


Indian River County
Park Locations
Legend
Park Locations
Major Roadways
City Boundaries
N
Date : January 2008
City of Fellsmere
City of Sebastian
Town of Orchid
Town of Indian River Shores
City of Vero Beach
C.R. 510
Oslo Rd.
I-95
S.R 60
Parks
1. Ambersand Beach Park
2. Boat Island
3. Blue Cypress Park
4. C-54 Stick Marsh
5. C.R. 512 Rec. Area
6. Dale Wishrow Park
7. Donald MacDonald Park
8. IRC Fairgrounds
9. Gifford Park
10. Golden Sands Park
11. Grovenor Estates Park
12. Hosie-Schumann Park
13. Shooting Range
14. Oslo Boat Ramp
15. Joe S. Eamian Park
16. Kiwanis-Hobart Park
17. MLK Park
18. North County Reg. Park
19. Wabasso Island River Park
20. Roseland Comm. Center
21. Round Island East
22. Round Island West
23. South County Reg. Park
24. Treasure Shores Park
25. Wabasso Beach Park
26. Sandridge Golf Course
27. West Wabasso Park
28. Seagrape Trail
29. Tracking Station Park
30. Turtle Trail Park
31. 16th Street Sports Complex
32. Sebastian Canoe Launch

• Oceanfront Parks

Overall, approximately 22,874 linear feet, or 19.2 percent of the County's oceanfront property, is under public ownership. Detailed information regarding oceanfront parks and public accesses is referenced in the Coastal Management Element and the Recreation and Open Space Element.

Of the eleven oceanfront parks in the county, the most utilized is the Sebastian Inlet State Recreational Area (S.R.A.) Owned by the State and operated by the FDEP, the park is divided between Brevard County to the north of Sebastian Inlet and Indian River County to the south. Approximately 457 acres of the park lie within Indian River County. This includes over 8,000 linear feet of shoreline. Sebastian Inlet S.R.A. is also considered part of the Archie Carr National Wildlife Refuge.

Of the eleven oceanfront parks in the county, Indian River County owns and operates six. Four parks, Ambersand Beach Park, Treasure Shores Park, Golden Sands Park, and Wabasso Beach Park, are located on the northern one-third (1/3) of the barrier island. While two public accesses, Seagrape Trail and Turtle Trail, are located on the northern portion of the island, Tracking Station Park is located within the Town of Indian River Shores. Round Island Park is located near the south County line.

The City of Vero Beach owns and maintains four public oceanfront parks. These include: Jaycee Park, Conn Beach, Humiston Beach Park, and South Beach Park. An inclusive listing of the public access points located in the City of Vero Beach is contained in the Coastal Management Element.

Improvements and facilities associated with these parks are discussed in the Recreation and Open Space Element. Additionally, public access and shoreline issues are discussed in detail in the Coastal Management Element and the Recreation and Open Space Element.

TABLE 8.7
PUBLICLY OWNED OCEANFRONT LANDS IN INDIAN RIVER COUNTY

OCEANFRONT PARKS	**PUBLICLY-OWNED SHORELINE (linear feet)**
Sebastian Inlet S.R.A	8,000 (portion in IRC)
Indian River County	7,620
City of Vero Beach	3,251
Public Accesses	520
SUB-TOTAL	**19,391**
UNIMPROVED	
Archie Carr N.W.R.	1,853*
Capt. Forster Hammock Preserve	1,550
SUB-TOTAL	**3,403**
TOTAL	**22,874 feet (4.33 miles)**

*Land in addition to County Parks and the Sebastian Inlet S.R.A

- Riverfront Parks

Donald McDonald Park and Dale Wimbrow Park are located adjacent to each other on the east side of the St. Sebastian River. They have a combined size of 74 acres.

Located near the South County line on both the west and east sides of State Road A1A, Round Island Park is a ±95 acre county-owned park. Recent improvements made to the river side of the park include: replacement of a one-lane boat ramp with a two-lane ramp, construction of fishing piers, and installation of manatee awareness signage. A walkway to Round Island and an observation tower have also been constructed.

Wabasso Island River Park consists of 51 acres of land located on the IRL along the C.R. 510 causeway. This park and the surrounding waters are among the most popular sites for on-water recreational activities in the county. Improvements at the park include picnic pavilions, a boat ramp, stabilized parking areas, restroom facilities, and an informational kiosk.

Located northeast of Grand Harbor marina on South Sister Island (Spoil Island # IR-25), Boat Club Island Park contains three docks and a picnic table. This park is owned by the State and managed by the County.

Joe S. Earman Park is a 4 acre park located on the northern tip of the Lost Tree Islands (on Spoil Island #28). This park contains picnic facilities and a temporary docking facility.

Two parks with access to inland waters are located within the City limits of Vero Beach. Riverside-Memorial Island Park is located on the barrier island west of S.R. A1A. The city of Vero Beach manages the 52 acre park extensively for recreational use. MacWilliams-Boat Basin Park is located on Orchid Island, north of the Merrill-Barber Bridge.

Within the City of Sebastian, Riverview Park and Main Street Riverfront Park have access to the IRL. Each park has a boat ramp with two lanes. As previously mentioned, the IRL is also accessible from the Sebastian Inlet S.R.A.

Indian River Lagoon Aquatic Preserves

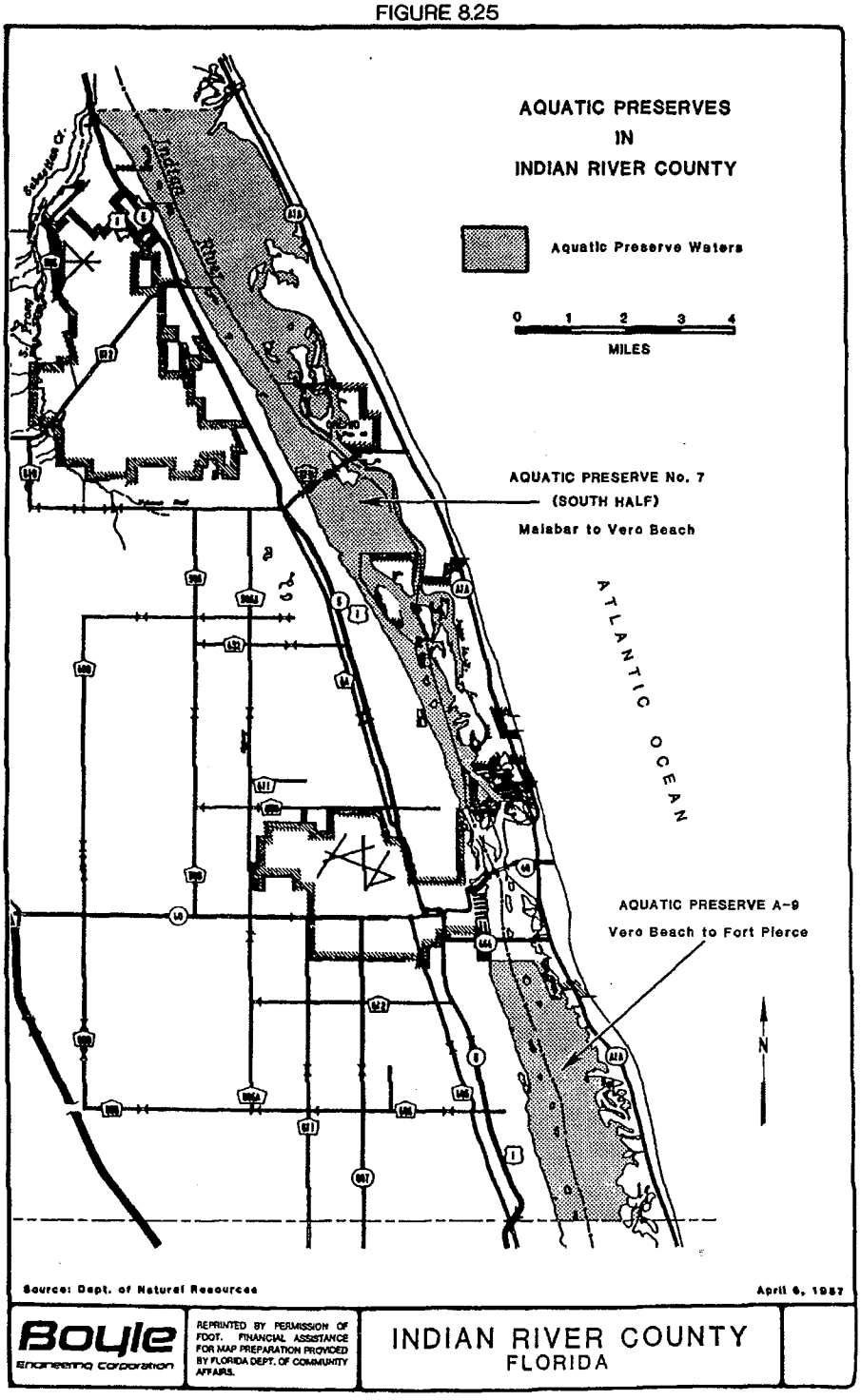
Aquatic preserves are exceptional areas of submerged lands and associated waters recognized by the State that are to be maintained in their existing or natural condition. Of the 40 aquatic preserves statewide, two are located in the portion of the IRL lying in Indian River County: Aquatic Preserve Number 7 (Malabar to Vero Beach) and Aquatic Preserve A-9 (Vero Beach to Ft. Pierce). Both aquatic preserves are depicted in Figure 8.25.

The major objectives of the FDEP's aquatic preserve management program are to manage the preserves to ensure the maintenance of an essentially natural condition and to restore and enhance those preserves which are not in natural condition. Aquatic preserve management also takes into consideration public recreational opportunities while assuring the continued propagation of fish and wildlife.

In the Indian River Lagoon Aquatic Preserves, boating is the major recreational use. Other recreational opportunities include fishing, clamming, and nature appreciation. Additional information regarding water-dependent uses and boating issues is contained in the Coastal Management Element.

As described in the "ecological communities" section of this element, the Indian River Lagoon consists of a variety of natural communities important to the survival of many estuarine species.

FIGURE 8.25


AQUATIC PRESERVES
IN
INDIAN RIVER COUNTY
Aquatic Preserve Waters
0 1 2 3 4
MILES
AQUATIC PRESERVE No. 7
(SOUTH HALF)
Malabar to Vero Beach
ATLANTIC OCEAN
AQUATIC PRESERVE A-9
Vero Beach to Fort Pierce
N
Source: Dept. of Natural Resources
April 6, 1987
Boyle Engineering Corporation
REPRINTED BY PERMISSION OF FDOT. FINANCIAL ASSISTANCE FOR MAP PREPARATION PROVIDED BY FLORIDA DEPT. OF COMMUNITY AFFAIRS.
INDIAN RIVER COUNTY
FLORIDA

Spoil Islands

Spoil islands are valuable conservation areas that provide important bird rookery and other habitat values. In Indian River County, major bird rookeries are located on the following islands: Riomar Island (IR-32), Johns Island Spoil, Duck Point Islands, and Pelican Island. While Riomar Island is located just north of the 17th Street Bridge in Vero Beach, the Johns Island Spoil includes two dredged spoil islands west of Johns Island. The Duck Point Spoil Islands are located north of C.R. 510 and just west of the ICW. Pelican Island, the County's premier bird rookery, is a natural feature.

In Indian River County, spoil islands are also utilized for recreational purposes by boaters for picnicking. On some of the islands, overnight camping is allowed. The location of the spoil islands is depicted in Figures 8.26 (A-B). Listed in Table 8.8 is an inclusive inventory of the Spoil Islands of Indian River County and their designated use.

FIGURE 8.26a

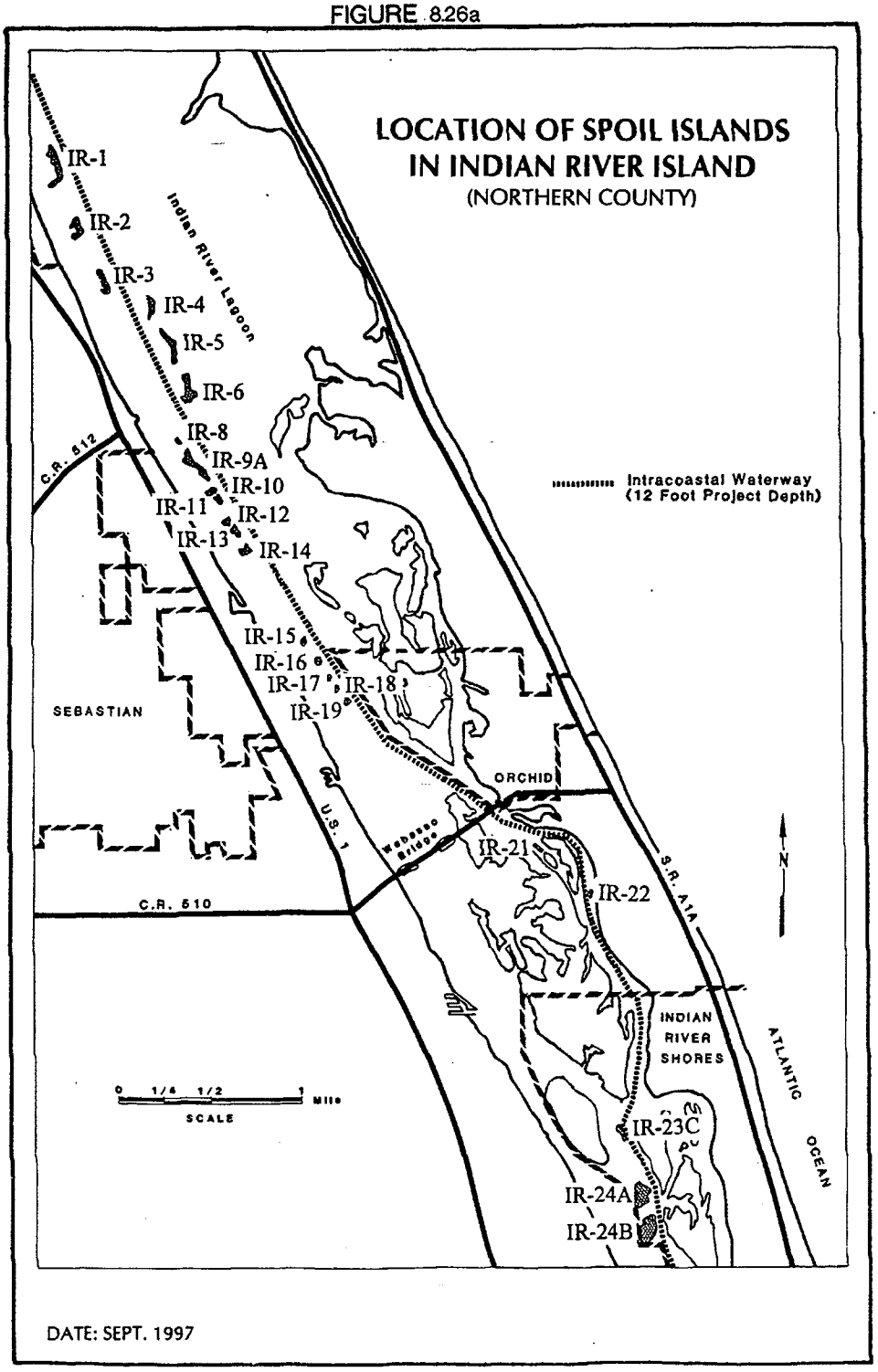

LOCATION OF SPOIL ISLANDS
IN INDIAN RIVER ISLAND
(NORTHERN COUNTY)
IR-1
IR-2
IR-3
IR-4
IR-5
IR-6
IR-8
IR-9A
IR-10
IR-11
IR-12
IR-13
IR-14
IR-15
IR-16
IR-17
IR-18
IR-19
IR-21
IR-22
IR-23C
IR-24A
IR-24B
Indian River Lagoon
Intracoastal Waterway
(12 Foot Project Depth)
C.R. 512
SEBASTIAN
U.S. 1
Wabasso Bridge
C.R. 510
ORCHID
S.R. A1A
INDIAN
RIVER
SHORES
ATLANTIC
OCEAN
N
0 1/4 1/2 1 Mile
SCALE
DATE: SEPT. 1997

FIGURE 8.26b

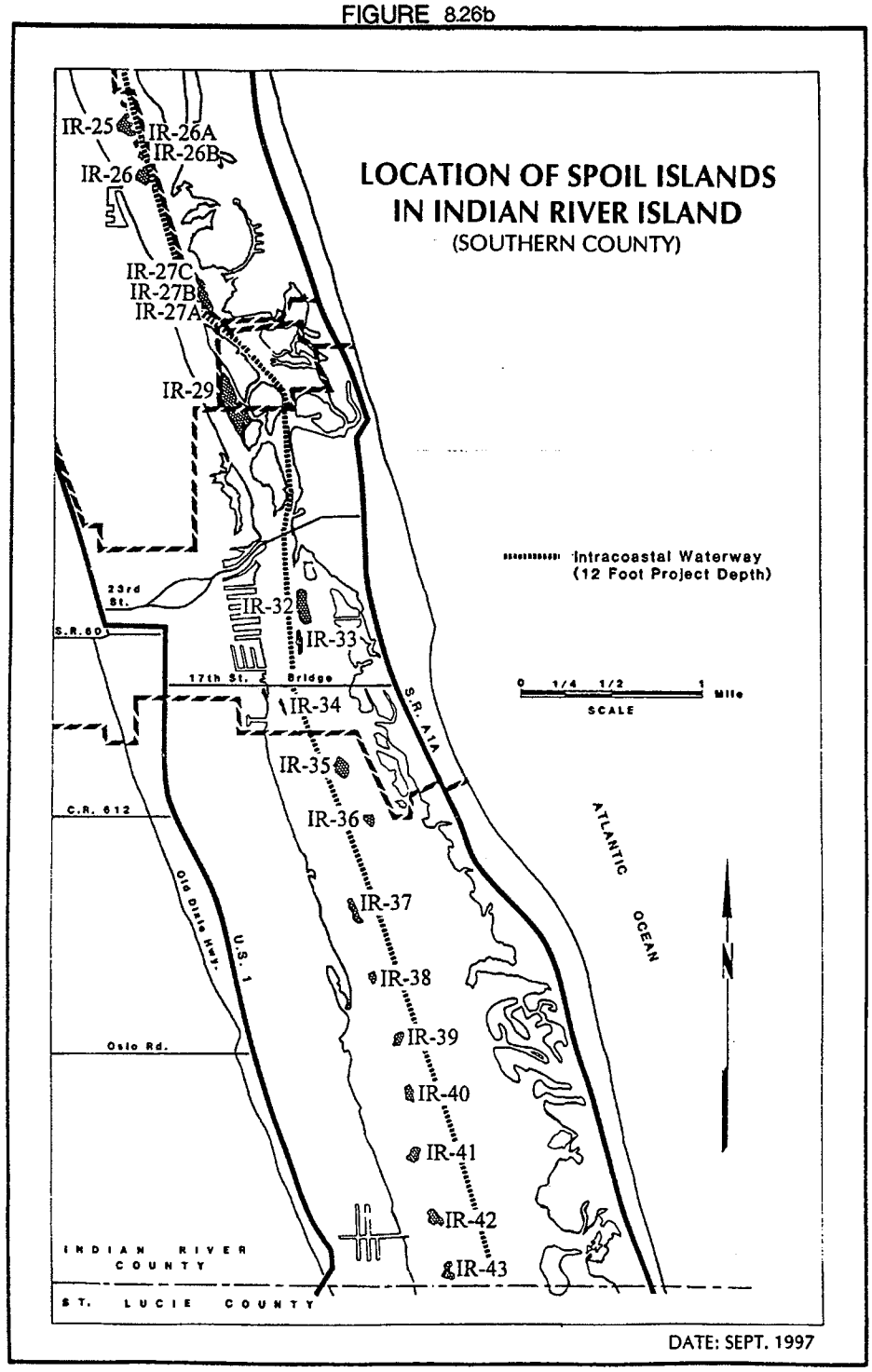

LOCATION OF SPOIL ISLANDS
IN INDIAN RIVER ISLAND
(SOUTHERN COUNTY)
IR-25
IR-26A
IR-26B
IR-26
IR-27C
IR-27B
IR-27A
IR-29
IR-32
IR-33
IR-34
IR-35
IR-36
IR-37
IR-38
IR-39
IR-40
IR-41
IR-42
IR-43
Intracoastal Waterway
(12 Foot Project Depth)
SCALE
0 1/4 1/2 1 Mile
23rd St.
S.R. 60
17th St. Bridge
S.R. A1A
C.R. 612
Old Dixie Hwy.
U.S. 1
Oslo Rd.
ATLANTIC OCEAN
N
INDIAN RIVER COUNTY
ST. LUCIE COUNTY
DATE: SEPT. 1997

TABLE 8.8
SPOIL ISLANDS OF INDIAN RIVER COUNTY

Name	Location	Designated Usage
IR-1	330 yards SW of Marker 62	Recreation
IR-2	605 yards NW of Marker 65	Recreation
IR-3	200 yards W of Marker 66	Conservation
IR-4	330 yards E of Marker 66	Recreation
IR-5	275 yards E of Marker 66	Recreation
IR-6	100 yards E of Marker 67	Education/Recreation
IR-8	500 yards S of Marker 68	Conservation
IR-9A	275 yards NW of Marker 69	Recreation
IR-9B	270 yards W of Marker 69	Recreation
IR-10	500 yards SE of Marker 69	Recreation
IR-11	600 yards NW of Marker 70	Recreation
IR-12	200 yards SW of Marker 70	Recreation
IR-13	100 yards S of Marker 70	Recreation
IR-14	600 yards S of Marker 70	Recreation
IR-15	400 yards SW of Marker 73	Conservation
IR-16	700 yards S of Marker 73	Conservation
IR-17	300 yards W of Marker 74	Conservation
IR-18	200 yards SW of Marker 74	Conservation
IR-19	500 yards S of Marker 74	Conservation
IR-21	50 yards W of Marker 85	Conservation
IR-22	165 yards SE of Marker 100	Conservation
IR-23C	100 yards SW of Marker 110	Conservation
IR-24A	360 yards W of Marker 116	Conservation
IR-24B	275 yards NW of Marker 118	Conservation/Education
IR-25A	70 yards SW of Marker 118	Recreation
IR-25B	86 yards SW of Marker 118	Conservation
IR-25	110 yards NW of Marker 120	Recreation
IR-26A	69 yards SW of Marker 120	Conservation
IR-26B	155 yards NW of Marker 121	Conservation
IR-26	140 yards W of Marker 121	Conservation
IR-27A	60 yards E of Marker 126	Conservation
IR-27B	70 yards SE of Marker 125	Conservation
IR-27C	75 yards E of Marker 125	Conservation
IR-28	69 yards E of Marker 130	Recreation
IR-29	50 yards E of Marker 133	Recreation
IR-32	137 yards E of Marker 143	Conservation
IR-33	64 yards SE of Marker 145A	Conservation
IR-34	165 yards NW of Marker 146A	Recreation
IR-34A	64 yards W of Marker 146A	Conservation
IR-35	385 yards SE of Marker 149	Conservation
IR-36	385 yards NE of Marker 153	Education/Recreation
IR-37A	144 yards SW of Marker 152	Recreation
IR-37	220 yards W of Marker 154	Conservation
IR-38	605 yards SE of Marker 155	Conservation
IR-39	275 yards SW of Marker 158	Conservation
IR-40	330 yards SW of Marker 160	Conservation/Education
IR-41	550 yards SW of Marker 161	Conservation

IR-42	275 yards W of Marker 166	Recreation
IR-43	200 yards W of Marker 168A	Recreation

In addition to publicly-owned lands and submerged lands, there are privately owned environmental lands in Indian River County that are protected by conservation easements. These conservation easements amount to over 900 acres of wetlands and over 120 acres of upland communities, respectively. Table 8.9 contains a partial list of conservation easements held by Indian River County.

TABLE 8.9
CONSERVATION EASEMENTS AND PRIVATELY OWNED CONSERVATION AND RECREATIONAL LANDS HELD IN INDIAN RIVER COUNTY

Name/Location	Ecological Community	Wetland Acreage	Upland Acreage
Orchid Isle Estates	Salt Marsh	275	N/A
Grand Harbor Development	Salt Marsh	241	N/A
RiverPointe Subdivision	Salt Marsh	29	N/A
Grove Isle Subdivision	Salt Marsh	27	N/A
Copeland's Landing Subdivision	Salt Marsh	23	N/A
Indian River Club Subdivision	Xeric Scrub / Freshwater Wetlands	27	13
Bent Pine Subdivision	Flatwoods	N/A	11
Seaview Subdivision	Coastal Strand	N/A	9
Windsor Development	Coastal Hammock	N/A	8
Disney's Vero Beach Resort	Coastal Strand	N/A	7
Indian River Mall	Cabbage Palm Hammock / Slough	34	5
McKee Jungle Gardens	Tropical Flora	N/A	18
River Park Place	Salt Marsh	15	N/A
Hoffman Mitigation Tract	Salt Marsh	35	N/A
Corrigan Sand Mine	Flatwoods	N/A	45
Red Stick Golf Course	Flatwoods/Freshwater Wetlands	24	47
Regency Park	Flatwoods	N/A	40
Valencia Point Subdivision	Flatwoods	N/A	14
Lost Tree Preserve	Sand Pine Scrub/ Freshwater Wetlands	13	36
Falcon Trace	Flatwoods / Freshwater Wetlands	9	6
Bristol Bay	Salt Marsh	14	N/A
Millstone PD	Flatwoods / Freshwater Wetlands	10	5
Waterway Village PD	Flatwoods / Freshwater Wetlands	20	66

- **Committee for a Sustainable Treasure Coast**

In March 2004, Governor Bush signed Executive Order 04-61, creating the Committee for a Sustainable Treasure Coast (CSTC). The Committee was established "to study the challenges and opportunities facing the [Treasure Coast] region and to recommend actions and tools that could be used to maintain a sustainable quality of life within the region." The Committee's final report (in September 2005) identifies the following "principles" for sustaining quality natural systems in the region:

Principle 1: The Indian River Lagoon Comprehensive Everglades Restoration Plan is fully implemented.

Principle 2: A viable, healthy and connected network of natural systems is protected throughout the region.

Principle 3: The right quantity and quality of water is available to sustain natural systems.

Principle 4: The air remains clean.

Principle 5: Land use planning, development regulations, and design standards support healthy natural systems.

- **Indian River Lagoon National Estuary Program CCMP Update**

In February 2008, the IRL National Estuary Program adopted an update to its 1996 IRL Comprehensive Conservation and Management Plan (CCMP). The update indicates that 11 years of implementation activities under the original CCMP have resulted in a "remarkable amount" of progress toward restoration and protection of the lagoon. Since the original CCMP's development, however, new issues and threats to the lagoon, such as climate change, toxic algae and exotic invasive fauna and flora, have emerged. In the 2008 update, 68 recommended actions in the original CCMP were evaluated. A summary table of the IRL CCMP 2008 update is included in the appendix of this element.

Air Quality

The Florida Department of Environmental Protection (FDEP) is responsible for monitoring air quality conditions throughout the state. From 1983 to 1986, total suspended particulates (TSP) and sulfur dioxide (SO_2) were monitored by the FDEP at three (3) locations in the County. Data collected were well below the National Ambient Air Quality Standards, indicating that air pollution was not a significant problem in Indian River County. Due to the superior air quality of Indian River County, monitoring was terminated after 1986.

Localized problems with air quality do occasionally arise. Most, however, can be attributed to brush fires, wood recycling/ mulching operations, or burning of land clearing debris associated with new construction projects.

In 1994, a Radon Protection Map was developed for Indian River County by the University of Florida. Based on this map, the only portion of the County identified as having an "elevated radon potential" is an area in the City Limits of Vero Beach and its immediate vicinity. New construction located within this area of elevated radon potential must incorporate passive or active radon control features, as applicable.

Hazardous Wastes

Hazardous waste is defined as waste, or a combination of wastes which, because of its quantity, concentration, physical, chemical, or infectious characteristics, may cause, or significantly contribute to, an increase in mortality or an increase in serious irreversible or incapacitating reversible illness or may pose a substantial present or potential hazard to human health or the environment when improperly transported, disposed of, stored, treated, or otherwise managed.

The Indian River County Utilities Department is responsible for planning and management of solid waste facilities serving the county, ensuring that existing facilities are operated in conformance with water quality regulations.

Currently, the County receives household hazardous waste (HHW) at the sanitary landfill, as well as the five transfer stations located throughout the County. The locations of these facilities are depicted in Figure 3.C.1 in the Solid Waste Sub-Element of the Comprehensive Plan. In 2005, the Solid Waste Disposal District (SWDD) recorded a total of 74,820 pounds of hazardous waste collected from its five transfer stations and the County landfill.

In compliance with requirements of Section 403.723, F.S., Indian River County maintains a facility at the County Landfill for the collection, temporary storage, and transfer of household hazardous waste. That storage and processing facility is designed to contain HHW materials. Once collected, hazardous waste material is transported out of the County by a licensed private hauler.

Consistent with state regulations, hazardous wastes are not knowingly disposed of in the landfill. Because household hazardous wastes are unregulated, however, a considerable amount of hazardous materials, such as paints, motor oil, automotive fluids, and batteries, are discarded into the regular waste stream. For that reason, the amount of hazardous waste generated is difficult to quantify.

For hazardous waste generated by commercial and industrial sources, each generator must contract with a licensed hazardous waste hauler for disposal of such materials at an authorized disposal site. In compliance with the Federal Superfund Reauthorization Act (SARA) - Title III Emergency Planning and Community Right-to-Know Act (42 U.S.C. 11001) requirements, the Indian River County Department of Emergency Services maintains an up to date inventory of the type, amount, and location of all commercial and industrial hazardous waste generators in the county.

The Solid Waste Sub-Element describes in detail the regulatory framework associated with solid waste management. That sub-element also contains information relating to solid waste generation, processing and disposal, resource recovery and recycling, solid waste management funding, and hazardous waste management practices.

- Superfund Site(s)

Currently, the Piper Aircraft facility is the only Superfund site listed in the county. Four additional sites in the County have been identified as contaminated by leaking underground storage tanks (LUSTs).

Abandoned Dump Sites and Illegal Dumping

Abandoned dump sites are closed landfills and specific locations where wastes were dumped in the past or are being dumped illegally. In cooperation with the Environmental Health Department (Florida Department of Health), the County's Code Enforcement Section handles complaints regarding illegal dumping in the unincorporated county. The full extent of illegal dumping, however, is difficult to determine and has not been quantified.

ANALYSIS

The purpose of this analysis section is to assess the existing conditions that have been identified and to identify current problems and future needs relating to conservation issues. Those problems and needs then form the basis for developing a set of conservation goals, objectives, and policies.

Soil Erosion

Over time, soil erosion has the potential to inflict damage on the natural environment and to cause economic losses. In Indian River County, economic losses attributed to soil erosion include: reduced agricultural productivity, increased maintenance costs, reduced habitat value for wildlife, reduced harvesting of fish and shellfish, and aesthetic problems.

When fertile topsoil is removed, the agricultural productivity of soils is reduced. As fertile topsoil is removed, agricultural operations must offset the loss of natural productivity by inputting a greater amount of energy, in the form of artificial fertilizer. This, in turn, raises the cost of production. Furthermore, fertilizer nutrients are transported by runoff, thereby reducing the quality of surface waters.

Within Indian River County, the Indian River Soil and Water Conservation District (IRSWCD) offers assistance to agricultural operators in developing soil conservation plans. Although implementing a soil conservation plan is voluntary, agricultural operators that adopt a plan are eligible to participate in federal incentive programs. Other economic benefits may include an increased yield per acre ratio.

Generally, a soil conservation plan is designed to minimize soil erosion through the use of Best Management Practices (BMPs). According to a SJRWMD report, non-structural BMPs, such as soil conservation plans, land use planning, preservation of wetlands and floodplains, and education, are cost effective erosion control measures. The following reductions of pollutants were attributed to the two most common structural BMPs: a vegetated conveyance system (grassed swale) and a wet pond.

TABLE 8.10
POLLUTANT REMOVAL EFFECTIVENESS OF
COMMON NON-STRUCTURAL BEST MANAGEMENT PRACTICES (BMPs)

water quality parameter	grassed swale	wet retention pond
total nitrogen	15%	30%
total phosphorous	30%	50%
biological oxygen demand	45%	60%
total suspended solids	80%	80%
flow	20%	25% (evaporation)

While the listed reductions were attributed to each BMP individually, the combined use of several BMPs results in even more efficient removal of pollutants.

In terms of water quality, stormwater runoff from agricultural operations, runoff from sites that have been cleared for development, and runoff from unpaved roads contribute to the deposit of sediment in the drainage canal network. Because of that sedimentation, more frequent maintenance of drainage canals and more dredging of manmade canals associated with riverfront subdivisions are necessary and costly.

On sandy soils and muck soils found in Indian River County, wind erosion is a potential problem, especially during the dry winter months. This wind-borne soil erosion has the potential to damage agricultural crops by sand blasting, spreading plant diseases, insects and weed seeds, and reducing soil fertility. Within the county, localized air quality problems can be attributed to wind-borne soil erosion from areas that have been denuded of vegetation. Negative impacts can include health hazards and cleaning problems.

Identifying specific wind erosion problem areas in the county is difficult, in that the occurrence of barren soils from urban development or agricultural land clearing is temporary. Therefore, locations of potential erosion problems change regularly over time as planting and development activities occur.

Over the past several years, Indian River County has made some advances in the control of soil erosion:

- In 2006, the county began requiring stormwater pollution prevention plans (SWPPP) on all new commercial developments.

- In 2006, the Indian River County Public Works Department created a new stormwater division. The stormwater division educates the public and enforces stormwater and erosion control standards.

- In 2007, the county adopted a revised littoral zone planting ordinance. This ordinance requires that vegetation be planted on the edges of stormwater retention ponds to reduce the amount of pollutants in runoff, create natural habitat, and reduce erosion.

Those measures taken to combat erosion have had a positive impact on reducing the amount of erosion occurring in the county, and the county should continue to implement those measures.

In 2008, County mining regulations were revised to include erosion control requirements. Those include:

- A requirement that pollution prevention plans addressing wind and water erosion on mining site plans be approved by County engineering staff prior to Planning and Zoning Commission review;

- A requirement that baseline water quality data be collected at project outfall points;

- A requirement that applicants monitor discharge at outfall points to ensure no increase in levels of turbidity at outfall points; and

- A requirement that comprehensive dust control plans be approved as part of mining site plans.

Going forward, the County should continue to implement and enforce these new mining regulations to reduce soil erosion.

In addition to addressing soil erosion associated with development, Indian River County has also taken several steps to combat beach erosion:

- Adopted a Beach Preservation Plan (BPP). The purpose of the plan is to ensure continued monitoring of areas of critical beach erosion and to identify areas of beach that are the best candidates for renourishment projects.

- Constructed a Prefabricated Erosion Prevention reef (PEP reef) just offshore of Vero Beach. Since the construction of the PEP reef, beach profile surveys have shown that the shoreline has stabilized within the area of the PEP reef.

- Completed two large-scale beach restoration projects. In 2003, approximately 500,000 cubic yards of sand dredged from offshore were placed along 2.2 miles of beach in the northern end of the County. In 2007, approximately 375,000 cubic yards of sand were distributed along two miles of beach in the south county.

Despite these efforts, beach erosion is an ongoing concern. While beach erosion control measures have been taken to control 'normal' beach erosion, issues such as climate change and sea level rise may lead to more severe coastal erosion in the future. Also, increases in strong tropical storms and hurricane activity along Florida's coasts increase the likelihood of catastrophic erosion events. In light of anticipated increases in erosion due to sea level rise, climate change, and hurricanes, the county should have policies that address the protection of coastal properties. These policies should include:

- An evaluation of the county's current Dune Stabilization Setback Line (DSSL) and consideration of relocating the DSSL westward from its current location (i.e., the 1981 Coastal Construction Control Line). The DSSL is the County's "line of prohibition," serving

as the easternmost building setback line from the ocean, with the exception of beach access dune crossovers that are allowed east of the line.

- A requirement that substantially damaged oceanfront structures in nonconforming "footprints" be relocated westward, in compliance with current coastal regulations, even when such structures are substantially damaged during declared natural disasters.

While on-site disposal systems (OSDS) associated with oceanfront homes are more vulnerable to potential erosion impacts than OSDS on inland home sites, state OSDS regulations address this potential problem by requiring that such systems, if they fail, be brought up to current standards and setbacks or otherwise be replaced by public sewer, where available. Since state regulations address this issue, no local policies are needed regarding OSDS associated with oceanfront homes.

Water Resources

Surface Water

The Stormwater Management Sub-Element provides a detailed account of water quality issues in Indian River County. Following is brief summary of the sub-element:

- Urban drainage systems often consist of impermeable, enclosed structures, such as pipes and culverts which collect substantial amounts of runoff from impervious, "urbanized" areas. Water quality from urban runoff is often of poor quality, since little, if any, natural filtration or percolation occurs.

- Stormwater runoff carrying pollutants to the IRL from urban development can be reduced through the proper use of on-site retention facilities and best management practices (BMPs).

- Wetlands associated with the St. Sebastian River and the Indian River Lagoon serve an important function by reducing the flow of pollutants.

- Where mosquito impoundments have been connected to the lagoon, they contribute to enhanced water quality and marine habitat for the benefit of estuarine organisms.

- The Upper St. Johns River Basin restoration project, a cooperative effort between the ACOE and the SJRWMD, was recently completed. This project has improved the flood storage capacity of the Basin, and restored lands back to their historic configuration. The completed Basin project has decreased the amount of freshwater inflow (particularly during major storm events) to the St. Sebastian River and Indian River Lagoon via the C-54 canal, thus contributing to improved water quality in estuarine waters.

- Data from an IRLNEP study rate the non-point source discharges from Indian River County (Segment 3) as a significant impact to water quality of the IRL.

- In addition to non-point source loadings, discharge from on-site (septic) disposal systems (OSDS) also presents a threat to the water quality of the IRL. Areas of particular concern for reducing OSDS discharge are residential developments with OSDS proximate to the Indian River Lagoon.

- Upper St. Johns River Basin

In 1988, the SJRWMD and the U.S. Army Corps of Engineers (USACOE) began construction of the Upper St. Johns River Basin Project to restore and enhance more than 150,000 acres of marshes in Indian River and Brevard counties. The $200 million project, considered one of the largest wetland restoration projects in the world, is targeted to be completed by 2010.

The SJRWMD describes the Upper Basin project as a semi-structural system of water management areas (WMAs), marsh conservation areas (MCAs), and marsh restoration areas. The project is designed to: provide flood control; improve water quality; reduce freshwater discharges to the Indian River lagoon; provide water supplies; and restore and enhance wetland habitat. The project also provides public recreational opportunities, including boating, hiking, biking, wildlife viewing, camping, fishing and hunting.

Since 1996, the SJRWMD and the USACOE have progressed in implementing the Upper Basin project, which is near completion. As a result, environmental conditions and recreational opportunities in the Upper Basin have improved.

With the recent acquisition of ±6,000 acres from Fellsmere Joint Venture, the SJRWMD will initiate a ±10,000 acre floodplain restoration project - the Fellsmere Water Management Area (FWMA) - associated with the Upper Basin. The FWMA project will produce public benefits by providing treatment for agricultural runoff, while reducing the occurrence of freshwater releases through the C-54 canal to the Indian River Lagoon. The FWMA project will also provide flood protection benefits; create wetland habitat; and provide more public recreation opportunities for fishing, nature study and boating.

According to the SJRWMD, another purpose of the FWMA project is to increase the reliability of the St. Johns River for water supply withdrawals and to ensure that downstream minimum flows (in Brevard County and north) are met. Consequently, the FWMA will enhance water supply on a regional basis, as well as increase alternative water supply opportunities in Indian River County.

Overall, the Upper St. Johns River Project provides many public benefits, both locally and regionally, and the County's policy should be to continue to support restoration and management efforts associated with the Upper Basin.

- Indian River Lagoon

Between 1996 and 2007, Indian River Lagoon water quality remained fairly constant. Within the lagoon, water quality is measured at various points. At each point, water quality generally fluctuates within established ranges. Recently, water quality at several water monitoring stations showed improvement. This improvement may be the result of several recent water quality projects, including muck dredging in the St. Sebastian River; construction of sub-regional stormwater treatment facilities in Vero Lake Estates, Gifford and Roseland; and improved sedimentation and erosion control practices through County implementation of the National Pollutant Discharge Elimination System (NPDES) Act.

Once completed, several projects that are currently under construction will contribute even more to water quality improvement. These projects include the Egret Marsh and Spoonbill Marsh water treatment projects, as well as the Main Relief Canal Pollution Control Facility.

In 1996, the portion of the Indian River Lagoon from approximately Grand Harbor south to the south county line was a "Class III" waterbody. In 2008, the portion of the lagoon from the northern tip of Round Island south to the south county line was upgraded to a "Class II" waterbody. At the same time, water quality was downgraded from "Class II" to "Class III" from the North Relief Canal south to the northern limits of the city of Vero Beach.

The slight increase in water quality in the lagoon indicates that water quality improvement projects are having a positive effect. For that reason, the County should consider construction of pollution control facilities in the North and South Relief canals, using series screening methodology similar to the Main Relief canal project. In that vein, the County should continue its policy of seeking funds through Section 319 Grants, Snook Tag grants, the Surface Water Improvement Management (SWIM) program, and other funding sources for stormwater management and pollution control projects that benefit lagoon water quality.

In the future, the County should analyze water quality measurements taken throughout the Indian River Lagoon to assess the specific effects that water improvement projects are having. Going forward, the county should work with other agencies, not only to monitor water quality results, but also to identify new water quality improvement project sites.

In 1990, the County adopted land development regulations requiring shoreline protection buffers along the St. Sebastian River and along the aquatic preserves in the Indian River Lagoon. The regulations prohibit development, except for docks, boat ramps, pervious walkways and elevated walkways which provide riparian access for landowners, within the protection buffers. Since 1990, the shoreline buffers have been applied to all parcels along the rivers, even those parcels that are platted lots with seawalls and no pre-existing shoreline vegetation. In the future, the County should continue its policy of requiring shoreline protection buffers, but should consider exempting existing platted lots with seawalls from the requirement, since applying the buffer in such circumstances does not serve the intent of the regulation.

In the IRL National Estuary Program's 2008 update to the IRL Comprehensive Conservation and Management Plan (CCMP), there are various recommended actions to address issues that affect the lagoon. These actions include eradication of invasive flora and fauna, reduction of sedimentation, and assessment of potential climate change impacts to lagoon resources. Going forward, the County should revise its policies to include those actions recommended in the CCMP update.

- St. Sebastian River

From 1996 to 2007, water quality in the St. Sebastian River remained unchanged. As in 1996, current water quality within the St. Sebastian River fails to meet the designation of Class III (swimming and fishing). Recently, a river-dredging project began in the St. Sebastian River. This project will result in the removal of two million cubic yards of muck from the river bottom and will likely lead to improved water quality.

Currently, the SJRWMD is working on plans for a stormwater park south of Micco Road in Brevard County, similar to the recently completed Sebastian Stormwater Park. When complete, the Sebastian Stormwater Park will reduce total suspended solids entering the South Prong annually by an estimated 173,180 pounds. In combination with the Sebastian Stormwater Park, the stormwater park in Micco will reduce the amount of sediment flowing into the St. Sebastian River and ultimately reduce the amount of muck reaching the lagoon.

In 2006, the County adopted a conceptual management plan for the St. Sebastian River Greenway. The St. Sebastian River Greenway extends from approximately one mile south of CR 510 (85th Street), northward along the South Prong, to the river's intersection with the C-54 Canal at the north county line (approximately five miles). The purpose of the greenway plan is to conserve river resources while affording an opportunity for public access along the greenway's length. In implementing the greenway plan, the County has acquired conservation lands to provide a buffer to the St. Sebastian River and to enhance recreational access opportunities along the river. In the future, the County's policy should be to continue to acquire land within the greenway corridor and to develop a greenway trail along the corridor.

Groundwater

The Natural Groundwater Aquifer Recharge (NGAR) Sub-Element of the Comprehensive Plan provides a detailed description and analysis of conditions relating to both the surficial aquifer and Floridan aquifer. As described in the NGAR Sub-Element, the Floridan aquifer will play an increasingly important role in augmenting water supplies from the surficial aquifer as population growth continues to increase at a healthy pace in Indian River County. Nevertheless, maintaining the water quality of the surficial aquifer is still an important concern since it continues to be the main source of potable water for the City of Vero Beach and for residents utilizing private wells.

- Surficial Aquifer

The Atlantic Coastal Sand Ridge and the Ten Mile Ridge are the primary recharge areas of the surficial aquifer. These areas, therefore, warrant protection to preserve permeability and to guard against potential hazardous pollutant discharges into the surficial aquifer. Another important recharge area for the surficial aquifer is the inter-ridge area between the Ten Mile Ridge and the Atlantic Coastal Sand Ridge. Within the inter-ridge area, freshwater wetlands contribute to the cleansing of surface water that replenishes groundwater supplies. Preservation of wetlands in that area therefore benefits the water quality of the surficial aquifer.

Historically, water levels above sea level have prevented lateral intrusion of saltwater in the coastal areas from infiltrating the potable water zone of the surficial aquifer. In the past, however, excessive pumping has lowered water levels enough to cause saltwater intrusion in some parts of the county, especially those areas proximate to the Indian River Lagoon. Overall, chloride concentrations from most wells that tap the surficial aquifer system in the Vero Beach well field have remained relatively unchanged since the early 1980s.

Within Indian River County, the close proximity of the surficial aquifer to the ground surface increases the risk of groundwater contamination from potentially hazardous land uses. This became apparent when industrial contamination was discovered in six of the City of Vero Beach's public supply wells near the City of Vero Beach Airport in the late-1980s. Since the City has remediated those impacts, however, the spread of contamination has been controlled, and groundwater contamination levels have decreased substantially.

To prevent contamination of the surficial aquifer, the County, in 1990, adopted a Wellfield and Aquifer Protection ordinance (LDR Chapter 931). LDR Chapter 931 established a special overlay district, the Surficial Aquifer Primary Recharge Overlay District (SAPROD), to protect surficial aquifer recharge areas proximate to the Atlantic Coastal Sand Ridge. Land uses, such as junk yards and landfills, are prohibited from locating in the SAPROD. Also, hazardous wastes, excavation and stormwater ponds are regulated within the SAPROD. Furthermore, LDR Chapter 931 requires abandoned flow wells to be plugged in conjunction with site development, and requires minimum setbacks for developments from public supply wells. Going forward, the County's policy should be to continue to implement and enforce these regulations.

Through its Excavation and Mining ordinance (LDR Chapter 934), the County prohibits dewatering within 1,000 feet of a platted subdivision not serviced by public water. Moreover, a maximum excavation depth of 25 feet above mean sea level (MSL) is required for mining operations located on the Atlantic Coastal Sand Ridge. These regulations serve to protect surficial aquifer water supply. As such, the County's policy should be to continue to apply these requirements.

- Floridan Aquifer

Overall, the Floridan aquifer is naturally higher in concentration of chlorides than the surficial aquifer. For that reason, water supplied from the Floridan aquifer must be treated by reverse osmosis. Compared to treatment of water from the surficial aquifer, treatment costs are considerably higher for water supplied by the Floridan aquifer. Due to the higher yield of the Floridan aquifer and the fact that it is less susceptible to contamination, however, this aquifer has been chosen as the source of water for the County's existing and proposed water treatment plants.

Generally, the groundwater aquifer recharge areas for the Floridan aquifer are located in the Osceola Plain west of Blue Cypress Lake. In this portion of the county, future land uses will remain limited to pastoral open space and livestock grazing. As such, land uses in Indian River County will not pose a threat to the water quality of the Floridan aquifer. This area, however, is not considered a "prime recharge area" by the SJRWMD, and its contribution to the replenishment of the Floridan aquifer is relatively minor when compared to aquifer recharge areas in neighboring counties. Therefore, the SJRWMD must coordinate with the counties west and northwest of Indian River County to ensure preservation of this important groundwater resource. The County's policy should be to maintain a low density agricultural land use designation in the Floridan aquifer recharge area.

The Sebastian Freshwater Lens is a confined pocket of potable water within the Floridan aquifer. The confining layers of the Sebastian Freshwater Lens prevent recharge of the aquifer as well as intrusion of water containing high chloride concentrations. As such, this non-replenishable source of groundwater should be carefully "mined" only for domestic consumption with continual monitoring. The SJRWMD is the lead agency that regulates and monitors consumptive water use in the Sebastian Freshwater Lens. With respect to County policy, the Sebastian Freshwater Lens is in an area designated on the County's future land use map as low-density residential. In the future, the County should maintain that low density land use pattern to deter an increase in water consumption.

Water Conservation

While the NGAR Sub-Element provides a detailed description and analysis of groundwater conditions and use in Indian River County, the Potable Water Sub-Element provides information on present and projected future demand for potable water in the county.

From 1996 to 2007, per capita water consumption in Indian River County increased from 70 gallons per day to 143 gallons per day. During the same time period, agricultural water consumption dropped approximately 11 million gallons per day, or 18%. That is significant because agricultural water usage is the single largest consumption category by volume in the county. Over the last ten years, the decrease in agricultural water usage has outpaced the increase in per capita daily water consumption. Due to the drop in agricultural water usage, total daily water consumption has decreased by nearly 10% in the last ten years.

Although total daily water consumption has decreased, it is anticipated that water consumption will increase in the future as non-citrus agricultural uses, including possible bio-fuel crop production, become established. For this reason, the county should develop policies to ensure that future water demand is adequately addressed. These policies should be incorporated into the Potable Water Sub-Element of the comprehensive plan.

Currently, the SJRWMD is preparing a regional groundwater model that will provide an updated estimate of groundwater quality and quantity in the surficial and Floridan aquifers. Indications from the SJRWMD suggest that there will be no significant reduction in the quantity or quality of water available in the Floridan aquifer in Indian River County through at least 2025. With respect to the surficial aquifer, however, there are preliminary indications from the SJRWMD of potential drawdown impacts in the Fellsmere and Vero Beach wellfield areas.

In 1988, the U.S. Geological Survey published a water resources investigations report on geohydrology in Indian River County. Because it has been 20 years since that report was completed, the County Agriculture Advisory Committee (AAC) recently recommended that the County obtain an updated countywide geohydrologic survey, with seismic profiles or comparable data. Going forward, the County should heed the AAC's recommendation and adopt a policy to obtain an updated countywide geohydrologic survey.

Consistent with the County's landscape ordinance, all new developments are required to install irrigation systems and connect to wastewater effluent lines when available. Additionally, the ordinance requires a minimum of 50 percent of all new landscape material associated with new developments to be drought tolerant ("xeriscape") vegetation. (Xeriscape refers landscape plants that require little or no artificial irrigation beyond natural rainfall).

Within the county, non-regulatory water conservation measures include fee simple purchases of scrub lands through the County's Environmental Lands Program. This has resulted in the preservation of large tracts of open space in groundwater recharge areas.

Over the last several years, drought-like conditions have persisted in Florida, with the year 2000 being the driest year on record in south Florida. To promote water conservation in light of these droughts, the SJRWMD has prohibited the irrigation of lawns and landscapes between 10 a.m. and 4 p.m. district-wide since 1991. Recently, additional watering restrictions were adopted. The newly adopted regulations limit the irrigation of lawns and landscapes to a maximum of two days per week, with all watering prohibited between the hours of 10 a.m. and 4 p.m. The current watering restrictions are projected to reduce overall water consumption by 15-20%.

Rather than adopt a water conservation ordinance duplicative of the SJRWMD's watering time restrictions, Indian River County's approach has been and will continue to be to promote public education on water conservation measures and to conserve water by means other than restricting watering times, such as requiring drought tolerant species in the county landscape ordinance and

promoting water re-use.

- Flow Well Program

Since 1990, Indian River County has participated in a cost-share program with the SJRWMD to plug abandoned flow wells. Through this program, abandoned flow wells are identified by county staff and plugged in coordination with the St. Johns Water Management District and the Environmental Health Department. As a result of the program, more than 375 wells were plugged or repaired between 1990 and 2007, saving millions of gallons of groundwater per day. In addition to wasting groundwater, abandoned flow wells provide easier access for surface pollutants to get into groundwater, may threaten crops and structures, and often contribute to mosquito problems.

Through the flow well plugging program, SJRWMD pays 50% of the cost associated with plugging flow wells on residential properties and 25% of the cost on commercial, industrial, and agricultural properties. In Indian River County, where flow wells tend to be larger and deeper than in other areas of Florida, the program has been effective. On average, a flow well in Florida costs $3,500 to plug, whereas in Indian River County the average flow well costs $4,500 to plug. Since inception, the flow well plugging program has saved Indian River County nearly $850,000 in flow well plugging fees.

Despite this success, many abandoned flow wells remain in Indian River County. Although SJRWMD staff has documented fewer reports of abandoned flow wells in the county in the last few years, this decline is attributable to the remaining abandoned flow wells in the county being less conspicuous. For this reason, the County should continue its policy to require that abandoned flow wells on development sites be identified and plugged by developers.

In the future, the county should, when funding is available, continue to participate with the SJRWMD in the flow well plugging program. Although funding may be an issue due to budget constraints, the importance of groundwater and the negative impacts that broken flow wells can have on existing groundwater supplies are reasons for continuing the program as long as possible.

Floodplains

The existing conditions portion of this element identifies 100-year floodplains found in Indian River County and explains the public benefits of floodplains, such as providing flood-carrying capacity, wildlife habitat, open space and recreational opportunities.

Due to the extent of floodplains in the county and the demand for development, building in "special flood hazard areas" (SFHAs) inundated by 100-year floods has been allowed subject to flood control regulations consistent with Federal Emergency Management Agency (FEMA) requirements and standards. Generally, structural and fill encroachments in floodplains reduce flood-carrying capacity, increase flood heights and velocities, and increase flood hazards in areas beyond the encroachments

themselves. Consequently, floodplain management involves balancing economic gain from floodplain development against the resulting increase in flood hazards.

To minimize potential off-site flooding impacts associate with development in SFHAs, the County's Stormwater Management and Flood Protection Ordinance requires that an equal volume of storage capacity be created on site for any volume of the base flood that is displaced by fill or structures within the SFHA. The County's policy should be to continue this requirement as it offsets development impacts within SFHAs.

Within the county, SFHAs are depicted on Flood Insurance Rate Maps (FIRMs) that are produced by FEMA. Currently, FEMA is undertaking a FIRM modernization project in the county. This modernization project entails assessment of current available flood studies and use of up-to-date high resolution aerials to revise the County's FIRMs to be more accurate and useable in depicting flood zones. The FEMA map modernization project is on schedule to be completed in 2011. Going forward, the County should assist FEMA in modernizing the FIRMs by making local drainage studies available to FEMA and by conducting public information workshops to advise development professionals, as well as the general public, of the floodplain map modernization project.

Currently, Indian River County participates in the Community Rating System (CRS) of the National Flood Insurance Protection (NFIP) program. By undertaking floodplain management activities beyond the minimum requirements of the NFIP, the County has achieved a CRS rating of 6, a rating which results in a 20% discount on all flood insurance premiums in the unincorporated county. By participating in the NFIP CRS, the County is conserving flood storage capacity and other natural functions and values of the 100-year floodplain. For these reasons, the County should continue its participation in the CRS program and should maintain or improve its current CRS rating.

Flora and Fauna Communities

Native Upland Communities

Over the past decade, the total acreage of all native plant communities in the county decreased. The loss of these plant communities is largely attributable to development of previously undeveloped lands within the Urban Service Area. Despite these losses, substantial progress has been made in the past ten years with respect to lands acquired for conservation and restoration or protected under conservation easements. These acquisitions include:

- Federal acquisition of land on north Jungle Trail for expansion of the Pelican Island National Wildlife Refuge (±500 acres);

- State, SJRWMD and County acquisition of the Carson Platt Estate portion of the St. Sebastian River Preserve State Park (±5,334 acres of the overall ±22,000 acre park);

- County acquisition of conservation easements on the "Padgett Branch" ranches in western Indian River County (±1585 acres) and on the ±462 acre Sexton Ranch on 82nd Avenue;

- SJRWMD acquisition of ±12,000 acres for water management and wetland restoration in the Upper St. Johns River Basin;

- County acquisition of other lands under the County Environmental Lands bond program; and

- Conservation of native uplands under conservation easements on private development sites, as a result of the County's native upland set-aside land development regulations (±500 acres).

In 1996, the county held 1,010 acres of native habitat in conservation. Since 1996, the county has conserved an additional 9,384 acres of native habitat, including approximately 500 acres of native habitat in upland set-aside areas related to private development.

As the County continues to acquire land for conservation, a major issue is how much environmental land acquisition is enough. In terms of how much is enough, a specific acreage amount is less important than acquisition benefits. According to the County's environmental lands acquisition program guide, a major objective is for the County to acquire environmentally significant lands that contribute to wildlife corridors and greenways that interconnect existing conservation areas.

Appropriately, the County's adopted Environmental Lands Program Guide identifies the following wildlife corridors as warranting conservation:

- Indian River Lagoon Blueway (including the St. Sebastian River Greenway)
- Atlantic Coastal Sand Ridge (Winter Beach area)
- Ten-mile Ridge (between CR 510 and SR 60)
- Western Indian River County (west of Blue Cypress Lake)

Combined, unprotected natural areas within these corridors total more than 50,000 acres. Because of financial constraints, it is not economically feasible or practical for the County to acquire that amount of acreage for conservation. Consequently, the land acquired under the County's environmental lands program is guided more by the amount of funding available for acquisition than by the amount of land warranting conservation.

For the County to succeed in conserving significant environmental lands within the referenced wildlife corridors, a number of approaches, beyond just fee-simple acquisition, have to be employed. Those approaches include transfer of development rights, less than fee-simple purchase of conservation easements, requirement(s) of natural area set-asides associated with new development, and requirement(s) of "greenbelts" for new towns established outside of the Urban Service Area. Given the amount of land that has been conserved over the past ten years by means other than fee-simple acquisition (i.e., through upland set-aside requirements), it is reasonable to conclude that conservation

of an additional 500 acres of native uplands over the next ten years is a reasonable objective. Of those 500 acres, at least 100 acres should consist of pine flatwoods, the most common plant community under threat of development.

Since the County has fulfilled its current environmental land acquisition objectives and funding for acquisition is limited, the County should shift its focus to management of and public access improvements to conservation lands that have been acquired. In doing so, the County should consider reserving a portion of remaining bond funds for initial restoration and public access improvements to such lands.

- **Upland Set-Asides**

In 1990, the Natural Resources section of the Treasure Coast Regional Planning Council's (TCRPC) Strategic Regional Policy Plan (SRPP) called for the preservation of a minimum of 25 percent of upland communities on development sites. At that time, the County initiated an alternative approach to meeting the same objective by adopting an Upland Habitat Protection ordinance (LDR Chapter 929), calling for the set-aside of upland conservation areas on development sites, combined with the County's environmental land acquisition program, to fulfill the SRPP's upland preservation objective.

In 2007, the county's native upland set-aside land development regulations were revised. County regulations now require that a minimum of 15% of the native upland habitat on parcels 5 acres and larger be preserved on site. The previous minimum required native upland set-aside was 10%. Since 1996, approximately 500 acres of native habitat have been preserved in upland set-aside tracts related to private developments.

The 2007 native upland set-aside revisions also included a provision prohibiting linear set-aside areas less than 50 feet wide. This change was based on the premise that the narrower an upland set-aside, the less the ecological value.

As a result of the upland set-aside ordinance revisions, recent native upland easements have consisted of larger and more ecologically valuable tracts of land on development sites. These upland set-aside areas are, however, often small "islands" that are located far from the next nearest native upland area. In that respect, these island set-asides may serve to protect native trees on-site that may not otherwise be conserved, but the island set-asides do not have the value of contributing to wildlife corridors. To address that issue, the county should have policies that maximize the ecological value of required upland set-aside areas. These policies should include evaluation of similar set-asides on adjacent development sites and requirements that such set-asides be contiguous where feasible. With respect to development sites with small initial native upland areas (i.e., 5 acres or less), the county should allow, in lieu of on-site set-asides, an option for developers to enhance or recreate native uplands off-site on existing county conservation lands. That option would provide more ecologically valuable habitat than small "islands" within development sites.

Wetlands

Wetlands function as important resources to Indian River County in that they provide socioeconomic, as well as environmental quality, benefits. Listed in Table 8.11 are the major benefits generally associated with wetlands in Indian River County.

TABLE 8.11
SOCIOECONOMIC AND ENVIRONMENTAL VALUES OF WETLANDS IN INDIAN RIVER COUNTY

Socioeconomic	Environmental
Flood control	Water quality maintenance:
Wave damage protection	Pollution filtration
Erosion control	Sediment removal
Groundwater recharge	Oxygen production
Livestock grazing	Nutrient absorption
Fishing and shellfishing	Aquatic productivity:
Hunting	Juvenile fish habitat
Recreation	Shellfish habitat
On-Water Recreation	Water fowl habitat
Aesthetics	Microclimate regulation
Aquaculture	(heat sink)
Education	
Scientific research	

As identified earlier in this element, wetlands can be found throughout Indian River County, in all shapes and sizes. In Indian River County, the Upper St. Johns River Basin comprises the largest contiguous palustrine (freshwater) wetland system. The majority of this system is owned by the St. Johns River Water Management District (SJRWMD) and is not threatened by urban or agricultural encroachment.

In assessing the functional value of wetlands, a number of criteria can be considered. According to one Florida study (Brown and Starnes, 1983), these criteria should include size, off-site connectedness with other wetlands, landscape diversity, quality of surrounding landscape, intactness, uniqueness, and utilization by endangered species. Another publication on wetlands (Moler and Franz, 1987), however, concludes that size and connectedness, where bigger is better and isolation is a negative, is not necessarily the case when considering the wildlife values of wetlands. For example, at least 15 species of amphibians of the southeastern Coastal Plain are exclusively or primarily dependent on small, isolated wetlands as breeding sites. Additionally, such sites may provide important foraging and nesting habitat for a variety of wading birds.

In Indian River County, certain wetland issues warrant particular attention. For example, small, isolated wetland systems located in the developing eastern portion of the county and in areas of agricultural development are most susceptible to adverse impacts. Many of these wetlands are on lands surrounded by urban development, and these wetlands have been impacted directly by filling or indirectly through drainage pattern changes, pollution, and/or invasion by nuisance exotic species. Questions arise as to the functional values of these isolated wetlands, and the benefits of preserving them in light of impending encroachment. As population growth and development continues, especially east of Interstate 95, pressure will inevitably be put on the natural functions of wetlands. The County's policy should be to continue to require that developers avoid impacts to wetlands and require that developers obtain jurisdictional agency wetland permits and mitigate such impacts where wetland impact avoidance is not practicable.

- **Wetland Conservation Easements**

Since 1990, approximately 1,723 acres of wetlands have been preserved under conservation easements. Listed below in Table 8.12 are the total acreages of each type of wetland community that has been preserved through conservation easements. Recorded conservation easements ensure that the wetlands subject to those easements are legally protected from future development. Going forward, the County should continue to require conservation easements on preserved, enhanced and/or created wetlands associated with new development projects.

TABLE 8.12
WETLAND CONSERVATION EASEMENTS HELD BY INDIAN RIVER COUNTY
(August 2009)

Wetland Community Type	Acreage
Freshwater Wetlands	1,241
Estuarine Wetlands	482
TOTAL	**1,723**

- **Public Acquisition of Wetlands**

Since 1992, the County has acquired approximately 3,100 acres of palustrine and estuarine wetlands through its Environmental Lands Program. In contrast to conserved wetlands on private property, public acquisition of wetlands affords compatible public access and recreational use of such wetlands. The County's policy should be to continue to acquire wetlands for conservation, when funding is available, but only wetlands that are not otherwise protected under easements.

- **Regulation of Wetlands**

In 1990, Indian River County adopted a wetlands protection ordinance. Because state law pre-empts local governments from requiring wetland mitigation inconsistent with or in addition to state regulation of wetlands, the County defers to state and federal agencies in determining mitigation for wetland impacts regulated through the county wetlands ordinance.

Between 1996 and 2006, Indian River County issued approximately 150 wetland alteration permits. With most of those permits, impacts to wetlands were less than one acre. In all cases, jurisdictional agencies assessed wetland impacts and required mitigation in the form of wetland enhancement, creation, and/or conservation to ensure no net loss of wetland functional values.

In 2004, the State adopted the Uniform Mitigation Assessment Method (UMAM) to establish wetland mitigation standards. Adopted under Chapter 62-345 of the Florida Administrative Code (FAC), the UMAM is binding on all Florida government agencies, including local governments. Recently, the FDEP notified local governments that the UMAM had to be reflected in local wetland protection ordinances.

Currently, the County's wetlands protection ordinance (LDR Chapter 928) does not reference the UMAM. To comply with state regulations, the County should reference the UMAM in its wetland protection regulations and ensure that the UMAM is the basis for mitigation determinations of wetland impacts in the County.

Although the County defers to other jurisdictional agencies in determining the extent of wetland mitigation, the County serves an important role in reviewing new development by requiring that developers adhere to the following sequence of actions to protect wetlands: avoidance of impacts; minimization of wetland impacts; and mitigation of wetland impacts. In that respect, the County's policy should be to continue to enforce this sequence of wetland protection as the County regulates new development.

- **Comprehensive Wetlands Management Program**

In order to address revised DCA Rule 9J-5.013(3), the County adopted the Comprehensive Wetlands Management Program (CWMP) described in this section and referenced under Objective 5 of this element. In the future, the County's policy should be to implement the CWMP and focus on non-regulatory measures of wetland protection such as increased intergovernmental coordination with jurisdictional reviewing agencies, acquisition of additional tracts containing environmentally-important wetlands, establishment of funding for restoration and management of acquired tracts, and creation of a wetland mitigation bank. Notwithstanding, the County's policy will be to continue to

enforce its Wetlands and Deepwater Habitat Protection ordinance (LDR Chapter 928) discussed in the preceding section.

- Intergovernmental Coordination

Since Indian River County supports efforts by the FDEP and the SJRWMD to minimize the amount of jurisdictional agency overlap regarding permitting and enforcement, the County's Environmental Planning Section (EPS) offers "in-kind" assistance to jurisdictional reviewing agencies. In doing so, the EPS serves in an advisory capacity by reviewing mitigation proposals, reporting wetland violations, and providing information pertaining to properties located throughout the County.

For wetland boundary determinations, the EPS defers to the appropriate jurisdictional reviewing agencies. In the future, the EPS should continue to review all proposed mitigation plans and make recommendations on a development-by-development basis. Furthermore, the County's policy should be to continue requiring wetland resource permits for any proposed development project that impacts a wetland. When proposed wetland impacts are less than state or federal thresholds and do not require permits, the County should continue to reserve the right to require wetland mitigation where appropriate.

- Wetland Conservation Land Use and Zoning

Currently, the Future Land Use Map of the comprehensive plan depicts two conservation land use designations for wetlands: the Public Lands Conservation District (C-1) and the Estuarine Wetlands Conservation District (C-2). Con-1 and Con-2 are the comparable zoning districts for the C-1 and C-2 land use designations, respectively. While the C-1/Con-1 designation applies to both upland and wetland conservation lands under public ownership, the C-2/Con-2 designation applies only to privately-owned estuarine wetlands found along the Indian River Lagoon and the lower reaches of the St. Sebastian River. Development density within the C-1/Con-1 designation is 0 units per acre. Within C-2/Con-2 designated areas, the allowed development density is 1 unit per 40 acres.

In accordance with LDR Section 911.12, all developments located in a Con-2 zoning district must be approved as a planned development (PD). For properties adjacent to the Indian River Lagoon or St. Sebastian River, the location of any proposed development is contingent upon determination of the jurisdictional boundaries of estuarine wetlands by site-specific survey. To minimize wetland impacts, the County should continue to require clustering in Con-2 areas and allow density transfers from the Con-2 zoning district to non-estuarine wetlands. Moreover, the County should continue to prohibit density bonuses on land zoned Con-2 and prohibit density transfer from off-site lands to PD projects on lands zoned Con-2.

- Wetland Conservation Easements/Fee-in-Lieu Payments

In exchange for agreeing to preserve a wetland area in perpetuity, a property owner may be granted full or partial tax assessment relief for the preserved property. While conservation easements are recognized as being an effective method of preserving environmentally-significant wetlands on development sites, ownership of the property is retained by either an individual or a corporation, and access to these sites by the general public is restricted.

When preserving an existing wetland on a proposed development site is not practicable, developers may, as a last alternative, pay a fee-in-lieu. A fee-in-lieu of protection may be considered only if it pertains to a small, isolated and disturbed wetland whereby the wetland's functional values are minimal. According to county regulations, a fee-in-lieu payment amount is derived from the current assessed value of one acre of the project site (a weighted average is applied if the proposed development is located on two or more parcels with different assessed values). Then, the per-acre assessed value is multiplied by the size of the proposed area of impact, in acres. In cases where funds are obtained by the county as fees-in-lieu of wetland conservation, those funds are put in an account earmarked for acquisition, restoration, and management of wetlands elsewhere in the county.

The County's current policies on wetland conservation easements and fees-in-lieu of wetland protection, as described herein, result in public benefits associated with wetland protection and enhancement. As such, the County should continue those policies.

- Wetland Acquisition and Management

In the future, Indian River County should continue to support and be an active participant in the Indian River Lagoon Blueway Florida Forever project, the multi-agency cooperative effort to acquire the remaining environmentally-important lands adjacent to the IRL. Through this program, a number of estuarine wetland sites along the IRL have been targeted by the county for public acquisition in partnership with the SJRWMD, the Acquisition and Restoration Council (ARC) and the Florida Communities Trust (FCT).

Going forward, the County's policy should be to solicit grants to restore degraded wetland areas on recently acquired conservation lands. Additional funding sources, such as fee-in-lieu and violation payments, will be used to supplement grant funding.

- Transfer of Development Rights

Indian River County's policy on transfer of development rights, as specified in LDR Section 928.09, has been successful in directing development away from estuarine wetlands to upland areas. Through that regulation, a developer is allowed to transfer development density, up to one unit per acre, from estuarine wetlands to adjacent uplands. In exchange, the developer is required to preserve

the "transferring" wetlands in perpetuity under a conservation easement. LDR Section 928.09 also provides that mitigation credit may be granted for the restoration or enhancement of impounded wetlands bordering the IRL on privately-owned properties. In the future, the County should continue to implement these policies.

Rare, Threatened and Endangered Species

Table 8.4 of this element lists the endangered and potentially endangered flora and fauna that occur within Indian River County. In the "existing conditions" section of this element, there is a discussion of habitat "specialists" and wide-ranging species (habitat "generalists") having different home range sizes and dependencies.

Throughout the county, development encroachment and human activities can detrimentally affect the survival of plant and animal species in a number of ways. With respect to development, loss of habitat is the most significant impact on the survival needs of certain species. For example, plants and animals associated with sand pine scrub/xeric uplands are endemic and decrease as scrub habitat is converted to urban development. As described earlier in this element, territorial acreage needs to be set aside and managed with natural vegetation intact if species such as the Florida scrub jay and gopher tortoise are to be preserved. Plant species also have minimum areal needs that must be met if they are to continue to propagate in sustaining amounts.

Generally, wide ranging species depend on a diversity of terrestrial and aquatic communities. For example, eagles and ospreys are species that depend on both aquatic and upland areas, while wide ranging land-bound species, such as the black bear and Florida panther, require large contiguous expanses of undeveloped lands. Indian River County is fortunate to have a large expanse of undeveloped land under public ownership in the Upper St. Johns River Basin, which provides a substantial contiguous land corridor for many animals.

Between 1996 and 2007, the following habitat conservation plans (HCPs) were adopted to conserve habitat for threatened and endangered species in the county:

- Florida Scrub Jay Habitat Conservation Plan (HCP)

In 2000, Indian River County (and City of Sebastian) adopted the Sebastian Area-Wide Scrub Jay Habitat Conservation Plan (HCP).

Assessing the success of the Scrub Jay HCP over the short time span since its adoption is difficult. In addition to the limited time since the HCP was adopted, problems related to tracking individual scrub jays and families have been encountered.

Since the HCP adoption in 2000, the number of documented scrub jay families has remained constant. Prior to the scrub jay HCP adoption, a drastic decline in the number of scrub jay families occurred from 1991 to 1998, resulting in a 50% decrease in the number of scrub jays. Since HCP adoption, the number of scrub jay families has fluctuated by less than 10%.

Post HCP adoption, the stabilization in scrub jay family populations suggests that the plan has had a positive effect. During the last five years, intensive habitat restoration has occurred within the "Scrub Jay Habitat Compensation Areas," including the Wabasso Scrub Conservation Area, Pelican Island Elementary School Scrub Habitat, and the North Sebastian Conservation Area. These areas were successfully timbered and show a marked reduction in pine canopy and an increase in suitable scrub jay habitat. These areas were also the subject of successful prescribed burns.

In the future, the County should continue to implement the scrub jay HCP by managing its scrub conservation lands with periodic prescribed burns, mechanical clearing, and timbering (as necessary) to maximize scrub jay habitat. Because of the drastic decline in scrub jay families prior to adoption and the stabilization in numbers post adoption, the evidence indicates that the HCP has been successful.

At this time, the HCP covers only a portion of the County. In 2008, scrub jays were documented inhabiting areas of the County, such as Vero Lake Estates, that historically did not support scrub jay populations. For that reason, the County should consider expanding its scrub jay HCP countywide, beyond the Sebastian area and inclusive of scrub jay habitat within municipalities. In order to promote in-county mitigation of scrub jay habitat impacts associated with development, the County should coordinate with the FWS and establish a scrub jay mitigation fund to derive revenue for acquiring and restoring scrub-jay habitat in the county.

- Manatee Protection Plan

In 2000, Indian River County adopted a Manatee Protection and Boating Safety Comprehensive Management Plan (MPP). Currently, county staff works with the FWC in implementing the plan. In 2005, the Coastal Management Element of the County Comprehensive Plan was revised to include the objectives and polices of the MPP.

Overall, collisions with watercraft account for the largest portion of manatee deaths. Since MPP adoption, the percentage of manatee deaths caused by watercraft collisions decreased from 29.6% to 23% in Indian River County. The actual number of overall collision deaths, however, increased from an average of one per year pre-MPP adoption to two per year post-MPP adoption. This average annual increase may be due to the fact that there were more years to average pre-MPP adoption compared to post-MPP adoption and, therefore, it is too early to tell if the MPP will have a positive effect in the long term. Similarly, other aspects of

the plan, such as habitat protection and marina siting, may have visible positive effects only after sufficient time has passed.

Overall, annual manatee mortalities in the County increased from three a year pre-MPP adoption to 6.8 a year post-MPP adoption, accounting for manatee deaths by old age or sickness as well as deaths from watercraft collisions.

Going forward, the County should continue to implement the MPP by reviewing all proposed multi-slip dock facilities and boat ramps in the county and requiring that those facilities meet the criteria set forth in the MPP. Also, the County should coordinate with the FWC and periodically consider modifications to the MPP based on a review of the mortality data for Indian River County.

- Sea Turtle Protection Plan

In 2004, Indian River County adopted a Sea Turtle Habitat Conservation Plan (HCP). Adoption of the Sea Turtle HCP has led to the development of a complete and accurate sea turtle nesting dataset, has increased public awareness of the issues facing sea turtle nesting, and has specifically identified threats to sea turtle nesting and survival.

Because light sources visible from the beach often disorient nesting sea turtles and are a leading cause of mortality and failed reproduction, Indian River County environmental planning staff, in 2007, began working in conjunction with the County Coastal Engineering Division on resolving beach lighting violations. This involved sending letters to beachfront property owners indicating lighting violations unique to each property.

One benefit of the Sea Turtle HCP is that the county compiled a complete database of sea turtle nesting sites and nest numbers beginning in 2005. Prior to 2005, comprehensive data were not available on nesting sea turtles in the county. Over the next several years, the county needs to continue to implement the HCP by enforcing lighting restrictions and by continuing to monitor nesting data to discern trends in nesting.

In 2008, the Florida Fish and Wildlife Conservation Commission (FWC), in partnership with the Florida Department of Environmental Protection (DEP), began an initiative to develop a Florida-wide HCP for coastal beaches. The purpose of the HCP is to establish uniformity in how the State addresses the effects of post-disaster recovery for construction east of the Coastal Construction Control Line on state (and federal) listed species. In light of this initiative, the County should assist the FWC in development of the statewide coastal beaches HCP by sharing local data on sea turtle nesting, erosion events, potential coastal mitigation sites, and other coastal data as may be requested by the FWC and DEP.

- Gopher Tortoise Protection

In 2007, the FWC's Gopher Tortoise Management Plan was revised. At that time, the gopher tortoise was upgraded from a species of special concern to a threatened species. This upgraded status, along with FWC's prohibition of gopher tortoise entombment on development sites, has heightened the importance of gopher tortoise habitat within the county. According to the FWC's revised gopher tortoise management plan, gopher tortoises must be relocated in all cases. At this time, the county has no established policies for gopher tortoise relocation beyond those established by the FWC.

In the past, Indian River County has acquired conservation lands, including the North Sebastian Conservation Area, the Wabasso Scrub Conservation Area, and the Sebastian Scrub Conservation Area, with scrub habitat suitable for receiving gopher tortoises. In light of the revised FWC gopher tortoise management plan, the County should develop policies for the relocation of gopher tortoises from private development lands to county owned lands. These policies should allow developers the option of paying a fee to have gopher tortoises relocated to county owned lands, rather than the current procedure of relocating gopher tortoises to largely private lands outside of the county. The fees collected could be used to support the ongoing management of resident tortoises and relocated tortoises on county owned lands.

As structured, the county's upland habitat protection ordinance (LDR Chapter 929) requires that an environmental assessment be conducted in coordination with wildlife agencies (e.g., USFWS, FWC) if a proposed development site contains known or potential habitat of threatened or endangered species. By requiring environmental assessments, the County ensures that any listed species that may exist on a development site are identified and protected in accordance with federal, state and local regulations. In the future, the County should continue its policy of requiring such environmental assessments, in that it furthers the protection of rare species.

Commercial Uses of Natural Resources

The major commercial uses of natural resources in Indian River County are agriculture (primarily citrus), fisheries, and sand mining. Woodland management also occurs in the county, but in relatively small amounts.

- Agriculture

From 1996 to 2004, Indian River County's annual production of citrus declined by 21%. During that time, Indian River County dropped from the sixth largest citrus producer in the state to the seventh largest producer. This decline in citrus production is a statewide phenomenon and attributable to various agricultural diseases and the conversion of agricultural lands to other uses.

In 2007, the County revised its landscape ordinance to prohibit the planting of Caribbean fruit fly and

citrus greening host plants, except as may be planted by government institutions or research centers conducting scientific research on control of agricultural diseases. In the future, the County should continue its policy of prohibiting the planting of agricultural disease host plants, with the caveat that such prohibition would "sunset" if, at sometime in the future, an identified host plant is no longer deemed a threat to citrus production.

Currently, Indian River County allows, but does not require, removal of citrus trees from unmaintained groves. While citrus trees in declining health in unmaintained groves have the potential of harboring agricultural diseases to the detriment of active citrus groves in the region, it would be over-reaching and impractical for the County to mandate that all unmaintained groves be cleared of trees to prevent the potential harboring of agricultural pests and diseases. Instead, the County should continue to allow (but not require) the removal of such citrus trees and rely on state agricultural regulations to address any potential diseases or pests associated with unmaintained groves.

- Commercial Fisheries

Comparison of 1996 and 2006 data indicates a 32% drop in commercial finfish catch in the county, from 1,236,473 pounds to 841,774 pounds. In 1996, the annual shellfish harvest in the county was 85,253 pounds. By 2006, the annual shellfish harvest was down to 9,638 pounds.

These decreases may be due to a number of factors. In 1995, the state imposed a net ban that has resulted in a decline in commercial fish landings statewide over the years. Another factor is a decline in "working waterfronts" in the county, particularly in the City of Sebastian, which is the hub of commercial fishing in the county. In Sebastian, several commercial fish houses have been converted to private marinas. Also, hurricanes in 2004 caused damage to riverfront businesses, including the Archie Smith Fish House, which closed due to storm damage.

The decline in working waterfronts is a statewide issue. Because of that decline, the 2008 State Legislature created "The Stan Mayfield Working Waterfronts" Florida Forever grant program to preserve and restore commercial fishery businesses. To fund the program, the Legislature provided 2.5% of the total Florida Forever program distribution.

In 2007, the County acquired the Archie Smith Fish House under the County's environmental lands program, with plans to restore the fish house as a visitor center and "demonstration" working waterfront. In the future, the County should seek grant funding for restoration of the fish house.

- Sand Mining

In Indian River County, the predominant use of sand is for construction purposes. This includes fill related to building construction in low lying areas and fill for septic tank absorption fields. As public

sewer is extended to serve more areas, less sand will be needed for construction fill on a per development site basis.

In the past, the Atlantic Coastal Sand Ridge, which is overlain by U.S. Highway #1, was used for sand mining in Indian River County. Additional mining operations on the Coastal Sand Ridge are not anticipated, however, since sites on the ridge with potential for mining have already been substantially mined. Moreover, the Coastal Sand Ridge is a primary recharge area for the surficial aquifer and is regulated under the County's Wellfield and Aquifer Protection ordinance such that substantial mining on the Ridge is no longer allowed. Additional information regarding aquifer protection is contained in the Natural Groundwater Aquifer Recharge Sub-Element.

Currently, LDR Chapter 934 requires reclamation of mining sites once mining activities are completed. This reclamation must include soil stabilization and vegetation plantings. In addition, the ordinance addresses issues such as off-site roadway impacts, water management, and hours-of-operation impacts for operations in residential zoning districts.

In the past, complaints have been received by County code enforcement staff regarding mining operation impacts on roadways, largely pertaining to grading maintenance of unpaved roads in the area of the operation. Other expressed concerns include excessive dust, sand spills on roadways, and noise pollution. In 2008, County mining regulations were revised to strengthen erosion control requirements and requirements relating to mining operation haul routes. Going forward, the County's policy should be to diligently enforce these revised regulations.

Conservation and Recreational Uses of Natural Resources

Since 1996, the county has acquired approximately 9,384 acres for conservation. As the County continues to acquire conservation lands, there is an increasing need to manage those lands. Currently, the County Parks Division employs a Conservation Lands Manager and a Lands Conservation Technician to oversee management of County owned (and leased) conservation areas. According to the County's Environmental Lands Program Guide, typical conservation area management tasks include:

- Invasive plant control
- Prescribed burns
- Trail blazing and maintenance
- Perimeter security (fencing)
- Construction and maintenance of public access facilities
- Historic building restoration and maintenance

Several sources of funding are available for management and development of conservation lands. One such source is the County environmental lands bond fund which may be used to provide for property security, initial resource management improvements and initial public access capital

improvements. In the future, the County should consider reserving a certain percentage of County environmental land bond funds for initial management improvements.

For upland and wetland enhancement projects, mitigation accounts may also be used to fund resource management on conservation lands. A third source of funds for resource management activities is the County's tree removal violation fines account. On an annual basis, operations, staffing and development funds are budgeted from these sources by the County Parks Division, subject to County Commission approval. Matching funds may be obtained through various grant programs and from donations of cash, materials or labor by local businesses and citizens. Going forward, the County should adopt a comprehensive plan policy that reflects use of these funding sources for conservation land management.

Over the past several years, private development off-site mitigation projects have been allowed to occur on County conservation lands. This allowance helps the County achieve its management objectives of eradicating invasive plants and restoring disturbed areas to natural conditions without expending county tax dollars. To formalize the allowance of mitigation and to establish parameters, the County should develop mitigation policies. The mitigation parameters in those policies should include: requiring that private developers carry out the mitigation work (instead of paying the County to do the mitigation); requiring that developers be responsible for annual reporting to permitting agencies; and requiring that developers be responsible for follow-up treatments and plantings (as warranted) for a minimum of five years to ensure that the mitigation project is successfully established. Moreover, the County should reserve certain opportunities for mitigation on County conservation lands for County public works and utilities projects, as the need may arise.

Although natural resource protection is the County's primary reason for acquiring conservation lands, the County always tries to make acquired conservation lands accessible to the public for resource-based passive recreation compatible with natural resource conservation. For that reason, each of the conservation areas acquired has an individual management plan which calls for public access improvements. While all management plans incorporate public access improvements, some conservation areas are more conducive for public access than others due to site characteristics. Over the next ten years, the County's policy should be to open at least 500 acres of acquired conservation lands for public access.

- Nuisance Exotic Plant Control

Nuisance exotic plants, also referred to as invasive exotic plants or natural-area weeds, are non-native plants found in natural areas that disrupt natural processes, such as fire and water flow, and displace native plant communities and wildlife habitat. In Indian River County, Brazilian pepper (*Schinus terebinthifolius*) is the most prevalent nuisance exotic species, followed by Australian pine (*Casuarina spp.*) and melaleuca (*Melaleuca quinquenervia*).

For the State as a whole, the Florida Exotic Pest Plant Council (FLEPPC) maintains a list of invasive exotic plants found in Florida. The EPPC classifies invasive exotic plants as **Category I** invasives when such plants are known to alter native plant communities by displacing native species, by changing community structures or ecological functions, or by hybridizing with natives. **Category II** invasive exotics are plants that have increased in abundance or frequency in natural areas but have not yet altered Florida plant communities to the extent shown by **Category I** species. These species may become **Category I** if ecological damage is demonstrated.

Since 1990, the County's upland habitat protection ordinance has contained requirements that certain nuisance exotic vegetation, including Brazilian pepper, Australian pine and melaleuca, be removed from development sites. In 2007, the County's landscape ordinance was revised to require that, in all new developments or redevelopments, all invasive exotic plants listed by the FLEPPC as Category I plants be removed from development sites.

In the future, the County should continue its policy to require that nuisance exotic plants be removed from development sites and to require that such sites be maintained free of nuisance exotic plants.

- Recommendations of the Committee for a Sustainable Treasure Coast

In 2005, the Committee for a Sustainable Treasure Coast (CSTC) adopted recommendations to sustain quality natural systems in the region. Action steps recommended in the CSTC's final report include:

  - Identifying funding sources and supporting funding for implementation of the IRL Comprehensive Everglades Restoration Plan;

  - Identifying and implementing strategies to protect a regional network of connected natural systems;

  - Implementing programs to regionalize wastewater treatment and move away from reliance on septic systems where they are not appropriate;

  - Developing a comprehensive regional approach to ensure that air quality in the Treasure Coast remains high; and

  - Using innovative tools, such as land acquisition, development clustering requirements, conservation easements, transfer of development rights, and mitigation banks to conserve natural systems.

Going forward, the County should adopt policies in its comprehensive plan to reflect CSTC's recommendations as they apply to natural systems in Indian River County.

- Green Building

In 2007, Indian River County initiated efforts to become a certified green county. Through the Florida Green Building Coalition (FGBC), counties and cities are designated as "certified green" if the city or county meets a minimum score measuring the degree to which green building principles are employed.

The term "green building" refers to the utilization of certain building methods and materials to minimize environmental impacts related to construction and to reduce both short term and long-term energy needs. Achieving certified status means that county building policies are more environmentally friendly and energy conscious than "standard" building policies. Certified counties within Florida are also eligible for certain state grants related to green building projects.

In March 2009, Indian River County achieved a "gold" certification from the FGBC for measures undertaken by the County that advance green building principles. In the future, the County should maintain or otherwise look for ways to improve its certification status with the FGBC.

Air Quality

Comparison of 1986 FDER (now FDEP) local monitoring station air quality data with national ambient air quality standards indicated that air pollution was not a significant problem in Indian River County. As such, monitoring was discontinued after 1986.

Generally, air quality in Indian River County is good. Problems do arise, however, on an area-specific basis, largely attributed to land clearing debris burning associated with the construction of sizable developments near residential areas. In 1990, the County adopted LDR Chapter 925, Open Burning/Air Curtain Incinerator regulations, requiring the use of air curtain incinerators - and minimum setbacks from occupied structures - for non-agricultural debris burning within the Urban Service Area (USA). Under this ordinance, the authority to issue burn permits is granted to the Fire Division. For the burning of land-clearing debris outside the USA, the local office of the Division of Forestry issues permits.

As part of the permitting process, separation from adjacent land uses, and weather conditions (i.e. wind, dryness) are taken into consideration to minimize adverse smoke impacts to adjacent properties and to prevent uncontrolled wild fire. While large burns in conjunction with stagnant air conditions have resulted in periods of poor air quality in the past, such occurrences are relatively uncommon, and burn permits are not issued if such conditions prevail.

Although the provisions of LDR Chapter 925 have been effective in reducing air quality problems that would otherwise occur more often, the County still receives smoke complaints when wind conditions are unfavorable and when incinerators are not properly used. Generally, the County's open

burning regulations strike a balance between air quality control and construction allowances. Although a total prohibition of open burning within the USA would eliminate most smoke/air quality nuisances, it would potentially increase land development expenses. The County's policy should be to continue to allow burning within the USA when incinerators are used, as required under LDR Chapter 925.

In the past, Indian River County has acquired xeric scrub properties in the USA for conservation purposes. In those areas, fire is an important management tool, and controlled "prescribed" burns are planned for these scrub conservation lands (e.g., the Wabasso Scrub property). For this reason, the County's policy should be to allow prescribed ecological burns in the context of the County's open burning regulations.

Another air quality issue relates to Radon. Radon is a radioactive gas occurring naturally in the environment. It is one of a chain of decay products of uranium, which ultimately turns into radium and then into non-radioactive lead. Radon in high concentrations has been linked to lung cancer.

In Indian River County, radon gas is not at a level to warrant health concerns; the State identifies the county as being in a "low probability" zone for radon. Only a small portion of the county, mostly within the City of Vero Beach, has been documented as having detectable levels of radon. Because radon is not a problem in the county, no special building regulations apply to address radon. Notwithstanding, the County, through its building division, should be prepared to provide information to citizens who inquire about radon as a potential health hazard.

Hazardous Waste Management

The Solid Waste Sub-Element of the Comprehensive Plan describes and analyzes current hazardous waste management practices in Indian River County. The following points are summarized:

- Currently, the processing of household hazardous waste (HHW) is accomplished by contracting with a State licensed contractor that operates the HHW Program in its entirety. Although the amount of household hazardous waste collected and processed increased by sixty percent (60%) between 1995 and 2005, this increase can be attributed to the County's growth during that period.

- According to the State Environmental Health Department, only three events involving the mismanagement of hazardous waste occurred in the county between the years 1995/96 and 2005/06. The Environmental Health Department attributes the awareness of the dangers of HHW and the convenience of the household hazardous waste (HHW) storage facility for the minimal occurrences of illegal HHW disposal by County residents. In the future, it is important for the county to continue to promote public awareness of proper hazardous waste disposal.

Intergovernmental Coordination

Table 8.13 contains a list of government agencies most often involved in the management and/or regulation of natural resources in Indian River County. Presently, Indian River County coordinates with these agencies on issues of land development and natural resource uses.

TABLE 8.13
GOVERNMENT AGENCIES INVOLVED IN RESOURCE MANAGEMENT

FEDERAL

Environmental Protection Agency (EPA)
Federal Emergency Management Agency (FEMA)
U.S. Army Corps of Engineers (USACOE)
U.S. Fish & Wildlife Service (USFWS)
Natural Resource Conservation Service (NRCS)

STATE AND REGIONAL

Florida Department of Agriculture & Consumer Services (FDACS)
Florida Department of Community Affairs (DCA)
Florida Department of Environmental Protection (FDEP)
Florida Department of Health and Rehabilitative Service (HRS)
Florida Fish and Wildlife Conservation Commission (FWC)
St. Johns River Water Management District (SJRWMD)
Treasure Coast Regional Planning Council (TCRPC)

SPECIAL DISTRICTS

Indian River Soil and Water Conservation District (IRSWCD)
Indian River Mosquito Control District (IRMCD)
Sebastian Inlet Tax District
F.S. 298 Special Drainage Districts
- Indian River Farms Water Control District (IRFWCD)
- Sebastian River Water Control District (SRWCD)
- Fellsmere Farms Water Control District (FFWCD)
- St. Johns Water Control District (SJWCD)

Based on the number of reviewing agencies that may be involved in the review of a given environmental issue, it is important that the county be familiar with these agencies and establish a system or mechanism to coordinate with the applicable agencies during the development review process.

Another aspect of multiple agency review is the potential for redundancy in regulation. On the federal, state, regional, and local levels, overlapping regulations may potentially cause undue expense to the development community. In recognizing this, the county defers certain regulatory responsibilities to other government levels, especially to such agencies with specialized expertise and resources not available to the county. Under this approach, however, care must be taken to evaluate

whether regulation at the local level is more appropriate for the purposes of local control, monitoring and enforcement. Notwithstanding, the County should continue its policy defer certain regulatory responsibilities to other jurisdictional agencies, when appropriate, to avoid undue redundancy.

An overview of the legislative authority and responsibilities associated with the agencies listed is contained in the Coastal Management Element. The Intergovernmental Coordination Element provides a detailed description and analysis of intergovernmental coordination in the county.

GOAL, OBJECTIVES AND POLICIES

GOAL

It is the goal of Indian River County to protect, conserve, enhance, or appropriately use the County's natural resources in a manner which maximizes their natural functions and values.

OBJECTIVE 1 Air Quality

Through 2020, air quality within Indian River County will continue to exceed state and federal minimum ambient air quality standards.

Policy 1.1: The county shall require that a burn permit be issued by the Fire Division prior to allowing burning of land clearing debris associated with development within the Urban Service Area. Issuance of a burn permit will be contingent upon the use of an air curtain incinerator, minimum separation distance from residential developments, wind direction, and/or any other conditions imposed by the Fire Division.

Policy 1.2: In coordination with the Office of Radiation Control and the Indian River County Health Department, the county shall make available information on the detection and control of radon gas.

Policy 1.3: The county shall coordinate with the State Division of Forestry to ensure that appropriate fire prevention methods are implemented for the burning of land clearing debris outside the Urban Service Area.

Policy 1.4: To reduce air-borne pollution, the county will ensure that land clearing and tree removal associated with urban development meets the criteria contained in county land development regulations. These criteria include, but are not limited to: phased clearing, minimizing cleared areas, and stabilizing cleared areas with ground cover. Bona fide agricultural operations will remain exempt from permitting requirements.

Policy 1.5: The county shall regulate excavation and mining activities to reduce air-borne particulates by requiring dust control measures, by limiting hours of operation, by requiring reclamation that includes soil stabilization, and by requiring Stormwater Pollution Prevention Plans (SWPPs).

Policy 1.6: The county shall promote the reduction of vehicular travel and associated emissions by encouraging planned residential developments, by promoting the establishment of bicycle and walking paths, and by planning for limited retail land uses closely accessible to residential areas.

OBJECTIVE 2 Surface Water Quality

By 2020, water quality throughout the Indian River Lagoon and the St. Sebastian River shall, at a minimum, meet State Class III water quality standards, and State Class II standards, where practicable.

Policy 2.1: Consistent with Policy 2.1 of the Coastal Management Element, the county hereby adopts the State designation of Class II - "shellfish propagation or harvesting," as defined in the FDEP's 2008 *Surface Water Quality Standards* report, as the minimum water quality standard for the following portions of the IRL located within Indian River County: from the north county line south to the CR 510 causeway east of the Intracoastal Waterway (ICW); south of the CR 510 causeway to the North Relief Canal, and from the northern tip of Round Island to the south county line.

Policy 2.2: Consistent with Policy 2.2 of the Coastal Management Element, the county hereby adopts the State designation of Class III - "Recreation, propagation, and maintenance of a healthy, well-balanced population of fish and wildlife," as defined in the FDEP's 2008 *Surface Water Quality Standards* report, as the minimum water quality standard for the following portions of the IRL located within Indian River County: from the north county line to the CR 510 causeway west of the ICW, and from the North Relief canal south to the northern tip of Round Island. The county will strive to improve the surface water quality within the aforementioned sections of the IRL to State Class II water quality standards.

Policy 2.3: The county shall minimize the amount of non-point source stormwater runoff draining to the Indian River Lagoon by requiring stormwater management systems associated with new development, as described in the policies under Objective 7 of the Stormwater Management Sub-Element.

Policy 2.4: The county shall require Stormwater Pollution Prevention Plans (SWPPs) for all new development projects that are subject to site plan or plat approval.

Policy 2.5: Consistent with SJRWMD Rule 40C-2, F.A.C. - Consumptive Use Permit requirements, the county shall prohibit the use of Floridan aquifer artesian flow wells to recharge new artificially created surface waterbodies in conjunction with urban development, except for four inch or less diameter wells with working valves.

Policy 2.6: The county shall continue to assist the SJRWMD, FDEP, U.S. Army Corps of Engineers (ACOE), and the County Environmental Health Department by undertaking code

enforcement actions, as necessary, to ensure the protection of wetlands and surface water quality.

Policy 2.7: The county shall prohibit the creation of new navigable canals or waterways connected to the Indian River Lagoon or St. Sebastian River. Excavation of any existing canal shall not be for the purpose of obtaining fill. Maintenance dredging of existing artificial navigable canals shall be the minimum necessary to accomplish the dredging purpose and shall be permitted in accordance with FDEP Rule 40C-4.051(11)(b), F.A.C., and under Section 10 of the Rivers and Harbors Act of 1899, as administered by the U.S. Army Corps of Engineers.

Policy 2.8: The county, in its land development regulations, shall require littoral zone vegetation plantings for artificially created ponds on project sites exceeding ten (10) acres in area. When littoral zones are required, the following minimum requirements shall apply:

- A minimum of 30 percent of the waterbody surface area or 21 square feet per lineal foot of shoreline, whichever is less, shall be planted with native littoral vegetation, and shall be maintained permanently as part of the waterbody;
- A minimum of one (1) tree, consisting of a native freshwater wetland species, shall be planted for every 500 square feet of littoral zone coverage;
- The water management system shall be designed to prevent siltation and eutrophication;
- A design and management plan, specifying remedial methods for correcting potential siltation, eutrophication, and/or infestation by nuisance species, shall be required;
- Consistent with Florida Administrative Code (FAC) Section 40C-42.026(4)(d), the planted littoral zone area shall consist of a 6:1 or flatter slope.

Policy 2.9: Consistent with Policy 4.2 of the Stormwater Management Sub-Element, the county shall, by 2012, request a formal meeting with representatives from all of the F.S. 298 Special Drainage Districts in the county to discuss the following issues: conducting comprehensive basin inventories, adopting maximum discharge limitations and pollutant load reduction goals (PLRGs), and setting level-of-service standards for water quality and flood protection.

Policy 2.10: Consistent with Policy 2.5 of the Coastal Management Element and Objective 7 of the Stormwater Management Sub-Element, the county will establish water quality level-of-service (WQLOS) standards for each drainage basin identified in the Stormwater

Management Sub-Element. The county's WQLOS standards will be based on the Pollutant Load Reduction Goals (PLRGs) being developed by the SJRWMD.

Policy 2.11: Consistent with Policy 7.6 of the Stormwater Management Sub-Element, Program Goal I of the Indian River Lagoon Comprehensive Conservation and Management Plan and Goal I of the Surface Water Improvement Management (SWIM) Plan, the county shall reduce the amount of non-point source pollution entering the Indian River Lagoon by applying for SWIM funds and Section 319 Grants to improve the pollutant removal of efficiency of existing stormwater management facilities and, where feasible, to construct new regional stormwater management facilities.

Policy 2.12: By 2010, the county will expand sanitary sewer service to all areas identified throughout the county by the SJRWMD as being "high" and "medium" priority areas of pollutant loading from on-site (septic) disposal systems.

Policy 2.13: The county shall require the retention of native vegetation adjacent to drainage canals or drainage ditches, where removal may otherwise result surface water sedimentation, except when such vegetation interferes with canal or ditch maintenance.

Policy 2.14: The county shall prohibit all new point sources of discharge not meeting state Class I water quality standards into the Blue Cypress Marsh Conservation Area.

Policy 2.15: The county shall monitor water quality data available from other agencies for the Indian River Lagoon and St. Sebastian River to determine the success or failure of water quality improvement projects, including the St. Sebastian River muck removal project, the Sebastian Stormwater Park, the Main Relief Canal Pollution Control Facility, and the Spoonbill Marsh project, and use the information to assess the need, design, and location of future water quality improvement projects.

Policy 2.16: The county shall support federal and state funding for implementation of the Indian River Lagoon Comprehensive Everglades Restoration Plan.

Policy 2.17: For parcels created after June 18, 1991 along the St. Sebastian River, a 100-foot shoreline protection buffer shall be provided. The shoreline protection buffer shall be measured from the mean high water mark of the river or 50 feet from the landward boundary of jurisdictional wetlands along the river or any tributary, whichever is greater, to any construction. For parcels of record which existed prior to June 18, 1991, a 50-foot shoreline protection buffer for unplatted parcels, and a 25-foot buffer for existing platted lots is required on land parcels bordering the St. Sebastian River or an Indian River Lagoon aquatic preserve, measured from the mean high water line to any construction. In no case, however, with reference to parcels or lots of record which existed prior to June 18, 1991, shall the

buffer(s) exceed twenty percent (20%) of the parcel or lot depth perpendicular to the applicable waterway. Shoreline protection buffers shall not apply to platted lots with existing seawalls.

- Within the shoreline protection buffer, no development shall be permitted with the exception of docks, boat ramps, pervious walkways and elevated walkways which provide the property owner with reasonable access to the waterway.

- No more than twenty percent (20%) or 25 feet, whichever is greater, of any shoreline may be altered for reasonable access. Native vegetation in the remainder of the shoreline protection buffer shall remain unaltered, except as may be allowed through county trimming regulations.

- Shoreline alteration shall be prohibited, unless it is in the public interest or prevents or repairs erosion damage, or provides reasonable access to the water, does not adversely impact water quality, natural habitat or adjacent shoreline uses, and is permitted by all applicable jurisdictional regulatory agencies.

Policy 2.18: The county shall take actions recommended in the 2008 update to the Indian River Lagoon Comprehensive Conservation and Management Plan (CCMP), including actions to eradicate invasive flora and fauna, reduce sedimentation and assess potential climate change impacts to lagoon resources.

Policy 2.19: The county shall coordinate with the Health Department to educate homeowners on the proper maintenance of on-site disposal system (OSDS), with particular focus on OSDS maintenance on lots proximate to the Indian River Lagoon. The coordination will involve the county providing technical assistance to the Health Department and assisting with distribution of education material.

OBJECTIVE 3 Groundwater Quality and Quantity

Through 2025, there will be no reduction in the quality or quantity of water in either the surficial aquifer or the Floridan aquifer in Indian River County. For the purpose of this objective, water quality will be based on SJRWMD's most current regional groundwater model.

Policy 3.1: Consistent with Policy 1.5 of the Natural Groundwater Aquifer Recharge Sub-element, the county shall continue to enforce existing land development regulations that protect existing and future public water supply wells from contamination by prohibiting any non-residential land use which stores, handles, or produces a toxic or petroleum-based product, or any substance regulated under 40 CFR 302, 40 CFR 122.21, and/or Chapter 487,

F.S., from locating within 1,000 feet of a public water supply well. The following minimum radial separation distances shall apply to the previously mentioned land uses:

- 200 feet for on-site disposal systems, unless approved by the FDEP or DHRS;
- 300 feet for wet retention/detention areas, unless approved by the SJRWMD;
- 500 feet for landfill and/or transfer stations, above ground or underground storage tanks, feed lots and animal facilities, and WWTP effluent discharges, unless approved by the FDEP;
- 1,000 feet from surficial aquifer public supply wells for any mining and/or excavation of waterways or drainage facilities which intersect the water table.

Policy 3.2: The county shall use water conservation measures, as described under Objective 4 of the Potable Water Sub-Element and Objective 4 of the Sanitary Sewer Sub-Element, to protect the surficial aquifer and Floridan aquifer from groundwater quantity depletion.

Policy 3.3: By 2010, the county will update the Surficial Aquifer Primary Recharge Overlay District (SAPROD) map into a Geographic Information System (G.I.S.) format.

Policy 3.4: The county will require landscaped areas for new developments to consist of a minimum of 50 percent drought-tolerant species, and to use treated wastewater effluent for irrigation, if available.

Policy 3.5: The county, in cooperation with the IRSWCD, shall provide technical assistance to agricultural operations and other large users of irrigation water relating to the design of low-volume irrigation systems.

Policy 3.6: By 2012, the county will establish an emergency water conservation plan consistent with the SJRWMD's District Water Shortage Plan, as specified in Chapter 40C-21, F.A.C. The county's emergency water conservation plan shall include the following criteria:

- local enforcement procedures relating to the District Water Shortage Plan;
- availability of public information on water conservation techniques; and
- advertisement of water restriction requirements and water conservation techniques in the local press during drought conditions.

Policy 3.7: By 2012, the county will coordinate with the SJRWMD and the FDEP to delineate and establish scientifically-based wellhead protection areas (WHPAs) for all public water supply wells.

Policy 3.8: By 2015, the county shall obtain an updated countywide geohydrological study with seismic profiles, or comparable data.

OBJECTIVES 4 Floodplains

Through 2020, there will be no reduction in flood storage capacity or the other natural functions and values of floodplains in Indian River County.

Policy 4.1: Consistent with Policy 5.1 of the Stormwater Management Sub-element, the county shall regulate development in areas designated as regulatory on FEMA's most current Flood Insurance Rate Maps (FIRMs). Within designated regulatory floodways, all encroachment shall be prohibited, including: fill, new construction, substantial improvements, and other development within the adopted regulatory flood that would result in any increase in flood levels within the county during the occurrence of the base flood discharge.

Policy 4.2: The county shall continue to regulate development within flood prone areas to minimize flood storage capacity reduction and to afford protection to life and property within floodplains.

Policy 4.3: The county shall maintain its annual certification as a participating community in the National Flood Insurance Program (NFIP) Community Rating System (CRS).

OBJECTIVE 5 Wetlands

Through 2020, there will be no net loss of the natural functions and values of wetlands or deepwater habitats in Indian River County.

Policy 5.1: The county shall continue to implement the Comprehensive Wetlands Management Program (CWMP) described in this Element.

Policy 5.2: Indian River County shall require the restoration and management of wetlands as mitigation for the limited filling of degraded wetlands, provided that the following criteria, as defined in LDR Chapter 928, are met:

- The benefits of the restoration and management of natural functions shall offset the losses of wetland functions associated with the limited wetland filling;

- A conservation easement shall be established to ensure protection; in addition, Indian River Mosquito Control District (IRMCD) will be granted access easements to allow for mosquito inspection, treatment, and management; and

- The restoration and management plan shall be consistent the Uniform Mitigation Assessment Method (UMAM) utilized by FDEP and SJRWMD, and with U.S. Army Corps of Engineers regulations, as defined in Section 404 of the Clean Water Act.

Policy 5.3: Indian River County shall require a buffer zone of native upland edge vegetation to be retained around wetland and open water habitats which are constructed or preserved on new development sites.

Policy 5.4: In recognition of the many natural functions and values of estuarine wetlands, and in recognition of the need to protect these resources from incompatible land uses for the sake of the public interest, all estuarine wetlands habitats shall be deemed environmentally-sensitive and designated C-2, Estuarine Wetlands Conservation, on the comprehensive plan future land use map. Consistent with Future Land Use Policy 1.31, the specific boundaries of estuarine wetlands and the C-2 designation shall be determined on a site-by-site wetland survey basis.

Policy 5.5: The county shall continue to accept fee-in-lieu payments as a last alternative for mitigation of wetlands alteration when on-site mitigation is not practicable, but only when consistent with the State's Uniform Mitigation Assessment Method (UMAM) and only in cases where the affected wetland is a small, isolated, disturbed wetland with minimal functional value. Funds obtained from fee-in-lieu payments will be earmarked for acquisition, restoration, or management of similar wetlands elsewhere in the county.

Policy 5.6: The county shall continue to coordinate with jurisdictional regulatory agencies pertaining to wetlands by providing comments to such agencies in a timely fashion, regarding agency dredge and fill permit applications and other wetland alteration projects proposed in Indian River County.

Policy 5.7: Development densities for environmentally sensitive wetlands and shallow water habitats shall be limited to a maximum density of one (1) unit per 40 gross acres, with a development density transfer credit of one (1) unit per gross acre.

Policy 5.8: Consistent with Policy 8.1 of the Coastal Management Element, Indian River County will participate in the Indian River Lagoon "Blueways" Acquisition and Restoration Council (ARC) project to acquire important undeveloped estuarine wetlands bordering the

IRL by providing local funding assistance, and by providing "in-kind" services, such as identifying environmentally-sensitive parcels.

OBJECTIVE 6 Upland Vegetation Communities

Using 2008 conservation land acreage as a baseline, Indian River County shall, by 2020, preserve a minimum of 500 additional acres of upland native plant communities to sustain viable populations of native plant and animal species and protect representative stands of each habitat type in Indian River County. The additional acreage shall be preserved through the establishment of conservation easements and/or fee simple acquisition.

Policy 6.1: The county shall continue to assist regional, state and federal agencies in the establishment of regional preserves for sand pine/xeric scrub, tropical/coastal hammock, and coastal strand, pine flatwood, and dry prairie vegetative communities by identifying lands eligible for acquisition, and by providing local cost-share funding. These preserves shall be of a sufficient size to function as "wildlife corridors" in order to maintain viable populations of endemic plant and/or animal species.

Policy 6.2: Using 2008 conservation land acreage as a baseline, the county shall, by 2015, restore and manage, or assist in the restoration and management of, a minimum of 100 additional acres of xeric scrub vegetation in coordination with the U.S. Fish and Wildlife Service (FWS) and the Florida Fish and Wildlife Conservation Commission (FWC), to ensure that use and management of the property is compatible with the maintenance of viable populations of endemic plants and/or animal species. The following sites shall be included: the North Sebastian Conservation Area Addition; the Cypress Bend Community Preserve; and the Sand Lakes Conservation Area.

Policy 6.3: The county shall, assist the FDEP and USFWS in the management of publicly owned coastal/tropical hammock and coastal strand conservation lands on the northern portion of Orchid island by providing "in-kind" services.

Policy 6.4: The county shall continue to review its environmental land acquisition guide on a regular basis, and shall update the guide as deemed appropriate.

a. The land acquisition guide shall include factors to be considered to assess and prioritize acquisition proposals, such as:

    1. resource values/physical features, such as proximity and value to other resources, recreational trail systems and greenways;
    2. environmental values, such as lands verified or expected to support rare, endangered, or threatened species;

3. water quality protection, such as whether or not such lands buffer natural surface waters or preserve aquifer recharge areas;
4. management considerations, such as feasible multiple public use of the property, compatible with resource conservation;
5. financial considerations, such as funding availability;
6. market considerations;
7. social and economic values, such as historic preservation, environmental education, recreation, and scenic aspects;
8. agriculture protection, such as preservation of active agricultural use lands through the acquisition of agriculture conservation easements; and
9. the need for acquisition to protect the natural community where appropriate protection cannot be afforded by land development regulations.

b. The land acquisition guide shall identify methods of land acquisition to be considered that may be appropriate, depending on any given proposal, including purchase, donation, exchange, installment sale, and use of intermediaries (e.g. Natural Conservancy).

c. Land acquisition shall be considered only after all "non-acquisition" options for environmentally sensitive or environmentally important lands protection have been explored and rejected as inappropriate, including easements, rental (lease), withdrawal (public domain), zoning, acquisition by other entities, cooperative agreement, permit restrictions, administrative regulation, and "no action".

Policy 6.5: The county shall require the preservation of native vegetative communities on county-owned land to the maximum extent feasible, unless otherwise in the public interest.

Policy 6.6: The county shall continue to encourage the preservation of mature trees on land development sites by providing landscape credit for the on-site preservation of mature trees and trees of special concern, and by allowing a reduction in the amount of required parking for the purpose of preserving existing mature trees on site.

Policy 6.7: As specific conditions of the site plan approval process, the county shall require the removal of all nuisance exotic vegetation from new development sites, and require that new development sites remain free of nuisance exotic vegetation. Furthermore, the county shall continue to prohibit the planting and sale of nuisance exotic vegetation.

Policy 6.8: The county shall continue to require the removal of and restrict the planting of nuisance exotic vegetation identified on the Florida Exotic Pest Plant Council's (FLEPPC's) Category I list.

Policy 6.9: The county shall, continue to protect all significant groupings of the following vegetative communities: xeric scrub, coastal strand, and coastal/tropical hammock. These native upland vegetative communities shall be preserved and protected through fee simple acquisition, the establishment of conservation easements under LDR Chapter 929 - Upland Habitat Protection, and by enforcing LDR Chapter 927 - Tree Protection and Land Clearing.

Policy 6.10: The county shall utilize G.I.S. computer mapping data of vegetative communities, imperiled species, wetlands, cultural resources and other similar available environmental data in the evaluation and regulation of land development activities.

Policy 6.11: Undeveloped tracts of xeric scrub and coastal/tropical hammocks 5 acres or larger shall be deemed environmentally important, in recognition of their scarcity and natural values, and in recognition of the public interest in encouraging the conservation of plants and animals associated with these vegetation communities. The county shall encourage the conservation of xeric scrub and coastal/tropical vegetative communities by establishing density transfer and cluster development incentive land use regulations to apply to these environmentally important areas.

Policy 6.12: In accordance with LDR Chapter 929, the county shall continue to require development projects five (5) acres or larger, excluding bona fide agricultural operations, to preserve a minimum of 15 percent of the total acreage of native upland area of the project site. The upland set-aside area shall be overlain with a conservation easement dedicated in perpetuity to Indian River County. The following upland ecological communities described in this element shall be subject to the native upland set-aside requirement:

- Coastal strand, including dune vegetation;
- Coastal tropical hammocks;
- South Florida flatwoods, including pine flatwoods and dry prairies;
- Xeric scrub, including sand pine scrub;
- Cabbage palm hammocks; and
- Upland hardwood hammocks.

Where on-site preservation of the native upland communities is not feasible, the county shall, as a last alternative, accept a fee-in-lieu payment. The fee-in-lieu payment shall be based on the current "per-acre" fair market appraised value of the project site multiplied by the number acres that would have been preserved under the 15 percent set-aside requirement. Fee-in-lieu

payments shall be paid prior to issuance of a land development permit, and shall be used to acquire comparable native habitat preserve areas or to manage such lands.

Policy 6.13: The county shall continue to prohibit the disturbance of dune vegetation oceanward of the county dune stabilization setback line, with the exception of dune walkover construction and other similar minor structures that may be allowed subject to approval from the FDEP Bureau of Beaches and Coastal Systems.

Policy 6.14: The county shall prioritize the following pine flatwood/dry prairie communities for acquisition:

- Flatwoods/dry prairie communities associated with the St. Sebastian River Buffer Preserve;
- Flatwoods/dry prairie communities in southwest Indian River County, identified by the Florida Fish and Wildlife Conservation Commission (FWC) and Treasure Coast Regional Planning Council (TCRPC) as potentially contributing to a regional "wildlife corridor"; and
- Flatwood/dry prairie communities complementary to riverine wetlands and other natural systems which contribute to upland wildlife species diversity.

Policy 6.15: The county shall protect the xeric scrub community abutting the St. Sebastian River by limiting densities in the area to a maximum of 1 unit per 2.5 acres, by encouraging cluster developments through density transfer, and by requiring residential developments to maintain a river buffer setback consisting of native vegetation in accordance with land development regulations. No off-site mitigation or fee-in-lieu payments will be accepted for developments proposing to locate in the area.

OBJECTIVE 7 Wildlife and Marine Habitat

Through 2025, there will be no reduction in the critical habitat of endangered or threatened aquatic and terrestrial species of flora and fauna occurring in Indian River County. For the purpose of this objective, "critical habitat" is defined as the minimum required sum of environmental conditions in a specific area necessary to sustain a given species. The protection of critical habitat shall be measured and evaluated on a site development basis.

Policy 7.1: As set forth in the policies of Objective 1 of the Coastal Management Element, the county shall conserve, appropriately use and protect non-threatened, non-endangered fisheries, wildlife, wildlife habitat and marine habitat (e.g. seagrass beds).

Policy 7.2: The protection of critical habitat shall be measured and evaluated on a site development basis. For developments on property known to support endangered or threatened species of plants or animals, or on property expected to significantly contribute to such species' habitat needs, the developer shall be required to notify the appropriate regional, state and federal agencies and provide proper protection to the maximum extent feasible.

Policy 7.3: The county shall take measures, as set forth in the policies of Objective 5 and Objective 6 of this element, to protect significant upland, wetland and deepwater communities that provide habitat for threatened or endangered species, as well as non-threatened, non-endangered species.

Policy 7.4: The county shall regulate land development activities, as set forth in Objectives 1, 7 and 16 of the Future Land Use Element.

Policy 7.5: By 2011, the county, in cooperation with the FDEP Bureau of Protected Species and Florida Marine Patrol, shall evaluate the need to revise manatee protection and speed zones in certain areas of the St. Sebastian River and the IRL, to protect the Florida manatee and to promote boating safety.

Policy 7.6: The county shall support state and federal land acquisition proposals throughout Indian River County by adopting resolutions in support of such acquisitions, and by providing "in-kind" services, such as land management.

Policy 7.7: The county shall protect nesting sea turtles by:

- conducting compliance inspections during sea turtle nesting season (March 1 - October 31);
- providing information to beachfront residents regarding seasonal lighting regulations and alternative methods of artificial lighting;
- prohibiting nighttime construction activity associated with rigid shoreline stabilization projects and new beachfront development during sea turtle nesting season;
- prohibiting storage of construction materials on the beach/dune system during sea turtle nesting season;
- requiring daily monitoring of sea turtle nesting activity to be conducted for all shoreline stabilization projects conducted during sea turtle nesting; and

- not allowing native dune vegetation oceanward of the county's DSSL to be trimmed more than four (4) feet above the existing grade;

Policy 7.8: The county will apply the following criteria when reviewing the lighting plans for beachfront development proposals in the unincorporated county:

- Outdoor lighting shall be held to the minimum necessary for security and convenience;
- Floodlights shall be prohibited;
- Wall-mounted light fixtures shall be fitted with hoods and low wattage bulbs;
- Low profile luminaries or shields shall be required for pole-mounted lighting;
- Tinted of filmed glass shall be used in windows and glass doors fronting the ocean on single and multi-family structures; and,
- Shielding requirements for pole-mounted fixtures and security lighting may be reduced if low pressure sodium bulbs are installed as an alternative to mercury vapor and high pressure sodium bulbs.

Policy 7.9: By 2015, the county, in cooperation with the USFWS, the City of Sebastian, City of Fellsmere, Indian River County School Board, and other appropriate agencies, will adopt a county-wide Habitat Conservation Plan (HCP) for the endangered Florida scrub jay. Cost-share funding for the countywide HCP will be sought from participating municipalities and agencies, and county mitigation funds will be used to fund the County's share of costs.

Policy 7.10: By 2011, the county will establish one or more state certified recipient sites for relocation of displaced gopher tortoises to county-owned conservation land. In establishing gopher tortoise recipient site(s), the county will collect fees from developers relocating gopher tortoises to county lands, with the fees to be used to fund management of such sites for gopher tortoises. In establishing recipient site(s), the county will identify and reserve certain receiving areas for county government projects.

Policy 7.11: The county shall take actions recommended by the Committee for a Sustainable Treasure Coast to sustain quality natural systems in Indian River County, including use of land acquisition, development cluster requirements, conservation easements, transfer of development rights and mitigation banks to conserve natural systems.

OBJECTIVE 8 Recreational Uses of Natural Resources

Using 2008 recreational and open space land acreage as a baseline, the county, by 2020, shall increase, by a minimum of 500 acres, the amount of recreational and open space land accessible to the public for resource-based passive recreation, compatible with natural resource conservation.

Policy 8.1: As set forth in Objective 6 of the Recreation and Open Space Element, the county shall take measures to provide sufficient resource-based parks, access, and outdoor recreational opportunities for the residents of Indian River County. These measures shall include developing public access improvements on county-acquired beachfront and riverfront conservation lands.

Policy 8.2: The county shall preserve native vegetative communities on county-owned recreational and open space land in conjunction with development design, to the maximum extent feasible.

Policy 8.3: The county shall coordinate with the U.S. Fish and Wildlife Service, the Florida Fish and Wildlife Conservation Commission, and other appropriate agencies to ensure that rare, threatened, or endangered plant or animal species identified or expected to occur on county recreational and open space lands are protected from adverse development impacts. Protection measures shall include: conducting an environmental survey prior to site development, preserving native vegetative communities on county-owned land to the maximum extent feasible, and where feasible, relocating animals to undeveloped portion of the site.

Policy 8.4: The county will pursue grant funding from the Florida Inland Navigation District's Waterway Assistance Program, or other appropriate grant programs, to fund construction of restroom facilities on the Lost Tree Islands and Prange Island.

Policy 8.5: The county shall support the establishment of recreational access sites and improvements in the Upper St. Johns River Basin in Indian River County by providing construction funding assistance and, where feasible, construction materials.

Policy 8.6: Consistent with Conservation Policy 6.4, the county, in evaluating lands to be acquired for conservation purposes, will give priority to those lands that create new or enhanced greenways and recreational trail systems.

OBJECTIVE 9 Commercial Uses of Natural Resources

Through 2025, the county will provide opportunities for the commercial use of natural resources. Notwithstanding, there will be no adverse environmental impacts in Indian River County attributed to the commercial use of natural resources.

Policy 9.1: The county, through LDR Chapter 934, shall regulate and issue permits for all proposed excavation/mining projects in the unincorporated county. County regulations for excavation/ mining projects shall include:

- a requirement that pollution prevention plans addressing wind and water erosion be depicted on mining site plans and approved by County engineering staff prior to Planning and Zoning Commission review;
- a requirement that baseline water quality data be collected at project outfall points;
- a requirement that applicants monitor discharge at outfall points to ensure no increase in levels of turbidity at outfall points; and
- a requirement of comprehensive dust control plans as part of mining site plans.

Policy 9.2: As set forth in the policies under Objective 2 of the Coastal Management Element, Objective 2 of the Conservation Element, and Objective 7 of the Stormwater Management Sub-element, the county shall undertake measures, such as establishing Water Quality Level of Service standards and prohibiting new point source discharges to increase the productivity of fishery habitat, to improve estuarine water quality, and to protect the estuarine ecological systems of the IRL, especially emergent and submergent aquatic vegetation.

Policy 9.3: The county shall support the City of Sebastian's efforts to preserve and reestablish working waterfronts in Sebastian by seeking grants to restore the Archie Smith Fish House to a demonstration working waterfront.

Policy 9.4: The county shall continue to prohibit, by legal document, the planting of agricultural disease host plants in development projects that are subject to county site plan approval. The legal document will be structured to sunset the prohibition if circumstances change such that the prohibition is no longer necessary.

Policy 9.5: The county shall evaluate energy conservation actions identified under the Florida Green Building Coalition (FGBC) green building certification program and adopt such actions when economically feasible.

OBJECTIVE 10 Soil Erosion

Through 2025, there will be no adverse off-site soil erosion impacts associated with land development and agricultural activities and beach shoreline systems will be stabilized.

Policy 10.1: Consistent with Policy 7.9 of the Stormwater Management Sub-element, the county, in cooperation with the Indian River Soil and Water Conservation District (IRSWCD), shall provide technical assistance to agricultural operations in implementing conservation plans and non-structural best management practices (BMPs). Non-structural BMPs, as defined by the Natural Resource Conservation Service (NRCS), include: land use planning, preservation of wetlands and floodplains, education, and erosion control methods.

Policy 10.2: The county shall enforce its tree protection ordinance to ensure that wind and water erosion associated with urban land-clearing activities is minimized through the use of erosion control techniques such as temporary seeding and mulching, sodding, diversion berms, interceptor ditches, sediment barriers, sediment basins, and related appurtenances or devices. A Stormwater Pollution Prevention Plan (SWPPP) addressing erosion control shall be required for all development projects.

Policy 10.3: The county shall undertake beach shoreline stabilization activities including:

- monitoring of the experimental Pre-fabricated Erosion Protection ("PEP") reef to determine the need for supplemental beach stabilization, such as sand renourishment;
- determining a funding source for public beach stabilization projects, including consideration of establishing a beach taxing district;
- coordinating with the Sebastian Inlet Tax District and the City of Vero Beach on beach restoration projects; and
- continuing meetings of a beach preservation and restoration advisory committee concerning recommendations on related issues.

Policy 10.4: To protect existing dune communities and reduce shoreline soil erosion, the county shall continue to prohibit development encroachment oceanward of the county dune stabilization setback line (DSSL), with the exception of dune walkovers and other similar minor structures subject to approval by the FDEP Bureau of Beaches and Coastal Systems. By 2012, the county will evaluate the location of the DSSL and will consider relocating the DSSL westward.

Policy 10.5: The county hereby adopts the following specific criteria pertaining to shoreline stabilization within the unincorporated portion of Indian River County and within the municipal limits of the City of Vero Beach:

- Only structures vulnerable to erosion from a 15 year or less storm event shall be permitted to construct rigid shoreline stabilization structures;

- All shoreline stabilization projects shall be approved by the Community Development Department, excluding those projects eligible for an emergency permit under Chapter 161, F.S., as authorized by the Public Works Director;

- Rigid shoreline stabilization structures shall not be permitted on vacant properties;

- The property owner(s) shall be required to assume responsibility for and agree to mitigate any adverse environmental impacts attributed to the stabilization project, including increased down-drift erosion to the adjacent property, throughout the life of the stabilization project;

- Construction activity oceanward of the County's Dune Stabilization Setback Line (D.S.S.L.) shall be avoided to maximum extent possible, and prohibited during sea turtle nesting season (March 1 to October 31) unless expressly approved by the Florida Department of Environmental Protection (FDEP).

- Daily monitoring of sea turtle nesting activity shall be conducted by an individual certified by the FDEP in conjunction with any construction activity oceanward of the D.S.S.L. during sea turtle nesting season. In the event a nest is discovered, the FDEP Bureau of Protected Species Management and the Environmental Planning Section shall be notified immediately. The individual responsible for sea turtle monitoring shall submit a nesting activity report to the Environmental Planning Section and FDEP Bureau of Protected Species Management on a weekly basis.

- All dune vegetation oceanward of the D.S.S.L. removed or damaged as a result of construction activity shall be replanted with native dune vegetation material capable of obtaining a minimum height of four (4) feet above the existing grade within two (2) years of planting;

- The contractor shall be required to meet on-site with the County's Coastal Engineer or a designee assigned by the Public Works Director prior to commencing construction;

- Prior to commencing construction, the applicant shall have received a Notice to Proceed from the FDEP's Bureau of Beaches and Coastal Systems;

- Nighttime construction activity associated with shoreline stabilization projects shall be prohibited during sea turtle nesting season; and,

- Storage of construction materials on the beach/dune system during sea turtle nesting season shall be prohibited.

Policy 10.6: The county shall require the banks of properties bordering the St. Sebastian River and the Indian River Lagoon Aquatic Preserve to be stabilized in conjunction with construction of a single-family residence and single-family docks. The preservation of existing native vegetation shall be required along the shoreline. When excessive shoreline erosion is present, the planting of native vegetation, especially red mangroves, in conjunction with installation of rip-rap will be encouraged. The use of rigid structural alternatives will not be permitted unless non-structural methods have proven ineffective or are otherwise impractical. Where structural alternatives are deemed appropriate, they will be required to be located on the upland portion of the site.

Policy 10.7: To reduce siltation loading to the IRL, the county shall promote petition road paving projects within the IRL watershed.

Policy 10.8: By 2012, the county will evaluate the appropriateness and feasibility of requiring that substantially damaged oceanfront structures in nonconforming "footprints" be relocated westward, in compliance with current coastal regulations, even when such structures are substantially damaged during declared natural disasters.

OBJECTIVE 11 Hazardous and Nonhazardous Wastes

Through 2025, there will be no new sites in Indian River County where domestic or industrial waste is improperly managed or illegally disposed.

Policy 11.1: To extend the life of the sanitary landfill, the county shall continue to expand recycling opportunities to the residents and business of Indian River County.

Policy 11.2: To maintain compliance with Title III (Emergency Planning and Community Right-to-Know Act) of the federal Superfund Amendments and Reauthorization Act (SARA), the county Emergency Services Department will maintain an update-to-date comprehensive inventory of the location, storage, manufacture, handling and/or transport of all hazardous materials in Indian River County.

Policy 11.3: To reduce improper management of hazardous and solid waste, the county will continue to investigate illegal waste disposal practices, evaluate current enforcement policies, and revise county enforcement policies if deemed appropriate.

Policy 11.4: Existing known hazardous waste contaminated sites shall be monitored and remediated, when feasible.

OBJECTIVE 12 Natural Resource Management

By 2020, 80% of the county's conservation lands shall be restored to viable ecological condition and improved for compatible passive recreational public access.

Policy 12.1: The county, in cooperation with the State Division of Forestry, U.S. Fish and Wildlife Service, and the Florida Fish and Wildlife Conservation Commission, will conduct prescribed burns on a rotational basis at the Wabasso Scrub Conservation Area, the North Sebastian Conservation Area, and other county-owned scrub habitat.

Policy 12.2: By 2010, the county shall adopt an interagency management agreement on implementation of the Sebastian Area-wide Florida Scrub-jay Habitat Conservation Plan.

Policy 12.3: By 2010, the county shall enter into a written interlocal agreement with the City of Vero Beach regarding management of the Prange Islands Conservation Area.

Policy 12.4: For land tracts acquired through the Environmental Lands Program, the county shall require a site specific management plan be adopted within one year of acquisition. Such management plans shall be subject to the review and recommendations of the County Conservation Lands Advisory Committee (CLAC). The County will, where feasible, construct public access improvements within two years of management plan adoption.

Policy 12.5: The county shall solicit grants from regional, state and federal agencies to supplement management funds for acquired lands. Funding will be used for the following purposes:

1. restoration and enhancement of impacted wetland and upland areas;
2. establishment and/or improvement of public access;
3. promotion of environmental education/awareness;
4. eradication of nuisance exotic vegetation;
5. posting of signage and boundary markers; and
6. prescribed burning on scrub lands.

Policy 12.6: County staff shall attend meetings concerning land acquisition and management issues for lands owned and managed by the SJRWMD, FDEP and the USFWS.

Policy 12.7: Suitable lands acquired under the Environmental Lands Program will be opened to the public for passive recreation. Passive recreation shall include the following: hiking, environmental education, fishing, and wildlife viewing.

Policy 12.8: To achieve management objectives on conservation lands while minimizing costs, the county shall allow private development off-site mitigation projects, subject to county staff oversight, on county conservation lands. In allowing such private mitigation on county conservation lands, the following conditions shall apply:

- the private developer shall be responsible for annual reporting to permitting agencies;
- the private developer shall be responsible for follow-up treatments and plantings to satisfy permitting agencies' requirements, for a minimum of five years; and
- opportunities for mitigation on conservation lands shall be reserved for county public works and utilities projects.

Policy 12.9: By 2010, the county will establish a dedicated funding source for ongoing management of county-owned and managed environmental lands.

Policy 12.10: By 2010, the county shall evaluate the need to hire additional conservation land management staff and establishment of a distinct Conservation Lands Management Section within the Parks Division or Planning Division.

Policy 12.11: The county shall coordinate with federal, state and local agencies, as well as nonprofit organizations, in acquiring and managing natural areas and open space.

PLAN IMPLEMENTATION

An important part of any plan is its implementation. Implementation involves execution of the plan's policies by taking actions and achieving results. For the Conservation Element, implementation involves various activities. While some of these actions will be ongoing, others are activities that will be taken by certain points in time. For each policy in this element, Table 8.14 identifies the type of action required, the entity or entities responsible for taking the action, the timing, and whether or not the policy necessitates a capital expenditure.

To implement the Conservation Element, several types of action must be taken. These include, but are not limited to: developing management strategies for acquired lands, preserving/protecting wildlife habitat, and coordination with jurisdictional agencies at the federal, state, and regional levels.

Overall plan implementation responsibility will rest with the Community Development Department. Besides its responsibilities as identified in Table 8.14, the Community Development Department has the additional responsibility of ensuring that other entities discharge their responsibilities. This will entail notifying other applicable departments of capital expenditures to be included in their budgets, notifying other departments and groups of actions that must be taken, and assisting other departments and agencies in their plan implementation responsibilities.

EVALUATION & MONITORING PROCEDURES

To be effective, a plan must not only provide a means for implementation; it must also provide a mechanism for assessing the plan's effectiveness. Generally, a plan's effectiveness can be evaluated by the degree to which the plan's objectives have been achieved. Since objectives are structured, to be measurable and to have specific timeframes, the plan's objectives are the benchmarks used as a basis to evaluate the plan.

Table 8.15 identifies each of the objectives of the Conservation Element and the measures used to evaluate progress in achieving these objectives. Most of these measures are quantitative, such as the acreage of environmentally-important/environmentally-sensitive acquired and estuarine water quality. Table 8.15 also identifies an anticipated timeframe associated with meeting the objectives.

The Community Development Department staff will be responsible for the overall monitoring and evaluating the Conservation Element. While monitoring will occur on a continual basis, formal evaluation of the Conservation Element will occur every five (5) years in conjunction with the Evaluation and Appraisal of the Comprehensive Plan. Besides assessing progress, the Evaluation and Appraisal Report (EAR) will also be used to determine if the Conservation Element's objectives and policies should be maintained, revised or deleted. In this way, the monitoring and evaluation of the Conservation Element will provide a means of determining the degree of success of the plan's implementation, as well as, providing a mechanism for evaluating needed changes to this Element.

TABLE 8.14
CONSERVATION ELEMENT
IMPLEMENTATION MATRIX

Policy	Type of Action	Responsibility	Timing	Capital Expenditure
1.1	Require burn permits for burning within USA	Fire Div.	Ongoing	NO
1.2	Provide information about Radon	DHRS/Building Div.	Ongoing	NO
1.3	Coordinate with Division of Forestry for burning outside USA	Div. of Forestry/ Planning	Ongoing	NO
1.4	Issue land clearing permits in accordance with county regulations	Planning	Ongoing	NO
1.5	Regulate excavation/mining activities	Planning/Pub. Works	Ongoing	NO
1.6	Reduce vehicle travel; promote planned developments	Planning	Ongoing	NO
2.1	Adopt State Class II water quality standards for IRL	Planning Dept.	Ongoing	NO
2.2	Adopt State Class III water quality standards for IRL and St. Sebastian River	Planning Dept.	Ongoing	NO
2.3	Minimize non-point source runoff entering the IRL	SJRWMD/FDEP/ Planning/ Pub. Works/ FS 298 Districts/ municipalities	Ongoing	YES
2.4	Require Stormwater Pollution Prevention Plans (SWPPs)	Planning/Pub. Works	Ongoing	NO
2.5	Prohibit use of wells to recharge surface waterbodies	SJRWMD/Planning	Ongoing	NO
2.6	Coordinate with state and federal agencies to protect surface water quality	SJRWMD/FDEP/ ACOE/DHRS/ Planning/ Pub. Works	Ongoing	NO
2.7	Prohibit creation of new canals and waterways	FDEP/ACOE/ Planning	Ongoing	NO
2.8	Require littoral zone plantings for ponds on projects >10 acres	Planning	Ongoing	NO
2.9	Request meeting with FS 298 District representatives	Planning/SJRWMD/ FS 298 Districts	2012	NO
2.10	Establish Water Quality Level-of-Service Standards	Planning/SJRWMD/ Pub. Works	2010	NO
2.11	Reduce amount of non-point source pollution entering the IRL; solicit SWIM funds and Section 319 Grants	Planning/BCC/ SJRMWD	Ongoing	YES
2.12	Expand sanitary sewer service throughout Urban Service Area	Utilities Dept./ SJRWMD	2010	YES
2.13	Require retention of native vegetation along canal banks	Planning	Ongoing	NO

Policy	Type of Action	Responsibility	Timing	Capital Expenditure
2.14	Prohibit new point source discharges not meeting state Class I standard into the Blue Cypress Marsh Conservation Area	Planning/SJRWMD/ FDEP	Ongoing	NO
2.15	Monitor water quality data from other agencies and assess needs for water quality improvement projects.	Planning/Pub Works	Ongoing	NO
2.16	Support federal and state funding for implementation of the IRL Comprehensive Everglade Restoration Plan	Planning/BCC	Ongoing	NO
2.17	Implement river shoreline protection buffer	Planning	Ongoing	NO
2.18	Implement recommendations in the IRL CCMP	Planning/Pub Works	Ongoing	YES
2.19	Coordinate with Health Department to educate homeowners on proper maintenance of OSDS, with focus on OSDS properties near the IRL	Planning/Health Dept	2012	NO
3.1	Enforce groundwater protection measures described in the Policy 1.5 of the NGAR Sub-element; apply minimum separation distances	Planning/Utilities	Ongoing	NO
3.2	Use water conservation measures described in Objective 4 of the Potable Water Sub-Element and Objective 4 of the Sanitary Sewer Sub-Element	Planning/SJRWMD	Ongoing	NO
3.3	Update SAPROD map to G.I.S. format	Planning	2010	NO
3.4	Require 50% xeriscape vegetation	Planning	Ongoing	NO
3.5	Provide technical assistance relating to the use of low-volume irrigation systems	Planning/IRSWCD	Ongoing	NO
3.6	Establish Emergency Water Conservation Plan	Planning	2012	NO
3.7	Coordinate with FDEP/SJRWMD to establish WHPAs	Planning/SJRWMD/ FDEP	2012	NO
3.8	Obtain an updated countywide geohydrological study with seismic profiles or comparable data	Planning/Utilities	2015	NO
4.1	Prohibit encroachment in regulatory floodways	Planning/Pub Works	Ongoing	NO
4.2	Regulate development in floodplains	Planning/Pub. Works	Ongoing	NO
4.3	Maintain annual certification in NFIP CRS program	Planning/Engineering	Ongoing	NO
5.1	Implement Comprehensive Wetlands Management Program	Planning	Ongoing	NO
5.2	Require protection, restoration and management of wetlands consistent with UMAM	Planning	Ongoing	NO
5.3	Require wetland/upland edge buffer zones	Planning	Ongoing	NO
5.4	All estuarine wetlands deemed environmentally-sensitive and zoned C-2 (Estuarine Wetlands Conservation)	Planning	Ongoing	NO
5.5	Accept fee-in-lieu payments as mitigation for wetlands	Planning	Ongoing	NO
5.6	Coordinate with state and federal agencies regarding wetlands and dredge and fill permit applications	Planning/ACOE/ SJRWMD/FDEP	Ongoing	NO
5.7	Maintain development densities and TDRs for wetlands	Planning	Ongoing	NO

Policy	Type of Action	Responsibility	Timing	Capital Expenditure
5.8	Participate in ARC "Blueway" project	Planning/BCC	Ongoing	YES
6.1	Coordinate with state and regional agencies concerning establishment of preserves of native upland vegetation	Planning	Ongoing	NO
6.2	Acquire a minimum of 100 acres of xeric scrub	Planning/FWC/ FWS	2015	YES
6.3	Assist FDEP and USFWS in management of coastal strand and coastal/ tropical hammock by providing in-kind services	Planning/FDEP/ USFWS	Ongoing	YES
6.4	Review and update Environmental Land Acquisition Guide	Planning	Ongoing	NO
6.5	Preserve native upland vegetation on county-owned lands	Planning	Ongoing	NO
6.6	Encourage preservation of trees on-site	Planning	Ongoing	NO
6.7	Require removal of nuisance exotic vegetation for new developments	Planning	Ongoing	NO
6.8	Require removal of and restrict planting of FLEPPC Category I plants	Planning	Ongoing	NO
6.9	Protect significant groupings of native upland vegetation	Planning	Ongoing	NO
6.10	Utilize G.I.S. inventory of native upland vegetative communities	Planning	Ongoing	NO
6.11	Conserve native upland vegetation	Planning	Ongoing	NO
6.12	Implement native upland set-aside requirement	Planning	Ongoing	NO
6.13	Prohibit disturbance of vegetation ocean ward of DSSL	Planning	Ongoing	NO
6.14	Prioritize pine flatwoods/dry prairie protection areas	Planning/FGFWFC	Ongoing	YES
6.15	Protect xeric scrub along St. Sebastian River	Planning	Ongoing	NO
7.1	Protect marine and wildlife habitat	Planning	Ongoing	NO
7.2	Evaluate protection of critical habitat on a site-by-site basis	Planning/USFWS/ FFWCC	Ongoing	NO
7.3	Protect significant upland and wetland habitats	Planning	Ongoing	NO
7.4	Regulate land development activities as set forth in Future Land Use Element Objectives 1,7 and 16	Planning	Ongoing	NO
7.5	Evaluate need to revise speed zones in IRL	Planning/FDEP	2011	NO
7.6	Support state and federal land acquisition proposals	Planning/BCC	Ongoing	NO
7.7	Enforce sea turtle protection regulations	Planning	Ongoing	NO
7.8	Regulate construction of docks and marinas	Planning/FDEP	Ongoing	NO
7.9	Adopt county-wide Habitat Conservation Plan for scrub jay	Planning/USFWS	2015	NO
7.10	Establish state certified gopher tortoise recipient site	Planning/Parks	2011	NO
7.11	Take actions recommended by the CSTC	Planning/Pub Works	Ongoing	NO

Policy	Type of Action	Responsibility	Timing	Capital Expenditure
8.1	Provide opportunities for recreation	Planning/Pub. Works	Ongoing	NO
8.2	Preserve native upland communities on county-owned parks	Planning/Pub. Works	Ongoing	NO
8.3	Coordinate with USFWS and FFWCC to protect threatened/ endangered species	Planning/FWC/ FWS	Ongoing	NO
8.4	Pursue FIND grants for improvements to the Lost Tree Islands and Prange Island	Planning	2011	NO
8.5	Support establishment of recreational access in the Upper St. Johns River Basin	Planning/SJRWMD	Ongoing	NO
8.6	Give Priority to acquisition of conservation lands that create or enhance greenways and recreational trail systems	Planning	Ongoing	NO
9.1	Regulate excavation/mining activities	Planning/Pub. Works	Ongoing	NO
9.2	Coordinate with SJRWMD regarding mining operations	SJRWMD/Planning	Ongoing	NO
9.3	Seek grants to restore the Archie Smith Fish House	Planning/Parks	Ongoing	NO
9.4	Continue to prohibit the planting of agricultural disease host plants in site plan approval projects.	Planning	Ongoing	NO
9.5	Undertake actions identified in the Florida Green Building Coalition (FGBC) program	Planning/BCC	Ongoing	NO
10.1	Coordinate with IRSWCD to encourage use of BMPs and Conservation Plans	Planning/IRSWCD	Ongoing	NO
10.2	Enforce land clearing and tree removal regulations	Planning	Ongoing	NO
10.3	Shoreline stabilization activities	Pub. Works/Planning/ FDEP/BCC	Ongoing	YES
10.4	Evaluate relocation of DSSL	Planning	2012	NO
10.5	Implement specific criteria for emergency shoreline stabilization	Pub. Works/Planning	Ongoing	NO
10.6	Require stabilization along IRL and St. Sebastian River	Planning	Ongoing	NO
10.7	Promote petition road paving projects	Pub. Works	Ongoing	NO
10.8	Evaluate requiring nonconforming oceanfront structures that are substantially damaged be relocated westward, even if substantially damaged during a declared natural disaster	Planning	2012	NO
11.1	Expand recycling opportunities	SWDD	Ongoing	NO
11.2	Maintain up-to-date list of hazardous materials	EMS	Ongoing	NO
11.3	Investigate illegal waste disposal practices	Planning	Ongoing	NO
11.4	Monitor and remediate contaminated sites	Planning/DHRS/FDEP	Ongoing	NO
12.1	Conduct prescribed burning on scrub lands	Planning/FWS/ FWC	Ongoing	NO
12.2	Interlocal agreement with the City of Sebastian	Planning/ Sebastian	2010	NO

Policy	Type of Action	Responsibility	Timing	Capital Expenditure
12.3	Interlocal agreement with the City of Vero Beach	Planning/ Vero Beach	2010	NO
12.4	Adopt management plans for all acquired environmental lands	Planning	Ongoing	NO
12.5	Solicit funding for management of environmental lands	Planning	Ongoing	NO
12.6	Attend meetings concerning land acquisition and management	Planning	Ongoing	NO
12.7	Provide passive recreation on Environmental Lands	Planning	Ongoing	YES
12.8	Allow private off-site mitigation on county conservation lands subject to conditions	Planning/Pub. Works	Ongoing	NO
12.9	Establish funding source for management of Environmental Lands	Planning/BCC	2010	YES
12.10	Evaluate need to hire conservation land management staff	Planning/Pub. Works	2010	NO
12.11	Coordinate w/ agencies and nonprofit groups in acquiring and managing natural areas	Planning/Parks	Ongoing	NO

TABLE 8.15
CONSERVATION ELEMENT
EVALUATION MATRIX

OBJECTIVE	MEASURE	TIMEFRAME
1	State and federal air quality standards	2020
2	Surface water quality standards	2020
3	Quality and quantity of groundwater in the surficial and Floridan aquifer	2025
4	Preservation of flood storage capacity and natural function and values of floodplains	2020
5	No net loss of natural function and values of wetlands and deepwater habitats	2020
6	Acreage of preserved native upland communities	2020
7	Protection of critical of habitat	2025
8	Amount of acreage available to public for passive recreation on environmental lands	2020
9	Extent of commercial use of natural resources	2025
10	Amount of soil erosion and dune destabilization	2025
11	Number of sites of illegally disposed waste	2025
12	Amount of conservation land restored and developed with public access facilities	2020

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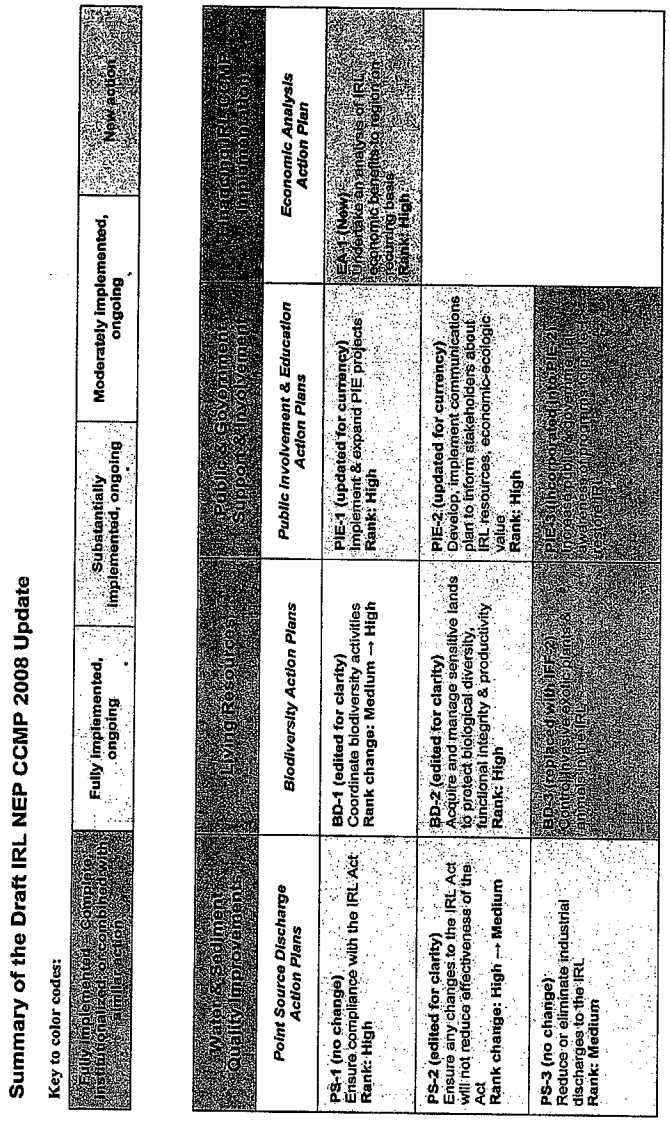
APPENDIX A: Summary of Draft IRL NEP CCMP 2008 Update



Summary of the Draft IRL NEP CCMP 2008 Update

Key to color codes:

Fully implemented. Complete, institutionalized, or combined with similar action	Fully implemented, ongoing	Substantially implemented, ongoing	Moderately implemented, ongoing	New action

Water & Sediment Quality Improvements	Living Resources	Public & Government Support & Involvement	Implement IRL CCMP

Point Source Discharge Action Plans	*Biodiversity Action Plans*	*Public Involvement & Education Action Plans*	*Economic Analysis Action Plan*
PS-1 (no change) Ensure compliance with the IRL Act **Rank: High**	**BD-1 (edited for clarity)** Coordinate biodiversity activities **Rank change: Medium → High**	**PIE-1 (updated for currency)** Implement & expand PIE projects **Rank: High**	**EA-1 (New)** Undertake an analysis of IRL economic benefits to tourism **Rank: High**
PS-2 (edited for clarity) Ensure any changes to the IRL Act will not reduce effectiveness of the Act **Rank change: High → Medium**	**BD-2 (edited for clarity)** Acquire and manage sensitive lands to protect biological diversity, functional integrity & productivity **Rank: High**	**PIE-2 (updated for currency)** Develop, implement communications plan to inform stakeholders about IRL resources, economic-ecologic value **Rank: High**	
PS-3 (no change) Reduce or eliminate industrial discharges to the IRL **Rank: Medium**	**BD-3 (replaced with IF-2)** Control invasive exotic plants & animals in the IRL	**PIE-3 (incorporated into PIE-2)** Increase public involvement in restoration projects	

Water & Sediment Quality Improvements	Living Resources	Public & Government Support & Involvement	Financing IRL CCMP Implementation
PS-4 (no change) Funding alternatives for upgrading WWTPs **Rank changed: Medium→High**	**BD-3 (New)** Create and maintain a species inventory for the IRL **Rank: Medium**	**PIE-4 (no change)** Increase public and governmental involvement in activities to protect and restore the IRL **Rank: High**	
PS-5 (edited for clarity) Promote alternatives to deep well disposal of effluent **Rank: Medium**	***Seagrass Protection, Restoration & Mgmt Action Plans***	**PIE-5 (New)** Prioritize & implement behavior change oriented education programs to reduce pointless personal pollution **Rank: High**	
On-site Sewage Treatment Action Plans	**SG-1 (edited for clarity)** Implement program of protection, restoration & management to restore SAV **Rank: High**	***IRL CCMP Implementation Action Plans***	
OSDS-1 (Complete) Complete projects in 1994 SWIM Plan	***Wetlands Action Plans***	**FI-1 (updated for currency)** Continue the IRL Advisory Board's oversight and guidance of the IRL CCMP **Rank: High**	
OSDS -2 (no change) Implement OSDS inspection program within the 6 lagoon counties **Rank changed: High→Medium**	**W-1 (edited for clarity)** Implement programs that protect ecological services of wetlands **Rank: High**	**FI-2 (updated for currency)** Continue measurement of progress of CCMP implementation activities **Rank: High**	
OSDS-3 (no change) Quantify impacts of OSDS on IRL & extent of problem areas **Rank changed: Medium→High**	**W-2 (edited for clarity)** Continue regular reviews of wetland protection rules & regulations **Rank: High**	**FI-3 (delete as unnecessary)** Adopt an implementation agreement for IRL CCMP among Management Conference	

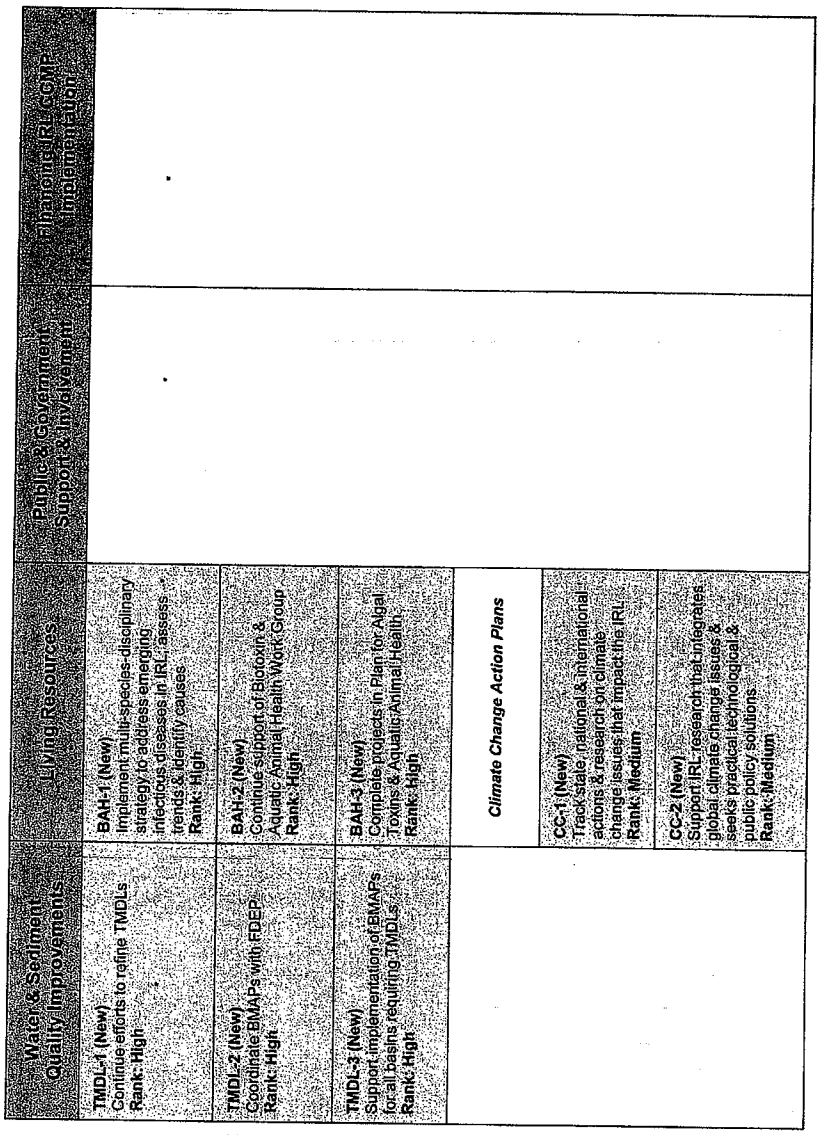
Water & Sediment Quality Improvements	Living Resources	Public & Government Support & Involvement	Financing IRL CCMP Implementation
OSDS-4 (New) Promote connections to central sewer or advanced OSTDS in problem areas & id and publicize funding sources **Rank: High**	**W-3 (edited for clarity)** Establish or enhance wetland or shoreline setback buffers **Rank: Medium**	***Data Information and Management Strategy Action Plans***	
Fresh & Stormwater Discharges Action Plans	**W-4 (updated for currency)** Implement innovative programs & incentives supporting wetlands protection & management on private lands. When necessary acquire crucial wetlands **Rank: High**	**DIM-1 (updated for currency)** Continue projects & strategies related to DIM **Rank: High**	
FSD-1 (updated for currency) Complete/continue stormwater and freshwater projects **Rank: High**	**W-5 (updated for currency)** Continue restoration & rehabilitation of impacted coastal wetlands **Rank: High**	**DIM-2 (Complete- delete)** Continue implementation of DIM strategies	
FSD-2 (updated for currency) Implement NPDES program **Rank changed: Medium→High**	**W-6 (edited for clarity)** Continue projects to restore shorelines **Rank changed: Medium→High**	**DIM-3 (updated for currency)** Improve public access to published research & reports specific to IRL **Rank: High**	
FSD-3 (updated for currency) Implement PLRGs for IRL ***Rank: High***	**W-7 (updated for currency)** Promote the removal of trash from wetlands, shorelines & islands **Rank: High**	**DIM-4 (edited for clarity)** Ensure water quality & benthic data is entered and retrievable through STORET **Rank: High**	

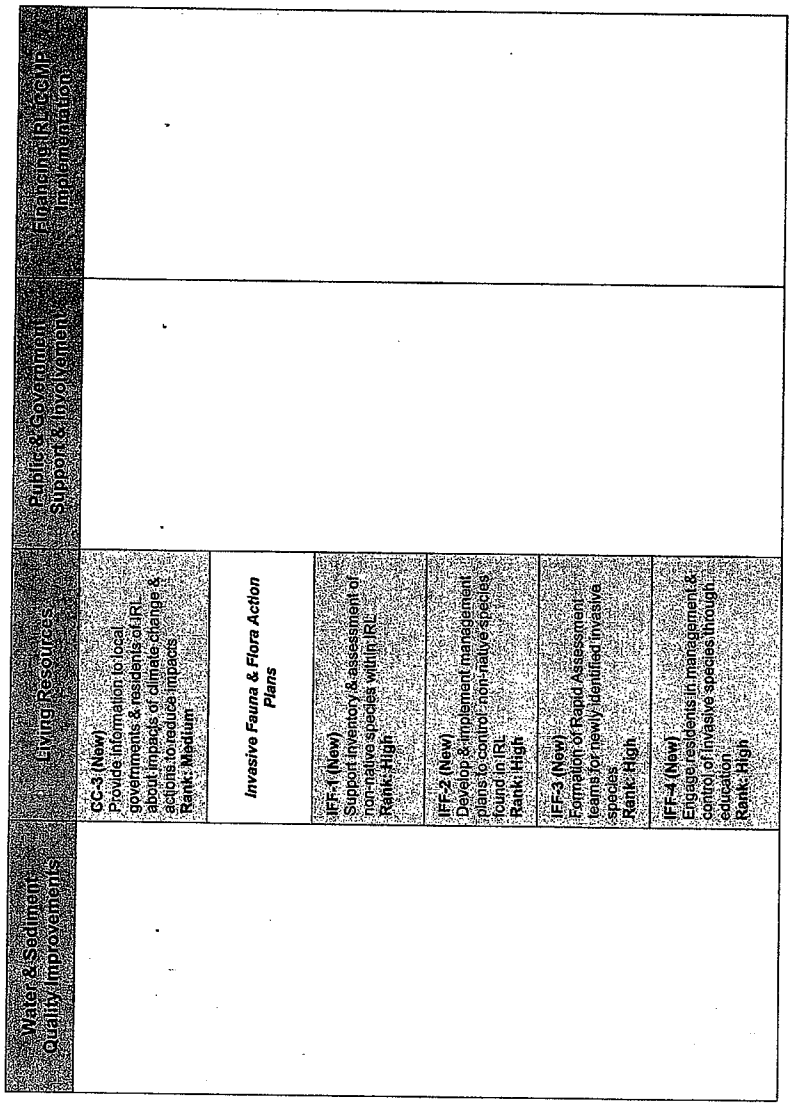
Water & Sediment Quality Improvements	Living Resources	Public & Government Support & Involvement	Financing IRL CCMP Implementation
FSD-4 (edited for clarity) Implement BMPs for management of stormwater, agricultural and freshwater discharges **Rank: High**	**W-8 (New)** Undertake research to develop new/ improved wetland management BMPs **Rank: Medium**	**DIM-5 (Complete)** Improve and update the SILORET system	
FSD-5 (edited for clarity) Update comprehensive drainage maps **Rank: Medium**	***Impounded Marsh Restoration & Management Action Plans***	***Monitoring Action Plans***	
FSD-6 (edited for clarity) Reduce impacts of muck on IRL **Rank: Medium**	**IM-1 (Incorporated into W-5)** Complete projects for impounded marshes found in 1994 SWIM Plan	**MON-1 (updated for currency)** Continue monitoring of IRL resources and address data gaps as needed **Rank: High**	
FSD-7 (updated for currency) Amend local comprehensive plans and land develop regulations to incorporate CCMP **Rank changed: Medium→High**	**IM-2 (Incorporated into W-4)** Continue acquisition of privately owned impounded marshes	**MON-2 (no change)** Continue Citizen Water Quality Monitoring Program **Rank: High**	
FSD-8 (Complete) State Revolving Trust Fund legislation for NPS Projects	***Land Acquisition and Protection Action Plans***	**MON-3 (updated for currency)** Provide support for a regular state of the lagoon report **Rank: Medium**	
FSD-9 (edited for clarity) Strengthen stormwater & freshwater discharge management programs **Rank: Medium**	**LA-1 (updated for currency)** Continue coordination to identify, classify, acquire & manage sensitive lands **Rank: High**	***IRL Scientific Research Action Plans***	

Water & Sediment Quality Improvements	Living Resources	Public & Government Support & Involvement	Financing IRL CCMP Implementation
FSD-10 (updated for currency) Encourage proper use of fertilizers, herbicides, pesticides & reuse water **Rank: High**	**LA-2 (incorporated into LA-1)** Acquire ownership or management of wetlands adjacent to IRL **Rank: High**	**SR-1 (New)** Create IRL Science & Management Work Group to develop & implement a scientific research vision for IRL consistent with FL Coastal & Ocean Resources Council and national coastal priorities **Rank: High**	
FSD-11 (no change) Educate residents about impacts of stormwater and freshwater discharges on IRL **Rank: High**	**LA-2 (New)** Support continued, expanded state funding for land acquisition programs **Rank: High**	**SR-2 (New)** Include the value of scientific research in IRL economic studies **Rank: High**	
FSD-12 (updated for currency) Plans of reclamation for WCDs and SOP for large drainage districts to reduce discharges & pollutants **Rank: Medium**	**LA-3 (New)** Develop incentives for conservation of privately owned sensitive lands **Rank: High**	**SR-3 (New)** Expand & diversify funding for research **Rank: High**	
FSD-13 (updated for currency) Upgrade stormwater systems to reduce pollutant loadings to IRL **Rank: High**	**LA-4 (New)** Promote acquisition of lands for public access to the IRL **Rank: Medium**	***Environmental Incident Assessment & Response Action Plans***	
FSD-14 (updated for currency) Funding for operation & improvement of stormwater systems **Rank: High**	***Endangered and Threatened Species Action Plans***	**EIAR-1 (New)** Inventory existing rapid assessment & response programs within IRL & identify data gaps **Rank: Medium**	

Water & Sediment Quality Improvements	Living Resources	Public & Government Support & Involvement	Financing IRL CCMP Implementation
Marina & Boat Impacts Action Plans	**ETS-1 (updated for currency)** Develop, implement adaptive management or recovery plans for endangered/threatened species **Rank changed: Medium→High**	**EIAR-2 (New)** Create & maintain inventory of support services & resources in IRL region **Rank: Medium**	
MB-1 (updated for currency) Implement clean marina program **Rank: Medium**	**ETS-2 (no change)** Improve enforcement of regulations to protect endangered/threatened species **Rank: High**	**EIAR-3 (New)** Develop response strategies for various environmental incidents **Rank: Medium**	
MB-2 (edited for clarity) Implement boat facility siting plans **Rank: Medium**	**ETS-3 (edited for clarity)** Protect & manage crucial habitats of endangered/threatened species of IRL through land acquisition **Rank: High**	**EIAR-4 (New)** Develop assessment & response strategies for environmental incidents not already addressed **Rank: Medium**	
MB-3 (updated for currency) Prevent spills & discharge impacts **Rank: Low**	**ETS-4 (replaced by new ETS-4)** Undertake studies of wildlife diseases caused by humans		
MB-4 (institutionalized MB-1) Reduce impacts from in-water hull cleaning activities	**ETS-4 (New)** Encourage private land owners to manage lands for ETS within IRL **Rank: Medium**		
MB-5 (updated for currency) Provide educational materials and programs to boaters **Rank changed: High→Medium**	**ETS-5 (New)** Identify distribution and crucial habitats for endangered/threatened species of the IRL **Rank: High**		

Water & Sediment Quality Improvements	Living Resources	Public & Government Support & Involvement	Financing IRL CCMP Implementation
MB-6 (updated for currency) Expand &coordinate enforcement of boating safety & resource protection regulations in IRL **Rank: High**	***Fisheries Action Plans***		
MB-7 (updated for clarity) Eliminate impacts from boating waste discharges & marine sanitation devices **Rank: High**	**F-1 (updated for currency)** Conserve, protect, restore & manage finfish & shellfish resources in IRL **Rank: High**		
MB-8 (updated for clarity) Monitor boating impacts on IRL natural resources & effectiveness of resource protection zones **Rank changed: Low→Medium**	**F-2 (Incorporated into F-3)** Develop coordinated fisheries research agenda for the IRL		
Atmospheric Deposition Action Plan	**F-3 (updated for currency)** Support & expand research initiatives & coordinated finfish & shellfish management strategies **Rank: High**		
AD-1 (updated for currency) Continue to determine the impacts of Atmospheric Deposition of pollutants on water quality & resources **Rank changed: Low→Medium**	**F-4 (New)** Identify, inventory & assess fisheries habitats within IRL & implement management & restoration strategies **Rank: High**		
Total Maximum Daily Loads Action Plan	***Biotoxins and Aquatic Animal Health Action Plans***		


Water & Sediment Quality Improvements
Living Resources
Public & Government Support & Involvement
Financing IRL CCMP Implementation
TMDL-1 (New)
Continue efforts to refine TMDLs
Rank: High
BAH-1 (New)
Implement multi-species-disciplinary strategy to address emerging infectious diseases in IRL; assess trends & identify causes
Rank: High
TMDL-2 (New)
Coordinate BMAP's with FDEP
Rank: High
BAH-2 (New)
Continue support of Biotoxin & Aquatic Animal Health Work Group
Rank: High
TMDL-3 (New)
Support implementation of BMAPs for all basins requiring TMDLs
Rank: High
BAH-3 (New)
Complete projects in Plan for Algal Toxins & Aquatic Animal Health
Rank: High
Climate Change Action Plans
CC-1 (New)
Track state, national & international actions & research on climate change issues that impact the IRL
Rank: Medium
CC-2 (New)
Support IRL research that integrates global climate change issues & seeks practical technological & public policy solutions
Rank: Medium


Water & Sediment Quality Improvements
Living Resources
Public & Government Support & Involvement
Financing IRL CCMP Implementation
CC-3 (New)
Provide information to local governments & residents of IRL about impacts of climate change & actions to reduce impacts
Rank: Medium
Invasive Fauna & Flora Action Plans
IFF-1 (New)
Support inventory & assessment of non-native species within IRL
Rank: High
IFF-2 (New)
Develop & implement management plans to control non-native species found in IRL
Rank: High
IFF-3 (New)
Formation of Rapid Assessment teams for newly identified invasive species
Rank: High
IFF-4 (New)
Engage residents in management & control of invasive species through education
Rank: High