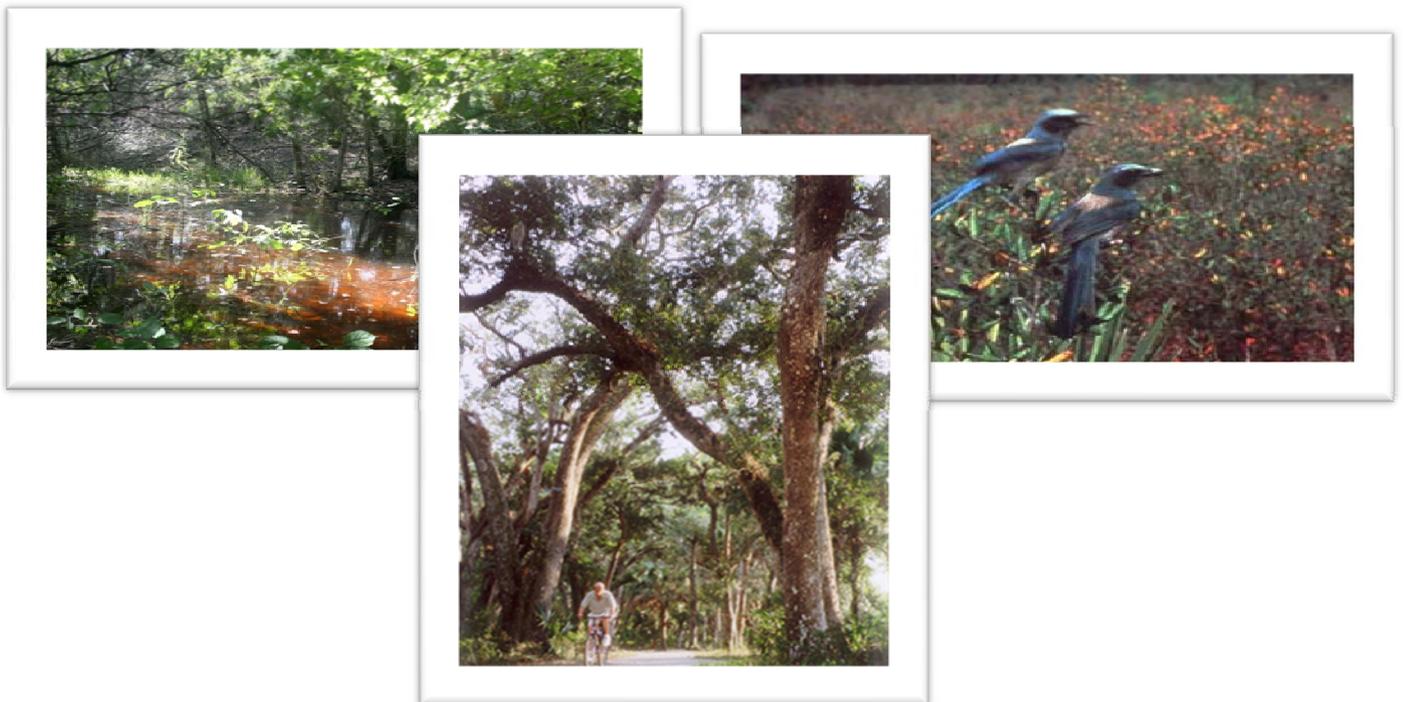




Flagler County Comprehensive Plan 2010-2035
Flagler County, Florida

Conservation Element
Data and Analysis



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**CONSERVATION ELEMENT
DATA AND ANALYSIS**

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I. Introduction

Flagler County is rich in natural resources. These resources have been one of the driving forces behind the County's rapid growth in from 2000 - 2007. In this rapidly urbanizing area, protection of the existing natural resources and planning for water-related and water-dependent uses has been a great concern of Flagler County.

The purpose of the conservation element is to provide a guide for the conservation, use and protection of the natural resources within Flagler County. The information, analyses and policy directives provided in the element are intended to be used by decision-makers and the public to ensure the protection and enhancement of the public health, safety, welfare and environmental quality. As growth continues to occur in Flagler County, the need for protection and appropriate management of the county's natural resources will become even greater.

In spite of rapid urban growth, the County contains a large abundance of high quality natural resources. The need for protection and management of the County's natural resources will continually increase as growth expands. Therefore, this Element is taking a responsible approach toward natural resource protection, recognizing the tremendous contribution of these resources to the quality of life of Flagler County residents and visitors.

The county's natural resources are identified and analyzed in the first part of the element, including a discussion concerning the conservation and protection of these resources and their significance to the county and the region. The map series provides additional data regarding the location, extent and type of natural resource and/or impacts from development occurring within Flagler County.

II. Current Conditions

Flagler County lies in the northeastern part of Florida, about sixty miles south of Jacksonville and 25 miles north of Daytona Beach. Flagler County is about 23 miles wide at its widest point east to west, and 29 miles long at its longest point north to south. The Atlantic Ocean beachfront area is 18 miles long and forms the eastern boundary, and Crescent Lake forms a significant portion of its western boundary.

Flagler County occupies approximately 571 square miles consisting of 485 square miles of land area and 86 square miles of water area. This area includes the incorporated cities of Beverly Beach, Bunnell, Flagler Beach, Marineland, and Palm Coast. The City of Bunnell, the county seat, is located at the geographical center of Flagler County (U.S. 1 and SR 100 crossroad).

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Flagler County can be divided into two major geographic areas: the coastal area east of U.S. Highway 1 and western Flagler County west of U.S. Highway 1 (See Map 2, Major Geographic Regions). These have been broken down into smaller study areas to aid in the compiling of data that is used to analyze the existing conditions and provide guidance for future actions.

The coastal area east of U.S. Highway 1 occupies approximately thirty-five percent of the total land area. This area contains the coastal cities of Flagler Beach, Beverly Beach, Marineland and Palm Coast. There are five areas of unincorporated Flagler County that include the planned communities of Plantation Bay, Matanzas Shores, Grand Haven and Hammock Dunes; and unincorporated Painters Hill and Hammock areas along A1A. Most of the urban development activity in Flagler County has occurred in this area due to following factors:

1. Traditional development pattern of the Florida Atlantic coast.
2. The attractive natural resources.
3. A relatively affordable supply of housing within a reasonable commute of employment opportunities in other counties.
4. A developed and connected roadway system providing access to SR A1A, Interstate 95, U.S.1 and SR 100.

Current land development patterns show that most of the residential development in the coastal area is occurring in the City of Palm Coast and surrounding unincorporated areas where central water and sewer facilities are available. Other residential development occurs in the incorporated areas of Flagler Beach, Beverly Beach or Bunnell, and older, small subdivisions or isolated single-family residences along A1A, SR 100, Old Dixie Highway, Old Kings Road and John Anderson Highway. There are many factors that have resulted in the residential development of the coastal area. The primary reason is the close proximity to the Atlantic Ocean and the Intracoastal Waterway. This location provides for a pleasant climate and appealing lifestyle. Additionally there are numerous parks and recreational facilities and a growing commercial base in Palm Coast. The coastal area also contains numerous opportunities for business development and excellent schools. The Flagler coastal area is characterized by an overall low-density residential land use pattern. This provides an attractive area for new residents, but may result in an inefficient land use pattern that increases the cost for urban services (roads, sewer, schools, etc.).

The eastern, coastal region of the county also has many regional inducements for continued growth. The eastern seaboard of Florida has traditionally experienced growth

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because of tourism/retirement and proximity to the ocean and Intracoastal Waterway. Flagler County has traditionally been a tourism and retirement destination. Given the changes in the global economy, Flagler County now has additional attributes (proximity to Interstate I-95, FEC rail line, close proximity to Jacksonville and Orlando Metropolitan Statistical Areas) that could be alluring for development of industrial and technological uses. These assets help local governments in the development of balanced, sustainable communities. Prior to the economic downturn of 2008 and 2009, both Volusia and St. John Counties were experiencing high growth rates and there were thriving employment opportunities to residents of Flagler County. This accelerated residential and service commercial opportunities in the eastern portions of the County. This accelerated growth has greatly diminished and employment opportunities have declined resulting from the down-turn of the worldwide economy. This trend emphasizes the need for Flagler County to diversify its land use options in order to attract industry and other business opportunities outside the real estate, construction, tourism and service sectors.

The region of Flagler County west of U.S.1 occupies approximately 65 percent of the total land area. This area is characterized by farming and timber production. Small rural communities that have existed for many years include St. Johns Park, Espanola, Haw Creek and Cody's Corner. Rural subdivisions (one acre minimum) include Flagler Estates, Daytona North and Smokerise. Daytona North is an old residential subdivision with no existing infrastructure and few paved roads. Flagler County has adopted a municipal services taxing district to fund improvements to roadways and drainage facilities. The residents in Daytona North rely on septic tanks and on-site wells for sewer and water services. Flagler Estates is an area that has been divided through a process that allowed the land to be used and sold for agricultural purposes. The Flagler Estates area is not vested since it is not a valid subdivision approved by Flagler County and Flagler County has no legal obligations to provide services. The County has identified these as critical issues in the 2009 Evaluation and Appraisal Report (EAR) and developed strategies to limit development and address private property rights.

Up until 2005 there was little development pressure seen in the West Flagler region. In 2005, the annexation of 10,000 acres into the City of Bunnell raised concerns from state and regional agencies. The Florida Department of Community Affairs, the Northeast Florida Regional Council and other reviewing agencies expressed a concern that the annexation would spur the unchecked development of the sparsely populated rural lands. The primary issue pertains to the potential for sprawling development occurring in a manner that:

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1. Does not address the provision of urban services in an efficient and orderly manner;
2. Results in the degradation of valuable natural resources including wetlands, wildlife corridors and aquifer recharge areas;
3. Establishes incompatible land use patterns that effectively eliminate the existing agricultural uses and rural land uses.

The current economic conditions have slowed the pressure for development of raw land for new housing and commercial products. This has not abated the concern from state and regional agencies. The critical element is to make sure all local governments have in place the necessary land use policies needed to guide the development or preservation in Western Flagler County. This will require the coordinated efforts of the County, the City of Bunnell and the City of Palm Coast to:

1. Ensure a cohesive method supporting the agricultural interests;
2. Establish meaningful standards for sustainable development; and
3. Prevent sprawl from occurring in the rural areas.

III. Environmental Setting

Flagler County, Florida lies mostly within the Lower St. Johns River Basin and partially within the Upper East Coast Basin, which is sometimes referred to as the Upper Coastal Basin or the Northern Coastal Basin, of northern Florida. The two basins are divided by the Atlantic Coastal Ridge. The county has a humid sub-tropical climate that is favorable, based on past history, for crop production, livestock and pine forests. The summers are long, hot and humid. Winters, although punctuated with occasional cold fronts dropping temperatures below freezing, are mild due to the southern latitude and proximity to the Atlantic Ocean. The mean annual precipitation in the County is approximately 50 inches.

In terms of physiography, Flagler County lies entirely in the Eastern Valley with the Atlantic Beach Ridges (relict beach ridges and bars) running along its eastern edge. A remnant of the Atlantic Coastal Ridge, which is also a relict beach ridge, is evident in the north-central part of the county. Furthermore, Flagler County is composed predominantly of a series of marine terraces, the three most important of which are the Silver Bluff, the Pamlico and the Talbot. The beaches have a high content of shell fragments, are not very wide and generally slope steeply seaward. Overall, much of the county is poorly drained and in many parts consists of poor soils and wetlands.

Flagler County is contained within the Northern Coastal Basin, which is composed of

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the Tolomato, Guana, Matanzas, Pellicer and Halifax watersheds. Pellicer Creek, which forms the boundary between St. Johns and Flagler Counties, is the only natural drainage in the area that cuts through the marine terraces and ridges to flow east into the Matanzas River. The Halifax drainage basin, directly south of the Pellicer basin, includes portions of Volusia and Flagler Counties.

The northeast corner of Flagler County is part of Guano-Tolomato-Matanzas National Estuarine Research Reserve (GTMNERR). According to National Estuarine Research Reserve regulations at 15 C.F.R. Part 921.1(b) the goals of the program are to:

1. Ensure a stable environment for research through long-term protection of National Estuarine Research Reserve resources;
2. Address coastal management issues identified as significant through coordinated estuarine research within the System;
3. Enhance public awareness and understanding of estuarine areas and provide suitable opportunities for public education and interpretation;
4. Promote Federal, state, public and private use of one or more Reserves within the System when such entities conduct estuarine research; and
5. Conduct and coordinate estuarine research within the System, gathering and making available information necessary for improved understanding and management of estuarine areas.

IV. Native vegetative communities

Flagler County has a wide diversity of natural ecological communities, falling into three broad categories: upland communities, wetland communities and estuarine communities. The upland communities include Pine Flatwoods and Upland Hardwood Hammocks. The wetland communities include Swamp Hardwoods, Cypress Swamp and Freshwater Marsh. The estuarine communities include Saltwater Marsh and Coastal Strand.

These ecological communities serve as habitat for a variety of flora and fauna, including many species that are threatened or endangered. The wetland communities have important hydrologic functions that affect water quality and quantity. They serve as noise barriers, reduce pollutants, modify temperature extremes, provide habitat for wildlife and provide resources for recreation and research. The upland communities serve both recreational and commercial purposes.

A. Upland Communities. Undeveloped habitats are divided into forested (greater than 10% canopy coverage) and non-forested (less than 10% canopy coverage) types. The following is a brief description of upland habitat communities found in Flagler County,

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based on maps produced by the Florida Geographic Data Library, as classified according to the Florida Land Use, Cover and Forms Classification System (FLUCFCS).

Upland Communities-Pine Flatwood: This community occurs on nearly level lands with gradual water movement to the natural drainageways. These flatwoods can best be described as open woodland dominated by pine trees. The community has fairly numerous and diverse animal populations. Larger animals such as deer and raccoon are commonly found near the boundaries between flatwoods and associated forest communities. Other animals also found here include the cottontail rabbit, cotton rat, skunk, squirrel and opossum. Water availability and fire are the major stress conditions of this community. Modification of either condition will change the plant and animal composition. The absence of fire could cause a succession of changes to a hardwood community.

These communities are good cellulose producers. The original areas of predominantly longleaf pine have been logged. Intensive management for pulp production can cause major changes in the vegetation, which in turn can result in a lower diversity of plants, and adverse change in some wildlife populations.

Upland Communities-Hardwood Hammock: This community occurs in relatively few areas throughout the county. It can readily be identified by the occurrence of thick stands of shade-tolerant hardwoods and few pines. Trees common in this community are live oak, cabbage palm, magnolia, laurel oak and American holly. Fauna include the gray squirrel, tufted titmouse, woodpeckers and crested flycatchers. From a purely aesthetic standpoint, the interior of this community is inspiring. Large hardwoods exhibit an interesting diversity in growth forms and sizes. In the moist drainageways, true mosses, several species of ferns and violets represent the fragile side of nature. This ecological community is valuable for watershed protection, hardwood products and is prized areas for residential development.

The following summarize the various types of upland systems within Flagler County.

310 – Herbaceous (Dry Prairie)

This is a more or less treeless dry grassy habitat. Although it is classified as upland, areas of this habitat may be occasionally inundated by water. Grasses such as Bahia grass (*Paspalum notatum*), panic grasses (*Panicum spp.*), Bermuda grass (*Cynodon dactylon*), and broomgrass (*Andropogon spp.*) are common dry prairie species. Some saw palmetto (*Serenoa repens*) may be present as well.

320 – Shrub and Brushland

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Areas dominated by shrubs such as saw palmetto, gallberry (*Ilex glabra*), wax myrtle (*Myrica cerifera*), baccharis (*Baccharis halimifolia*), and saltbush (*Iva spp.*). Grasses and other herbaceous species are usually present as well. Such shrub-dominated habitats can occur as coastal communities or as inland communities.

330 – Mixed Rangeland

Habitats consisting of a mixture of grass-dominated prairie and shrub-dominated brushland are classified as mixed rangeland. Species for this habitat type are as described in the above two categories.

411 – Pine Flatwoods

Much of Flagler County and what has become the City of Palm Coast was once pine flatwoods habitat. This flat, poorly drained upland habitat is characterized by slash pine (*Pinus elliotii*), gallberry, and saw palmetto. Most natural pine flatwoods habitat in the City was converted to pine plantation about fifty years ago, and then much of that was converted again into residential and commercial development with the construction of Palm Coast. The remaining natural pine flatwoods have been drained by the surrounding development, and their natural fire regiment has been disrupted. Due to these changes, some areas have succeeded into hardwood forest. Unburned areas of pine forest were allowed to accumulate high levels of undergrowth, until the material was consumed in the fires of 1998. After the fires, many areas were logged or cleared to reduce further fire hazards. The resulting current pine flatwoods are less diverse and valuable than undisturbed, fire-maintained pine flatwoods in other parts of the State.

412 – Longleaf Pine – Xeric Oak

Some drier pine forests, dominated by longleaf pine (*Pinus palustris*), with some sand pine (*P. clausa*), laurel oak (*Quercus laurifolia*), live oak (*Q. virginiana*), and sand live oak (*Q. geminata*), are found in the City. Wiregrass (*Aristida spp.*) is a common groundcover species. These tend to be on high sand ridges such as old inland dunes.

421 – Xeric Oak

This forest community is similar to and occupies the same sites as the Longleaf Pine-Xeric Oak community except that the pines, if present, are not the dominant species. In many cases, longleaf pine may have been present in significant numbers prior to harvesting but were never regenerated.

434 – Hardwood – Conifer Mixed Forest

This upland vegetative community occurs along the marine terraces throughout Flagler County and is characterized by large pines, live oaks, magnolias, and other shade-

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tolerant hardwoods. The hardwood forest, or hammock, may lie within floodplain or flood prone areas as much of the vegetation within this community is able to stand short periods of inundation. Hammocks are considered prime development areas for residential property due to their picturesque nature. They typically contain large oaks that dominate the landscape and provide abundant shade.

441 – Coniferous Plantations

Much of the natural pine flatwoods in Flagler County were converted to pine plantations about fifty years ago. Many areas have been planted, harvested, and replanted several times. Slash pine was most commonly planted, but some areas of sand pine or loblolly pine (*Pinus taeda*) can be found. Timber companies in Flagler County predominantly use the row-and-furrow method of culture, which results in disturbed soils and high densities of trees per acre. Pine plantations can have similar pine flatwoods accessory species, but the overall diversity of vegetation and wildlife value is much lower. Occasionally, pine plantations are established and maintained in wetland areas.

443 – Forest Regeneration Areas

Areas of pine flatwoods that have been cleared for silviculture or areas of pine plantation that have been recently harvested are classified as forest regeneration areas. Temporary growth of weedy secondary species may predominate, including wax myrtle, broomgrass, and panic grasses.

The importance of upland communities emphasizes the need to establish viable regulations for protection and preservation purposes. Very few regulations exist to protect upland habitats and vegetative communities. A 25-foot-wide upland area (known as a buffer) is required around protected wetlands by the Flagler County Land Development Code (LDC), SJRWMD and the ACOE in order to receive development approvals. Flagler County's LDC also identifies sensitive areas where increased buffers are required, extending these protection zones up to 75-feet. In cases where certain protected wildlife species are present, areas are required to be set aside to ensure the long-term viability of the species. Flagler County has used a variety of tools from regulatory and fee acquisition to protect and preserve these valuable natural resources.

The quality of the upland communities has been brought into question throughout the early 2000's. Many of the upland habitats in the central and eastern portions of the County were burned in the fires of 1998 and are currently in a stage of regeneration or succession. Many upland habitats lack canopy cover. Most of the remaining forested areas are planted slash pine plantations. In addition, large tracts of Flagler County are in silviculture production. Pine plantations are low quality habitat due to their

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homogeneous, simple, and disturbed nature. Most upland areas are platted for more residential lots, and many larger areas are planned for larger-scale development. The County has established landscape and natural area preservation regulations to address standards for clearing, replacement, and establish size and quantity standards.

Areas of natural upland habitat that escaped development and the 1998 fires are now overgrown due to the suppression of natural fire. Thick growth of greenbriars (*Smilax* spp.), grapevine (*Vitis rotundifolia*), gallberry, wax myrtle, saw palmetto, and blackberry (*Rubus* spp.) covers many sites. These sites provide food and cover for some species, but larger species tend to avoid such sites due to their impassable nature. In addition, the thick growth can be a significant fuel source and become a potential wildfire hazard. Therefore, careful consideration on the types and quantity of preserving native vegetation but be established within the LDC.

B. Wetland Communities

In general, the Flagler County is topographically flat and poorly drained. Freshwater wetlands are generally divided into forested (greater than 10% canopy coverage) and non-forested (less than 10% canopy coverage) systems. Habitats are further classified by dominant vegetation and other characteristics. The following is a brief description of County's individual freshwater wetland types (based on maps produced by the Florida Geographic Data Library) and classified using the Florida Land Use, Cover and Forms Classification System (FLUCFCS)(i.e. 611, 615, etc.).

611 – Bay Swamp

The canopy of this forest community is dominated by one or more species of tupelo (*Nyssa* spp.). Associated species may include cypress (*Taxodium* spp.), red maple (*Acer rubrum*), sweetbay magnolia (*Magnolia virginiana*), and a wide variety of other wetland hardwoods.

615 – Stream and Lake Swamps (Bottomlands)

This community, often referred to as bottomland or stream hardwoods, is usually found on but not restricted to river, creek and lake floodplain or overflow areas. The canopy of this habitat type is characterized by a wide variety hardwood species, including red maple, water oak (*Quercus nigra*), sweet gum (*Liquidambar styraciflua*), willow (*Salix caroliniana*), tupelos, water hickory (*Carya aquatica*), swamp ash (*Fraxinus* spp.), and buttonbush (*Cephalanthus occidentalis*). Associated coniferous species include cypress, slash pine (*Pinus elliotii*), and loblolly pine (*P. taeda*).

616 –Inland Ponds and Sloughs

These communities are similar to the above-described bottomland areas, but represent

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depressions and drainage areas that are not directly connected to streams or lakes. Canopy composition is similar to that of bottomland habitats.

617 – Mixed Wetland Hardwoods

Mixed wetland hardwood swamps have a canopy composed of a very diverse mixture of wetland hardwoods. Red maple, water hickory, willow, sweetbay magnolia, sweet gum, loblolly bay (*Gordonia lasianthus*), hydric oaks (*Quercus spp.*) ashes, tupelos, and bays (*Persea spp.*) may be present.

621 – Cypress

This community is the first of the coniferous forests. It is characterized by a canopy dominated by pond cypress or bald cypress (*Taxodium ascendens* or *T. distichum*). Associated species may include tupelo, red maple, sweetbay magnolia, sweet gum, slash pine, water hickory, swamp ash, American elm, willow, and hydric oaks.

624 – Cypress, Pine, Cabbage Palms

The canopy of this community is characterized by an even mixture of cypress, pine and/or cabbage palm (*Sabal palmetto*). This habitat often forms a transitional area between deeper wetlands and the surrounding upland habitats.

625 – Hydric Pine Flatwoods

This community resembles upland pine flatwoods in structure and vegetative composition, with the characteristic slash pine and saw palmetto (*Serenoa repens*). However, pine flatwoods classifiable as wetlands usually have strongly hydric soils (i.e. muck), and a high percentage of wetland hardwoods (loblolly bay, red maple, sweet gum, and red bay in the canopy or subcanopy).

626 – Hydric Pine Savanna

This community resembles upland pine savanna in structure and vegetative composition, with the characteristic scattered pine canopy over sparse saw palmetto and grassy groundcover. However, hydric pine savannas usually have strongly hydric soils, along with a strong component of wetland shrubby and herbaceous vegetation. This component may include such species as maidencane (*Panicum hemitomon*), blue maidencane (*Amphicarpum muhlenbergianum*), yellow-eyed grass (*Xyris spp.*), and corkwood (*Stillingia aquatica*)

627 – Slash Pine Swamp Forest

This community is typically a depression domed swamp or strand dominated by slash pine, pond cypress, tupelo, loblolly bay, and sweetbay magnolia.

630 – Wetland Forested Mixed

Mixed wetland forest habitat is characterized by an even mixture of wetland hardwoods and wetland conifers – including red maple, oaks, sweetbay magnolia, sweet gum, willow, elm, red bay, tupelos, ashes, pines, cypresses, and sabal palm.

641 – Freshwater Marshes

Freshwater wetland habitats with less than 10% canopy coverage are classified as marshes or wet prairies. Marshes are dominated by non-grassy herbaceous vegetation, including the following: buttonbush, rushes (*Scirpus spp.*, and *Juncus spp.*), arrowheads (*Sagittaria spp.*), cattails (*Typha spp.*), arrowroot (*Thalia geniculata*), St. Johns wort (*Hypericum spp.*), and bacopa (*Bacopa spp.*). Some grassy vegetation (as described under Wet Prairie below) may be present as well – especially maidencane and sawgrass.

643 – Wet Prairie

Wet Prairies are freshwater herbaceous wetlands dominated by grassy vegetation. Sawgrass (*Caladium jamaicense*), maidencane, blue maidencane, beakrushes (*Rhynchospora spp.*), spikerushes (*Eleocharis spp.*), cordgrass (*Spartina bakeri*), and yellow-eyed grasses are characteristic. Some non-grassy species characteristic of marshes (as described above) may be present as well – especially St. Johns wort and rushes.

644 – Emergent Aquatic Vegetation

Many of the City's freshwater bodies contain areas of floating or emergent aquatic vegetation. Common species are arrowheads, pickerelweed (*Pontederia cordata*), rushes, waterlilies (*Nymphaea spp.*), and cattails.

The following provides a description and overview of the major wetland areas within Flagler County.

Big Cypress Swamp is located in western Flagler County. It flows to the south and drains into Crescent Lake via White Oak Branch. Big Cypress Swamp consists mainly of hardwood- and conifer-dominated swamp forest, much of it classified as Stream and Lake Swamps (615), Mixed Wetland Hardwoods (617), Cypress (621), and Mixed Wetland Forested (630).

Graham Swamp is a large forested wetland located between Colbert Lane and Old Kings Road in the City of Palm Coast. It flows in part to the north and west to the

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Intracoastal Waterway and in part to the south to Bulow Creek. Much of it is under the ownership of the SJRWMD as the Graham Swamp Conservation Area. Graham Swamp consists mainly of hardwood- and conifer-dominated swamp forest, much of it classified as Stream and Lake Swamps (615), Mixed Wetland Hardwoods (617), Cypress (621), and Mixed Wetland Forested (630). See above for habitat descriptions. Much of Graham Swamp's hydrology was historically altered by the construction of a network of canals and ditches to allow the development of its edges. Much surface water that historically flowed through the swamp is now routed quickly past, bypassing the swamp and reducing the level of water quality filtration and aquifer recharge.

Hulett Swamp is located between I-95 and US 1, north of Palm Coast Parkway. Hulett Swamp consists mostly of Stream and Lake Swamps (615), Mixed Wetland Hardwoods (617), Cypress (621), and Mixed Wetland Forested (630) habitats. Much of the swamp burned in the 1998 fires, but it is now slowly reestablishing itself as a high quality, regionally-significant feature. Hulett Swamp drains north under Matanzas Woods Parkway and US Highway 1 through Hulett Branch to Pellicer Creek, which ultimately flows into the Matanzas River.

Black Branch Swamp, located southwest of the Flagler County Airport, is a mixture of upland hardwood hammock and isolated cypress and hardwood wetlands. Wetland habitats include Mixed Wetland Hardwoods (617), Cypress (621), Hydric Pine Flatwoods (624), Hydric Pine Savanna (625), and Mixed Wetland Forested (630). There is no central drainage way (natural or man-made) through the swamp. The water sheet flows west, ultimately to Haw Creek and Crescent Lake in western Flagler County.

There is a long history of altering wetlands in Flagler County and the City of Palm Coast and surrounding areas in particular. Agricultural interests altered wetlands and other low-lying areas to create additional lands for farming, cattle grazing, and silviculture. In the late 1960s the comprehensive network of canals and ditches was constructed by ITT to "reclaim" large areas for development of Palm Coast. Such widespread and indiscriminate wetland impact is no longer possible due to local, State, and Federal wetland dredge and fill regulations.

At the State level, the SJRWMD regulates the dredge and fill of both contiguous and isolated wetland systems and any secondary impacts to these systems as a result of proposed construction. The general conditions of issuance for a SJRWMD Environmental Resource Permit include: the determination of the wetland boundaries, size, type, and quality; a description of the proposed project, including a summary of the wetland impact acreage; the minimization and/or avoidance of wetland impacts; and a description of the proposed mitigation. In many cases, compensatory mitigation is

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required by the SJRWMD for impacts to wetlands.

Wetlands are defined by the ACOE as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration significant to support, and that under normal conditions do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (33 CFR 323.2). The ACOE uses three indices to determine if an area is a wetland; vegetation, soil, and hydrology. Current determinations of the boundaries of ACOE jurisdictional wetlands are based on the ACOE's 1987 Wetlands Delineation Manual. The ACOE will have jurisdiction over all the areas described as wetlands (i.e., 500 and 600 series cover types) on the Level III FLUCFCS code map.

The ACOE issues two types of permits; standard form (or individual) or nationwide (NWP) permits. A Section 404 (Clean Water Act) (or Dredge and Fill) permit is required for the discharge of dredged or fill material into waters of the U.S. A joint application for a federal and state dredge and fill permit can be made to the ACOE and the SJRWMD (the SJRWMD was delegated dredge and fill permitting authority from the DEP in the fall of 1992). Standard form or individual permits are processed through a public interest review procedure, including public notice and receipt of comments from various federal agencies and the general public (third party). Important commenting agencies in this process are the Environmental Protection Agency (EPA) and USFWS. 33 USC 1341 requires that the ACOE receive water quality certification from the State prior to the issuance of a permit. In Florida, the State's water quality certification takes the form of an issued dredge and fill permit from the SJRWMD or letter stating that a State dredge and fill permit is not required for the project.

Once the ACOE deems an application complete for processing, it will issue a public notice for individual permit to those parties on the maintained mailing list by the ACOE District Office and to the federal commenting agencies. The notice provides for a comment period not exceed 30 days. Few individual (or standard form) permit applications are processed by the ACOE without some review as to whether the application satisfies the practicable alternatives test contained in the EPA 404 (b)(1) guidelines (40 CFR 230). Under the guidelines, a primary screening mechanism to determine the necessity of permitting a discharge of dredged or fill material is the analysis of practicable alternatives. The guidelines prohibit all discharges of dredged or fill material into regulated waters, including wetlands, unless a discharge, as proposed, constitutes the least environmentally-damaging, practicable alternative that will achieve the basic project purpose. The ACOE goes through a sequential review process of applications: (1) avoidance - are upland sites available; (2) minimization - have

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proposed impacts been reduced and minimized; and, (3) compensatory mitigation - for unavoidable adverse impacts.

In 2007 Flagler County passed Ordinance 2007-17, Amending Appendix C, Article IV, of the Flagler County Land Development Code. The intent of this revised ordinance is to provide for the protection, maintenance, and enhancement of wetlands while ensuring no net loss of wetland functions. This ordinance also outlined an innovative mechanism to permanently protect wetlands not in immediate danger of impact via a density transfer program.

C. Estuarine Communities

Saltwater habitats have a strong saline component, and are influenced to some extent by tidal action. The following is a brief description of saltwater wetland types found in the County classified according to the Florida Land Use, Cover and Forms Classification System (FLUCFCS).

642 – Saltwater Marshes

Saltmarshes in this region are dominated by the following salt-tolerant species: Cordgrasses (*Spartina alterniflora*, *S. patens*, and *S. bakeri*), needlerush (*Juncus roemerianus*), saltgrass (*Distichlis spicata*), dropseed (*Sporobolus virginicus*), and seashore paspalum (*Paspalum vaginatum*). Some black mangrove (*Avicennia germinans*) may be present, but generally not in sufficient densities to form mangrove-dominated areas.

651 – Tidal Flats and 652 – Shorelines

Tidal flats and shorelines generally have little vegetative cover, but they are important foraging, nesting, and nursery habitats for a variety of wildlife species. Tidal flats are the portions of shores that are protected from wave action. Many muddy estuaries in the region are tidal flats. Parts of the Intracoastal Waterway (ICW) channel edge fall into this category. Shorelines in the region include barrier beaches and other sandy shores not protected from direct wave action.

Coastal Strand: The coastal strand ecological community occurs along Flagler County's Atlantic coastline. The flora found here is tolerant to salt spray from the ocean. Vegetation consists of low growing grasses, vines and herbaceous plants with few trees or large shrubs. The trees that do exist in this environment are cabbage palm, live oak, and sand live oak. Shrubs include saw palmetto, Spanish bayonet and yaupon holly, grasses and grasslike plants such as cordgrass, sea oats and sandbur also exist here. Animals that may be found in this community are bobcats, raccoons, mice, terns, gulls

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and the American kestrel among others. The coastal strand is highly endangered. A major concern is the pressure imparted by development. Many new residences, hotels, motels and so forth are continuously chipping away at this ecological community. These strands are very valuable in regulating wave action along the coast and if not properly managed could result in accelerated beach and coastal dune erosion.

Salt Marsh: This community occurs along the Atlantic coast and inland along tidal rivers. Vegetation includes grasses, sedges and rushes. Tidal action in this community causes saturation of the soil to a depth of a few inches making the soil so soft that it will not support the weight of a person or a large animal. Fauna found here include otter, raccoon, egrets, gulls and alligators. Salt marshes are very important because they are in essence the transition zone between terrestrial and oceanic life on low energy coastlines and estuaries. Furthermore, during storm tides they can aid in the stabilization and protection of the shoreline. The nutrients, sediments and detritus from the uplands, which find their way into the marsh, are swirled about in this community creating an environment in which ocean species thrive during their early life stages. The salt marshes are also abundant with invertebrate organisms, which contribute even more to this thriving community.

One of the most important estuary systems, Matanzas River Estuary, occurs on the County's north border. The estuary is the very last on the east coast of Florida that still has a naturally occurring inlet, spared from the dredging and diking that has commonly occurred elsewhere on Florida's coast. . After obtaining support from the citizens and legislators of St. Johns and Flagler counties, the State of Florida nominated the estuarine ecosystem composed of the Guana, Tolomato and Matanzas Rivers for designation as a NERR in March 1994. GTM Research Reserve has become the manager of a portion of Guana Peninsula. In addition, it is responsible for managing state sovereign submerged lands within Matanzas River and its tributaries within the boundary of GTM Research Reserve. The following provides a quick summary of the creation and approval of the GTMNERR.

- 1957 - The State of Florida leases the bulk of Guana Peninsula (12,000 acres) from several investors for public use.
- 1970 - Pellicer Creek Aquatic Preserve is established.
- 1984 - The State of Florida purchases that acreage through the Conservation and Recreation Lands and Save Our Coasts programs.
- 1985 - The Guana River system is designated Guana River Marsh Aquatic Preserve.
- 1988 - Management authority of Guana River State Park (2500 acres) is conveyed to Division of Recreation and Parks under Lease #3462.
- 1999 - GTM Research Reserve is officially designated.

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- 2003 - Lease #3462 is transferred to CAMA, giving them management authority over the former Guana River State Park.
- 2005 - Environmental Education Center opens to the public

GTM Research Reserve accomplishes resource management by physically conducting management activities on the resources for which it has direct management responsibility and by influencing the activities of others within and adjacent to its managed areas and within its watershed. GTM Research Reserve has lead responsibility for daily monitoring of 5.2 miles of Atlantic beach for sea turtle nesting. Other listed species that are monitored include several species of wading and shore birds. There have been isolated cases of harm or harassment of non-listed plant and wildlife species within GTM Research Reserve boundaries. All plants and animals within CAMA managed uplands are protected and cannot be collected without permission or a permit. The prevention of illegal removal of the natural resources of GTM Research Reserve requires a cooperative effort involving staff, local law enforcement and the public. Shoreline erosion is a serious problem at several locations. Erosion on the eastern shore of the Guana River was stabilized in 2006 with a demonstration project that included revegetation with native coastal plant species. There are 25 known archaeological sites at GTM Research Reserve. Some sites are in danger of feral hog damage or erosion. Human looting is not known to be a significant problem.

V. Wetlands

Wetlands are defined by Chapter 9J-5 of the Florida Administrative Code as:

“areas that are inundated or saturated by surface water or ground water at a frequency and a duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soils. Soils present in wetlands generally are classified as hydric or alluvial, or possess characteristics that are associated with reducing soil conditions. The prevalent vegetation in wetlands general consists of facultative or obligate hydrophytic macrophytes that are typically adapted to areas having soil conditions described above. These species, due to morphological, physiological, or reproductive adaptations, have the ability to grow, reproduce or persist in aquatic environments or anaerobic soil conditions. Florida wetlands generally include swamps, marshes, bayheads, bogs, cypress domes and strands, sloughs, wet prairies, riverine swamps and marshes, hydric seepage slopes, tidal marshes, mangrove swamps and other similar areas. Florida wetlands generally do not include longleaf or slash pine flatwoods with an understory dominated by saw palmetto.”

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Much of Flagler County is poorly drained and conspicuously marked by large swamps. Big Cypress Swamp and Hull Cypress Swamp are the two largest. These wet areas are not usually the result of perched water tables, but instead result from the non-artesian aquifer being filled to capacity. These swampy areas provide recharge to the groundwater system and require protective measures to ensure continued water quality and quantity. Degraded water quality in the surface water has the potential to directly reduce the quality of the groundwater. Similarly, reduction in the recharge capacity due to drainage processes and/or increase in discharges as the result of development will lower the water levels in the aquifers and potentially permit the contamination of the aquifer with the underlying saline waters. Wetlands also serve as natural water retention areas, regulate the flow of water, protect otherwise dry upland areas from inundation and provide habitat for many species in the food chain. When the weather is wet or the area is flooding, wetlands accept the excess water and when drought conditions exist, wetlands keep the surround area from becoming parched.

Flagler County adopted a wetlands protection ordinance in 1990, which was incorporated within the land development code to provide for the protection, maintenance and enhancement of wetlands within Flagler County. The intent of this regulation is to “ensure that there be no net loss of wetlands.” This ensures that wetlands and the natural functions of wetlands are protected and conserved. Proposed developments must identify wetlands on site plans and provide measures to assure that the normal flow and quality of water will be maintained after development. Activities that impact wetlands less than one-half (1/2) acre in size are exempted from the regulation. Applicants must submit a wetland management plan for staff to evaluate the criteria for a variance, the environmental characteristics of the wetlands, the potential and predicted impacts of the proposed activities on wetlands and the effectiveness and acceptability of those measures proposed by the applicant for reducing adverse impacts. Mitigation is acceptable if it takes place on site, in close proximity to the site or in areas designated by the county.

This regulation has been successful in that, although 20-30 inquiries that have been made concerning requirements for receiving a variance, only two applications for a variance have been submitted. The first was in 1994 and the second in 1998. Both variances were granted based on public health, safety and welfare reasons. Although denial was recommended by the planning staff for the 1994 variance, both were approved by the Flagler County Board of County Commissioners.

The trend throughout Florida to permit the mitigation of impacts to smaller isolated wetlands, which no longer have functional value by protecting larger wetland areas off-

site, is being addressed during a review of the current regulations.

VI. Surface Water

A. Overview

There are two major drainage basins in Flagler County. The majority of the county lies within the Lower St. Johns River Basin, with the majority of the eastern part of the county lying within the Upper East Coast Basin, which is sometimes referred to as the Upper Coastal Basin or the Northern Coastal Basin.

Lower St. Johns River Basin: The St. Johns River is the longest river entirely within the state of Florida, extending approximately 270 miles, and is one of only a few northward flowing rivers in the United States. Dunns Creek is the second largest of the St. John's River tributaries. Its drainage basin includes approximately 400 square miles of low swamps, 100 square miles of Karst terrain with no surface runoff and approximately 30 square miles of lakes on the east side of the St. Johns River. Little Haw Creek and Middle Haw Creek, two tributaries of Dunns Creek, have average flows of 90 cubic feet per second (cfs) and 60 cfs, respectively and the projected average runoff from the total area is about 500 cfs. A maximum discharge of 27 cfs per square mile from the part of the Little Haw Creek drained by streams indicates that it is surrounded by flat slopes and swamps which have high storage capacity. Middle Haw Creek has a maximum-recorded flow of 60 cfs per square mile, and in most years the flow decreases significantly, sometimes to point that it ceases completely. The surficial material through which Haw Creek flows in Flagler County consists of sand, shell and clay, while the bedrock material consists of quartz sands, with varying proportions of silt, clay, organic materials and carbonate of the Holocene and Pleistocene series.

According to the Florida Department of Environmental Protection's *Northeast Florida District Water Quality Assessment 1996 305 (b) Technical Appendix*, the water quality in the southern portion of the Lower St. Johns River is good, however most of its tributary systems have water quality problems.

The Haw Creek/Crescent Lake/Dunns Creek tributary system, for example, which is located on the boundary of Flagler County and Putnam County, has acidic, colored water from swampy drainage, low levels of dissolved oxygen, elevated nutrients from agricultural runoff, septic tanks and treated wastewater effluent. One point source pollutant is the city of Bunnell wastewater treatment facility, which discharges into Haw Creek. The Environmental Protection Agency estimated in 1975 that about half the nutrient load to Crescent Lake came from Haw Creek. Consequently, Crescent Lake, which is the tenth largest lake in the state, has become eutrophic and by 1990, a

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second study found the Crescent Lake had depressed biological diversity, significant blue-green algal blooms, high algal growth potential, and chlorophyll a concentrations.

Similar conditions were found in the Bull Creek Canal and Dead Lake. Dead Lake and Crescent Lake had depressed oxygen levels below state water-quality standards and elevated levels of zinc, copper and cadmium were found in sediments of nearby potato and cabbage farming operations.

Lake Disston, in the southwest corner of the county, is threatened by land-clearing operations close to the shoreline and row-crop farming, however, the lake continues to be used for both fishing and swimming.

Upper East Coast Basin: The Upper East Coast Basin, which is more recently referred to as the Northern Coastal Basin by the St. Johns River Water Management District, consists primarily of the Tolomato, Guana, Matanzas, Pellicer and Halifax watersheds drained by relatively small creeks.

According to the *Florida Department of Environmental Protection's Northeast Florida District Water Quality Assessment 1996 305 (b) Technical Appendix*, the basin consists of a strip of coastal ridge separating the Atlantic Ocean from a narrow lagoon system and the mainland. The Intracoastal Waterway in Flagler County is one of three major estuarine "rivers" which drain the coastal area and contribute to the lagoon system. Increased development in Palm Coast could potentially affect the water quality in the Intracoastal Waterway. The surficial material through which the Intracoastal Waterway flows consists mostly of sand, shell and clay, while the bedrock geology consists of fossiliferous limestone, marls and lesser amounts of sand and clay of the Pleistocene and Pliocene.

Smaller creeks, such as the Pellicer Creek, drain the watershed into the lagoons system. The Pellicer Creek, which forms the boundary between St. Johns and Flagler County, is the only natural drainage in the area that cuts through the marine terraces and ridges to flow east into the Matanzas River. Pellicer Creek is dominated by forests, but also contains some wetlands. According to the Florida Department of Environmental Protection's, *1994 Florida Nonpoint Source Assessment*, both construction and urban runoff have contributed to the degradation of Pellicer Creek. The Matanzas River is classified for shellfish harvesting, but is currently closed to shellfishing because of pollution.

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TABLE F-1. Major Lakes in Flagler County ¹			
Name	Surface Area (acres)	Water Surface Elevation (feet above msl)	Type
Black Lake	59	36	landlocked
Crescent Lake	15,960*		streams flow in and/or out
Dead Lake	398		streams flow in and/or out
Disston Lake	1,844		streams flow in and/or out
Gore Lake	85	22	landlocked
Lehigh Cement Co. Lake	20	22	
Mud Lake	11		landlocked
Neoga Lake	14	37	landlocked
Poplar Pond	5	46	landlocked
Rayonier, Inc. Lake 1	11	25	
Rayonier, Inc. Lake 2	10	20	
Speckled Perch Lake	52	43	landlocked
Tank Lake	39	33	landlocked
Grand Haven Lake	93		landlocked

* most of the lake is in Putnam County

Sources:

1 – Gazetteer of Florida Lakes, 1986

2 – Northeast Florida District Water Quality Assessment 1996 305 (b)
 Technical Appendix, Florida Department of Environmental Protection

To assess water quality, the Florida Department of Environmental Protection developed a Water Quality Index to assess *streams* based on clarity, dissolved oxygen, oxygen-demanding substances, bacteria, nutrients and biological diversity. A similar Trophic State Index was developed to classify *lakes* and *estuaries* based on levels of chlorophyll, nitrogen and phosphorus. The following table includes the the range of values assigned to each index and the associated water quality. The index for each water body is determined by averaging the measured criteria. All lakes, streams and estuaries are classed as “freshwater”, functioning for wildlife and recreation, except the Matanzas River (primarily in St. Johns County), which is classified for shellfish harvesting. Water quality data based on designated use or function is used for determining water quality indices.

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<u>Index</u>	<u>Good</u>	<u>Fair</u>	<u>Poor</u>
River/Stream/Blackwater	0-44	45-59	60-90
Estuary	0-49	50-59	60-100
Lake	0-59	60-69	70-100

Source: Northeast Florida District Water Quality Assessment
 1996 305 (b) Technical Appendix, Florida Department of Environmental Protection

The following table provides a summary of water quality assessment data collected during the period 1990-1995 for the major water bodies in the Lower St. Johns River Basin and the Upper East Coast Basin.

Name	Water Body Type	Basin	Water Class	Water Quality Indices*	Water Quality
Little Haw Creek	Blackwater	Lower St. Johns	III – Freshwater	40	Good
Lake Disston	Lake	Lower St. Johns	III – Freshwater	46	Good
Crescent Lake	Lake	Lower St. Johns	III – Freshwater	63	Fair
Haw Creek above** Crescent Lake	Stream	Lower St. Johns	III – Freshwater	63	Poor
Haw Creek	Stream	Lower St. Johns	III – Freshwater	40	Good***
Matanzas River (primarily in St. Johns County)	Estuary	Upper East Coast	II – Shellfish Harvesting* ***	48/55	Good/Fair
Palm Coast	Estuary	Upper East Coast	III – Freshwater	50	Fair, Bordering on Good
ICWW	Estuary	Upper East Coast	III – Freshwater	42	Good
Hulett Branch	Stream	Upper East Coast	III – Freshwater	42	Good

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Pellicer Creek	Stream	Upper East Coast	III – Freshwater	54	Fair
Stevens Branch	Stream	Upper East Coast	III – Freshwater	46	Fair

**indicates Haw Creek upstream of Crescent Lake, due to the fact that the St. Johns River flows north; creek is physically located southeast of Crescent Lake

*** indicates historical data from period prior to 1990

****classified for shellfish harvesting, but closed to shellfishing due to pollution, data recorded at several points

Source: *Northeast Florida District Water Quality Assessment 1996 305 (b) Technical Appendix*, Florida Department of Environmental Protection

B. Outstanding Florida Waters

The Florida Department of Environmental Protection has designated Haw Creek and Pellicer Creek as Outstanding Florida Waters (OFW) under Section 403.061 (27), Florida Statutes, which means that they are worthy of special protection because of their natural attributes. This designation affords protection to waters in areas managed by the state or federal government meant *to maintain the existing water quality*. The regulatory significance of such a designation means that, in general, the Florida Department of Environmental Protection cannot issue permits for direct pollutant discharges into Haw Creek or Pellicer which would lower the ambient (existing) water quality or indirect discharges which would significantly degrade the water in the creeks. In addition, permits for new dredging and filling must be clearly in the public interest, determined by the following factors:

1. Whether the activity will adversely affect the public health, safety, or welfare or property of others;
2. Whether the activity will adversely affect the conservation of fish and wildlife, including endangered or threatened species, or their habitats;
3. Whether the activity will adversely affect navigation or the flow of water or cause harmful erosion or shoaling;
4. Whether the activity will adversely affect the fishing or recreational value or marine productivity in the vicinity of the activity;
5. Whether the activity will be of a temporary or permanent nature;
6. Whether the activity will adversely affect or will enhance significant historical and archaeological resources under the provisions of sec. 267.061, F.S.; and
7. The current condition and relative value of functions being performed by areas affect by the proposed activity (373.414(1)(a), F.S.).

The following are granted exceptions to the Outstanding Florida Water requirements:

1. Permitted activities existing on the date of designation, which are “grandfathered”;

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2. Activities not regulated by the Florida Department of Environmental Protection for water quality protection purposes, such as fishing, river setback ordinances, and boat speeds;
3. Restoration of seawalls at previous locations;
4. Non-commercial boat docks on pilings of less than 500 square feet;
5. Temporary lowering of water quality during construction activities (with special restrictions); and
6. Activities to allow or enhance public usage or to maintain pre-existing activities (with certain safeguards).

Flagler County is also home to two state parks with designated OFW's: Bulow Creek State Park and Gamble Rogers Memorial Park, one state garden: Washington Oaks, and part of the state aquatic preserve, Tomoka Marsh.

C. Classification

The Clean Water Act requires that the surface waters of each State be classified according to designated uses. Florida has five classes with associated designated uses, which are described by the FDEP as:

Class I - Potable Water Supplies.

Impoundments and associated tributaries, and certain lakes, rivers, or portions of rivers, used as a drinking water supply. None exist in or immediately within the County.

Class II - Shellfish Propagation or Harvesting.

Coastal waters where shellfish harvesting occurs. None exist in or immediately adjacent to the County.

Class III - Recreation, Propagation, and Maintenance of a Healthy, Well-Balanced Population of Fish and Wildlife.

Most surface waters in the State of Florida fall under this classification.

Class IV – Agricultural Water Supplies.

Surface waters designated as sources for agricultural interests. There are no natural bodies of water used for agricultural resources, except for small areas around Crescent Lake and its tributaries.

Class V - Navigation, Utility and Industrial Use.

Currently, there are no designated Class V bodies of water within the State of Florida.

D. Coastal and Estuarine Issues

The Coastal Planning Area is entirely located within the Upper East Coast Basin. The SJRWMD identifies those areas of the Upper East Coast Basin within Flagler County as belonging to the Northern Coastal Basin. As of 2009, this basin consisted of the

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Tolomato/Matanzas River, Pellicer Creek, and Halifax River planning units. A general summary of water quality issues based on the SJRWMD assessments follow:

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

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

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

4. The Halifax River planning unit includes portions of Flagler and Volusia counties along the northeast Florida coast and encompasses an area of nearly 208,000 acres, within 33 basins. Major drainage into the estuary comes from Bulow Creek, the Tomoka River, and Spruce Creek, and their natural tributaries. Rose Bay, which is a large embayment partially isolated from the main part of the Halifax River by an abandoned causeway and the present U.S. 1 causeway, also contributes drainage to the Halifax River. Both the Tomoka River and Spruce Creek basins are listed as OFWs. The Halifax River unit has several 303(d) listed water bodies, including the Halifax River for nutrients, coliform bacteria, copper, lead, and iron; Rose Bay for nutrients, coliform bacteria, and dissolved oxygen; the Tomoka River for lead,

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

Flagler County has two primary estuarine areas. The Matanzas Estuary and Bulow Creek portion of the Tomoka Marsh Aquatic Preserve. These estuarine systems receive freshwater from Pellicer Creek and Bulow Creek respectively. Both Pellicer Creek and Bulow Creek are aquatic preserves. The estuaries in Flagler County face a number of potential sources of degradation. Surrounding land uses, habitat alteration, and point and non-point sources could all potentially impact these systems in the future.

Estuarine Pollution can be monitored many ways. One such method is tracking water quality via the Total Maximum Daily Load program. A Total Maximum Daily Load (TMDL) is a regulatory term in the U.S. Clean Water Act (CWA), describing a value of the maximum amount of a pollutant that a body of water can receive while still meeting water quality standards. Alternatively, TMDL is an allocation of that water pollutant deemed acceptable to the subject receiving waters. TMDLs have been used extensively by the United States Environmental Protection Agency (EPA) and the Florida Department of Environmental Protection in implementing the CWA by establishing maximum pollution limits for industrial wastewater dischargers. EPA published regulations in 1992 establishing TMDL procedures. Application of TMDL has broadened significantly in the last decade to include many watershed-scale efforts. This process incorporates both point source and nonpoint source pollutants within a watershed.

E. Recreational Uses of Freshwater and Saltwater Wetland Systems

Passive activities such as bird watching, hiking, biking, fishing and wildlife monitoring allow residents to appreciate the Flagler County's unique natural amenities. Examples include the Princess Place Preserve and Betty Steflik Memorial Preserve, both of which are owned and maintained by the County. These preservation areas have a trail networks that allows residents a close-up look at wetlands systems and wetland-dependent wildlife they support.

In general, the water quality found in freshwater wetlands is fair. The water appears brown from the region's naturally occurring tannic acid and iron. Runoff from surrounding developments also contributes to increased turbidity and mineral levels.

The close relationship between the region's surficial aquifer and the remaining wetland systems means that much of the natural filtration of the aquifer's water takes place in the wetlands. Thus, it is important to preserve both the wetlands and the aquifer as a

mutually supporting pair.

Saltwater systems provide essential habitat for many species of fish, invertebrates, and other species of hatchling aquatic wildlife. This serves as a nursery area and the base of many food chains that end in larger mammals, fish, and birds. Long Creek is considered a high quality habitat, with large valuable undisturbed areas of productive saltmarshes and tidal flats. The canal system is considered a low to moderate quality habitat, with some value as fish habitat and manatee refuge and forage areas. The Intracoastal Waterway is considered a moderate quality habitat. It provides food, cover, refuge, and nesting areas for many species of birds, fish, mammals, fish, and invertebrates.

The Conservation land use designation provides for preservation of large interconnected wetland systems and other environmentally sensitive areas. Other areas that may be classified “conservation” may include natural water bodies and lakes, estuaries, oak hammocks and other large areas consisting of native vegetation areas, and wildlife corridors. Unlike most of the other land use designations that follow property lines, the boundaries of most areas assigned this land use designation have been drawn to encompass the environmentally sensitive area using best available aerial mapping data from the SJRWMD and will require field verification to determine boundaries with precision.

Other methods to protect, promote, and preserve wetlands and other identified natural resources should include public acquisition, obtaining easements, developer dedications and land development regulations, which should be incorporated into the LDC. The County should pursue federal, state, and county funding sources and partnerships to leverage the purchase of environmentally sensitive areas for greenways and open space.

VII. Floodplains

Floodplains are areas adjacent to rivers, lakes, oceans and other low-lying areas subject to flooding. Although normally dry, these areas become inundated under certain conditions. The major causes of flooding in Flagler County are those originating from storm surge generated in the Atlantic Ocean and riverine flooding resulting from heavy rainfall.

Floodplains are valuable resources areas that provide a rich diversity of vegetation and wildlife. These areas are sources for groundwater recharge that filters through soils during periods of high water levels. The highest surface water levels usually occur from

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February through April (associated with frontal type rainfalls) and June through August (associated with convection type rainfalls). Major storms associated with tropical disturbances also occur during summer and fall. Of the many storms that have passed through Flagler County, eight were significant. These occurred in October 1906, October 1910, October 1944, August 1949, October 1950, August 1960 (Hurricane Donna: \$4.6 million for urban damage along Florida's East Coast), March 1962 and September 1964 (Hurricane Dora).

The standard reference base flood is the 100-year flood, which has a one-percent chance of occurring or being exceeded in any given year. Lands within the 100-year floodplain are considered flood prone areas and are mapped by the Federal Emergency Management Administration (FEMA).

Periodic flooding has caused loss of life and property, disruption of services, and great economic loss. Development in the floodplain has the potential to contribute even more to this loss by compromising the area's ability to absorb water and by restricting the flow of water from land areas. To address this problem, Flagler County adopted floodplain regulations as part of the Land Development Code in 1991 and then updated the regulations in 2006.

The purpose of the ordinance is to:

1. restrict or prohibit uses which are dangerous to health, safety and property due to water or erosion hazards, or which result in damaging increases in erosion or in flood heights or velocities;
2. require that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction;
3. control the alteration of natural floodplains, stream channels and natural protective barriers which are involved in the accommodation of flood waters;
4. control filling, grading, dredging and other development which may increase erosion or flood damage; and
5. prevent or regulate the construction of flood barriers which will unnaturally divert floodwaters or which may increase flood hazards to other lands.

The LDC regulation include requirements that any new construction or substantial improvement to existing structures be placed no lower than 1 foot above base flood elevation. For areas of shallow flooding and where no depth value is specified on the Flood Insurance Rate Map, the lowest floor (including the basement) must be elevated at least 2 feet above the highest adjacent grade. The LDC regulations also include

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requirements requires that no encroachment (fill material or structure) be located within a distance of the stream bank equal to 3 times the width of the stream at the top of the bank or 20 feet on each side from the top of the bank. The coastal high hazard areas (those areas associated with wave wash) are required to have the lowest supporting horizontal member (excluding piling and columns) located not lower than 1 foot above the base flood elevation level. It is also specified that there shall be no alteration of sand dunes or mangroves which would increase potential flood damage.

The St. Johns River Water Management District's Management and Storage of Surface Waters Rule (Rule 40C-4, F.A.C.) complements the floodplain ordinance while at the same time avoiding duplication.

The policies set forth in the rule include:

1. to regulate and control the management and storage of surface water throughout the District;
2. to foster agricultural, commercial, industrial and residential growth in a manner consistent with the objectives of the District; and
3. to recognize that the soil and water conservation districts play an important role in preventing soil erosion and floodwater and sediment damage.

In cooperation with the St. Johns River Water Management District and a professional engineering firm, the first phase of a Stormwater Management Plan was developed for Flagler County in 1998 that addresses stormwater quantity and quality.

For areas subject to flooding in the coastal area, Flagler County has a coastal construction control line (CCCL) and defers to the Florida Department of Environmental Protection for administration in these areas. These areas are defined as seaward of the CCCL. The coastal construction control line program is an essential element of Florida's coastal management program. It provides protection for Florida's beaches and dunes while assuring reasonable use of private property. Recognizing the value of the state's beaches, the Florida legislature initiated the Coastal Construction Control Line Program to protect the coastal system from improperly sited and designed structures which can destabilize or destroy the beach and dune system. Once destabilized, the valuable natural resources are lost, as are its important values for recreation, upland property protection and environmental habitat. Adoption of a coastal construction control line establishes an area of jurisdiction in which special siting and design criteria are applied for construction and related activities. These standards may be more stringent than those already applied in the rest of the coastal building zone because of

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the greater forces expected to occur in the more seaward zone of the beach during a storm event.

Chapter 62B-33, Florida Administrative Code, provides the design and siting requirements that must be met to obtain a coastal construction control line permit. Approval or denial of a permit application is based upon a review of the structural design adequacy and the potential impacts to the beach dune system, adjacent properties, native salt resistant vegetation, and marine turtles.

The CCCL for Flagler County was relocated in 1988, placing several developed areas seaward of the line. The Coastal Management Element of the Flagler County Comprehensive Plan includes recommended policies for existing and planned development seaward of the CCCL.

VIII. GROUNDWATER (AQUIFER PROTECTION/WATER SUPPLY PLANNING)

A. General Conditions

There are three sources of groundwater in Flagler County: the Floridan aquifer, the intermediate aquifer and the surficial aquifer. The Floridan aquifer extends throughout much of the state and the southern part of Georgia and is the major source of water in Flagler County. The Floridan is an artesian aquifer. Artesian aquifers are the result of groundwater in a permeable geologic formation confined by an impermeable formation, or aquiclude, so that its surface is not free to rise and fall. The theoretical limit to which water from an artesian aquifer will rise in a tightly cased well is called its potentiometric level. The depth to the top of the Upper Floridan varies from 50 to 150 feet below mean sea level (msl) while its potentiometric level is typically about 15 feet.

The Upper Floridan is primarily contained in Eocene Age limestone. The lower portion of the Eocene Age limestone is known as the Avon Park Formation. It is the deepest formation penetrated by wells in Flagler County. Over lying the Avon Park deposits is a layer of Ocala Limestone. The primary aquiclude of the Floridan is the Middle Miocene Hawthorn Formation. It consists of sand, clay, and marl embedded with phosphorate and phosphatic substances. The base of this formation consists of a thin layer of dolomitic limestone in northern Flagler County. The Ocala Limestone and the dolomitic limestone of the Miocene Age are the primary sources of water for Flagler County wells. Upper Floridan aquifer wells can yield from 50 to more than 100 gallons per minute.

Water from the Upper Floridan aquifer in all but southern Flagler County is highly mineralized in both chlorides and hardness. Chlorides are present as dissolved solids

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and are indicative of saltwater contamination. Saline water in the Floridan aquifer remains from a previous geologic era when sea levels were higher and where flushing from freshwater recharge is incomplete. Saltwater intrusion also occurs due to over pumping of the overlying, less dense, freshwater from the aquifer. Hardness is a measure of the concentration of cations, primarily calcium and magnesium, present in the water. Other primary dissolved solids present in the Upper Floridan are sulfate and iron. The sulfate is from remnant seawater or is dissolved out of other minerals typically found in carbonate rocks.

The intermediate aquifer is also an artesian consisting of interstratified lenses of permeable sand, shell and limestone within the Hawthorne Formation. These lenses are usually from under 1 to more than 10 feet thick. They are normally low yielding, from 5 to 50 gallons per minute, but valuable alternative sources of water in those areas where the Upper Floridan is of marginal or non-potable quality. Total dissolved solids in the form of chlorides, hardness, sulfate and iron, are also found in the intermediate artesian aquifer.

The surficial aquifer is contained in Pleistocene and Holocene Age sand and shell deposits overlaying the intermediate and Floridan aquifers. It occurs throughout all of Flagler County and ranges in thickness from less than 20 feet to more than 50 feet. The well yield from the surficial aquifer system varies from a low of 2 gallons per minute in western Flagler County to 10 to 50 gallons per minute in eastern and central Flagler. It is a minor although important source of domestic water supply, particularly in costal areas where the deeper aquifers contain non-potable water. Water from this source varies greatly in quality and may be easily polluted. The upward and lateral movement of saltwater and the infiltration of contaminated surface waters are two areas of concern.

B. Regulatory Framework

The Federal Safe Drinking Water Act provided national legislation establishing water quality standards of potable water for public use, and regulated the operation of water supply, treatment, and distribution facilities to help achieve the standards set in the national legislation. This act established primary and secondary water quality standards. These primary water quality standards established minimum measures of water quality to ensure the public health. The secondary standards covered aesthetic water quality, such as taste and appearance. Implementation of the Act is the responsibility of the U.S. Environmental Protection Agency (EPA).

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The U.S. EPA has delegated its responsibilities for implementing and enforcing certain conditions of the Federal Safe Drinking Water Act to the Florida Department of Environmental Protection. Florida adopted rules in Chapter 17-22, F.A.C., regulating drinking water quality standards.

FDEP, has in turn, delegated some of these responsibilities to the regional level. For example, the St. Johns River Water Management District (SJRWMD) has permitting authority over public water supply wells. This permitting authority is conferred under Chapter 40 of the Florida Administrative Code. The water management district monitors wells and water systems to insure that quantitative and qualitative standards are met.

Public supply water use is defined as water supplied to homes and industry that serve 400 or more people or that withdraw more than 0.01 mgd from groundwater or surface water sources. All public supply in Flagler County is from groundwater sources. Rule 62-40.520, Florida Administrative Code, which implements Section 373.036(4) Florida Statutes, requires water management districts to prepare assessments of water needs and sources for the next 20 years, including areas where resource problems exist or are anticipated. The SJRWMD published the Water Supply Needs and Sources Assessment, and the District Water Management Plan was approved. These documents provide the core of the regulatory framework for potable water planning in Flagler County. A critical resource impact was identified, and resulted in the designation of a Water Use Caution Area in Flagler County, in the vicinity of the Palm Coast wellfields.

At the local level the Development and Subdivision Regulations of Flagler County, (Article IV), specifies that water systems are part of the required improvements for development. This requires subdivisions with minimum lot sizes less than 1 acre (excluding road rights-of-way) to be served by a complete water treatment/distribution system. Individual wells are permitted in subdivisions with minimum lot sizes of 1 acre or greater (excluding road right-of-way) depending on drainage, water potability, environmental sensitivity, and public health and safety concerns. However, all dwelling units in cluster developments had to be served by approved central water systems

A shortcoming in the current local regulations is the lack of controls for well siting after the permitted building or facility is in place. To address this issue, the Division of Environmental Health of the Flagler County Health Department is preparing an ordinance for adoption, which would establish a permitting procedure for residential wells. This ordinance is being written to provide guidance for well siting.

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C. Water Supply Planning

New legislation has been adopted to require local governments (by January 2005) to consider the SJRWMD's Water Supply Plan in local comprehensive plans in response to the concern on future demand and potential lack of supply. The County recognizes the importance of coordination with the SJRWMD on matters concerning water supply planning. The County has and will continue to participate in work groups regarding water resource planning, aquifer protection, and water conservation.

The SJRWMD has designated Flagler County as a Priority Water Resource Caution Area (PWRCA). SJRWMD identifies PWRCAs based on a comparison of water resource constraints to the results of assessments of hydrologic impacts related to projected 2030 water use. A PWRCA is defined as an area in which existing and reasonably anticipated sources of water and conservation efforts may not be adequate to: (1) supply water for all existing legal uses and reasonably anticipated future needs and (2) sustain the water resources and related natural systems of the region.

The PWRCAs that have been identified in Draft Water Supply Assessment (WSA) 2008 cover 40% of SJRWMD's 18-county jurisdiction. Boundaries of the 2008 PWRCAs include all or parts of Brevard, Flagler, Lake, Marion, Orange, Osceola, AND Volusia counties.

Pursuant to Paragraph 373.0361(1), F.S., SJRWMD is required to initiate water supply planning for each water supply planning region where it is determined that sources of water are not adequate for the planning period to: (1) supply water for all existing and projected reasonable-beneficial uses and (2) sustain the water resources and related natural systems. Because SJRWMD has identified its entire jurisdictional area as one water supply planning region, one districtwide water supply plan will be developed in 2010 as an update to replace the *District Water Supply Plan 2005 (DWSP 2005)* and its addenda

Flagler County's 2030 population will include 33,186 people living in the jurisdiction of the County. SJRWMD in the draft 2008 Water Supply Assessment includes the following water demand projections, assuming that average rainfall is realized:

Source	Ground	Surface	Total
Public Supply	32.91	5.33	38.24
Public Supply/Domestic Self Supply	5.69	0	5.69
Commercial/Industrial/	0.43	0	0.43

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Table F-4. 2030 Projected Water Demand (MGD)			
Source	Ground	Surface	Total
Institutional Self Supply			
Recreational (Golf Course)	0.14	0.93	1.07
Agriculture Irrigation Self Supply	4.55	2.37	6.92
Total	43.72	8.63	52.36

Source: SJRWMD 2008 Draft Water Supply Assessment

The primary water providers within the County are projected to use the following amount in 2030 to address the needs of their service population.

1. City of Bunnell (municipal)- 4.63 MGD
2. City of Flagler Beach (municipal)- 0.78 MGD
3. Dunes Community Development District (special district)- 1.29 MGD
4. Plantation Bay Utilities (private, but regulated by the PSC)- 0.90 MGD
5. Manufactured Home Communities- 0.32 MGD
6. Volusia County Utilities- 0.18 MGD
7. City of Palm Coast (municipal)- 16.451 MGD
8. City of Ormond Beach (municipal)- 0.31 MGD

Those residents who are not served by the centralized systems listed above will use domestic self supply as the primary source of potable water. This is a concern given that Flagler County is in a Priority Resource Caution Area. The impacts of additional draw down on the surficial and Florida aquifers from public supply and agricultural users severely limit opportunities for domestic self-supply users. This will have to be addressed through coordinated planning efforts with private and public water supply entities and the local governments to protect natural resources and prevent undue costs on the users of domestic self-supply.

The Flagler County Water Supply Facilities Plan is incorporated and referenced in this and the Infrastructure Element to meet the requirements of Florida Statutes and to provide Flagler County with a technical document that guides future decisions regarding protection and use of the area's water supplies.

Flagler County will need to address groundwater supplies and protection of those supplies for their residents and agricultural businesses. Flagler County has identified the protection and support of the rural and agrarian lifestyle established in the area west of US 1. The potential for conflict between the users of the areas groundwater resources has been in place for several years. This is not projected to end within the 2010-2015 planning horizon. Conservation efforts, alternative water sources and reuse of wastewater are all elements of the Flagler County approach to address this issue.

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There will also need to be the implementation of development standards that emphasize “Green” development as a viable option. The County shall use the Water Supply Facilities Work plan and the SJRWMD Water Supply Assessment and Water Supply Plan in the development of land development regulations that further emphasize water conservation and “Green” development.

Flagler County realizes that the conservation of water is the most cost-effective method of reducing demand and resulting impacts. The recommendations of the Water Supply Facilities Work Plan recommend that interlocal agreements, memorandums of understanding, or similar instruments be developed with surrounding local governments that:

1. Require that coordination of land uses and future land use changes with the availability of water supplies and water supply facilities;
2. Establish enforceable potable water LOS standards for residential and nonresidential users;
3. Includes provision for the protection of water quality in the traditional and new alternative water supply sources;
4. Establish priorities for the replacement of facilities, correction of existing water supply and facility deficiencies, and provision for future water supply and facility needs;
5. Establish provision for conserving potable water resources, including the implementation of reuse programs and potable water conservation strategies and techniques;
6. Establish provisions for improved or additional coordination between a water supply provider and the recipient local government concerning the sharing and updating of information to meet ongoing water supply needs;
7. Require the coordination between local governments and the water supply provider in the implementation of alternative water supply projects, establishment of level of service (LOS) standards and resource allocations, changes in service areas, and potential for annexation;
8. Require the coordination of land uses with available and projected fiscal resources and a financially feasible schedule of capital improvements for water supply and facility projects; and
9. Determine the need for additional revenue sources and identify how to fund water supply and facility projects.

The SJRWMD draft *2008 Water Supply Assessment* projected a 232% increase in projected water demand use with a 38% increase in public supply use by 2030 within Flagler County. Flagler County realizes that amendments to the Land Development

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Regulations (LDRs) to ensure consistency with the water conservation elements of the adopted Water Supply Facilities Work Plan that may include, but are not limited to:

1. Implementation of native, xeric landscaping requirements for new development and retrofitting of existing development;
2. Installation of reclaimed water with augmentation from stormwater storage facilities in order to reduce the use of potable water for irrigation purposes;
3. Development of incentive to use water saving programs, such as Water Star, in new construction or major renovation of existing development;
4. Implementation on restrictions/disincentives on irrigation that uses potable water; and
5. Adjustment of potable water and sanitary sewer impact fees when meeting specific criteria for conservation purposes.

These changes are already in process. On March 2, 2009 Flagler County's Board of County Commissioners approved adopting a local landscape irrigation ordinance modeled after that of the SJRWMD. This ordinance gives Flagler County the authority to enforce irrigation rules within unincorporated areas of the County. The rules are found in Ordinance 2009-02 and Article IV, Chapter 20 of the Flagler County Code.

D. Groundwater Protection

The United States Environmental Protection Agency (EPA) has determined that Flagler County is in an area that is the principal source for drinking water. "Sole source aquifers" are aquifers which supply at least 50 percent of the drinking water consumed in the area overlying the aquifer and are areas that currently have no alternative drinking water source which could physically, legally and economically supply all those who depend upon the aquifer for drinking water. Protection measures are necessary to ensure that the quality of the sole source aquifer is maintained.

Human activities result in the production of a large number and variety of contaminants, including those associated with urban stormwater runoff, petroleum storage tanks and agricultural activity. Even though the County lacks the heavy industry of many established towns overlaying land use activities may provide sources of groundwater quality degradation if wastes are not managed properly.

Contaminants can enter groundwater from a variety of sources related to human activities. These sources commonly are referred to as either point or nonpoint sources. Point sources are localized in areas of an acre or less, whereas nonpoint sources are dispersed over broad areas such as stormwater runoff that contain pesticides from agricultural lands. Common sources of human-induced groundwater contamination

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may be a result from waste disposal practices; storage and handling of materials and wastes, and agricultural activities.

FDEP addresses groundwater quality issues in their groundwater rules. These rules classify groundwater, establish groundwater quality standards, and require facilities that are potential sources of contamination to obtain permits and implement monitoring plans for maintaining regulatory compliance. The Florida Legislature created the State Underground Petroleum Environmental Response Act (Super Act) in response to groundwater contamination resulting from leaking underground petroleum storage tanks. The Super Act program is responsible for identifying areas in the State having drinking water contaminated as a result of leaking underground storage tanks, surface spills and other discharges to the environment. The Florida Department of Health (FDOH) is currently managing the program under the direction of the FDEP. In addition, the FDOH is responsible for coordinating statewide groundwater sampling for chemical contamination of private drinking water supplies for the Drinking Water Toxics Program and Drycleaning Solvent Surveillance Program. According to the DOH, the programs were established in the early 1980s in light of growing concerns over the detection of ethylene dibromide (EDB) in private water supplies. Over the past 20 years the program has been expanded to include additional pesticides as well as other surface applied compounds. Since its creation, the Drinking Water Toxics Program and Drycleaning Solvent Surveillance Program has collected and analyzed approximately 70,000 samples from more than 34,000 private wells located statewide. Over 5,700 of these wells were found to contain contaminants at levels exceeding primary drinking water standards. In addition, contaminants were detected at levels within acceptable limits in additional 14,300 wells, which will continue to be monitored under the FDOH program. The following table summarizes well samples that have exceeded drinking water standards due to human induced contaminants. All well samples depicted have been collected in Florida, including Flagler County, under the DOH Programs.

Table F-5. Florida Well Contamination Summary	
Chemical Contaminant	Number of Wells (Florida)
Ethylene Dibromide (EDB)	2,466
Nitrate (Total As N)	2,036
Tetrachloroethylene	531
Benzene	428
Trichloroethylene	411

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Table F-5. Florida Well Contamination Summary	
Chemical Contaminant	Number of Wells (Florida)
Vinyl Chloride	172
MTBE	162
Lead	109
Other	534

Source: FDOH, 2002, *Drinking Water Toxics Program and Super Act*

The previous table shows that the highest two ranking chemical contaminants found in Florida were EDB and nitrate-both utilized in the agricultural industries. Tetrachloroethylene, was the third leading contaminant found in groundwater. Tetrachloroethylene is a chemical used for dry cleaning and metal degreasing. Due to the high specific gravity of Tetrachloroethylene, the chemical can migrate very deeply into the groundwater. Benzene, the fourth ranked contaminant, has been identified in numerous private and public wells in Florida. Groundwater contaminated with benzene is usually associated with petroleum products as a result of leaking underground petroleum storage tanks. Petroleum hydrocarbons have a lower specific gravity and are usually “floaters” and do not usually migrate deep into the aquifer system. However, petroleum hydrocarbons can impact potable water wells.

The source of contamination typically consist of

1. Chemical Storage Tanks: Petroleum stored in underground storage tanks (UST) is one of the greatest threats to groundwater quality. According to the EPA, over 418,000 UST releases had been confirmed in the United States as of September 30, 2001 with 24,816 releases occurring in Florida. According to FDEP records, 54 petroleum facilities located in Flagler County have undergone cleanup activities associated with storage tank system failures. Contaminants usually associated with petroleum groundwater contamination are benzene, xylenes, toluene, ethylbenzene, naphthalene, lead, cadmium, chromium, and arsenic.

Contaminated UST sites in Florida vary considerably. Some are very contaminated sites at which groundwater resources have been adversely impacted and may involve years of cleanup activities that can cost a considerable amount of money. According to the Planning Advisory Service Report, *American Planning Association, 1995, A Guide to Wellhead Protection*, a leaking gasoline from a storage tank

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resulted in an 80% loss in pumping for the town of Provincetown, Massachusetts, and South Hollow well field.

Florida enacted legislation enabling the FDEP to write and to enforce rules pertaining to the operation, maintenance, installation and closure of underground and aboveground petroleum storage tank systems. Florida has approximately 32,627 active USTs. Due to the large number of petroleum facilities, the FDEP established contracts with county governments to manage the tanks program at the local level. Currently, St. Johns County inspects all registered petroleum and mineral acid facilities in Flagler County annually. The purposes of the inspections are to insure that facilities are adhering to the FDEP rules and guidelines set forth in Chapter 62-761 F.A.C. In addition to annual compliance inspections, St. Johns County conducts inspections during tank installations, tank removals and closures, and investigates potential discharges. Florida regulations require spill prevention systems to be in place for all regulated storage tanks. Regulations typically require monitoring systems, tank liners, double walled tanks, leak detections, emergency alarms, secondary containment, daily inspections, and spill prevention plans.

2. Commercial and Industrial: Sunbelt Chemicals (Matschel of Flagler, Inc.) packages paint related solvents for retail market. The facility has numerous regulated storage tanks that are registered with FDEP. During a tank inspection conducted by St. Johns County (St. Johns County conducts storage tank inspections for Flagler County) at Matschel of Flagler on May 31, 2000, the inspector identified the presence of kerosene product on the asphalt outside the tank containment area. According to the FDEP report, while draining storm water from the secondary containment area, a sight glass on a kerosene tank failed. As a result, product was released from the containment area and approximately 188.58 tons of contaminated soil was excavated from the site. No public supply wells have known to be impacted.

A Preliminary Contamination Assessment was conducted in July of 1996 at a dry cleaning business (Mr. Dry Clean) located in Palm Coast. The assessment concluded that the groundwater had been impacted by tetrachloroethene (PCE) above groundwater concentration limits. A Monitoring Only Plan (MOP) was approved by FDEP on August 10, 2001 and groundwater samples are collected semi-annually to monitor PCE concentrations. According to FDEP, the cause of the release is unknown. However, FDEP personnel indicated that PCE is difficult to manage and that a small spill can contaminate groundwater. No public supply wells have been impacted.

3. Residential

Septic systems, if not properly managed or installed correctly, can be a potential source of groundwater contamination and threat to potable groundwater supplies. Septic systems can be a sources of bacteria, viruses, nitrate, phosphorus, chloride and organic substances, including organic solvents such as trichloroethylene that are sold commercially to clean the systems. According to the Flagler County Health Department (FCDOH) ensures that septic systems are constructed and maintained in accordance with State requirements. Provided soil types are suitable and lots are large enough, well and septic can provide an acceptable alternative to central utilities.

4. Wellhead Protection

The protection of groundwater is vital to the County, since its sole source of potable water is the aquifer. The aquifer is recharged by percolation of rainfall through sandy soils and wetlands. Because of this direct connection, it is important that sources of pollution, which could threaten the resource, be identified, minimized and/or eliminated. Potential sources of pollution include underground storage tanks, industrial sites that use, manufacture or store hazardous materials, and untreated point source surface water runoff. It is apparent from the contamination inventory that a variety of land use activities may contribute to a decrease in groundwater quality and impact other natural resources. Some activities have a greater threat than others. Although environmental rules and regulations are currently implemented and enforced to protect natural resources, accidental release of chemicals and other contaminants and the lack of proper management can lead to a threat to the quality of groundwater and other natural resources. The County has a wellhead protection ordinance that prohibits incompatible land uses, such as industrial and commercial land uses, which handle, store or generate hazardous or toxic materials, landfills, borrow pits, and waste storage, transfer, disposal and treatment facilities from locating within a 200-foot radius of an existing or designated production well. The County will coordinate with SJRWMD and FDEP and utilize aquifer studies and models to establish appropriate wellfield protection. These areas provide an opportunity for the County to utilize non-regulatory groundwater and wellhead protection strategies that could include: land acquisition, land donations, purchase of development rights, and conservation easements. Current strategies being implemented include establishing zoning districts for environmentally sensitive areas. Determination of whether heavy or light industry is appropriate for an area will be refined in the Zoning Map based on the potential environmental impact on

surrounding lands. For example, an industrial use's proximity to wellfields will be considered.

IX. Plant and Wildlife Protection and Preservation

Each of the vegetative associations discussed in Section IV above is a wildlife habitat. The discussion below will address the wildlife or marine life associated with each of the habitats.

The following animals have been identified as inhabitants of the hardwood hammocks: raccoons, opossums, armadillos, hispid cotton rats, eastern cottontails, least shrews, eastern moles, red-shouldered hawks, warblers, vireos, woodpeckers, southern toads, tree frogs, skunks, anoles, eastern diamondback rattlesnakes, rat snakes, and gopher tortoises. Common animals of the pinewoods include armadillos, eastern cottontail rabbits, hispid cotton rats, white tail deer, wild boars, skunks, raccoons, opossums, pileated woodpeckers, warblers, eastern diamondback rattlesnakes, pygmy rattlesnakes, rat snakes, oak toads, and pinewood tree frogs.

The beaches and dunes of the county are important nesting areas for the Atlantic loggerhead sea turtle (Map 2). Other animals inhabiting beach and dune areas are semipalmated plovers, black-bellied plovers, ruddy turnstones, willets, least sandpipers, western sandpipers, sanderlings, least terns, royal terns, black skimmers, herring gulls, laughing gulls, ring-billed gulls, and raccoons. The secondary dunes provide habitat for gopher tortoises, eastern cottontails, raccoons, skunks, anoles, and black racers.

The several wetland communities also provide habitat for wildlife and marine life. The largest wetland habitats are the mosquito ditches. These ditches contain many species of small fish. As a result of the population of small fish and shallow waters, all of the wading birds known to the area use the mosquito ditches. In addition, wood ducks, mottled ducks, blue-winged teals, pintails and American coots inhabit the mosquito ditches either year round or seasonally.

The saltwater marsh areas are inhabited with red-shouldered hawks, clapper rails, marsh rabbits, rice rats, raccoons and bobcats.

The freshwater swamps that do exist in the coastal area of Flagler County show inhabitation by deer, raccoon, bobcat, eastern grey squirrel, barred owl, horned owl, pileated woodpecker, wood duck, wood stork, limpkin, frogs, snakes and turtles.

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Flagler County contains habitats used by several endangered species. Table 1 lists these species and their special status as determined by the Florida Game and Fresh Water Fish Commission and the U.S. Fish and Wildlife Service. The reason each species is imperiled and therefore given special status varies with the species. The various reasons are the impacts of development on these species as discussed below.

There are two species of fish listed in the following table, the primitive looking shortnose sturgeon and Atlantic sturgeon. These were once common spring visitors to Atlantic estuaries and rivers but due to overfishing and the deterioration of water quality, few remain to be seen in the area. Sturgeons are bottom feeders whose diet consists mostly of worms, insect larvae, crabs and small fishes.

SPECIES NAME	COMMON NAME	FFWCC	USFWS	FNAI	FCREPA	HABITAT
<i>Accipiter cooperi</i>	Cooper's hawk			S3?	SSC	Deciduous mixed forests, and riparian woodlands
<i>Aimophila aestivalis</i>	Bachman's sparrow			S3		Open pine woods, dry prairies and old fields
<i>Alligator mississippiensis</i>	American alligator	SSC	T(S/A)	S4		Swamps, reservoirs, lakes, and freshwater canals
<i>Aphelocoma coerulescens</i>	Florida scrub-jay	T	T	S3	T	Scrub and scrubby flatwoods
<i>Aramus guarana</i>	Limpkin	SSC		S3	SSC	Swamps, forested floodplains, and mangrove swamps
<i>Ardea alba</i>	Great egret			S4	SSC	Marshes, swamps, lakes, ponds, ditches and estuaries
<i>Buteo brachyurus</i>	Short-tailed hawk			S3	R	Open country and forested areas; avoids dense forest
<i>Clemmys guttata</i>	Spotted turtle			S3?	R	Flatwoods, shallow ponds, swamps, and marshes
<i>Dendroica kirtlandii</i>	Kirtland's warbler	E	E	S1	E	Migrant, utilizing various uplands and wetland habitats
<i>Drymarchon corais couperi</i>	Eastern indigo snake	T	T	S3	SSC	Wide variety of habitats; winters in tortoise burrows
<i>Egretta caerulea</i>	Little blue heron	SSC		S4	SSC	Marshes, ponds, meadows, streams and mangroves
<i>Egretta thula</i>	Snowy egret	SSC		S4	SSC	Marshes, lakes, ponds and shallow, coastal habitats
<i>Egretta tricolor</i>	Tricolored heron	SSC		S4	SSC	Marshes, ponds and rivers

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Table F-6. Protected Wildlife Species Within Flagler County

<u>SPECIES NAME</u>	<u>COMMON NAME</u>	<u>FFWCC</u>	<u>USFWS</u>	<u>FNAI</u>	<u>FCREPA</u>	<u>HABITAT</u>
<i>Eptesicus fuscus</i> <i>fuscus</i>	Big brown bat			S3	SU	Caves, buildings and trees
<i>Eudocimus albus</i>	White ibis	SSC		S4	SSC	Marshes, mangroves, lakes and estuaries
<i>Falco peregrinus</i> <i>tundrius</i>	Arctic peregrine falcon	E		S2	E	Wide variety of open habitats
<i>Falco sparverius</i> <i>paulus</i>	Southeastern American kestrel	T		S3?	T	Open, or partly open habitats with scattered trees
<i>Gopherus polyphemus</i>	Gopher tortoise	SSC		S3	T	Sandhills, scrub, prairies, flatwoods, and ruderal areas
<i>Grus canadensis</i> <i>pratensis</i>	Florida sandhill crane	T		S2S3	T	Shallow wetlands, marshes and wet prairies
<i>Haliaeetus leucocephalus</i>	Bald eagle	T	T			Marshes, the Everglades, lakes, rivers and streams
<i>Lanius ludovicianus</i> <i>migrans</i>	Migrant loggerhead shrike					Open woodland and scrub areas with scattered trees
<i>Mustela frenata</i> <i>olivacea</i>	Southeastern weasel			S3?	R	Scrub, sandhills, flatwoods, swamps and hammocks
<i>Mustela frenata</i> <i>peninsulae</i>	Florida weasel			S3?	R	Scrub, sandhills, flatwoods, swamps and hammocks
<i>Mycteria americana</i>	Wood stork	E	E	S2	E	Marshes, swamps, streams and mangroves
<i>Myotis austroriparius</i>	Southeastern brown bat				SU	Caves, buildings and trees
<i>Neofiber alleni</i>	Round-tailed muskrat			S3	SSC	Shallow freshwater and salt marshes
<i>Notophthalmus perstriatus</i>	Striped newt			S2S3	R	Ponds in sandhills, and cypress and bay ponds
<i>Nyctanassa violacea</i>	Yellow-crowned night-heron			S3?	SSC	Marshes, lakes, lagoons, tidal flats, and mangroves
<i>Nycticorax nycticorax</i>	Black-crowned night-heron			S3?	SSC	Marshes, lakes, lagoons, mangroves and wet prairies
<i>Pelecanus occidentalis</i> <i>carolinensis</i>	Eastern brown pelican	SSC		S3	T	Open, coastal habitats on islands
<i>Picoides villosus</i>	Hairy woodpecker			S3?	SSC	Deciduous and coniferous woods

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Table F-6. Protected Wildlife Species Within Flagler County

<u>SPECIES NAME</u>	<u>COMMON NAME</u>	<u>FFWCC</u>	<u>USFWS</u>	<u>FNAI</u>	<u>FCREPA</u>	<u>HABITAT</u>
<i>Plecotus rafinesquii macrotis</i>	Southeastern big-eared bat			S3?	R	Caves, buildings, forests and pine flatwoods
<i>Plegadis falcinellus</i>	Glossy ibis			S2	SSC	Marshes and swamps
<i>Podomys floridanus</i>	Florida mouse	SSC		S3	T	Scrub, longleaf pine-oak sandhills, and hammocks
<i>Rana capito</i>	Gopher frog	SSC		S3	T	Xeric uplands and pine flatwoods; and cypress heads
<i>Sciurus niger shermani</i>	Sherman's fox squirrel	SSC		S2	T	Longleaf pine-oak sandhills, mesic flatwoods, swamps
<i>Sterna antillarum</i>	Least tern	T		S3	T	Open, flat beaches, river and lake margins
<i>Sterna caspia</i>	Caspian tern			S2?	SSC	Sand and gravel beaches, shell banks and marshes
<i>Sterna maxima</i>	Royal tern			S3	SSC	Open sand beaches and sparsely vegetated sandbars
<i>Sterna sandvicensis</i>	Sandwich tern			S2	SSC	Coastal beaches, flats and islands
<i>Tadarida brasiliensis cyanocephala</i>	Brazilian free-tailed bat				SU	Caves, buildings and trees near water
<i>Trichechus manatus latirostris</i>	Florida manatee	E	E	S2?	E	Spring-runs, streams, and coastal estuaries
<i>Ursus americanus floridanus</i>	Florida black bear	T		S2	T	Variety of forested landscapes
<i>Vermivora bachmanii</i>	Bachman's warbler	E	E	SH	E	Lowland forests; breeds in hardwood swamps

Notes: * FFWCC = Florida Fish and Wildlife Conservation Commission

E= Endangered; T= Threatened; SSC= Species of Special Concern

USFWS = US Fish and Wildlife Service

(S/A)= Similarity of Appearance; (E/P)= Experimental Population

FNAI = Florida Natural Areas Inventory

S1= Critically Imperiled Due to Extreme Rarity; S2= Imperiled Due to Rarity; S3= Very Rare and Local;

S4= Apparently Secure; SH= Historical Occurrence; ?= Tentative Ranking

FCREPA = Florida Committee on Rare and Endangered Plants and Animals

SSC= Species of Special Concern; R= Rare; SU= Status Undetermined

The following are critical species to the Flagler County area.

Southern Bald Eagle (*Haliaeetus leucocephalus*)

On June 28, 2007 the Interior Department removed the American bald eagle off the

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Federal List of Endangered and Threatened Wildlife and Plants. The bald eagle will still receive Federal oversight via the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act.

The Florida Fish and Wildlife Conservation Commission (FWC) approved removing the bald eagle from the state list of threatened species on April 9, 2008. The eagle is still protected by both the FWC by F.A.C. 68A-16.002. This code outlines that it is illegal to disturb or take an eagle in Florida.

Eagles can be seen flying over many habitat types, but they require open water bodies for feeding and large trees for nesting. The FFWCC lists twelve eagle nests in Flagler County, eleven (11) of which were active nests as of 2008.

Eastern Indigo Snake (*Drymarchon corais couperi*)

The Eastern Indigo Snake is a large glossy black snake with iridescent blue highlights. The throat and chin are reddish or white. The underside is dull orange and blue gray. Juveniles are black with narrow whitish blue bands. The indigo snake is a habitat generalist, using a variety of habitats from mangrove swamps to pine flatwoods. During winter months, however, it can typically be found in uplands utilizing gopher tortoise burrows as shelter.

Florida Scrub-jay (*Aphelocoma coerulescens*)

The Florida scrub-jay (*Aphelocoma coerulescens*) was first listed by the Florida Game and Fresh Water Fish Commission as a State-listed threatened species in 1975. The U. S. Fish and Wildlife Service (FWS) subsequently listed it as federally threatened pursuant to the Endangered Species Act in 1987.

The Florida scrub-jay is a 2.5 to 3-ounce, 12-inch-long, blue and gray crestless jay that is endemic to peninsular Florida's xeric oak scrub and scrubby pine flatwoods. In fact, the Florida scrub-jay is the only bird species entirely restricted to the state of Florida. In the adult plumage, a necklace of blue feathers separates the whiter throat from the gray underparts, and a white superciliary line or eyebrow often blends into a whitish forehead. The back is gray and the tail is long and loose in appearance. Scrub-jays less than about 5 months of age can be identified by their dusky brown head and neck and shorter tail. However, in late summer and early fall, juvenile scrub-jays undergo a partial molt of body feathers that renders them indistinguishable from adults in the field. Adult male and female Florida scrub jays are not distinguishable by plumage, but are differentiated by a distinct "hiccup" call vocalized only by females.

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Flagler County is the northern extent of the Florida scrub-jay habitat range. In Flagler County's recent past, scrub jays have been reported in Bulow; in the vicinity of Flagler Beach; 7 miles north of Flagler Beach; near Marineland and Matanzas Island. At this time no known nests are located in Flagler County at this time.

American Alligator (*Alligator mississippiensis*)

The American Alligator is listed as Threatened by the USFWS and as a Species of Special Concern (SSC) by the FWC. American Alligators can be found in most types of wetlands that have standing water and ample food supplies. Suitable habitat in Flagler County includes freshwater canals, reservoirs, lakes, swamps, and marshes.

Wood Stork (*Mycteria americana*)

This wading bird, listed as Endangered by both the USFWS and the FFWCC, is the most endangered wading bird in Florida. It requires feeding areas in the form of pools or ditches in which fish congregate, and nesting areas in forested swamps and mangroves. Three other wading (all listed as Species of Special Concern by the FFWCC) - the little blue heron, snowy egret, tri-colored heron, and white ibis - are all wading birds that require the same basic habitats for feeding and nesting as the wood stork. Existing regulations protecting wetlands and surface waters provide these species with the habitats needed for their long-term survival.

Kirtland's Warbler (*Dendroica kirtlandii*)

This warbler is an extreme habitat specialist and has one of the most restricted breeding ranges of any North American bird. It only breeds in approximately 500 square miles of the open jack pine plains of central Michigan. The bird winters in the Bahamas, so it only passes through Florida during the spring and fall migrations. While in Florida, it will utilize a wide variety of upland and wetland habitats as stopover locations during migration, so no specific cover type is considered significant. The likelihood of occurrence of this species is low.

Gopher Tortoise (*Gopherus polyphemus*)

Gopher tortoises are a threatened wildlife species and are protected by state law, Chapter 68A-27, Florida Administrative Code. Gopher tortoises must be relocated before any land clearing or development takes place, and property owners must obtain permits from the Florida Fish and Wildlife Conservation Commission before they can move them.

Gopher tortoises live in well-drained sandy areas with a sparse tree canopy and abundant low growing vegetation. They are commonly found in habitats such as

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sandhill, pine flatwoods, scrub, scrubby flatwoods, dry prairies, xeric hammock, pine-mixed hardwoods, and coastal dunes which have historically been maintained by periodic wild fires. When fire is suppressed in gopher tortoise habitat, small trees, shrubs, and brambles begin to grow making it difficult for the gopher tortoise to move around and eventually shade out the low growing plants that gopher tortoises eat.

Gopher tortoises have adapted to living in dry habitats with frequent fire occurrence by digging burrows deep into the sandy soil. The burrows which average 15ft long and 6.5ft deep, provide the gopher tortoise with refuge from wildfires as well as heat, cold, drought, and predators. Upper Respiratory Tract Disease (URTD) is an extremely contagious and mostly fatal illness caused by the bacterium *Mycoplasma agassizii*. URTD was first discovered in gopher tortoises in Florida's Sanibel Island in 1991, and has since been found throughout the tortoise's range in the southeast U.S. Symptoms include an inflamed respiratory tract, wheezing, runny nose, and swollen eyelids. An infected tortoise eventually starves to death because it cannot find and consume food. A test that detects antibodies for URTD in tortoise blood has been developed, but so far, there is no vaccination against the disease, or cure. Tortoises that test positive for the disease (i.e. have been exposed to it) do not always show symptoms. URTD is spread between populations by the introduction of a diseased tortoise into a healthy population. Tortoises that test positive for this disease, or any others within the same population, cannot be relocated due to the danger of transmission to healthy populations.

West Indian Manatee (*Trichechus manatus*)

The West Indian Manatee is federally listed as an endangered species under the ESA (32 FR 4001), and the species is further protected as a depleted stock under the MMPA. Manatees are large fusiform-shaped mammals with skin that is uniformly dark grey, wrinkled, sparsely haired, and rubber-like. They possess paddle-like forelimbs, no hind limbs, and a spatulate, horizontally flattened tail. Adults average about 10 feet in length and 1,200 pounds in weight, but may reach lengths of up to 15 feet (Gunter 1941) and weigh as much as 3,570 pounds (Rathbun et al.1990).

Manatee distribution in Florida is heavily influenced by water temperature. In Florida, manatees are not known to be limited by food during warm seasons nor are they thought to be limited by the availability of breeding or nursery habitat.

Manatees are herbivores that feed opportunistically on a wide variety of submerged, floating, and emergent vegetation. Because of their broad distribution and migratory patterns, manatees utilize a wide diversity of food items (Lefebvre et al.2000). Feeding rates and food preferences depend, in part, on the season and available plant species.

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Manatees frequently feed in waters three to nine feet in depth where aquatic vegetation is abundant. Seagrasses are a dietary staple for manatees in coastal areas (Ledder 1986; Provanha and Hall 1991; Kadel and Patton 1992; Koelsch 1997; Lefebvre et al. 2000).

Breeding takes place when one or more males are attracted to an estrous female and form an ephemeral mating herd (Rathbun et al. 1995). Mating herds can last up to four weeks, with different males joining and leaving the herd throughout the cycle (Hartman 1979; Bengtson 1981; Rathbun et al. 1995; Cited in Rathbun 1999). Permanent bonds between males and females do not form. During peak activity, the males in mating herds compete intensely for access to the female (Hartman 1979). Successive copulations involving different males have been reported. Some observations suggest that larger, presumably older, males dominate access to females early in the formation of mating herds and are responsible for most pregnancies (Rathbun et al. 1995). Males as young as three years old are spermatogenic (Hernandez et al. 1995). Although breeding has been reported in all seasons, Hernandez et al. (1995) reported that histological studies of reproductive organs from carcasses of males found evidence of sperm production in 94 percent of adult males recovered from March through November. Females appear to reach sexual maturity by about age five (but have given birth as early as four years of age), and males may reach sexual maturity at two to three years of age (Marmontel 1995; Odell et al. 1995; O'Shea and Hartley 1995; Rathbun et al. 1995). Manatees may live in excess of 50 years (Marmontel 1995), and evidence for reproductive senescence is unclear (Marmontel 1995; Rathbun et al. 1995).

Calf dependency usually lasts one to two years after birth (Hartman 1979; O'Shea and Hartley 1995; Rathbun et al. 1995; Reid et al. 1995). Calving intervals vary greatly among females, with an average birth cycle of 2 to 2.5 years. Intervals may be considerably longer depending on age and perhaps other factors (Marmontel 1995; Odell et al. 1995; Rathbun et al. 1995; Reid et al. 1995). Females that abort or lose a calf may become pregnant again within a few months (Odell et al. 1995), or even weeks (Hartman 1979).

Manatees often use secluded canals, creeks, embayments and lagoons, particularly near the mouths of coastal rivers and sloughs, for feeding, resting, cavorting, mating, and calving (Marine Mammal Commission 1986, 1988). Manatees frequent coastal, estuarine, and riverine habitats and are capable of extensive north-south migrations. Manatees depend on areas with access to natural springs or man-made, warm water refugia and access to areas with vascular plants, algae and fresh water sources. Manatees normally migrate along shorelines and use deeper corridors to access shallow water feeding and resting areas. When ambient water temperatures drop below

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68°F (20°C) in autumn and winter, manatees aggregate within the confines of natural or artificial warm water refuges (Lefebvre et al. 1989) or move to the southern tip of Florida (Snow 1991). Most artificial refuges are created by warm water outfalls from power plants or paper mills. As water temperatures rise, manatees disperse from these winter aggregation areas. While some remain near their winter refuges, others undertake extensive migrations along both Florida coasts and far up rivers and canals. Many manatees return to the same warm water refuges each year. However, it has been recorded that some manatees use different refuges in different years, while others use two or more refuges in the same winter (Reid and Rathbun 1984, 1986; Rathbun et al. 1990, Reid et al. 1991, and Deutsch et al. 2003). There are many lesser known, minor aggregation areas used as temporary thermal refuges. These include canals, boat basins, seeps, and lesser springs where warmer water temperatures persist as temperatures in adjacent bays and rivers decline.

X. Commercially Valuable Minerals

There are three major minerals in Flagler County that have commercial value: sand, clay and coquina. Some of the sands in the county are suitable for such uses as brick masonry, sand cement, riprap, sand asphalt hot mix and sand seal coat. The coarser sands could be suitable for construction purposes while suitability for glass is doubtful due to widespread occurrence of impurities in the sand. The Paola-Pomello, Palm Beach Canaveral, Candler-Tavares, Myakka-Pomello-Businger, Myakka-Wachula-Placid, Wabasso-Myakka-Felda and Pompano-Anclote soil associations are good for use as roadfill.

Some of the clays in the county could be used for bricks, drain tiles and hollow-blocks. Coquina is primarily found in the coastal areas of the county and for the most part underlie the Urban Service Area and is protected from destruction or removal from the point along the ocean beach eastward of the coastal setback line by county code.

The Florida Department of Environmental Protection identifies two mining operations in Flagler County. Both are sand extracting operations that began operating in 1986 and have an operating life of 30 years.

Table F-7. Commercially Valuable Minerals				
Operator	Mine Name	Acreage	Township-Section-Range	Location
FDOT/Deland	FDOT	12	38/39-12-31	1 mile west of Flagler Beach
Iroquois LLC	Iroquois Shell Pit	19	38-12-31	1 mile west of Flagler Beach

XI. Soil Erosion

The Natural Resources Conservation Service (formerly the U.S. Soil Conservation Service) issued a *Soil Survey of Flagler County* in October 1997. The survey identifies soil types throughout the entire county. This soil survey can be used to evaluate the effect of specific land uses on productivity and on the environment in certain areas, helping planners maintain or create land use patterns that are in harmony with nature. The information can be used to plan the use and management of soils for crops, pasture and woodlands, sites for buildings, sanitary facilities, highways and other transportation systems, parks and other recreational facilities and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties. The information is not site specific and does not eliminate the need for onsite investigation of the soils or testing and analysis by personnel experienced in design, construction and engineering.

For *recreational development*, for example, the favorability of the soil is evaluated based on the type and amount of use and the site preparation and construction activity typical for camp areas, picnic areas, playgrounds, paths and trails and golf fairways. According to this analysis, all of the soils in Flagler County rate as severely or moderately limited for recreational development because they are too wet, sandy, clayey, droughty, salty or percolate too slowly.

A similar analysis was completed for soils used for *crops and pasture*, with a focus on soil erosion. Approximately 11,000 acres in Flagler County is used for pasture and crop production, according to estimates from the Flagler County Extension Service. Most of the soils used for agricultural production are sandy and nearly level. This erosion by water is not as serious as it is in many areas in the United States. In areas where slopes are steep, there is the potential for erosion from rapid runoff during periods of torrential rainfall. In areas that are experiencing rapid urban development, erosion can be a problem if water quantities are concentrated and runoff is accelerated. The use of properly designed water control systems could help control erosion in built-up areas. Erosion control measures can provide a protective surface cover, help to control runoff, and increase the infiltration rate. This helps keep the soil in place in areas where erosion is a hazard. Conservation tillage, for example, can help to increase the infiltration rate by minimizing soil disturbance and leaving a maximum amount of crop residue on the surface.

Wind erosion is a hazard on sandy and mucky soils. Blowing soil can damage soils and crops if the soils are not protected by vegetation or by surface mulch. A system of

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conservation tillage would minimize soil blowing on these soils. Windbreaks and environmental plantings protect crops, livestock, buildings and yards from wind and blowing sand.

According to the United States Department of Agriculture's *Forest Statistics for Northeast Florida*, 1995, Flagler County has approximately 241,116 acres of forestland. Of this, 237,592 acres is timberland, of which 235,942 acres is privately owned for producing pulpwood and sawtimber. For all the soils in Flagler County, the erosion hazard for woodland management and productivity was slight, which means no particular preventative measures are needed under ordinary conditions.

The soils in Flagler County were grouped according to their wind erodibility and were assigned erosion factors based on their susceptibility to sheet and rill erosion by water and the maximum average annual rate of soil erosion by wind or water that can occur over a sustained period without affecting crop productivity. The erodibility column rates the soils from 1 to 8, with those rated 1 being the more coarse sands that are extremely erodible and those rated 8 being those that are not subject to wind erosion because rock fragments on the surface or because of surface wetness. Soils with a higher erosion factor K are more susceptible to sheet and rill erosion by water.

Soil Name	General Soil Map Symbol *	Detailed Soil Map Symbol **	Acreage and Proportionate Extent		Erosion Factors (tons/acre/year)		Wind Erodibility**** 1 – very erodible 8 – no erosion
					K***	T	
Riviera	1, 7	2	12,441	3.8	.18	4	2
Samsula	6	3	18,729	5.8	.17	2	2
Hontoon	6				---	2	2
Wabasso	2	4	19,482	6.0	.14	5	2
Pineda	1, 2	5	13,615	4.2	.22	5	2
Wabasso	2				.14	5	2
Favoretta	5, 9, 16	6	8,627	2.6	.37	5	4
Favoretta	5, 9, 16	7	16,643	5.1	.37	5	4
Chobee	9				.21	5	2
Winder	1, 5, 11				.21	5	2
Hicoria	7	8	36,036	11.1	.17	5	2
Riviera	1, 7				.18	4	2
Gator	7				.32	2	2
Eaugallie	2	9	15,918	4.9	.14	5	2
Winder	1, 5, 11	10	19,473	6.0	.18	5	2
Myakka	3	11	18,449	5.7	.11	5	2
Placid	8	12	17,638	5.4	.10	5	2
Basinger	8				.10	5	2
St. Johns	8				.11	5	2

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Table E-8. Soils Susceptible to Soil Erosion by Wind and Water in Flagler County, 1997							
Soil Name	General Soil Map Symbol *	Detailed Soil Map Symbol **	Acreage and Proportionate Extent		Erosion Factors (tons/acre/year)		Wind Erodibility**** 1 – very erodible 8 – no erosion
					K***	T	
Imokalee	3, 13	13	9,914	3.1	.11	5	2
Pineda	1, 2	14	17,065	5.3	.14	5	2
Pomello	13, 15	15	4,691	1.4	.12	5	1
Malabar	4	16	7,272	2.2	.14	5	1
Holopaw	---	17	780	0.2	.15	5	1
Valkaria	3	18	4,544	1.4	.10	5	2
Smyrna	3				.12	5	2
					K***	T	
Valkaria	3	19	10,141	3.1	.10	5	2
Orsino	13, 14	20	2,009	0.6	.10	5	1
Smyrna	3	21	14,927	4.6	.12	5	2
Astatula	12	22	1,277	0.4	.10	5	1
Adamsville	12, 13	23	1,292	0.4	.10	5	1
Samsula	6	24	2,049	0.6	.10	2	8
Placid	8				.10	5	2
Tavares	12	25	1,013	0.3	.10	5	1
Turnbull	10	26	3,828	1.2	.21	2	2
Pellicer	10				.27	5	4
Cassia	13	27	3,821	1.2	.12	5	2
Udarents	---	29	5,876	1.8	.10	5	2
Pits	---	30	942	0.3	---	---	8
Palm Beach	14	31	887	0.3	.10	5	1
Narcoossee	14	32	493	0.2	.10	5	2
Welaka	---				.10	5	1
Beaches	---	33	335	0.1	.05	5	1
Cocoa	15	34	1,484	0.5	.13	2	2
Bulow	12				.14	3	2
Quartzipsammments	---	35	922	0.3	.10	5	2
Bimini	---	36	660	0.2	.18	5	1
Tuscawilla	16	37	2,700	0.8	.15	5	1
Paola	15	38	829	0.3	.10	5	1
Udarents	---	39	919	0.3	.14	5	2
Pomona	4	40	11,593	3.6	.13	5	1
Terra Ceia	11	41	3,598	1.1	---	2	2
Areas of water less than 40 acres			1,138	0.3			
Areas of water more than 40 acres			10,700	3.3			
TOTAL			324,800	100.0			

* Refer to General Soil Map, Map #

** Detailed Soil Map, Soil Survey of Flagler County, Natural Resources Conservation Service, 1997

*** based on average of depth profile

**** refers only to the surface layer

note: The General Soil Map shows broad areas that have a distinctive pattern of soils, relief and drainage. Each unit typically consists of one or more major soils and some minor soils. The soils making up one unit can occur in another unit, but in a different pattern.

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Source: *Soil Survey of Flagler County*, Natural Resources Conservation Service, 1997

According to this analysis, the soils that are on the sand ridges, coastal dunes, low-lying hammocks and on some flatwoods are most susceptible to wind erosion. They are made up of coarse sands, sands, fine sands and very fine sands. Crops can be grown if intensive measures to control wind erosion are used. Those soils that are most susceptible to water erosion are Pineda, Favoretta, Chobee, Winder, Gator, which are primarily found in the western part of the county on flatwoods and coastal wetlands. Turnbull and Pellicer soils, also susceptible to water erosion are found in the northeastern part of the county around the Pellicer Creek and Longs Creek and along the Intracoastal Waterway in the southeastern part of the county near Flagler Beach, Flagship Harbor and around Bulow Creek.

The Soil Survey also indicates the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, lawns and landscaping. Limitations include wetness, slopes, low strength, flooding and cutbanks cave (walls of excavation tend to cave in or slough). Limitations are *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

In Flagler County, the majority of the soils are severely or moderately limited for all types of building site development. In the urban service area, most of the soils between US1 and I95 are severely limited for building site development, however, for most of the area east of I95, soils are moderately to slightly limited for building site development. East of I95, the Bulow Creek area and the low-lying hammock of Graham Swamp are severely limited to development, however little or no development is permitted in these areas due to their protection status by state and county conservation programs and regulations.

Those soils that have severe limitations for shallow excavations and lawns and landscaping, but slight to moderate for dwellings with basements, dwellings without basements, small commercial buildings and local roads and streets are: Orsino, Astatula, Tavares, Palm Beach, and Paola. Those that have severe limitations for shallow excavations, buildings with basements and lawns and landscaping, but moderate for dwellings without basements, small commercial buildings and local roads

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and streets are: Adamsville, Cassia, Udarents, Narcoossee, Cocoa, Quartzipsamments and Bimini. Welaka and Bulow soils are severely limited for shallow excavations, lawns and landscaping, but only slightly limited for all other building site developments. The Future Land Use Element provides a more detailed discussion on the limitations of soils in relation to current and future development.

The Natural Resources Conservation Service provides information about water control practices, wind erosion prevention and environmental plantings.

XII. Air Resources

The air quality monitoring program of the State of Florida provides measures of pollutant concentration levels in ambient air, the portion of the atmosphere near ground level. The Environmental Protection Agency and the State of Florida establish primary standards and legal limitations of pollution concentration levels for ambient air. Amendments to the Clean Air Act have changed the measurement criteria since the 1991 Comprehensive Plan; historic data is no longer comparable and has not been included. Chapter 62-204 of the Florida Administrative Code outlines rules and regulations concerning air pollution.

A geographic area that meets or exceeds the primary standard is called an attainment area. Flagler County is currently in compliance with each of the National Air Quality Standards (NAAQS) for criteria pollutants. The NAAQS contained in the Federal Clean Air Act, as amended by the United States Congress in 1970, 1977, and 1990 are permitted levels for pollutants which must be met in order for a region to be in attainment for that pollutant. NAAQS standards are established for Carbon Monoxide (CO), Sulfur Dioxide (SO₂), Nitrogen Dioxide (NO₂), lead (Pb), ozone (O₃), and particulate matter (pm₁₀).

NON POINT SOURCE AIR POLLUTANT

There are six major air pollutants that can cause health problems if they are at high concentrations in the ambient air. The pollutants are Carbon Monoxide(CO), Nitrogen Oxides(NO_x), Ozone(O₃), Lead(Pb), Sulfur Dioxide(SO₂) and Particulate Matter(PM-2.5 and PM-10). These pollutants are referred to as "criteria pollutants" and a National Ambient Air Quality Standard (NAAQS) has been established for each based on health related criteria and data.

1. Carbon monoxide, or CO, is a colorless, odorless gas that is formed when carbon in fuel is not burned completely. Higher levels of CO generally occur in areas with heavy traffic congestion. In cities, 85 to 95 percent of all CO emissions may come from motor

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vehicle exhaust. High levels of CO in the air are poisonous to healthy people. The level of CO can be of major concern to people with heart disease and affects the central nervous system.

(USEPA)

2. Nitrogen oxides, or NO_x, are the generic term for a group of highly reactive gases, which contain nitrogen and oxygen in varying amounts. Many nitrogen oxides are colorless and odorless. Nitrogen oxides form when fuel is burned at high temperatures, as in a combustion process. The primary sources of NO_x are motor vehicles, electric utilities, and other industrial, commercial, and residential sources that burn fuels. Nitrogen oxides contribute to the formation of acid rain and contribute to nutrient overload that deteriorates water quality.

(USEPA)

3. Ozone (O₃) is a gas composed of three oxygen atoms. This compound is formed by the combination of nitrogen oxides, volatile organic compounds, heat, and sunlight. As a result, it is known as a summertime air pollutant. Ozone has the same chemical structure whether it occurs miles above the earth or at ground level and can be "good" or "bad," depending on its location in the atmosphere. "Good" ozone occurs naturally in the stratosphere approximately 10 to 30 miles above the earth's surface and forms a layer that protects life on earth from the sun's harmful rays. In the earth's lower atmosphere, ground-level ozone is considered "bad." The primary cause of concern is that it can trigger a variety of health problems at low levels and may cause permanent lung damage after long-term exposure. Elevated ozone levels are detrimental to plants and the ecosystem. (USEPA) Many urban areas tend to have high levels of "bad" ozone, but even rural areas are also subject to increased ozone levels because the wind can carry ozone and pollutants that form it hundreds of miles away from their original sources. Elevated ozone levels are detrimental to plants and the ecosystem.

(USEPA)

4. Lead (Pb), a metal which is found naturally in the environment as well as in manufactured products. The major sources of lead emissions have been historically from motor vehicles (such as cars and trucks) and industrial sources. Due to the phase out of leaded gasoline, metals processing is the major source of lead emissions to the air today. The highest levels of lead in air are generally found near lead smelters. Other stationary sources are waste incinerators, utilities, and lead-acid battery manufacturers. Since the 1980's, EPA and its federal partners have phased out lead in gasoline, reduced lead in drinking water and industrial air pollution, and banned or limited lead used in consumer products, including residential paint.

5. Particulate matter, or PM-2.5 and PM -10, the term for particles found in the air, including dust, dirt, soot, smoke, and liquid droplets. Particles can be suspended in the air for long periods of time. Some particles are large or dark enough to be seen as soot or smoke. Others are so small that individually they can only be detected with an electron microscope. The particles come from a variety of sources such as cars, trucks, buses, factories, construction sites, tilled fields, unpaved roads, stone crushing, and burning of wood. Particulate matter is associated with serious health effects and is a major source of haze that reduces visibility.

(USEPA) Particulate matter is categorized by the following sizes:

1. *Particulate matter 2.5, or PM 2.5*, is the measurement of particulate matter smaller than 2.5 micrometers in size. By comparison, the thickness of a human hair is approximately 90 micrometers.
2. *Particulate matter 10, or PM 10*, is the measurement of particulate matter smaller than 10 micrometers in size.

In addition, this rule designates all areas of the State as attainment, non-attainment, or unclassifiable with respect to each pollutant for which ambient air quality standards have been adopted; further designates certain attainment and unclassifiable areas of the State as air quality maintenance areas for particular pollutants; classifies all areas of the State as Class I, Class II, or Class III for determining which set of prevention of significant deterioration (PSD) increments apply; and designates all attainment and unclassifiable areas of the State as one or more PSD areas for determining which pollutant-specific PSD baseline dates apply.

The County currently maintains levels of air pollution below federal attainment levels. The following table summarizes the levels of SO₂ and PM₁₀ and O₃ at surrounding counties are below air quality standards. The County currently does not contain a station to measure ambient air quality standards. The closest station is located in northern Volusia County. No exceedances of air quality standards have been registered at this station since 1996, according to FDEP, Air Resource Management records. The highest readings for carbon monoxide and nitrogen dioxide occurred the wide spread forest fires in Flagler County in June and July of 1998.

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Table E-9 . SO₂, PM₁₀ and O₃ Concentrations in Putnam and Volusia Counties, 1997-2001			
County	SO₂ (Standard-0.030 ppm)	PM₁₀ (Standard-50ug/m3)	O₃ (Standard-85 ppm highest 8 hr. average)
Putnam	0.020ppm-0.030 ppm	23ug/m3-27ug/m3	NA
Volusia	NA	19ug/m3-22ug/m3	69-76 ppm

Ug/m3 – micrograms per cubic meter

Ppm – parts per million

NA – not analyzed

Source: Division of Air Resource Management, Department of Environmental Protection, 2003

There are five types of air permits issued by FDEP, a Construction Permit, a Federally Enforceable State Operating Permit (FESOP), a General Permit, an Operational Permit, and a Title V Operational Permit. A construction permit is required prior to the construction or modification of any facility or emissions unit, which may emit air pollutants. An operating permit is required for any new or modified facility or emissions unit subsequent to construction or modification of the facility or emissions unit and after demonstrating compliance in accordance with the terms and condition of the construction permit.

The following facilities are eligible to operate under the terms of an air general permit, provided all existing air permits authorizing operation of the facility are surrendered: facilities comprising volume reduction, mercury recovery, and mercury reclamation processes, bulk gasoline plants, facilities comprising heating units and general purpose internal combustion engines, facilities comprising surface coating operations, facilities comprising polyester resin plastic products fabrication activities, and facilities comprising cast polymer operations. Certain facilities are eligible to operate under the terms of an air general permit issued pursuant to the procedures and general conditions of Rule 62-213.300, Florida Administrative Code. The following facilities are eligible to operate under the terms of a Title V air general permit: perchloroethylene dry cleaning facilities, ethylene oxide sterilization facilities, halogenated solvent degreasing facilities, chromium electroplating and anodizing facilities, and asbestos manufacturing and fabrication facilities.

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There are EPA Title V permitted facilities, Non-Title V permitted facilities, and Dry Cleaner Title V General permitted facilities within Flagler County. There have been two violations for unconfined particulate emissions from East Coast Concrete and odor violation at Sea Ray Boat. East Coast Concrete and Sea Ray Boat is currently in compliance with air quality standards. The following table lists air quality permitted facilities and facility identification numbers in Flagler County.

Facility Name	Facility I.D.	Title V	Non-Title V	Dry Cleaner
Kanthal Palm Coast	0350011	Yes	No	No
Sea Ray Boats	0350003	Yes	No	No
Alderson Palm Coast Funeral Home	0350019	No	Yes	No
East Coast Concrete	0350018	No	Yes	No
Matschel of Flagler	0350012	No	Yes	No
Rinker Materials	0350004	No	Yes	No
Tarmac America	0350002	No	Yes	No
All Star Dry Cleaners	0350015	No	No	Yes
Mr. Dry Clean	0350016	No	No	Yes

Source: Florida Department of Environmental Protection

The Florida Department Environmental Protection (DEP), Division of Air Resource Management provides a summary of the air quality for the State of Florida on an annual basis. The report includes summaries on the Air Quality Index (AQI). The AQI has been developed by the EPA to provide a simplified method to advise the public on daily basis of any possible adverse health effects due to air pollution. The AQI uses measured levels of five criteria pollutants. These are combined to create a single number that can be translated into a simplified word that describes the air quality. The descriptor words used are: good, moderate, unhealthy for sensitive groups, unhealthy, and very unhealthy. Generally, the AQI value of 101, which marks the beginning of the unhealthy for sensitive groups range, corresponds to being over the air quality standard for the pollutant. The AQI value of 51, which marks the beginning of the moderate range, corresponds to the concentration of the pollutant that is just above half of the value of the air quality standard or annual standard, whichever is lower. The AQI reported is based on the pollutant(s) with the highest index value of all of the pollutants being monitored at specified sites in an urban area. Normally, only one pollutant will have the highest index value, although it is possible for two or more pollutants to tie for the

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highest value on a given day. The values determined by the AQI are meant to be used to compare the air quality in one urban area day to day. They are not designed to compare one urban area to another.

The annual report from DEP does not include any specific data for Flagler County since the agency does not have any monitoring stations established in the county. The report does reference Volusia and Putnam counties. The report on these counties can be used to identify if there are any specific issues with the five pollutants that are monitored by the DEP. According to the 2009 Annual Report, the adjoining counties did not experience significant impacts due to air pollution. The report shows that Putnam County experienced 365 days deemed to be "Good". This is consistent with other measurements dating back to 2000. In Putnam County the primary pollutants seen by the DEP are ozone and particulate material under 10 microns in size. Volusia County, being more urbanized and closer to major roadways, experienced 346 days deemed to be "Good" and 19 days deemed "Moderate". This is also consistent with previous measurements dating back to 2000. The primary pollutants in Volusia County are ozone and particulate material under 10 and 2.5 microns. Given the location of the monitoring equipment it is reasonable to assume that the air quality index for Putnam County would be similar to Flagler County, west of US 1 and the air quality index for Volusia County is similar to Flagler County, east of US 1. This reflects that Flagler County does not currently have any significant air quality issues that need to be addressed within the timeframe of 2010 to 2015.

The planning horizon for the comprehensive plan spans from 2010 to 2035. During this 25 year period Flagler County and the cities within the county are expected to grow. The population is projected to double. This reflects a shift from a rural county to a suburban/urban county. It is difficult to project exactly what air quality issues will occur during the 2015 to 2035 timeframe, but comparison to similarly located counties in Florida can provide insight to the potential pollutants that may result with the increased urbanization of Flagler County.

According to the 2010 population projections from the Bureau of Economic and Business Research, Flagler County is projected to have a population of 200,300 people in 2035. Volusia County is a county that is the best for comparison. The current population and land use pattern in Volusia County is similar to what could occur in Flagler County by 2035. Flagler County in 2035 should not be facing any significant air quality issues assuming that there are not any significant changes in air quality technology and based on current conditions seen in Volusia County.

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The passage of House Bill 697 in the 2009 Legislative Session required that all counties and cities include provisions for the reduction of greenhouse gases (GHG) in the comprehensive plan. The specific rules requiring specific data and analysis and goals, objectives and policies had not been finalized during the drafting of this element. The use of the latest draft version of the amendments to Rule 9J-5 was used to ensure that Flagler County addressed this issue using the best data available.

The revisions to Chapter 163.3177(6)(a) included a requirement for strategies to reduce GHG. A working definition of GHG, based on draft rules means materials found in the atmosphere that absorb heat energy from the Earth and prevent this heat from escaping into space. Primary greenhouse gases include water vapor, carbon dioxide, methane, nitrous oxide, and ozone. In Flagler County the primary producer of GHG is the combustion engine. The Future Land Use Element has to include goals, objectives and policies to guide development in a manner that emphasizes “Green” standards. Additionally, incentives and other protective measure must be incorporated into the County’s efforts to reduce sprawl and protect rural and natural resources

XIII Hazardous Wastes

In 1976 the U.S. Congress enacted the Resource Conservation and Recovery Act (RCRA) to protect the public and the environment from improper management of hazardous waste. RCRA was written to regulate hazardous waste generators. The State has adopted by reference portions of the federal regulations into its Florida Administrative Code (FAC) Rule 62-730. Waste is identified as hazardous if it can be found on lists published in the Code of Federal Regulations (40 CFR Part 261). In addition, waste can be considered hazardous if it exhibits one or more characteristics of ignitability, corrodibility, reactivity or toxicity. In general, hazardous waste generators are broken into three categories based upon the quantity of hazardous waste generated per month:

Conditionally Exempt Small Quantity Generator:

less than 220 pounds of hazardous waste generated per month.

Small Quantity Generator:

220-2,200 pounds of hazardous waste generated per month.

Large Quantity Generator:

Greater than 2,200 pounds of hazardous waste generated per month.

The FDEP Northeast District and Flagler County are currently managing the hazardous

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waste generator program for the City of Palm Coast. According to FDEP records, approximately 29 facilities have been registered as generators of hazardous waste. Individual businesses have the ultimate responsibility to register their business if they meet the generator criteria. The following table lists registered hazardous waste facilities in the Flagler County and the date of the last regulatory inspection.

Table F-11. Registered Hazardous Waste Facilities in Flagler County				
Name	Address	Status	Registration Date	*FDEP Inspection Date
Abb Ceag Power Supplies INC	1 Pine Lakes Pkwy N	CES	8/22/94	NI
Albertsons #4469	4950 Belle Terre Pkwy SW	SQG	2/14/01	NI
All Star Dry Cleaners	126 Flagler Plaza Dr.	CES	9/25/98	NI
American Radionics	32 Hargrove Grade	NHR NNOT	4/11/01	4/11/01
BellSouth PLCSFLMA44E 33017	5 Clubhouse Dr.	CES	3/24/97	NI
Boulder Rock BP	2 Boulder Rock Dr.	SQG	6/6/91	NI
Cardiac Control Systems INC	3 Commercial Blvd.	CLO	10/5/00	NI
Coastal Oral & Cosmetic Surgery	9 Pine Cone Dr.	CES	4/8/99	NI
Community Animal Clinic	15 Old Kings Road N	NHR NNOT	8/24/01	NI
Don Olson Tire Center	5002 Palm Coast Pkwy	CES NNOT	4/14/00	NI
Exxon Co. USA	220 Palm Coast	CLO	3/20/00	NI
Flagler Ford	1150 Palm Coast Pkwy	SQG	8/15/01	6/16/00
International Tool & Machine	5 Industry Dr.	SQG	5/7/96	NI
Kanthal Palm Coast	1 Commercial Blvd.	LQG	8/24/00	8/24/01
Kanthal Palm Coast	1 Industry Dr.	CLO	10/9/00	NI
Lil Champ Food Stores INC	1501 St. Joe Grade	SQG	5/29/91	NI
Lil Champ Food Stores INC	1201 Palm Harbor Pkwy	SQG	5/29/09	NI
Lil Champ Food Stores INC	3 Kingswood Dr.	SQG	5/29/91	NI
Mr. Dry Clean	118 Palm Coast Pkwy	SQG	10/4/96	8/22/96
Palm Coast Engineering	5 Hargrove Grade	SQG	10/3/96	NI
Sea Ray Boats INC Palm Coast DIV	100 Sea Ray Dr.	LQG	7/29/02	7/29/02
Sebastian Auto Repair Center	23 Hargrove Grade	NHR NNOT	8/24/01	NI

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Table F-11. Registered Hazardous Waste Facilities in Flagler County

Name	Address	Status	Registration Date	*FDEP Inspection Date
Sunbelt Chemicals INC	77 Hargrove Grade	SQG	5/7/96	NI
Tire Kingdom	1050 Palm Coast Hwy	CES NNOT	4/14/00	4/14/00
Wal Mart Supercenter #1182	174 Cypress Point Pkwy	CES	1/3/02	NI
Walgreens	1109 Palm Coast Pkwy	SQG	2/19/01	NI
Winn Dixie #2244	111 Flagler Plaza Dr.	SQG	3/5/96	NI
Winn Dixie #2247	1240 W Palm Coast Pkwy	SQG	4/15/96	NI

Source: Florida Department of Environmental Protection - Northeast District, Hazardous Waste Section, Oct. 2002

Explanation

CES = Conditionally Exempt Small Quantity Generator; less than 220 pounds of hazardous waste generated per month.

SQG = Small Quantity Generator; 220-2,200 pounds of hazardous waste generated per month.

LQG = Large Quantity Generator; Greater than 2,200 pounds of hazardous waste generated per month.

NHR = Non-handler (facility that does not generate or handle Hazardous waste).

NNOT = Non-notifier (Facility that do generate Hazardous waste but has not notified)

CLO = Closed/out of business

NI = No records of inspection

The Institutional Control Registry, maintained by FDEP, contains information about all contaminated sites in Florida that are subject to institutional and engineering controls. Examples of such controls include deed restrictions or conservation easements that may restrict land use or prohibit the installation of drinking water wells on the property to eliminate human exposure to residual contamination in the soil and groundwater. Engineering controls may include physical barriers such as surface capping or fencing to restrict access to areas that contain residual soil contamination.

XIV Industrial Wastewater

Flagler County does not have any centralized system in place for the collection or treatment of industrial wastewater. The City of Palm Coast provides utility services to the large industrial users that may have discharges into the centralized system. The City of Palm Coast is authorized to discharge to waters of the State under the National Pollutant Discharge Elimination System (NPDES) program into the Royal Palm Canal via outfall # D-001, which is located upstream of the intersection of the East Hampton Canal. The discharge is rejected concentrate water from the membrane softening system operated at the domestic water treatment plant. As part of the NPDES permit, monitoring of recoverable iron, specific conductance, and chronic toxicity are required. The most recent inspection conducted in 2010 by the State of Florida indicates the facility is operating 'in compliance' with the issued permit and levels of recoverable iron,

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specific conductance, and chronic toxicity are within acceptable levels. Additionally, industrial wastewater discharge to the Intracoastal is permitted from the City's WTP #3.

XV Solid Waste Facilities

The Flagler County Construction and Demolition Debris (Class III) site is located off of Old Kings Road, south of State Road 100. Class III waste is non-putrescible household waste (yard trash, etc.) and construction and demolition debris. There are two other solid waste landfills operated by private providers, Flagler C&D landfill and LCD of Flagler landfill, both of which are located in unincorporated Flagler County. LCD of Flagler, located west of U.S. 1, is a land clearing debris landfill and no other solid waste or hazardous waste is permitted for disposal.

Solid waste and recycling services are subject to interlocal agreement with Volusia County for disposal and private companies for collection. This will not change within the 2010-2015 planning horizon. There is adequate space for the disposal of solid waste at the Volusia County facility and this is anticipated to be the primary source for solid waste disposal until 2035. The County Commission also identified a need to seek out alternative methods of disposal and treatment to reduce the overall impacts to the environment and to provide for alternatives to the Volusia landfill.

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Flagler County Comprehensive Plan 2010-2035

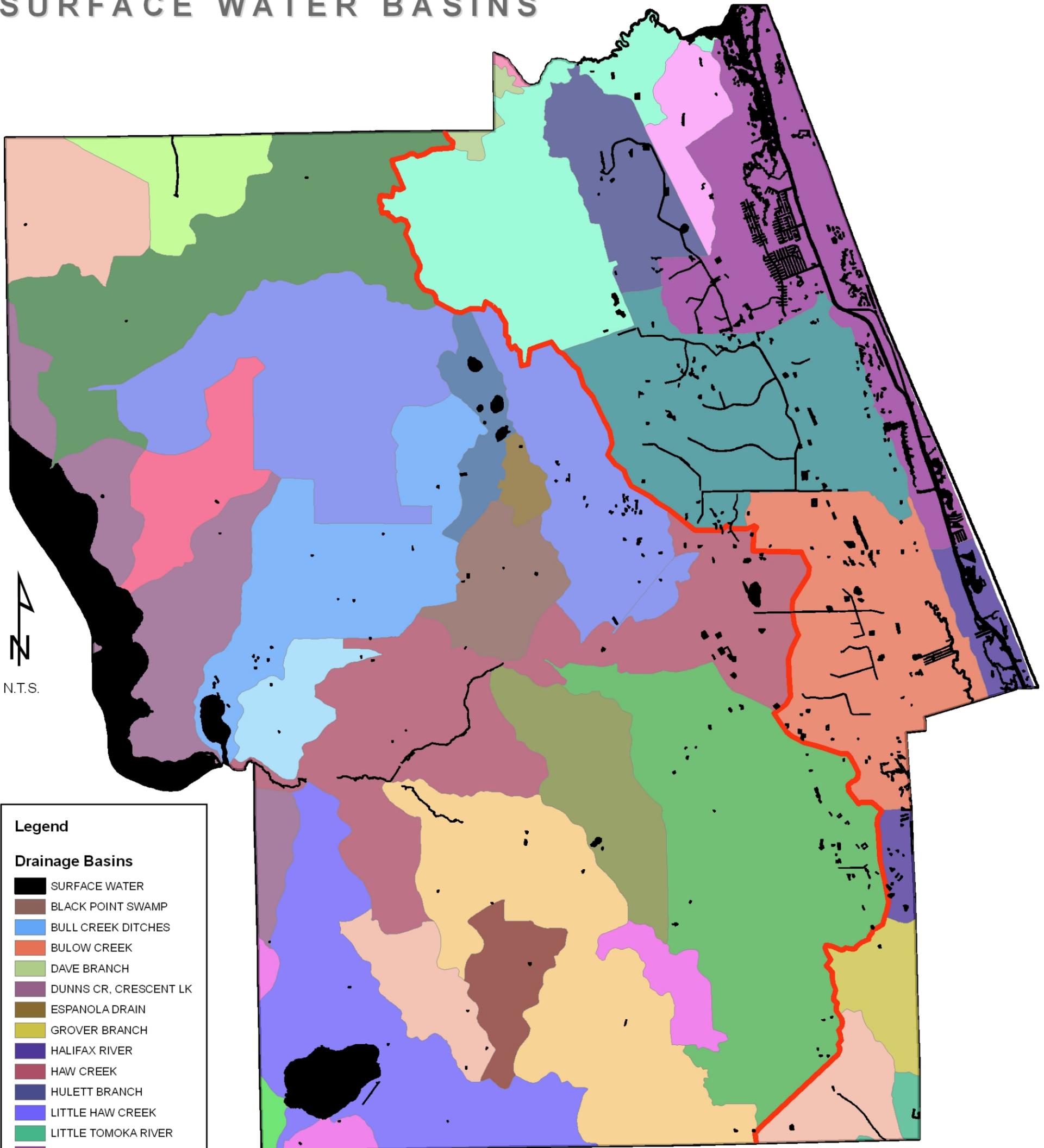
Flagler County Conservation Element Map Series

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SURFACE WATERS & SURFACE WATER BASINS



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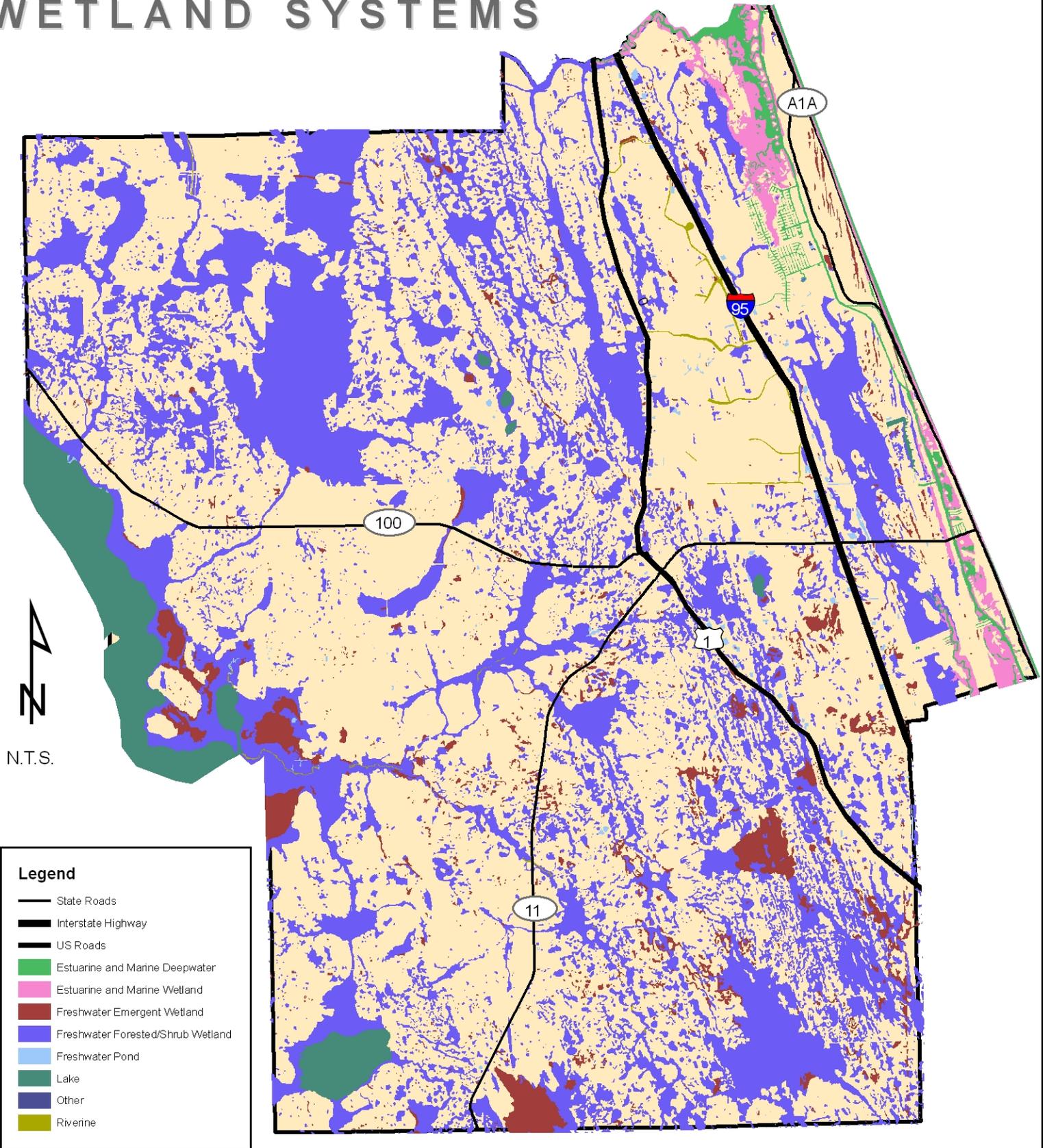
Drainage Basins

- SURFACE WATER
- BLACK POINT SWAMP
- BULL CREEK DITCHES
- BULOW CREEK
- DAVE BRANCH
- DUNNS CR, CRESCENT LK
- ESPANOLA DRAIN
- GROVER BRANCH
- HALIFAX RIVER
- HAW CREEK
- HULETT BRANCH
- LITTLE HAW CREEK
- LITTLE TOMOKA RIVER
- MATANZAS RIVER
- MIDDLE HAW CREEK
- MUD LAKE OUTLET
- PARKER CANAL
- PELLICER CREEK
- SALT CREEK DITCHES
- SAW GRASS BAY
- SIXTEENMILE CREEK
- ST. JOE CANAL
- STEVENS BRANCH
- STYLES CREEK
- SWEETWATER BRANCH
- TANK LAKE OUTLET
- UNNAMED BRANCH
- UNNAMED CANAL
- UNNAMED DITCHES
- UNNAMED SLOUGH
- WHITE OAK SWAMP

Regions to the West of the red line are in the Lower St. Johns River Basin.
Regions to the East of the red line are in the North Coastal Basin.

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NATIONAL WETLANDS INVENTORY WETLAND SYSTEMS

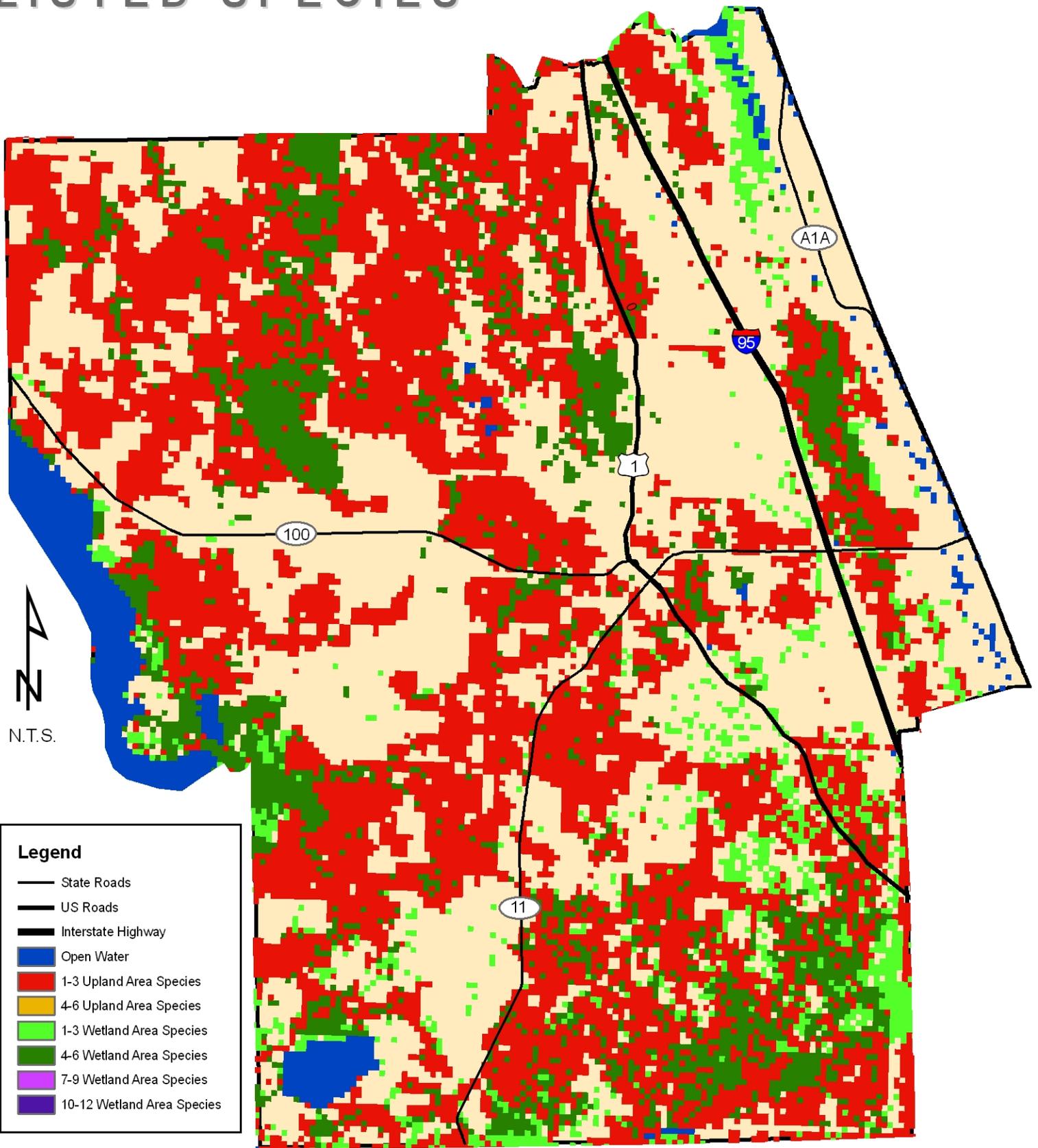


Legend

-  State Roads
-  Interstate Highway
-  US Roads
-  Estuarine and Marine Deepwater
-  Estuarine and Marine Wetland
-  Freshwater Emergent Wetland
-  Freshwater Forested/Shrub Wetland
-  Freshwater Pond
-  Lake
-  Other
-  Riverine

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PRIORITY WETLANDS FOR LISTED SPECIES



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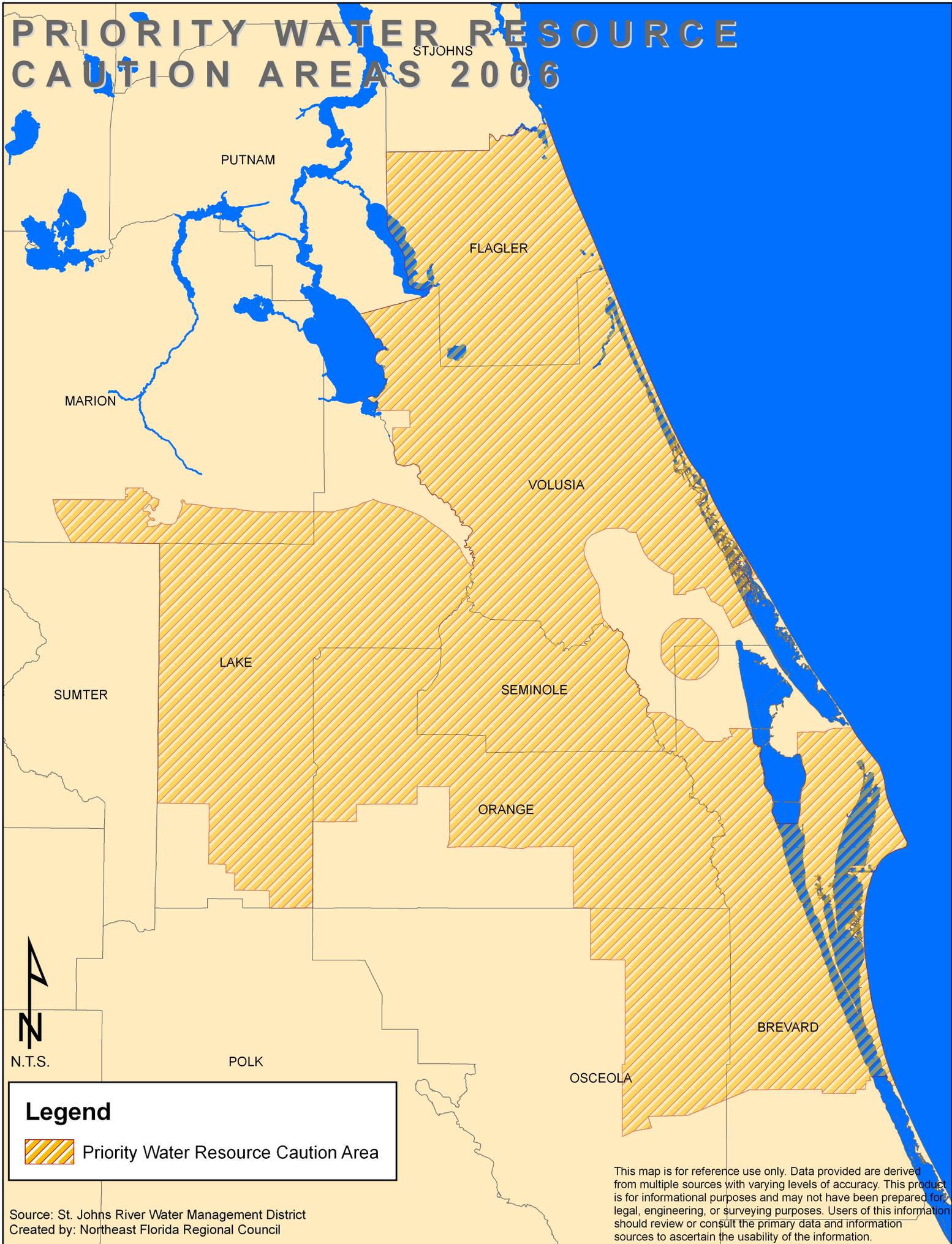
- State Roads
- US Roads
- Interstate Highway
- Open Water
- 1-3 Upland Area Species
- 4-6 Upland Area Species
- 1-3 Wetland Area Species
- 4-6 Wetland Area Species
- 7-9 Wetland Area Species
- 10-12 Wetland Area Species

Source: Florida Geographic Data Library
 Florida Fish and Wildlife Conservation Commission
 Created by: Northeast Florida Regional Council

This map is for reference use only. Data provided are derived from multiple sources with varying levels of accuracy. This product is for informational purposes and may not have been prepared for, legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information.

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PRIORITY WATER RESOURCE CAUTION AREAS 2006

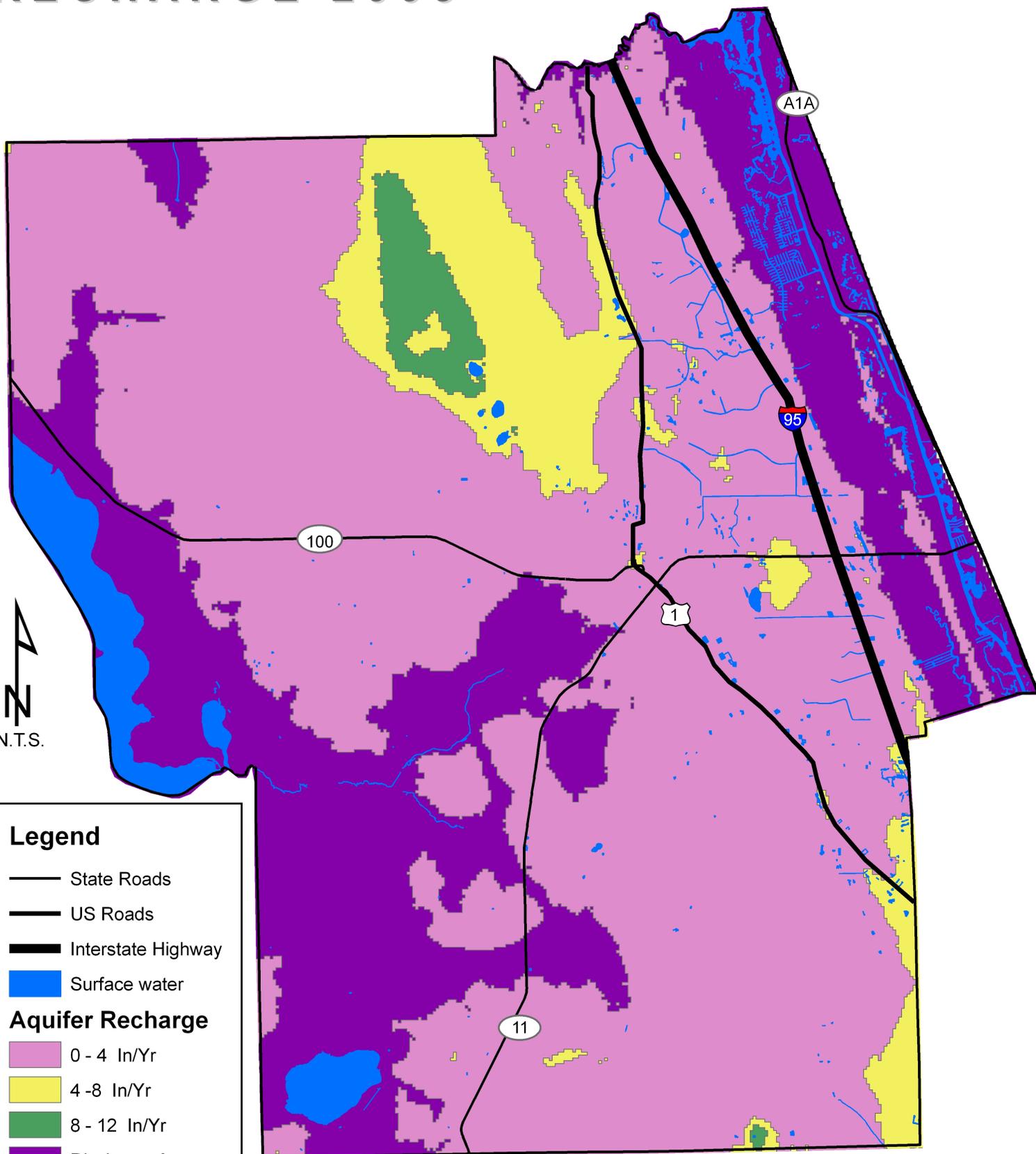


Source: St. Johns River Water Management District
Created by: Northeast Florida Regional Council

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FLORIDAN AQUIFER PRIME RECHARGE 2005



N
N.T.S.

Legend

- State Roads
- US Roads
- Interstate Highway
- Surface water

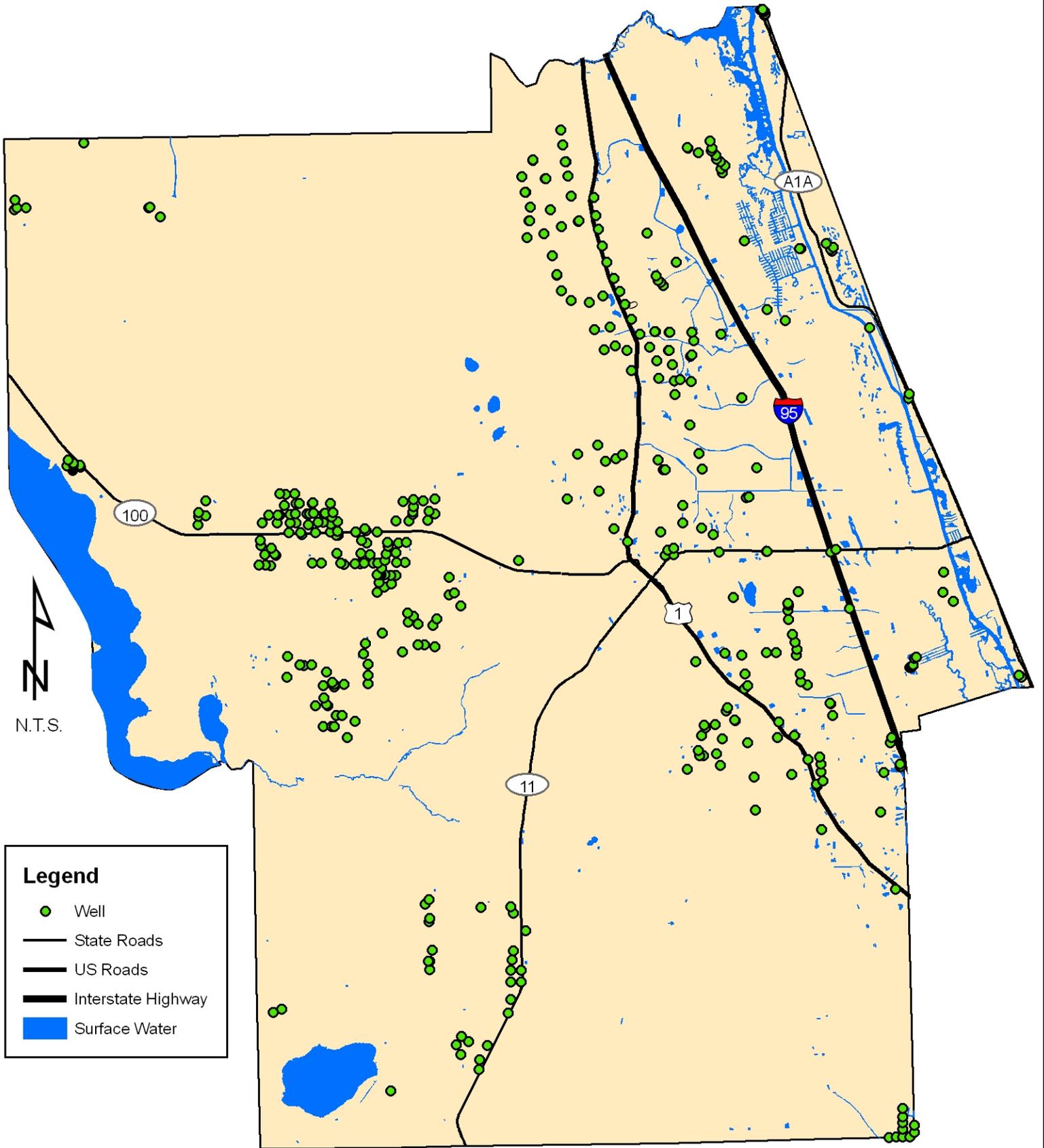
Aquifer Recharge

- 0 - 4 In/Yr
- 4 - 8 In/Yr
- 8 - 12 In/Yr
- Discharge Area

All of Flager County is located within a Priority Water Resource Caution Area

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PUBLIC SUPPLY WELLS 2007

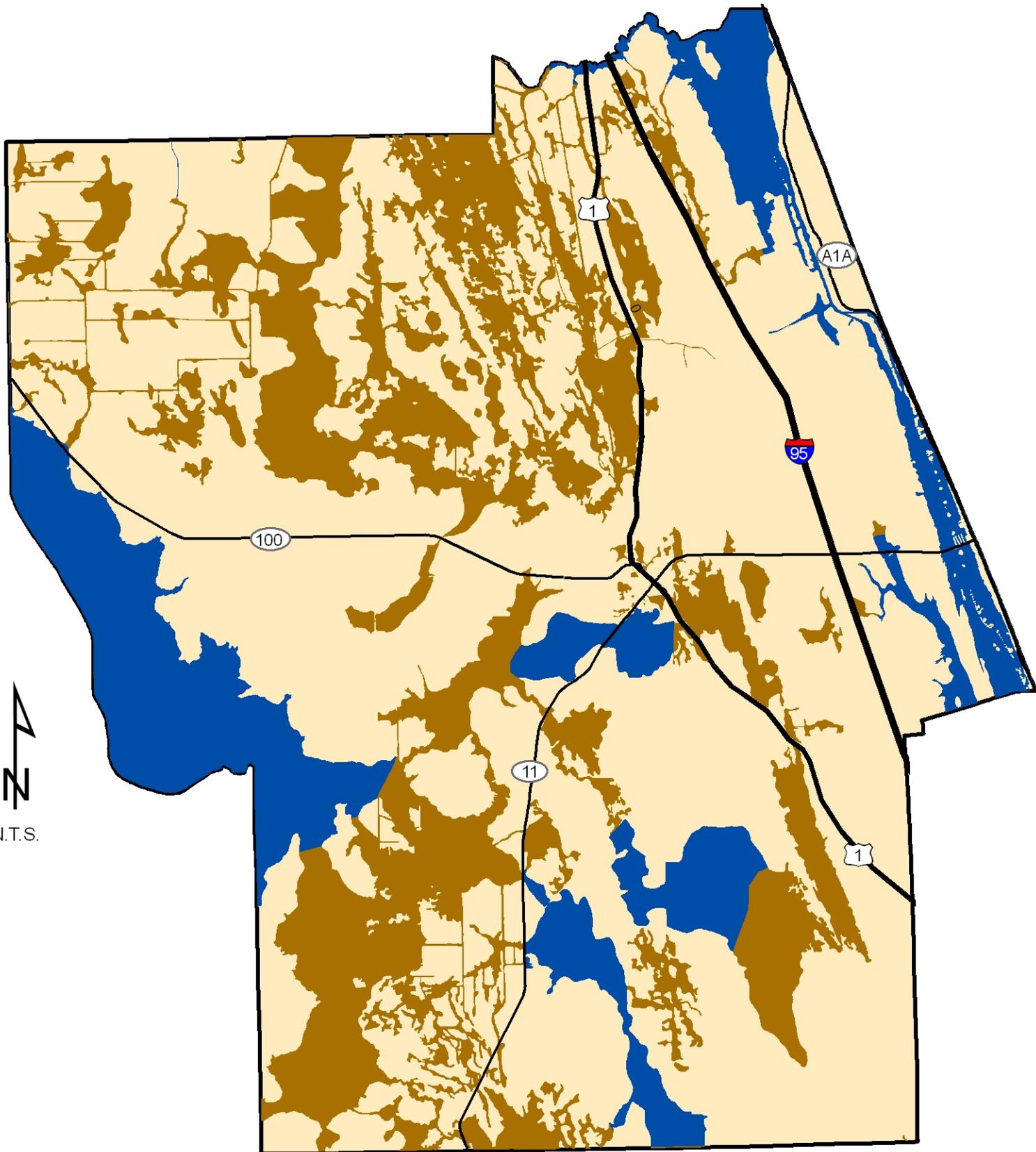


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- Well
- State Roads
- US Roads
- Interstate Highway
- Surface Water

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100 YEAR FLOODPLAIN MAP



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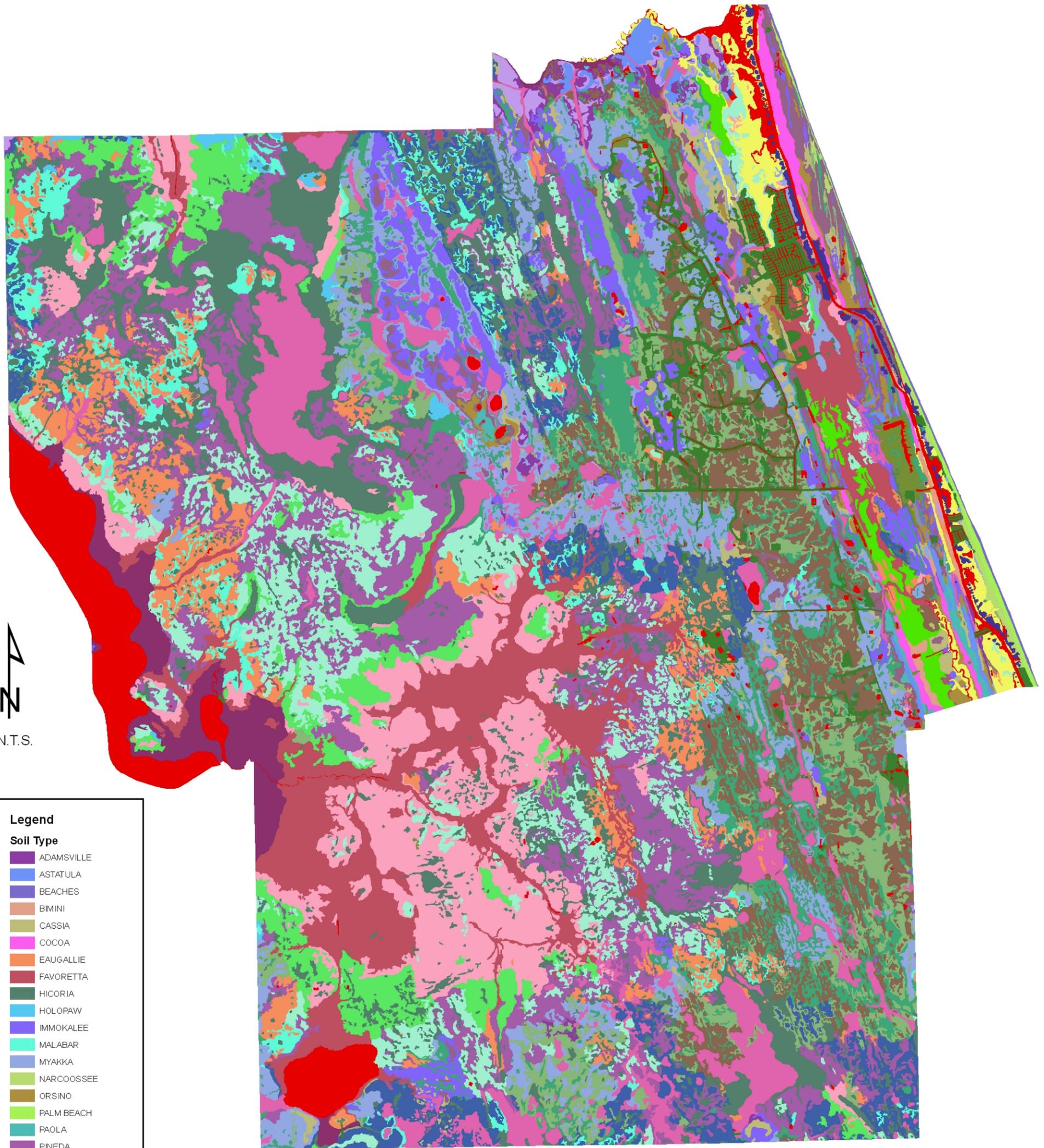
-  Determined Base Flood Elevations
-  No Base Flood Elevations Determined

Source: Federal Emergency Management Agency
Created by: Northeast Florida Regional Council

This map is for reference use only. Data provided are derived from multiple sources with varying levels of accuracy. This product is for informational purposes and may not have been prepared for, legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information.

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GENERAL SOIL MAP



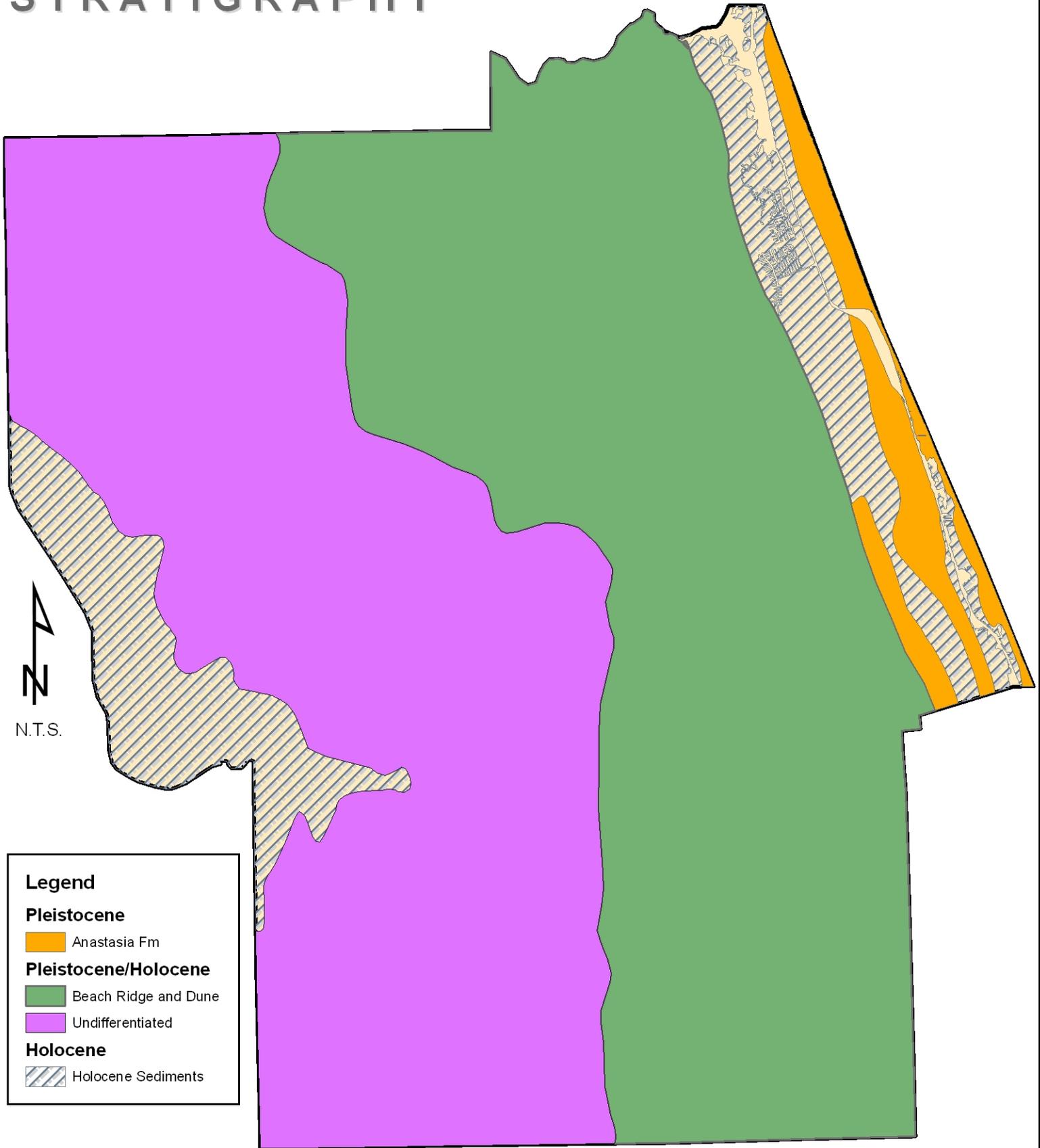
Legend

Soil Type

ADAMSVILLE
ASTATULA
BEACHES
BIMINI
CASSIA
COCOA
EAUGALLIE
FAVORETTA
HICORIA
HOLOPAW
IMMOKALEE
MALABAR
MYAKKA
NARCOOSSEE
ORSINO
PALM BEACH
PAOLA
PINEDA
PITS
PLACID
POMELLO
POMONA
QUARTZIPSAMMENTS
RIVIERA
SAMSULA
SMYRNA
TAVARES
TERRA CEIA
TURNBULL
TUSCAWILLA
UDARENTS
VALKARIA
WABASSO
WATER
WINDER

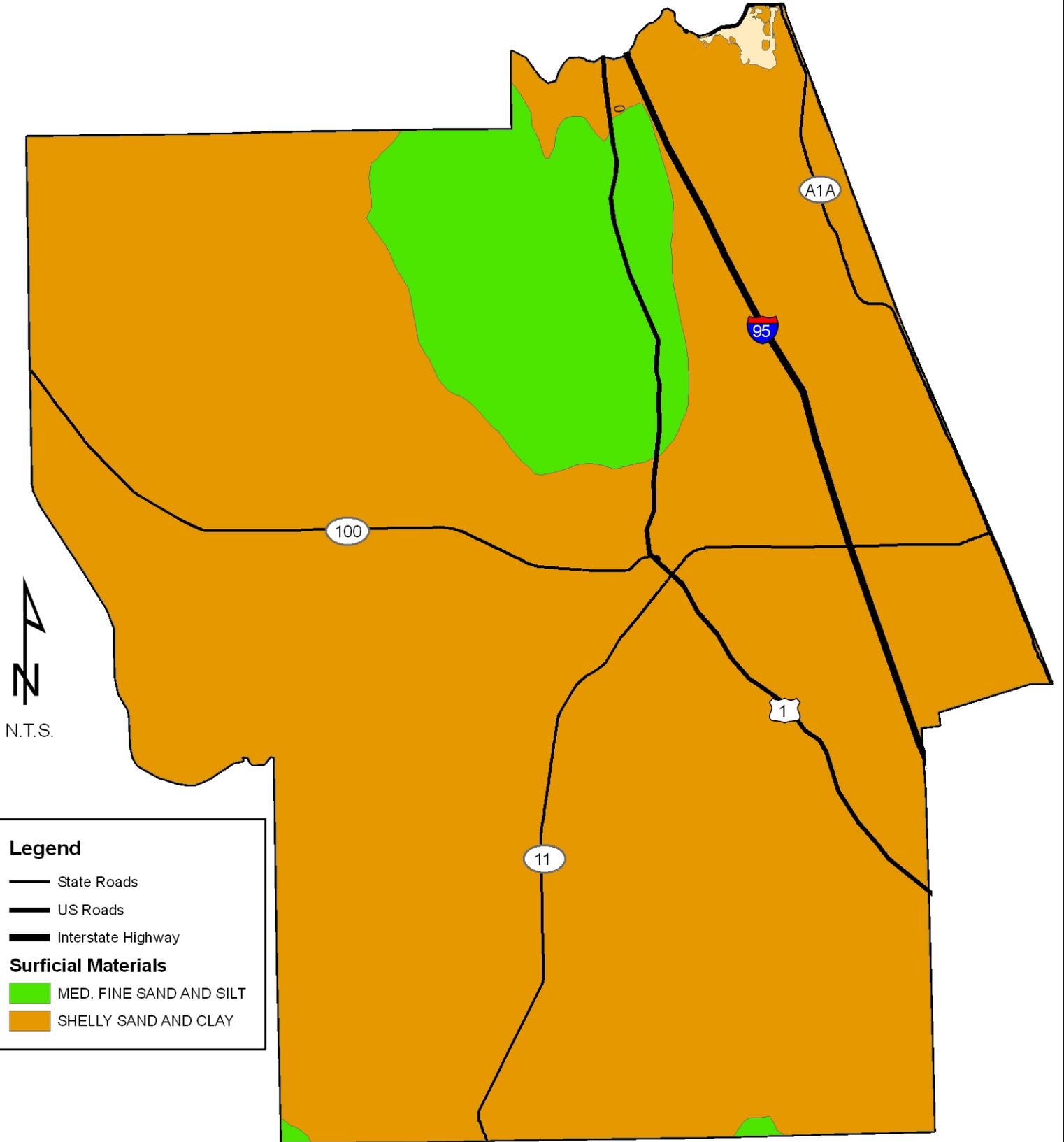
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ROCK AND MINERAL RESOURCES STRATIGRAPHY



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ROCK AND MINERAL RESOURCES SURFICIAL MATERIALS



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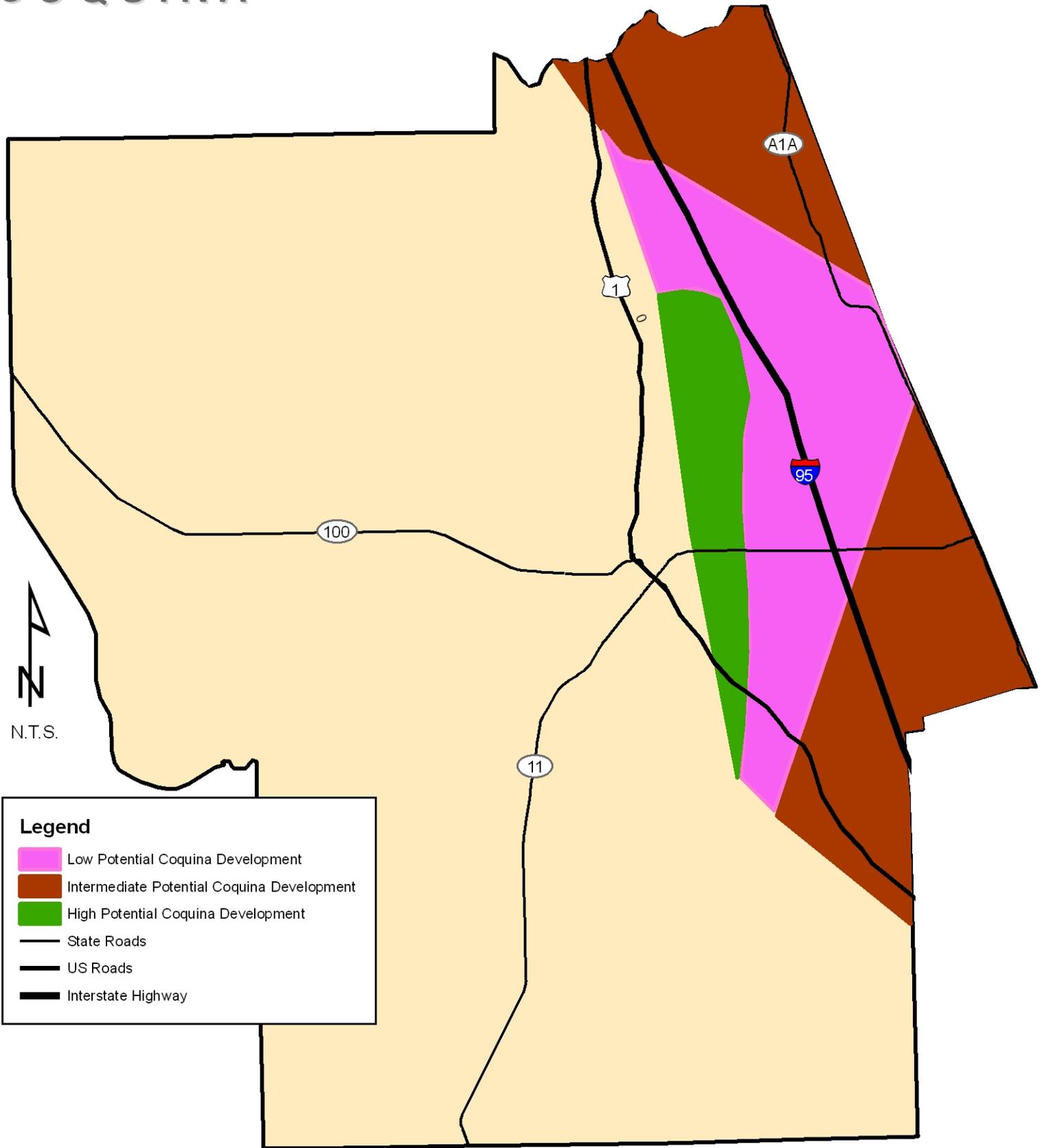
- State Roads
- US Roads
- Interstate Highway

Surficial Materials

- MED. FINE SAND AND SILT
- SHELLY SAND AND CLAY

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ROCK AND MINERAL RESOURCES COQUINA

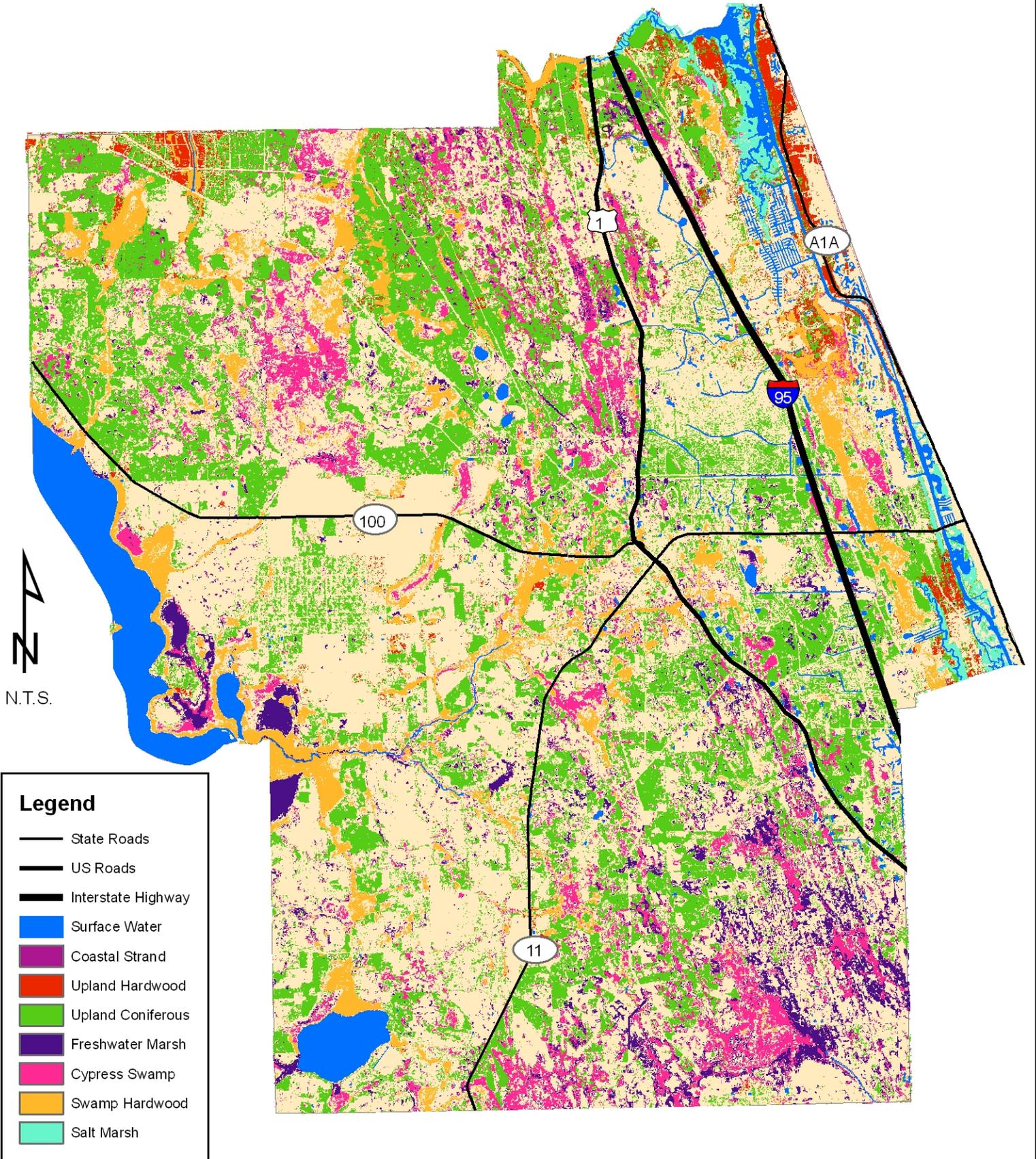


Legend

- Low Potential Coquina Development
- Intermediate Potential Coquina Development
- High Potential Coquina Development
- State Roads
- US Roads
- Interstate Highway

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ECOLOGICAL COMMUNITIES 2004 HABITAT & LANDCOVER

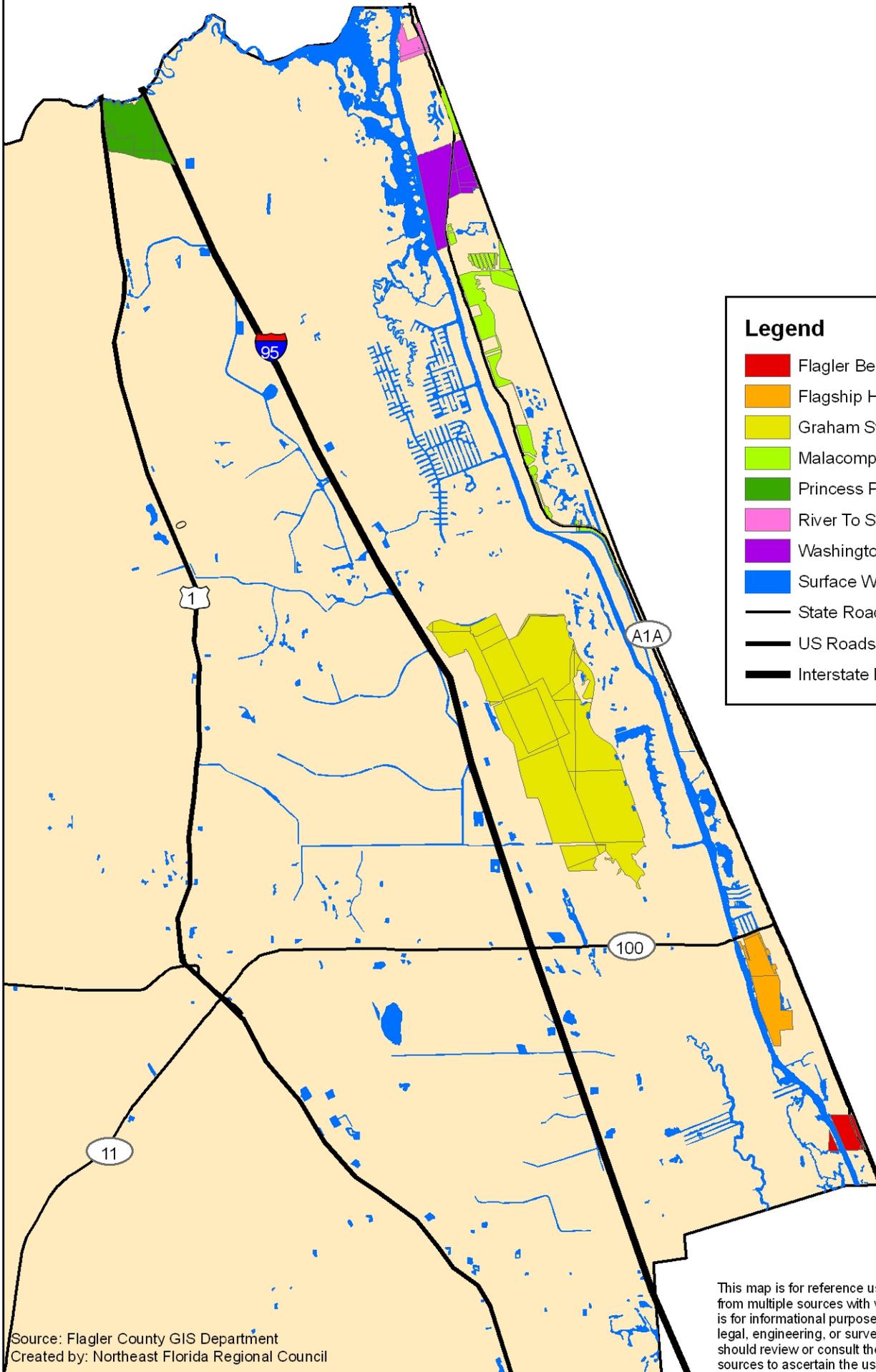


Legend

-  State Roads
-  US Roads
-  Interstate Highway
-  Surface Water
-  Coastal Strand
-  Upland Hardwood
-  Upland Coniferous
-  Freshwater Marsh
-  Cypress Swamp
-  Swamp Hardwood
-  Salt Marsh

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COASTAL GREENWAYS

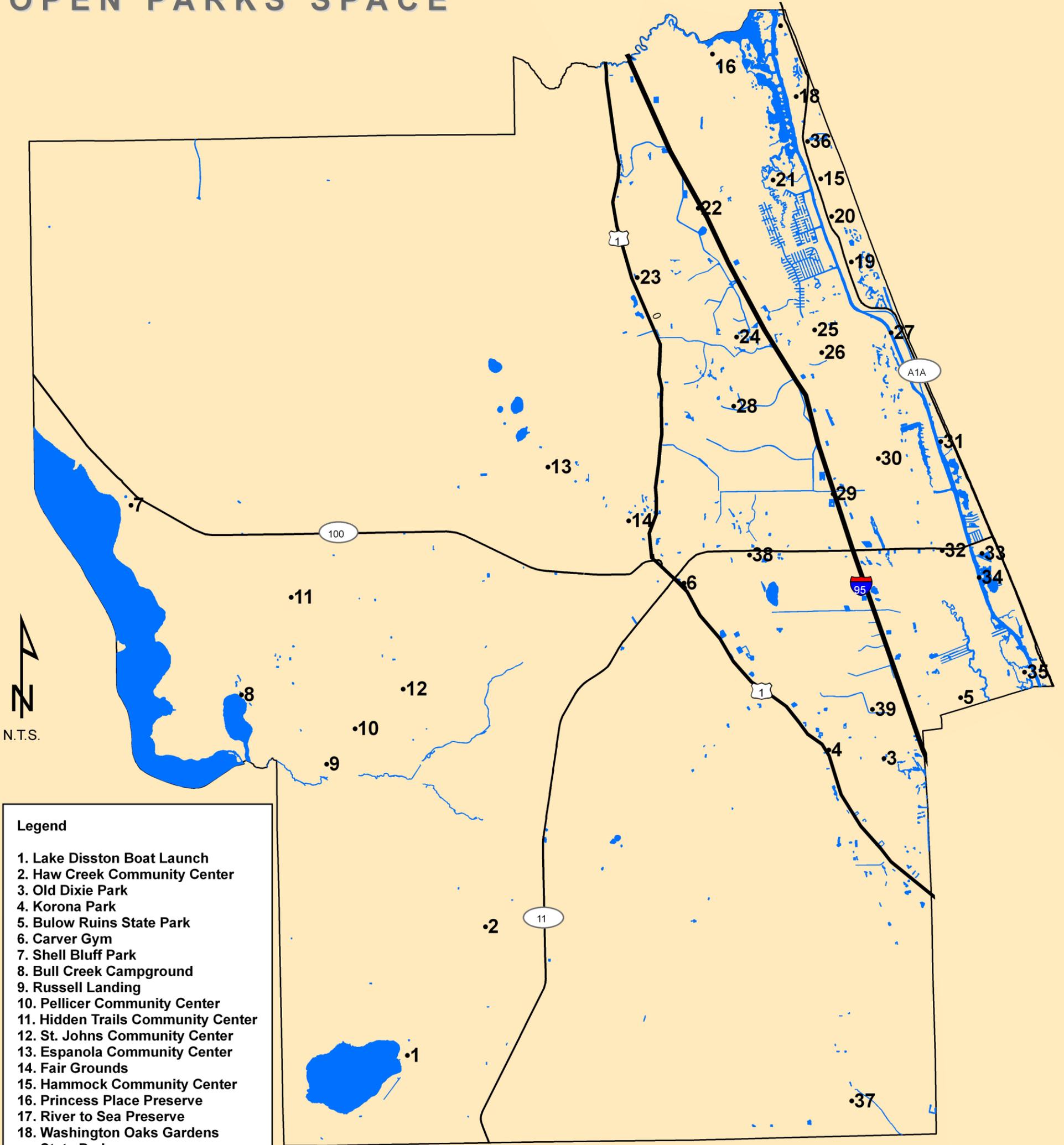


Legend

- Flagler Beach State Park
- Flagship Harbor Conservation Area
- Graham Swamp
- Malacompra Greenway
- Princess Place
- River To Sea
- Washington Oaks State Park
- Surface Water
- State Roads
- US Roads
- Interstate Highway

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EXISTING RECREATION AND OPEN PARKS SPACE



Legend

1. Lake Disston Boat Launch
2. Haw Creek Community Center
3. Old Dixie Park
4. Korona Park
5. Bulow Ruins State Park
6. Carver Gym
7. Shell Bluff Park
8. Bull Creek Campground
9. Russell Landing
10. Pellicer Community Center
11. Hidden Trails Community Center
12. St. Johns Community Center
13. Espanola Community Center
14. Fair Grounds
15. Hammock Community Center
16. Princess Place Preserve
17. River to Sea Preserve
18. Washington Oaks Gardens State Park
19. Jungle Hut Park
20. Old Salt Road Park
21. Bings Landing
22. Bird of Paradise
23. Indian Trails Sports Complex
24. James F. Holland Memorial Park
25. Palm Coast Community Center
26. Palm Coast Linear Park
27. Varn Park
28. Belle Terre Park
29. Lehigh Rail Trail
30. Graham Swamp
31. Herschel King Park
32. Wadsworth Park
33. Betty Stefflick Park
34. Moody Boat Launch
35. Gamble Rogers Memorial State Recreation Area
36. Mala Compra Park
37. Relay Wildlife Management Area
38. Moody Homestead
39. Seminole Woods Park

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