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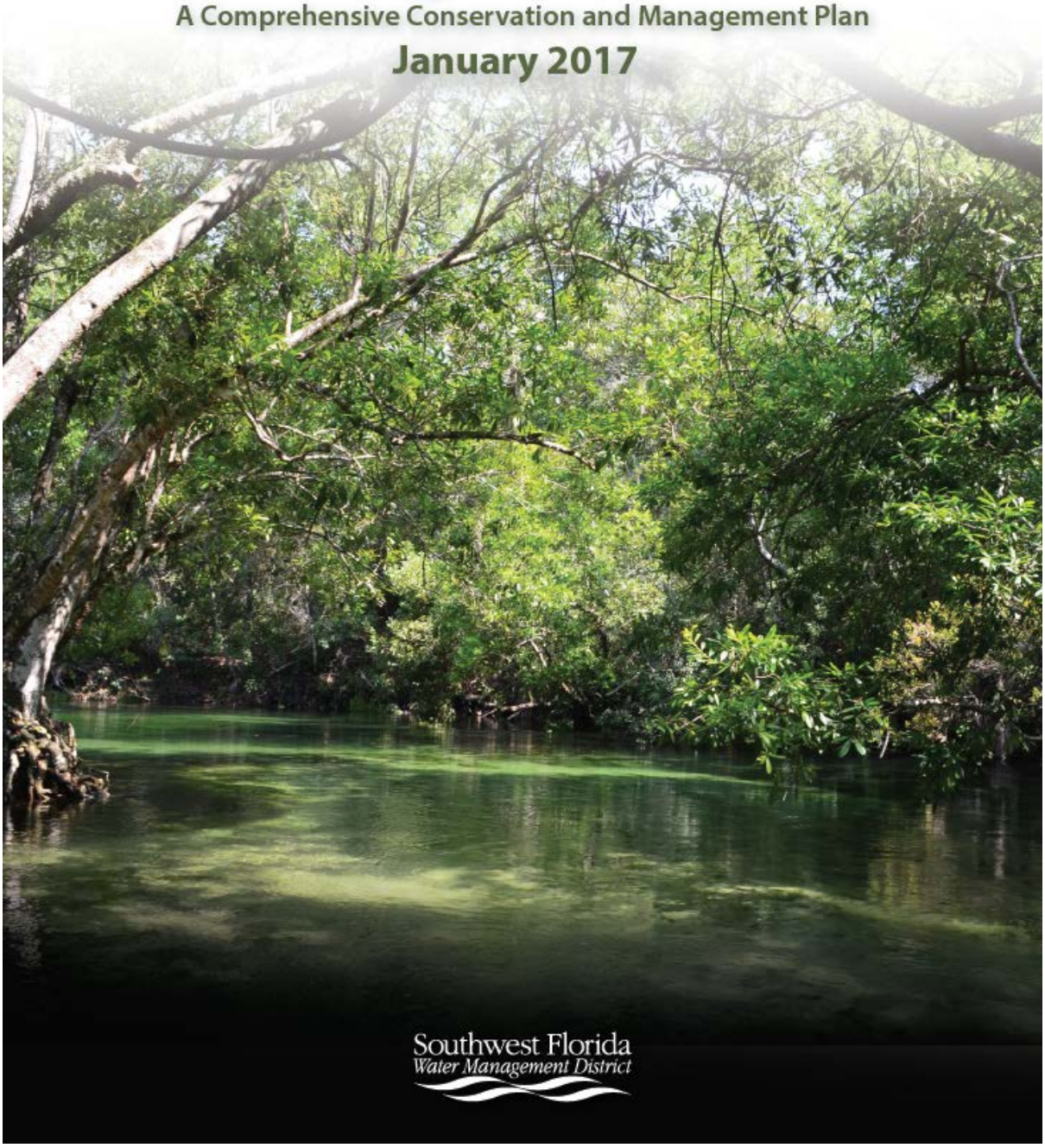
Weeki Wachee Surface Water Improvement and Management (SWIM) Plan

A Comprehensive Conservation and Management Plan

January 2017



Southwest Florida
Water Management District

Springs Coast Steering Committee Members

Each spring system in the Springs Coast region is a unique, complex system with different sets of challenges. To address these issues, the Springs Coast Steering Committee (SCSC) was formed of local, regional and state agencies. The first goal of the SCSC is to develop management plans tailored for each spring system to identify issues, objectives, projects and responsibilities. This document serves as satisfaction of that first goal for the Weeki Wachee River.

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Executive Summary

The Weeki Wachee River is located in Hernando County, approximately 40 miles north of Tampa, Florida. The Weeki Wachee River starts at Weeki Wachee Spring and flows approximately 7 river miles to the Gulf of Mexico. Over the past hundred years, the spring and river have experienced significant ecological shifts, caused by both natural variability and human activities.

In 1987, the Florida Legislature created the Surface Water Improvement and Management (SWIM) Act to protect, restore, and maintain Florida's highly threatened surface water bodies. Under this act, the state's five water management districts identify a list of priority water bodies within their authority and implement plans to improve them. In January 2014, the Governing Board of the Southwest Florida Water Management District approved the inclusion of the Weeki Wachee River as a SWIM Priority Water Body. This plan is the first SWIM plan for this system and within the framework of the Springs Coast Steering Committee (SCSC), Springs Coast Management Committee (SCMC), and Technical Working Group (TWG), takes a much broader approach than traditional SWIM plans by identifying management actions and projects from a wide variety of stakeholders. It is only through this consensus-building process that the Weeki Wachee River can adequately be protected and restored for generations to come. Recognizing that one entity alone cannot do it all, the most important element of this plan is the consensus and partnerships that came together and made this plan a reality.

This SWIM plan lays out a restoration and management strategy for the Weeki Wachee River. It is a road map, a living document with adaptive management at its core. As such, this document will be revised periodically to assess overall progress in meeting quantifiable objectives. The goal of this plan is to identify and implement management actions and projects that address the major issues facing the Weeki Wachee River, and to restore, maintain, and preserve the ecological balance of the system. The primary issues facing this system as identified in this plan are:

- Nitrate Enrichment
- Potential Decrease in Historical Flows
- Altered Aquatic Vegetation
- Sedimentation

To address these issues and their drivers, this plan presents several management actions and specific projects supporting those management actions that fall within one of three focus areas:

- Water Quality
- Water Quantity
- Natural Systems (Habitat)

The Weeki Wachee River SWIM plan includes numeric targets called quantifiable objectives. If these objectives are achieved, the expected result is a healthy spring ecosystem. These are long term goals that are being used to develop and prioritize management actions and projects, thus promoting effective and efficient resource management. Table 1 describes the quantifiable objectives for each of the three focus areas: water quality, water quantity, and natural systems.

Table 1: Quantifiable Objectives

Water Quality	**Target**
Water clarity – river average	>50 feet[1]
Water clarity – near the headspring	>120 feet[1]
Nitrate concentration in the river	<0.20 mg/L[2]
Water Quantity	
Minimum flow for the river system	>90% natural flow[3]
Natural Systems	
Coverage of desirable submerged aquatic vegetation in the river	>40%[4]
Coverage of invasive aquatic vegetation (including filamentous algae) in the river	<10%[4]

[1] Based on data presented in Figure 15
[2] Dodson and Bridger 2014 – Nutrient TMDLs for Weeki Wachee Spring and Weeki Wachee River (WBIDs 1382B and 1382F)
[3] SWFWMD 2008 – Weeki Wachee River Recommended Minimum Flows and Levels
[4] Based on data presented in Figure 21

To achieve these quantifiable objectives, the SCSC has identified numerous management actions categorized under three broad focus areas of Water Quality, Water Quantity, and Natural Systems. Further, the SCSC has identified 83 ongoing and proposed projects that meet one or more management actions. Of the 35 proposed projects, the SCSC identified 26 proposed priority projects that are included in the body of this plan with the remaining 9 listed in the Appendix F.

The water quality management actions and projects are primarily focused on reducing nitrogen from the sources identified by FDEP during the BMAP process. The SCSC recognizes that **Septic Tanks**, **Urban/Residential Fertilizer**, and **Agricultural Operations** are the priority water quality management action categories for the Weeki Wachee River. This SWIM plan includes 19 ongoing and 11 proposed priority projects to address water quality issues in the Weeki Wachee River (Figure 1).

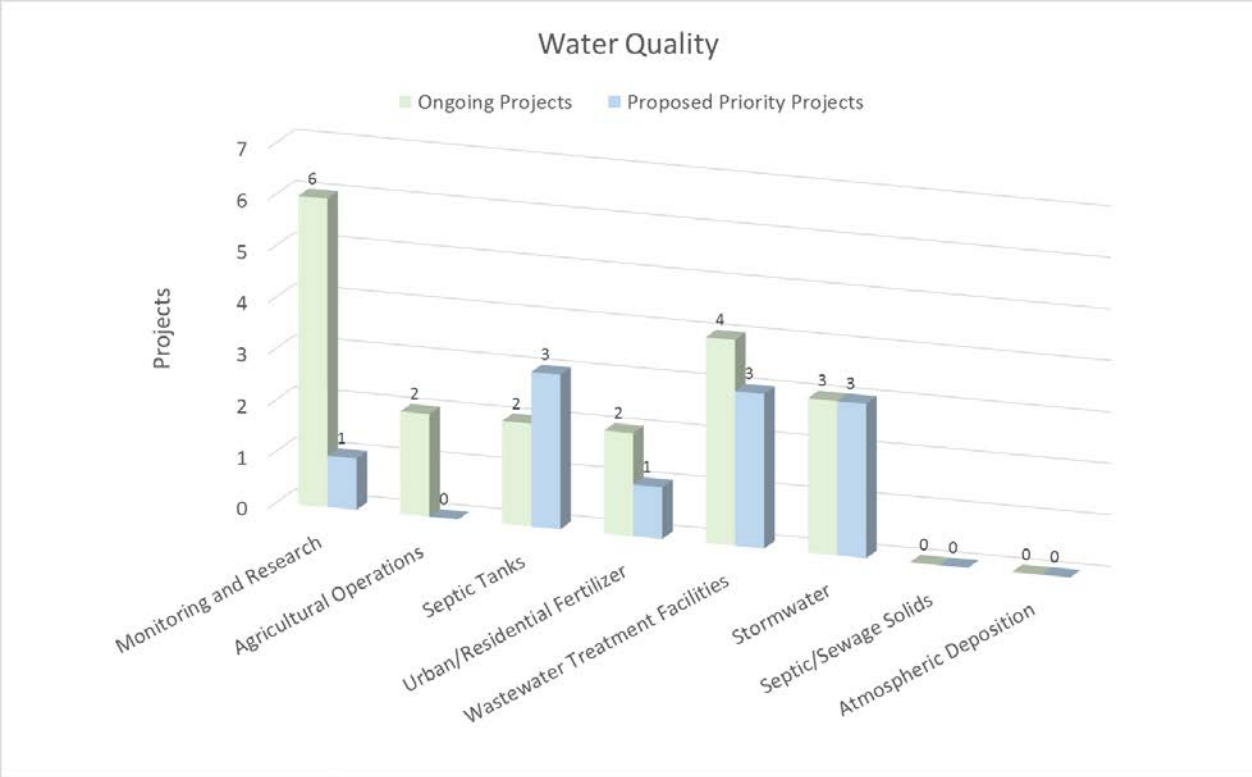


Figure 1: Water Quality Projects by Management Action Category

The water quantity management actions and projects are intended to protect and maintain flow in the springs that feed the Weeki Wachee River. The SCSC recognizes that **Conservation** and **Alternative Water Supply** are the priority water quantity management action categories for the Weeki Wachee River. This SWIM plan includes 23 ongoing and 5 proposed priority projects to address water quantity (Figure 2).

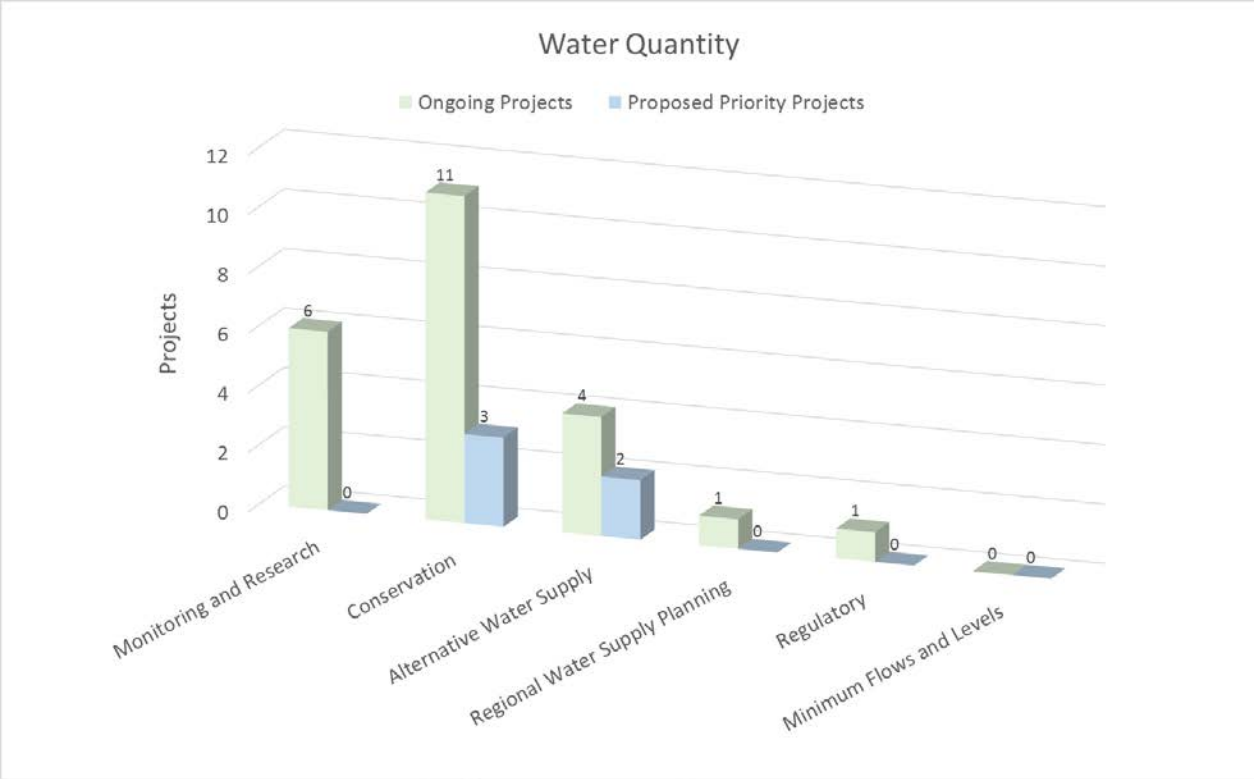


Figure 2: Water Quantity Projects by Management Action Category

The natural systems management actions and projects are focused directly on the restoration and protection of the diverse fish and wildlife habitat of the Weeki Wachee River. The SCSC recognizes that **Habitat Restoration** and **Recreation Management** are the priority natural systems management action categories for the Weeki Wachee River. The SWIM plan includes 6 ongoing and 10 proposed priority projects to address natural systems issues (Figure 3).

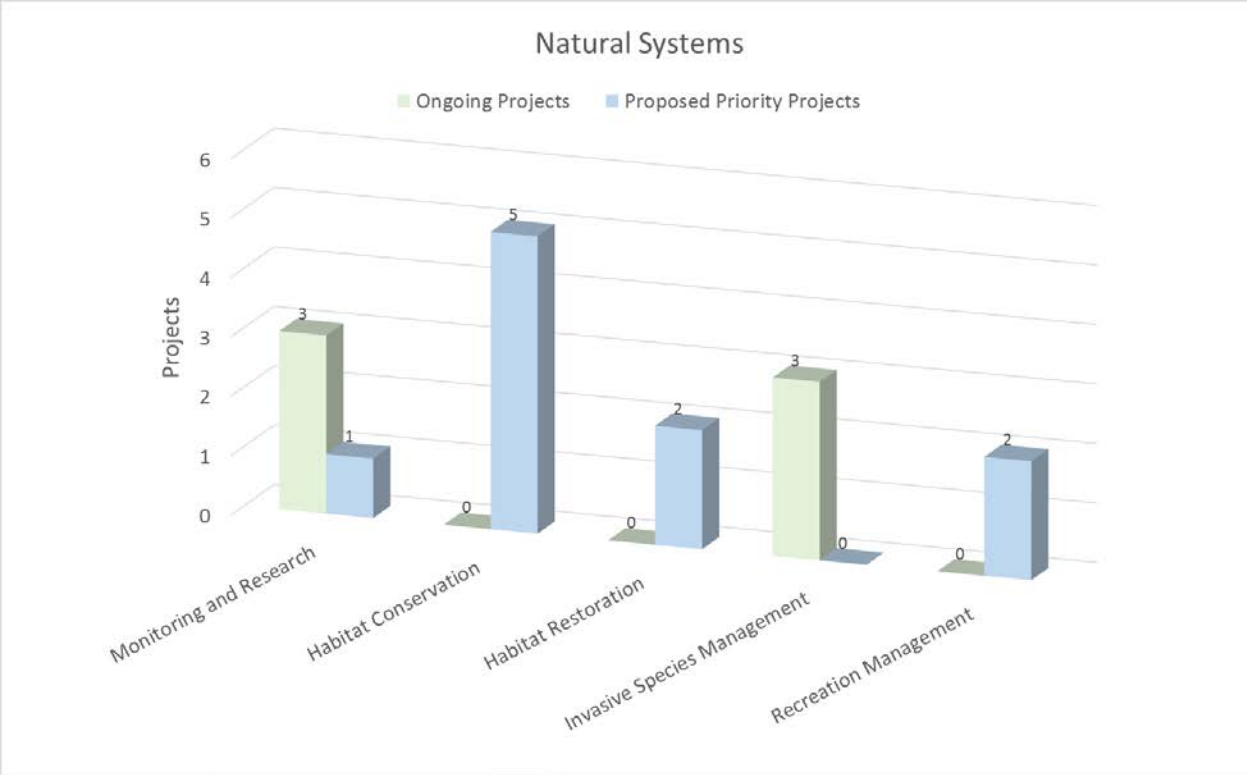


Figure 3: Natural Systems Projects by Management Action Category

Introduction

The Springs Coast

While recognizing the need to manage all springs, priority is placed on the five first-magnitude spring groups: Rainbow, Crystal River/Kings Bay, Homosassa, Chassahowitzka, and Weeki Wachee (Figure 4). These spring groups are located in an area known as the Springs Coast and collectively discharge more than 800 million gallons per day.

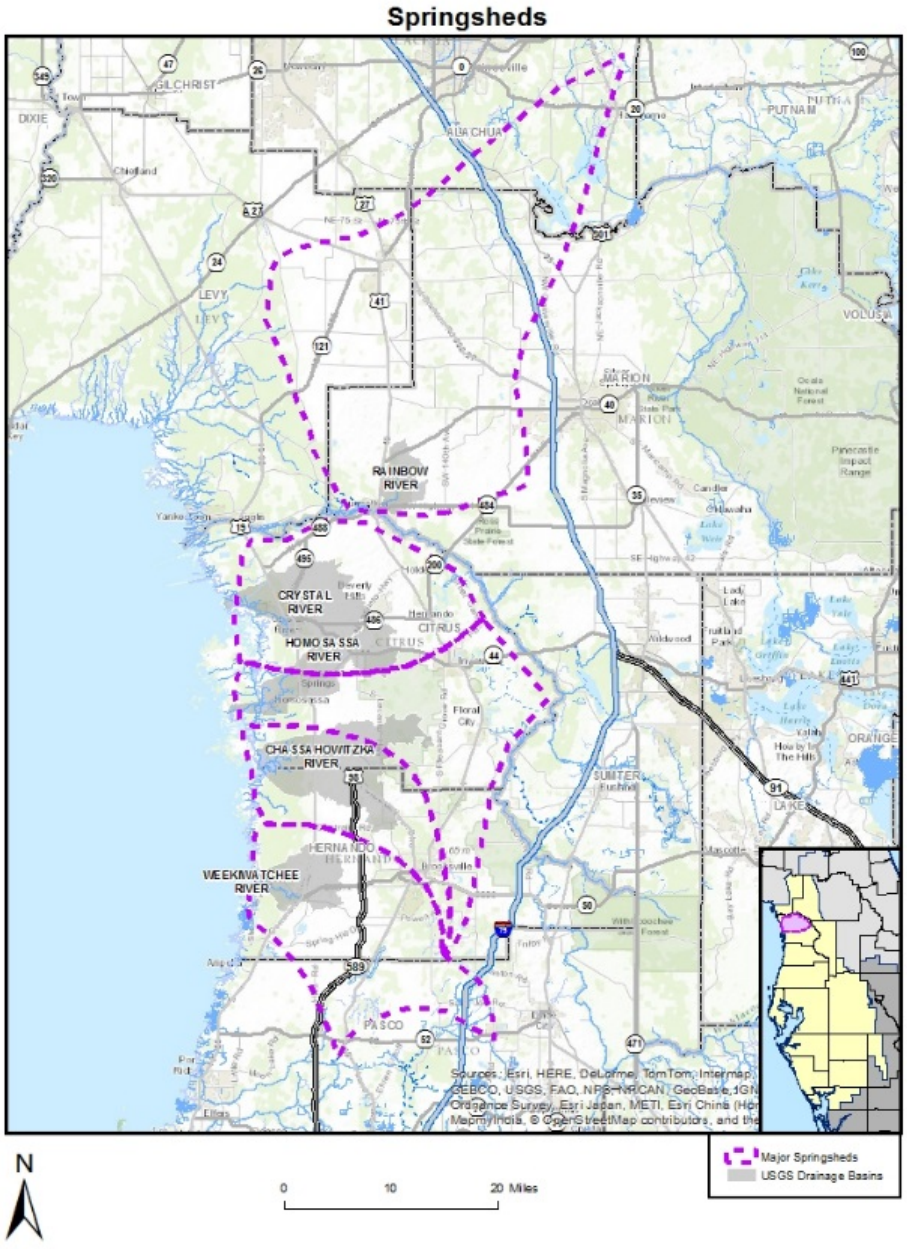


Figure 4: SWFWMD Major Springsheds

The source of spring discharge for the Weeki Wachee River is from groundwater in the aquifer, which is replenished by seasonal rainfall that soaks into the ground. Another source of water to the river is surface water flow within the area known as the watershed. The area of land that contributes rainfall to a spring is referred to as a springshed, which extends much farther than just the land immediately surrounding a spring. Unlike watershed boundaries, springshed boundaries are mostly defined from maps of the potentiometric surface of the Upper Floridan aquifer and can shift slightly from year to year based on rainfall patterns and aquifer levels.

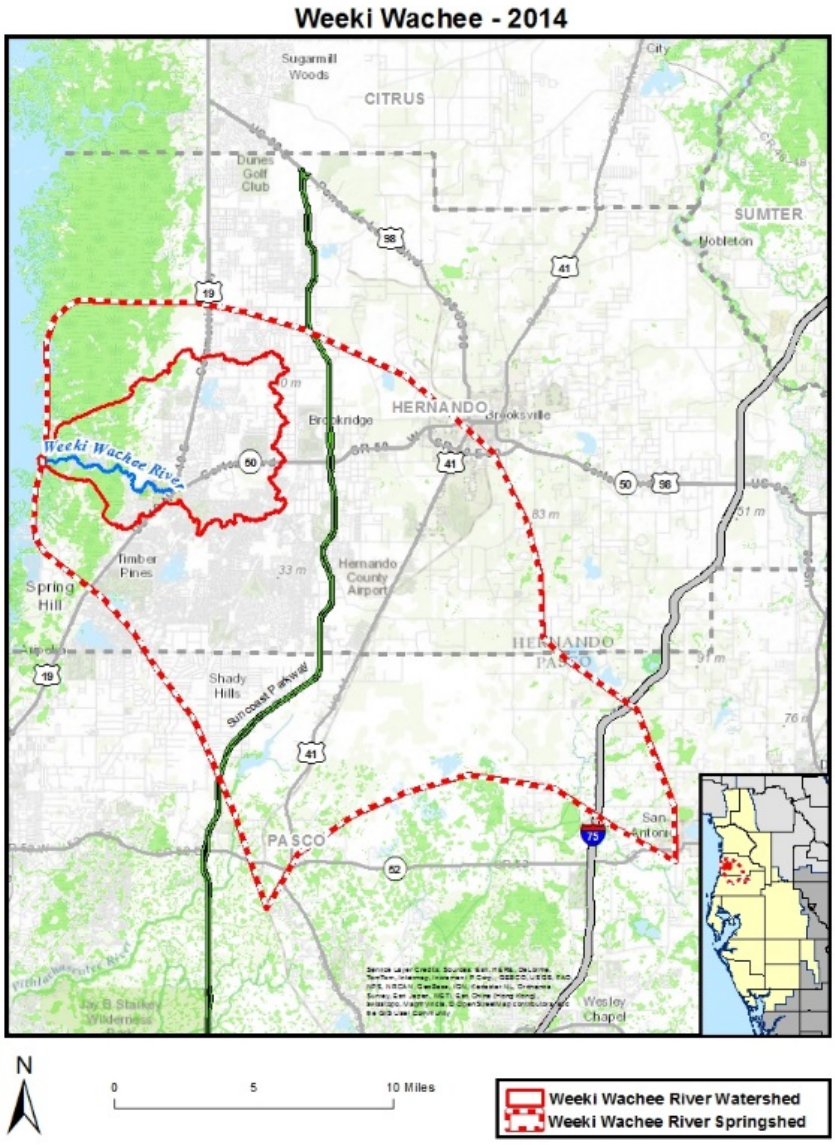


Figure 5: Weeki Wachee Watershed and Springshed Boundaries

The planning boundary for the Weeki Wachee River encompasses both the surface watershed as defined by the United States Geological Survey (USGS) and the much larger springshed as defined by the Southwest Florida Water Management District (SWFWMD) (Figure 5). Both areas must be considered when evaluating an effective plan for impacts to the system since both areas have direct impacts to the spring system.

Springs Coast Steering & Management Committees

Each spring system in the Springs Coast region is a unique, complex system with different sets of challenges, so each one will require different management techniques. In August 2014, the SWFWMD along with local, regional and state agencies formed the Springs Coast Steering Committee (SCSC). The members of this committee are listed in Table 2 below.

Table 2: Members of the Springs Coast Steering Committee

Organization	Representative	Title
City of Crystal River	Robert Holmes	City Council Member
Citrus County	Scott Carnahan	County Commissioner
Hernando County	Nick Nicholson	County Commissioner
Marion County	Kathy Bryant	County Commissioner
FDEP	Tom Frick	Environmental Assessment and Restoration Division, Director
FFWCC	Shannon Wright	Northeast Regional Director
FDACS	Steven Dwinell	Office of Agricultural Water Policy, Director
Pasco County	Mike Moore	County Commissioner
SWFWMD	Kelly Rice	Governing Board Member, Chair

To assist in the effort, the SCSC created the Springs Coast Management Committee (SCMC) to review technical data and make recommendations to the SCSC. The SCMC is composed of representatives from the founding organizations of the SCSC, along with other involved stakeholder groups. The members of this committee are listed in Table 3 below:

Table 3: Members of the Springs Coast Management Committee

Organization/Interest	Representative	Title
City of Crystal River	Dave Burnell	City Manager
Citrus County	Ken Cheek	Director of Water Resources
Hernando County	Alys Brockway	Water Resource Manager
Marion County	Tracy Straub	Utilities Director
Pasco County	Flip Mellinger	Assistant County Administrator, Utilities
FDEP	Rick Hicks	Professional Geologist
FFWCC	Kevin Kemp	Biologist
FDACS	Ray Scott	Office of Agricultural Water Policy, Deputy Director
SWFWMD	Michael Molligan	Public Affairs Assistant Bureau Chief
Agriculture	Curt Williams	Florida Farm Bureau, Assistant Director of Government Affairs
Public Supply	Richard Owen	Withlacoochee Regional Water Supply Authority (WRWSA), Executive Director
Environmental	Charles Lee	Audubon Society, Director of Advocacy
Regional Planning Council	Heather Young	Tampa Bay Regional Planning Council, Senior Environmental Planner
Industry	David Bruzek	Duke Energy, Lead Environmental Specialist
Academia	Dr. Mahmood Nachabe	University of South Florida
State Parks	Rick Owen	Florida State Parks

The Springs Coast Steering and Management Committee's mission is to build consensus and partnerships to restore and protect our Springs Coast through effective implementation of system-specific, scientifically sound, and community-based management plans. Modeled after the National Estuary Programs (NEP), like Tampa Bay, the first goal of the SCSC is to develop Comprehensive Conservation and Management Plans tailored for each of the five first-magnitude spring systems (Rainbow River, Crystal River/Kings Bay, Homosassa River, Chassahowitzka River, and Weeki Wachee

River). These plans will be living documents identifying issues, solutions, costs and responsibilities to ensure the region's long-term sustainability.

Springs Coast Technical Working Group

To further assist the SCSC, the Technical Working Group (TWG) was assembled, and is an informal group of stakeholders whose primary charge is to engage at the technical level to develop the management plans. The TWG consists of participants from federal, state, regional, and local governments, private industry, academia, and non-governmental organizations (see Appendix A for participant list).

The SCSC and SCMC requested the TWG focus on three key elements: Water Quality, Water Quantity, and Natural Systems. While these are interdependent, for the purpose of writing the management plans, each of these elements was considered individually.

The SWIM Act & SWIM Priority Water Bodies

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

Under the Act, water management districts identify water bodies for inclusion into the program based on their regional significance and their need for protection and/or restoration. This process is carried out in cooperation with the Florida Department of Environmental Protection (FDEP), the Florida Fish and Wildlife Conservation Commission (FFWCC), the Florida Department of Agriculture and Consumer Services (FDACS) and local governments. Weeki Wachee River was named a SWIM priority water body in 2014.

In accordance with the SWIM Act, once a water body is selected, a SWIM plan must be adopted by the water management district's governing board and approved by the FDEP. Before the SWIM plan can be adopted, it must undergo a review process involving the required state agencies. The purpose of

this Weeki Wachee River SWIM plan is to set forth a course of action by identifying the quantity, scope, and required effort of projects appropriate for the system, while considering the levels of funding.

What Makes a Healthy Spring?

There are three attributes that are common to a healthy river and the springs that feed it and can be used to assess their condition: water quality, flow and discharge (water quantity), and fish and wildlife habitat (natural systems).

The quality of water is a key attribute of the ecology and aesthetics of the river, especially with regard to clarity, nutrients, and salinity. A defining characteristic of many Florida springs is exceptionally clear water, which is a primary driver of the productive aquatic vegetation that supports spring ecosystems. Nutrients control many ecological processes and may lead to imbalances of flora and fauna at elevated levels, particularly when natural flow is diminished simultaneously with increased nutrient loading. For the coastal spring systems, salinity variation has a major influence on the type and abundance of organisms that live in these historically freshwater ecosystems.

The amount of water that discharges from a spring vent, or in most cases a collection of spring vents, is the primary feature of a spring system. Spring discharge is the main source of flow that creates and maintains the riverine portion of spring systems. Adequate flow influences springs ecology by maintaining water temperature, inhibiting algal blooms, reducing detrital buildup, and stimulating productivity. Without adequate flow, the ecology and human use potential of a spring diminishes.

Florida spring ecosystems are known for their abundance and diversity of aquatic vegetation, fish, and wildlife, including birds, turtles, alligators and otters. Native aquatic vegetation is the foundation of spring ecosystems by providing habitat for many organisms, removing nutrients from the water, stabilizing sediments, and improving water clarity by filtering particles.

System Description

The Weeki Wachee River is located in western Hernando County. The river runs approximately 7.5 miles from the main spring to the Gulf of Mexico. The upper reaches of the river lie within a relic dune system comprised mostly of sandhill vegetation. Further downstream as the landscape becomes flat, the river flows through mostly hardwood swamps (Frazer, et al. 2001). At approximately 5.5 miles downstream from the main spring, the river enters a large salt marsh complex. From the beginning of the salt marsh, the river runs another few miles to the open waters of the Gulf of Mexico. Prior

descriptions of the main spring have been provided by Rosenau et al. 1977, while the river has been characterized by the District (SWFWMD 1994), and the broader Springs Coast by Wolfe (1990).

Geology

The Florida peninsula is formed on top of thick layers of sedimentary rocks. Extensive marine carbonate deposits have turned into alternating layers of limestone and dolostone rock formations that collectively are several thousand feet thick. Subsequent sediment deposition and geologic processes have created a mantle of overlying sand and clay deposits that, along with dissolution of the underlying rock formations, have formed the karst landscape surrounding Weeki Wachee Spring. The Brooksville Ridge is a prominent geologic feature across Pasco and Hernando Counties and the springshed. The saturated carbonate rocks beneath the land surface form the Floridan aquifer system, one of the most productive aquifers on earth, and the source of groundwater discharging to Weeki Wachee Spring and most of the other springs in the state.

Understanding the dominant role of karst processes on groundwater flow is prerequisite to characterizing the hydrology of the aquifers in the region. The topography and internal drainage in the Weeki Wachee groundwater basin, or springshed area, has been formed by karst processes and contains numerous sinkholes, sinking streams, and springs. In karst areas, the dissolution of limestone by slightly acidic rainfall water acts to dissolve the limestone bedrock, enlarging fractures in the rock and forming cavities which may eventually collapse to form sinkholes. Sinkholes capture surface water drainage and funnel it underground which further promotes dissolution of the limestone. This leads to progressive integration of voids beneath the surface, and allows larger and larger amounts of water to be funneled into the underground drainage system.

Hydrology

The ultimate source of water flowing through the aquifer and discharging from Weeki Wachee Springs is rainfall. Rainfall across the Florida peninsula is the result of three types of weather patterns: frontal, convective, and tropical or cyclonic. Although most of the rainfall is associated with summer convective storms, the region has two distinct peak rainfall periods: June through September and February through April. Measured rainfall in the Weeki Wachee springshed based on the average of the Brooksville and St. Leo National Weather Service Stations is 55 inches per year with the highest monthly rainfall in August.

Springsheds or spring recharge basins are catchment areas that contribute groundwater to a spring vent or spring group (FGS 2003). The boundaries of a springshed are mostly defined by groundwater potentiometric surface elevations as measured by water levels in monitoring wells. Similar to topographic drainage, groundwater elevation differences and other aquifer properties cause groundwater movement through the springshed to the spring. Springshed boundaries can move slightly from year-to-year based on variations in rainfall and groundwater recharge. The Weeki Wachee springshed covers a significant land area in northern Pasco County and southwest Hernando County. The Florida Geological Survey (FGS) estimated the springshed area for Weeki Wachee Springs to be approximately 240 square miles (Figure 5).

The geologic units, in descending order, that form the freshwater portion of the Upper Floridan aquifer (UFA) include the Oligocene age Suwannee Limestone, the upper Eocene age Ocala Limestone, and the middle Eocene age Avon Park Formation (Table 4). The total thickness of the UFA in the springshed area ranges from 700 to 900 feet (Miller, 1986). The hydrogeology in the Weeki Wachee springshed includes a surficial aquifer, a discontinuous intermediate confining unit, and a thick carbonate UFA (Figure 6). In general, a regionally extensive surficial aquifer is not present except along the Brooksville Ridge because the clay confining unit is thin, discontinuous, and breeched by numerous karst features. Because of this geology, the UFA is unconfined over most of the western Hernando and northwest Pasco County area. In this unconfined setting, high infiltration soils and generally deep water table conditions exist away from the gulf coast. Much of the springshed is internally-drained with little to no runoff. Within the Weeki Wachee springshed, the UFA is the primary source of water for the springs and withdrawals for public supply, agricultural, recreational, and industrial/commercial uses.

The Weeki Wachee springshed is located within the larger 4,600 square mile Northern West-Central Florida Groundwater Basin (SWFWMD 1987) one of eight regional groundwater basins located on the Florida peninsula. Similar to topographic divides that separate surface water drainage basins, groundwater basins are delineated by divides formed by high and low elevations in groundwater levels. Groundwater does not flow laterally between basins. Each basin also generally contains similar geology regarding the confinement of the UFA. In the Southwest Florida Water Management District there are three regional groundwater basins: The Northern, Central and Southern. The UFA is generally unconfined in the northern basin, semi-confined in the central basin, and well-confined in the southern basin. In well-confined basins, water level declines due to pumping are greatest and most widespread. In leaky or unconfined basins, water level declines are more localized and close to major pumping centers. This limits regional pumping impacts to within each basin or along their boundaries.

The UFA within the Weeki Wachee springshed is recharged from local rainfall. Net recharge values are determined by rainfall inputs minus evapotranspiration loss and runoff. Because much of the springshed is internally-drained, runoff values are negligible. The highest recharge rates to the aquifer occur in west-central Hernando County with values ranging between 10 and 25 inches per year (Sepulveda, 2002). Much of the flow to Weeki Wachee Springs is concentrated within the upper 200 feet of the UFA. This uppermost portion of the aquifer is characterized by rapid recharge and flow, with shorter groundwater residence and travel times to the point of discharge at the springs. The vulnerability of aquifers in the Weeki Wachee springshed, evaluated on a statewide scale (FGS 2004) found that the majority of the springshed is "more vulnerable" to contamination, due to the permeable soils and karst geology in the springshed.

Table 4: Hydrogeology of the Weeki Wachee Springshed area
(Modified from Miller, 1986, Sacks and Tihansky, 1996)

Series	Stratigraphic Unit	Hydrogeologic Unit	Lithology
Holocene to Pliocene	Undifferentiated Surficial Deposits	Unsaturated zone, surficial aquifer or locally perched surficial aquifer	Sand, silty sand, clayey sand, sandy clay, peat, and shell
Oligocene	Suwannee Limestone	Upper Floridan aquifer	Limestone, cream to tan, sandy, vuggy, fossiliferous
Eocene	Ocala Limestone		Limestone, white to tan, friable to micritic, fine-grained, soft, abundant foraminifera
	Avon Park Formation	Middle Confining Unit 2	Dolomite is brown, fractured, sucrosic, hard. Interstitial gypsum in MCU 2
	Oldsmar Formation	Lower Floridan aquifer	Limestone and dolomite. Limestone is tan, recrystallized. Anhydrite and gypsum inclusions.
Paleocene	Cedar Keys Formation	Basal Confining Unit	Massive anhydrites

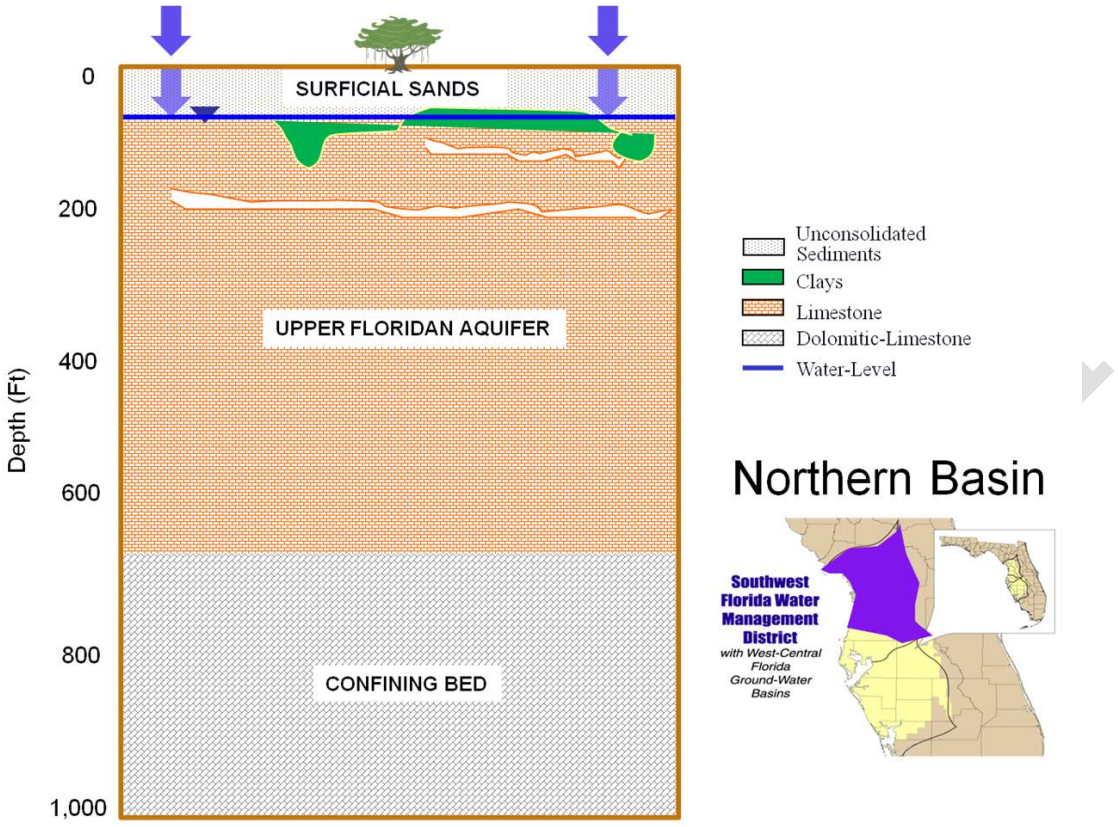


Figure 6: Generalized Hydrogeology of the Weeki Wachee Springshed

Weeki Wachee Springs, located at the headwaters of the Weeki Wachee River, lies just southwest of the junction of U.S. Highway 19 and State Highway 50. The river extends westward 7.5 miles from the main spring vent through predominantly lowlands (coastal swamps and marshes) to the Gulf of Mexico. There are eight springs associated with or in proximity to the Weeki Wachee system (Figure 7). With the exception of first magnitude Weeki Wachee Spring main vent, most of the springs in the Weeki Wachee area have very limited flow and water quality data. Little Spring, also known as Twin Dees Spring, provides flow contribution to the river from its tributary run downstream of the main spring. Mean annual discharge for Weeki Wachee Spring averaged 171 cubic feet per second (cfs) or 112 million gallons per day (mgd) for the period 1931-2015.

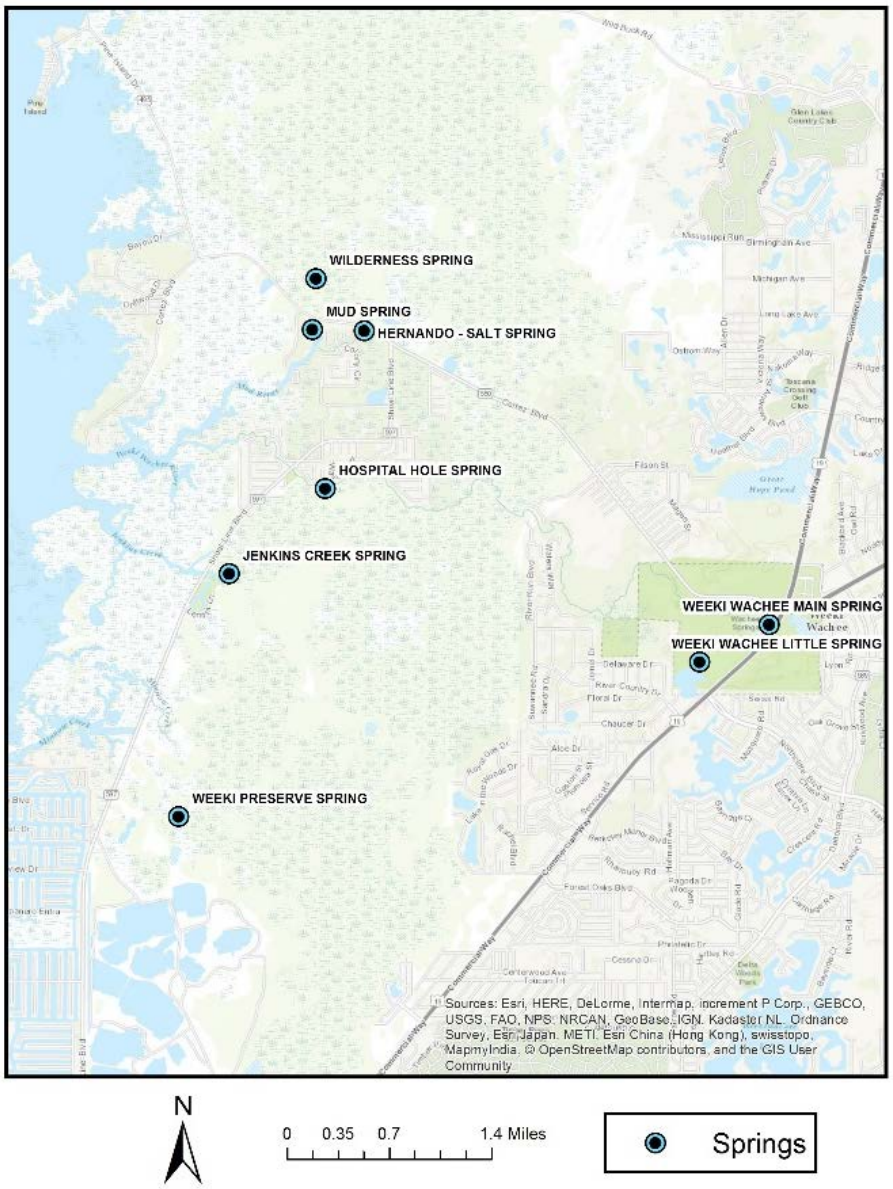


Figure 7: Weeki Wachee Springs Locations

Weeki Wachee Spring discharges from the bottom of a conical depression with gentle side slopes. The spring pool measures 165 ft. (50.3 m) east to west and 210 ft. (64 m) north to south. Spring depth is 45 ft. (13.7 m) over the vent in the center of the pool (FGS 2004). A large north-south trending fracture extends deeper below the spring pool to a depth of 180 feet, connecting to an extensive system of large cave passages and tunnels that convey water from the aquifer to the springs. Bare limestone is located near the vent, but none is exposed around the pool edges. The water is clear and light greenish blue, and a boil is visible in the center of the pool.

Ecology

Ecologically, the Weeki Wachee River can be divided into three distinct regions (Figure 8). The upper part of the river functions like a classic spring-fed freshwater river with no significant tidal influence. The lower section of the river is tidally influenced and is estuarine in structure. Between the fresh and estuarine parts of the river is a transition zone where salinity is generally low but still exhibits tidal effects. The transition from freshwater to saltwater occurs relatively quickly and therefore the estuarine portion of the Weeki Wachee River is much more compressed (Heyl 2008) when compared to the other Springs Coast rivers (Crystal River, Homosassa River, and Chassahowitzka River) where estuarine conditions can occur throughout.

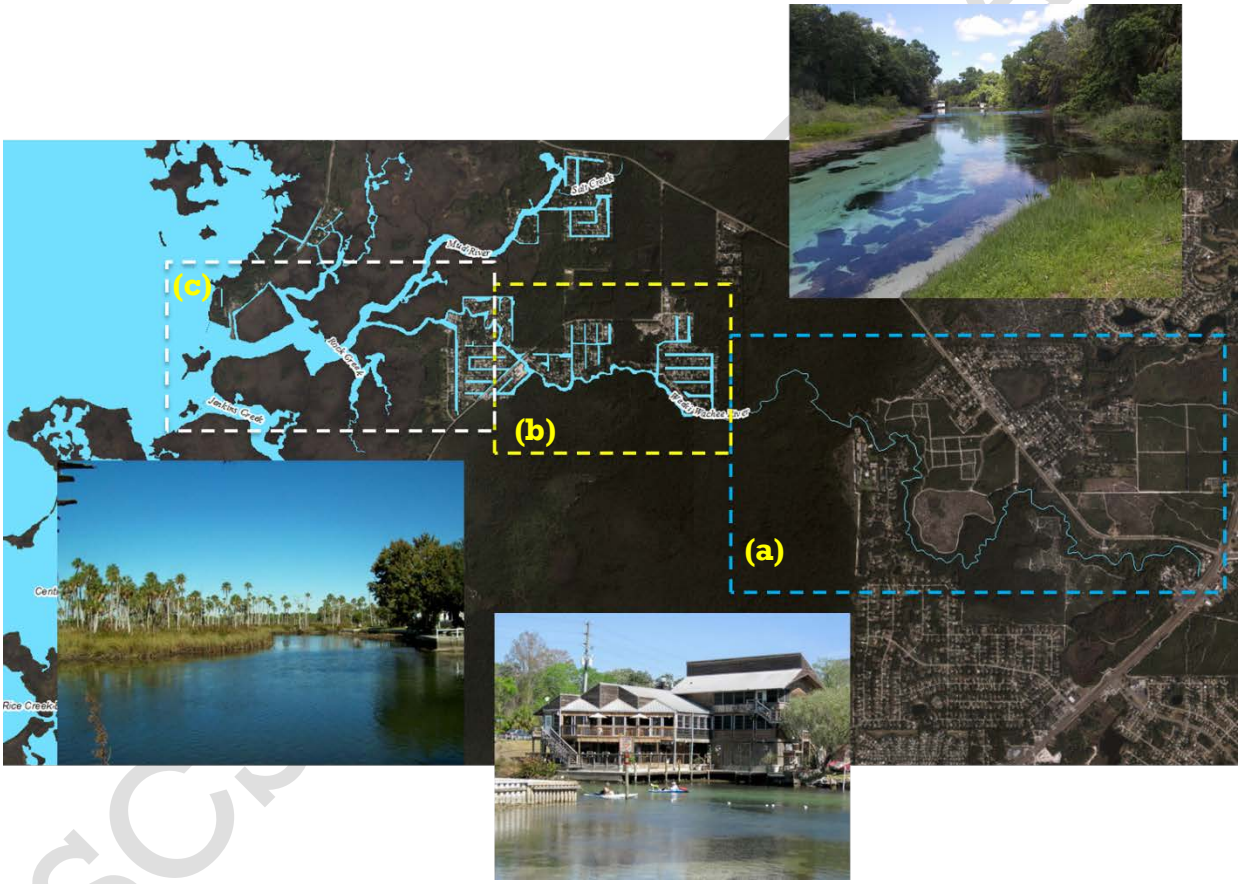


Figure 8: Three ecological zones of the Weeki Wachee River
Three ecological zones of the Weeki Wachee River. (a) The upper zone is characterized non-tidal freshwater conditions. (b) The transition zone between the freshwater zone and the estuarine zone. (c) The lower or estuarine zone is characterized by salt marsh, mangrove, and palm uplands typical of the large wetland complex that makes up the Springs Coast.

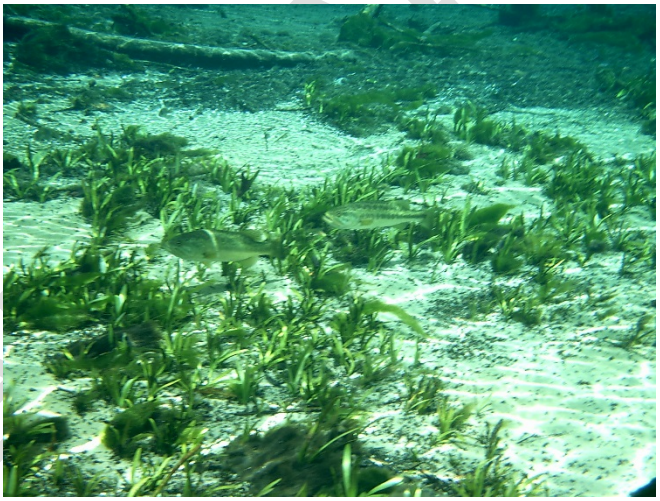
The upper Weeki Wachee River lies within a relic dune historically comprised mostly of sandhill vegetation. Today, due to lack of fire and logging of long-leaf pine, much of these relic dunes are dominated by sand pine. As the river flows toward the Gulf of Mexico, sandhill gives way to dense hydric swamps of bald cypress, red maple, sweet gum, and bay trees. The lower Weeki Wachee River flows among a labyrinth of shallow tidal channels surrounded by emergent salt marsh vegetation interspersed with palm islands.

A defining characteristic of the Weeki Wachee River is its incredible water clarity (Figure 9). Near the main spring, water clarity is typically well over 100 feet. There is a sharp decline in clarity within the first mile downstream of the main spring but this is a natural phenomenon typical of spring-fed rivers. Despite this rapid decline in clarity, the river remains remarkably clear as far as 5 miles downstream of the main spring where clarity is still over 20 feet. In the upper river, fast flowing water and dense canopy cover can limit the growth of submerged aquatic vegetation (SAV) while in the lower river salinity tends to be the major limiting factor for SAV growth.

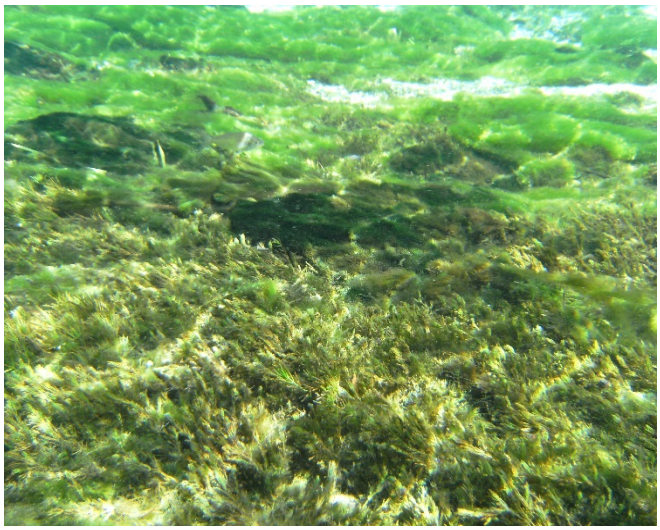
Figure 9: Exceptional Water Clarity in the Weeki Wachee River

A historical description of the submersed aquatic vegetation (SAV) has been presented by Sloan (1956) as part of an examination of the aquatic insects utilizing the Weeki Wachee River. SAV was sparsely present in the pool but the dominant species in this location and the upper river was strap-leaf Sagittaria (*Sagittaria kurziana*). Slightly less common in the upper spring run was southern naiad (*Najas guadalupensis*). However, in the lower river, sago pondweed (*Stuckenia pectinata*) became dominant followed by eel grass (*Vallisneria americana*). The historical estimate of SAV abundance ranged from 10-15% coverage in the spring pool, 30-45% coverage in the mid-stream area, and about 20-35% in the lower river (Sloan 1956).

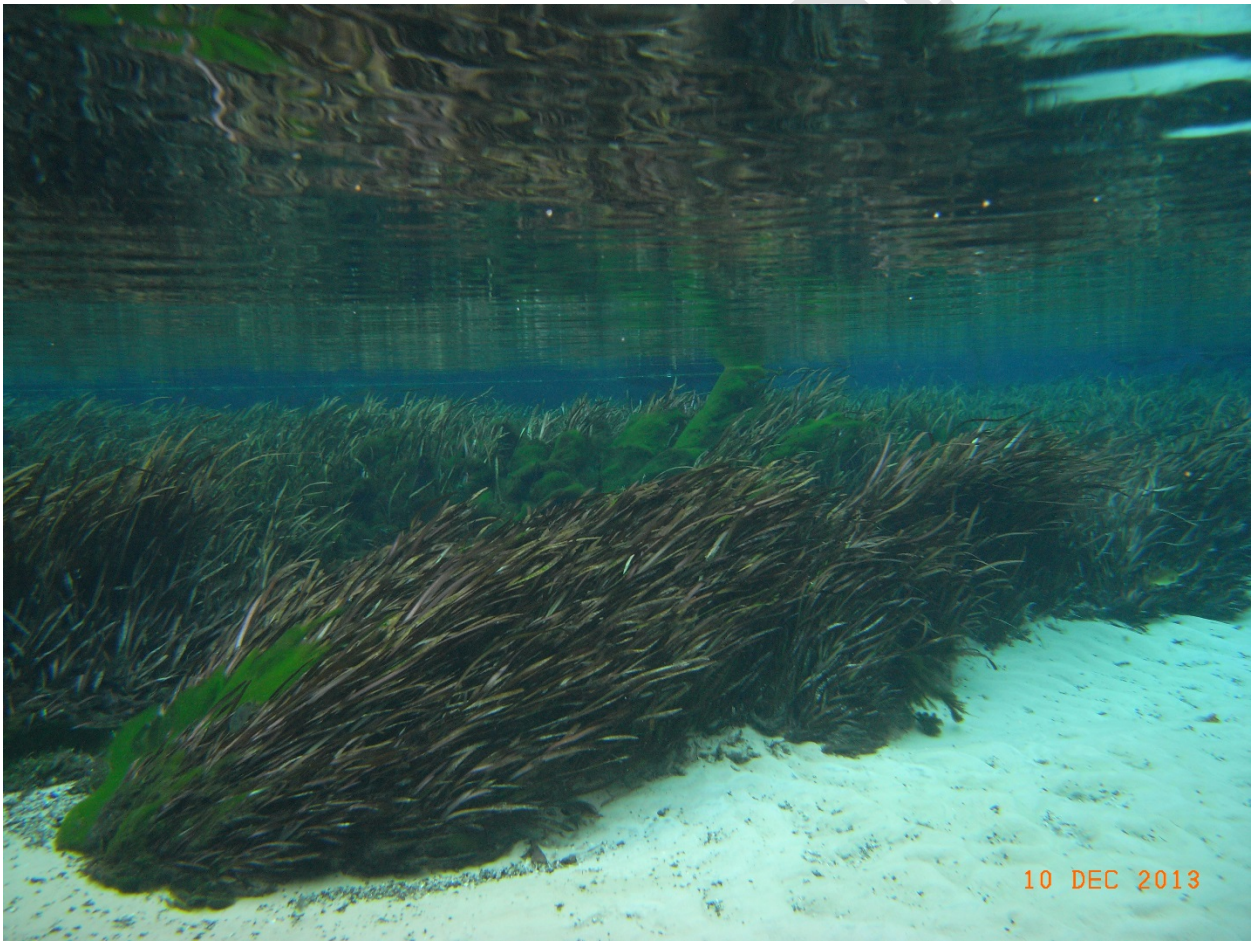
Modern assessments of SAV abundance have been made from 1998 to 2015, typically during late summer (SWFWMD 2016a). A total of eight species of vascular submersed plants have been observed during this time period. Data collected in 2015 estimate SAV coverage was about 25%, and reflect that strap-leaf Sagittaria is currently much less common, while eelgrass and southern naiad remain commonly observed. Hydrilla (*Hydrilla verticillata*) is also common in the middle and lower sections of the river. Invasive aquatic plant abundance is monitored by FWC at least annually on the Weeki Wachee River and adjoining canals (FWC 2016).



Muskgrass (*Chara sp.*) and multiple types of filamentous algae (e.g., *Dichotomosiphon, Hydrodictyon, Lyngbya, Spirogyra, and Vaucheria*) are common in the Weeki Wachee River. The macroalgae in the spring pool area was surveyed during March and November of 2003 (Stevenson et al. 2007), and at that time, algal mats in the headspring had 74% to 86% bottom coverage with a maximum thickness of nearly 22 inches. During that 2003 survey, *Lyngbya sp.* comprised about 53%, *Dichotomosiphon* about 22% *sp.*, and *Spirogyra sp.,* about 17% of the macroalgae present (Stevenson et al. 2007).



The accumulation of algal mats in the spring pool was addressed by the SWFWMD in 2008, when approximately 6,000 cubic yards of accumulated organic debris and filamentous algae was vacuum dredged from the headspring area. Some non-native shoreline plants were also removed and eelgrass was planted in the pool and upper run area after dredging. Subsequently, eelgrass meadows developed and continue to expand downstream in the upper portion of the Weeki Wachee River.



Shoreline tree and shrub species noted by WSI (2010) include red maple (*Acer rubrum*), Florida dogwood (*Cornus foemina*), Dahoon holly (*Ilex cassine*), sweetgum (*Liquidambar styraciflua*), fetterbush (*Lyonia lucida*), southern magnolia (*Magnolia grandiflora*), wax myrtle (*Myrica cerifera*), swamp bay (*Persea palustris*), sand pine (*Pinus clausa*), slash pine (*Pinus elliotti*), laurel oak (*Quercus laurifolia*), live oak (*Quercus virginiana*), cabbage palm (*Sabal palmetto*), willow (*Salix sp.*), American elderberry (*Sambucus canadensis*), bald cypress (*Taxodium distichum*); while vine-like species include: climbing aster (*Aster carolinianus*), rattan vine (*Berchemia scandens*), climbing hemp vine (*Mikania scandens*), poison ivy (*Rhus radicans*), and grape (*Vitis sp.*). Emergent plant species noted by WSI (2010) include water hemlock (*Cicuta maculata*), sawgrass (*Cladium jamaicense*), sedge (*Cyperus sp.*), pennywort (*Hydrocotlye sp.*), panic grass (*Panicum sp.*), smartweed (*Polygonum sp.*), bulrush (*Scirpus sp.*), marsh fern (*Thelypteris palustris*) and cattail (*Typha sp.*).

Non-native emergent and shoreline plant species include split-leaf philodendron (*Philodendron bipinnatifidum*), wild taro (*Colocasia esculenta*), water lettuce (*Pistia stratiotes*), lady palm (*Rhapis excelsa*), and azalea (*Rhododendron sp.*). Non-native species are most commonly observed along the shoreline of developed properties.

A detailed examination of the aquatic insect larvae utilizing the Weeki Wachee River has been provided by Sloan (1956) who collected species from the orders Diptera, Ephemeroptera, Trichoptera, Hemiptera, Coleoptera, Lepidoptera, and Odonata. Sloan (1956) concluded that oxygen and salinity gradients influenced the observed insect distributions. In 2009, emergent invertebrates were sampled, with a total of 19 types (15 Diptera, 1 Ephemeroptera, and 3 Trichoptera) of insects collected (WSI 2010).

Gastropods such as apple snails (*Pomacea sp.*) are commonly observed in the Weeki Wachee River, as well as smaller types like *Melanoides sp.* and mud snails (Hydrobiidae). A potential endemic invertebrate is the Lepidoptera *Parargyractis drumalis*, a tiny moth, with aquatic larvae (Heppner 1976). Another possible endemic macroinvertebrate of the Weeki Wachee system is the water strider (Hemiptera), *Metrobates hesperius depilatus*, in which, subsequent examination suggested their status as a distinct sub species (Hussey and Herring 1949).

Benthic invertebrates in the Weeki Wachee River were assessed in 2005 in which core samplers were used to collect infauna and sweep nets were used to collect bottom dwelling invertebrates from fifteen transects in the Weeki Wachee River (Janicki Environmental, Inc. 2006). Dominant epifauna taxa were the polychaete *Laeonereis culveri* and the amphipod *Gammarus mucronatus*; while the dominant epifaunal taxa consisted of amphipods (*Gammarus mucronatus* and *Grandidierella bonnieroides*) and the isopod *Uronmunna reynoldsi* (Janicki Environmental, Inc. 2006). In 2015, the amphipod *Hyalella azteca* species complex was the dominant taxon in the samples collected from Weeki Wachee making up 58% of the organisms found in the samples. Tubificidae worms; Hydrobiidae snails; the bivalve *Melanoides sp.*; and the caddisfly *Cheumatopsyche sp*. were the following dominant taxa from the samples collected from Weeki Wachee River system, and combined, made up 20% of the organisms found in the samples (SWFWMD 2016b).

The fish community utilizing the lower Weeki Wachee River was sampled using three types of sampling gear (seine, trawl, and plankton net) during 2004-2005 (Matheson et al. 2005). Results of this sampling found that rainwater killifish (*Lucania parva*) were the dominant catch in all three collection types, while dominant plankton net taxa included larval gobies and blennies. Killifish (*Lucania sp.*), pinfish (*Lagodon sp.*) and mojarras (Gerreidae) accounted for 90%of the trawl catch, while the seine gear captured a

greater diversity of taxa, with 90% of the catch represented by killifish, silversides (Atherinopsidae), mojarras, pinfish, sheepshead and sailfin mollies (*Poecilia latipinna*) (Matheson et al. 2005).

The Weeki Wachee River has been historically sampled for fish using electrofishing gear by the FWC on at least three occasions (1984, 1991, and 2005). Results from those sampling events produced 20 different fish species, with a range of 13 to 16 species per sampling event (Matheson et al. 2005). The most commonly collected species were centrarchids (sunfish and bass family). More recently, the fish community is being assessed by FWC using electrofishing and seines in both summer and winter seasons between 2014 and 2016. To date, FWC has collected 33 species of freshwater and saltwater fish. During the summer, the majority of collected fish were freshwater species, while during the winter, nearly half of the fish community was marine. Common freshwater species include coastal shiners (*Notropis petersoni*), spotted sunfish (*Lepomis punctatus*), bluegill (*L. macrochirus*), redear sunfish (*L. microlophus*) and largemouth bass (*Micropterus salmoides*). Common marine species include snook (*Centropomus undecimalis*), Crevalle jack (*Caranx hippos*), gray snapper (*Lutjanus griseus*), sheepshead (*Archosargus probatocephalus*), and tidewater mojarra (*Eucinostomus harengulus*).

Smaller alligators (*Alligator mississipiensis*) are occasionally observed basking along the Weeki Wachee River, while Diamondback terrapin (*Malaclemys terrapin*) and sea turtles are present in the gulf waters off of Bayport. The reptiles and amphibians utilizing the Weeki Wachee system have been characterized by two studies. The first was conducted in 1999-2000 and concerned the herpetofaunal community of the Chassahowitzka Wildlife Management Area which borders the northern shore of the upper river (Enge and Wood 2000). Over the course of the survey, 16 frog, 7 salamanders, 5 turtle, 1 crocodile, 8 lizards, and 24 snake species were documented (Enge and Wood 2000).

The second study, based on hand capture mark/release surveys made during March 2015 focused on turtles in the spring and upper three miles of the river (Munscher et al. 2016). A total of 182 turtles representing 11 species were collected, Florida Softshell (*Apalone ferox*), Eastern Snapping Turtle (*Chelydra serpentina*), Florida Chicken Turtle (*Dierochelys reticularia*), Suwannee River Cooter (*Pseudemys concinna suwanniensis*), Florida Red-bellied Cooter (*P. nelsoni*), Peninsula Cooter (*P. peninsularis*), Striped Mud Turtle (*Kinosternon baurii*), Eastern Musk Turtle (*Sternotherus odoratus*), Loggerhead Musk Turtle (*S. minor*), Red-eared Slider (*Trachemys scripta elegans*), and Yellow-bellied Slider (*T. s. scripta*). The 2015 turtle survey revealed the most abundant species was the Eastern Musk turtle with 101 individuals captured, the presence of eight Suwannee River Cooters (a species of special concern in Florida), and that Weeki Wachee Springs had the highest species richness (11 species) and the second highest diversity of turtles among five other Florida springs (Munscher et al. 2016).

More than two dozen bird species have been documented on the Weeki Wachee River (WSI 2010). Hoyer et al. (2006) examined the birds on Weeki Wachee and nearby spring fed rivers and compared findings to Florida lakes. Primary conclusions from that publication found that both bird abundance and species richness was higher in winter months than summer months likely due to migratory bird species utilizing the river. Total bird abundance and species richness per unit of area were also similar to data collected on Florida lakes. It was concluded that water depth and presence of SAV were two major factors impacting the distribution and abundance of aquatic birds (Hoyer et al. 2006).

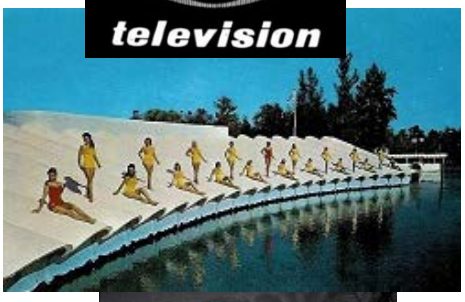
Because of the direct connection to the Gulf of Mexico, Weeki Wachee Springs and the associated river system are utilized by Florida manatees (*Trichechus manatus latirostris*) as both forage and thermal refuge sites. The number of manatees observed in the spring pool and run is relatively low compared to some nearby coastal spring systems (e.g. Crystal and Homosassa Rivers). Aerial surveys conducted by the US Fish and Wildlife Service between 1996 and 2005 reveal that the Weeki Wachee Springs system averaged ten animals per survey during that time period; with the maximum number of manatees counted in the Weeki Wachee being 34 animals on February 13, 2006 (Heyl 2008).

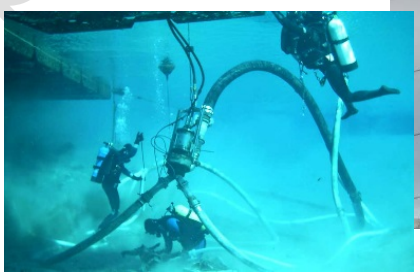
The habitat suitability of the Weeki Wachee system for manatees was investigated by Taylor (2006) who found that anthropogenic use and modification of the spring pool shoreline has resulted in the erosion of beach sand into the spring system. A shoal near the mouth of the spring pool was noted which could prevent manatees from entering the spring pool during low water levels. Similarly, portions of the Weeki Wachee River have shallow riffles and bars due to accumulation of sand which may also limit manatee access (Taylor 2006).

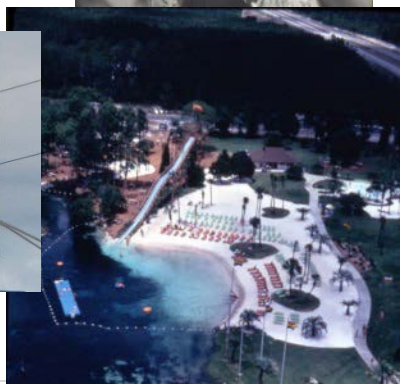
Historical Context

Weeki Wachee is best known throughout the world for its mermaids who have inhabited the main spring boil since 1947 when Newton Perry, a University of Florida graduate and member of the Gators swimming and diving team, built a small 18-seat theater to host an underwater mermaid show. Since then, Weeki Wachee, known as the "City of Mermaids" and whose mayor was a former mermaid, has drawn visitors from around the world.

Weeki Wachee History – The City of Mermaids	
1940	City of St. Petersburg purchases lands surrounding spring
1946	Newton Perry, former member of the Florida Gators swimming and diving team, scouts the site for a new mermaid-themed attraction
1947	18-seat theater is built and first mermaid show presented on October 13th becoming one of the nation's most popular tourist stops
1959	ABC purchases attraction enlarging the original theater to its current 500 seat capacity
1961	Movie "Follow that Dream" starring Elvis Presley is filmed on location
1963	TV show Route 66 episode "The Cruelest Sea of All" is filmed on location
1966	City of Weeki Wachee is incorporated putting the "City of Mermaids" on the map and on road signs
1982	Buccaneer Bay water park opens
2001	SWFWMD purchases 1,267 acres around the springs
2008	State of Florida takes over the private attraction and Weeki Wachee Springs State Park is born
2009	SWFWMD completes Weeki Wachee Springs Restoration Project removing sediments, algae, and other exotic vegetation







Since the early part of the 20th Century, Weeki Wachee springs has been a tourist attraction drawing close to a million people per year in the 1950's during its heyday. Still today, over 200,000 people visit the Weeki Wachee Springs State Park every year. Recently, more and more people enjoy not only the state park and the springs but the entire river from the fast flowing upper river to the estuarine reaches of the lower river. Recreational use has continued to increase river-wide over the last several decades.

Land Use

US Highway 19 serves as a rough divide between the more urbanized and agricultural areas east of the highway and the more natural wetland and sandhill areas west of the highway (Figure 10). Although there are some concentrated areas of development along the river, regionally, the densest development is single-family residential homes southeast and up-gradient of Weeki Wachee springs.

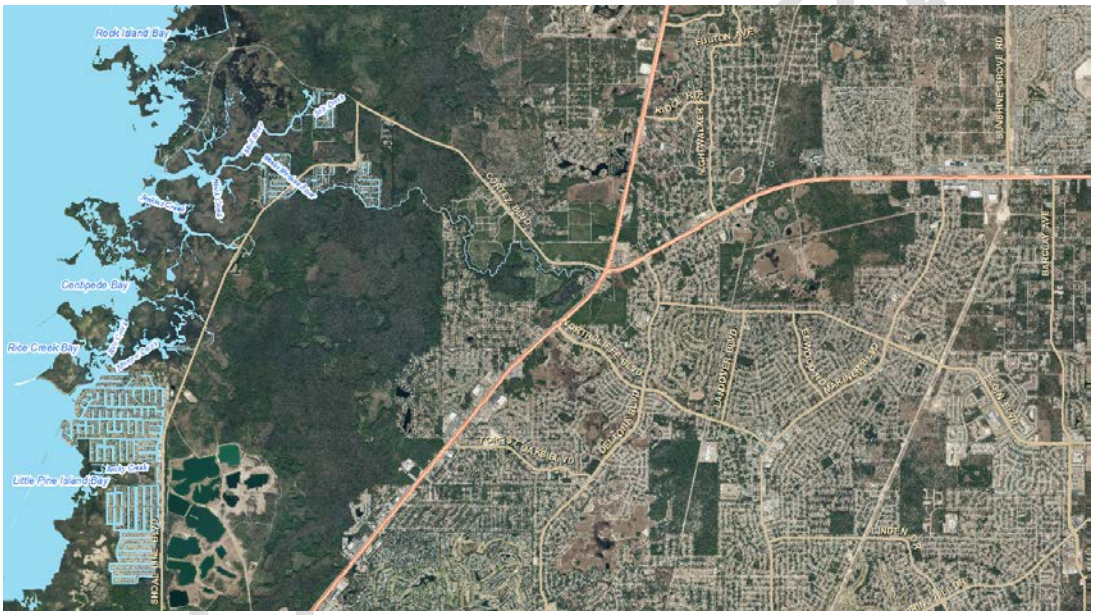


Figure 10: Dense Development near the Weeki Wachee River

The land use within the Weeki Wachee springshed is mostly classified as urbanized (residential) and agriculture. Most of the urbanization is concentrated just east of the headsprings (Figure 11). Since 1995, many areas within the springshed have been converted from rangeland and forest to urban uses. By 2009, residential, forest, and agricultural areas were the predominant land uses in the Weeki Wachee springshed covering 27%, 23%, and 23%, respectively. Wetlands covered 15% of the springshed.

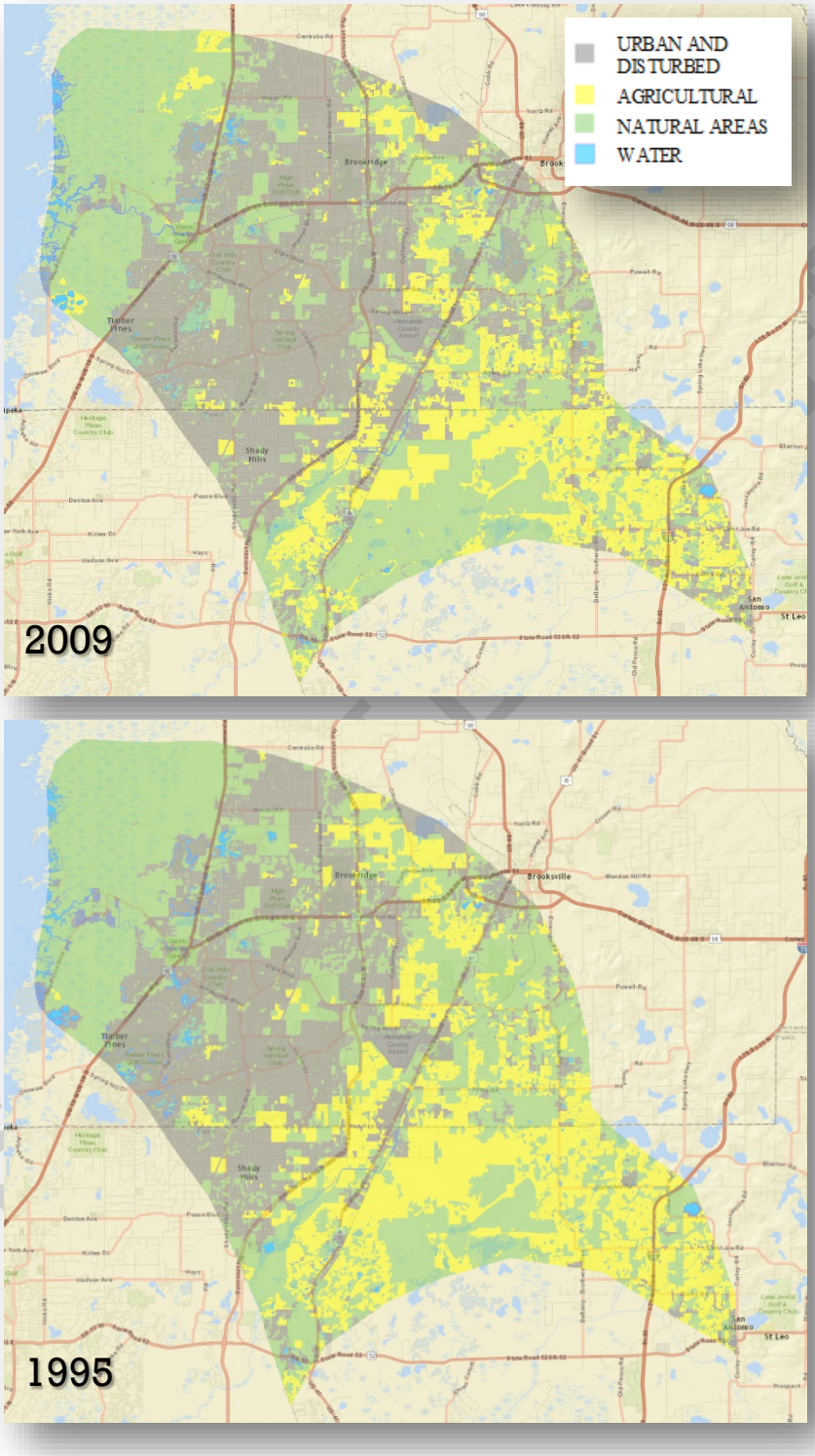


Figure 11: Weeki Wachee Springshed Land Use in 2009 and 1995

Issues and Drivers

Over the past hundred years, Weeki Wachee River has experienced significant ecological shifts, caused by both natural variability and human activity. The primary issues affecting the river include nitrate enrichment, a potential decrease in historical flows, altered aquatic vegetation, and sedimentation. To address these issues and their drivers, the SWIM plan is organized into the following three focus areas: water quality, water quantity, and natural systems (habitat).

Water Quality

For the Weeki Wachee River, management of water quality issues has focused largely on identifying and quantifying sources of nitrogen as well as reducing the nitrogen load delivered to groundwater within the springshed (Jones et al. 1997, Dodson and Bridger 2014). Extremely clear water is a defining characteristic of Florida springs and while water clarity remains high in the upper river, it declines in the lower river (Figure 12). Changing salinity is an emerging water quality issue, due to both variation in river flow and sea-level rise, and has major implications to the ecology of the lower river.

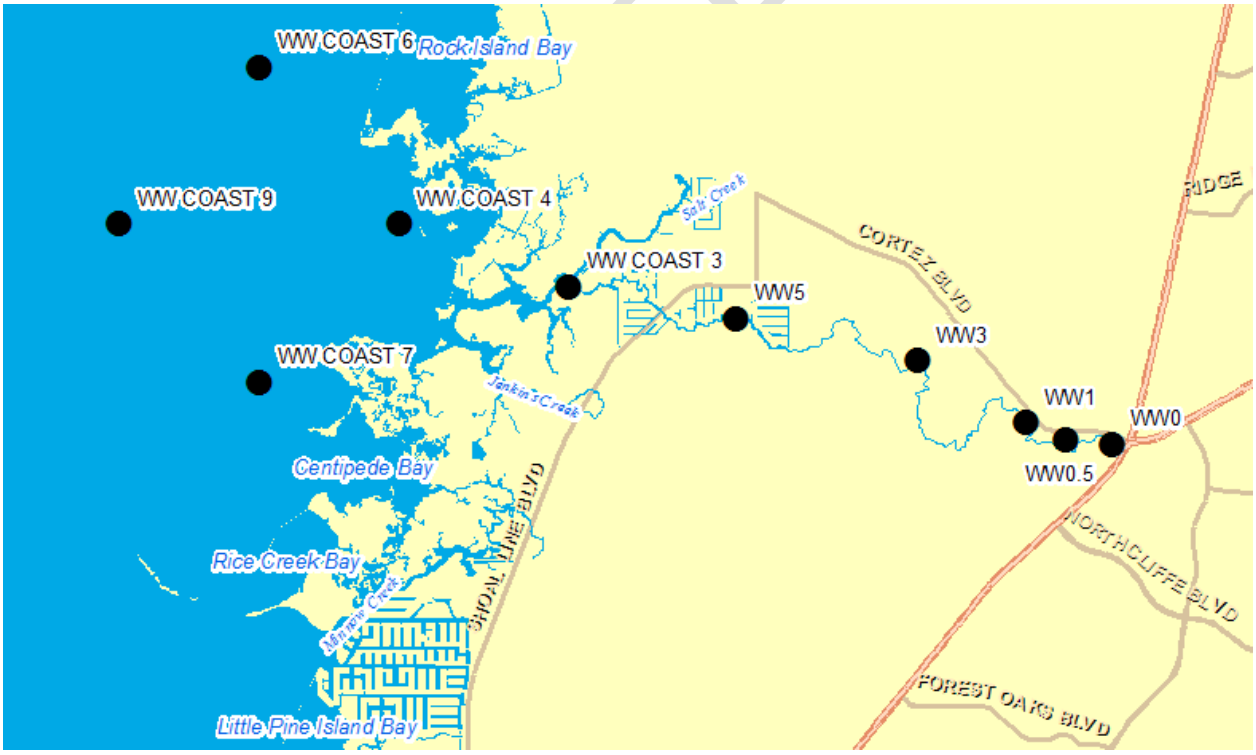


Figure 12: Weeki Wachee River Water Quality Data Stations

The primary nutrient of concern is nitrogen because it can stimulate the growth of aquatic plants and algae. Although nitrogen occurs naturally and is necessary to sustain aquatic ecosystems, current concentrations are enriched compared to historic concentrations in many springs in Florida, including Weeki Wachee Spring. Given that increased nitrogen supply in spring ecosystems has been observed to stimulate the growth of phytoplankton (Frazer et al. 2002), epiphytic algae (Notestein et al. 2003) and nuisance filamentous algae (Cowell and Dawes 2008) a great deal of concern exists. Additionally, studies have suggested that there could be toxic effects of elevated nitrogen concentrations on aquatic fauna (Mattson et al. 2007).

Nitrogen enrichment, particularly in the inorganic form nitrate, is currently an issue in the majority of springs in Florida because nitrate is mobile and conservative once it reaches the groundwater. Nitrate concentrations have been increasing in the water discharging from Weeki Wachee Spring (Figure 13). Nitrate concentration averaged 0.9 mg/L in 2015, whereas historical background nitrate concentration for springs is considered to be 0.1 mg/L or less (Rosenau et al. 1977).

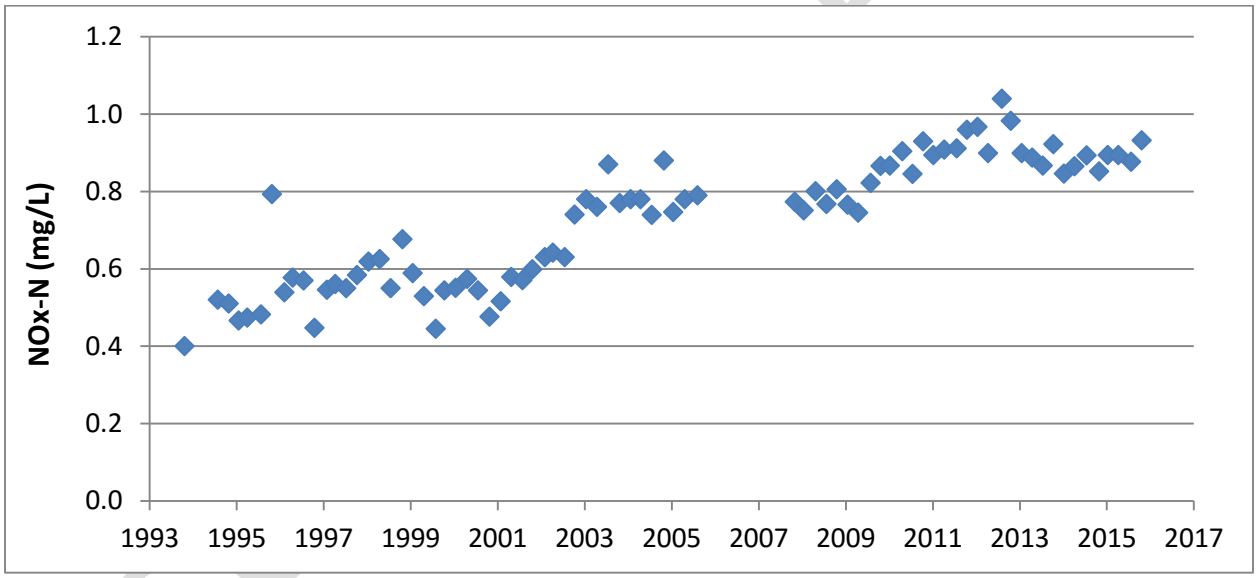


Figure 13: Nitrate Changes in Weeki Wachee Spring

In 2009, the FDEP adopted Weeki Wachee Spring (WBID 1382B) and Weeki Wachee River (WBID 1382F), on the Verified List of impaired waters for the Springs Coast Basin as required by Section 303(d) of the Clean Water Act. The FDEP used a methodology (per Rule 62-303, F.A.C.) for listing nutrient impaired surface waters based on documentation that supports the determination of an imbalance of flora and fauna in Weeki Wachee Spring and River.

Due to elevated nutrient concentrations (nitrate-nitrogen), along with corresponding excessive growth of algae, a TMDL was established in 2014 that set the allowable level of nutrient loading for these segments to meet their applicable water quality criterion for nutrients (Dodson and Bridger 2014). As part of the TMDL, the FDEP attributed the excessive algal growth strictly to nitrogen enrichment. Phosphorus was another nutrient that was evaluated but an increasing temporal trend was not detected and concentrations remain close to those levels found in the early 1970's. The FDEP used historical documentation of algae to establish the TMDL nutrient targets. For Weeki Wachee Spring and River the annual average nitrate concentration TMDL targets are 0.28 mg/L and 0.20 mg/L, respectively.

The Weeki Wachee Spring and River TMDLs will require reductions in nitrate concentrations of 71% and 77%, respectively. FDEP has developed a Nitrogen Source Inventory Loading Tool (NSILT) to identify major sources of nitrogen for the Weeki Wachee River and estimate their loads to groundwater in the Basin Management Action Plan area (Eller et al. 2016). The NSILT is a geographic information system and spreadsheet-based tool that provides estimates of the relative contribution of nitrogen from major sources, while taking into consideration the processes affecting the various forms of nitrogen as they move from the land surface through soil and geologic strata into the groundwater. As a planning tool, the NSILT can identify areas where nitrogen load reduction efforts could be directed.

The draft NSILT identified septic systems as the primary source of nitrogen loading to groundwater within the Weeki Wachee River BMAP area (30%). Agriculture (fertilizer and livestock waste) was also a substantial source (17% and 10% respectively). The other nitrogen sources were 22% from urban turf fertilizer, 10% from atmospheric deposition, 6% from sports turf fertilizer, and 5% from wastewater treatment facilities (Figure 14). The resulting estimates of nitrogen loading to groundwater take into account environmental processes that attenuate nitrogen and the rate of recharge to groundwater using information from published studies. The NSILT information will be included in the BMAP report that FDEP is currently developing.

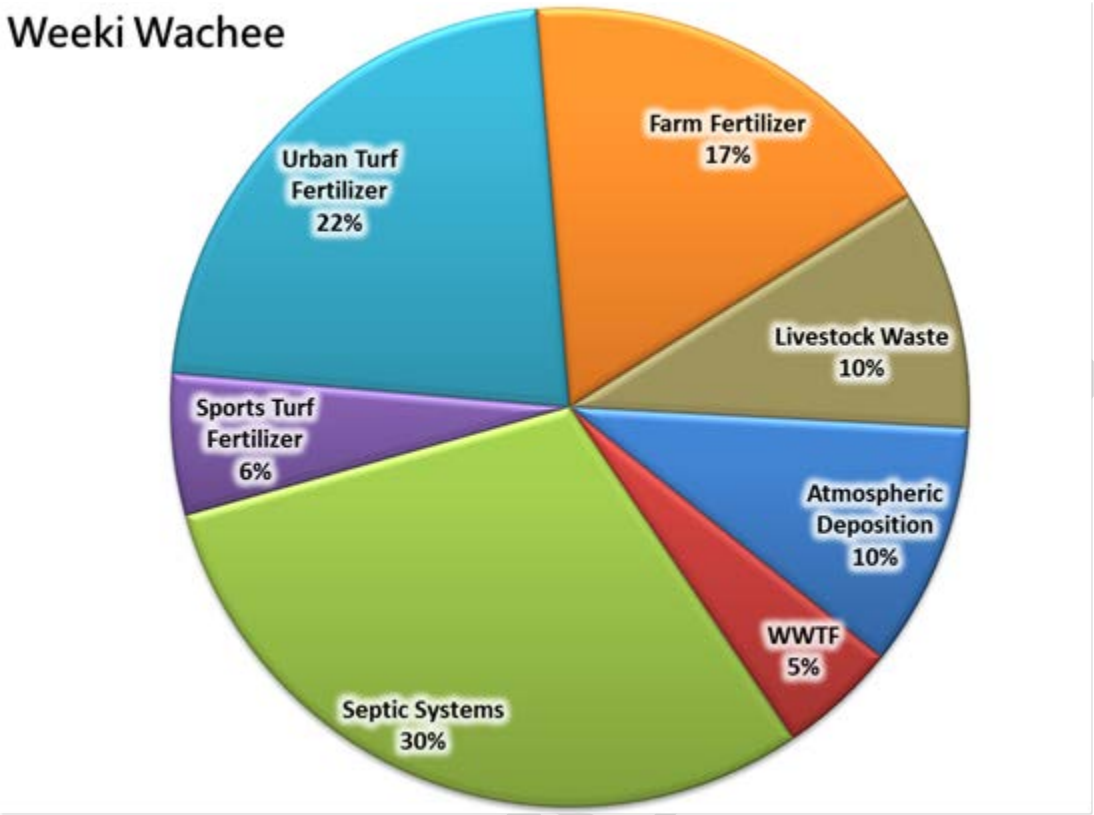


Figure 14: Nitrogen Inputs to Groundwater in the Weeki Wachee River BMAP Area by Source Category (Eller et al. 2016)

Phosphorus, specifically in the biologically available form orthophosphate, is also a nutrient of concern although phosphorus enrichment is minimal in comparison to nitrogen. Phosphorus can reach the river from surface runoff from the watershed or from groundwater moving through areas with phosphatic deposits in the overlying geologic formation (Harrington et al. 2010). Phosphorus enrichment is uncommon in Florida springs because phosphorus is typically retained in the limestone matrix of the aquifer (Heffernan et al. 2010). Measured phosphorus concentrations from Weeki Wachee Spring do not indicate an increasing trend over time.

The springs of Florida are known for their exceptional water clarity (Duarte and Canfield 1990). High water clarity is important because it allows sufficient light penetration for the productive aquatic vegetation and beneficial algal communities that support spring ecosystems. Water clarity in the Weeki Wachee River is highest near the main spring vent and declines substantially with distance downstream, which typically occurs in spring systems due to accumulation of particles and tannins in the water. From 2006 to 2015 the average water clarity in the river ranged from 46 to 61 feet, with over 100 feet of visibility near the headspring and less than 30 feet of visibility in the lower river (Figure 15). Runoff from riparian wetlands periodically causes tannic water to enter the river which reduces water

clarity. Heavy recreation (primarily from motorboats, canoes, and kayaks) has also been observed to substantially reduce water clarity by stirring up and suspending sediments.

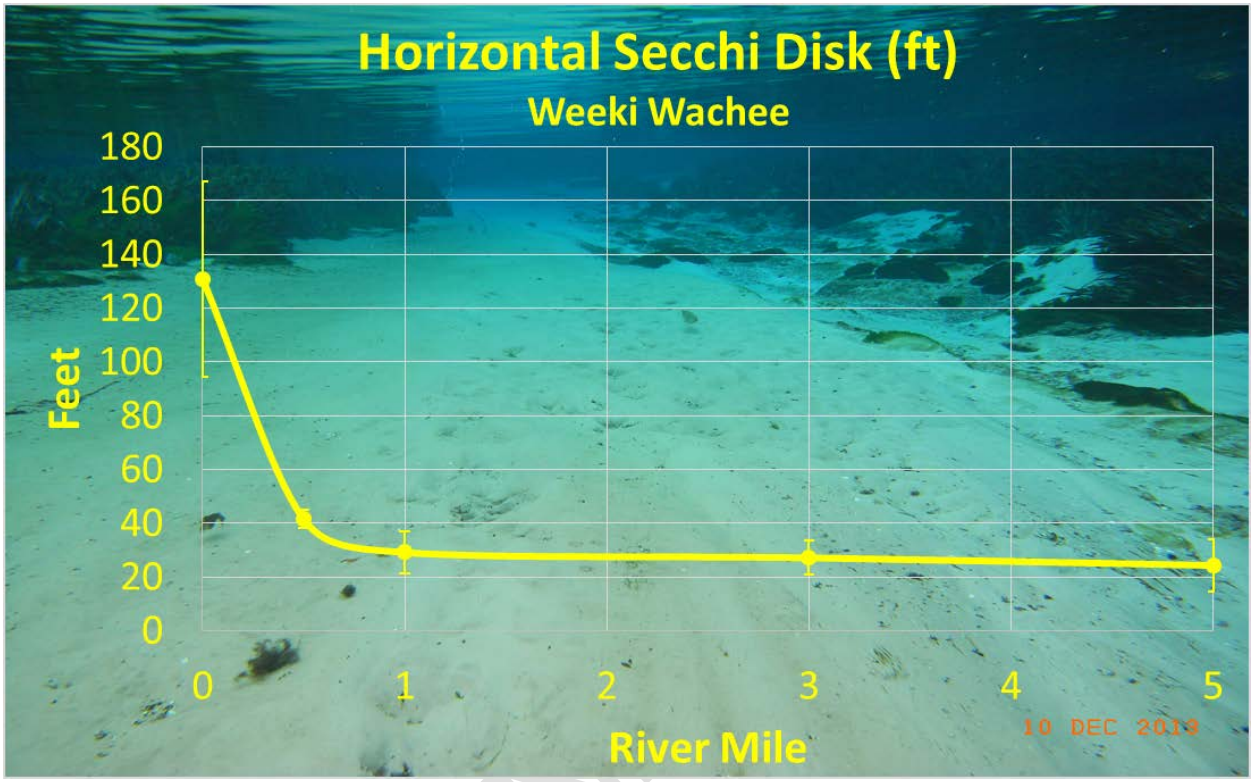


Figure 15: Water Clarity in the Weeki Wachee River

Water clarity, as measured by a horizontal secchi disk, over time at the five fixed river stations. Clarity is affected by many factors including the amount of tannins and suspended sediment in the water column.

Changing salinity is an emerging issue in Weeki Wachee River, particularly in the lower river that is tidally influenced by the Gulf of Mexico. Potential decreases in historical flows and sea-level rise are the major contributors to increased salinity in the lower river. Researchers at the National Oceanic and Atmospheric Administration (NOAA) have been monitoring sea-level rise along the Springs Coast and estimate a rise of seven inches over the past hundred years (0.07 in/yr, NOAA 2009) (Figure 16). Salinity in the lower river fluctuates due to tides and variation in river flow; however monthly data collected since 1998 (Jacoby et al. 2014) suggest that salinity is increasing (Figure 17). The Gulf of Mexico has always exerted some influence on the lower Weeki Wachee River and significant changes are expected in the coming decades due to continued sea-level rise.

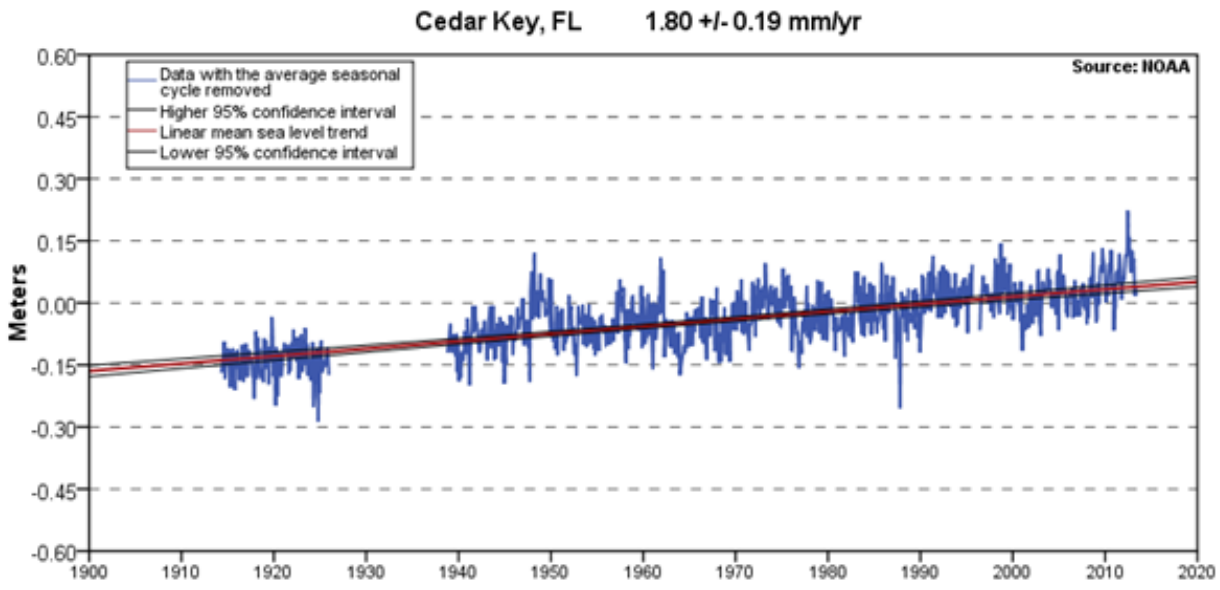


Figure 16: Sea Level Data from Cedar Key, Florida

Cedar Key is located north of Weeki Wachee River on the Springs Coast. Similar trends in sea-level rise have been recorded at most other NOAA stations throughout the United States though sea-levels and rates of increase vary from station to station (NOAA 2009).

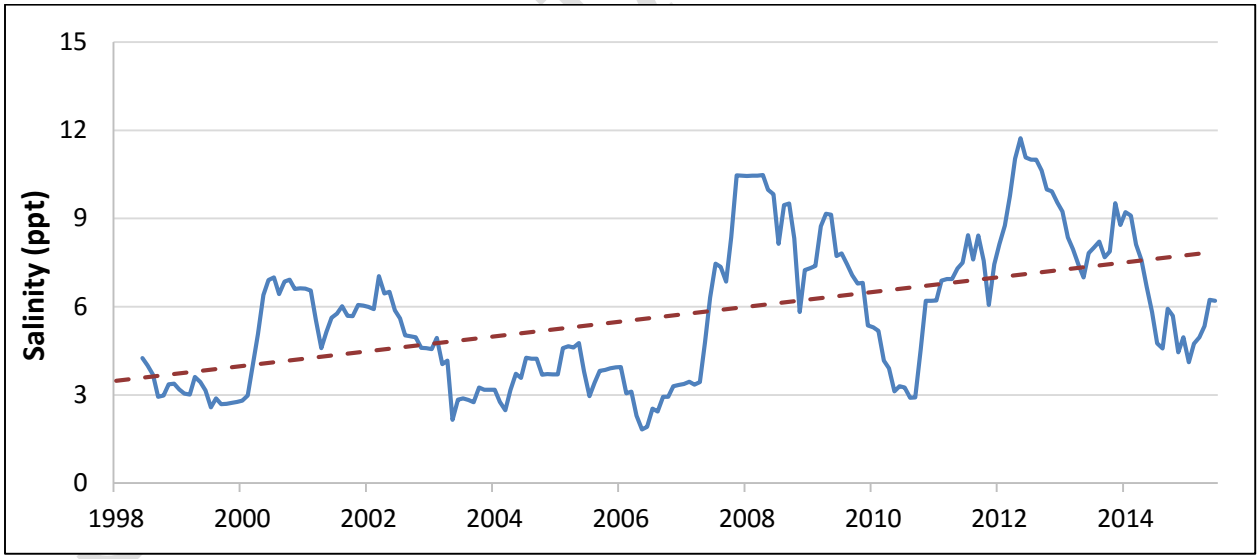


Figure 17: Salinity Changes in the Lower Weeki Wachee River (12-month moving average at WW COAST 3)

Water Quantity

Weeki Wachee River is a large first-magnitude spring system with an average flow of 171 cubic feet per second (cfs). Long-term spring flow is largely affected by rainfall patterns and to a lesser extent by groundwater withdrawals. Sea-level rise is having an effect on the surface hydrology in the lower river and likely will lead to more substantial changes in the future.

Flow is a critical factor that interacts with multiple aspects of spring ecosystems. While reduced flow has been observed in the Weeki Wachee River over the past few decades, the effects of reduced flow on the ecosystem have not been well documented. In other west-central Florida spring systems lower flows allowed increased filamentous algal abundance (Hoyer et al. 2004, King 2014), likely due to reduced drag and downstream export. Another issue related to declining flow, along with other drivers, is increased sedimentation. As velocity decreases, particles begin to settle out of the water column, potentially smothering SAV and limiting light from reaching the river bottom. By smothering SAV beds, sedimentation also promotes the invasion of *Lyngbya* and other mat-forming macroalgae, further reducing native SAV cover.

Flow in the Weeki Wachee River near the headspring has been routinely measured by the USGS since 1931 (Figure 18). The lowest annual average flow occurred in 1932 at 118 cfs and the highest annual average flow peaked in 1960 at 253 cfs. Flow gradually rose from the 1930s to about 1970 and then has slowly declined over the last 40 years. However, over the last three years, higher rainfall has returned flow to above its long-term average value with 2015 mean flow at 193 cfs. This pattern of increasing and decreasing flow generally corresponds to multi-decadal periods of above average rainfall prior to 1970 and below average rainfall post-1970 associated with the Atlantic Multi-decadal Oscillation or AMO (Kelly and Gore 2008) and other climatic oscillations.

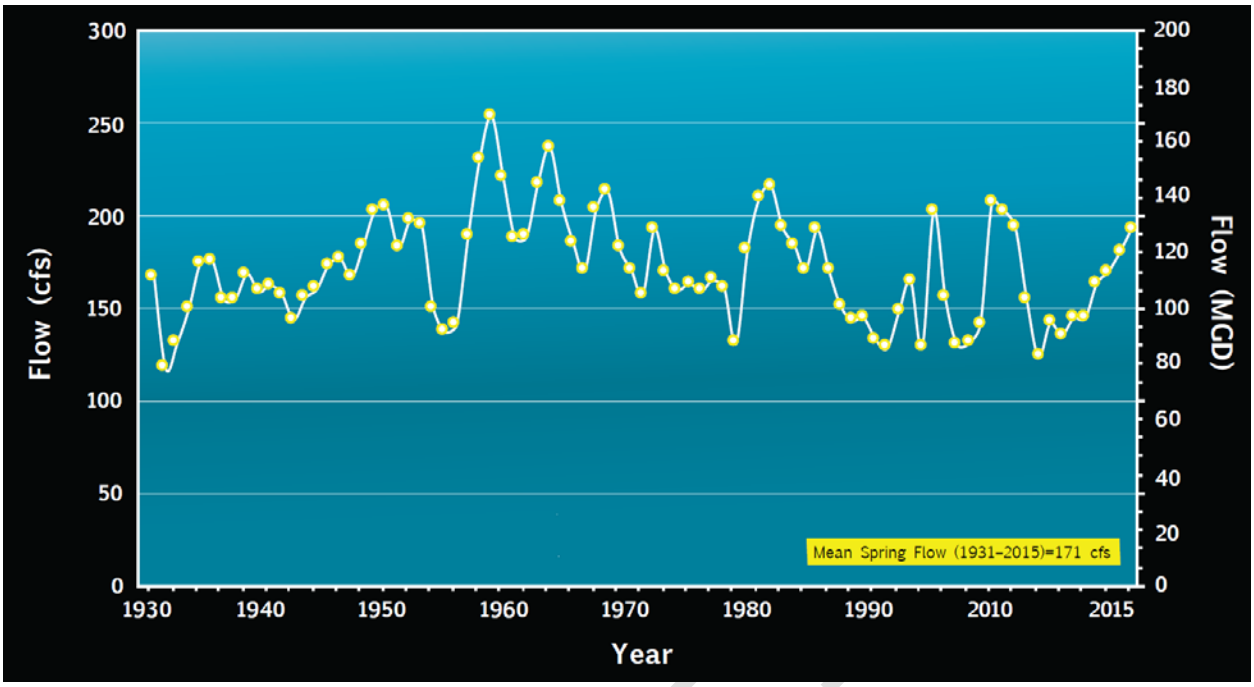


Figure 18: Annual Average Flow Observed in the Weeki Wachee River

Based on computer flow modeling, rainfall-regression modeling, and water budget results from the SWFWMD, the cumulative impact of groundwater withdrawals on Weeki Wachee River spring flow has resulted in a relatively modest impact on flow compared to rainfall changes – approximately seven percent reduction in the long-term average discharge. A majority of the groundwater withdrawals are from two large wellfields within the springshed: west Hernando County Utilities (Spring Hill) and Tampa Bay Water's (TBW) Cross Bar Ranch wellfield in northern Pasco County (Note: the southern part of Cross Bar wellfield is outside the springshed). Beginning in 2008, however, TBW's central system wellfield withdrawals were reduced by 40 percent as part of the Partnership Plan between the District and TBW. Groundwater withdrawals for Cross Bar Ranch wellfield have fallen by roughly 50% since 2000 and averaged 13.3 mgd in 2014 (this includes the southern part of Cross Bar Ranch wellfield that is outside of the springshed). West Hernando County utilities withdrew just 16.2 mgd in 2013 – down from a peak of 24.3 mgd in 2006. This was largely due to increased water conservation efforts and slowing population growth. Outside of those two wellfields, groundwater withdrawals are low in magnitude and dispersed within the springshed. In 2013, estimated and metered groundwater withdrawals from all use types in the springshed were equivalent to 2.9 in/yr, and using an average recharge rate of 20 inches per year, groundwater withdrawals made up 14.5 percent of recharge in the basin. If 50 to 60 percent of water withdrawn (minus Cross Bar Ranch wellfield since its exported out of the springshed) is returned to the aquifer in the springshed through septic tank leakage, wastewater

treatment facilities, and irrigation, then consumptively-used quantities would account for 9.5 percent of average recharge (Marella 2008).

The SWFWMD maintains a metered and estimated water use database from 1992 through 2013 (Ferguson 2014). In the Weeki Wachee springshed, groundwater withdrawals have declined from their recent peak of 47.5 mgd in 2006 (Figure 19). In 2013, groundwater withdrawals based on estimated and metered use were 33.0 mgd. Since the early-1990s, groundwater use within the springshed has declined from a peak usage of 51.4 mgd in 1992 to 33.0 mgd in 2013. Public supply accounts for the majority of groundwater use in the Weeki Wachee springshed, with lesser amounts used for domestic self-supply, recreation (e.g. golf courses), and agriculture (Figure 20).

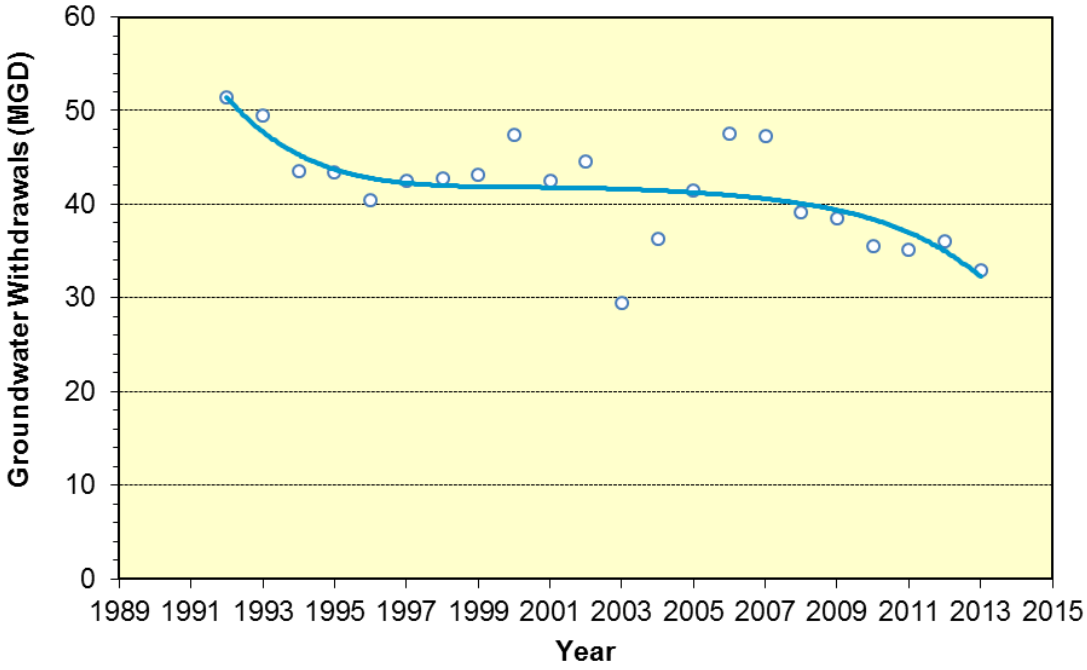


Figure 19: Groundwater Withdrawals within the Weeki Wachee Springshed from 1992-2013

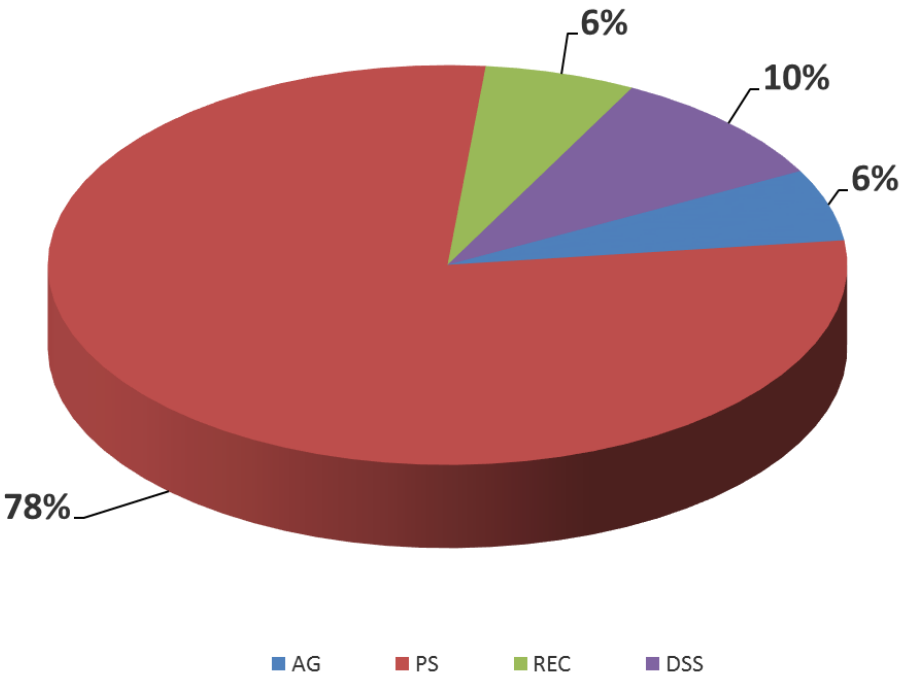


Figure 20: Groundwater Withdrawals by Category within the Weeki Wachee Springshed
AG – Agriculture, PS – Public Supply, REC – Recreation, DSS – Domestic Self-Supply

While the hydrologic assessment by the SWFWMD indicates groundwater withdrawals currently have a small impact on Weeki Wachee River spring flow, the expected increase in demand for water over the coming decades is being addressed through the development of water supply plans and Minimum Flows and Levels (MFLs). Both the SWFWMD and the Withlacoochee Regional Water Supply Authority (WRWSA) periodically publish water supply plans to address current and future demands on water resources. The SWFWMD's most recent regional water supply plan, published in accordance with Florida Statutes, includes an assessment of projected water demands and potential sources of water to meet these demands for the period 2010-2035 (SWFWMD 2015). The Weeki Wachee River lies within SWFWMD's Northern Planning Region where the 2010-2035 regional increase in demand is projected to be 62.8 mgd (SWFWMD 2015).

The SWFWMD has been directed to establish MFLs for priority surface watercourses (e.g. streams and rivers) and aquifer systems within its boundaries (Section 373.042, F.S.). As defined by statute, "the minimum flow for a given watercourse is the limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area." In scheduling the development and adoption of MFLs, State Law further directs the SWFWMD to prioritize all first-magnitude springs, and second-magnitude springs within state or federally owned lands purchased for conservation purposes. Recent changes to State Law also designate all first-magnitude springs, such as the Weeki Wachee River, as Outstanding Florida Springs and requires that MFLs be adopted for these systems by July 1, 2017. MFLs

serve as a protective metric for making permitting and planning decisions regarding both surface and groundwater withdrawals. If it is determined that water levels or flows in a water body are either below or projected to fall below the applicable MFLs during the next 20 years as a result of water withdrawals, then a recovery or prevention strategy must be developed and implemented as part of a regional water supply plan.

The MFL for the Weeki Wachee River was adopted in 2009. Resources evaluated for the MFL included: salinity-based habitats, the benthic community, molluscs, free-floating and actively swimming fish and invertebrates, thermal-based refuge habitat for manatees, and freshwater instream habitats. After thorough evaluation of the relationships between these factors and flows in the Weeki Wachee River, a MFL that maintains 90% of the natural flow, the flow that would exist in the absence of water withdrawals, was recommended (Heyl 2008).

Natural Systems

The Weeki Wachee River supports a productive ecosystem that contains abundant fish and wildlife habitat. Over the past century filamentous algae has increased in the river, particularly near the headspring, and may be displacing native SAV in some areas leading to an altered aquatic plant community. Erosion in the upper river has led to sedimentation in the lower river which has caused impacts to SAV and other benthic habitat.

A primary issue regarding aquatic habitat in the Weeki Wachee River is altered aquatic vegetation. In the early 1950s, the average SAV coverage was estimated at 30% and consisted of native species only (Sloan 1956). By 1991, filamentous algae, primarily the cyanobacteria *Lyngbya*, and Hydrilla had become the second and third most abundant species in the river, respectively, and only southern naiad was more abundant (SWFWMD 1994). Records of SAV biomass began in 1998 (Frazer et al. 2001) and show a substantial decrease after 1999, mostly due to decreases in hydrilla and filamentous algae (Figure 21). Since 2007, average desirable and invasive SAV coverage were 11% and 22%, respectively. In 2015 filamentous algae and hydrilla abundance decreased and eelgrass abundance increased (SWFWMD 2016a), possibly related to higher flow in the river (Figure 22). While eelgrass expansion is beneficial for the SAV community in the Weeki Wachee River, a once common native species strap-leaf sagittaria has declined substantially and was not observed in 2015. Overall, loss of native SAV is likely due to a combination of drivers including invasive species competition, recreation (boaters, waders), and sedimentation.

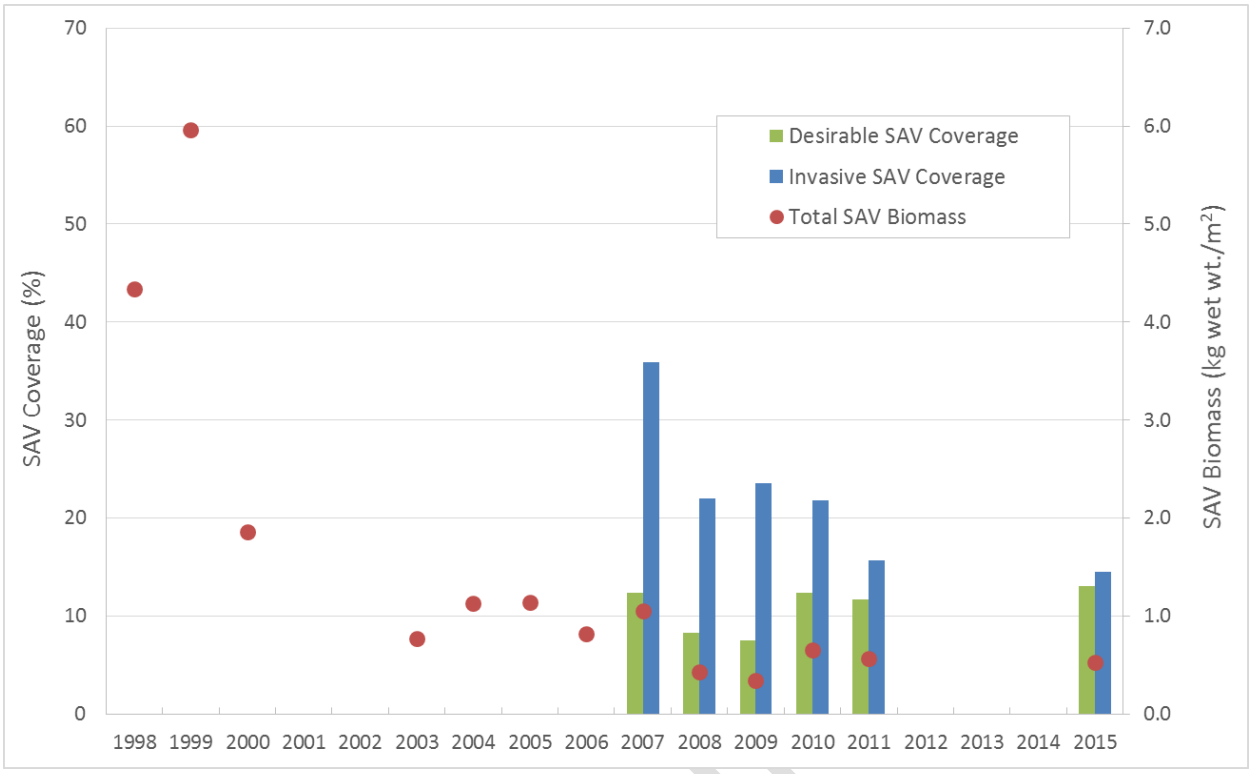


Figure 21: SAV Coverage and Biomass in the Weeki Wachee River

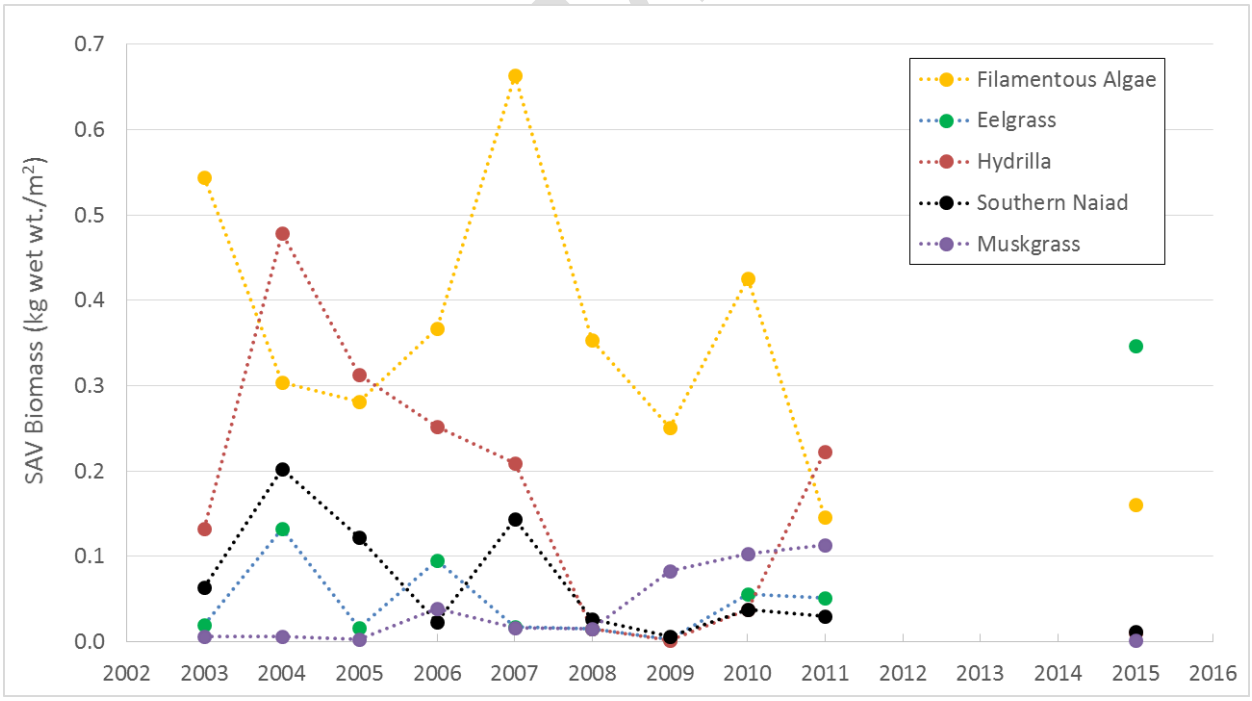


Figure 22: Biomass for Common SAV Species in the Weeki Wachee River

Another primary issue for the Weeki Wachee River is sedimentation which alters the river channel morphology and can smother beneficial aquatic vegetation and other habitats. While the past sources of erosion have been addressed, sedimentation within the river persists as observed by widening sand bars and increasingly shallow areas in the lower river. Sedimentation is particularly problematic in the tidally influenced portions of the lower river where the water slows down and suspended sediments settle out onto the river bottom.

Heavy recreation uses by power boats, kayaks, and canoes along the Weeki Wachee River likely contributes to the altered aquatic vegetation and sedimentation issues. On busy weekends thousands of people recreate on the river, which can cause turbid conditions for several days due to sediment disturbance and resuspension. People who wade in the river and walk along the shoreline can displace SAV and emergent shoreline vegetation. Another issue related to recreation, particularly power boats, is the lack of coarse woody material. Coarse woody material, including tree trunks and branches that have fallen into the water, is preferred habitat for wildlife such as turtles and fish; however, this material is typically removed to improve boat access in this narrow river.

Management Actions

One of the goals of this SWIM plan is to identify strategic initiatives that will address the major issues and drivers and provide management actions that will restore, maintain and preserve the ecological balance of the Weeki Wachee River. The quantifiable objectives and management actions listed in this section are grouped into three focus areas: water quality, water quantity, and natural systems. In several cases, actions in one area may impact another area. For example, restoration of aquatic vegetation is considered a natural systems management action, but will also lead to improved water quality. Monitoring and research actions are included for each of the three focus areas and while not highlighted as priority actions, these actions are considered essential to the adaptive management of this complex system.

Quantifiable Objectives

The Weeki Wachee River SWIM plan includes numeric targets called quantifiable objectives (Table 5). If these objectives are achieved, the expected result is a healthy spring ecosystem. These are long term goals that are being used to develop and prioritize management actions and projects, thus promoting effective and efficient resource management. The table below describes the quantifiable objectives for each of the three focus areas: water quality, water quantity, and natural systems.

Table 5: Quantifiable Objectives

Water Quality	**Target**
Water clarity – river average	>50 feet[1]
Water clarity – near the headspring	>120 feet[1]
Nitrate concentration in the river	<0.20 mg/L[2]
Water Quantity	
Minimum flow for the river system	>90% natural flow[3]
Natural Systems	
Coverage of desirable submerged aquatic vegetation in the river	>40%[4]
Coverage of invasive aquatic vegetation (including filamentous algae) in the river	<10%[4]

[1] Based on data presented in Figure 15
[2] Dodson and Bridger 2014 – Nutrient TMDLs for Weeki Wachee Spring and Weeki Wachee River (WBIDs 1382B and 1382F)
[3] SWFWMD 2008 – Weeki Wachee River Recommended Minimum Flows and Levels
[4] Based on data presented in Figure 21

Water Quality

The water quality management actions for the Weeki Wachee River are primarily focused on reducing nitrogen loads in accordance with the BMAP being developed by FDEP. The TMDL for the Weeki Wachee River sets a target nitrate concentration of 0.20 mg/L, which would require a 77% decrease in concentration in the surface waters (Dodson and Bridger 2014). The SCSC recognizes that **Septic Tanks**, **Urban/Residential Fertilizer**, and **Agricultural Operations** are the priority Water Quality Management Action categories for the Weeki Wachee River. Table 6 lists the management actions which are primarily focused on reducing nitrogen loading and have been categorized according to the source type. These management actions are types of potential actions that would improve water quality in the river if implemented.

Table 6: Water Quality Management Actions

Monitoring and Research
Improve our understanding of the ecological responses to nutrient enrichment and reductions
Maintain and expand water quality monitoring programs
Report annual status and trends
Evaluate new and emerging technologies (e.g. treatment wetlands, LID, denitrification systems for septic tanks)
Evaluate effectiveness of existing BMPs for water quality improvements
Identify nutrient sources and vulnerable (karst) areas
Understand sediment contributions to nutrient enrichment and water clarity reductions
Develop and evaluate methods to improve water quality and circulation in canals
Evaluate opportunities for salinity barriers and technologies
Agricultural Operations (Cattle Farms, Horse Farms, Row Crops)
Outreach and coordination
Implement available BMPs
Evaluate available BMPs
Research and develop advanced BMPs
Evaluate land development code regulations
Promote cost-share programs
Septic Tanks
Improve existing septic tank performance
Prioritize and convert septic tanks to sewer systems or nutrient reduction methodologies
Limit new septic tank installations
Conduct a social marketing based education campaign
Develop an inventory of septic tank locations, age, and condition if known
Urban/Residential Fertilizer (includes Golf Courses)
Evaluate fertilizer application strategies
Implement fertilizer ordinances
Implement Florida Friendly Landscaping practices and golf course/green industry BMPs
Expand re-use water for landscape irrigation
Conduct a social marketing based education campaign
Wastewater Treatment Facilities
Upgrade WWTFs to advanced treatment
Implement post-treatment nutrient removal systems
Identify and fix inflow and infiltration (I&I) into sewer infrastructure
Identify and fix leaky sewer infrastructure (residential, commercial, utilities)
Stormwater
Develop regional and local stormwater master plans as needed
Implement stormwater ordinances
Implement stormwater treatment systems
Evaluate performance of stormwater treatment systems
Implement advanced stormwater treatment systems
Develop new advanced stormwater treatment systems
Develop a standard design manual for advanced stormwater treatment systems
Conduct a social marketing based education campaign
Septic/Sewage Solids Disposal
Improve regulatory oversight of land disposal activities and siting
Establish capacity for land disposal activities
Atmospheric Deposition
Evaluate potential sources

Water Quantity

The water quantity management actions for the Weeki Wachee River are intended to maintain spring flows for future generations. The SCSC recognizes that **Conservation** and **Alternative Water Supply** are the priority Water Quantity Management Action categories for the Weeki Wachee River. Table 7 lists all of the management actions that have been identified by the SCSC to address water quantity issues. These management actions are types of potential actions that would maintain flow in the springs and river if implemented.

Table 7: Water Quantity Management Actions

Monitoring and Research
Improve understanding of how rainfall patterns, climate drivers, and sea-level rise affect spring flow
Maintain and expand as needed spring flow and aquifer level monitoring programs
Evaluate the influence of hydrologic alterations and their operation on spring flow
Better quantify the impacts of land use and resource management activities on recharge rates
Continue refinement of surface and groundwater modeling to evaluate water withdrawals and their effects on the springs
Conservation - Public & Self Supply
Facilitate the retrofit of inefficient water devices in pre-1994 structures
Promote low-water use landscaping
Promote cost-share programs
Utilize appropriate guidance documents to promote water conservation
Improve infrastructure efficiency
Utilize conservation rate structures
Conduct a social marketing based education campaign
Conservation - Agriculture
Implement water quantity based BMPs
Promote cost-share programs
Promote agriculture water conservation based research
Evaluate and incentivize effective ecosystem services (e.g. water storage/recovery)
Conservation - Industry/Commercial
Improve infrastructure to reduce water loss and increase efficiency
Promote technology and engineering improvements
Promote cost-share programs
Conservation - Golf Courses
Implement water quantity based BMPs
Promote and incentivize low-water use landscaping
Promote cost-share programs
Alternative Water Supply - Reclaimed Water
Evaluate areas where the use of reclaimed water and greywater could be used to offset groundwater withdrawals and implement where most effective
Promote permit incentives
Evaluate and promote where feasible indirect and direct potable reuse
Expand education campaign
Promote cost-share programs

Alternative Water Supply - Surface Water/Desalination
Continue to evaluate sources and project options
Continue to evaluate storage & recovery options and desalination
Alternative Water Supply - Lower Floridan Aquifer
Determine feasibility, impacts, benefit and cost estimates
Alternative Water Supply - Stormwater
Utilize stormwater for local and regional storage and reuse
Install rain gardens and other LID components to capture and store stormwater for reuse
Promote cost-share programs
Regional Water Supply Planning
Support the implementation of the WRWSA's 2014 Regional Water Supply Plan Update where determined to be consistent with the SCSC goals
Explore the need to adopt a multi-stakeholder approach
Regulatory
Evaluate springs-specific Water Use Permitting criteria
Evaluate the need for Water Use Caution Areas
Evaluate potential local ordinances
Consider water use when developing comprehensive plans
Minimum Flows and Levels
Develop and adopt Minimum Flows and Levels
Continue to explore new approaches for establishing Minimum Flows and Levels

Natural Systems

The natural systems management actions for the Weeki Wachee River directly address fish and wildlife habitat. Habitats include those within a spring system itself (e.g. submerged aquatic vegetation) and those adjacent to a spring system (e.g. wetlands and uplands). The SCSC recognizes that **Habitat Restoration** and **Recreation Management** are the priority Natural Systems Management Action categories for the Weeki Wachee River. Table 8 lists all of the management actions that have been identified by the SCSC to address natural systems issues. These are types of potential actions that would improve and maintain fish and wildlife habitat in and along the springs and river if implemented.

Table 8: Natural Systems Management Actions

Monitoring and Research
Continue to develop and test restoration techniques for improving fish and wildlife habitat in spring systems
Continue and refine efforts to monitor aquatic plant and animal communities
Improve understanding of trophic dynamics (i.e. food webs) and nutrient cycling in spring systems
Improve understanding of the effects of sediment characteristics, flow velocities, and other factors on aquatic plants and algae
Evaluate effects of salinity changes and sea-level rise on habitat
Evaluate effects of manatee grazing on aquatic vegetation
Identify areas where erosion is a problem
Evaluate effectiveness of erosion control BMPs

Habitat Conservation
Maintain and expand conservation easements and land acquisition programs to purchase land along spring systems and throughout springsheds
Develop management and use plans for acquired lands
Develop and enhance management standards, setbacks, and land use planning to prevent shoreline disturbance
Improve education and outreach to riparian homeowners and boat rental companies
Develop stormwater management plans and standards for shorelines with high erosion potential
Implement BMPs to reduce stormwater runoff and erosion
Preserve existing native trees within a shoreline buffer
Limit clearing for river access corridors
Mitigate for impacts of new shoreline development (BMPs, shoreline restoration, etc.)
Evaluate methods to incentivize shoreline conservation and improvements
Habitat Restoration - Revegetation
Install and maintain desirable submerged aquatic vegetation where appropriate
Install and maintain emergent aquatic vegetation where appropriate
Investigate ways for permit exemptions and for streamlined permitting pathways for appropriate revegetation projects
Conduct a river-wide assessment that identifies areas for vegetation restoration
Develop adaptive strategies for vegetation restoration in changing conditions
Habitat Restoration - Shorelines
Install living shorelines and stormwater treatment techniques where appropriate
Install and properly maintain floating wetland systems where appropriate
Develop a homeowners guide to living shorelines
Investigate ways for permit exemptions and for streamlined permitting pathways for appropriate living shoreline projects
Habitat Restoration - Woody Material
Install woody material where appropriate
Conduct an education campaign to explain benefits of woody material
Habitat Restoration - Sediment/Muck Management
Remove undesirable benthic sediments where appropriate
Evaluate causes and sources of sediment/muck accumulation
Assess the relationship between flow and muck accumulation
Habitat Restoration - Reforestation
Install and maintain trees and shrubs along the shoreline where appropriate
Install and maintain native communities in upland areas within springsheds
Habitat Restoration - Other
Enhance/restore adjacent wetlands to provide wildlife habitat and increase treatment of runoff
Evaluate feasibility, benefits and costs of filling dredged ditches and canals
Invasive Species Management
Manage invasive aquatic plants based on sound scientific research and stakeholder input
Implement initiatives with local residents to participate in proper invasive plant management
Implement initiatives with local residents that demonstrate how proper invasive plant management benefits the system
Encourage new and innovative techniques for invasive plant management through scientifically sound research
Manage invasive animals as necessary
Evaluate effects and management of terrestrial invasive plants along the shoreline
Recreation Management
Increase the presence of law enforcement to enforce existing ordinances/rules
Establish and implement comprehensive recreation management plans
Promote low impact ecotourism activities

Projects and Initiatives

Projects and initiatives for the Weeki Wachee River identified in this plan address specific management actions as outlined in the previous section. Not every management action has a specific project associated with it. The TWG provided ongoing and proposed projects to the SCMC and SCSC for review and approval. All ongoing projects were included within the plan. The proposed projects were reviewed and some were recommended as priority projects by the SCMC and SCSC.

Ongoing Projects and Initiatives

Ongoing projects and initiatives currently exist and have funding secured (if applicable). Tables 9-11 list the projects and initiatives that are considered ongoing and will support the overall objective of improving the water quality, water quantity, and natural systems aspects of the Weeki Wachee River.

Water Quality Projects

Table 9: Ongoing Water Quality Projects

Monitoring & Research
Evaluation of Nitrogen Leaching from Reclaimed Water Applied to Lawns, Spray Fields, and RIBs Lead Entity: SWFWMD This multi-year funded project will assess nitrogen leaching from reclaimed water application to lawns, spray fields, and rapid infiltration basins (RIBs). Several different types of soil amendments such as sawdust, tire crumbs, and limestone will also be evaluated to determine their ability to reduce nitrogen leaching from reclaimed water applied to RIBs. This project will determine typical nitrogen leaching rates from reclaimed water application to lawns, spray fields, and RIBs. This information can be used to refine estimates of nitrogen loading to the aquifer and springs, and identify the best reclaimed water disposal methods to minimize nitrogen loading to groundwater. The nitrogen reduction capabilities of several soil amendments will also be assessed to develop new best management practices (BMPs) to reduced nitrogen loading from RIBs to the groundwater. Implementation of these BMPs has the potential to improve water quality in the aquifer and springs. Cost: $294,000
Project COAST Lead Entity: SWFWMD Beginning in 1997, the Southwest Florida Water Management District has funded the University of Florida to collect and analyze monthly surface water quality data at 50 fixed stations along the coast of Hernando, Citrus, and Levy Counties. Project COAST represents the longest, most comprehensive water quality data set on the Springs Coast and was instrumental in FDEP/EPA's efforts to establish Springs Coast Numeric Nutrient Criteria (NNC). Cost: $100,000 (annual)

Quarterly Springs Water Quality Monitoring

Lead Entity: SWFWMD

Quarterly to yearly water sample collection and analyses from 70 springs across the District including Weeki Wachee.
Springs monitoring tracks and assesses trends in dissolved nitrate and 27 other water quality parameters. Monitoring water quality of spring discharge is critical in evaluating the environmental and ecologic conditions of these rivers. Water-quality monitoring of springs is also the principle means of assessing the overall groundwater quality in the spring basins that recharge the Upper Floridan aquifer and deliver water to the springs. Ongoing monitoring and trend analyses of water quality characteristics at springs are critical to effective management and protection of this vital resource. Springs water quality is directly associated with groundwater resources assessment, including Minimum Flows and Levels, and evaluation of potential impacts from permitted water uses in the District. Long term monitoring of springs will be instrumental in determining effectiveness of BMPs applied to both urban and rural land uses. Data are also utilized by FDEP and EPA for Total Maximum Daily Load assessments and establishment.

Cost: $180,000 (annual)

Springs Initiative Monitoring

Lead Entity: SWFWMD

This project is for the collection of water quality and quantity data in our five first-magnitude springs systems, including Weeki Wachee. This project aims to determine the relationships between nutrient (nitrogen and phosphorus) and chlorophyll concentrations in these spring-fed systems and understand the role that salinity, springs discharge, and velocity are having on their ecology. This will provide critical information to drive management actions to address nutrient sources for the springshed.

Cost: $360,000 (FDEP providing full amount through Legislative Appropriation to SWFWMD)

Stream Water Quality Monitoring

Lead Entity: SWFWMD

District-wide monitoring network including thirteen surface water stations spread throughout the Weeki Wachee River.

This project supports key areas including:

- Establishment of baseline water quality conditions
- Biological and water quality studies and evaluation
- Determining loading estimates for basins with available discharge data
- MFL development, evaluation and compliance
- Project planning and performance monitoring
- SWIM plan management strategies
- SWIM recommendations for action and restoration
- Establishment and re-evaluation of Total Maximum Daily Loads
- Environmental Resource permitting and compliance

Cost: $365,000 (annual)

Upper Floridan Aquifer Nutrient Monitoring

Lead Entity: SWFWMD

The Upper Floridan Aquifer Nutrient Monitoring Network (UFANMN) currently consists of approximately 100 wells covering springs-groundwater basins across Levy, Marion, Citrus, Hernando and Pasco counties. This project involves yearly water sample collection and analyses from these wells.

Data collected through the UFANMN are instrumental in evaluating groundwater-quality BMPs for dominant land uses in the spring basins. Current strategies for maintaining and improving groundwater quality, and reducing nitrate levels at springs, depends on implementing and assessing effectiveness of BMPs in the basins. The UFANMN data can be used in this process as a means to evaluate changes in groundwater quality where BMP programs are established. Current understanding of groundwater movement from the basins to the springs requires effective monitoring in the basin, as well as monitoring of the springs. Since groundwater moves relatively slow, and can take years to eventually move from sources of nitrate loading to the springs, BMP assessments must include groundwater monitoring near the potential sources.

Cost: $120,000 (annual)

Agricultural Operations (Cattle Farms, Horse Farms, Row Crops)

Adopted Water Quality/Quantity BMP Implementation and Compliance

Lead Entity: FDACS

Agricultural nonpoint sources in a Basin Management Action Plan (BMAP) area are required by state law (Subsection 403.067[7], F.S.) either to implement Florida Department of Agriculture and Consumer Services (FDACS)-adopted best management practices (BMPs) or to conduct water quality monitoring prescribed by the Florida Department of Environmental Protection (DEP) or water management district, to demonstrate compliance with water quality standards. Failure either to implement BMPs or conduct water quality monitoring may bring enforcement action by the DEP or water management district. The implementation of FDACS-adopted, DEP-verified BMPS in accordance with FDACS rules provides a presumption of compliance with state water quality standards. FDACS field staff and technicians (either through Soil and Water Conservation or University of Florida's Institute of Food and Agricultural Sciences) are continually working to reach agricultural operations to enroll in the FDACS-BMP Program. The Office of Agricultural Water Policy (OAWP) within FDACS is authorized to update, develop, adopt, and assist producers in implementing agricultural BMPs to improve water quality and water conservation. Currently, there are adopted BMP manuals for cow/calf, citrus, vegetable and agronomic crops, dairies, nurseries, equine, specialty fruit and nut, sod, and wildlife. A poultry manual is under development and will be adopted by the end of 2016. The OAWP also has an Implementation Assurance (IA) Program, which is a follow-up program once a producer enrolls in the FDACS-BMP Program. The IA Program is currently under revision as a result of requirements under the Water Law.

Cost: TBD

Central Florida Springs Region Agricultural BMP Cost-Share Program

Lead Entity: FDACS

The Central Florida Springs Region Agricultural Best Management Practice (BMP) Cost-Share Program was established to promote water quality and water quantity BMPs that provide overall water resource benefits to commercial agricultural producers. Through this program, the Florida Department of Agriculture and Consumer Services (FDACS) will reimburse eligible producers, through the Hardee Soil and Water Conservation District, for selected agricultural practices that have potential sediment control, water conservation and/or water quality improvement benefits. It is anticipated that the program will provide farm managers and owners with economic incentives to facilitate implementation of FDACS-adopted BMPs. FDACS funding levels vary year-to-year dependent upon the State of Florida program allocations and are not currently adequate to keep up with demand.

Cost: TBD

Septic Tanks

Hernando County Septic to Sewer Conversion Study

Lead Entity: Hernando County

This project is a study to quantify and study the feasibility of converting septic tanks to central sewer in the Spring Hill area. It is estimated that there are approximately 30,000 septic tanks in the Spring Hill area. This study includes a data collection phase where the consultant is assembling available information about the septic tanks installed to date and developing a GIS layer utilizing the information. The consultant is reviewing available hydro-geologic information about the area and developing a map with groundwater travel time contours for the 1 year, 5 year and 10 year travel times to the Weeki Wachee Spring. The ultimate output of the study is to provide the County with a districting map that delineates and prioritizes areas for pursuit of septic to sewer conversion construction projects.

Cost: $138,652

Oakley Island Sewer Infrastructure Installation

Lead Entity: Hernando County

Oakley Island is located 3.5 miles WNW of Weeki Wachee Springs State Park off of Hwy 550. This 25 lot community is appropriately named as it is surrounded by the Mud River. Oakley Island is ¼ to ½ miles from Salt Spring and Mud Spring which are part of the Weeki Wachee Spring Group. Salt Spring, is a brackish vent that discharges to Salt Creek then flows into the Mud River. Mud Spring forms the headwaters of the Mud River then joins the Weeki Wachee River near Bayport. Most of the residential units on Oakley were built in the 1970's with some as old as 1956. The newest unit in this community was built in 2009. Oakley Island have public water supply provided by Hernando County Utilities Department. This proposal would have the septic systems from each property properly abandoned and sewer infrastructure installed to tie each home into a new sewer system. The flow from this area goes to the County's Glen Water Reclamation Facility (WRF) which is capable of producing Public Access Reuse. Construction would consist of installing gravity mains, force mains, lateral services and a lift station.
Improve water quality of nearby coastline with higher nutrient removal, mitigate impact of septic tanks on water quality. The estimated load reduction is 208 lb per year for the 17 septic tanks. The estimate is based on 37 lb N/system/yr and 33% removal efficiency. The additional reuse water that will be available will be distributed through a 16" Reclaimed Water Main (RCWM). This reclaimed water main is a current project with funding from Hernando County Utilities Department ($3 million), Southwest Florida Water Management District's Cooperative Funding Initiative ($3 million) and the Florida Department of Environmental Protection ($6 million).

Cost: $596,648

Urban/Residential Fertilizer (includes Golf Courses)
Development of Landscape Fertilizer BMPs Lead Entity: UF-IFAS/SWFWMD The objective of this project is to verify the accuracy of the Florida Yards and Neighborhoods (FYN) and Florida Green Industries best management practices (BMPs) fertilizer recommendations across a wide range of common landscape plants. Plant growth, biomass allocation, shoot nutrient status, foliar characteristics and aesthetic quality will be evaluated. This project represents a significant step to develop and implement accurate, science-based fertilizer BMPs for urban (residential and commercial) landscapes. This study aims to improve the quality of stormwater that leaves an urban landscape by influencing the amount of fertilizer that is applied to these landscapes. The results of the project will be applicable to ornamental plants grown in residential and commercial landscapes. This research will provide scientific data on the fertilizer needs of landscape plants and will improve the accuracy, credibility and long-term viability of statewide BMP programs, such as the FYN program. Cost: $274,429
Education Campaign Lead Entity: SWFWMD Existing communications products produced by the District's Public Affairs Bureau. Fertilizer campaign is in place, plan to expand the campaign to include septic system inspection and maintenance. Cost: $10,000
Wastewater Treatment Facilities
Hernando County's Package WWTP Connection Initiative (Camp-A-Wyle) Lead Entity: Hernando County Camp-A-Wyle Lake Resort, 9206 Grizzly Bear Lane Brooksville, FL 34613, is approx. 3 miles north of State Road 50, east of Highway US 19 (across from Glen Lakes sub-division). This a modular home/RV community with over 200 residential lots/homes and a clubhouse. The purpose of the proposed project is to connect the package plant located at Camp-A-Wyle to the County's sewer system via a new force main and lift station. Package Plants are treatment facilities used to treat wastewater in small communities or on individual properties. This connection would improve water quality in the nearby spring basin and surrounding surface waters. The proposed project would redirect the flow to the County's Glen Water Reclamation Facility (WRF) which is capable of producing Public Access Reuse. The typical package plant generates secondary wastewater treatment which does not include the enhanced nitrogen removal capabilities that the county's larger WRF's can achieve. Improve water quality in the spring basin and mitigate impact of the package waste water treatment plant on water quality. The additional flows from this package plant will increase the amount of reclaimed water that will be available. The additional reclaimed water that will be available will assist in the water conservation goals of offsetting ground water usage. It is estimated the load reduction would be 267 lbs per year based on effluent discharge limit of 7 mg/L nitrates. The additional reuse water that will be available will be distributed through a 16'' Reclaimed Water Main (RCWM) is adjacent to this property. This reclaimed water main is a current project with funding from Hernando County Utilities Department ($3 million), Southwest Florida Water Management District's Cooperative Funding Initiative ($3 million) and the Florida Department of Environmental Protection ($6 million). Cost: $608,300

Hernando County's Package WWTP Connection Initiative (Frontier Campground)

Lead Entity: Hernando County

Frontier Campground, 15549 SR 50 Brooksville, FL 34613, is approx. 1 mile east of the Suncoast Parkway. This a modular/RV home community with over 180 residential lots/homes and a club house. The purpose of the proposed project is to connect the package plant located at Frontier Campground to the County's sewer system via a new force main and lift station. Package Plants are treatment facilities used to treat wastewater in small communities or on individual properties. This connection would improve water quality in the spring basin and surrounding surface waters. The proposed project would redirect the flow in the interim to the County's Subregional Brookridge Wastewater Treatment Plant Glen Water (WWTP). This WWTP is scheduled to be taken off line within the next two years and all the flows will be sent to the County's Glen Water Reclamation Facility (WRF) which is capable of producing Public Access Reuse. The typical package plant generates secondary wastewater treatment which does not include the enhanced nitrogen removal capabilities that the county's larger WRF's can achieve.
Improve water quality of nearby Spring basin and mitigate impact of the package waste water treatment plant on water quality. The additional flows from this package plant will increase the amount of reclaim water that will be available. The additional reclaim water that will be available will assist in the water conservation goals of offsetting ground water usage. It is estimated the load reduction would be 146 lbs per year based on effluent discharge limit of 7 mg/L nitrates.
The additional reuse water that will be available will be distributed through a 16'' Reclaimed Water Main (RCWM) that is adjacent to this property. This reclaimed water main is a current project with funding from Hernando County Utilities Department ($3 million), Southwest Florida Water Management District's Cooperative Funding Initiative ($3 million) and the Florida Department of Environmental Protection ($6 million).

Cost: $463,000

Hernando County's Package WWTP Connection Initiative (Topics RV Community)

Lead Entity: Hernando County

Topics RV Community, 13063 County Line Road Brooksville, FL is approx. 1.5 miles west of the Suncoast Parkway. This a modular home/RV community with over 200 residential lots/homes and a clubhouse. The purpose of the proposed project is to connect the package plant located at Topics RV Community to the County's sewer system via a new force main and lift station. Package Plants are treatment facilities used to treat wastewater in small communities or on individual properties. This connection would improve water quality in the spring basin and surrounding surface waters. The proposed project would redirect the flow to the County's Airport Water Reclamation Facility (WRF) which is planned to be modified to produce reclaim water within the five (5) year Capital Improvement Plan (CIP). The typical package plant generates secondary wastewater treatment which does not include the enhanced nitrogen removal capabilities that the county's larger WRF's can achieve.
Improve water quality of nearby coastline, mitigate impact of the package waste water treatment plant on water quality. The County's Airport WRF is shown to be modified in the five (5) year Capital Improvement Plan (CIP) to produce reclaim water and the additional flows from this package plant will increase the amount of reclaim water that will be available. The additional reclaim water that will be available will assist in the water conservation goals of offsetting ground water usage. It is estimated the load reduction would be 233 lbs per year based on effluent discharge limit of 7 mg/L nitrates.

Cost: $666,000

Hernando County's Package WWTP Connection Initiative (Weeki Wachee North)

Lead Entity: Hernando County

Weeki Wachee North Mobile Home Park (MHP), 10401 Amity Ave Weeki Wachee, FL 34614, is approximately six (6) miles north of State Road 50. This a modular home community with over 160 residential lots/homes and a clubhouse. The purpose of the proposed project is to connect the package plant located at Weeki Wachee North MHP to the County's sewer system via a new force main and lift station. Package Plants are treatment facilities used to treat wastewater in small communities or on individual properties. This connection would improve water quality in the nearby spring and surrounding surface waters. The proposed project would redirect the flow to the County's Glen Water Reclamation Facility (WRF) which is capable of producing Public Access Reuse. The typical package plant generates secondary wastewater treatment which does not include the enhanced nitrogen removal capabilities that the county's larger WRF's can achieve. Improve water quality of nearby Spring, mitigate impact of the package waste water treatment plant on water quality. The additional flows from this package plant will increase the amount of reclaim water that will be available. The additional reclaim water that will be available will assist in the water conservation goals of offsetting ground water usage. It is estimated the load reduction would be 248 lbs per year based on effluent discharge limit of 7 mg/L nitrates.
The additional reuse water that will be available will be distributed through a 16" Reclaimed Water Main (RCWM) is adjacent to this property. This reclaimed water main is a current project with funding from Hernando County Utilities Department ($3 million), Southwest Florida Water Management District's Cooperative Funding Initiative ($3 million) and the Florida Department of Environmental Protection ($6 million).

Cost: $906,400

Stormwater

Water's Journey: Kass Circle to Weeki Wachee Springs – Education Program

Lead Entity: Hernando County/SWFWMD

The program will educate residents and business owners of the Kass Circle Community and other Hernando County students and residents about how stormwater runoff in this urban springshed can affect Weeki Wachee Springs. This project is intended to be a pilot project in hopes of expanding the activities into other neighborhoods in the springshed.

The County will implement the project activities with assistance from students in the University of Florida's Sustainability Program. Activities will include:

- A map of the stormwater system showing stormdrain stenciling locations selected
- An educational flier to be distributed to the community
- Classroom presentations at local schools
- A stormdrain stenciling event
- A short report outlining potential Low Impact Development and Best Management Practices to reduce stormwater runoff from Kass Circle

By reducing nutrients entering Weeki Wachee Springs, this program helps prevent further degradation of this natural system.

Cost: $2,250

Weeki Wachee Rogers Park LID

Lead Entity: SWFWMD

Design, permit, and construct stormwater improvements at Rogers Park, which is adjacent to the spring-fed Weeki Wachee River. Benefits include water quality improvement by reducing sediment, nutrient, and other contaminant loads to the Weeki Wachee River, a first magnitude spring system and Outstanding Florida Water.

Cost: $450,000

Weeki Wachee State Park Canoe Launch Improvements

Lead Entity: SWFWMD

This project involves the implementation of surface water quality improvement projects at the Weeki Wachee Springs State Park and the Ellie Schiller Homosassa Wildlife State Park. As a result of land use practices, nutrient levels in Weeki Wachee Springs and Homosassa Springs have been increasing for the past several decades. Untreated stormwater has been identified as a source of nutrient loading and sediment contribution to those systems. Both springs have been identified as impaired by the Florida Department of Environmental Protection due to abundant algae caused by excess nitrogen. In April 2011, the Coastal Rivers Basin requested staff evaluate options to further address water quality issues in the springs. District staff met with Florida Department of Environmental Protection staff to discuss potential restoration and stormwater retrofit projects associated with the Weeki Wachee and Homosassa state parks.
Cardno TBE Group, the District's consultant, completed the Stormwater BMP analysis and generated a report in September 2012. Cardno TBE identified a total of 19 potential improvements for water quality. 15 of these are for Weeki Wachee and 4 are for Homosassa. The benefits of corrective action associated with the sites are categorized as either moderate or low. Of the 19 sites, 4 were ranked as moderate, all of these are in Weeki Wachee. The District will complete the design, permitting, and construction to the projects "canoe launch site soil stabilization" and "canoe launch pick-up and drop-off site improvements."
The current project to be implemented will reduce stormwater pollutants entering the Weeki Wachee River via the canoe launch and canoe launch parking area. The project entails the stabilization of soils at the ramp entrance to the Weeki Wachee River and the improvements to the degraded parking area near the launch.

Cost: $350,000

Septic/Sewage Solids

NONE

Atmospheric Deposition

NONE

Water Quantity Projects

Table 10: Ongoing Water Quantity Projects

Monitoring & Research
Managing Forests for Increased Regional Water Supply Lead Entity: FDACS/WMDs This four-year University of Florida research project, with funding support provided by the five water management districts and FDACS, will measure forest water use via groundwater and soil moisture monitoring in differently managed stands (e.g., thinning, understory management, typical silviculture). This information will be used to develop relationships between forest management techniques and water supply benefits, with broad application to regional water availability. This project will quantify the water supply benefits of several forest management practices that could be implemented on District lands and other public and private lands within the District. Cost: $637,725
RADAR Rainfall Data Services Lead Entity: SWFWMD This project provides high-resolution rainfall data for modeling purposes. This is a cooperative effort between the five Water Management Districts. The RADAR rainfall estimate dataset is derived from the National Weather Service's NexRad RADAR imagery calibrated by point rainfall data. A contractor uses 15-minute rainfall data collected by the District to calibrate the mathematical model used to translate RADAR images to 15-minute estimates of rainfall accumulation for each 2-kilometer x 2-kilometer grid cell across the entire District. Data are available through the Water Management Information System back to February 1994 in 15-minute, hourly, daily and monthly total estimates for each 2 km x 2 km grid cell across the entire District. Cost: $40,000 (SWFWMD portion only)

USGS Evapotranspiration Data Collection

Lead Entity: USGS/SWFWMD

This project allows for the operation of one mixed-forest wetland evapotranspiration (ET) station that directly measures actual ET. Funding also provides for District participation in a cooperative effort between the USGS and all five Florida Water Management Districts to map state-wide potential and reference ET using data measured from the Geostationary Operational Environmental Satellites (GOES). Data are available back to 1995 and are provided on the same grid system as the RADAR rainfall data, making them suitable to calibrate District groundwater and surface water models and improve permitting efforts.

The cooperative data program between the District and the United States Geological Survey (USGS) provides data collection to support District regulatory and resource management initiatives. The costs for this data collection program are split between the District and the USGS. The data collected by the USGS complement the data from the District's data collection program, and provide independent verification of District data collection efforts. USGS data site locations are coordinated with District data site locations to ensure optimum data coverage. These USGS data are being made available to District staff through the Water Management Information System (WMIS), and to the public through the USGS Hydrologic Data Web Portal.

ET constitutes the largest water loss component in most water budgets for Florida watersheds. In Florida, approximately 50 percent of mean annual precipitation is returned to the atmosphere as ET. Lakes have been measured to return up to 110 percent of mean annual precipitation. The statewide ET project was initiated to quantify actual, not potential, ET to improve the accuracy of a wide range of hydrologic analyses. The intention of this project was to install eddy-correlation equipment in a variety of settings to develop reasonable estimations of ET that can be tied to land use/land cover information, thereby increasing the detailed input for watershed modeling purposes. Equipment would remain on-site for a few seasons to ensure the ET is quantified sufficiently, and then the equipment would be moved to another location to obtain information from a different land use. In this fashion, a dataset could be developed to improve model results.
The GOES ET program was initiated to develop a better tool for watershed modeling by developing a dataset of ET estimates using the same grid system utilized by the RADAR rainfall project. This provides both an estimated monthly rainfall value and estimated monthly ET value for every 2-kilometer-by-2-kilometer grid cell in the state. Datasets for the period 1995-2012 have been compiled and processed into computed values of evapotranspiration. They are available through WMIS.

ET data support integrated surface water and groundwater modeling, water use and environmental resource permitting and compliance, Minimum Flows and Levels development, evaluation and compliance, the Southern Water Use Caution Area recovery plan, and water shortage implementation and evaluation.

Cost: $50,700 (recurring)

USGS Groundwater Data Collection

Lead Entity: USGS/SWFWMD

This agreement includes data collection at 16 groundwater monitor wells, which complements the data from the District's 1,553 groundwater level monitor wells. The cooperative data program between the District and the United States Geological Survey (USGS) provides data collection to support District regulatory and resource management initiatives. Costs are split between the District and the USGS. The USGS data are available to District staff through the Water Management Information System (WMIS), and to the public through the USGS Florida Water Science Center Web Portal. USGS data site locations are coordinated with District data site locations to ensure optimum data coverage and prevent redundancy.

Groundwater level data provide critical support for integrated surface water and groundwater modeling, water use and environmental resource permitting and compliance, Minimum Flows and Levels development, evaluation, and compliance, the Southern Water Use Caution Area recovery plan, water shortage implementation and evaluation, and many resource evaluations and reports, including the Hydrologic Conditions Report. Most of these groundwater monitoring sites have extensive historical records, with some dating back to the 1930's. The length and completeness of the data records provide a necessary regional framework for scientifically evaluating impacts to water supplies in response to changes in climate and development.

Cost: $100,000

USGS MFL Surface Water Data Collection Sites

Lead Entity: USGS/SWFWMD

This project is to keep in operation hydrologic gages that are necessary to establish minimum flows in the District. This initiative is to establish and maintain the District's gaging network needed to establish/re-evaluate minimum flows and levels (MFLs) on priority waterbodies throughout the District. Beginning in FY2004, data collection associated with MFLs was funded under a separate agreement with the U.S. Geological Survey (USGS). While the USGS (with cooperative funding from the District in recent years) has long maintained a stream gaging network in the state, coverage is not adequate for establishing the most defensible MFLs. It is envisioned that gage sites will routinely be established along rivers to estimate flow at various distances along the River's length. Coupled with information from long-term gage sites, a few years' records at these short-term gages can be used to establish more accurate flows in the vicinity of biological monitoring sites used to evaluate and establish MFLs. Based on empirical relationships to be established with long-term gages and using hydraulic modeling results, flow records can be re-created at short-term sites using flow records at long-term sites. In addition, while the flow regimes of many of the District's rivers have been historically monitored along their freshwater reaches, flow data for rivers where they enter their respective estuarine areas is often lacking or has not adequately been monitored. The influence of tide and the braided nature of some of the Rivers in their estuarine reaches make discharge measurements difficult and costly. In addition to stage and flow data, monitoring in tidal areas involves increased instrumentation to allow for salinity and sometimes dissolved oxygen measurements to be made. Flows can greatly affect the distribution of salinity and low dissolved oxygen zones in estuarine river reaches.

Cost: $491,950 (recurring)

USGS Surface Water Data Collection

Lead Entity: USGS/SWFWMD

This agreement includes continuous and periodic discharge and water-level data collection at 126 river, stream and canal sites, which complements the data from the District's 776 surface water level gauging sites. The cooperative data program between the District and the United States Geological Survey (USGS) provides data collection to support District regulatory and resource management initiatives. Costs are split between the District and the USGS. The USGS data are available to District staff through the Water Management Information System (WMIS), and to the public through the USGS Florida Water Science Center Web Portal. USGS data site locations are coordinated with District data site locations to ensure optimum data coverage and prevent redundancy.

The USGS is the recognized international expert on streamflow gauging and monitoring, a complicated and labor-intensive process. Surface water flow data provide critical support for watershed studies for proper drainage and water control, integrated surface water and groundwater modeling, biological monitoring, water use and environmental resource permitting and compliance, operations of the District's water conservation and control structures, Minimum Flows and Levels development, evaluation and compliance, water shortage implementation and evaluation, the Southern Water Use Caution Area recovery plan and many resource evaluations and reports, including the Hydrologic Conditions Report. Most of these groundwater monitoring sites have extensive historical records, with some dating back to the 1930's. The length and completeness of the data records provide a necessary regional framework for scientifically evaluating impacts to water supplies in response to changes in climate and development.

Cost: $1,089,400 (recurring, District-wide)

Conservation

Agricultural Water Supply Planning

Lead Entity: FDACS

The Florida Department of Agriculture and Consumer Services (FDACS) Office of Agricultural Water Policy (OAWP) compiles 20-year-demand projections for agricultural self-suppliers, using best available data. The OAWP provides these projections, in five-year increments, to each water management district during the development or revision of regional water supply plans. Section 373.709, Florida Statutes, requires the water management districts to consider this data in their planning and to explain any adjustment to or deviation from the data.
The FDACS OAWP has developed a central data repository for agricultural water use projections, called the Florida Statewide Agricultural Irrigation Demand (FSAID). The FSAID contains standardized statewide parcel-level GIS coverage of all agricultural and irrigated lands for 2015. It includes estimates of 2015 irrigated agricultural acreage by crop type or category, spatially for each county, and future projections of irrigated agricultural acreage to 2035. Future water supply demand projections are calculated both for an average year and a 1-in-10-year drought.
This effort is ongoing to update the data.

Cost: TBD

Analysis of Utility Water Rates for Planning & Regulatory Support and Water Rate Model Workshops

Lead Entity: SWFWMD

This project explores the use of rate structures through research and a series of rate workshops.

Cost: TBD

Center Pivot Mobile Irrigation Lab (CPMIL)

Lead Entity: SWFWMD

This project provides a mobile irrigation lab that specializes in center pivot irrigation systems to service the northern District.

MILs are highly regarded tools for improving water use efficiency on agricultural lands. The water savings generated by implementing efficiency improvements identified by the MILs are substantial and represent one of the best methods of water conservation. Additionally, these savings are tracked in the Florida Department of Agriculture and Consumer Services (FDACS) MIL web portal thus allowing the water savings to be quantified on an annual basis.

There are approximately 65 center pivot systems permitted in the SWFWMD. The budgeted amount of $25,000 per year will allow a continual rotation of about 12 system evaluations per year (pre and post evaluations) to cover all systems once every 5 years which is the industry recommendation to maintain optimal efficiency.

Cost: $25,000 (recurring)

District Utility Services Program

Lead Entity: SWFWMD

The District's Utility Outreach Program involves proactively coordinating with the public water supply utilities throughout the District's boundaries in a systematic manner to achieve the water supply planning and water conservation goals; this would be in addition to the ongoing support provided to Regulation as part of the Water Use Permitting process (see IOP/WUP- 053.00, dated October 19, 2009). This activity was designed to account for general work that is not assigned to any specific project. As such, there are no critical project milestones and staff time is budgeted each year.

The District's Utility Outreach Program is intended to improve water supply planning, water conservation, and relations with the 170 public water supply utilities within the District. The key program goals are to: reach agreement with utilities on population and demand projections; achieve a Districtwide goal of 150 gallons per capita per day (gpcd) or less of water use; enhance support to the District's Division of Regulation to accomplish District goals; improve communication and coordination with utilities; achieve 75% utilization of reclaimed water and 75% offset efficiency of traditional water supply; and better align District resources to achieve water supply planning and water conservation goals.

Cost: $134,016 (District-wide cost)

Enhanced Regional Irrigation System Evaluations and Conservation Incentive Program

Lead Entity: WRWSA

The project includes an education strategy; advertising and marketing; and the administration of irrigation audits in Citrus & Hernando counties, eligible portions of Marion County, the Village Center Development District (VCDD) and the North Sumter County Utility Development District (NSCUDD) located in Sumter County. The project includes up to 320 "core" evaluations with recommendations to homeowners and 96 "enhanced" evaluations whereby some or all recommendations will be implemented by the project contractor. It is anticipated that as much as 144,000 gpd will be saved through the proper installation of rain sensors, appropriate water scheduling, and implementation of Florida-friendly landscaping practices. It may also be used to provide a cost-sharing financial incentive to implement recommendations. The program will also supply and install replacement batteries in controllers; replace obsolete controllers with Water Sense® approved controllers; provide rebate incentives for homeowners who replace landscape and/or irrigation systems that are water conserving; and provide landscape and irrigation contractor training for certification in water conserving practices. The project will include the verification through inspection of the proper installation of efficiency devices by way of follow-up site visits and interviews concerning landscaping practices. The water savings will favorably affect groundwater, public water supply and reclaimed water demand.

Cost: $200,000

FARMS Program: Facilitating Agricultural Resource Management Systems

Lead Entity: SWFWMD

Agricultural BMPs provide important water resource benefits, and the District's FARMS Program, as an agricultural BMP cost-share reimbursement program, provides incentives to the agricultural community for implementation of approved water quantity and water quality BMPs. BMPs can promote improved water quality in spring systems through reduction of nutrients. BMPs can also impact groundwater resources by reducing groundwater withdrawals from the Floridan aquifer through conservation measures. While FARMS has largely focused on reducing groundwater withdrawals in the District's southern region, the program is expanding its role in the northern region to include a focus on reducing nutrient loading to groundwater. FARMS can cost-share proposals from 50 percent up to 75 percent of total project costs, and can partner with other federal, state and local agencies such as the U.S. Department of Agriculture - Natural Resources Conservation Service (USDA-NRCS) Environmental Quality Incentives Program, FDACS, and FDEP. Total annual fiscal year funding available for these projects is upwards of approximately $6.0 million. Potential projects may include approved precision nutrient application technologies or conservation practices. The agricultural community is highly encouraged to contact FARMS staff to discuss and develop potential projects. The SWFWMD and FDACS have worked cooperatively to help fund FARMS projects and are looking to expand their partnership within the Springs Coast area.
The SWFWMD and FDACS also work cooperatively with the Mini-FARMS Program, which is a scaled down version of the FARMS Program for growers that are 100 irrigated acres or less to implement water quantity BMPs. The program cost shares at a rate of 75% up to a maximum reimbursement of $5,000. Examples of projects include irrigation conversions and soil moisture probes.

Cost: TBD

Florida Water Star Certification and Builder Education

Lead Entity: SWFWMD

This project reduces water use and helps to improve water quality by reduced stormwater runoff in the building industry. Florida Water StarSM (FWS) is a statewide water conservation certification program for new and existing homes and commercial developments. The program educates the building industry about water efficient building practices and provides incentives to make these practices common to the marketplace.

Based on estimates, a home meeting Florida Water Star indoor and outdoor criteria uses approximately 54,287 gallons of water less per year compared to a home with non-Energy Star rated appliances indoors and 100 percent high-volume irrigation outdoors, which is traditionally seen in Florida homes.

Quantified results illustrate program benefits includes On Top of the World Communities in Marion County where a FWS certified home uses about one-third the amount of water as a comparable property in the same community.

Cost: $65,169 (District-wide cost)

Hotel/Motel/Restaurant Water Conservation Education

Lead Entity: SWFWMD

This project reduces water use in the lodging industry. The District provides free educational materials for Water CHAMP properties that agree to implement a towel and linen reuse program. Based on prior audit results and average occupancy rates, this project will save an estimated 149 million gallons of water per year at a cost benefit of $0.47 per thousand gallons of water using the total cost amortized over five years. Currently, Water CHAMP has 365 participants.

Cost: TBD

My Florida Farm Weather Program

Lead Entity: FDACS

This is a project with Florida Department of Agriculture and Consumer Services (FDACS) and the University of Florida's Institute of Food and Agricultural Sciences Florida Automated Weather Network (FAWN). It is a partnership that assists producers when to irrigate during frost-freeze conditions or when to apply nutrients or pesticides during wet months. This program reimburses producers for implementing an on-farm weather station. Information from these on-farm weather stations is displayed on FAWN's website to create a weather station network for producers looking to be more accurate on irrigating for freeze protection or timing of fertilizer or pesticides, which includes graphical information that allows users to view real-time data. The FDACS is currently trying to expand the program into more of the Springs Coast area.

Cost: $500,000 (statewide)

Water Loss Reduction Program

Lead Entity: SWFWMD

The Water Loss Reduction Program is an ongoing program which provides assistance to public supply water utilities and water use permit holders in conserving water and in documenting and reducing water loss. Among the services provided upon request are comprehensive leak detection surveys (systematic or point), meter accuracy testing (source and service), and water audit guidance and evaluation. The ongoing program (formerly referred to as the Leak Detection Program and historically known as the Urban Mobile Lab) has been very successful since it was started in the early 1990s, completing 103 leak surveys that has helped to prevent the unnecessary real water loss of an estimated 5.8 million gallons per day throughout the District. It has been calculated that the project and resulting water savings is one of the most cost-effective methods of water conservation currently employed by the District.
During recent years, and especially since the inception of the Utility Services program, there has been a significant increase in requests for leak detection as well as meter accuracy testing activities. The ten leak detection surveys conducted in 2013 resulted in a total of 101 leaks located/repaired that equated to an estimated 172,440 gallons per day of water saved (62,940,600 gallons/year). Considering the cost of staff time and equipment to perform services during 2013, the estimated cost to realize the conserved water is $0.15 per thousand gallons (using a three-year District budget average of $39,952 amortized at 8% over five years and not including the costs by the utility to repair the leak). This is a very cost-effective water conservation method considering the cost of alternative water supplies which, per thousand gallons, are in the $10.00 to $15.00 range.

Cost: $39,901 (recurring, District-wide)

WRWSA Regional Landscape and Irrigation Evaluation Program: Phase 3

Lead Entity: WRWSA/ SWFWMD

This conservation project will provide approximately 140 irrigation system evaluations to high-water use, single family residential customers. These evaluations will come with recommendations for optimizing the use of water outdoors through Florida-Friendly Landscaping TM practices and other efficient irrigation best management practices. Rain sensor devices will be provided and installed for project participants who do not have a functioning device.

This project aims to conserve approximately 58,800 gallons per day.

Cost: $71,000

Alternative Water Supply
Central Pasco County Beneficial Water Reuse Project Lead Entity: Pasco County The DISTRICT and the COUNTY have partnered to design, permit and construct an infiltration, treatment wetland system that uses excess reclaimed water from the Pasco County Master Reuse System (PCMRS) to recover and enhance the water resources of central Pasco County. In 2010, the feasibility of using constructed wetlands coupled with land application systems was investigated. Recommendations included a constructed wetland infiltration system for water quality polishing and groundwater recharge. These facilities would provide recharge to impacted groundwater levels, and additional water for hydrologically altered wetlands and flow systems. A parcel of interest of approximately 3,000 acres in size (4G Ranch) was identified and includes areas of upland and hydrologically-altered wetlands located between the Cross Bar Ranch and Cypress Creek public supply well fields. The objective of this multi-year PROJECT is to design, permit, and construct a wetlands recharge facility to provide recharge to the Upper Floridan aquifer. Up to 5 mgd of surplus reclaimed water will be delivered to the site. We anticipate up to 1.6 mgd will infiltrate into the UFA. This public-private partnership has several cost components. Actual construction costs are $13,224,955. The County will lease the facility for $95,000 annually. Costs were determined by the contractor; vetted by the Water Management District, Pasco county, and two separate independent 3rd party appraisals. Cost: $13,224,955 (construction)
Crews Lake Natural Systems Restoration Project Lead Entity: Pasco County The Crews Lake Project is designed to deliver an initial 4 mgd of highly treated reclaimed water to the Weeki Wachee Springshed to recover water levels in the Crews Lake Basin, which has experienced significant dehydration due to regional water production from the Cross Bar Ranch Wellfield. The withdrawal and distribution of 15 mgd of water from that wellfield out of the springshed basin has contributed to reduced flows in the Weeki Wachee Spring and water levels in natural aquatic systems throughout the watershed. The project will be designed to allow expansion to accommodate up to 15 mgd. Preliminary analyses suggest that 2 million gallons of the initial 4 mgd could infiltrate into the Upper Floridan Aquifer. Cost breakdown: • Natural wetland retrofit - $2,149,000 • Pipeline - $2,200,000 • Contractor markup - $2,394,000 • Permitting & Engineering - $682,000 • Construction Services - $341,000 Cost: $7,766,000

Hernando County US19 Reclaimed Water Transmission

Lead Entity: Hernando County

The US19 Reclaimed Water Transmission Phase I project will involve constructing approximately 52,000 feet of 16-inch reclaimed water main from the Glen WRF to the intersection of US 19 and Trenton Avenue inside the US 19 and Bourassa Boulevard right-of-way in Hernando County and will provide up to 1.7 MGD of reclaimed water to the Timber Pines Subdivision and Golf Course. The Airport WRF is currently in the construction phase to expand the capacity to 3.0 MGD and will be completed in the summer of 2016. A new 16 inch and 20-inch force main also will be constructed by the summer of 2016 to transmit the flow from the Spring Hill WRF to the Airport WRF. The Spring Hill WRF will be decommissioned after construction of the force main and Airport WRF expansion is complete. Currently, the Timber Pines Subdivision and Golf Course receives approximately an average daily flow of 1.2 MGD of reclaimed water from the Spring Hill WRF. The new reclaimed water main will tie into the existing reclaimed water distribution system in Timber Pines which has an existing flow meter. This project is funded with FDEP springs funds, SWFWMD funds, and County funds.

The project would be the first phase of a reclaimed water main loop around western Hernando County. The project would initially provide a utilization of 1.7 MGD of reclaimed water to the Timber Pines Subdivision and Golf Course, with future utilization of up to 4.5MGD of Reclaimed Water

Cost: $12,000,000

Reclaimed Water Master Plan Revision

Lead Entity: Hernando County

The following are the major items of the project description:

1) The service areas for Water Reclamation Facilities (WRF) need to be updated and the growth projections need to be revised to accurately reflect current conditions.

2) The potential future reuse customers served by each WRF needs to be revised along with the revised routes of reclaimed water mains and revised cost analysis for each needs to be calculated.

3) Cost analysis for each water reclamation facility shall be performed to determine the best combination of Rapid Infiltration Basin (RIB) and storage tank construction.

4) The alternative analysis for the alternative routes discussed in the previous reclaimed water master plan needs to be revised to reflect the changes described above with new alternative routing scenarios developed with accompanying maps and cost estimates.

The increased use of reclaimed water will result in the reduction of fertilizer application, thus improving the water quality in the springs. Also, the increased use of reclaimed water will reduce groundwater withdrawal and thus increase spring flow.

Cost: $150,000

Regional Water Supply Planning
Development of 2015 to 2035 Districtwide Regional Water Supply Plan (RWSP) Lead Entity: SWFWMD The Regional Water Supply Plan (RWSP) assesses the projected water demands and potential sources of water to meet the demands in the Southwest Florida Water Management District (District) for the 20-year period from 2015 through 2035. The Plan is updated every five years, in accordance with Section 373.709, Florida Statutes. The RWSP consists of an executive summary and four geographically-based volumes that correspond to the District's four designated water supply planning regions (Northern, Tampa Bay, Heartland and Southern). The RWSP provides a framework for future water management decisions in the District and demonstrates how water demands can be met through a combination of alternative water sources, fresh groundwater and water conservation measures. The District's first RWSP was published in 2001 and is updated every five years. The District updates the RWSP with significant public comment to ensure all stakeholders with the opportunity for input. For the 2015 RWSP, the District will hold public workshops, with live webcasting, to provide status updates, answer questions and solicit public comment. The District has also developed this webpage to provide public drafts of the documents, advertise public workshops, and solicit comments from all interested stakeholders including the public. This process will help shape the final draft of the RWSP, scheduled to be completed in December 2015. Cost: $150,000
Regulatory
SWFWMD Water Use Permitting Program Lead Entity: SWFWMD The purpose of this program is to implement the provisions of Part II of Chapter 373, F.S., and the Water Resource Implementation Rule set forth in Chapter 62-40, F.A.C. Additional rules relating to water use are found in Chapter 40D-3, F.A.C., entitled Regulation of Wells, Chapter 40D-8, F.A.C., entitled Water Levels and Rates of Flow, Chapter 40D-80, F.A.C., entitled Prevention and Recovery Strategies For Minimum Flows and Levels, Chapter 40D-21, F.A.C., entitled Water Shortage Plan, and Chapter 40D-22, F.A.C., entitled Year-Round Water Conservation Measures. In addition to permitting, the Water Use Program engages in a comprehensive compliance program that checks and verifies critical information such as monthly pumpage quantities and over pumpage. Cost: $3,208,319
Minimum Flows and Levels
NONE

Natural Systems Projects

Table 11: Ongoing Natural Systems Projects

Monitoring & Research
Annual Aquatic Plant Survey Lead Entity: FFWCC The entirety of the Weeki Wachee River and its major canals will be surveyed annually for presence/absence of key aquatic plant species. Additionally, total acreages for FLEPPC Category I invasive exotic species observed will be recorded. Comments of interest including dominant species observed, spreading or new infestations, presence of rare natives, water level, water clarity, watershed changes, etc. will also be recorded. Cost: $200 (per year cost)
Springs Coast Fish Community Assessment Lead Entity: FFWCC Since 2013, FFWCC was allotted funds to sample fish communities in 5 spring-fed water bodies including the Rainbow, Chassahowitzka Homosassa and Weeki Wachee Rivers and Kings Bay. The purpose of the project is to obtain baseline information for fish communities as very little data has been previously reported. Habitat and flow data has also been collected during the project and will be included in fish community analyses. A final report will be submitted to the Southwest Florida Water Management District upon completion. The current project includes 8 sampling events on each of the spring-fed systems. However, to adequately document future trends and obtain current information, more monitoring is necessary. Cost: $185,620 (SWFWMD Funded)
Weeki Wachee Sand Assessment Lead Entity: SWFWMD The project will assess erosion and sedimentation in the Weeki Wachee River. The Weeki Wachee River has historically had issues with erosion of sand into the upper river due to human activities, which has detrimentally impacted the downstream ecosystem. The assessment will determine the sources of sand and other sediments, the rate of sedimentation, the extent of sand deposition, and rate of downstream sediment export. This information will be used to identify opportunities for future habitat restoration projects in the river. Cost: $75,000
Habitat Conservation
NONE
Habitat Restoration
NONE

Invasive Species Management
Cooperative Aquatic Plant Control Funded Program Lead Entity: FFWCC/SWFWMD SWFWMD cooperates with FFWCC pursuant to an existing agreement to manage aquatic plants on public waterbodies within the District. FFWCC drafts annual workplans for public waterbodies of the state that address the management objectives, target plant species, control acres, methods of control, etc. The District conducts the physical plant control. Cost: $1,000 (per year cost for Weeki Wachee only and does not include costs for District)
FWC Aquatic Plant Control Permitting Program Lead Entity: FFWCC Given that the Weeki Wachee Riverine System is an Outstanding Florida Water, no aquatic plant control (hand removal, chemical control, mechanical control) can occur on any part of the river without an FWC Aquatic Plant Control Permit issued by the state to the riparian owner. These permits intend to regulate the removal/control of aquatic plants by ensuring native vegetation is maintained to a certain percentage, revegetation is done if necessary to offset vegetation removal, allow removal of exotic plant species, etc. During site visits with riparian owners, we also have the opportunity to educate the public on the differences in native/non-native aquatic plant species and the numerous benefits of these native plant species. Cost: $10,000
Invasive Plant Management Educational Website Lead Entity: University of Florida UF/IFAS Center for Aquatic and Invasive Plants and FWC maintain the website https://plants.ifas.ufl.edu/manage/. This website is a mecca for plant identification, why we manage plants, Florida waterbodies, various methods of plant control that exist, how we develop management plans, research and outreach, etc. The website is currently under revision but is a great invasive plant management education tool. Cost: $63,424
Recreation Management
NONE

Proposed Priority Projects and Initiatives

Proposed priority projects and initiatives have been reviewed and approved by the SCMC and SCSC. Tables 12-14 list the projects and initiatives that, if implemented, will support the overall objective of improving the water quality, water quantity, and natural systems aspects of the Weeki Wachee River.

Water Quality Projects

Table 12: Proposed Water Quality Priority Projects and Initiatives

Monitoring & Research
Hernando/Pasco Aquifer Vulnerability Assessment Develop an aquifer vulnerability assessment for Hernando and Pasco Counties, using a similar methodology as the Citrus County Aquifer Vulnerability Assessment. This assessment will estimate the vulnerability of the aquifer to contamination throughout both counties, which will be used to identify priority areas to implement management actions to reduce nitrogen and other pollutant loading. Cost: $80,000
Agricultural Operations (Cattle Farms, Horse Farms, Row Crops)
NONE
Septic Tanks
Community Outreach and Education Campaign for Wastewater Solutions Develop educational tools and provide education on wastewater solutions available for the area of interest. Each area will have unique needs, and public education should be targeted so that it will make the greatest positive impact. For several years, the Department of Health in Duval County has successfully implemented a door-to-door inspection project that has been funded for many years through EPA's nonpoint source pollution program. Inspectors go through a neighborhood looking for sanitary nuisances to ensure a healthier and safer community. This type of program increases public awareness and helps identify failing septic systems. This would also allow for ground-truthing of the wastewater treatment method and drinking water source from the Florida Water Management Inventory to increase confidence in the data. This project will evaluate at the Duval County model, enhance and expand on it as appropriate, and execute the program in the areas of interest. Tasks would include: 1) Compile best practices from successful public education campaigns for onsite sewage system and develop an action list for implementing a public education campaign 2) Survey the community of interest to determine most effective methods of communication and determine community concerns 3) Implement a modified door-to-door inspection project in the area of interest 4) Compile data to update the Florida Water Management Inventory 5) Write draft and final project report, including lessons learned and a template public education campaign that can be used by other communities. Cost: $188,000

Update GIS Map of Drinking Water Source and Wastewater Disposal for Areas of Concern

The FDOH has developed a comprehensive and updateable inventory utilizing best available information to help assess the potential impacts from septic systems. As various groups work to reduce pollutant loadings to impaired waters, there is a need for an up-to-date comprehensive inventory to help determine impacts from onsite wastewater. The Florida Water Management Inventory will update each of the developed maps showing the location of all septic systems in the counties of concern. Up-to-date Geographic Information System (GIS) data and maps will provide information facilitating analysis to address this pollution source.

1) Update for areas of concern
   a) Modify process, as needed, based on results and recommendations from the initial Florida Onsite Sewage Treatment and Disposal Systems Inventory project
   b) Update geodatabase with new parcel and tax roll parcel data sets from the Florida Department of Revenue (FDOR) for areas of concern
   c) Identify built/not-built parcels, for areas of concern
   d) Request, collect, and document receipt of data sets for areas of concern
   e) Respond to and follow-up with inquiries, correspondence, and workflow action items for areas of concern
   f) Perform data assessment and preparation for geodatabase import for areas of concern
   g) Update existing geodatabase with imported data for available drinking water and wastewater data for areas of concern
   h) Apply estimation methodology for drinking water and wastewater in areas of concern where no data exists ("unknown") and where there is conflicting information ("undetermined")
   i) Develop GIS maps illustrating, and summary tables detailing, parcels and known/estimated drinking water and wastewater data by county for areas of concern
   j) Identify recommendations for improvements/enhancements and limitations/challenges for subsequent statewide inventory work with the goal of a sustainable inventory cycle
2) Quality Management and Assurance
   a) Update quality management plan; document data to be assessed, update quality objectives and metrics, update methods to reconcile assessment results
   b) Perform quality audits, document quality deficiencies, and assign action items to project team
   c) Update process documents and data structure elements as needed
   d) Develop training materials for FDOH Environmental Health Program staff required to acquire, update, analyze, and maintain data
   e) Train FDOH Environmental Health Program staff and other stakeholders as well as present results of the project to various audiences
3) Analysis
   a) Identify areas with high septic system failure rates based on an analysis of data from the FDOH Environmental Health Database
   b) Identify areas with older septic systems with no record of repairs
4) Project Management and Reporting
   a) Develop and publish the project schedule
   b) Develop and maintain a project task list for day-to-day activities derived from the high-level tasks in the project schedule
   c) Upon approval of the project budget, provide regular reporting on planned versus actual expenditures
   d) Prepare and publish project status reports quarterly including tracking baseline project milestones, executive summaries of completed work during the current reporting period, planned work for the upcoming reporting period, risks that require assessment and mitigation strategies, and issues that require intervention from the project owner, sponsors, or other executive leadership
   e) Update the project website with maps and project data
   f) Maintain and improve a web application to enhance access to project results
   g) Coordinate outreach efforts to inform current and potential stakeholders on project goals and progress, seek out potential collaboration opportunities at the federal, state, and local levels, and make presentations to interested parties

h) Seek out potential new funding sources to enable the inventory to be continued in an ongoing, cyclical manner to fully realize the potential of data sharing with both public and private sector organizations and with the general public
i) Prepare draft final project report summarizing project accomplishments, recommendations for the future, lessons learned, and any deviations from the project schedule and task list for review by the Department and other interested parties
j) Prepare final project report summarizing project accomplishments

Cost: $245,000

Shady Hills Septic Tank Abatement

This project will install a public wastewater system including sewer collection, pump station and force mains which will eliminate the usage of septic systems. There are several residences within the Weeki Wachee springshed that are currently on septic systems. This project will consist of four phases: feasibility/conceptual design; wastewater treatment facility improvements and expansion; wastewater transmission system; and neighborhood wastewater collection systems.

The wastewater treatment facility expansion will occur at the Shady Hills Wastewater Treatment Facility (SHWWTF). This facility is located within the Weeki Wachee springshed which is regarded by the Florida Department of Environmental Protection as one of the Outstanding Florida Waters.

Cost: $27,200,000

Urban/Residential Fertilizer (includes Golf Courses)

Develop a Springs Coast Model Fertilizer Ordinance

The current Florida Model Fertilizer Ordinance attempts to provide guidance for all Florida urban settings, however the Karst Geology found on the Springs coast is unique to Florida. Water flows through this type of topography much more quickly than other parts of Florida, this requires lower levels of nitrogen and soluble nitrogen than the Florida model which allows 40% soluble nitrogen content and prohibits lawn watering if a hurricane if forecast. Twenty-nine percent of the nitrates found in the Weeki Wachee River are from urban fertilizer, according to FDEP. The decrease in nitrogen from urban fertilizers would not be significant for the springs coast rivers without providing better guidance on fertilizers. Urban fertilizer is a direct contributor to nitrogen in the springs waterways.

Cost: TBD

Wastewater Treatment Facilities

Advanced Wastewater Treatment Plant Study

Have a master plan prepared to perform a feasibility study to construct advanced wastewater treatment components at the Hernando County Water Reclamation Facilities (WRF). The feasibility study will examine the site constraints and provide the recommended treatment process at each Water Reclamation Facility. The study will account for existing and future septage and leachate flows and examine the comparative costs for nutrient removal options and shall consider the use of effluent filters capable of denitrification, the use of chemicals such as methanol, the use of anaerobic and anoxic reactors, along with any other tankages or process modifications and biological modeling to achieve advanced wastewater treatment capabilities at each WRF.
By constructing advanced wastewater treatment components, nutrient loadings to the springs can be further reduced.

Cost: $100,000

City of Brooksville Package Plant Connection

This project will connect two private wastewater package plants within the Chassahowitzka and Weeki Wachee springsheds to the City of Brooksville central wastewater collection system. The project will provide facility connection, plant demolition and permitting and wastewater collection fees.
This project will reduce nutrient loading and increase the availability of reclaimed water for potential reuse or recharge.

Cost: $1,400,000

Wastewater Disposal Soil Amendment Pilot Project

This project will test the ability of soil amendments (e.g. wood chips) to remove nitrogen from treated wastewater effluent disposed in rapid infiltration basins (RIBs). The Hernando County Airport WWTF has several RIBs that would be an ideal test site for this innovative technology. This project will reduce nitrogen loading to groundwater within the Weeki Wachee springshed.

Cost: $300,000

Stormwater

Buccaneer Bay Impervious Surface Reductions Project

Project aids in meeting the WWSSP Unit Management Plan (2011) GOAL II, Objective B and quoted portions are directly from(B821) SWFWMD Improvement Projects Report (2012), project BMP 2A

Impervious surfaces within the attraction generate runoff with velocities that erode sediments and transport them into the spring head area. All or portions of three impervious areas have been identified for removal or replacement with pervious material. They are; 1) preparation of the site, 2) removal of the maintenance building located along the east side of the sidewalk near the park's entrance and, 3) removal of the loop segment of the sidewalk located near the park entrance, and removal and replacement with pervious material of a portion of the sidewalk. The east portion of the sidewalk will require removal and replacement in order to meet current ADA standards.

Solutions/Benefits: Removal of the impervious surfaces identified will reduce the amount of runoff entering directly to the spring. Also removal of the existing slide and building could provide for additional treatment areas within Buccaneer Bay attraction.

Recommendation is to utilize pervious materials to reconstruct needed walkways. All areas will be re-graded and stabilized" with appropriate native vegetation.

Cost: $93,000

Main Parking Area Stormwater Retrofit

The project is based on the WWSSP Master Plan and aids in meeting the WWSSP Unit Management Plan (2011) GOAL II, Objective B. Quoted portions are directly from (B821) SWFWMD Improvement Projects Report (2012), project BMP 3A-E.
Rework on main access and parking infrastructure for WWSSP in order to reduce existing impervious surfaces and reduce stormwater impacts from these areas. Components include the following:
"A) reduce the amount of impervious surface in the existing asphalt parking lot in order to reduce runoff into...stormwater ponds" or bioswales. "Removal of the terminus parking areas which are designated by paint on the existing asphalt. The option would be to remove the asphalt, stabilize edge with standard curb and inlets to allow stormwater runoff to enter and infiltrate. Areas could be appropriately landscaped with" appropriate native plants.
B) Relocate main "entrance to south". This would increase "land area to" improve "stormwater treatment of runoff entering the main spring head." Elimination of "the existing north entrance and require alterations to t the south entrance making it the main entry point. Although there is currently a driveway located on the west side of US-19 which lines up with the proposed improvements to the South entrance, the alterations associated with the Park entrance would require permitting and coordination with the local District 7 FDOT."
C) "Reduce Impervious Pavement and Install Pervious" materials. "The existing parking area located on the west side of the existing parking area has limited stormwater treatment. This option proposes to remove the existing impervious asphalt pavement and replacing it with pervious material thereby reducing the amount of runoff entering the existing and proposed treatment facilities. The existing asphalt would be removed. The underlying ground would be replaced with a permeable sub base and a combination of turf areas and turf block would replace the old asphalt. Runoff will be reduced and pollutants retained within the turf areas."(Consideration of use of bioswales in place of turf/sod should be considered.)
D) "Configure Existing Parking Lot". " Re-design of main parking area to reduce impervious area and maximize parking spaces in remaining area... "layout to utilize 90 degree parking including construction of landscape islands with filtration system to connect to the existing drainage collection system. This will reduce the amount of impervious surface by 6 percent (9,435 square feet). By creating landscape Islands which will allow for the capture and infiltration of runoff."
E) "Create Vegetative Buffer Between US-19 and Park" "To reduce the amount of impervious parking area contributing to the limited treatment system" "Removal of a portion of the main parking area and replace with a 15' " (native) " landscape buffer. This would reduce impervious area and runoff and improve water quality."

Cost: $1,267,183

Roof Stormwater Capture Project

Project aids in meeting the WWSSP Unit Management Plan (2011) GOAL II, Objective B and D. Details were taken from B821 SWFWMD Improvement Projects Report (2012), project BMP 2F. Stormwater runoff from the existing building roofs of the theater building, entrance building and pavilion building outfall directly to the Weeki Wachee headspring. Gutter the roofs and redirect downspouts into water barrels or cisterns for irrigations of landscape. In addition to the removal of direct runoff to the main spring area, the capture and subsequent use of the water for landscape irrigation is a positive water conservation practice. The Park with support from the District could promote conservation education with signage around the water barrels and cisterns.

Cost: $40,370

Septic/Sewage Solids

NONE

Atmospheric Deposition

NONE

Water Quantity Projects

Table 13: Proposed Water Quantity Priority Projects and Initiatives

Monitoring and Research
NONE
Conservation
Adopt Landscape Irrigation Design and Maintenance Standards Similar to Florida Water Star Certification Section 373.228, Florida Statutes, recognizes landscape irrigation as a significant source of water use (as much as 50% of total consumption in some areas) and directs local governments to improve landscape irrigation and design standards. Additionally, excessive amounts of water used by irrigation systems can cause nutrient run-off to flow from the irrigated land to nearby water resources, which can have an adverse effect on the environment and water quality. New construction offers the greatest opportunity for outdoor water savings with the least financial impact. Under current construction standards, new residential and commercial construction are often equipped with 100% high-volume irrigation in the irrigable landscape with no efficiency requirements to reduce water consumption. This project proposes the adoption of standards for new construction similar to those of the Florida Water Star program. The standards would require greater outdoor efficiencies, such allowing no more than 60% of the irrigable area be equipped with high-volume irrigation, separating plantings by water needs and providing low-volume irrigation in plant beds. Florida Water Star certified homes can save more than 40,000 gallons of water per year in the landscape compared to a typical new home. For example, an estimated 325 new residential construction permits were issued in Citrus County in 2015. If these new homes had been constructed to FWS standards, together they could have reduced their outdoor water consumption by approximately 13,000,000 gallons of water per year. To learn more about Florida Water Star, visit FloridaWaterStar.com. Cost: $20,000 (annual cost)
Domestic Self-Supply Indoor Water Conservation Pilot Project District-led indoor water conservation program for Domestic Self Supply households. Financial incentives to domestic self-supply households for the replacement of conventional toilets with high-efficiency toilets which use 1.28 gallons per flush or less. This project will include rebates and program administration for the replacement of approximately 200 high flow toilets. In addition, 200 do-it-yourself water conservation kits will be distributed. These include educational materials, low-flow showerhead, an aerator, and leak detection dye tablets. Also included are program promotion and surveys as necessary to ensure the success of the program. This program will conserve an estimated 5,200 gallons per day. With a cost effectiveness of $1.96 per thousand gallons saved. Cost: $37,000
Springshed Water Conservation Incentive Program and Projects Springshed water conservation incentive program will offer all residents the opportunity to participate in conservation programs. Currently, water conservation incentive programming is offered only through Hernando County Utilities Department (HCUD) with programs such as (but not limited to) low flow toilet replacement, rain sensor replacement, rain barrels, and sprinkler check-ups are only available to HCUD rate payers (customers). These programs offer financial incentives to make changes by replacing appliances or participating in programs that assist in the more efficient use of water indoors and outdoors. By broadening conservation incentives to include all residents within the springshed would heighten resource awareness and would save groundwater supplies for the future. Cost: $200,000

Alternative Water Supply
City of Brooksville Reclaimed to Hernando Oaks Golf Course Project involves providing reclaimed water flows from City of Brooksville to Hernando Oaks Golf Course located on US 41. Golf course currently uses an average of around 170,000 gpd of ground water. Approximately 4,600 ft of 6" reuse pipe would be needed. Cost: $300,000
Potential Reclaimed Water User Study Hire a consultant to complete an analysis that will identify users of groundwater that could feasibly utilize reclaimed water to offset the groundwater impacts, develop preliminary cost estimates for the additional infrastructure needed, and develop a prioritization matrix to assist developing projects for alternative water supply in the SWFWMD first magnitude springsheds. This project will address the priority management action of Water Conservation as well as be valuable in possible offset of fertilizer application by using recycled water in lieu. Cost: $200,000
Regional Water Supply Planning
NONE
Regulatory
NONE
Minimum Flows and Levels
NONE

Natural Systems Projects

Table 14: Proposed Natural Systems Priority Projects and Initiatives

Monitoring & Research
Aquatic Vegetation Mapping Evaluation This project will monitor aquatic vegetation throughout the Homosassa, Chassahowitzka, and Weeki Wachee Rivers. This project will use similar vegetation sampling methods previously conducted by the SWFWMD and the University of Florida so that change analysis can be performed to assess trends and support management strategies. Cost: $150,000
Habitat Conservation
Establish the Nature Coast Aquatic Preserve Work with DEP to prepare and coordinate passing of legislation to establish an aquatic preserve which would include the outfall from the Weeki Wachee, Homosassa, Chassahowitzka, and Crystal River areas. The extent would be from the Pinellas Pasco county line to the channel serving the Duke Energy plant in Citrus County. The legal description is defined in HB 1325 filed in the 2010 session. Estimates were prepared in the staff analysis or HB 1325. Non-recurring costs of $145,000 for supplies, computers, furniture, 2 vehicles, 2 boats (inshore and offshore) and scientific field instruments. An estimated $350,000 in Fixed Capital Outlay is needed to construct a field office, lab, meeting place and educational displays. $ FTE, $250,000 for salaries and operating expenses annually Cost: $745,000
Mud Spring Property Acquisition This proposed project is to acquire Mud Spring and the adjacent parcel to the west located in Weeki Wachee. This project is to conserve approximately 71.0 acres of environmentally sensitive land in Hernando County currently in private ownership through acquisition or by a less than fee method. Provided seller(s) are willing, the scope would entail appraisals, environmental site assessment, land/boundary surveys, and required documents in accordance with the land acquisition process. Acquisition of these properties will conserve coastal habitat for listed species and provide springs protection within the coastal greenway corridor. These properties are adjacent to SWFWMD owned properties located to the west and northwest. Conservation allows buffering with native vegetation providing water quality benefits to fragile spring systems. Cost: $401,625
Springs and Related Waterway Law Enforcement Funding a FWC Officer dedicated to enforcing existing (and new) regulations, laws, and ordinances. Existing regulations are of no use if there is no enforcement. Based on observation there is one officer on one river 3 hours per week - 1.7% of the time. Cost: $59,800

Weeki Wachee Adjacent Land Acquisition

Purchase parcel key 341570 and 340615 (123 acres) adjacent to the Weeki Wachee River and existing SWFWMD property. This would preserve the property along the river and maintain the habitat along the springshed. This property runs east of East Richard Street to existing SWFWMD property and from the Weeki Wachee River to Cortez Blvd. The property consists of wetlands and forest that drain into the Weeki Wachee River.
The property belonged to the Suncoast Seabird Sanctuary, which has gone bankrupt and no longer exists. The property is currently listed under a private individual in the Hernando County Property Appraiser records.

Cost: $600,000

Wilderness Spring Conservation Easement Acquisition

This proposed project is to acquire a conservation easement for Wilderness Spring, approximately 28.0 acres of environmentally sensitive land north of Mud Spring in Hernando County, currently in private ownership. Provided seller(s) are willing, the scope would entail appraisals, environmental site assessment, land/boundary surveys, and required documents in accordance with the land acquisition process.
Acquisition of an easement on this property will conserve habitat for listed species in the coastal zone and provide springs protection within the coastal greenway corridor. This property is surrounded by property under SWFWMD ownership. Conservation allows buffering with native vegetation providing water quality benefits to fragile spring systems.

Cost: $417,000

Habitat Restoration

Oyster and SAV Enhancement

Both the Weeki Wachee and Homosassa Rivers have lost much of their submerged aquatic vegetation (SAV). Planting native SAV would improve water quality and clarity, stabilize the sediments, enhance fisheries habitat, and provide foraging habitat for a variety of fish and wildlife, including the Florida Manatee. Additionally, given changing salinity regimes, oyster recruitment in the lower reaches could provide an opportunity for the creation of oyster habitat. Similar to SAV, oyster reefs provide benefits including improved water quality and clarity, sediment stabilization, and important fish and wildlife habitat. In fact, establishment of oyster reefs has been shown to create conditions more suitable for seagrass recruitment and recovery.
Propose identifying suitable locations for SAV plantings and oyster reef habitat creation and performing feasibility studies to inform subsequent scaled-up restoration and enhancement projects. The site suitability assessment will be conducted by a qualified contractor tasked with reviewing existing aerial and survey information to identify sites that have restoration/enhancement potential. The sites will them be ground-truthed and any locations that meet specifically identified criteria qualifying them as potential restoration sites will be categorized and ranked. Riparian issues (i.e., ownership) will be investigated for each potential restoration location and the owners will be contacted to learn their level of willingness to participate in future restoration or enhancement plans. The goal of this phase of the study is to identify properties that have habitat restoration potential. The next phase of this study will be to further investigate each of these locations and to develop restoration plans.

Cost: $75,000

Weeki Wachee River Restoration Feasibility Study

This project will develop proposed actions that address identified and potential impacts on the Weeki Wachee River and will include design options and cost estimates for implementation. For example, the Weeki Wachee River Retreats development portion was significantly altered when the channel was deepened and widened during dredge and fill activities. These activities have affected 2 miles of river per the ACOE (1972). Over time, the channel has since filled in with sediment.

Cost: $200,000

Invasive Species Management

NONE

Recreation Management

Recreation Carrying Capacity Project

Project is based on WWSSP Unit Management Plan (2011) GOAL II, Objective C.
Determine the appropriate recreational carrying capacity for the main headspring and Weeki Wachee River. The cumulative effects, seasonality and long-term impacts of the current development and use of the main headspring are poorly understood. In particular, additional information on the condition of both the biotic and abiotic environment of the spring is needed. The recreational use of the river by motor boats and paddle craft will likely continue to increase. Research is needed to determine the recreational carrying capacity of the main headspring and river that would allow the maximum level of public access and recreational enjoyment while preventing damage to the river bottom and shoreline, impacts to wildlife or hindrances to wildlife access.
Agency staff should coordinate the design and implementation of the recreational use study. Public workshops will be included in the study process to assure that the local community is well informed and thoroughly involved in the study and in any subsequent recommendations on management of the river and the headspring.
Based on the results of the study, a range of potential management actions may be considered to adjust recreational carrying capacities, recommend vessel type use restrictions or establish minimum water levels for the operation of tour boats, as needed, on the portion of the river managed by the DRP. Depending on funding and needs, the proposed contracted study could be expanded to consider potential impacts associated beyond water-use areas to include adjacent recreation activities.

Cost: $132,500

Weeki Wachee River Recreation Education

Recreation on the Weeki Wachee River has become very intense and is not restricted. HELP (Hernando Environmental Land Protectors) will develop guidelines in the form of a brochure and signs (posted at the appropriate boat/kayak launches) and a model recreational user agreement that addresses environmental concerns. The purpose of these guidelines is to educate river users in safe and enjoyable practices while avoiding harm to the natural systems of the river. These guidelines will be reviewed and endorsed by FWC, Hernando County, and SWFWMD. The brochures will be printed on biodegradable paper and provided to users at entry points - some waterproof distribution boxes will be required.

Cost: $35,000 (cost for initial setup, $25,000 annually after initial set up)

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Appendix A: Technical Working Group Participant List

Name	Title	Organization	Meeting Attendees		
			1/13/2016 Issues, Drivers, Quantifiable Objectives	3/16/2016 Management Actions	4/7/2016 Projects
Andy and Terri Auner	-		PRESENT		PRESENT
Anne Birch	Marine Conservation Director	The Nature Conservancy			
Bob Bonde	Research Biologist	USGS			
Bob Knight	Director	Florida Springs Institute			
Brad Rimbey			PRESENT	PRESENT	
Brad Smith		Hernando County		PRESENT	PRESENT
Chris Anastasiou	Chief Scientist, Natural Systems & Restoration	SWFWMD	PRESENT		PRESENT
Chris Becker		FDEP			
Chris Oliver		FDEP	PRESENT		PRESENT
Chris Zajac	FARMS Manager	SWFWMD			
Chuck Jacoby		UF			
Chuck Morton		Hernando Environmental Land Protectors (Help)	PRESENT	PRESENT	PRESENT

Name	Title	Organization	Meeting Attendees		
			1/13/2016 Issues, Drivers, Quantifiable Objectives	3/16/2016 Management Actions	4/7/2016 Projects
Clay Black		Hernando County	PRESENT		
Dan Hilliard		WAR	PRESENT	PRESENT	
Danielle Rogers	Environmental Science Project Lead, Natural Systems & Restoration	SWFWMD	PRESENT	PRESENT	
Dave DeWitt	Chief Professional Geologist, Data Collection	SWFWMD	PRESENT	PRESENT	
Dawn Velsor	Lead Environmental Planner	Hernando County	PRESENT	PRESENT	PRESENT
Eberhard Roeder	Professional Engineer	FDOH		PRESENT	PRESENT
Ed Jennings	Regional Specialized Agent - Livestock	UF IFAS - Central Florida Livestock Agents' Group			
Elke Ursin	Environmental Health Program Consultant, Bureau of Onsite Sewage Programs	FDOH			
Emma Lopez	Student	USF	PRESENT		
Gary Ellis	President	Gulf Archaeological Research Institute			

Name	Title	Organization	Meeting Attendees		
			1/13/2016 Issues, Drivers, Quantifiable Objectives	3/16/2016 Management Actions	4/7/2016 Projects
Geoffrey Lokuta	Biological Scientist III, Invasive Plant Management Section	FWC	PRESENT	PRESENT	PRESENT
George Foster		HCTF	PRESENT		
Jamie Letendre	Environmental Specialist I	FDEP CAMA			
Jeff Harris	Environmental Biologist	Pasco County	PRESENT		
John Burnett		Hernando County	PRESENT	PRESENT	
Josh Madden	Environmental Scientist, Water Resources	SWFWMD	PRESENT	PRESENT	PRESENT
Karen Van Sickle		Rotary Club of Brooksville			
Katie Tripp	Director of Science and Conservation	Save the Manatee Club			
Kelsey Jennings	Staff Biologist	Save Manatee Club			
Kent Smith	Marine and Estuarine Habitat Leader, Habitat Species Conservation	FWC			
Kevin Grimsley	Supervisory Hydrologist	USGS	PRESENT	PRESENT	

Name	Title	Organization	Meeting Attendees		
			1/13/2016 Issues, Drivers, Quantifiable Objectives	3/16/2016 Management Actions	4/7/2016 Projects
Kym Holzwart	Senior Environmental Scientist, Natural Systems & Restoration	SWFWMD	PRESENT		
Laura Digruttolo		FWC			
Laura Rankin	Student	USF			
Laura Rodriguez-Gonzalez	Student	USF		PRESENT	
Lauren Greenfield	Environmental Manager, ERP	FDEP			
Mahmood Nachabe	Professor	USF Civil & Environmental Engineering			
Maria Merrill	Biological Scientist	FWCC/Marine & Estuarine Subsection		PRESENT	PRESENT
Mariben Anderson	Natural Resources Technical Manager	Michael Baker International			
Mary Hartney	President	Florida Fertilizer & Agrichemical Association			
Matt Warren	Cow/Calf BMP, Office of Agricultural Water Policy	FDACS	PRESENT	PRESENT	PRESENT
Megan Keserauskis		FWC			

Name	Title	Organization	Meeting Attendees		
			1/13/2016 Issues, Drivers, Quantifiable Objectives	3/16/2016 Management Actions	4/7/2016 Projects
Pam Wright		Pasco County			
Patricia Robertshaw	Environmental Scientist, FARMS	SWFWMD			
Ron Basso	Chief Hydrologist, Resource Evaluation	SWFWMD	PRESENT	PRESENT	
Ron Mezich	Biologist, Habitat Species Conservation	FWC			
Samantha Whitcraft					
Sarina Ergas	Professor and Graduate Student Coordinator	USF Civil & Environmental Engineering			
Scott McBride	Hydrologist	USGS			
Sean King	Staff Engineer, Natural Systems & Restoration	SWFWMD	PRESENT	PRESENT	PRESENT
Shannon Herbon		FDEP			
Siobhan Gorham	Research Associate, FWRI	FWC		PRESENT	
Sky Notestein	Senior Environmental Scientist, Natural Systems & Restoration	SWFWMD	PRESENT	PRESENT	PRESENT

Name	Title	Organization	Meeting Attendees		
			1/13/2016 Issues, Drivers, Quantifiable Objectives	3/16/2016 Management Actions	4/7/2016 Projects
Terri Calleson	Co-Team leader, Project Consultations, Coastal and Marine	USFWS			
Terry Hansen	Environmental Consultant	FDEP	PRESENT	PRESENT	
Tim Jones	Environmental Specialist III, Office of Coastal and Aquatic Managed Areas	FDEP CAMA			
Toby Brewer	Weeki Wachee State Park	FDEP			
Tom Lynn	Student	USF			
Vivianna Bendixson	Environmental Scientist	SWFWMD	PRESENT	PRESENT	PRESENT
Warren Hogg		Tampa Bay Water		PRESENT	PRESENT

Appendix B: Permitted Point Sources

This appendix lists point sources and water use permits within the Weeki Wachee watershed and springshed (Tables 15-21). Point source permit information was obtained from the FDEP report website and GIS library, FDEP Southwest District office, and the District GIS data. Based on correspondence received from the FDEP on 2/24/2016, no facilities were operating without a permit, with a temporary permit or known to be violating effluent limits or standards or data were insufficient to make the determination, therefore, no timetable is provided to bring the facilities into compliance with FDEP regulations. Correspondence received from FDEP on 4/13/2016 indicated there are no surface water discharges into the system. There are no permitted power plants within the Weeki Wachee watershed and springshed boundaries as of 2/23/2016.

Table 15: Small Quantity Generators of Hazardous Waste as of 2/23/2016

HANDLER ID	SITE ID	NAME
FLD984197301	43903	Oak Hill Hospital
FLR000018697	47909	Wal-Mart Supercenter #1213
FLD981753106	53946	Rick Matthews Buick Pontiac GMC
FLR000020479	33560	Register Chevrolet Olds
FLR000130393	73192	Touch of Quality Dry Cleaners
FLR000158584	83959	Target #2489
FLR000015685	48344	Home Depot #0281
FLD021707344	57420	Kens Springhill Service Center
FLD047105598	15488	Jim Quinlan Ford Lincoln - Mercury
FLR000091462	7480	Wal-Mart Supercenter #3526

Table 16: Large Quantity Generators of Hazardous Waste as of 2/23/2016

HANDLER ID	SITE ID	NAME
FLR000057828	33835	Target #0919
FLR000194654	92147	Micro Matic USA LLC
FLR000182378	89000	Klicos Painting Co Inc

Table 17: Solid Waste Facilities as of 2/23/2016

FACILITY ID	NAME	STATUS
40741	AIRPORT LF	Closed, No Gw Monitoring
40774	GRAVES PROPERTY	Nfa,No Further Action
40924	SUNSHINE GROVE RD PHASE I (C & D)	Active
41063	WILSON C & D FACILITY	Closed, No Gw Monitoring
95266	ROBERT E. GRAVES, INC.	Nfa,No Further Action
93907	BROOKSVILLE DUMP #1 (SWFWMD DATA)	Closed, No Gw Monitoring
93908	BROOKSVILLE DUMP #2 (SWFWMD DATA)	Closed, No Gw Monitoring
101809	PAFF LANDSCAPE, INC.	Registered
100026	FDOT/MASON SMITH	Inactive
102269	ANDERSON SNOW PARK DEBRIS MANAGEMENT SITE	Inactive
101233	AUSLEY SITE	Activity Not Permitted/Registered

Table 18: Dry Cleaner Facilities as of 2/23/2016

FACILITY ID	**NAME**	**STATUS**
9500463	CLASSIC CLEANERS	CLOSED
9807920	IMPERIAL DRY CLEANERS	OPEN
9500244	IMPERIAL DRY CLEANERS	CLOSED
9502240	SPRING HILL CLEANERS	OPEN
9500781	DRESS WELL TAILORS & CLEANERS	CLOSED
9800763	IMPERIAL CLEANERS	CLOSED
9500643	CARDINAL CLEANERS	OPEN
9811391	FORD DIVERSFIELD ENTERPRISES INC	OPEN
9813352	BEST CLEANERS AND LAUNDRY	OPEN

Table 19: Water Use Permits as of 2/23/2016

Permit Number	NAME	Permitted Quantity (Avg Annual GPD)
156	Randy and Barbara Barthle	12,500
215	Brooksville Quarry	264,350
351	HERNANDO COUNTY AIRPORT	8,900
441	Springstead High School	21,800
617	Big Hines Groves	122,200
677	Janice H. Urban	29,400
733	Florian C & Sylvia Gude Family	30,600
777	Herman Schrader	61,100
778	MARY C SCHRADER	69,600
780	Yankee Citrus	45,100
862	Lake Iola Trailer Park	26,700
923	Travelers Rest Resort Inc	85,600
1009	HAROLD P BRUCE	22,200
1192	John and Diana Madison	96,932
1561	Hines Properties	45,000
1636	Spray Miser International, Inc.	177,000
1891	Campers Holiday Association	25,000
2101	Florida Hills Memorial Gardens, Inc.	76,400
2119	IMPERIAL ESTATES	9,000
2679	Marshall Crum and Max Crum	75,500
2982	BROOKRIDGE COUNTRY CLUB GOLF ASSOC INC	281,200
3720	Frontier Campground	16,100
3726	High Point Golf Club, Inc.	149,000
4550	City of San Antonio	206,500
4649	Cross Bar Ranch Ecosystem Management	800,000
4688	MIDILI ENTERPRISES	38,500
4722	PASCO CO SCHOOL BOARD/Shady Hills Elementary	26,600
4788	Running "M" Ranch & Groves	44,200
4893	Weeki Wachee Springs State Park	135,500
4910	Vincent W Straigis	500
4953	SARAN RANCH	90,400
4998	Evergreen Woods Retirement Center	11,400

Permit Number	NAME	Permitted Quantity (Avg Annual GPD)
5093	Finest Farms	93,000
5789	Hernando County Water System	23,299,000
5897	Barthle Brothers Ranch	205,000
5914	DARCY MIRABAL	49,600
6302	AVALON DEVELOPMENT LLC	85,400
6592	Spring Hill Country Club	190,300
6785	CELIA M WILLIAMS	65,900
6930	JOLANDER WELL DRILLING INC	1,000
7497	Moody Lake	146,000
7499	LAKE PLACID GROVES - SMITH GROVE	187,000
7627	City of Brooksville	2,448,000
7722	Midili Enterprises, Inc.	25,900
7769	JOSEPH W AND BEVERLY J GILMORE	15,800
8124	Oak Hills Golf Course	299,800
8308	RICHARD F & IRENE G QUIRK	3,800
8443	CAMP-A-WYLE CONDOMINIUM	44,800
8453	HERNANDO EGG PRODUCERS INC	41,200
8506	The Waters of Weeki Wachee	1,200
8598	BE MAC SERVICES INC	1,900
8639	TIMBER PINES COMMUNITY ASSOCIATION	20,000
8725	JOHN L AYERS ESTATE	3,600
9060	Seven Hills Golfers Club	284,700
9071	DARBY FARMS	250,000
9214	LENA MAUL GROVE	23,300
9247	HERNANDO COUNTY SCHOOL BOARD	65,300
9344	GLEN LAKES Golf and Country Club	237,941
9444	Coy E. Viars	24,800
9609	RUNNING M RANCH AND GROVES INC	9,900
9952	BRUCE L WEBER	16,800
10493	Lykes Springhill Foundation, Inc.	1,650
10760	Rivard Golf Club	194,000
11059	GLEN LAKES DEVELOPMENT	402,200
11116	Heather Walk	23,800
11127	Pasco Lake Environmental Augmentation	498,000

Permit Number	NAME	Permitted Quantity (Avg Annual GPD)
11128	CONWAY LAKE	160,000
11129	Lake Loyce Environmental Augmentation	416,000
11131	Triangle Lake Environmental Augmentation	84,000
11132	Monsees Pond Enviromental Augmentation	200,000
11174	MANOR PLACE HOMEOWNERS	29,300
11187	MASARYKTOWN COMMUNITY CENTER	4,300
11558	Al-Bar Ranch Ecosystem Management	1,343,000
11634	Milo Thomas	345,500
11656	SOUTHERN PEAT MINE	13,700
11771	TBW-CONSOLIDATED PERMIT	90,000,000
11836	TABCAV	14
11863	Master Pasco County	6,286,000
12072	ZENEN AND GRISELDA M VALDES	71,300
12203	FINEST FARMS	148,000
12233	Hernando Oaks, LLC	307,000
12289	JG Ranch	59,800
12310	Hernando County - High School BBB	71,700
12311	James R. McClelland	22,600
12387	The Greens at the Heather	6,300
12517	Silverthorn Golf Club	421,700
12545	Southern Hills Plantation	97,600
12625	Daniel J. Ebbecke, III	22,900
12776	Petersons Blueberry Farm	35,100
12791	CHRISTIAN CONTRACTORS ASSOC INC	14,500
12809	Southern Pines	27,600
12864	D AND S BLUEBERRIES	36,500
12891	Aventura Nursery and Landscape, Inc.	32,700
12917	LEVITT AND SONS	150,900
12919	CORNERSTONE TREE FARM	150,500
12963	CITY OF BROOKSVILLE DEPT OF	16,500
12982	SCHWEND INC	17,500
13080	O'HEARN HAY & LIVESTOCK FARM	98,100
13090	Lago Verde Sand Mine	68,720
13205	Bloo Angel Groves	1,000

Permit Number	NAME	Permitted Quantity (Avg Annual GPD)
13316	AL-BAR PARTNERSHIP	149,100
20148	Edwards	540
20178	Finest Farms Inc	56,200
20199	CPM2 Inc	52,000
20223	Hunnicutt Farms LLC	67,200
20407	Sorrel Street Well	1,500
20413	Frogmore Ranch	475,000
20500	Big Fish Lake Augmentation	1,540,000
20580	Heavenly Fruit Farms	7,400

Table 20: Petroleum Facilities as of 2/23/2016

FACILITY ID	NAME
8508845	KEN'S SPRING HILL SERVICE CENTER
8508857	CHEVRON-BROOKSVILLE #755
8508862	WD LUMBER & TRUSS CO
8508864	WEEKI WACHEE SPRING
8508866	WEEKI WACHEE MARINA
8508734	AMERICAN AVIATION INC
8508741	THUNDER BAY ENTERPRISES INC
8508745	COMMUNITY AUTOMOTIVE SERVICES
8508766	COX LUMBER CO
8508768	7-ELEVEN STORE #35369
8508780	RICHEE RICH PANTRY
8508781	HAROLD'S AUTO CENTER
8508784	HERNANDO BEACH MARINA LLC
8508790	AMIN JIFFY #119
8508791	LIL CHAMP FOOD STORE #135
8508792	SUNOCO #0611-6974
8508801	CORTEZ STATION
8508807	MINNIES GARAGE
8508815	MARATHON-BROAD ST #407
8508818	CAMPERS MINI MART
8508825	CALIENTA ONE LLC
8508828	PRESTO FOOD STORE #17
8508829	A & J DISCOUNT BEVERAGES
8508830	SHORT STOP II
8508837	RIDGE POINT HOMES INC
8508841	SPRING HILL CITGO
8508843	CIRCLE K #2707508
8514893	347 CORP OF FL INC
8514899	C J PETTERS & SONS INC
8514979	BEST TOBACCO LLC
8514980	4-B MARKET
8515061	ST JOE STORE & STATION
8515062	STAGE COACH RANCH-MR R SANDERS
8518606	BLUE STER PETRO LLC

FACILITY ID	NAME
8519830	CROSSROADS SAWMILL
8519854	CEMEX - COUNTY LINE RD READY MIX AND BLOCK
8519866	RICHTER RAY
8519758	MCKENDREE PAUL
8519942	BARTHLE BROTHERS GROVE & RANCH CO INC
8519969	CITGO-LAND O'LAKES #218
8520255	SOUTHDOWN INC
8520256	COMMERCIAL CARRIER CORP
8520259	SPRINGBROOK HOSPITAL
8520260	SPEEDWAY #6532
8521963	CIRCLE K #00566
8521245	OVERSTREET PAVING INC
8520034	BP-SAN ANTONIO #391
8520187	CIRCLE K #7485
8520190	II FRIENDS ENTERPRISES INC-FRIENDLY MINI MART
8520042	URBAN GEORGE D
8520217	CIRCLE K #7486
8520219	CIRCLE K #7484
8520229	DIVISION OF FORESTRY-WEEKI WACHEE
8520234	HERNANDO EGG PRODUCERS INC
8520235	BROOKSVILLE CITY
8520236	TEXACO #24-204-1339
8520237	SOUTHERN BELL-BKVLFLWC
8520240	SOUTHWEST FL WATER MGMT
8520241	OMAN CONSTRUCTION CO INC
8626849	KMART #9702
8626851	PTL TRUCKING
8626852	SPEEDWAY #6533
8626862	INTEGRATED TURF MGMT-TROPICARE
8626875	KMART #7574
8626876	QUIK MART #213
8627076	GOODYEAR AUTO SERVICE CTR #2485
8630493	AL BAR FARM & RANCH LP
8630496	TAMPA FARM SERVICES INC

FACILITY ID	NAME
8626615	TRAVELERS REST INC
8626676	LOU'S AUTO REPAIR INC
8626680	WHITES' SEPTIC TANK SERVICE INC
8626272	SUNCOAST MARINA
8630628	PASCO CNTY-SHADY HILLS FIRE STATION
8626839	CUMBERLAND FARMS #1048
8628816	HARRIS BUICK-PONTIAC/WES
8630513	MCCARTHY & SONS HARVESTING
8628820	AMBER AUTOMOTIVE
8733581	SPEEDWAY #6531
8732894	SUNCOAST TREE FARM INC
8733601	WHITES SEPTIC TANK SERVICE INC
8733602	DON OLSON TIRE & AUTO
8732605	PINECREST FUNERAL CHAPEL
8732661	TIMBER PINES
8628759	WITHLACOOCHEE RIVER ELECTRIC CO-OP
8732358	SAV-U-GAS
8732745	CIRCLE K #2726512
8732309	SPEEDWAY #6534
8732322	UNITED PARCEL SERVICE
8732052	CIRCLE K #1880
8735349	NASTRAC
8734403	SOUTHERN BELL-WWSPFLSH
8735748	GUDE FARM & GROVE
8735103	CURTIS BOWEN JR
8734176	BELLSOUTH TEL INC #30966
8735844	H B SHRIMP CO INC
8735531	WEEKI WACHEE NORTH
8837335	SMITH ALTON
8837687	HERNANDO CNTY-SHERIFF'S AVIATION UNIT
8736818	HERNANDO CNTY - ELDRIDGE WTP
8837312	HINES JAMES E
8837324	FIELDS RAY N
8841502	JANET R FAULKINGHAM

FACILITY ID	NAME
8839518	FL DEPT OF TRANSPORTATION-BROOKSVILLE
8841547	FL HILLS MEMORIAL GARDENS
8841519	J E AUSLEY CONSTRUCTION INC
8841395	BROOKRIDGE COUNTRY CLUB GOLF ASSOC
8841396	SAND HILL SCOUT RESERVATION
8839893	W A KIRKLAND
8840143	L G EDWARDS GROVES
8840144	J C WILLIAMS
8841449	D & B PAVING INC
8841452	PAFF-DEASON CO
8841460	HOT WHEELS PAINT & BODY
8841461	SUNSHINE GAS & GO
8841669	CAMPERS HOLIDAY ASSOCIATION
8839621	LEMKO FL INC
8839961	QUINLAN FORD JIM
8841476	EARLY BIRD PLUMBING
8841481	DONTO CONSTRUCTION CO INC
8841850	SUN TOUCHED TREE FARM
8839314	MILLER INC SOD & LANDSCAPING
8943951	SUN 2 LLC
8841868	B & F CONCRETE PRODUCTS INC
8943170	INDUSTRIAL ELECTRICAL SERVICES INC
8943527	MAZOUREK RANCH
8943528	DELTONA CORP-SPRING HILL UTILITIES
8943529	DELTONA CORP-SPRING HILL UTILITIES
8943530	DELTONA CORP-SPRING HILL UTILITIES
8942833	CAMP-A-WYLE GENERAL STORE
8841905	CAUFIELD EDWARD B
8841917	VOSCINAR POULTRY FARM INC
8842242	HEATHER GOLF & COUNTRY CLUB
8944019	MOBIL-WEEKI WACHEE #540
8943531	DELTONA CORP-SPRING HILL UTILITIES
8943532	DELTONA CORP-SPRING HILL UTILITIES
8942806	MI NURSERY

FACILITY ID	NAME
8944389	CEMEX - SPRING HILL READY MIX
8943561	SIMMONS CONSTRUCTION CO
8944043	SHOP & SAVE
8842469	WEEKI WACHEE NORTH-DAVID GRIMES
8841947	HIGH PINES FARMS
8944254	WEST COAST GRASSING
8943083	KLEPAC PAUL W
8944427	SARAN RANCH INC
8842149	ROBERT E GRAVES INC
8943919	CHRYSLER JEEP DODGE CRYSTAL
8842056	NICK'S COUNTY LINE VINEYARD
8942998	DICK'S HEATING & AIR CONDITIONING INC
8942790	OAK HILL HOSPITAL
9046743	MOBIL-MARINER #546
9045573	P C MILLER
9045610	CLARKS MARKET
8944704	JIM PEYTON MOTORS-FORMER
9101745	STANS GARAGE
9063967	HERNANDO CNTY-SHERIFFS DEPT
8945406	WEST HERNANDO POOLS
9102277	FL TREE PRODUCERS INC
9063989	SUNOCO #0611-6958
9201021	SPRINGSTEAD PROPERTY
9200562	HERNANDO CNTY-FAIRLANE AVE FACILITY
9103596	THOMAS RANCH MILO
9102454	BOLTIN PASTURE
9203059	PINELLAS CNTY-WATER SYSTEM-CROSS BAR
9103031	MANCINI TIRE & AUTOMOTIVE
9103297	HIGH POINT GOLF CLUB
9202958	D & B PAVING INC
9103488	COX LUMBER CO
9805865	SHELTON TRUCKING INC
9806183	RACETRAC #109
9805174	MURPHY USA #6845

FACILITY ID	NAME
9807920	IMPERIAL DRY CLEANERS
9808790	PUBLIX SUPER MARKET #1132
9809134	MOBIL-SPRINGHILL #701
9807570	HOLLAND FAMILY TRUST
9808323	KENAN ADVANTAGE GROUP INC 2006-4I-6464
9807389	BAYFRONT HEALTH BROOKSVILLE
9808488	BROOKSVILLE CITY-SOUTHERN HILLS PLANTATION
9300160	GORDONS TIRE & AUTO CENTER
9300315	REVENNAUGHS SERVICE CENTER
9300501	HERNANDO CNTY-JAIL
9500244	IMPERIAL DRY CLEANERS
9202499	LOUISE MCMULLEN
9402039	SILVERTHORN COUNTRY CLUB
9401115	SUNCOAST FISH MRKT
9202345	ROBERT KOSHEFSKY
9202545	HERNANDO CNTY-SOUTHWEST WATER PLANT
9401348	REGISTER CHEVROLET OLDS INC
9201703	HERNANDO CNTY FIRE RESCUE ST #2
9201426	AT&T #33490 WWSPLSH
9400597	FAST LUBE INC
9400880	OAK HILLS GOLF COURSE
9400921	ARBYS ROAST BEEF RESTAURANT
9400658	WHETSTONE OIL CO INC
9300944	DANTES
9502240	SPRING HILL CLEANERS
9502004	MARKE CLEANERS CORP
9400427	FLAMMER FORD OF SPRINGHILL
9400824	TOWN TAVERN
9601626	HERNANDO CNTY-UTIL SITE
9500522	AA LAUNDROMAT
9501592	APAC FL INC
9500463	CLASSIC CLEANERS
9500781	DRESS WELL TAILORS & CLEANERS
9500643	CARDINAL CLEANERS

FACILITY ID	NAME
9500937	HIGH POINT COIN LAUNDRY
9600367	IMPERIAL DRY CLEANERS
9600368	A A LAUNDROMAT
9600745	HERNANDO CNTY BROOKRIDGE WWT PLANT
9600943	CONE DISTRIBUTERS FUEL SPILL
9600961	SPEEDWAY #6535
9800477	SPEEDWAY #6441
9800170	SOUTHDOWN INC-POWER KLEEN CORP
9601029	FINEST FARMS
9700369	VETERAN MEMORIAL EDUCATIONAL CENTER
9700377	OAK HILL HOSPITAL
9700381	WAL-MART SUPERCENTER #1213
9800743	HERNANDO CNTY SCHOOL BD TRANSPORTATION
9700743	SPRING HILL LAUNDROMAT & CLEANERS-SPRING HILL PLZ
9800763	IMPERIAL CLEANERS
9700796	SPRING HILL REGIONAL HOSPITAL
9700834	HERNANDO BEACH SEFOOD INC
9602572	SPRING HILL REGIONAL HOSPITAL
9700534	HERNANDO CNTY SCHOOL BD-PLANT
9800700	D A B CONSTRUCTORS INC
9803882	FL ROCK & TANK LINES TANKER SPILL - 01-41-0028
9802547	7-ELEVEN FOOD STORE #32859
9801405	7-ELEVEN FOOD STORE #32718
9802107	HERNANDO CNTY-AIRPORT SUBREGIONAL WWTF
9801983	CEMEX INC - POWER KLEEN-MIN ACID TANK
9802410	SPORT FISHERMANS LANDING - LIGHT & CHARTERS INC
9802411	H B SHRIMP CO INC
9802412	MCCARYS INC
9802413	JERRY & KIMBERLY SELF
9802415	RICHARD THOMAS
9802417	HERNANDO OIL CO
9802418	PRECISION SCRAPING INC
9802419	LANG PHILLIPS - SOUTH END HERNANDO BEACH MOTEL
9802420	CAPTAIN BRADS SEAFOOD

FACILITY ID	NAME
9801878	7-ELEVEN FOOD STORE #32791
9802530	BROOKSVILLE CITY-COBB RD WATER RECLAMATION FAC
9806054	BRIGHT HOUSE NETWORKS
9806264	SAMS CLUB #4818
9804636	LOWES #1605
9804797	GEORGE J STAITTIS TRUST
9806281	BAYFLITE 4
9806618	HERNANDO CNTY AIRPORT
9806286	ALL SAINTS SURGERY CTR
9805486	HERNANDO CNTY UTL DEPT ADMIN BLDG
9805812	WAL-MART SUPERCENTER #3526
9805076	HERNANDO CNTY SCH BD-CENTRAL HS
9804021	PITTMAN PROPERTY
9806015	SPRING HILL HEALTH & REHAB CTR
9807414	D A B CONSTRUCTORS INC
9808198	FAST LANE EXPRESS
9809029	HERNANDO CNTY EMERG COM & OPERAT CNTR
9807935	LOWES #1827
9807876	BP-SNOW #734
9810078	HERNANDO CO MINING ASSOC ENRICHMENT CTR
9809580	HERNANDO CNTY UTIL-HUT PUMP STAT
9810778	HOME DEPOT #0281
9812029	JET ICU
9811481	PUBLIX SUPER MARKET #1282
9810802	LINDEN/DEER WATER TREATMENT PLANT
9811028	HPH HOSPICE/STURGILL CARE ATR
9811722	SEVEN HILLS GOLFERS CLUB
9809648	PUBLIX SUPER MARKET #813
9810010	HERNANDO CNTY UTIL-RAIL PARK PS
9811912	BROOKSVILLE-TAMPA BAY REG AIRPORT & TECH CTR
9806912	SOUTHERN HILLS PLANTATION
9811391	FORD DIVERSFIELD ENTERPRISES INC
9810872	HERNANDO CNTY UTIL-GRETNA WTP
9811416	CROSS TRANSPORTATION SPILL

FACILITY ID	NAME
9811824	HERNANDO CNTY SCHOOL-CHALLENGER K-8
9812130	HERNANDO CNTY SCHOOLS-WEEKI WACHEE HS
9809393	JET ICU
9810393	PUBLIX SUPER MARKET #1198
9813963	J D FLOYD K-8
9813964	PINE GROVE ELEMENTARY SCHOOL
9814575	WAWA FOOD MARKET# 5184
9812391	HERNANDO CNTY-GLEN WTR RECLAM FAC
9813965	NATURE COAST TECH HIGH SCHOOL
9812405	ARC NATURE COAST HURRICANE SHELTER
9810152	CIRCLE K #2705992
9810166	PUBLIX SUPER MARKET #457
9810167	PUBLIX SUPER MARKET #411
9810168	PUBLIX SUPER MARKET #630
9813352	BEST CLEANERS AND LAUNDRY
9812449	HERNANDO CNTY UTIL-HEXAM RD WTP
9814034	HEALTHSOUTH REHAB
9812145	RACETRAC #89
9813042	TRACERS INFORMATION SPECIALISTS INC
9812915	HERNANDO CNTY HEALTH DEPT
9814669	WAL-MART NEIGHBORHOOD MRKT #6207
9803203	STERLING MARINA

Table 21: Wastewater Permits as of 2/23/2016

FACILITY ID	NAME	TYPE	PERMITTED CAPACITY (MGD)
FLA012045	Camper's Holiday Association WWTF	Domestic Wastewater Program	0.0300
FLG110005	CEMEX LLC - Spring Hill Plant	Industrial Wastewater Program	0.0000
FLA012831	Travelers Rest WWTF	Domestic Wastewater Program	0.1000
FLG110793	BET - ER Mix Inc - SR 50 Brooksville Plant	Industrial Wastewater Program	0.0000
FLA012719	Shady Hills Elementary School WWTF	Domestic Wastewater Program	0.0100
FLA546925	Armor RV & Self Storage Car Wash	Industrial Wastewater Program	0.0000
FLA017223	Hernando Airport Subregional WWTF	Domestic Wastewater Program	0.7500
FLA287733	Durkee Ranch RAF	Domestic Wastewater Program	0.0000
FLA280348	Appalachian Materials Systems	Domestic Wastewater Program	*1652.0000
FLA012044	Camp - A - Wyle Resort WWTF	Domestic Wastewater Program	0.0350
FLA012065	Topics RV Community WWTF	Domestic Wastewater Program	0.0250
FLA012756	Big Oaks RV Park WWTF	Domestic Wastewater Program	0.0100
FLA012036	Brooksville City of - Cobb Road WWTF	Domestic Wastewater Program	1.6000
FLA287717	Nordgren Property RAF	Domestic Wastewater Program	0.0000
FLA012038	Weeki Wachee North MHP WWTF	Domestic Wastewater Program	0.0260
FLG110528	CEMEX LLC- County Line Rd CBP	Industrial Wastewater Program	0.0000

FACILITY ID	NAME	TYPE	PERMITTED CAPACITY (MGD)
FLA733237	TIMBER PINES COMMUNITY ASSOCIATION, INC.	Industrial Wastewater Program	0.0000
FLA012059	Imperial Estates MHP WWTF	Domestic Wastewater Program	0.0200
FLA729299	Outlaw Ridge Inc Lago Verde Mine	Industrial Wastewater Program	0.0000
FLA186830	Eckerd Youth Challenge Program WWTF	Domestic Wastewater Program	0.0050
FLA012722	San Antonio Elementary School WWTF	Domestic Wastewater Program	0.0123
FLA012069	Glen Water Reclamation Facility	Domestic Wastewater Program	1.0000
FLA012054	Frontier Campground MHP	Domestic Wastewater Program	0.0200
FLA012048	Big Tree MH & RV Village	Domestic Wastewater Program	0.0135
FLA012028	Brookridge Subregional WWTF	Domestic Wastewater Program	0.7500

* Unit is dry tons instead of MGD

Appendix C: Jurisdictional Authority

FEDERAL

Federal jurisdiction in the Weeki Wachee River involves the regulatory responsibilities of the U.S. Army Corps of Engineers, the U.S. Environmental Protection Agency, the U.S. Coast Guard, the U.S. Fish and Wildlife Service, and the U.S. Department of Interior (which coordinates its many agriculture-related activities with those of the Florida Department of Agriculture and Consumer Services). Their main regulatory functions include overseeing dredge and fill activities, maintaining navigability of the waters of the United States, overseeing cleanups following pollution spills, protecting endangered species, protecting overall environmental quality, and managing offshore activities. These agencies, in conjunction with the U.S. Geological Survey and the National Oceanic and Atmospheric Administration, also contribute to the collection of technical data concerning the Weeki Wachee River and its watershed. Land based conservation measures within the springshed may be addressed by the U.S. Department of Agriculture, Natural Resources Conservation Service (USDA / NRCS) which provides farmers and ranchers with financial and technical assistance to voluntarily apply conservation measures which benefit the environment and agricultural operations.

U.S. Army Corps of Engineers (USACE)

The U.S. Army Corps of Engineers (USACE) received jurisdiction over Inland Waters of the United States, for navigation purposes, in Section 9 and 10 of the Rivers and Harbors Act of 1899. A revision of the Rivers and Harbors Act in 1968 extended USACE jurisdiction allowing them to consider the fish and wildlife, conservation, pollution, aesthetics, ecology and other relevant factors of a project. The USACE regulatory program was further expanded in 1972 with the passage of the Federal Water Pollution Control Act Amendments, also known as the Clean Water Act (CWA). The discharge of dredge and fill into United States waters is regulated by the USACE under Section 404 of this act. The USACE jurisdiction was extended to wetlands due to a Supreme Court order in 1975 and Amendments to the CWA in 1977. Projects constructed by the USACE for local flood protection are subject to regulations prescribed to cover operation and maintenance. These regulations are contained in Sections 208.10 and 208.11, Title 33 of the Code of Federal Regulations.

U.S. Environmental Protection Agency (EPA)

The Environmental Protection Agency (Southeast Regional Office, Region IV, Atlanta, Georgia) has jurisdiction over surface waters in the state. Enforcement authority was given under the Clean Water Act of 1972 and broadened under its revision in 1977. Key activities include the issuance of National Pollution Discharge Elimination System (NPDES) permits and restoration of surface and groundwater. The agency also reviews Corps of Engineers permit activities, sets minimum quality standards, and sets guidelines for state environmental 64 programs. The EPA also funds sewerage facilities' studies through the SWFRPC and the TBRPC, and system improvements through the Florida Department of

Environmental Protection. Authority regarding the discharge of oil or hazardous substances into surface water is divided between the EPA and the U.S. Coast Guard.

U.S. Coast Guard (USCG)

In inland waters the Coast Guard Auxiliary performs boating safety inspections and search and rescue missions. The Auxiliary is a volunteer group reimbursed expenses when assigned missions by the U.S. Coast Guard.

U.S. Department of Interior (USDOI)

The primary water-related functions performed by this agency involve the review of proposed activities which may impact threatened or endangered species, review of U.S. Army Corps of Engineers permits for potential effects on fish and wildlife, and management of all federally-owned public lands. Within the department, the U.S. Geological Survey conducts investigations concerning hydrology, hydrogeology, water use, and ground and surface water quality. The U.S. Fish and Wildlife Service manages and restores fish and wildlife populations and conducts research on the effects of pollution on those resources. The National Park Service maintains federal parks and sanctuaries, regulating multiple uses on these lands to achieve a balance of benefits for both man and wildlife. The department also oversees those requests and offshore activities associated with exploration and development on the outer continental shelf.

U.S. Fish and Wildlife Service (USFWS)

The U.S. Fish and Wildlife Service is responsible for oversight of the federal program for fish and wildlife as authorized in the Coastal Resources Barrier Act, National Environmental Protection Act, Migratory Bird Act, Endangered Species Act, and Fish and Wildlife Coordination Act. "Under provisions of the Fish and Wildlife Coordination Act, the Fish and Wildlife Service must be consulted before the Corps of Engineers can submit a plan for Congressional approval. The Fish and Wildlife Service comments on the impacts of proposed projects on endangered species, migratory birds and other fish and wildlife and their habitats.

U.S. Geological Survey (USGS)

The USGS is the nation's largest water, earth, and biological science and civilian mapping agency. The USGS collects, monitors, analyzes, and provides scientific understanding about natural resource conditions, issues, and problems. Of particular relevance are the surface and ground water quality monitoring, stream flow measurements, and ground water recharge and contamination research.

U.S. Department of Agriculture (USDA)

The primary environmental related functions of the USDA are to preserve and conserve natural resources through restored forests, improved watersheds, and healthy private working lands. These

broad objectives are facilitated by three USDA agencies: Farm Service Agency, the U.S. Forest Service, and the Natural Resources Conservation Service.

Natural Resources Conservation Service (NRCS)

The Natural Resources Conservation Service (NRCS) is an agency of the U.S. Department of Agriculture (USDA) which provides financial and technical assistance to farmers, ranchers, and forest landowners. The NRCS administers multiple programs: Farm Bill conservation programs, Landscape Conservation Initiatives, small-scale farm fact sheets, and resources. All NRCS programs are voluntary science-based solutions. The NRCS was established by Congress under Public Law 74-46 in 1935.

STATE AGENCIES

Many state agencies are involved in environmental regulation and resource management in the The Weeki Wachee River watershed and estuary. The Florida Department of Environmental Protection is the lead state agency in the protection and management of The Weeki Wachee River. Other relevant entities include the Florida Fish & Wildlife Conservation Commission, the Marine Fisheries Commission, Florida Department of Agriculture and Consumer Services, Florida Department of Health and Rehabilitative Services, Florida Sea Grant Program, and the Florida Department of Transportation.

Florida Department of Agriculture and Consumer Services (FDACS)

The Department, through its Division of Agriculture Environmental Services (AES) regulates the registration and use of pesticides, including the purchase of restricted pesticides, maintains registration and quality control of fertilizers, regulates pest control operations, mosquito control, and evaluates and manages environmental impacts associated with agrochemicals.

The Office of Agricultural Water Policy (OAWP) facilitates communications among federal, state and local agencies and the agricultural industry on water quantity and water quality issues involving agriculture. The OAWP has developed Best Management Practices (BMPs) addressing both water quality and water conservation on a site-specific, regional and watershed basis for commercial agricultural operations. The office is directly involved with statewide programs to implement the Federal Clean Water Act's Total Maximum Daily Load (TMDL) requirements for agriculture. The OAWP works cooperatively with agricultural producers and industry groups, the Florida Department of Environmental Protection, the university system, the Water Management Districts, and other interested parties to develop and implement BMP programs that are economically and technically feasible. The office facilitates the participation of Soil and Water Conservation Districts in water-related issues at the County or watershed level.

Through the Florida Forest Service (FFS), the FDACS is responsible for developing, implementing, and monitoring BMP's through the Silviculture BMP Program to control forestry-related non-point source pollution. The FFS manages Florida's 34 State Forests and several other parcels of public land. The

Division of Plant Industry is responsible for, among other duties, regulation of the movement of noxious weeds, and, with input from the Endangered Plant Advisory Council, protecting endangered, threatened or commercially exploited plant species.

Florida Department of Environmental Protection (FDEP)

The Florida Department of Environmental Protection (FDEP), itself a result of the merger of the old Department of Environmental Regulation and the Department of Natural Resources, is the lead state agency involved in water quality, pollution control, and resource recovery programs. The Department sets state water quality standards and has permit jurisdiction over point and non-point source discharges, certain dredge and fills activities, drinking water systems, power plant siting, and many construction activities conducted within waters of the state. The department also interacts closely with other federal and state agencies on water-related matters, and the Department and the District share responsibilities in non-point source management and wetland permitting. The Division of State lands oversees the management of state lands, including state parks. The Division of Recreation and Parks and the Florida Coastal Office (formerly Coastal and Aquatic Managed Areas) are directly responsible for day to day land management in this watershed. The FDEP Bureau of Geology reviews leasing requests involving nearshore and state waters. The Bureau of Beaches and Shores oversees beach re-nourishment activities. The FDEP is the primary reviewer of SWIM plans and is responsible for the disbursement of legislatively appropriated funds to the water management districts. The FDEP is also highly involved in the management of estuarine resources.

Division of Recreation and Parks

On January 24, 2008, with concurrence of the SWFWMD, an Asset Purchase Agreement was entered between Weeki Wachee Springs, LLC and the FDEP to bring the Weeki Wachee Springs attraction under management as a unit of Florida's state park system, and on November 1, 2008, the Division of Recreation and Parks (DRP) and the SWFWMD signed a 50-year lease giving the Division authority to manage the Weeki Wachee Springs attraction and additional SWFWMD land surrounding the attraction. In all, the area leased by SWFWMD to the DRP for management as a unit of the Florida state park system totals 538 acres. In addition, the Trustees of the Internal Improvement Trust Fund leased approximately 32 acres of sovereign submerged land to the DRP on February 17, 2010, to include the Weeki Wachee headsprings and the upper segment of the river in the state park.

Division of Water Resource Management

The Southeast District Office in Tampa has responsibility for proprietary and regulatory permitting issues in the Weeki Wachee River area.

Florida Department of Health (FDOH)

The primary environmental directive of the Florida Department of Health (FDOH) is to prevent disease of environmental origin. Environmental health activities focus on prevention, preparedness, and

education and are implemented through routine monitoring, education, surveillance and sampling of facilities and conditions that may contribute to the occurrence or transmission of disease. Department of Health responsibilities include the public health functions of water supplies (primarily small to medium supplies), onsite sewage treatment and disposal systems permitting and inspection, septic tank cleaning and waste disposal (in conjunction with FDEP), and solid waste control (secondary role). The Onsite Sewage Program is administered by the Environmental Health Section of the FDOH office in each county.

The primary statutes providing FDOH authority are to be found in Chapter 154, 381 and 386 of the Florida Statutes and the 64E Series of the Florida Administrative Code, known as the "Sanitary Code". Each county has a FDOH Office responsible for jurisdiction within the county.

Florida Fish & Wildlife Conservation Commission (FFWCC)

Florida voters elected in 1998 to replace The Florida Game and Fresh Water Fish Commission (GFC) and the Marine Fisheries Commission (MFC) with the Florida Fish and Wildlife Conservation Commission (FFWCC) - effective July 1, 1999. The result is that Florida has placed responsibility for conserving the state's freshwater aquatic life, marine life and wild animal life all under a single agency.

The new FFWCC basically encompasses all the programs of the old GFC and MFC, plus some employees and programs from the Florida Department of Environmental Protection. FDEP's Florida Coastal Office (formerly Coastal and Aquatic Managed Areas) and some other elements stayed with FDEP's Division of Marine Resources. The Florida Marine Research Institute (FMRI), the Office of Fisheries Management and Assistance Services (OFMAS) and the Bureau of Protected Species Management were transferred to the new agency. OFMAS, with some MFC staff, will be the new agency's Division of Marine Fisheries.

All employees from FDEP's Division of Law Enforcement, except for the Park Patrol, the Bureau of Emergency Response, the Office of Environmental and Resource Crimes Investigations and some field investigators now are part of the FFWCC.

Former Marine Patrol officers will continue to concentrate on enforcing saltwater laws, and former wildlife officers will continue to focus on freshwater and wildlife laws. However, when there is a need to reallocate law enforcement officers to deal with an emergency, the agency can do so. The Marine Patrol serves as an enforcement agency for the Florida Endangered and Threatened Species Act and the Oil Spill Prevention and Pollution Control Act. The Florida Marine Patrol also enforces state motorboat laws and the saltwater fisheries regulations of the Commission.

The FDEP Bureau of Protected Species Management, with responsibility for managing imperiled marine life, is now part of the FFWCC's Office of Environmental. The old GFC's Endangered Species Section is part of the new agency's Division of Wildlife.

Meanwhile, the Bureau of Marine Resource Regulation and Development which has jurisdiction over processing plants and shellfish management, is now part of the Florida Department of Agriculture and Consumer Services.

The Commission's efforts within the SWIM plan area primarily involve freshwater sport and commercial fishing, fisheries and habitat management, fish stocking, fisheries research, wildlife monitoring, enforcement of fisheries/wildlife regulations, listed species protection, wildlife research, development review, and regional planning. The Commission is directed by law to review SWIM plans to determine if the plan has adverse effects on wild animal life and fresh water aquatic life and their habitats.

Florida Department of Transportation (FDOT)

The Department of Transportation's Project Development and Environmental Offices assist in the design, review, and permitting of road and right-of-way projects in the Weeki Wachee region.

Florida Sea Grant Program

The Florida Sea Grant Program is supported by awards from the Office of Sea Grant (National Oceanic and Atmospheric Administration) under provisions of the National Sea Grant College and Programs Act of 1966. The Florida Sea Grant Program has three major components: applied marine research, education, and advisory services (through local marine extension agents). Florida Sea Grant provides scientific research and habitat-related information that are useful in the management of The Weeki Wachee River's natural resources.

REGIONAL AGENCIES

Three regional agencies exist that have been actively engaged in the development and implementation of this SWIM plan. These are the Tampa Bay Regional Planning Council, the Southwest Florida Water Management District, and the Withlacoochee River Water Supply Authority.

Tampa Bay Regional Planning Council (TBRPC)

The Tampa Bay Regional Planning Council (TBRPC) was established in 1962 and includes Citrus, Hernando (added in 2015), Hillsborough, Manatee, Pasco and Pinellas counties. The mission of the TBRPC is to serve its citizens and member governments by providing a forum to foster communication, coordination and collaboration to identify and address needs/issues regionally. The TBRPC is a multi-purpose agency responsible for providing a variety of services including natural resource protection and management, emergency preparedness planning, economic development and analysis, transportation and mobility planning, growth management and land use coordination, and technical assistance to local governments. Regional planning council powers and duties are designated in Section 186.505 of the Florida Statutes.

Southwest Florida Water Management District (SWFWMD)

The mission of the Southwest Florida Water Management District is to manage water and related natural resources to ensure their continued availability while maximizing the benefits to the public. Central to the mission is maintaining the balance between the water needs of current and future users while protecting and maintaining water and related natural resources which provide the District with its existing and future water supply. The SWFWMD is responsible for performing duties assigned under Ch. 373, F.S., as well as duties delegated through FDEP for Ch. 253 and 403, F.S., and for local plan review (Ch. 163, F.S.). It performs those duties for the entire Weeki Wachee River watershed.

In July 1991, the Governing Board of the SWFWMD approved the acquisition of the Weeki Wachee Preserve project, consisting of approximately 16,000 acres located along the coastal region of the Hernando and Pasco Counties. To date, over 10,300 acres have been acquired by SWFMWD within the project area. This acreage preserves a rich mosaic of habitats including Weeki Wachee Springs, several miles of Weeki Wachee River frontage, dense hardwood swamps, fresh and saltwater marshes and a variety of upland natural communities.

In 2001, the SWFMWD negotiated a three-party agreement with the City of St. Petersburg, and their lessee, Weeki Wachee Springs, LLC, to purchase 442 acres surrounding the springs. As with the larger Weeki Wachee Preserve project, the purpose of this acquisition was primarily for the protection and management of Florida's water resources.

Withlacoochee Regional Water Supply Authority (WRWSA)

The Withlacoochee Regional Water Supply Authority (WRWSA) is a multi-county (Marion, Citrus, Hernando, and Sumter) special district of the State of Florida charged with planning for and developing cost-efficient, high-quality water supplies for its member governments. The Authority promotes environmental stewardship through its water conservation programs and will develop alternative water sources when necessary to augment traditional water supplies to meet the region's long-term needs. The WRWSA was created in 1977 by inter-local agreement among its member counties and this agreement was revised in 2014. The WRWSA operates under the authority of Florida Statute, Section 120.54 and Florida Administrative Code, Chapter 28-101.

LOCAL GOVERNMENTS

There are primarily two local governments within the Weeki Wachee River watershed, Hernando County and Pasco County which play a role in management of The Weeki Wachee River through the daily management of their communities, the planning, zoning and other land use decisions, and the implementation and enforcement of local codes.

Hernando County

Building Department

The mission of the Building Division is to promote the health, safety, and welfare of the residents of Hernando County through efficient and effective implementation of building codes and County regulations.

Code Enforcement

The Code Enforcement Division enforces ordinances that prohibit the existence of conditions deemed to be a hazard to public health, safety, and welfare.

Department of Public Works

The DPW is responsible for providing a high quality network of roadways, traffic systems, stormwater drainage, engineering, and waterway services for the County.

Pasco County

Building Department

The Building Department promotes the health, safety, and welfare of County residents through efficient and effective implementation of building codes and County regulations.

Code Enforcement

The Code Enforcement Division enforces ordinances that prohibit the existence of conditions deemed to be a hazard to public health, safety, and welfare.

Department of Public Works

The DPW is responsible for providing a high quality network of roadways, traffic systems, stormwater drainage, engineering, and waterway services for the County.

Appendix D: List of Acronyms

Abbreviation	Description
AES	Agriculture Environmental Services
AMO	Atlantic multi-decadal Oscillation
BMAP	Best Management Action Plan
BMP	Best Management Practices
CAMA	Office of Coastal and Aquatic Managed Areas (of FDEP)
CFS	Cubic Feet per Second
CHAMP	Conservation Hotel and Motel Program
CIP	Capital Improvement Plan
CPMIL	Center Pivot Mobile Irrigation Lab
CWA	Clean Water Act
DMR	Discharge Monitoring Reports
DPW	Department of Public Works
EPA	United States Environmental Protection Agency
ET	Evapotranspiration
FARMS	Facilitating Agricultural Resource Management Systems
FDACS	Florida Department of Agriculture and Consumer Services
FDEP	Florida Department of Environmental Protection
FDOH	Florida Department of Health
FDOT	Florida Department of Transportation
FFB	Florida Farm Bureau
FFS	Florida Forest Service
FFWCC	Florida Fish and Wildlife Conservation Commission
FGS	Florida Geological Survey
FLEPPC	Florida Exotic Pest Plant Council
FMRI	Florida Marine Research Institute
FSAID	Florida Statewide Agricultural Irrigation Demand
FWC	Florida Fish and Wildlife Commission
FWRI	Fish and Wildlife Research Institute
FWS	Florida Water Star
FYN	Florida Yards and Neighborhoods
GFC	Florida Game and Freshwater Fish Commission
GIS	Geographic Information System
GOES	Global Online Enrollment System
HCTF	Hernando County Task Force
HCUD	Hernando County Utilities Department
HELP	Hernando Environmental Land Protectors
HSC	Habitat and Species Conservation
LID	Low Impact Development
MFC	Marine Fisheries Commission
MFL	Minimum Flows and Levels
MGD	Million Gallons Per Day
MHP	Mobile Home Park
MIL	Mobile Irrigation Lab
NEP	National Estuary Program
NNC	Numeric Nutrient Criteria
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System

Abbreviation	Description
NRCS	Natural Resources Conservation Service
NSILT	Nitrogen Source Inventory and Loading Tool
OAWP	Office of Agricultural Water Policy
OFMAS	Office of Fisheries Management and Assistance Services
OSTDS	Onsite Sewage Treatment and Disposal System
PAC	Percent Area Coverage
RCWM	Reclaimed Water Main
RIB	Rapid Infiltration Basins
RWSP	Regional Water Supply Plan
SAV	Submerged Aquatic Vegetation
SCMC	Springs Coast Management Committee
SCSC	Springs Coast Steering Committee
SLER	Submerged Lands and Environmental Resources
SWFRPC	Southwest Florida Regional Planning Council
SWFWMD	Southwest Florida Water Management District
SWIM	Surface Water Improvement Management
SWMP	Stormwater Management Programs
TBRPC	Tampa Bay Regional Planning Council
TBW	Tampa Bay Water
TMDL	Total Maximum Daily Load
TWG	Technical Working Group
UF	University of Florida
UFA	Upper Floridan Aquifer
UF-IFAS	University of Florida – Institute of Food and Agriculture Sciences
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
USDA	United States Department of Agriculture
USDOI	United States Department of Interior
USDW	underground sources of drinking water
USF	University of South Florida
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WAR	Withlacoochee Aquatic Restoration
WBID	Water Body Identification
WCAP	Water Compliance Assurance Program
WMD	Water Management District
WMIS	Water Management Information System
WRF	Water Reclamation Facilities
WRWSA	Withlacoochee Regional Water Supply Authority
WSI	Wetland Solutions, Inc.
WWSSP	Weeki Wachee Springs State Park
WWTF	Waste Water Treatment Facility
WWTP	Waste Water Treatment Plant

Appendix E: Partners and Programs

A central focus of this plan and of the Springs Coast Steering & Management Committees, is to bring together the various public & private entities, and their respective programs, to achieve the common goal of restoring, protecting, and managing our spring-fed systems. This section highlights some of the programs and organizations that are key to the successful implementation of this plan.

Southwest Florida Water Management District (SWFWMD)

The mission of the Southwest Florida Water Management District is to manage water and related natural resources to ensure their continued availability while maximizing the benefits to the public.

District Springs Team

The District put together a team of spring experts whose knowledge is based on decades of research, pilot projects and complex groundwater models. Since each spring system is different, the team uses a variety of techniques such as regulation, monitoring, research and development, restoration and education to address each system's individual challenges.

Surface Water Improvement and Monitoring Program (SWIM)

The District's SWIM Program is responsible for many of the District's water quality and natural systems initiatives. With the help of state agencies, local governments and other organizations, the SWIM Program focuses on water quality and habitat restoration projects to accomplish these department initiatives.

Minimum Flows and Levels

Florida law (Chapter 373.042, Florida Statutes) requires the state water management districts or the Department of Environmental Protection to establish minimum flows and levels (MFLs) for aquifers, surface watercourses, and other surface water bodies to identify the limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area. Rivers, streams, estuaries and springs require minimum flows, while minimum levels are developed for lakes, wetlands and aquifers. Minimum flows and levels are adopted into Southwest Florida Water Management District (District) rules (Chapter 40D-8, Florida Administrative Code) and used in the District's water use permitting program to ensure that withdrawals do not cause significant harm to water resources or the environment. Minimum Flows and Levels for the Weeki Wachee River were adopted in 2009.

Facilitating Agricultural Resource Management Systems (FARMS)

Implement agricultural BMPs in the Springs Coast springsheds—Weeki Wachee, Chassahowitzka, Homosassa, Crystal River/Kings Bay and Rainbow—that will reduce groundwater withdrawals and/or reduce nutrient impacts to groundwater and spring systems BMP implementation within the Springs Coast project area that will focus on both a reduction in groundwater use and/or a reduction in nutrient loadings to spring systems.

Utility Services Program

The District's Utility Services Program is a unique program that strengthens communication and improves water use efficiency. The Utility Services Program enhances cooperation by communicating key programs that the District offers to help utilities conserve water as well as allowing the District to learn about specific challenges that utilities face in meeting their customers' demand for potable water supply. This manual identifies the key contacts, conservation program tools, resources and documents that are available from the District, and provides links to additional information.

Florida Department of Agriculture and Consumer Services (FDACS)

The Florida Department of Agriculture and Consumer Services supports and promotes Florida agriculture, protects the environment, safeguards consumers, and ensures the safety and wholesomeness of food.

Division of Agricultural Environmental Services

The Division of Agricultural Environmental Services administers various state and federal regulatory programs concerning environmental and consumer protection issues. These include state mosquito control program coordination; agricultural pesticide registration, testing and regulation; pest control regulation; and feed, seed and fertilizer production inspection and testing. The Division of Agricultural Environmental Services, through its four bureaus, ensures that: pesticides are properly registered and used in accordance with federal and state requirements; mosquito control programs are effectively conducted; and feed, seed and fertilizer products are safe and effective. Estimates of the quantity of agricultural fertilizer applied are collected by the Division.

Office of Agricultural Water Policy

The Office of Agricultural Water Policy (OAWP) facilitates communications among federal, state and local agencies and the agricultural industry on water quantity and water quality issues involving agriculture. The OAWP has developed Best Management Practices (BMPs) addressing both water quality and water conservation on a site-specific, regional and watershed basis for commercial agricultural operations. The office is directly involved with statewide programs to implement the Federal Clean Water Act's Total Maximum Daily Load (TMDL) requirements for agriculture. The OAWP works cooperatively with agricultural producers and industry groups, the Florida Department of

Environmental Protection, the university system, the Water Management Districts, and other interested parties to develop and implement BMP programs that are economically and technically feasible. The office facilitates the participation of Soil and Water Conservation Districts in water-related issues at the County or watershed level.

Florida Forest Service

The Florida Forest Service has a mission to protect and manage the forest resources of Florida, ensuring that they are available for future generations. The Florida Forest Service's forestry programs are implemented by its Field Operations staff within 15 field units across the state. Field personnel and equipment provide a more responsive and comprehensive approach to land management and wildfire control statewide. The Forest Hydrology Section provides specialized technical services and information to Florida's private and public forest landowners and to other interested parties, for the protection of the state's water resources in association with Silviculture activities. The core of this area of service is Florida's Silviculture Best Management Practices (BMP) program, which originated in 1979.

Florida Department of Environmental Protection (FDEP)

The Florida Department of Environmental Protection (FDEP), the lead agency for environmental management and stewardship, is one of the more diverse agencies in state government - protecting our air, water and land. FDEP is divided into three primary areas: Regulatory Programs, Land and Recreation, and Water Policy and Ecosystem Restoration.

Florida Green Lodging Program

The Florida Green Lodging Program is a voluntary initiative that designates and recognizes lodging facilities that make a commitment to conserve and protect Florida's natural resources. The program's environmental guidelines allow the hospitality industry to evaluate its operations, set goals and take specific actions to continuously improve environmental performance.

Florida Forever

Florida's premier conservation and recreation lands acquisition program, a blueprint for conserving natural resources and renewing Florida's commitment to conserve the state's natural and cultural heritage. Florida Forever replaces Preservation 2000 (P2000), the largest public land acquisition program of its kind in the United States. With approximately 9.9 million acres managed for conservation in Florida, more than 2.5 million acres were purchased under the Florida Forever and P2000 programs.

Bureau of Laboratories

The Department's Bureau of Laboratories specializes in providing scientific information to assess the nature and extent of human disturbances on Florida's environment. The Bureau provides a full range of

environmental services, including a diverse array of chemical and biological laboratory analyses, field sampling, technical review and interpretations of the data.

Office of Legislative Affairs

The legislative program includes developing legislation and support information, and finding sponsors for legislation. The Office also serves as the central point of contact for legislators and their staffs for information about the Department's programs.

Water Resource Management/Environmental Assessment & Restoration

The Department's Water Programs are responsible for protecting the quality of Florida's drinking water as well as its rivers, lakes and wetlands, and for reclaiming lands after they have been mined for phosphate and other minerals. The programs establish the technical basis for setting the State's surface water and ground water quality standards. They also implement a variety of programs to monitor the quality of those water resources.

Division of Air Resource Management

The Division of Air Resource Management is charged with regulation of Florida's air resource, including air monitoring, permitting and compliance of emission sources, and implementing the Siting Acts. Through a variety of services for our customers—the public and industry—the Division of Air Resource Management regulates Florida's air resource fairly, consistently, and efficiently to enable economic opportunities for the state, while implementing state, federal Clean Air Act, and U.S. Environmental Protection Agency requirements.

Division of State Lands

The Division of State Lands acquires and manages lands as directed by the Board of Trustees of the Internal Improvement Trust Fund. The Division provides oversight for approximately 12 million acres of public lands, including islands and 700 freshwater springs. The Division also provides upland leases for state parks, forests, wildlife management areas, historic sites, educational facilities, vegetable farming, and mineral, oil and gas exploration.

Division of Recreation and Parks

Florida's 171 award-winning state park and trail properties have inspired residents and visitors with recreation opportunities and scenic beauty that helps to strengthen families, educate children, expand local economies and foster community pride. With 161 parks, 10 state trails, nearly 800,000 acres, 100 miles of beaches and more than 1,500 miles of multi-use trails, visit soon and often to enjoy Florida's natural treasures.

Aquifer Protection Program

The Aquifer Protection program consists of a team of geologists and engineers dedicated to protecting Florida's underground sources of drinking water (USDW) while maintaining the lawful option of disposal of appropriately treated fluids via underground injection wells.

Wastewater Management Program

The Wastewater Program is divided into three areas:

The Water Compliance Assurance Program (WCAP)

The Water Compliance Assurance Program in Tallahassee serves to facilitate statewide coordination of compliance and enforcement activities relating to the development of policy, guidance and training materials to ensure consistency among the six District Offices for the state's Industrial and Domestic Wastewater Programs. Furthermore, the WCAP administers the compliance and enforcement components of the National Pollutant Discharge Elimination System (NPDES) Stormwater program; which includes conducting inspections, handling compliance and enforcement activities and processing stormwater Discharge Monitoring Reports (DMRs).

Domestic Wastewater Program

The Domestic Wastewater Program in Tallahassee is responsible for the development and administration of rules and policy for proper treatment of wastewater from domestic facilities. Other responsibilities include such activities as industrial pretreatment, biosolids management, reuse of reclaimed water, wastewater to wetlands and coordination of on-site sewage treatment and disposal activities with the Department of Health.

Industrial Wastewater Program

The Industrial Wastewater Program issues permits to facilities and activities that discharge to surface waters and groundwaters of the state. Industrial wastewater that discharges to domestic wastewater treatment facilities, however, is regulated under the Industrial Pretreatment component of the Department's Domestic Wastewater Program.

Submerged Lands and Environmental Resources (SLER)

The Office of Submerged Lands and Environmental Resources addresses the dredging, filling and construction in wetlands. The Office also ensures that activities in uplands, wetlands or other surface waters do not degrade water quality or the habitat for wetland dependent wildlife.

Office of the Florida Geological Survey (FGS)

The FGS specializes in geoscience research and assessments to provide objective quality data and interpretations. Environmental, conservation and public-welfare issues are addressed through applied field and laboratory investigations supported by our geologic sample and research libraries as well as collaborative efforts within the Florida Department of Environmental Protection and with other regulatory or policy-making entities.

Office of Environmental Education

The Office of Environmental Education seeks to promote and support environmental citizenship by building awareness, understanding and appreciation of Florida's environment. Together with other government agencies, non-profits, the academic and the private sector, the Office contributes structure and funding for environmental education in Florida.

Florida Department of Health (FDOH)

The Florida Department of Health (FDOH) has responsibility and authority to prevent disease of environmental origin. Environmental health activities focus on prevention, preparedness, and education and are implemented through routine monitoring, education, surveillance and sampling of facilities and conditions that may contribute to the occurrence or transmission of disease. In addition, aquatic toxins such as those produced by blue-green algae (cyanobacteria) are monitored by and under the purview of the FDOH.

Onsite Sewage Program

Of particular relevance to springs protection is the role that FDOH has regarding the permitting and inspection of onsite sewage treatment and disposal systems (OSTDS). The Onsite Sewage Program is administered by the Environmental Health Section of the FDOH office in each county. Other related FDOH roles include septic waste collection and disposal (in conjunction with FDEP), and solid waste control (secondary role).

Passive Nitrogen Reduction Study

In 2008 as part of the state wide effort to reduce nitrogen delivery to the environment, the legislature directed the FDOH to conduct the Florida Onsite Sewage Nitrogen Reduction Strategies Project. The project had three areas of concern: 1) quantification of life-cycle costs and cost-effectiveness of passive nitrogen reduction treatment technologies in comparison to more active technologies and to convention treatment systems; 2) characterization of nitrogen removal from effluent in the soil underneath the drainfield and in shallow groundwater; and 3) development of simple models to describe the fate and transport of nitrogen from onsite sewage treatment and disposal systems. The project findings to date and completed tasks can be found at the FDOH onsite sewage research website.

Florida Fish and Wildlife Conservation Commission (FFWCC)

The Florida Fish and Wildlife Conservation Commission (FFWCC) manages the wildlife and wildlife habitats for their long-term well-being and the benefit of people. Threatened and endangered species protection, fishing activities, wildlife harvesting, and aquatic vegetation management are all conducted under FFWCC rules and regulations. The FFWCC Division of Law Enforcement is a lead agency in the enforcement of environmental, fisheries, and wildlife laws.

Division of Habitat and Species Conservation

The Division of Habitat and Species Conservation (HSC) integrates scientific data with applied habitat management to maintain stable or increasing populations of fish and wildlife. Integration efforts focus on the ecosystem or landscape scale to provide the greatest benefits to the widest possible array of fish and wildlife species through extensive collaboration and partnering with local, state and federal agencies.

Aquatic Habitat Conservation and Restoration Section

This section uses a multidisciplinary approach to develop and implement comprehensive management programs to improve the ecological health of freshwater, estuarine and marine habitats. Its primary focus is identifying high-priority water bodies and implementing a variety of management treatments to maintain quality habitat for wetland-dependent fish and wildlife. Working with other agencies and user groups, this section builds cooperative relationships to address various issues affecting aquatic resources, including nutrient enrichment, water-use policy, and protection of rare and imperiled fish and wildlife.

Conservation Planning Services Section

Working with private and public sector landowners, this section develops and helps implement comprehensive, habitat-based management plans and incentive programs for landowners. Conservation Planning Services also provides managers of publicly owned lands with technical assistance to implement land-use plans that reduce negative impacts on fish and wildlife. This section uses scientific data to review and comment on FFWCC-regulated activities that may affect wildlife habitat.

Species Conservation Planning Section

Conserving Florida's native wildlife diversity is the mission of this section. It develops and implements high-priority conservation activities for native wildlife, with an emphasis on threatened species. Partnerships with other governmental agencies (local, state and federal), nongovernmental organizations and individuals help achieve conservation goals for wildlife. This section manages most of the state's threatened species and coordinates activities relating to Florida's listing process and permitting of human activities that may affect listed species.

Imperiled Species Management Section

This section is responsible for conservation of manatees, sea turtles, panthers and black bears through implementation of federal recovery plans and state management plans. Other key section tasks include development of rules and regulations that provide needed protections, providing technical assistance to local governments and other state agencies for planning purposes and permit reviews, and addressing human-wildlife conflicts. The section coordinates with the Fish and Wildlife Research Institute's researchers to identify information needs that will assist in making management decisions. The section conducts outreach activities to encourage the public to become watchful stewards over Florida's threatened species.

Exotic Species Coordination Section

This section works with the FWC's Division of Law Enforcement's Captive Wildlife staff to prevent nonnative species from harming native fish and wildlife and develop science-based regulations to prevent the release and establishment of nonnative species. Partnerships with other local, state and federal groups promote responsible pet ownership and increase awareness of the problems of introduced species, while also managing nonnative species present in Florida.

Invasive Plant Management Section

This section is responsible for directing, coordinating and funding two statewide programs controlling invasive upland plants on public conservation lands and invasive aquatic plants in public waterways. This section regulates, through a permitting program, projects for control of aquatic plants that do not meet the eligibility requirements for state funding. The FFWCC protects Florida's native plant and wildlife diversity with controls to manage invasive plants on public lands and waterways, dissemination of information, public education efforts, contractual research, and surveillance of plant communities on public lands and waterways. This section's goal is to protect native fish and wildlife habitat by reducing existing populations of invasive plants and preventing new invasive plant populations from becoming established.

Hernando County

Hernando County Code of Ordinances 94-8 under Chapter 28 – Utilities, include Article VII. - Groundwater Protection and Siting is intended to protect and maintain the quality of groundwater in Hernando County by providing criteria for land uses and the siting of facilities which use, handle, produce, store or dispose of regulated substances and by providing protection to vulnerable features which discharge directly to the Floridan aquifer. This article is designed to protect the quality of water obtained from existing and future community public supply wells and county-wide groundwater resources. Other Articles under Section 28 include regulation of wastewater, reclaimed water, stormwater, watering restrictions, and fertilizer application.

Hernando County has a fertilizer ordinance due to the concern of increases in nutrients from lawn fertilizers in local springs and surface waters and the potential for these increased nutrients to cause the growth and rapid spread of algae. The fertilizer ordinance restricts the use of fertilizers from January 1 through March 31 and requires that all commercial and institutional fertilizer applicators be trained and registered with Hernando County and those who are not trained and registered as professional applicators are prohibited from applying any fertilizer during the restricted season. Residents who hire a landscape professional to fertilize their lawn are encourage to request to see a competency card to verify the landscaper is properly registered with Hernando County. Residents who choose to fertilize their lawn themselves are prohibited from applying it during the ordinance's restricted period and encouraged to follow guidelines. Recommendations include starting with a soil test to determine pH and nutrient levels; consideration of the time of year, climate, soil type and type of grass and health or condition of the lawn; fertilization only when the grass is actively growing; not applying fertilizer if heavy rain is predicted in the next 24 to 36 hours; an if using reclaimed water for irrigation, checking with your utility to determine if your reclaimed water nutrient levels to reduce the need to fertilize.

Hernando County has an active water conservation program that is administered by the Utilities Department and includes water conservation tips, water conservation programs, Florida-Friendly Landscaping guidance, and the Groundwater Guardian Team. The Groundwater Guardian program is an earned designation for communities which take pro-active steps toward groundwater protection through adoption and implementation of activities that protect groundwater, such as public awareness, education, conservation, pollution prevention, public policy, or best management practices. The Hernando County Groundwater Guardian Team operates pursuant to the Florida Sunshine Laws and is an advisory and advocacy committee of the Utilities Director and the County Commission that includes four components: 1) Website, 2) Commitment to strengthen and expand coordination with Florida Yards & Neighborhoods Program, 3) Investigation of methodologies to identify and improve protection of karst or karst sensitive areas of Hernando County, and 4) Coordination of a local government and SWFWMD groundwater and springs education workshops.
The Hernando County Utilities Department has water conservation incentive programs which provide water bill credits to offset low flow toilet and irrigation rain sensor installation.

Hernando County Department of Public Works staff assist and support public safety emergencies and issues pertaining to waterways and waterfront property. The Public Works stormwater management program addresses EPA Phase II NPDES requirements, as well as watershed management and floodplain mapping, and water quality improvement projects. The Public Works Waterways Division is responsible for maintaining the County's network of aids-to-navigation, docks, piers, lights, and buoys in a manner consistent with applicable state and federal regulations.

Hernando County has a Port Authority composed of a five-member board appointed by the Board of County Commissioners for a period of four years. The Port Authority addresses citizen concerns and supports hurricane planning, boater alerts for invasive species, navigation maintenance, and developing saltwater reefs in the coastal waters.

The Hernando County Sheriff's office has a marine patrol section that enforces state and local rules regarding pubic use of waterways. Inland boating regulation on Weeki Wachee is primarily the responsibility of the Hernando County Sheriffs office and Florida Fish and Wildlife Conservation Commission law enforcement division.

Pasco County

Pasco County has a fertilizer ordinance (14-16) contained in Article IV of Chapter 42, Code of Ordinances. The ordinance finds that as a result of impairment to Pasco County's surface waters by excessive nutrients, or as a result of increasing levels of nitrogen in the surface and/or ground water within the aquifers or springs within the county, the use of fertilizer on lands creates a risk to contributing to adverse effects on surface and/or groundwater. The fertilizer ordinance generally follows the Florida-Friendly Best Management Practices of Protecting of Water Resources. The ordinance regulates the proper use of fertilizers by any applicator; require proper training of commercial and institutional fertilizer applicators, establish training and licensing requirements (by FDACS); establish a prohibited and restricted application period; specifies allowable fertilizer application rates and methods, fertilizer-free zones; low maintenance zones; and exemptions.

The Pasco County Utilities Department provides water and sewer services, reclaimed water, solid waste and recycling, hazardous waste, and environmental lab service to most of the residents within Pasco County. Pasco County water utility customers are supplied a blend of groundwater, surface water, and desalinated water to reduce reliance on a single source of drinking water. The county is one of six members that make up the organization known as Tampa Bay Water, which provides approximately 85% of the water delivered to Pasco County customers. Pasco County has an extensive reclaimed water program and distribution network. The largest component being the Boyette Road Reservoir, a 500- million-gallon reclaimed water reservoir that provides increased storage as part of the Pasco County Master Reuse System (PCMRS). The reservoir balances reclaimed water supply and demand, helping to make sufficient reclaimed water available to meet higher dry season demands. The addition of reclaimed water customers to the PCMRS will help extend limited fresh drinking water supplies by increasing the availability of reclaimed water for lawn and landscape irrigation. The Pasco Utility Department administers an ultra-low flow / high efficiency toilet (1.28 gallons per flush or less) rebate program with SWFWMD, which provides water bill credit upon toilet upgrade. Drinking water

quality is supported by ongoing monitoring for contaminants in drinking water according to federal and state laws, rules and regulations.

Pasco County Stormwater Management ordinance 07-18 provides for collection, treatment, and disposal of stormwater. The Stormwater Management Division is under the Public Works Department and is responsible for the design, construction, maintenance of the County's drainage system including all of unincorporated Pasco County. The overall Division goal is to protect the public's safety and welfare through the proper collection, conveyance and storage of stormwater runoff through new and existing drainage flow-ways. The Division has four areas of responsibility: Operations and Maintenance, Capital Improvement Program (CIP), Program Management, and National Pollutant Discharge Elimination System (NPDES) Permit Compliance. The Operation and Maintenance Program activities include regular maintenance of the drainage system, major maintenance, project management, mowing, cleaning of stormwater structures manually or with vacuum trucks, conducting litter control and street sweeping for the NPDES permit, stormwater structure repair, and culvert/pipe replacement. The Capital Improvement Program is responsible for constructing new stormwater assets. Projects are generally identified in the Watershed Management Plans, are identified by staff after evaluation of problem areas or were formerly part of the maintenance program but have deteriorated to the point that they require replacement. These projects go through the process of engineering analysis, benefit-cost evaluations, and then if feasible the design, permitting, and construction of the project. Projects that are feasible become part of CIP and are contracted out when funding is available. The construction phase of these projects is managed by the Project Management Division and not the Public Works Department. Stormwater Program Management consists of activities related to planning, administration, engineering, inspections, public information and watershed modeling. This program also includes conducting watershed studies with the SWFWMD. These studies are used to develop Digital Flood Insurance Rate Maps (FIRM) and identifying Best Management Practices (BMPs) for flood prone areas. The Watershed Management Plans contain listings/maps of BMP projects. Staff conducts cost-benefit analyses to determine if projects are feasible or if other alternatives are available. An in-house team designs and permits various drainage improvements along with using General Service Agreements with consultants for design and permitting services. The NPDES MS4 Permit authorizes Pasco County to discharge stormwater to State waters in accordance with the approved Stormwater Management Programs (SWMPs), effluent limitations, monitoring requirements, and other provisions as set forth in the permit. The County implements SWMPs that include pollution prevention measures, treatment or removal techniques, stormwater monitoring, use of legal authority, education and training, and other appropriate means to control the quality of stormwater discharged into waters of the State. Compliance with the SWMPs is reported annually to FDEP in an annual report.

The Pasco County Environmental Lands Division is assigned to the Engineering Services Department. Its primary mission is to administer objectives listed under the Conservation Element of the Pasco County Comprehensive Plan. The Pasco County Environmental Lands Division objectives include critical linkages (wildlife corridors), ecological planning units, elimination of exotic nuisance and plant species, Environmental Lands Acquisition and Management Program (ELAMP), groundwater and surface water protection, natural resources protection, and wetland protections. The objectives of the Environmental Lands Division are achieved by four sections: Acquisition which is the lead processing ELAMP nominations, seeking and managing grants, acquiring land and securing conservation easements; Environmental education which schedules educational activities, participates in community outreach and coordination of volunteer support; Environmental review which reviews site development, zoning, and variance applications as well as provides technical input to other departments; and Land management which oversees habitat management, restoration and maintenance on all acquired preserves and conservation easements.

The Pasco County Sheriff's Office (PCSO works with local, state, and federal agencies to enforce applicable environmental laws. The PCSO has an Environmental Crimes Unit (ECU) which patrols the counties waterways and agricultural community. The Agricultural Unit (AG) has specialized training assigned to patrol the agricultural and farming communities. The Marine unit patrols the counties waterways enforcing Florida boating laws and responding to calls for service on the waterways. The Marine unit also participates in search and rescue missions and criminal investigations on the waterways and waterfront communities.

Tampa Bay Regional Planning Council

The Tampa Bay Regional Planning Council (TBRPC) provides a forum to foster communication, coordination and collaboration to identify and address needs/issues regionally. The TBRPC is a multi-purpose agency responsible for providing a variety of services including natural resource protection and management, emergency preparedness planning, economic development and analysis, transportation and mobility planning, growth management and land use coordination, and technical assistance to local governments.

Withlacoochee Regional Water Supply Authority

The Withlacoochee Regional Water Supply Authority (WRWSA or "Authority") is a multi-county special district of the State of Florida charged with planning for and developing cost-efficient, high-quality water supplies for its member governments. The Authority promotes environmental stewardship through its water conservation programs and will develop alternative water sources when necessary to augment traditional water supplies to meet the region's long-term needs.

Florida Farm Bureau

The Florida Farm Bureau Federation's mission is "to increase the net income of farmers and ranchers, and to improve the quality of rural life." The vision of the FFBF is "Florida Farm Bureau will be the most effective, influential and respected Farm Bureau in the nation. To truly be recognized as Florida's Voice of Agriculture.

Audubon Florida

Audubon's mission is to conserve and restore natural ecosystems, focusing on birds, other wildlife, and their habitats for the benefit of humanity and the earth's biological diversity.

The Howard T. Odom Florida Springs Institute, Inc.

The mission of the Florida Springs Institute is to provide a focal point for improving the understanding of spring ecology and to foster the development of science-based education and management actions needed to restore and protect springs throughout Florida.

Save the Manatee Club

Save the Manatee Club is a national non-profit 501(c)3 organization created to protect endangered manatees and their aquatic habitat for future generations. Their objective is the recovery and protection of manatees and their ecosystems.

Hernando Environmental Land Protectors:

The HERNANDO COUNTY LAND PROTECTORS Inc. (HELP) was established as a not-for-profit corporation on May 20, 1976 and is one of the oldest established environmental organizations in Hernando County, FL. Its overall objective is to promote and protect the environment of Hernando County, Florida lying west of US 19. This area includes a large variety of relatively unspoiled habitats for wildlife and the goal of HELP is to promote the preservation of these pristine wildlife habitats.

Appendix F: Draft Potential Projects and Initiatives to Support Management Actions

Draft potential projects and initiatives were provided by participants of the TWG for review by the SCMC and SCSC. Tables 22-24 list projects and initiatives provided by participants of the TWG that were not approved by the SCMC or SCSC to be included as a priority project or initiative.

Water Quality

Table 22: Draft Potential Water Quality Projects and Initiatives

Monitoring & Research
Cleaning Canals with Aeration Develop and evaluate methods to improve water quality and circulation in canals by using aeration to create vertical movement of sediments. Place pond aerators in "dead End" canal systems to create water movement. One is presently in use on Mound canal at the end between Arbordale and Richard Drive, Weeki Wachee FL. Another aerator will be installed at the north end of John's Canal after baseline water clarity data is obtained courtesy of Chuck Morton, the adjacent property owner. After evaluation of data more may be requested, approximately 12 for the Weeki Wachee system, 12 for Chassahowitzka and 8 for Homosassa (32 total). Electrical cost is approximately $4.50 per month and could be borne by the property owner. Cost: $60,000 (Cost for implementation in Weeki Wachee, Homosassa, and Chassahowtizka)
Legacy Nutrient Inventory and Management Develop ground-truthed estimates of existing legacy nutrients, accumulation rates, and resuspension risk factors. Identify areas where management of nutrient inputs has been effective, and/or where resuspension of legacy nutrients from sediment is a leading cause of water quality deterioration. Use these findings to develop a legacy nutrient management plan involving careful planning and permitting of suction dredge operations to remove muck and algae from areas where such actions would have significant long-term impacts. Cost: $75,000
Agricultural Operations
NONE
Septic Tanks
Hybrid Adsorption Biological Treatment (HABiTS) Biological Nitrogen Removal (BNR) Pilot Scale Study Carry out a full scale pilot study at residential sites to compare the effectiveness of a 2-stage passive nitrogen reducing system incorporating ion exchange media with conventional 2-stage passive biological nitrogen removal systems for onsite wastewater treatment. Tasks would include: 1) Design and construction of HABiTS and conventional BNR systems at residential sites with septic systems. 2) Monitoring of system performance monthly over a two-year period. 3) Annual follow up to determine long term performance and maintenance requirements. Cost: $150,000

Septic Tank Conversion Study

Develop GIS map of springshed septic systems and conduct dye trace groundwater travel studies and necessary additional geologic and hydrologic research to determine localities where conversion from septic to municipal sewage would most alleviate nutrient inputs to groundwater. Develop plan to reduce septic inputs by one third over 5 years.

Cost: $140,000

Urban/Residential Fertilizer (includes Golf Courses)

NONE

Wastewater Treatment Facilities

Private Sewer Line Cost Sharing Program

Aged private commercial and residential sewer laterals, are often in poor condition. Laterals are the portions of the sewer network connecting private property to the public sewer system. Newer laterals are generally installed with polyvinyl chloride (PVC) pipe, but old private laterals can also be made of vitrified clay pipe (VCP). Both older PVC and VCP are victim to root intrusion, cracks, joint misalignment and general leakage. Private laterals are significant contributors to a utility system's infiltration and inflow and are difficult to manage with no means to address the I & I source. High levels of I & I can have possible negative environmental impacts due to sanitary system overflows that may happen during storm events. Additionally, according to the EPA's Guide for Estimating Infiltration and Inflow, in some cases, high levels of infiltration can also lower groundwater levels and can cause significant hydrologic impacts to nearby streams.
The proposed initiative would first create regulation that incentivizes the certification of a private lateral being leak free. For example, such certification could require a lateral be certified leak free when the property is bought or sold, or if a remodel/expansion exceeds a set dollar amount.
The second aspect to the initiative is to provide funding assistance when a lateral fails certification, i.e. is found to be leaking. The funding would provide 50% reimbursement (up to a maximum of $5,000) for full lateral replacement. The program would not provide funding for rehabilitation of leaking laterals, only replacement.

Cost: $290,000

Stormwater

State Control Structures

ID tributaries within state owned lands surrounding the springs and install water control structures in higher nitrate reading areas.

Cost: $100,000

Septic/Sewage Solids

NONE

Atmospheric Deposition

NONE

Water Quantity

Table 23: Draft Potential Water Quantity Projects and Initiatives

Monitoring and Research
NONE
Conservation
NONE
Alternative Water Supply
NONE

Natural Systems

Table 24: Draft Potential Natural Systems Projects and Initiatives

Monitoring & Research
Compliance Monitoring Technology Feasibility Study Identify efficiencies that can be gained by implementing various technologies to monitor and report compliance issues within the spring system. Study would recommend an implementation plan and provide an alternatives analysis regarding the effectiveness of the technology implementation and establish a baseline to compare success criteria with. Given the cost of an enforcement officer on the rivers: salary, benefits, management, equipment and operating costs of some $100K per year we need to find technological alternatives. All enforcement of the large number of rules and laws is not practical so a determination of which have the highest priority and then research and test technological systems to meet those specific tasks. Cost: $125,000
Erosion/Sedimentation Modeling Study Identify/GPS LOCATE/QUANTIFY (measure) Areas Where Erosion Is A Problem 1. Map/GPS locate all turns (112 total/Weeki Wachee tour boat to Rogers Park) to establish benchmark and enable yearly follow up surveys. 2. Photograph each turn from relevant vantage points to document baseline visuals and ongoing yearly impacts to shoreline vegetation, consequent erosion and changing depth of water. Visual ongoing history of impacts to river turns. 3. Measure radius area of each turn from inside to outside of turns. Quantify sq footage of these areas. 4. Measure depth of water from inside turn (beaches created by human and water craft activity) to outside (deeper water) of turn. 5. Measure water velocity at low and high tides. 6. Measure existing beach areas at low tide. 7. Photo/video document human activity on all river turns on significant summer weekends. 8. Utilize concerned volunteer citizens to accomplish these tasks. I know of 3 concerned/able individuals willing to take on these tasks. 9. Provide instruments/tools to accomplish these tasks. a. Computer tablets for data input, GPS coordinates, surface area measurements and photo/video documentation. b. Measuring devices for surface area measurements and water depth measurement. c. Water velocity instrument. 10. Provide training and/or certification if necessary.

NOTE: A photo/video/measurement data base system of river turns is critical to establish baseline history and negative and positive progress regarding shoreline vegetation and erosion status (positive or negative) and the consequent impact on river channel alterations.

ROOT CAUSE analysis and treatment of is essential if any positive progress is to be made.

Cost: $50,000 (for equipment only, work to be completed by volunteers)

Habitat Conservation

Norfleet Property Acquisition

This proposed project is to complete the Boat Spring acquisition in Aripeka of approximately 6.2 acres of environmentally sensitive land in Hernando County currently in private ownership. Provided seller(s) are willing, the scope would entail appraisals, environmental site assessment, land/boundary surveys, and required documents in accordance with the land acquisition process.

Acquisition of these properties will conserve coastal habitat for listed species and provide springs protection within the coastal greenway corridor adjacent to SWFWMD/publically owned property and property acquired by SWFWMD in the vicinity of the spring. Conservation allows buffering with native vegetation providing water quality benefits to fragile springs systems.

Cost: $22,800

Habitat Restoration

NONE

Invasive Species Management

NONE

Recreation Management

NONE