# Chassahowitzka River Surface Water Improvement and Management (SWIM) Plan

## A Comprehensive Conservation and Management Plan

## August 2017 - REVISED

Southwest Florida
Water Management District

Governing Board Approval: June 25, 2024

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**Background**

The Chassahowitzka River is a first-magnitude spring system located in Citrus County and was designated as a Priority Water Body in 2014. 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 F.S.). The most recent SWIM Plan for the Chassahowitzka River was developed in the framework of the Springs Coast Steering Committee (SCSC), the Springs Coast Management Committee (SCMC), and the Technical Working Group (TWG) before its adoption in 2017. This SWIM Plan includes numeric targets called quantifiable objectives that can be used to develop and prioritize management actions and projects.

SWIM Plans are living documents created with adaptive management at their core. As such, plans will be revised periodically, including reviewing the quantifiable objectives. The Springs Coast Committees review the status of the quantifiable objectives for each of the five first-magnitude spring systems annually. In 2020, the SCMC tasked the TWG to reevaluate the quantifiable objectives to identify potential refinements utilizing the newest science and data available. These interim refinements are specific to this portion of the SWIM Plan, with a full SWIM Plan update occurring at a later date. The refinements to these quantifiable objectives will facilitate understanding of short- and long-term drivers to support response to changes occurring within this system.

The Chassahowitzka TWG was called to reconvene in August, September, and November 2022 to determine if the quantifiable objectives in the 2017 Chassahowitzka River SWIM Plan, specifically those in the water quality and natural systems focus areas, were still suitable through detailed review of current data and discussion of current issues and drivers present in the system. The TWG reviewed water quality and submerged aquatic vegetation data collected by the District as part of their discussions. Water quality data is available through the District's Environmental Data Portal. Submerged aquatic vegetation data can be requested by emailing SpringsTeam@WaterMatters.org. Highlights of these discussions were brought to the Management and Steering Committees for their review at their publicly noticed meetings. The SCSC took action at their public meeting on March 8, 2023, to refine the quantifiable objectives based on the recommendations from the SCMC, also reviewed over two public meetings, and vetted through discussions from the TWG. The Quantifiable Objective Refinements section details these actions.

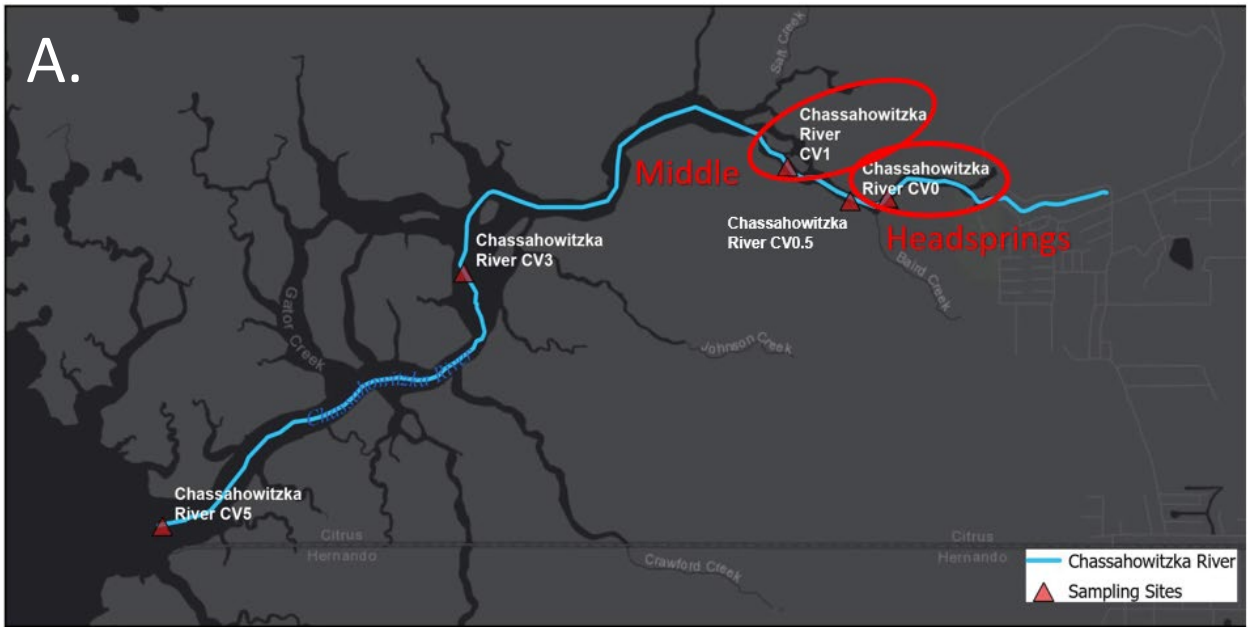
In alignment with Section 373.453, Florida Statutes (F.S.), public hearings in the northern region were held during the publicly noticed Springs Coast Committee meetings and the public workshop held on October 18, 2023. Going above and beyond these requirements, the District utilized the Environmental Advisory Committee to review these refinements at their October 10, 2023 meeting prior to review by the District's Governing Board on January 23, 2024 for approval to submit to agencies and appropriate local governments. Following this review process in accordance with F.S. 373.453, comments were incorporated prior to the Governing Board's approval for submission to FDEP on June 25, 2024.

This memo serves to amend the quantifiable objectives as noted hereafter in the SWIM Plan.

**Quantifiable Objective Refinements**

The Minimum Flows and Levels (MFLs) for the Chassahowitzka were established in 2013, although at the time of this SWIM Plan establishment this MFLs was scheduled to be re-evaluated. The re-evaluation took place in 2019 and set the adopted minimum flow for the Chassahowitzka River that is referenced in these Quantifiable Objective refinements. Based on this adopted MFL, the SCSC has included a target of >92% natural flow for the minimum flows quantifiable objective target.

To better capture changes occurring throughout the river, the water clarity and submerged aquatic vegetation (SAV) targets will be presented as different portions (see Figure 1). Previously, the targets for water clarity were calculated as an annual average of five sampling stations for the river wide target and an annual average from one sampling station near the headsprings for the headsprings target. The river wide target is redefined to the "middle portion of the river" to capture changes occurring at the freshwater-saltwater interface within the river (see Figure 1A). The SAV targets were previously calculated as averages of the 25 SAV mapping transects. The desirable and invasive SAV targets are redefined into the tidal freshwater habitat, transition zone, and estuarine zone based on data analysis presented to the Springs Coast Committees, and will be calculated by transects 0-2, transect 2.5-5, and transects 5.25-10 respectively (see Figure 1B).



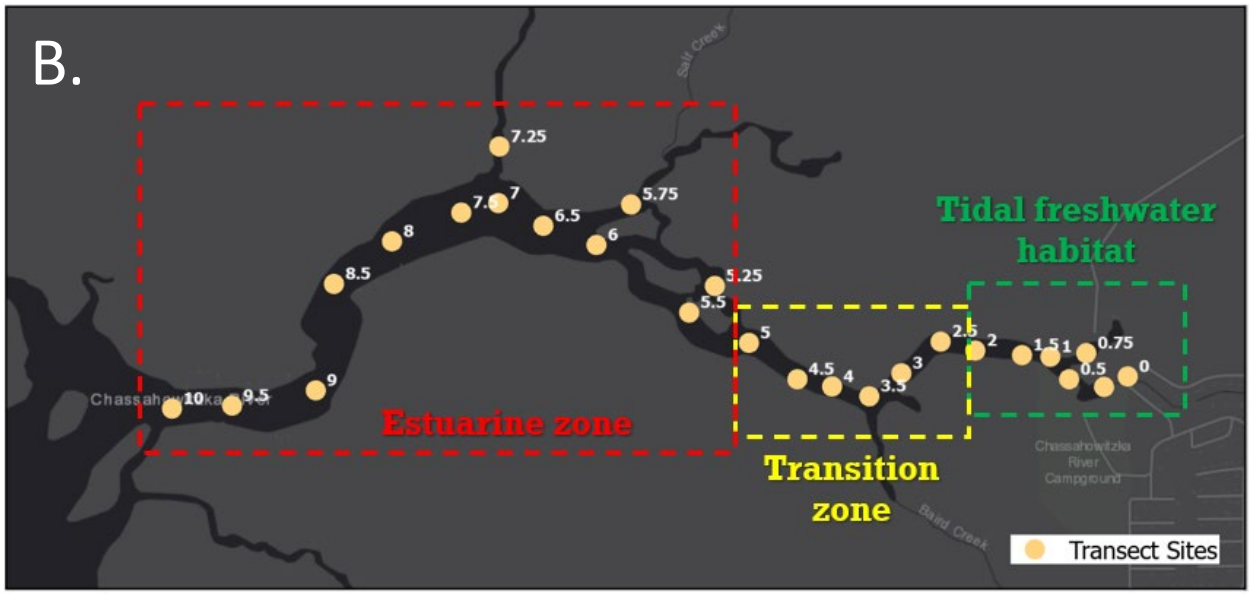



*Figure 1: Sampling locations for (A) water clarity and (B) submerged aquatic vegetation the Chassahowitzka River.*

Water clarity is influenced by numerous factors and localized conditions including rainfall, suspended solids, and color. As a result, we see a lot of variability with this parameter. Due to these influences, water clarity was redefined as an indicator and will be monitored until a threshold is surpassed. The thresholds were established based on a reference period selected by the committees. The thresholds were derived by using the 2006-2015 averages of the headsprings and middle sampling locations. If surpassed, the SCMC may determine what next steps, if any, are warranted.

Additional data collection on a more frequent basis that occurred after the SWIM Plan establishment in 2017 exposed trends within the SAV community that are unique to the Chassahowitzka River. Based on this data analysis, the desirable SAV targets for each river region were redefined using a stretch goal derived from the max summer coverage and adding 5% to set the targets for each river region. The current desirable SAV targets are as follows: >55% coverage of desirable SAV in the tidal freshwater habitat, >45% coverage of desirable SAV in the transition zone, and >25% coverage of desirable SAV in the estuarine zone.

Based on these discussions, the SCSC and SCMC have approved refinements to the quantifiable objectives, shown in Table 1. These refinements include the following: updating the minimum flows target as adopted; defining water clarity as evaluated as headsprings and middle portions; redefining water clarity as an indicator; defining the SAV targets as evaluated as tidal freshwater habitat, transition zone, and estuarine zone; and redefining the desirable submerged aquatic vegetation targets.

### *Table 1: Indicators and Quantifiable Objectives*

**Indicators**

| **Water clarity** | **Threshold** |
|---|---|
| Near the headspring | 32 ft |
| Middle portion of river | 13 ft |

**Quantifiable Objectives**

| **Water quality** | **Target** |
|---|---|
| Nitrate concentration in the springs | < 0.23 mg/L |
| Total nitrogen concentration in the river | < 0.25 mg/L |
| **Water quantity** | |
| Minimum flows for the springs and river | > 92% natural flow |
| **Natural systems** | |
| Coverage of desirable submerged aquatic vegetation in the tidal freshwater habitat. | > 55% |
| Coverage of desirable submerged aquatic vegetation in the transition zone. | > 45% |
| Coverage of desirable submerged aquatic vegetation in the estuarine zone. | > 25% |
| Coverage of invasive aquatic vegetation in the tidal freshwater habitat, transition zone, and estuarine zone. | < 10% |


## *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 Chassahowitzka River.

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# Executive Summary

The Chassahowitzka River is a first magnitude spring system that originates in southwest Citrus County. The uplands around the headsprings consist of a hydric hammock plant community that transitions to the west into an extensive marsh complex along the Gulf of Mexico. The shallow, low-gradient Chassahowitzka River discharges into the Gulf of Mexico near the Citrus and Hernando County border. Over the past hundred years, the spring and river have experienced 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 (SWFWMD) approved the inclusion of the Chassahowitzka 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 Chassahowitzka 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 Chassahowitzka 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 Chassahowitzka 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
- Changing Salinity
- Potential Decrease in Historical Flows
- Altered Aquatic Vegetation

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 Chassahowitzka 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 | >20 feet[1] |
| Water clarity – near the headspring | >40 feet[1] |
| Nitrate concentration in the springs | <0.23 mg/L[2] |
| Total nitrogen concentration in the river | <0.25 mg/L[2] |
| **Water Quantity** | |
| Minimum flow for the river system | >97% natural flow[3] |
| **Natural Systems** | |
| Coverage of desirable submerged aquatic vegetation in the river | >65%[4] |
| Coverage of invasive aquatic vegetation (including filamentous algae) in the river | <10%[4] |

[1] Based on data presented in Figure 22
[2] Dodson et al. 2014 – Nutrient TMDLs for Chassahowitzka Springs Group, Crab Creek Spring, Chassahowitzka River–Baird Creek, Baird Springs, Ruth Spring, and Beteejay Springs (WBIDs 1348Z, 1348D, and 1361B)
[3] Heyl et al. 2012 –Recommended Minimum Flows and Levels for the Chassahowitzka River System
[4] Based on data presented in Figure 28

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 41 ongoing and 26 proposed projects that meet one or more management actions. Of the 26 proposed projects, the SCSC identified 19 proposed priority projects that are included in the body of this plan with the remaining 7 listed in 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 Chassahowitzka River. This SWIM plan includes 10 ongoing and 5 proposed priority projects to address water quality issues in the Chassahowitzka River (Figure 1).

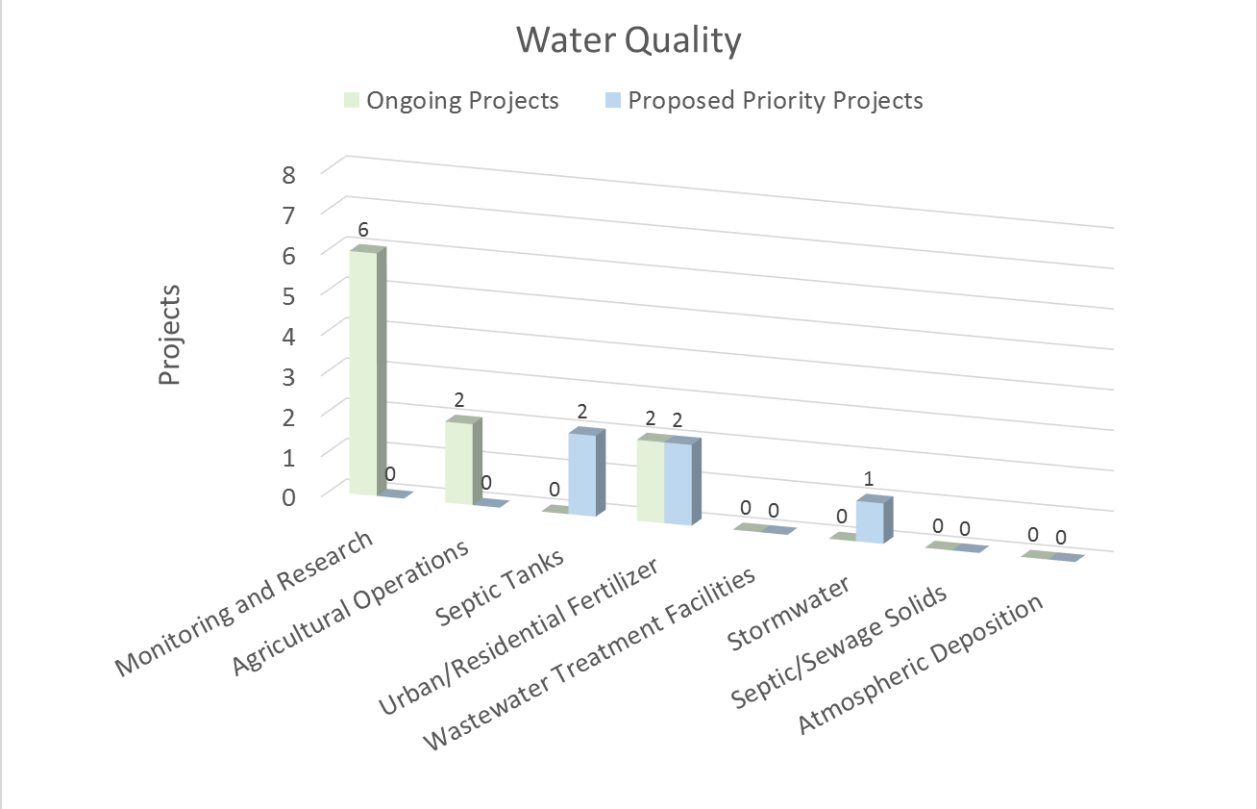



*Figure 1: Water Quality Projects by Management Action Category*

The water quantity management actions and projects are intended to protect and maintain flow in the springs that feed the Chassahowitzka River. The SCSC recognizes that **Conservation** and **Minimum Flows and Levels** (MFL) are the priority water quantity management action categories for the Chassahowitzka River. This SWIM plan includes 26 ongoing and 6 proposed priority projects to address water quantity (Figure 2).

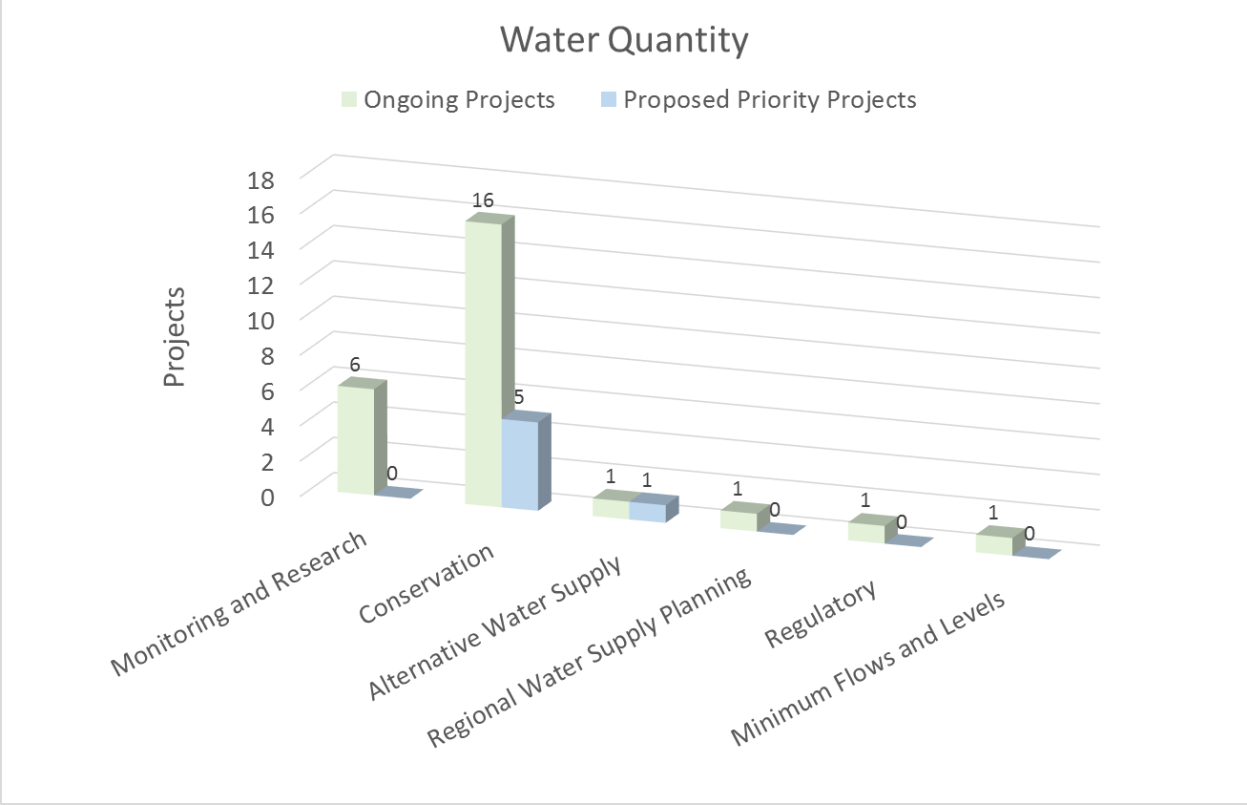



*Figure 2: Water Quantity Projects by Management Action Category*

The natural systems management actions and projects are focused directly on the restoration and protection of the diverse fish and wildlife habitat of the Chassahowitzka River. The SCSC recognizes that **Monitoring and Research** and **Habitat Conservation** are the priority natural systems management action categories for the Chassahowitzka River. The SWIM plan includes 5 ongoing and 8 proposed priority projects to address natural systems issues (Figure 3).

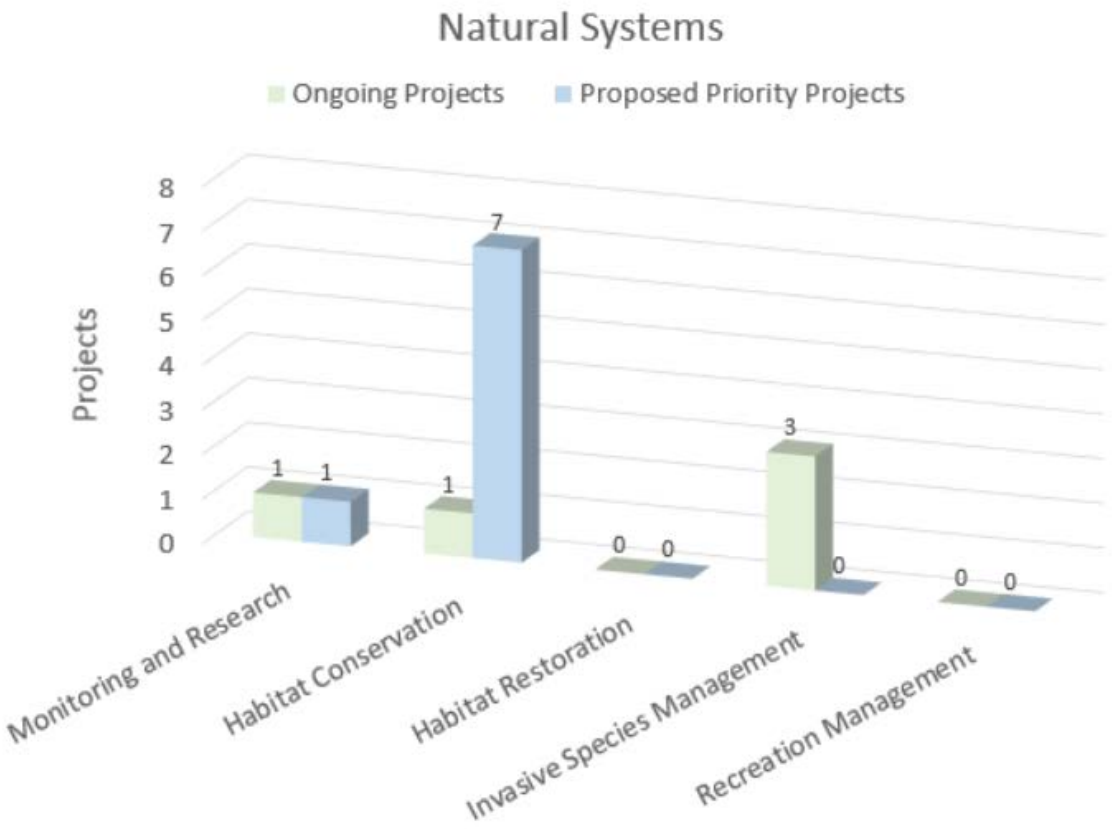



*Figure 3: Natural Systems Projects by Management Action Category*

# 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, located in or discharging to an area known as the Springs Coast, collectively discharge more than 800 million gallons per day.

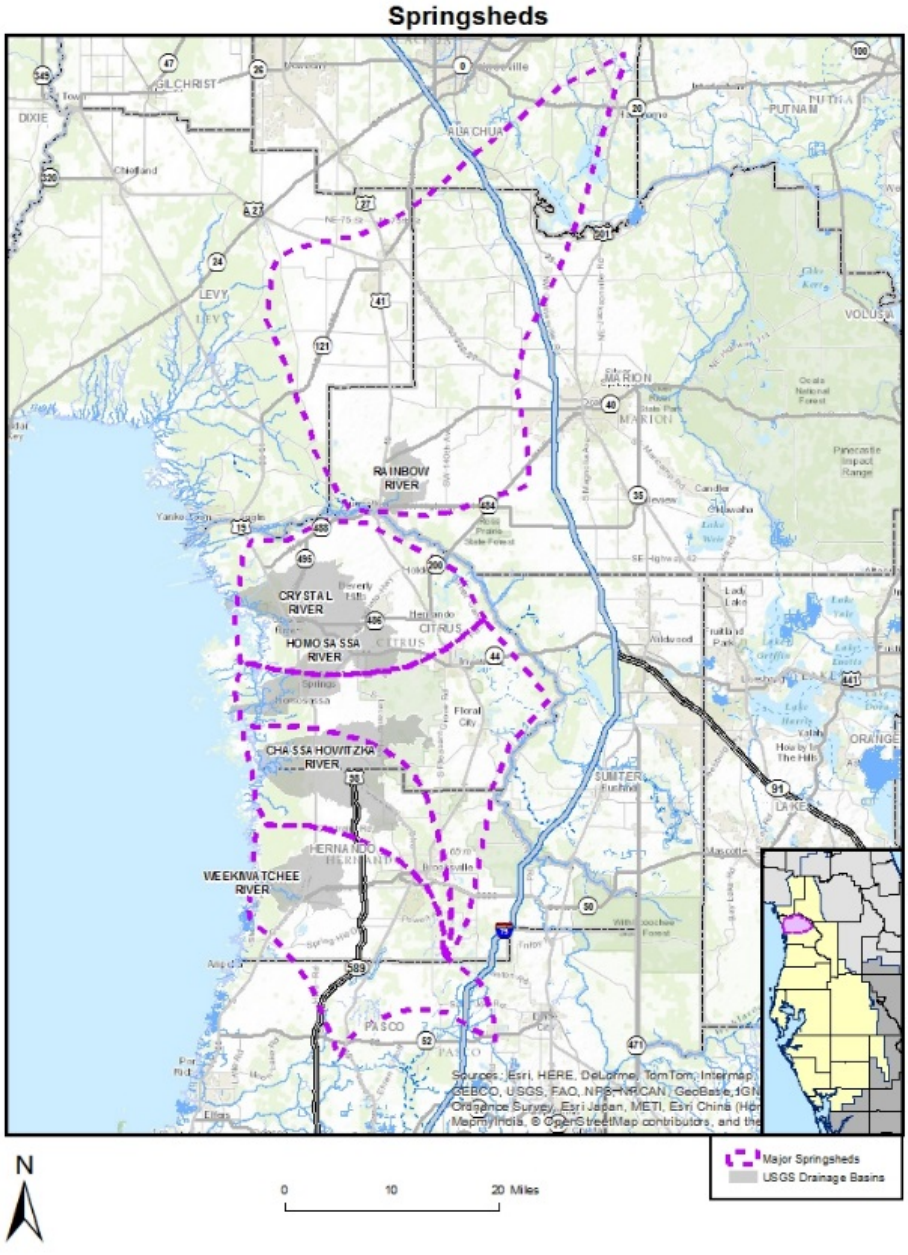



*Figure 4: First Magnitude Springsheds in the Springs Coast Region*

The source of spring discharge for the Chassahowitzka 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 (Figure 5). 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.

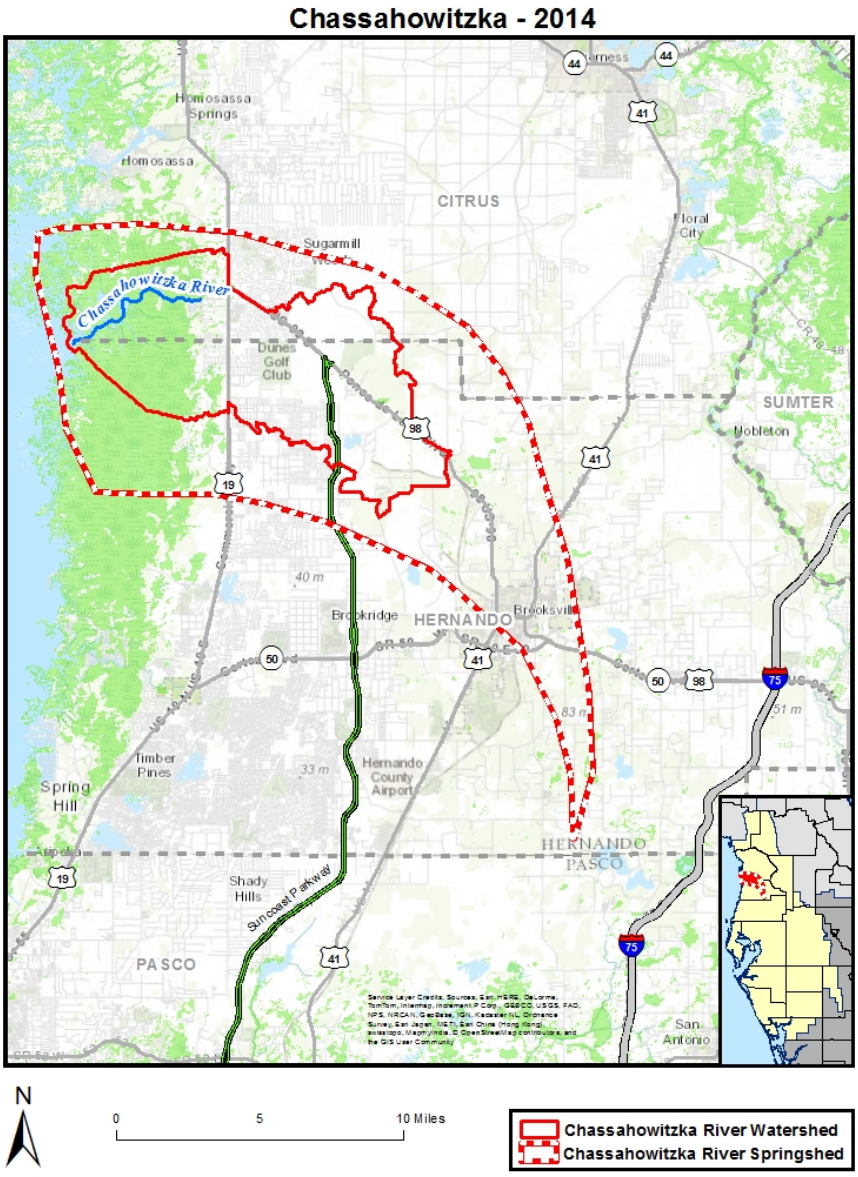



*Figure 5: Chassahowitzka Watershed and Springshed Boundaries*

The planning boundary for the Chassahowitzka springshed 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). 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 Carahan | County Commissioner |
| Hernando County | Nick Nicholson | County Commissioner |
| Marion County | Kathy Bryant | County Commissioner |
| Pasco County | Ron Oakley | County Commissioner |
| FDEP | Tom Frick | Environmental Assessment and Restoration Division, Director |
| FFWCC | Shannon Wright | Northeast Regional Director |
| FDACS | Ray Scott | Office of Agricultural Water Policy, Deputy Director |
| SWFWMD | Kelly Rice | Governing Board Member, Chair |
| *Citrus County Commissioner Dennis Damato contributed to the development of this plan. | | |

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 |
| Pasco County | Flip Mellinger | Assistant County Administrator, Utilities |
| Marion County | Tracy Straub | Utilities Director |
| FDEP | Rick Hicks | Professional Geologist |
| FFWCC | Kevin Kemp | Biologist |
| FDACS | Katie Hallas | Environmental Administrator, Office of Agricultural Water Policy |
| 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 Technical Working Group consists of members 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 both direct and indirect losses of habitats.

Under the act, water management districts identify water bodies for inclusion into the SWIM 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 or FWC), the Florida Department of Agriculture and Consumer Services (FDACS) and local governments. The Chassahowitzka River was named a SWIM priority water body in 2014.

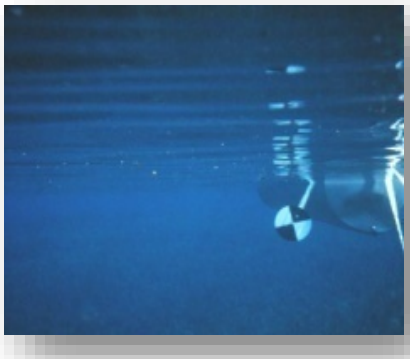
In accordance with the SWIM act, once a water body is selected, a SWIM plan must be adopted by the water management district's governing board and approved by the FDEP. Before the SWIM plan can be adopted, it must undergo a review process involving the required state agencies. The purpose of this Chassahowitzka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

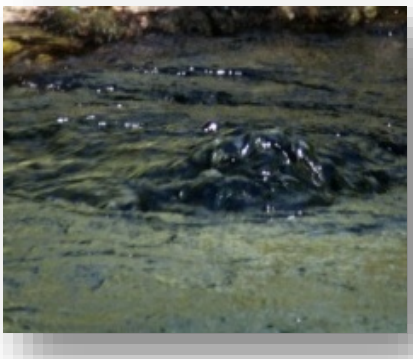
### What Makes a Healthy Spring?


There are three attributes that are common to a healthy bay 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 bay, 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. For the coastal spring systems, salinity variation has a major influence on the type and abundance of organisms that live in these 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 Chassahowitzka River originates in southwest Citrus County. The uplands around the headsprings typically have land elevations of 10 feet or less and consists of a hydric hammock plant community that transitions to the west into an extensive marsh complex along the Gulf of Mexico. The shallow, low-gradient Chassahowitzka River discharges into the Gulf of Mexico near the Citrus and Hernando County border (Figure 6). This region of the state is commonly referred to as the Springs Coast (Wolfe 1990) and the Chassahowitzka River is a significant contributor of fresh water to the regional estuary and marine habitats found offshore. Given the low land elevation and coastal proximity, the Chassahowitzka River system is vulnerable to flood and storm surge.


*Figure 6: Aerial View of the Chassahowitzka River System*
*(Google Earth, 2016 image)*

Consistent with the Springs Coast region, multiple springs and a general diffusion of submarine groundwater discharge contribute groundwater to the Chassahowitzka River system. Surface water from the surrounding hydric hammock and wetlands contribute flow to the system following heavy rainfall events. The Chassahowitzka Springs group, is composed of a large main spring and numerous smaller springs spread over an area of nearly five square miles (Figure 7). Many of these smaller springs form spring runs (e.g., Crab, Baird, and Potters Creeks) that join the Chassahowitzka River. In addition, the canal system east of the main spring, has several small spring vents which contribute

water to the system. The Chassahowitzka River is classified as an Outstanding Florida Water (OFW) and Sovereign Submerged Lands (SSL) by the State of Florida.

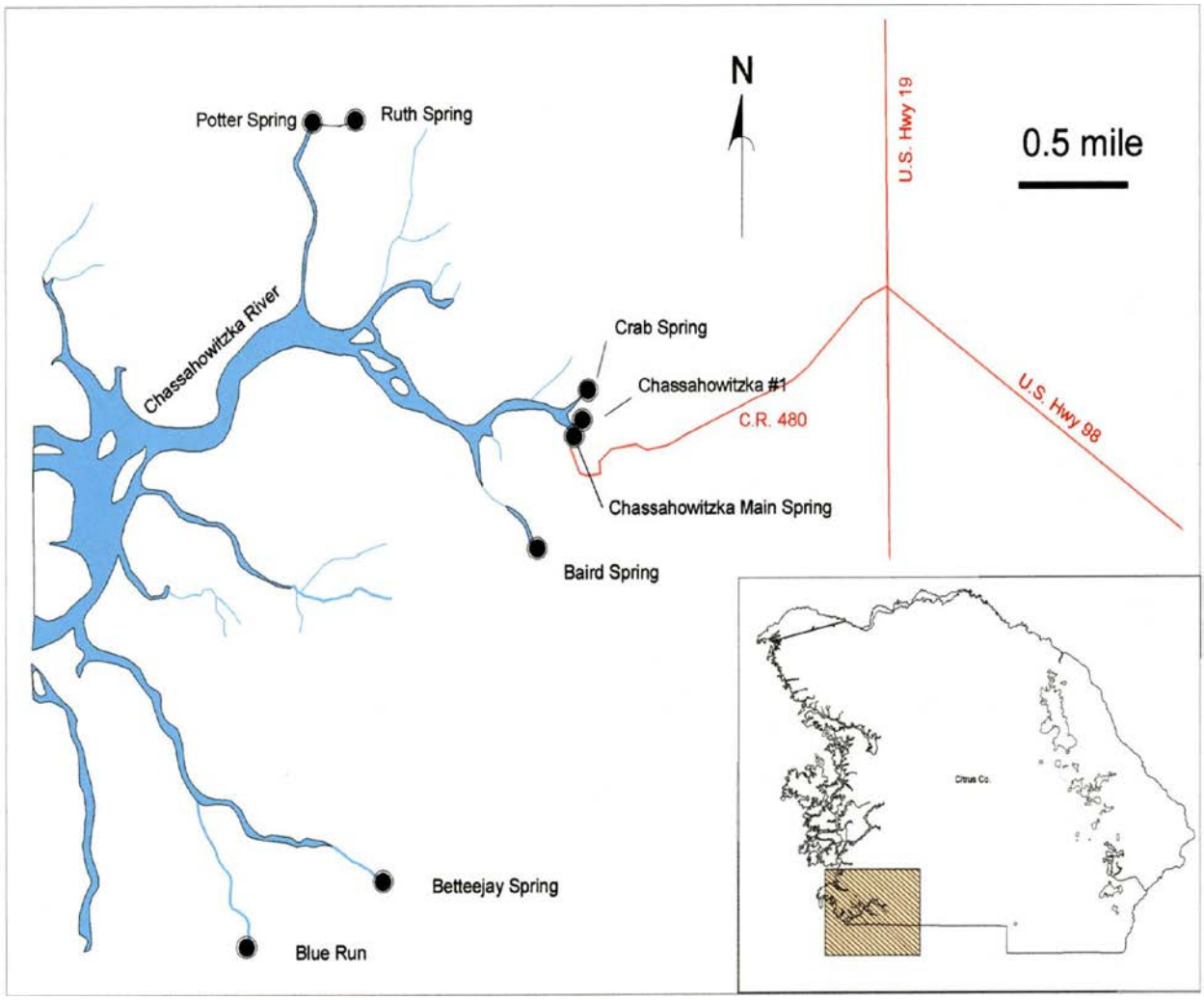



*Figure 7: Springs of the Chassahowitzka River System*
*(Champion and Starks 2001)*

The groundwater discharging from the Chassahowitzka Spring group vary from fresh to brackish conditions, corresponding to tides and water levels in the Floridan aquifer (Champion and Starks 2001). Even during low tide, total dissolved solids can exceed 5,000 mg/L and chloride concentrations greater than 3,000 mg/L have been measured in the water discharging from springs closest to the Gulf of Mexico (Champion and Starks 2001).

From the main headsprings, the Chassahowitzka River travels less than two and a half miles before reaching the salt marsh, and then meanders southwest another four miles before waters of Chassahowitzka Bay are encountered. Above the salt marsh, the river ranges from 100 to 600 feet in

width, mid-channel water depths range from less than 2 feet to nearly 9 feet in depth, depending on location and tidal stage (Frazer et al. 2001). Seven spring-fed tributaries join the river in this stretch.

### *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 Chassahowitzka Springs and the Chassahowitzka River. The Brooksville Ridge is a prominent geologic feature across Citrus and Hernando counties and the springshed. The sand and clay sediments of the ridge, along with thinner, more permeable deposits of quartz sand, mantle the underlying limestone across the Springs Coast region. 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 Chassahowitzka Springs and most of the other springs in the state. 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).

*Table 4: Hydrogeology of the Chassahowitzka 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 |

Karst processes play an important role in characterizing groundwater flow to springs and in understanding the hydrology of the region. Closed-basin topography and internal drainage in the Chassahowitzka groundwater basin, or springshed area, has been formed by the dissolution of limestone from slightly acidic rainfall water that recharges the aquifer, enlarging bedrock fractures 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

a progressive integration of voids beneath the surface, and allows larger amounts of water to be funneled into the aquifer.

### *Hydrology*

The ultimate source of water flowing through the aquifer and discharging from Chassahowitzka 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 Chassahowitzka springshed based on the average of the Brooksville and Inverness National Weather Service Stations is 53.8 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 2004). 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 are relatively constant but can move slightly from year-to-year based on variations in rainfall and groundwater recharge. The Chassahowitzka springshed covers a significant land area in northern Hernando County and southern Citrus County. The Florida Geological Survey (FGS) estimated the springshed area for Chassahowitzka Springs to be approximately 180 square miles (Figure 5).

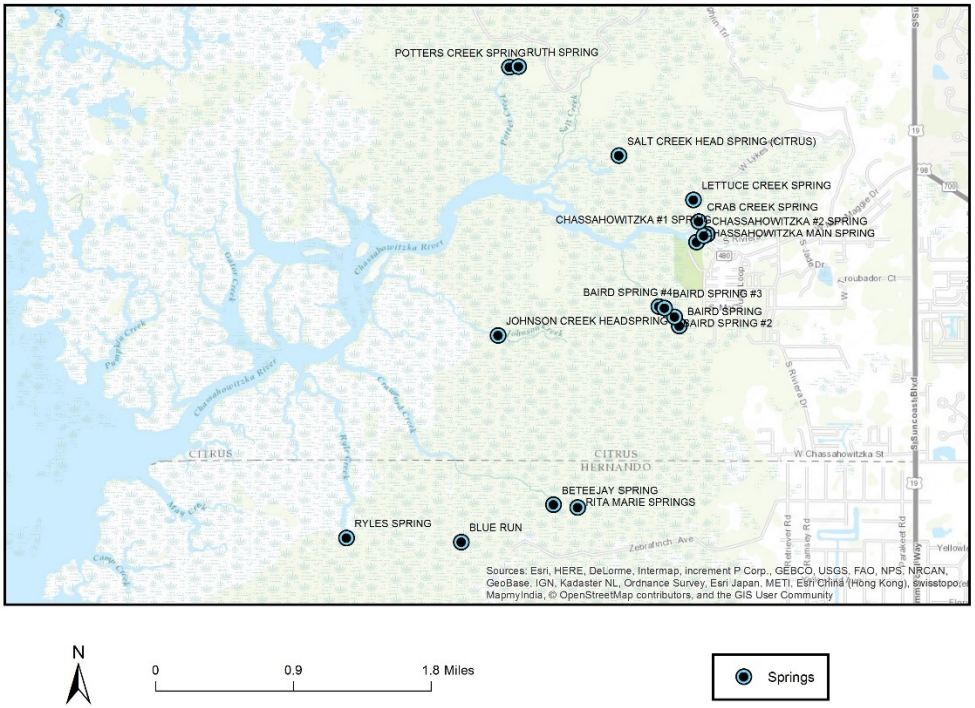



*Figure 8: Chassahowitzka Springs Locations*

The hydrogeology in the Chassahowitzka springshed includes a surficial aquifer, a discontinuous intermediate confining unit, and a thick carbonate Upper Floridan aquifer (Figure 9). The total thickness of the UFA in the springshed area ranges from 600 to 800 feet (Miller, 1986). In general, a regionally extensive surficial aquifer is not present except along the southern portion of the Brooksville Ridge because the clay confining unit is thin, discontinuous, and breeched by numerous karst features. Because of this geology, the Upper Floridan aquifer is unconfined over most of the Northwest Hernando and southern Citrus 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 Chassahowitzka springshed, the Upper Floridan aquifer is the primary source of water for the springs and withdrawals for public supply, agricultural, recreational, and industrial/commercial uses.

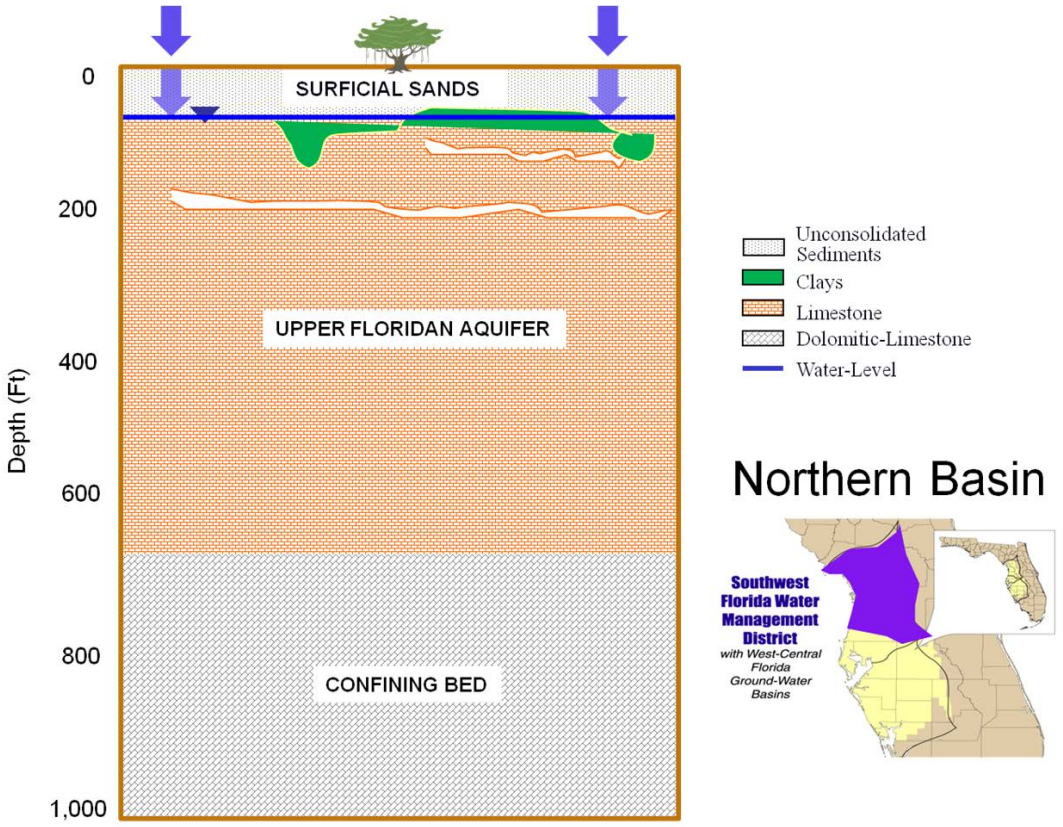



*Figure 9: Generalized Hydrogeology of the Chassahowitzka Springshed*

The Chassahowitzka 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 SWFWMD there are three regional groundwater basins: Northern, Central and Southern (Figure 9). 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 Upper Floridan aquifer within the Chassahowitzka 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 and Citrus Counties with values ranging between 10 and 25 inches per year (Sepulveda, 2002). Much of the flow to Chassahowitzka Springs is concentrated

within the upper 200 feet of the Upper Floridan aquifer. 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 Chassahowitzka springshed, evaluated on a statewide scale found that the majority of the springshed is "more vulnerable" to contamination, due to the permeable soils and karst geology in the springshed (FGS, 2005).

The Chassahowitzka River and springs system is located in southwest Citrus County within the District. The spring complex forms the headwaters of the Chassahowitzka River, which flows west to the Gulf of Mexico approximately six miles through low coastal hardwood hammock and marsh. There are as many as five springs that flow into the upper part of the river and many more springs are known to exist in the lower portion (Rosenau et al., 1977). The entire river is tidally influenced (FGS, 2004). Chassahowitzka Main Spring is 360 feet northeast of the public boat ramp and is in the middle of the run. This spring is at the head of a large pool that measures 147 feet north to south and 135 feet east to west (FGS, 2004).

The Chassahowitzka River System includes the watercourse from the Chassahowitzka Main Springs Complex to the Gulf of Mexico, including contributing tributaries, Blind Springs and all named and unnamed springs that discharge to the river. Mean annual discharge for the Chassahowitzka spring group (including Blind Spring) is estimated at 152 cubic feet per second (cfs) or 100 million gallons per day (mgd). Chassahowitzka Main spring averaged 60 cfs of flow from 1997-2015 based on measurements by the USGS (station 2310650).

### *Ecology*

The natural uplands surrounding the headsprings of the Chassahowitzka River include scrub oak and pine sandhill plant communities that have been partially developed to form a small residential community and campground. Closer to the water features, hardwood swamp and emergent wetlands become the dominant plant communities. Around the springs and upper river, common riparian trees include bald cypress (*Taxodium distichum*), oaks (*Quercus* spp.), cabbage palmetto (*Sabal palmetto*), bay (*Persea* sp.), pop ash (*Fraxinus caroliniana*), maple (*Acer* spp.), Southern Redcedar (*Juniperus silicicola*), holly (*Ilex* spp.), and wax myrtle (*Myrica cerifera*). Emergent and shrub vegetation along the upper river includes cattail (*Typha latifolia*), sawgrass (*Cladium jamaicense*), saltbush (*Baccharis sp.*), swamp lily (*Crinum americanum*), duck potato (*Sagittaria lancifolia*), bulrush (*Scirpus* sp.), southern amaranth (*Amatanthus australis*), and maidencane (*Panicum hemitomon*) (Frazer et al. 2001).

*Lower river view of the Chassahowitzka River*

Traveling towards the gulf, the coastal wetland emergent vegetation is primarily comprised of cattail (*Typha latifolia*), sawgrass (*Cladium jamaicense*), giant leather fern (*Acrostichum danaeifolium*), knotgrass (*Paspulum distichum*), salt marsh cordgrasses (*Spartina alterniflora*, *S. patens*), black needle rush (*Juncus roemerianus*), and scattered cabbage palmetto islands. Going westward, higher elevation marsh islands retain black needle rush and cordgrasses with red (*Rhizophora mangle*) and black (*Avicennia germinans*) mangroves forming the canopy vegetation, while low tide exposed lands accumulate oyster bars. Within the main river, submerged aquatic vegetation (SAV) abundance declines with distance downstream, a result of the salinity inhibiting freshwater plants (Hoyer et al. 2004). This change in SAV is also a result of the river going from a mostly fresh, clear water spring run, to a tannin colored, brackish coastal river in the lower reach. Within the lower river and estuary, SAV (especially freshwater types) are challenged with survival in the higher salinity and reduced light environment found in this part of the system. Continuing westward to the outer mangrove islands and oyster bars, water clarity improves as the system transitions to a more marine environment. In the shallow offshore waters, water clarity can be very good and seagrass and macroalgae are common.

In the Gulf waters, offshore of the Chassahowitzka River up to approximately 20 foot depths, multiple seagrass species can be found. Turtle grass (*Thalassia testudinum*) and manatee grass (*Syringodium filiforme*) can be the dominant species in these seagrass meadows. However, shoal grass (*Halodule wrightii*) and star grass (*Halophila engelmannii*) can be interspersed and are generally more common towards the estuary. The thin sands overlying the karst geology favor a diverse group of macroalgae in the estuarine and gulf waters of the Chassahowitzka River system (Dixon and Estevez 1997).

Commonly observed unattached drift forms include *Bryocladia* sp., *Chondria* sp., *Gracilaria* sp., *Hypnea* sp., *Laurencia* sp., and *Spyridia* sp. Attached macroalgae include *Acetabularia* sp., *Avrainvillea* spp., *Caulerpa* spp., *Halimeda* spp., *Penicillus* spp., *Sargassum* sp., and *Udotea* spp. Many of these attached species are calcareous green algae which form marine sediments through biological accretion of carbonates.

Traditionally, the focus of springs flora has been on the SAV, especially the freshwater vascular and macroalgae species (Canfield and Hoyer 1988). The majority of SAV studies on the Chassahowitzka River system have focused on the area just downstream of the main spring to the lower river where it joins the salt marsh (Frazer et al. 2001). Compared to the other coastal spring systems in Citrus County, the overall amount of SAV in the Chassahowitzka River is greater, although the dominant types and abundance are dynamic. In general, SAV is most abundant in the upper mile of the river and within the spring fed creeks. Crab Creek stands out as an area with dense SAV coverage that grows to the water surface. Although the spring vents that supply Crab Creek are brackish (~ 2 ppt salinity), dense beds of eelgrass (*Vallisneria americana*), southern naiad (*Najas guadalupensis*), sago pondweed (*Stuckenia pectinata*), and Eurasian water milfoil (*Myriophyllum spicatum*) predominate this spring run. A thick cover of rust-colored epiphytes can be observed and at times, filamentous algae (*Chaetomorpha* and *Enteromorpha*), can become abundant along lower velocity shoreline stretches. Contrast this to Chassahowitzka #1 Spring, which is largely absent of SAV and primarily a limestone and sand spring run.

*Dense beds of sago pondweed (Stuckenia pectinata) with filamentous green macroalgae from the upper Chassahowitzka River*

In the fall of 2015, the portion of the Chassahowitzka River upstream of the salt marsh was sampled for SAV. Samples were collected from multiple transects, each with 5 stations and correspond to historically sampled transects in 1998 (Figure 10, SWFWMD 2016a). In 2015, ten different vascular plant species were documented and six macroalgal species were collected. The most common species had the following frequency of occurrence: southern naiad (*Najas guadalupensis*) at 56%, *Gracilaria* sp. (an estuarine macroalgae, 30%), Eurasian water milfoil (*Myriophyllum spicatum*) at 25%, eelgrass (*Vallisneria americana*) at 22%, and filamentous algae (e.g., *Enteromorpha* sp. or *Chaetomorpha sp*., at 11%).

In general, vascular SAV biomass is greater than macroalgae biomass and declines faster with distance downstream. In the middle to lower half of the Chassahowitzka River, where the river broadens and becomes shallower, filamentous algae can be the dominant aquatic plant form. Other SAV species which have been observed in the Chassahowitzka River include strap-leaf sagittaria (*Sagittaria kurziana*), sago pondweed (*Stuckenia pectinata*), Illinois pondweed (*Potamogeton illinoensis*), horned pondweed (*Zannichellia palustris*), fanwort (*Cabomba caroliniana*), coontail (*Ceratophyllum demersum*), and widgeon grass (*Ruppia maritima*). Floating plants are less commonly observed in the upper Chassahowitzka River, but include water lily (*Nymphaea* sp.), water hyacinth (*Eichhornia crassipes*), and water lettuce (*Pistia stratiotes*), Mosquito fern (*Azolla caroliniana*), and small duckweed (*Lemna valdiviana*). Non-native plants observed include hydrilla (*Hydrilla verticillata*), Eurasian water milfoil, Brazilian waterweed (*Egeria densa*), and common reed (*Phragmites australis*).

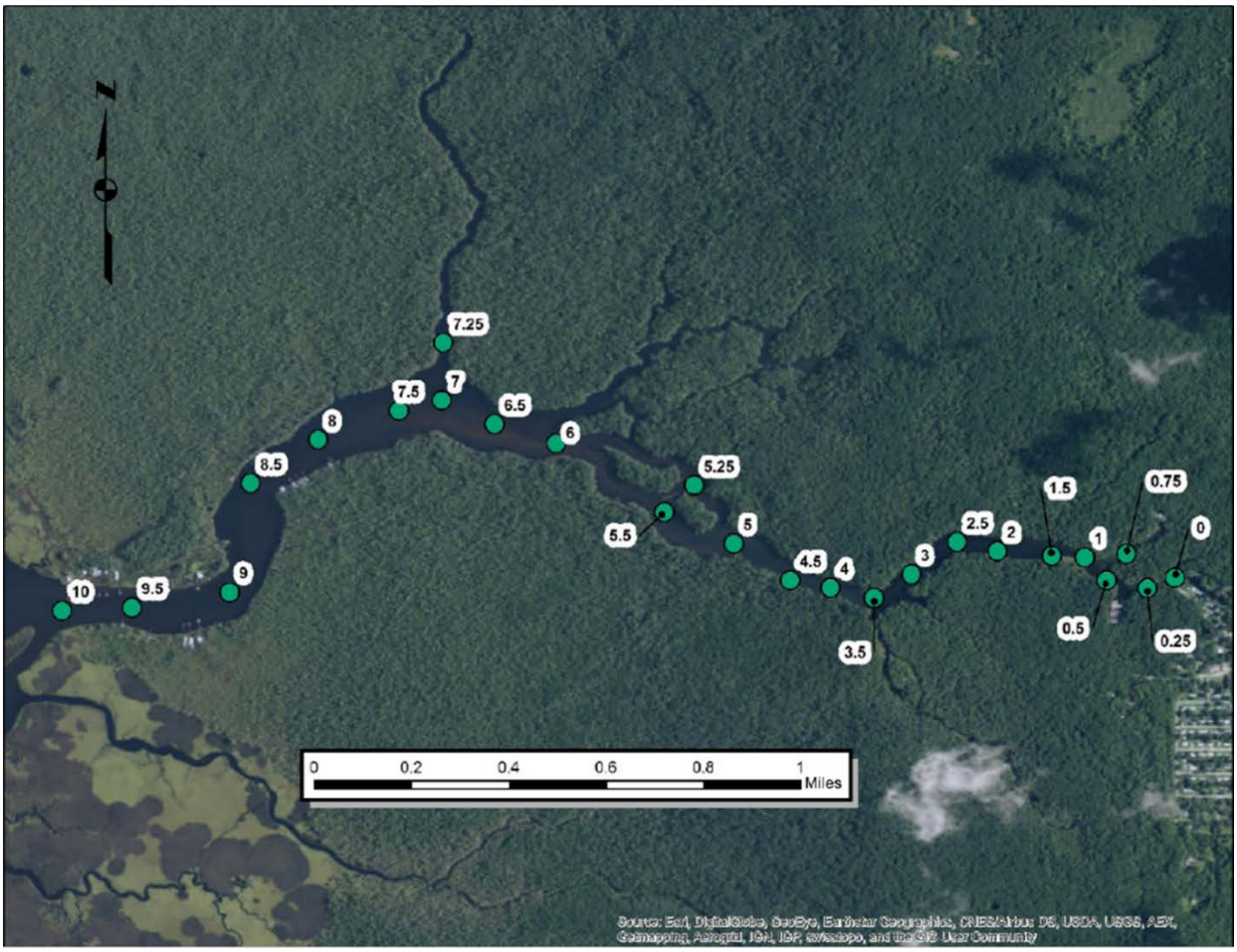



*Figure 10: SAV Sampling Transects along the Chassahowitzka River System*
(from SWFWMD 2016a)

SAV data have been collected from the Chassahowitzka River once yearly near the end of the growing season for most of the years between 1998 and 2011. For the 1998-2000 and 2003-2005 data, the Frazer et al. studies (2001 and 2006) characterized the Chassahowitzka River physical, water quality, and SAV conditions for the periods of the studies and analyzed the changes that were seen, including the reduction of SAV for the later period of sampling. Data from the Chassahowitzka River were also collected from 2006-2011 but have not previously been analyzed. After a 3-year hiatus, data collection in the Chassahowitzka River resumed in 2015 and a statistical comparison was made current versus available historic data (SWFWMD 2016a).

For all sampling events, the vascular (or angiosperm plants) biomass portion was at least 50% of the total SAV biomass. For four sampling events, the angiosperm biomass was more than 90% of the total SAV biomass. The macroalgae biomass was as low as 10% and never exceeded 50% of the total SAV biomass. Because of this, increases and decreases in angiosperm biomass drive the change in total SAV biomass to a great extent (SWFWMD 2016a). Key findings from the period-of-record comparison

of SAV are that highest total SAV biomass was observed in 1998 and 1999, and the average 2015 total SAV biomass was slightly less than 50% of the 1998-2011 mean value. The trend in declining SAV biomass was observed at 17 of 20 transects, and decreases ranged from 21% to 99%. SAV coverage exhibited variation river-wide, the 2015 mean total SAV percent cover was lower than the mean for the historical data by about 39%. River-wide, the average 2015 vascular (angiosperm) biomass was about 35% of the 1998-2011 mean angiosperm biomass, whereas the average 2015 macroalgae biomass was about 96% lower than the 1998-2011 mean macroalgae biomass (SWFWMD 2016a).

Sediment characteristics of the Chassahowitzka River were measured in the fall of 2015 along 20 transects along the main river between the headsprings and the salt marsh (SWFWMD 2016b). The sediments of the river are generally composed of fine sands and organic matter overlying the karst limestone. Measured sediment thickness ranged from 0 to 8 feet, with an average of nearly 2 feet (SWFWMD 2016b). Exposed karst outcroppings, from headsprings to barrier islands, are a common and defining feature of this system.

While overall sediment thickness generally increases with distance downstream, shoreline areas of higher sediment accumulation are present when compared to the mid-channel location where the majority of flow is conveyed (Figure 11). The sediment characteristics include sand, silts, and a combination of these types. On average, sediments contained approximately 8% fines (passing through a 200 series mesh) and less than 3% organic content (SWFWMD 2016b). Silt content generally increases downstream of the tributary confluences, transitioning from primarily fine sand to silty sand, and this transition correlates with an overall increase in percent fines in the downstream direction.

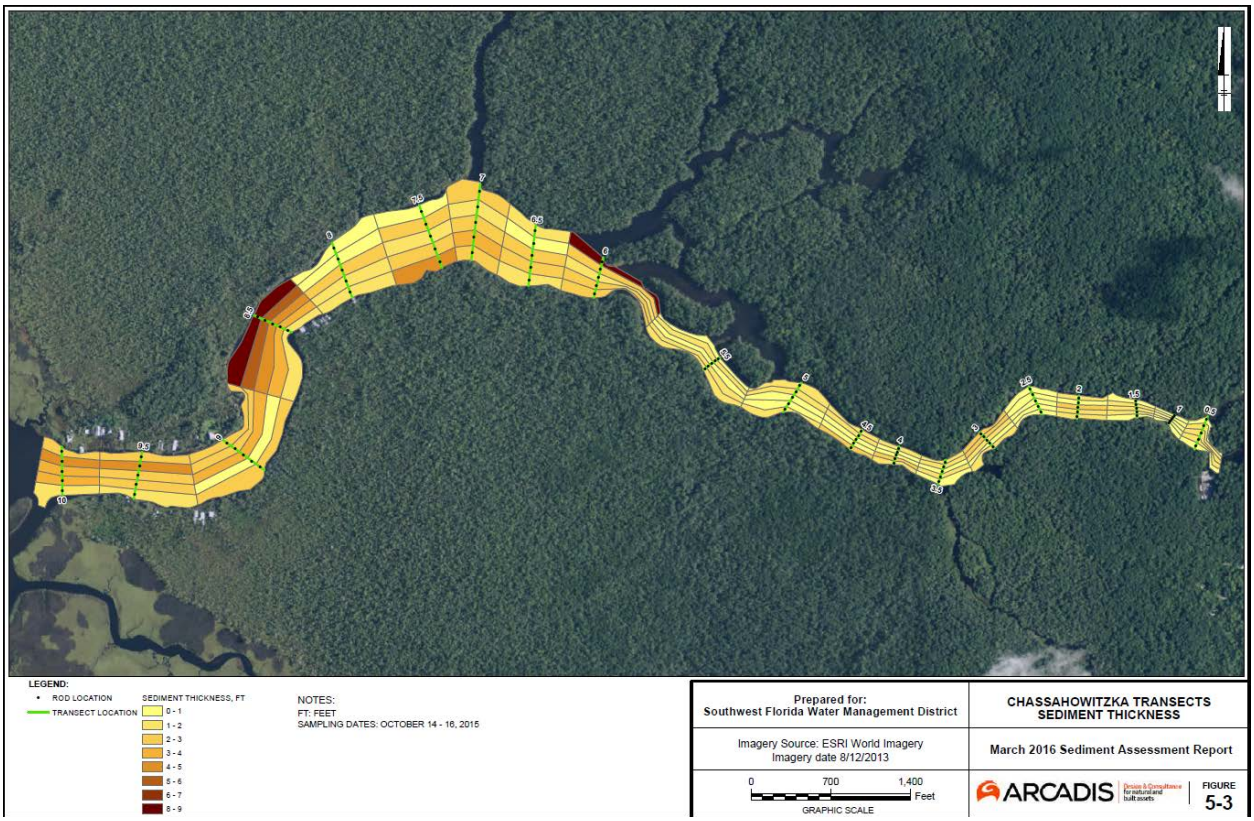



*Figure 11: Sediment Thickness at Sampled Locations Along the Chassahowitzka River* (SWFWMD 2016b)

In the fall of 2015, SWFWMD characterized the spatial variability of the benthic macroinvertebrate community abundance and distribution within the Chassahowitzka River (SWFWMD 2016c). A total of 44 samples were collected from multiple zones (spring vent areas, associated tributaries, and riverine areas) from headsprings to the salt marsh, and multiple habitats including SAV, benthic macroalgae mats, snags/woody debris, rock/limestone outcropping and sediments (Figure 12). Overall findings showed that the marine waters entering the Chassahowitzka River are driving factors controlling the distribution of the macroinvertebrate communities.

Different habitat types were observed to favor different macroinvertebrate communities and that the diversity of habitat types was found to be an important component supporting species richness, and influencing the composition and abundance of invertebrate communities within these systems (SWFWMD 2016c). A longitudinal gradient in species richness was noted, with lower species richness in the headspring areas, an increase in the upper-middle portion of the river, and then a sharp decrease further downstream in the lower river reaches. The invertebrates collected in spring vent habitats in the Chassahowitzka River had a greater number of different grazer taxa when compared to the nearby Homosassa and Weeki Wachee River spring habitats. Positive correlations were found between canopy cover, dissolved oxygen, and species richness indices of the grazer community in the springs zones.

Negative correlations between salinity and abundance of grazers in the springs zone were also found to be significant (SWFWMD 2016c).

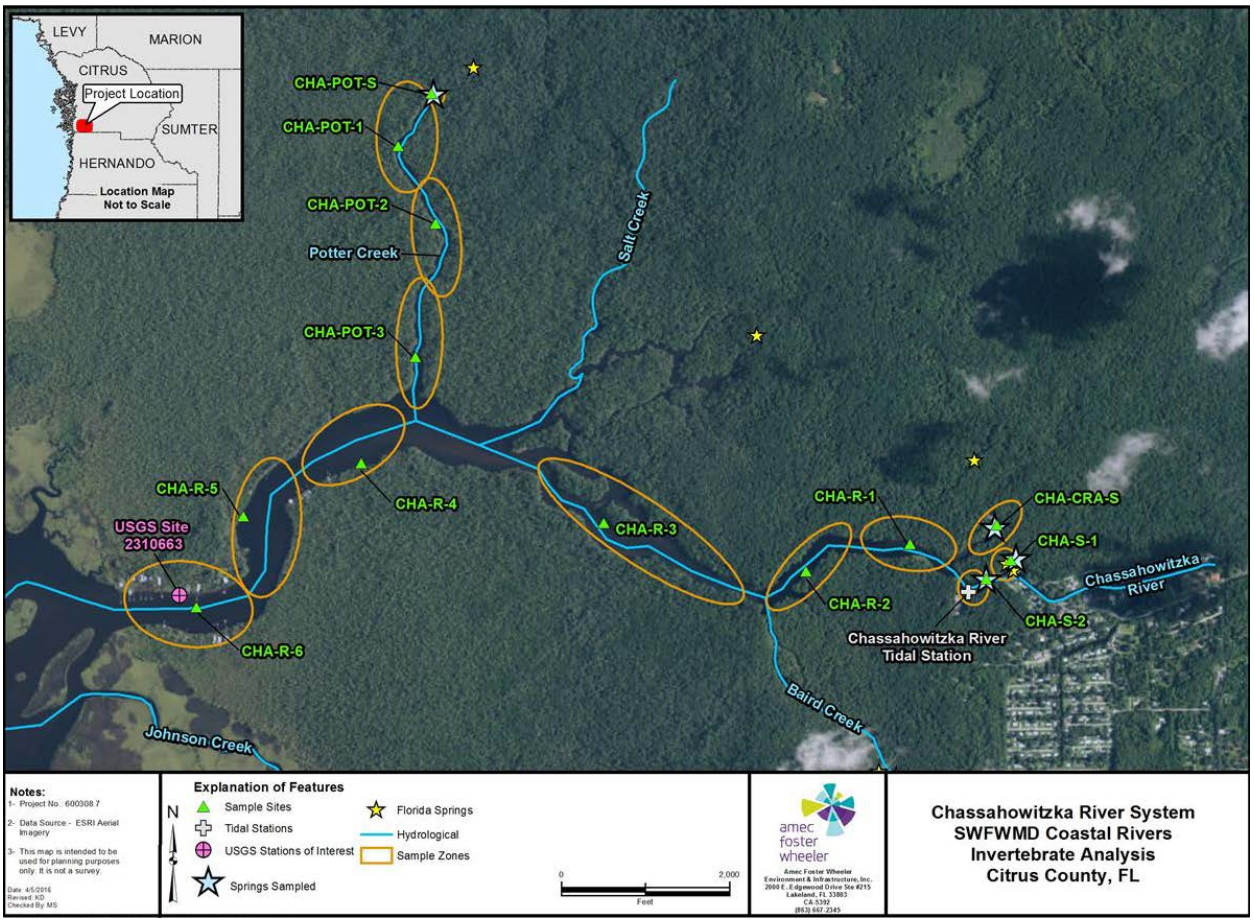



*Figure 12: Macroinvertebrate Sampling Zones for the Chassahowitzka River System (SWFWMD 2016c)*

Overall macroinvertebrate metrics for the 2015 Chassahowitzka River sampling include the number of taxa ranging from 1 to 29, with an average of 17 taxa; abundance from 43 to over 34,000 inverts per square meter, with an average of about 5,100; and Shannon's Diversity Index ranged from 0 to 2.52, with an average of 1.73 (SWFWMD 2016c). In the Chassahowitzka River, crustaceans were the dominant taxonomic group in the macroalgae, rock, sediment and snag habitats, while midges were the most abundant and dominant taxa in the SAV habitats. Ephemeroptera were rare across all habitats; however, when found, they were most commonly collected from macroalgae samples. Trichoptera were also rare across all habitats; yet they were most common in SAV samples. When percent composition of organisms within each functional feeding group was examined by habitat, collector-gatherer/deposit feeders were found to be the dominant group, followed by browser-grazers, in all habitats. Filter-feeders were most common in snag habitats (SWFWMD 2016c).

The tanaid *Leptocheliidae* spp.; the amphipods *Gammarus* spp., *Grandidierella bonnieroides*, and *Apocorophium louisianum*; and the polychaete worm *Laeonereis culveri* were the most dominant taxa found in samples collected from the Chassahowitzka River system. These five taxa made up 56% of the organisms found in these samples (SWFWMD 2016c). For the fall 2015 sampling, the most common collected worms (Annelida) were *Laeonereis culveri*, Tubificinae spp., and *Pristina leidyi*; and the most common Crustacea were *Grandidierella bonnieroides*, Leptocheliidae spp., *Gammarus* spp., *Apocorophium louisianum*, *Uromunna reynoldsi*, and *Sinelobus stanfordi*. The most common insects were midges (Diptera) *Tanytarsus* spp., *Dicrotendipes* spp., *Cricotopus* spp., and the *Polypedilum illinoense* group; while the dominant snail (Gastropoda) collecte was *Hydrobiidae* spp.

Aquatic invertebrates in the Chassahowitzka River system have been previously characterized as part of general surveys and ecological evaluations (Mote Marine Laboratory 1986). Janicki Environmental, Inc.'s (2006) analysis of the benthic community structure revealed the dominant taxa to be the amphipod *Gammarus mucronatus*, and the polychaete worm *Laeonereis culveri*. *Laeonereis culveri* and *Gammarus* spp. were among the top fifteen dominant taxa in Chassahowitzka during the recent 2015 study; however, the tanaid *Leptocheliidae spp.* was the most dominant taxa found during this study. Mote Marine Laboratory (2006) collected and processed invertebrate samples from Chassahowitzka River over a gradient from the head spring to the mouth using a coring device and dipnet sweeps. Results illustrated a general trend in increased species diversity with distance downstream. The recent 2015 study found a similar trend with a positive correlation between species richness and distance from headspring; however, there was not a longitudinal trend in Shannon's diversity index.

Janicki Environmental, Inc. (2008) performed a study of the macroinvertebrate community within Chassahowitzka River and its tributaries. Samples were collected with a Van Veen modified sampler within the mainstem of the river, Crab Spring Run, Lettuce Spring, Salt Creek, Potter Creek, Crawford Creek and Ryle Creek. Janicki Environmental, Inc. (2008) reported a mean number of species per samples as < 15 taxa, similar to the current study of 17 taxa per sample. They also observed that the invertebrate community of the downstream estuarine creeks (Crawford and Ryles Creeks) differed from the other creek systems and the river. General trends differentiating the creeks included higher abundances of oligochaetes and the amphipod *G. mucronatus* in the Potter-Salt Creek systems and in the upper river. *Gammarus* spp. was the second dominant taxa found in the current study behind the tanaid Leptocheliidae spp., however, oligocheate worms were not common in the current study. Janicki Environmental, Inc. (2008) also found the highest abundance of *Ampelisca* in the two most downstream creeks (Ryles and Crawford). *Ampelisca* spp. was not found in the 2015 study; however, the current study was limited to the upper oligohaline portion of the river, and did not extend to the gulf (SWFWMD 2016c).

Fish utilizing the Chassahowitzka River have been characterized by FWC using both electrofishing and seine collection methods. A total of 42 species have been documented in this system between 2013 and 2016. Half of the species are fresh water and half are salt water, each with a strong seasonal component. In the summer, fresh water species make up the majority of the species diversity, while in winter salt water species dominate the fish species collected. Commonly collected freshwater fish include spotted sunfish (*Lepomis punctatus*), rainwater killifish (*Lucania parva*), largemouth bass (*Micropterus salmoides*), inland silverside (*Menidia beryllina*), ironcolor shiner (*Notropis chalybaeus*), bluefin killifish (*Lucania goodie*), coastal shiner (*Notropis petersoni*), lake chubsucker (*Erimyzon sucetta*), golden shiner (*Notemigonus crysoleucas*), redear sunfish (*Lepomis microlophus*) and American eel (*Anguilla rostrata*). A variety of other killifish and minnows were collected, while gar (*Lepisosteus* sp.) were rarely collected. Marine fish species collected include tidewater mojarra (*Eucinostomus harengulus*), pinfish (*Lagodon rhomboides*), striped mullet (*Mugil cephalus*), gray snapper (*Lutjanus griseus*), spot (*Leiostomus xanthurus*), common snook (*Centropomus undecimalis*), menhaden (Clupeidae), sheepshead (*Archosargus probatocephalus*), hogchoker (*Trinectes maculatus*), leatherjacket (*Oligoplites saurus),* Atlantic needlefish (Strongylura marina). Other less common marine species included clown goby (*Microgobius gulosus*), naked goby (*Gobiosoma bosci*), red drum (*Sciaenops ocellatus*), ladyfish (*Elops saurus*), Gulf pipefish (*Sygnathus scovelli*), and gafftopsail catfish (*Bagre marinus*).

The bioenergetics and growth patterns of largemouth bass were contrasted between the Homosassa and Chassahowitzka River populations by Tetzlaff et al. (2010). They concluded that largemouth bass in the Homosassa River have higher prey consumption rates in comparison to largemouth bass in the Chassahowitzka River, but largemouth bass in the Homosassa River experience less seasonal variation in prey abundance. Observations of differences in prey consumption and prey abundance patterns for largemouth bass between rivers supported these findings. Largemouth bass prey items for the Chassahowitzka River revealed that 62% of diet was made up of fish across all bass size classes (Tetzlaff 2008). Size class differences in diet reveal for the 200 to <300 mm size class, largemouth bass consumed a greater proportion of crayfish, while the largest size class of largemouth bass in the Chassahowitzka River consumed a greater proportion of amphibians and a lower proportion of fish than largemouth bass in the Homosassa River. Tetzlaff (2008) hypothesized that largemouth bass in the Chassahowitzka River can reduce energetic costs by sitting in vegetation and waiting until prey pass nearby. In patchily distributed vegetation, predators are provided areas from which to ambush prey as well as areas containing high densities of prey.

Other fish research on the Chassahowitzka River tested the relationship between fish predation risk based on submersed aquatic vegetation (Camp et al. 2012). Relative predation risks experienced by rainwater killifish (*Lucania parva*) were assessed among three habitats. The relative predation risks

were highest in bare substrate, intermediate amongst eelgrass (*Vallisneria americana*), and lowest in filamentous macroalgae. These findings suggested that small prey fish predation risk may decline within filamentous macroalgae habitats, and counter widely held beliefs that SAV habitat changes from vascular plants to filamentous algae will result in exclusively negative faunal effects (Camp et al. 2012). Camp et al. (2014) further explored the differences in morphology and characteristics of rooted aquatic plants and filamentous macroalgae, and hypothesized that these habitat types were not interchangeable for small-bodied fishes and macroinvertebrates. Their findings revealed faunal densities were on average greater among filamentous macroalgae dominated habitats when compared to vascular plants, but differences in the small fish and invertebrate community assemblage structure suggest that the two types of vegetative habitat do not function interchangeably. Camp et al. (2014) concluded that replacement of vascular aquatic plants with filamentous macroalgae would alter both small fish and macroinvertebrate communities, as well as other animal life that feed upon it.

Reptiles and amphibians utilizing the Chassahowitzka River system are not well described. Green (*Chelonia mydas*) and other sea turtles feed in the estuary, particularly during warmer months. Within the river, a limited number of basking river cooter (*Pseudemys* sp.) can be observed, American alligators (*Alligator mississipiensis*) are present, but generally observed in the lower marsh.

A diversity of resident and migratory birds utilizes the Chassahowitzka River system. The Chassahowitzka National Wildlife Refuge provides migratory waterfowl habitat and has served as a wintering grounds for whooping cranes (*Grus americana*). In the winter, large flocks of white pelican (*Pelecanus erythrorhynchos*), groups of common loon (*Gavia immer*), and a variety of marine waterfowl like horned grebes (*Podiceps auritus*) or lesser scaup (*Aythya affinisutilize*) are observed in the estuary. Year round bird species include bald eagle (*Haliaeetus leucocephalus*), osprey (*Pandion haliaetus*), double crested cormorant (*Phalacrocorax auritus*), gulls (Laridae), terns (Sternidae), sandpipers (Scolopacidae), and herons (Ardeidae). Within the Chassahowitzka River, a variety of song birds utilize the riparian habitats. More aquatic habitat dependent birds observed on the Chassahowitzka River include anhinga (*Anhinga anhinga*), belted kingfisher (*Megaceryle alcyon*), black-crowned night heron (*Nycticorax nycticorax*) and the more common yellow-crowned night heron (*Nyctanassa violacea*), double-crested cormorant, great blue heron (*Ardea herodias*), great egret (*Ardea alba*), green heron (*Butorides virescens*), limpkin (*Aramus guarauna*), little blue heron (*Egretta caerulea*), pied-billed grebe (*Podilymbus podiceps*), rails (Rallidae), snowy egret (*Egretta thula*), tricolored heron (*Egretta tricolor*), white ibis (*Eudocimus albus*), and wood stork (*Mycteria americana*). Turkey vultures (*Cathartes aura*) and black vultures (*Coragyps atratus*) roosting near the headsprings can be abundant in the winter.

Aquatic birds utilizing the Chassahowitzka River and four nearby coastal rivers were surveyed to determine if these river systems supported densities, biomass and species richness similar to those

found on Florida lakes (Hoyer et al. 2006). In the Chassahowitzka River, 28 species were identified, with abundance and species richness being higher in winter months than in summer months, a consequence of migratory bird populations. Hoyer et al. (2006) reported that river bird densities and biomass were similar to data collected on Florida lakes and are therefore important habitats for aquatic bird populations. These researchers concluded that SAV was positively correlated with bird density, biomass and species richness within the river systems.

Marine mammals which utilize the Chassahowitzka River system include Common bottlenose dolphin (*Tursiops truncates*) which occasionally enters the river to feed and is regularly observed in the estuary and gulf waters. A subspecies of the West Indian manatee (*Trichechus manatus*), the Florida manatee (*T. m. latirostris*), is found throughout coastal Citrus County waters and during the winter, large numbers of manatee may aggregate around springs vents as a thermal refuge. The Chassahowitzka River does not attract as many manatee as the nearby Crystal River/Kings Bay or Homosassa River systems. Anecdotal observations suggest that manatee aggregations in the Chassahowitzka River are comprised of less than two dozen individuals. It has been speculated that the shallow, tidal conditions of the Chassahowitzka River may reduce manatee utilization of the headsprings during winter months.

Northern river otter (*Lontra canadensis*) are occasionally observed in the river, while raccoon (*Procyon lotor*), white-tailed deer (*Odocoileus virginianus*), eastern gray squirrel (*Sciurus carolinensis*), and feral pig (*Sus scrofa*) have been observed along riparian lands.

### Historical Context

Evidence of several Native American campsites and a Weeden Island Culture (A.D. 300- A.D. 1300) burial mound have been documented on lands surrounding the Chassahowitzka River system. Although no archeological evidence has been found, the Seminole Indians were known to have been in the area during the Second Seminole War (1835-1842). The name Chassahowitzka, meaning "pumpkin hanging place" is attributed to the Seminole Indian name for a small climbing variety of pumpkin they found in this region.

In the early 1900's regional timber harvesting occurred, first logging bald cypress trees from swamps and then Southern red cedar after the marketable cypress was removed. Timber operations were served by a mule powered tram system to haul timber from the swamp to a railroad in Homosassa. Remnants of these tram ways can still be found in the coastal conservation lands along Citrus County (FWC 2014).

Between 1910 and 1922, Tidewater Cypress operated a lumber mill at Centralia, a town of 1,500 laborers and their families. The town had a well-stocked commissary, school, restaurant and even a theater, doctor and dentist. The mill, one of the largest in the state, could produce 100,000 board feet of lumber each day during peak periods. By 1938 the railroad ceased operation and Centralia became a ghost town.

In the early 20th century, parts of the Chassahowitzka River were developed to serve as fishing and duck hunting cabins. At the regional scale, the lack of sand beaches or deep natural marine channels, in combination with the absence of major cities nearby has resulted in limited residential development of the lands adjacent to the river and springs prior to the 1970's. The headsprings have long served as a swimming location and these recreational activities are supported by Chassahowitzka River Campground which includes 53 full hookup RV sites, 28 primitive tent sites, a general store, and boat rentals.

The changes in human development conditions surrounding the Chassahowitzka River are illustrated in Figures 13 and 14. In 1944, development was limited to two small boat ramps and associated campgrounds, and by 1974, the majority of upland development had occurred and a small residential community around a canal system had been constructed. There are about a dozen primitively developed properties along the river, all without public utilities or roads.

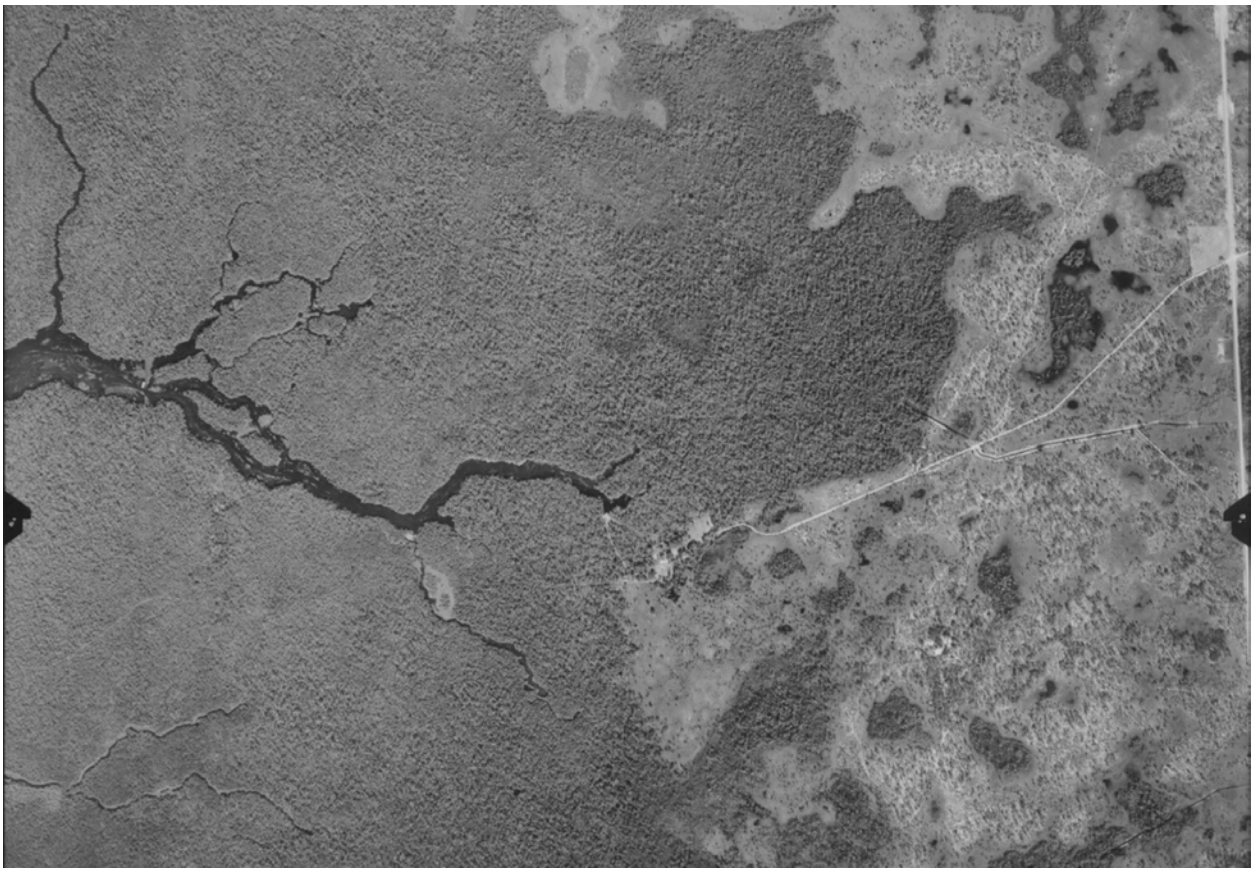


*Figure 13: Historical aerial image of the upper Chassahowitzka River and surrounding lands from November 1944*

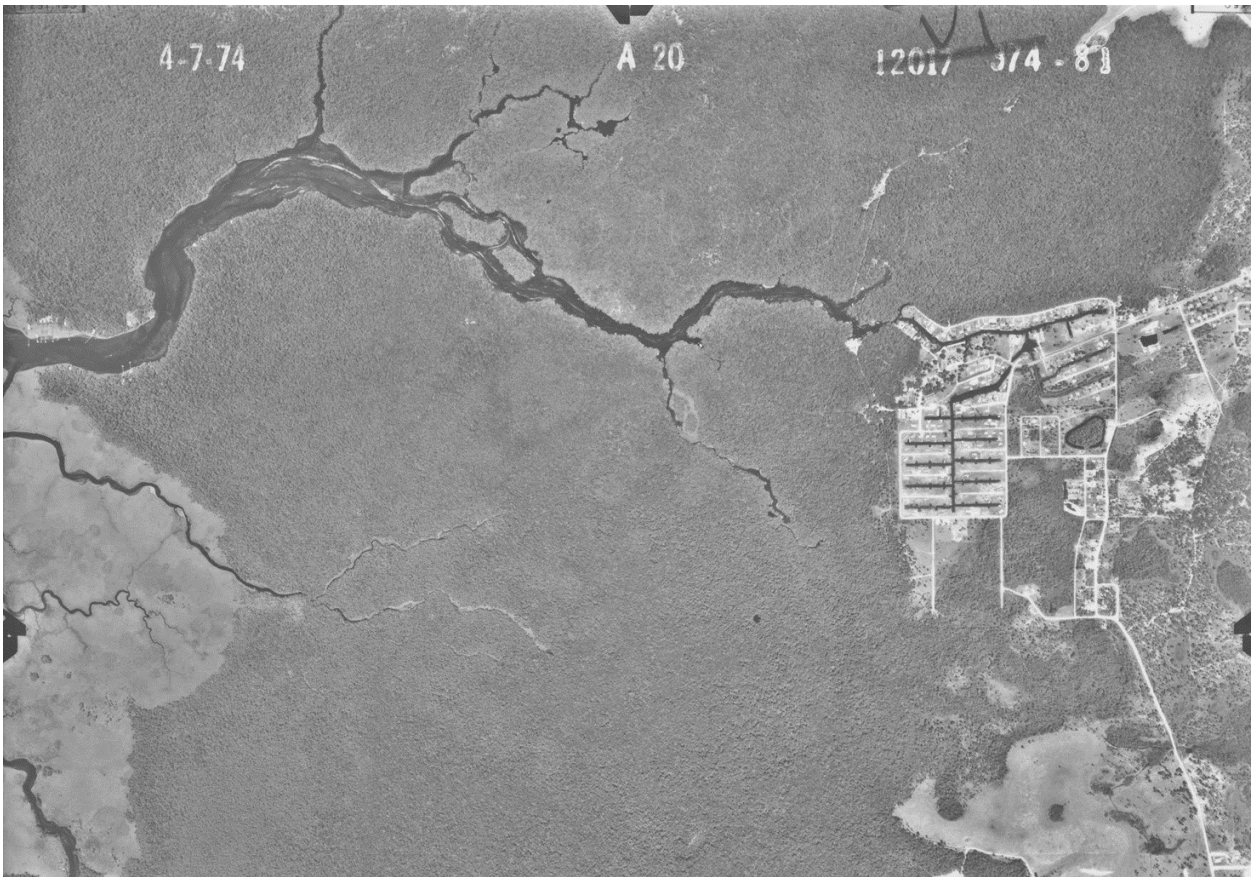



*Figure 14: Historical aerial image of the upper Chassahowitzka River and surrounding lands from April 1974*

Modern development of the Chassahowitzka River centers around a canal system excavated by a private land developer in the 1950's. In total, this canal system spans nearly 2 miles and connects to the river system just east of the Main Spring. These residential canals are relatively shallow, with water depths ranging from approximately 1 to 5 feet, have shorelines that include both naturally vegetated banks and residential properties with seawalls, lawns and planted landscaping.

Several small spring seeps are found within the canals and contribute to the overall discharge of the river system. The canals are periodically treated for nuisance aquatic vegetation and in some locations a mixture of sediments and organic material have accumulated. A campground abuts the Citrus County public boat ramp. Local residents, professional guides, and tourists access the Gulf of Mexico for fishing via the river as does a small commercial blue crab fishery. Increasingly, paddle craft are used to explore the river and feeder creeks as part of ecotourism. The shallow waters and limestone geology of the Chassahowitzka River make for a challenging environment for power boat operation.

*Recreation circa 1970 at the Chassahowitzka main spring pool (courtesy Brad Rimbey).*

## Land Use

Conservation lands within the Chassahowitzka River springshed include the southern portions of the Citrus Tract division of the Withlacoochee State Forest. The Citrus Tract includes one of the largest contiguous sandhill habitats in Florida. West of U.S. Highway 19, a large amount of conservation land encompasses the Chassahowitzka River system. The Chassahowitzka headsprings, several tributaries, and the upper river are contained within the SWFWMD Chassahowitzka River and Coastal Swamps conservation lands. This SWFWMD property is nearly 5,700 acres and part of a large tract of public lands (Figure 15). Adjoining these conservation lands to the south is the Chassahowitzka Wildlife Management Area, with more than 24,400 acres that are managed by the Florida Fish and Wildlife Conservation Commission (FWC). These FWC lands contain over 15,000 acres of hydric hammock and more than 4,000 acres of sandhill habitat. To the west and north, approximately 31,000 acres comprise the Chassahowitzka National Wildlife Refuge (NWR) which is managed by the US Fish and Wildlife Service (USFWS). The Chassahowitzka NWR is composed of saltwater bays, estuaries, and coastal marshes with a fringe of hardwood swamps along the eastern boundary. The northern NWR boundary parallels and includes some of the Homosassa River, while the southern boundary of the NWR extends 12 miles beyond the Chassahowitzka River to Raccoon Point (Figure 16).

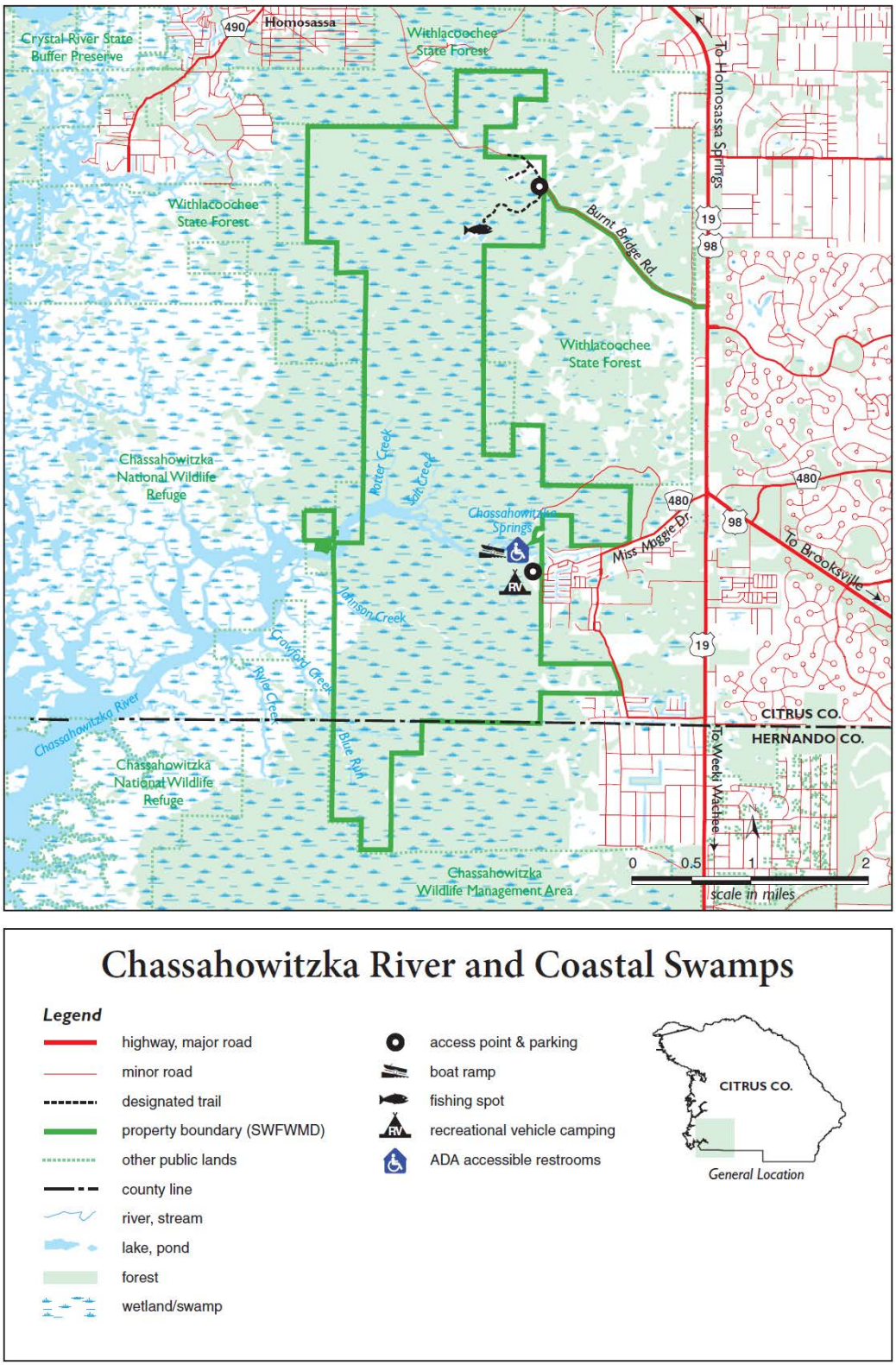



*Figure 15: The Chassahowitzka River and Coastal Swamps conservation land (SWFWMD), with the Withlacoochee State Forest (FDACS), Chassahowitzka National Wildlife Refuge (USFWS), and Chassahowitzka Wildlife Management Area (FWC) noted adjacent*

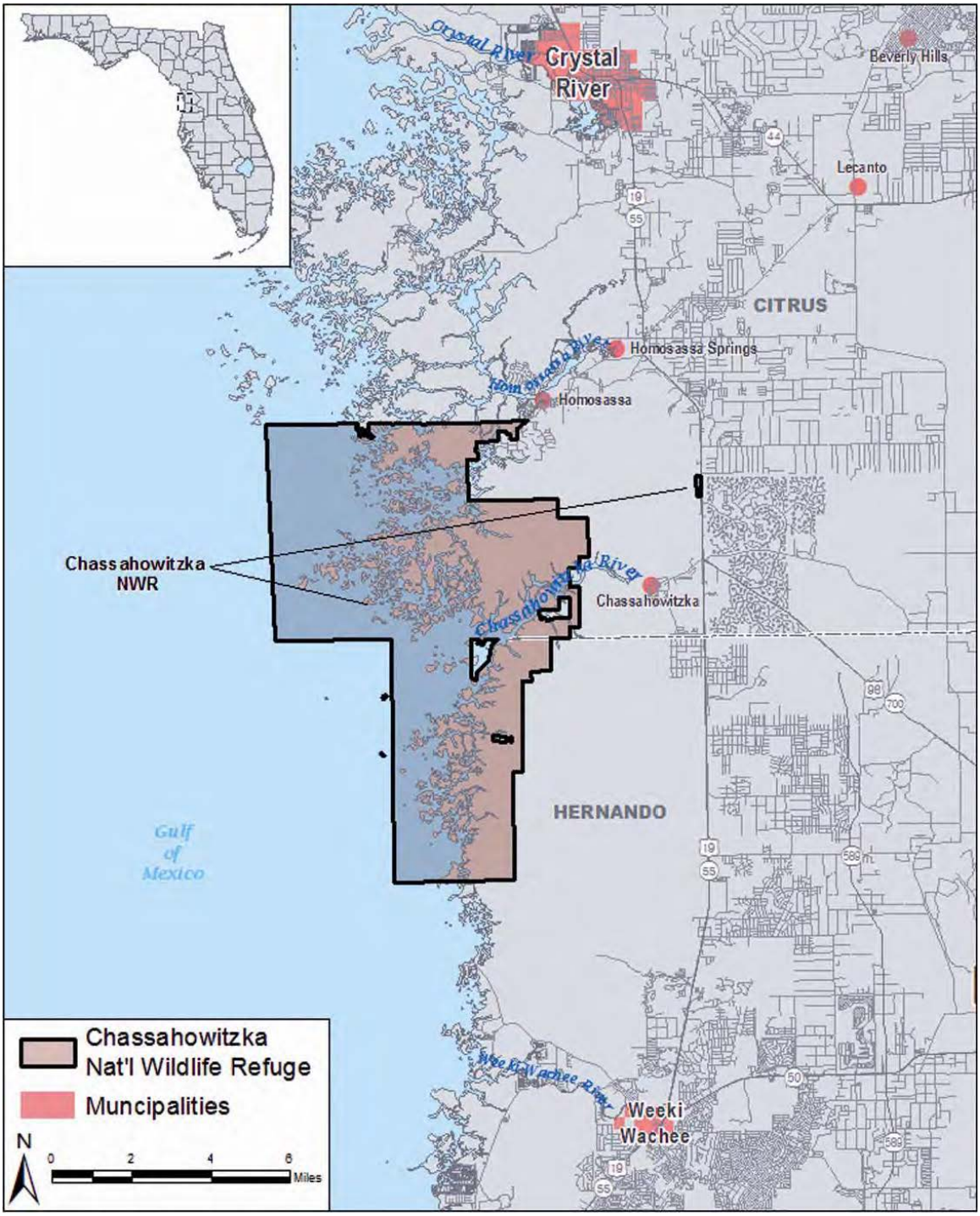



*Figure 16: Chassahowitzka National Wildlife Refuge Boundary*

Since the 1970's there has been a rapid increase in human population within Citrus and Hernando Counties (Figure 17). In 2013, the total residential population of Citrus County was about 139,000 and the population of Hernando County was about 173,000 (U.S. Census Bureau). There are approximately 77,300 housing units (HU) in Citrus County and 84,500 HU in Hernando County. In terms of density,

Citrus County contains about 242 people per square mile of land and 106 HU per square mile, while Hernando County contains about 366 people per square mile of land and 179 HU per square mile (Dodson et al. 2014).

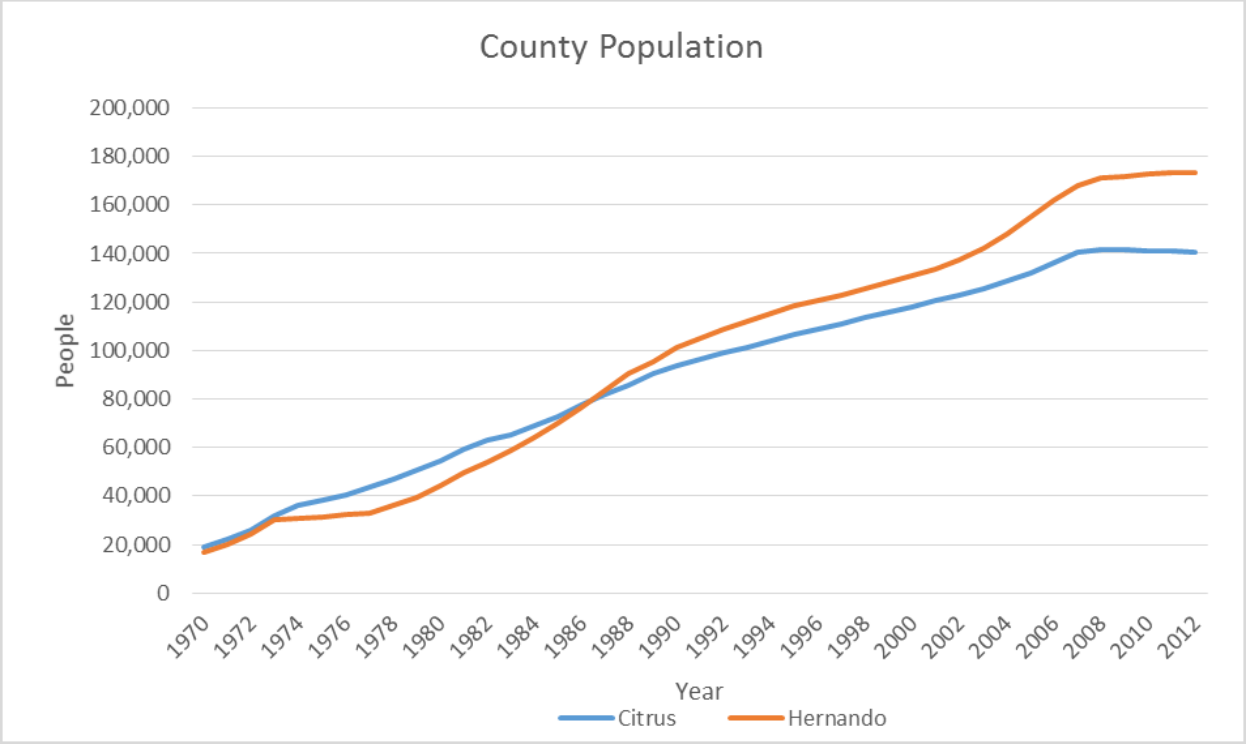



*Figure 17: Population growth for Citrus and Hernando Counties from 1970–2012 (University of Florida Bureau of Economic and Business Research 2014 data, from Dodson et al. 2014)*

The Chassahowitzka springshed occupies portions of both Citrus and Hernando Counties and covers approximately 122,000 acres (190 sq. miles). In a review of aerial photography from 1989-91, Jones et. al (1997) characterized this area as rural with pastures, woodlands, lakes, and coastal swamps that were gradually being reduced as residential development expanded. Modern land use remains least developed along the coast, where coastal swamps and wetlands are managed as conservation lands by state and federal agencies. Commercial development is concentrated along U.S. Highway 19 and the corridor it forms between the coastal swamps and upland forest of the Brooksville ridge. Undeveloped forest is found in the Withlacoochee State Forest while the eastern springshed is dominated by lakes and wetlands on the Tsala Apopka. The western and central portion of the lands contain a number of growing communities with dense residential development and several golf courses. Corresponding to this development, there has been a large increase in the number of septic systems, as well as smaller wastewater treatment plants ("package plants") and regional wastewater treatment plants (WWTP) to serve communities with sewer connections.

In 2013, about 39% of the Chassahowitzka springshed was residentially developed (Dodson et al. 2014). Areas of dense residential development in Citrus County are in close proximity to the head springs, principally just east of U.S. Highway 19; and in Hernando County within the portion of the city of Brooksville that lies within the springshed (Dodson et al. 2014). The closest residential area to the Chassahowitzka River system is the Sugarmill Woods development in Citrus County. This unincorporated residential area covers nearly 10 square miles and was platted in 1972. By 2013, Sugarmill Woods was home to over 8,000 people making it a significant population center in the springshed (Hernando County 2012).

The largest incorporated community in the Chassahowitzka springshed is the city of Brooksville in Hernando County. The 2010 residential population of Brooksville was 7,719 persons, comprised of 3,504 total households, that are located in the approximately 4.3 square miles of the Brooksville city limits that are located in the Chassahowitzka springshed (Dodson et al. 2014). In northwestern Hernando County between US Highway 19 and the Suncoast Parkway (SR 589), and north of Centralia Road, an area of over 12,000 acres (19 sq. miles) of partially developed residential neighborhoods exists. Locally known as Annutteliga Hammock, future residential development in this area could contribute additional nutrient loads to the Chassahowitzka River.

The classification of different land use categories within the springshed has been made by FDEP as part of the TMDL/BMAP program and were based on the 2011 SWFWMD land use Geographic Information System (GIS) coverage (Dodson et al. 2014) (Figure 18). In 2011, the primary land use categories were urban and residential (37%), forested (30%), wetland areas (16%), and agricultural lands (14%). Land use changes have followed human growth patterns and population increases in Citrus and Hernando Counties with future increases in urban and residential land use expected. It has been observed that nitrate concentrations in the springs of the Chassahowitzka River system have increased during the period of time when land use transitioned from natural lands to agriculture, and then to urban development (Dodson et al. 2014). Anthropogenic sources of nitrate within the springshed are primarily supplied by urban/sports turf grass fertilizers, farm/agriculture fertilizers, and human and livestock waste.

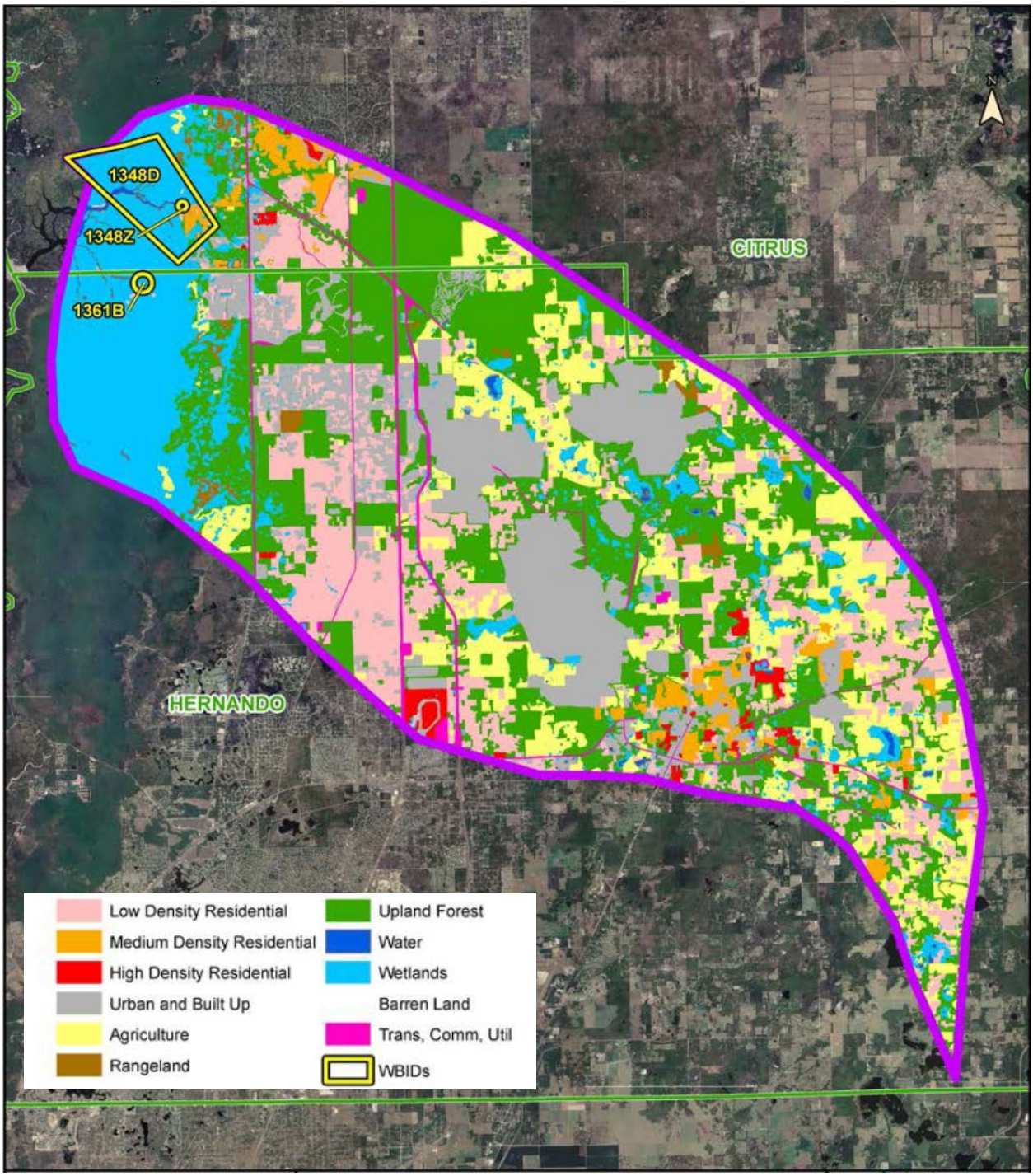



*Figure 18: Land use categories within the Chassahowitzka springshed (2011, Dodson et al. 2014)*

# Issues and Drivers

Over the past hundred years, the Chassahowitzka River has experienced significant ecological shifts, caused by both natural variability and human activity. The primary issues affecting the river include nitrate enrichment, changing salinity, a potential decrease in historical flows, and altered aquatic vegetation. 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 Chassahowitzka 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 et al. 2014). The SWFWMD has been routinely collecting surface water quality data from multiple locations in the Chassahowitzka system (Figure 190). Extremely clear water is a defining characteristic of Florida springs and while water clarity remains relatively high in the upper river, it declines in the lower river. 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 river.

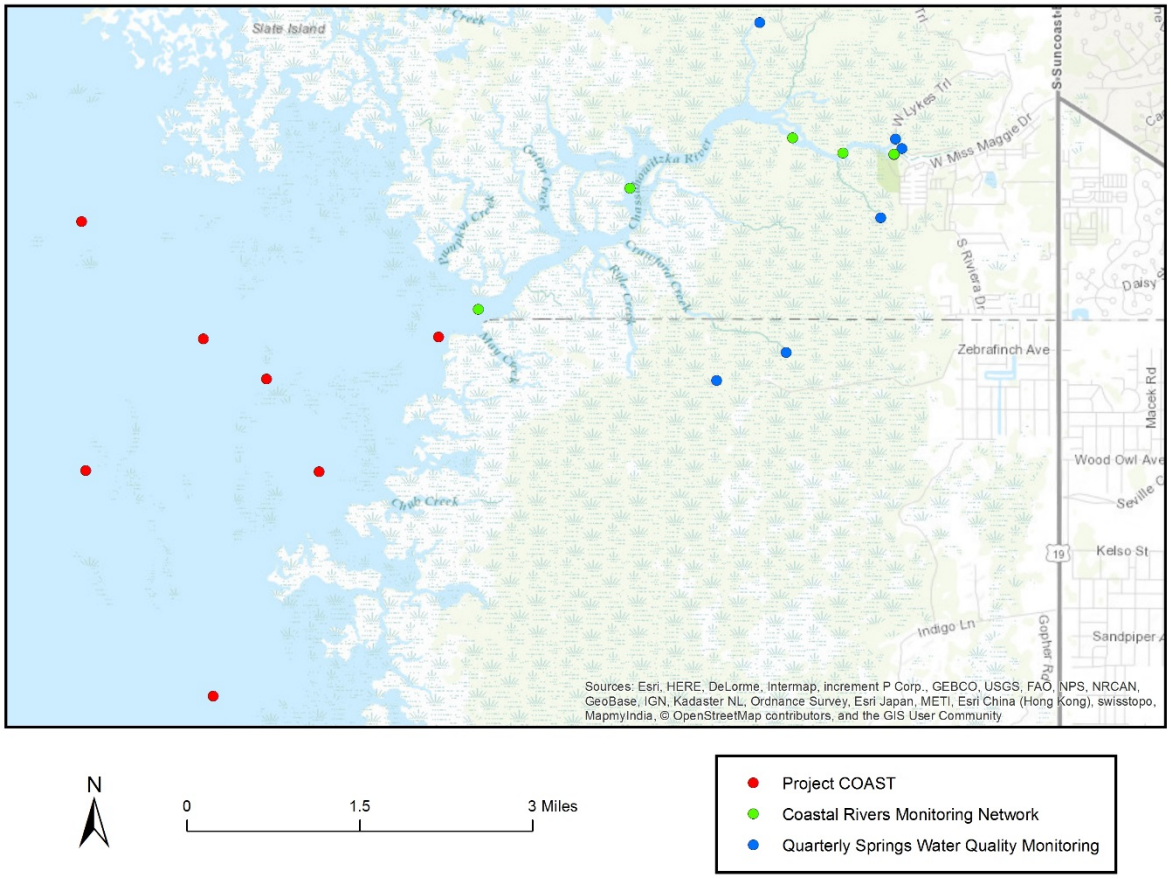



*Figure 19: Chassahowitzka River Water Quality Data Stations*

Nitrogen is a nutrient that naturally occurs in a variety of forms, including organic nitrogen, ammonium, and nitrate that are necessary to sustain aquatic ecosystems. However current concentrations are enriched compared to historical concentrations in many springs in Florida, including springs in the Chassahowitzka River. 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 springs in the Chassahowitzka River (Figure 20) since at least 1972 (FGS 2004). Nitrate concentration in Chassahowitzka Main Spring averaged 0.54 mg/L in 2015, whereas the earliest measurement was 0.26 mg/L in 1972 (FGS 2004).

Historical background nitrate concentration for springs is considered to be 0.1 mg/L or less (Rosenau et al. 1977).

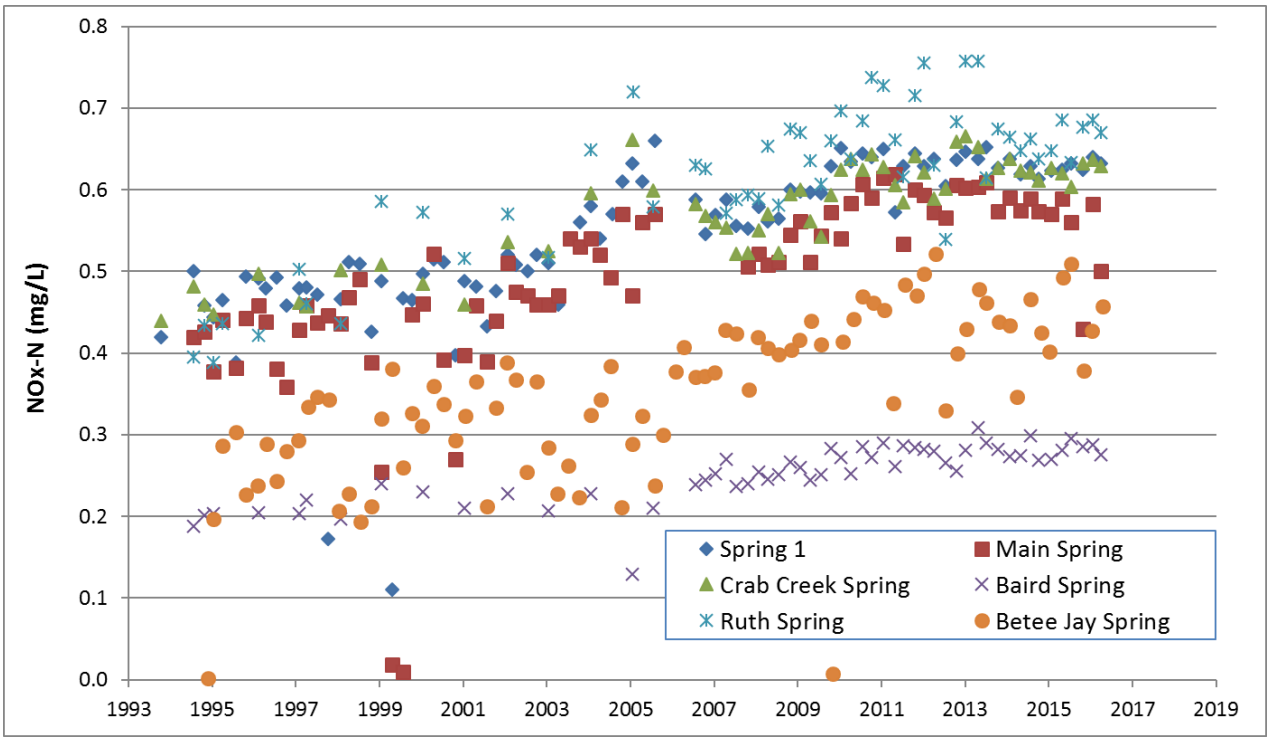



*Figure 20: Nitrate Changes in Several Chassahowitzka River Springs*

In 2012, the FDEP adopted Chassahowitzka Springs Group, Crab Creek Spring, Chassahowitzka River-Baird Creek, Baird Springs, Ruth Spring, and Beteejay Springs (WBIDs 1348Z, 1348D, and 1361B) 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 ecological imbalance for these springs within the Chassahowitzka River.

Due to elevated nutrient concentrations (especially 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 et al. 2014). As part of the TMDL, the FDEP attributed the excessive algal growth strictly to nitrogen enrichment. The FDEP used results from laboratory experiments that tested the response of algal growth to nitrate enrichment (Stevenson et al. 2007) to establish the TMDL nutrient targets. For the impaired springs within the Chassahowitzka River the annual average nitrate concentration TMDL target is 0.23 mg/L. For the Chassahowitzka River and Baird Creek the annual average total nitrogen concentration TMDL target is 0.25 mg/L.

The Chassahowitzka River springs TMDLs will require reductions in nitrate concentrations ranging from 21% to 67%. FDEP has developed a draft Nitrogen Source Inventory Loading Tool (NSILT) to identify major sources of nitrogen and estimate their loads to groundwater within the Chassahowitzka River Basin Management Action Plan (BMAP) area. 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 agriculture (fertilizer and livestock waste) as the primary source of nitrogen loading to groundwater within the Chassahowitzka River BMAP area (35% total). Urban fertilizer was also a substantial source (19%). The other sources identified were septic tanks, atmospheric deposition, sports turf fertilizer, and wastewater treatment facilities (Figure 21). 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 final NSILT information will be included in the BMAP report that FDEP is currently developing.

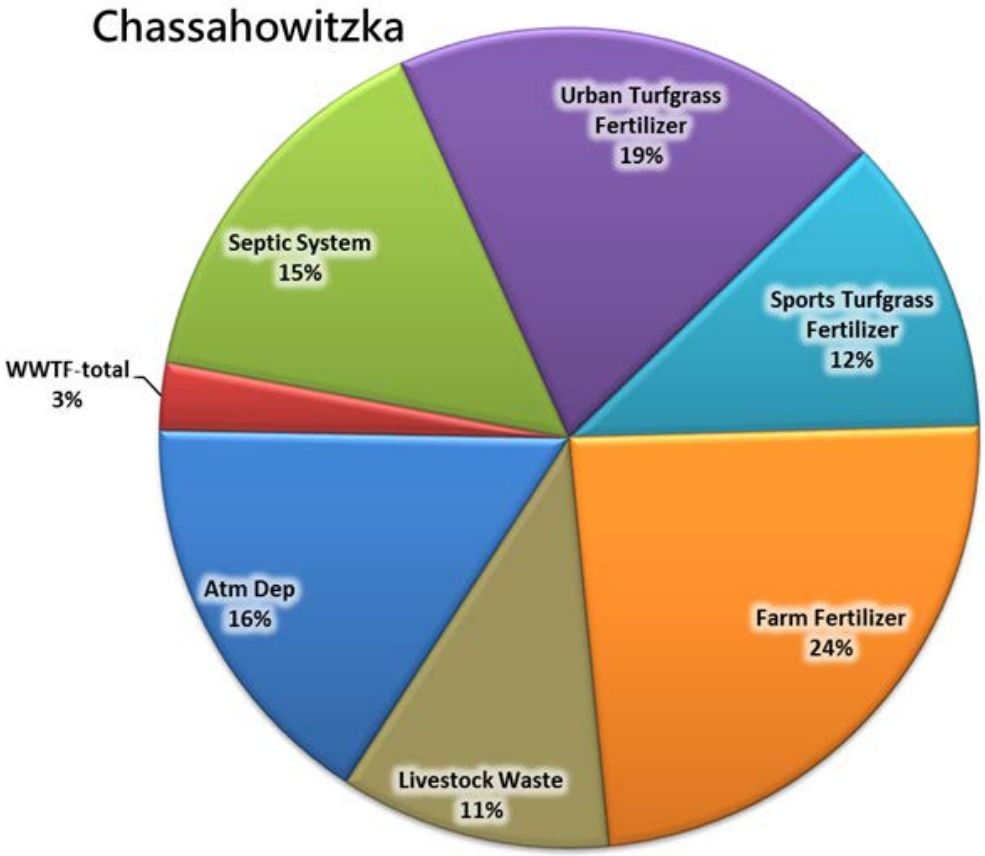



*Figure 21: Relative Nitrogen Inputs to Groundwater in the Chassahowitzka River BMAP Area by Source Category (draft)*

Phosphorus, specifically in the biologically available form orthophosphate, can also be a nutrient of concern within spring systems although phosphorus enrichment is minimal in comparison to nitrogen. Phosphorus can reach these water bodies 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 in springs within the Chassahowitzka River do not indicate an increasing trend over time (Dodson et al. 2014).

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 Chassahowitzka River is highest near the main spring vent and declines substantially with distance downstream, which typically occurs in spring systems due to accumulation of chlorophyll, tannins, and suspended sediments in the water. From 2006 to 2015 the average water clarity in the river ranged

from 13 to 17 feet, with over 30 feet of visibility near the headspring and less than 6 feet of visibility in the lower river (Figure 22). Chlorophyll from phytoplankton and other algae is the main contributor to reduced water clarity, particularly in the lower river where the chlorophyll maximum occurs at the interface of freshwater and saltwater. Runoff from riparian wetlands periodically causes tannic water to enter the river which also reduces water clarity.

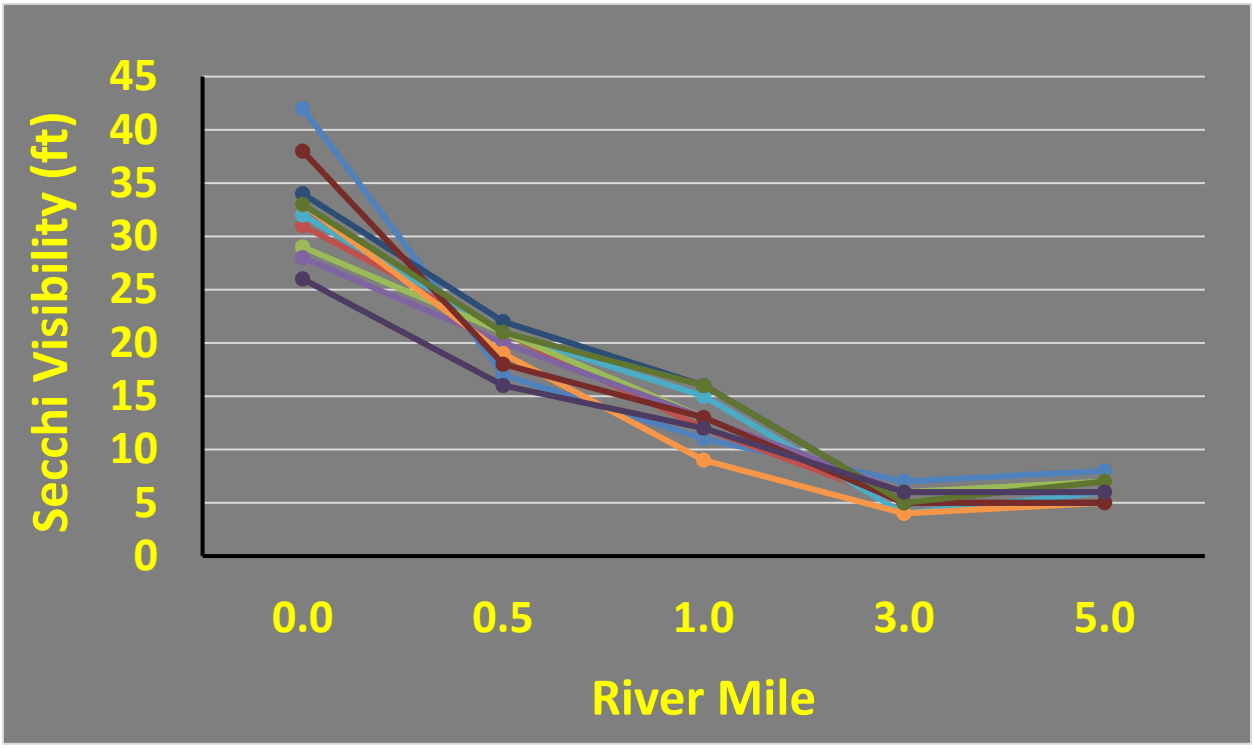



*Figure 22: Water Clarity in the Chassahowitzka River*
*Water clarity, as measured by a horizontal secchi disk, over time at the five fixed river stations. Clarity is affected by many factors including the amount of chlorophyll, tannins, and suspended sediment in the water column. The different colored lines represent annual averages for each station from 2006 to 2015.*

Changing salinity is an emerging issue in the Chassahowitzka River, which 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 23). Salinity fluctuates throughout the Chassahowitzka River system due to tides and variation in river flow; however monthly data collected since 1997 do not indicate that salinity is increasing (Figure 24). This is in contrast to salinity increases in the lower Homosassa and Weeki Wachee Rivers, which suggests that the Chassahowitzka River is more buffered from increasing salinity. Regardless, significant changes are expected in the coming decades due to continued sea-level rise.

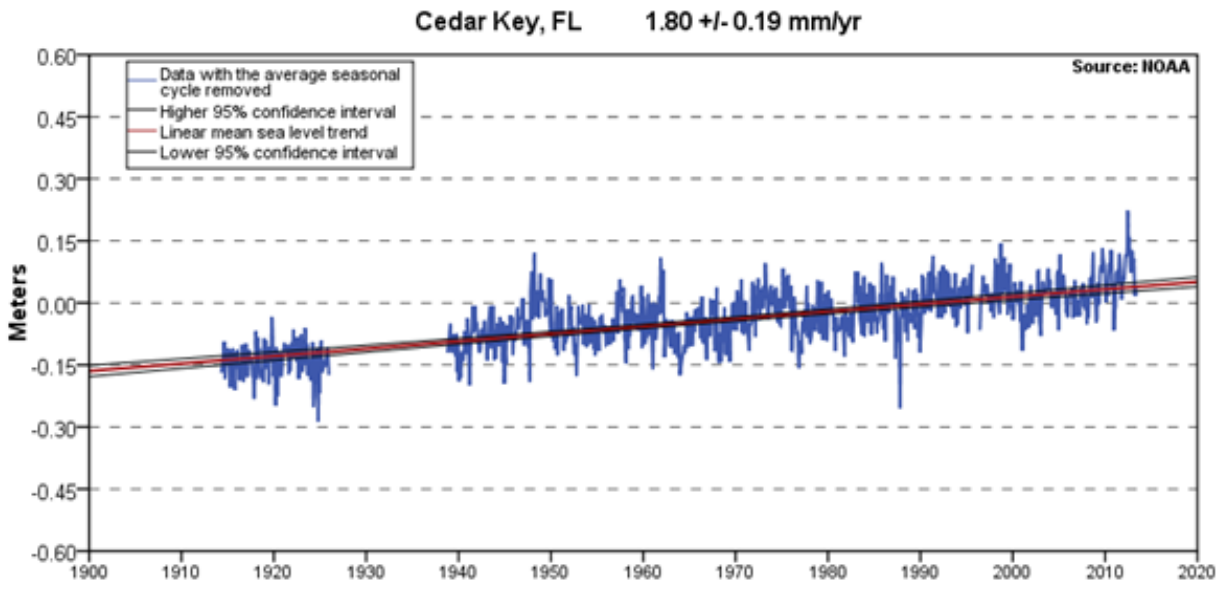



*Figure 23: Sea Level Data from Cedar Key, Florida*
*Cedar Key is located north of the Chassahowitzka River on the Springs Coast. Similar trends in sea-level rise have been recorded at most other NOAA stations throughout the United States though sea-levels and rates of increase vary from station to station (NOAA 2009).*

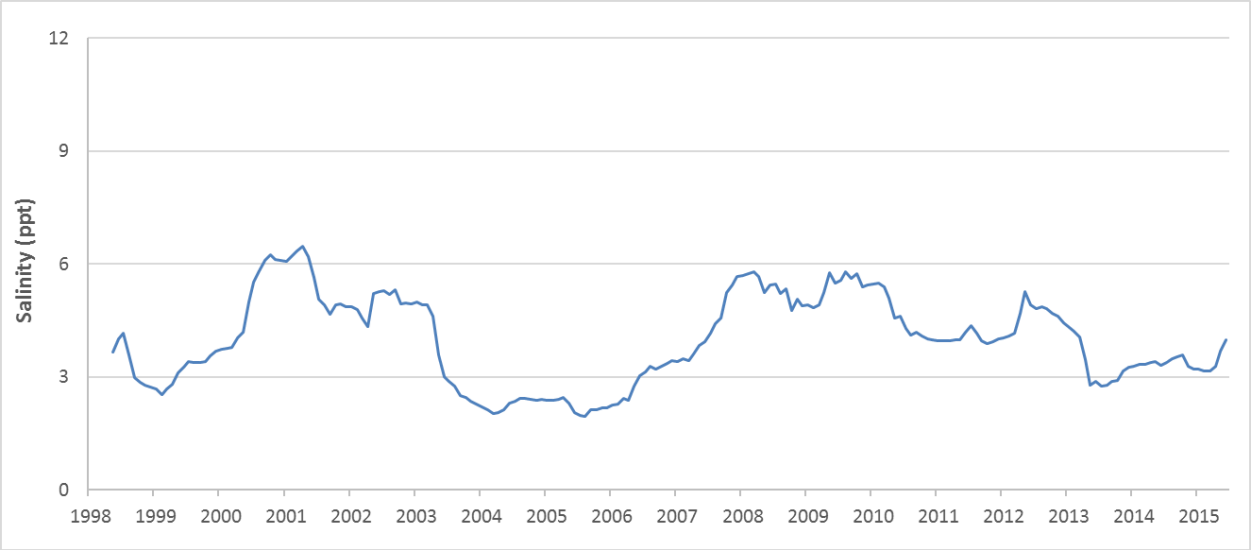



*Figure 24: Salinity Changes in the Chassahowitzka River*
*(12-month moving average at Chass COAST 2)*

## Water Quantity

The Chassahowitzka River is a first-magnitude spring system with an estimated average flow of 152 cubic feet per second (cfs). Long-term 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 at Chassahowitzka Main Spring has been routinely measured by the USGS since 1997 (Figure 25). The other springs within the group are tidally-influenced and not continuously measured by the USGS. The lowest average annual flow occurred in 1997 at 44 cfs and the highest annual average flow peaked as a result of a strong El Niño in 1998 at 72 cfs. This pattern of increasing and decreasing flow generally corresponds to periods of above average and below average rainfall

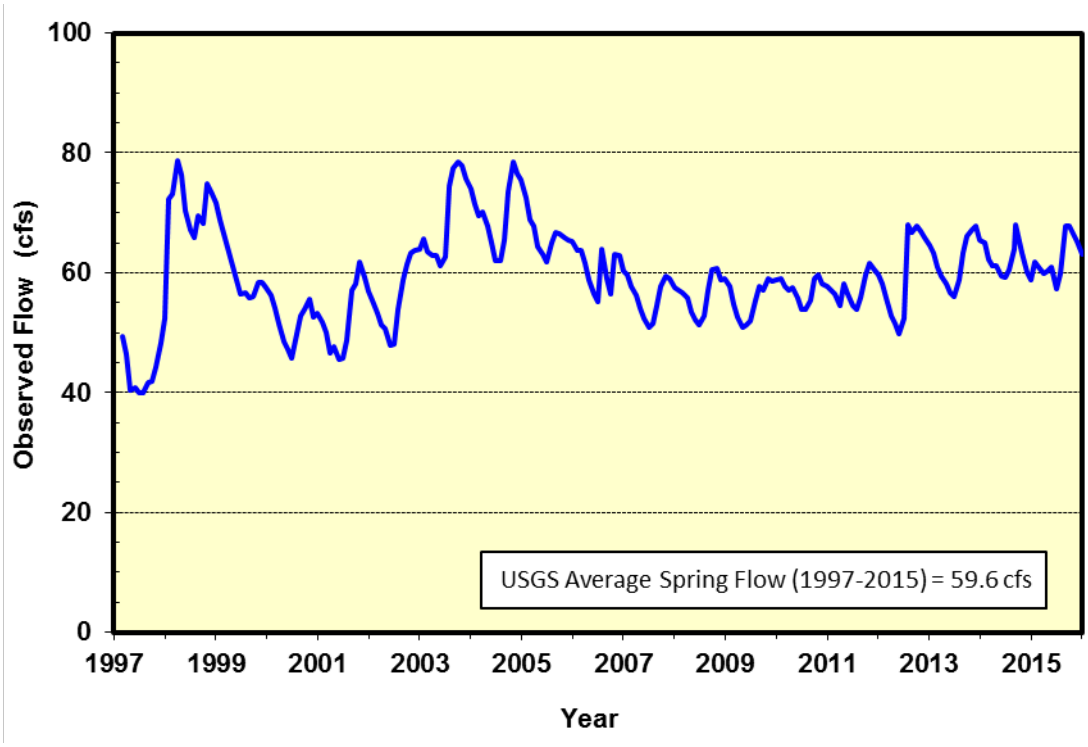



*Figure 25: Average monthly flow at Chassahowitzka Main Spring (1997-2015)*

Based on computer flow modeling and water budget results from the SWFWMD, the cumulative impact of groundwater withdrawals on the Chassahowitzka River spring flow has resulted in a relatively small impact on flow compared to rainfall changes – approximately a two percent reduction in the long-term average discharge. In 2014, estimated and metered groundwater withdrawals from all use types in the springshed were equivalent to 0.9 in/yr., and using an average recharge rate of 18.5 inches per year, groundwater withdrawals made up 4.7 percent of recharge in the basin. If 50 to 60 percent of water withdrawn is returned to the aquifer in the springshed through septic tank leakage, wastewater treatment facilities, and irrigation, then consumptively-used quantities would account for 2.1 percent of average recharge (Marella, 2008).

The SWFWMD maintains a metered and estimated water use database from 1992 through 2014. In the Chassahowitzka springshed, groundwater withdrawals have declined from their recent peak of 10.1 mgd in 2008 (Figure 26). In 2014, groundwater withdrawals based on estimated and metered use were 7.5 mgd. Current groundwater withdrawn in the springshed is lower than in the 1990s due to increased water conservation practices. Public supply accounts for about 46% of groundwater use in the Chassahowitzka springshed. Recreational water use is second at 19% and agricultural use is third at 18%. The remainder of other groundwater withdrawn in 2014 was for domestic self-supply and industrial/mining (Figure 27).

While the hydrologic assessment by the District indicates groundwater withdrawals currently have a small impact on Chassahowitzka 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 Chassahowitzka River lies within SWFWMD's Northern Planning Region where the 2010-2035 increase in demand is projected to be 51.4 mgd.

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 Chassahowitzka 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.

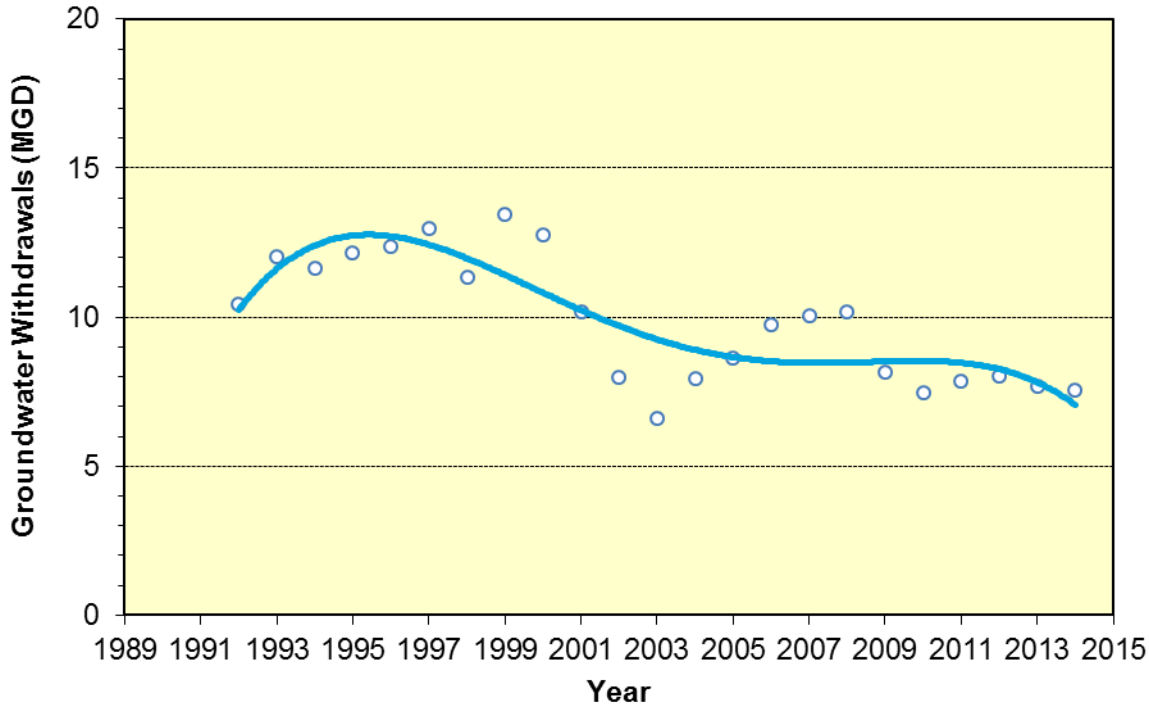



*Figure 26: Groundwater Withdrawals within the Chassahowitzka Springshed from 1992-2014*

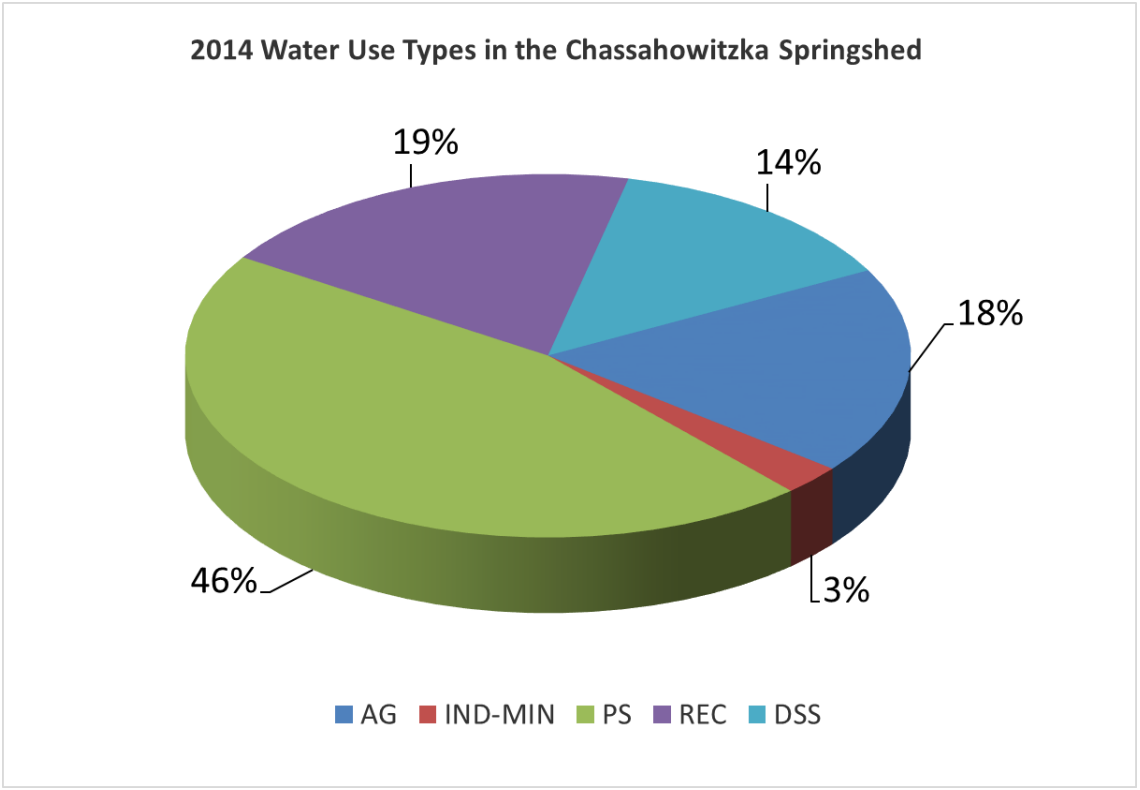



*Figure 27: Groundwater Withdrawals by Category within the Chassahowitzka Springshed*
*AG – Agriculture, PS – Public Supply, REC – Recreation, DSS – Domestic Self-Supply, IND-MIN – Industrial & Mining*

The MFL for Chassahowitzka River was adopted in 2013. Resources evaluated for the MFL included: salinity habitat, fish and invertebrates, West Indian manatees, and primary productivity. After thorough evaluation of the relationships between these factors and flows in the Chassahowitzka River, a MFL that maintains 91% of the natural flow, the flow that would exist in the absence of water withdrawals, was recommended (Heyl et al. 2012). Prior to adoption the MFL was adjusted to maintain 97% of the natural flow and is scheduled to be re-evaluated by 2019.

Effects of reduced flow on the ecosystem have not been well documented. Flow in the river is a critical factor that interacts with multiple aspects of the ecosystem. In other west-central Florida spring systems, lower flows allowed increased filamentous algal abundance (Hoyer et al. 2004, King 2014) by reducing 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.

### Natural Systems

The Chassahowitzka River has experienced changes to fish and wildlife habitats, but is in relatively healthy condition compared to nearby spring systems. Over recent decades, SAV abundance has fluctuated and appears to be declining overall, however the SAV community remains dominated by desirable species such as eelgrass. The shoreline of the river is mostly undeveloped, with large tracts of conservation land surrounding the spring system. Dead-end canals upstream of the headspring and shoreline erosion in certain areas have led to some habitat degradation. Despite the relatively healthy condition of the Chassahowitzka River, the drivers of habitat degradation in nearby spring systems, primarily increased salinity and herbivory, are also expected to have substantial impacts to SAV and other fish and wildlife habitats in the near future.

The primary issue regarding aquatic habitat in the Chassahowitzka River is altered aquatic vegetation. By 1998, invasive species such as hydrilla and filamentous algae (primarily the cyanobacteria Lyngbya and the green algae Chaetomorpha) had become the most abundant species in the river, although native species such as eelgrass and sago pondweed were also relatively abundant (Frazer et al. 2001). Records of SAV biomass began in 1998 and show a substantial decrease after 1999 (Figure 28), likely due to a decline in both macrophytes and filamentous algae in the lower river related to increased salinity (Frazer et al. 2001). Both SAV biomass and species composition have fluctuated, with 2006-2007 being a particularly low biomass period; however, eelgrass has rebounded and was the dominant SAV species in 2015 (Figure 29). Since 2003, average desirable and invasive SAV coverage were 20% and

13%, respectively, which makes the Chassahowitzka River the only coastal spring system in the region with a majority of desirable species.

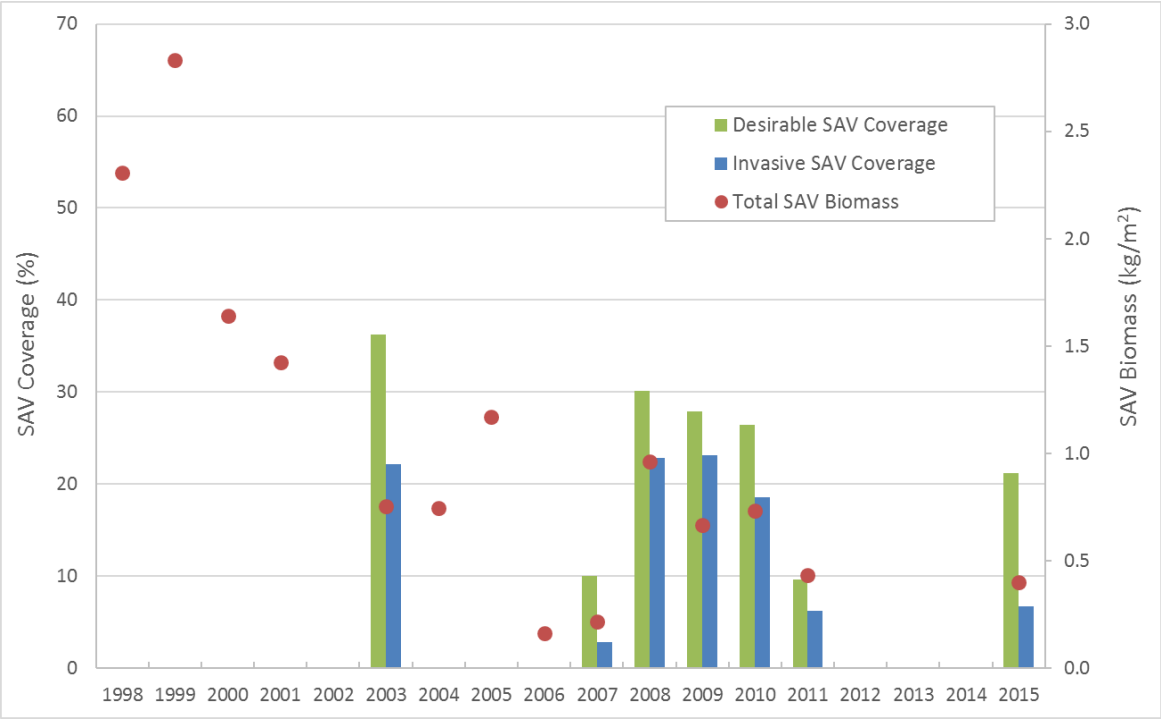



*Figure 28: SAV Coverage and Biomass in the Chassahowitzka River*

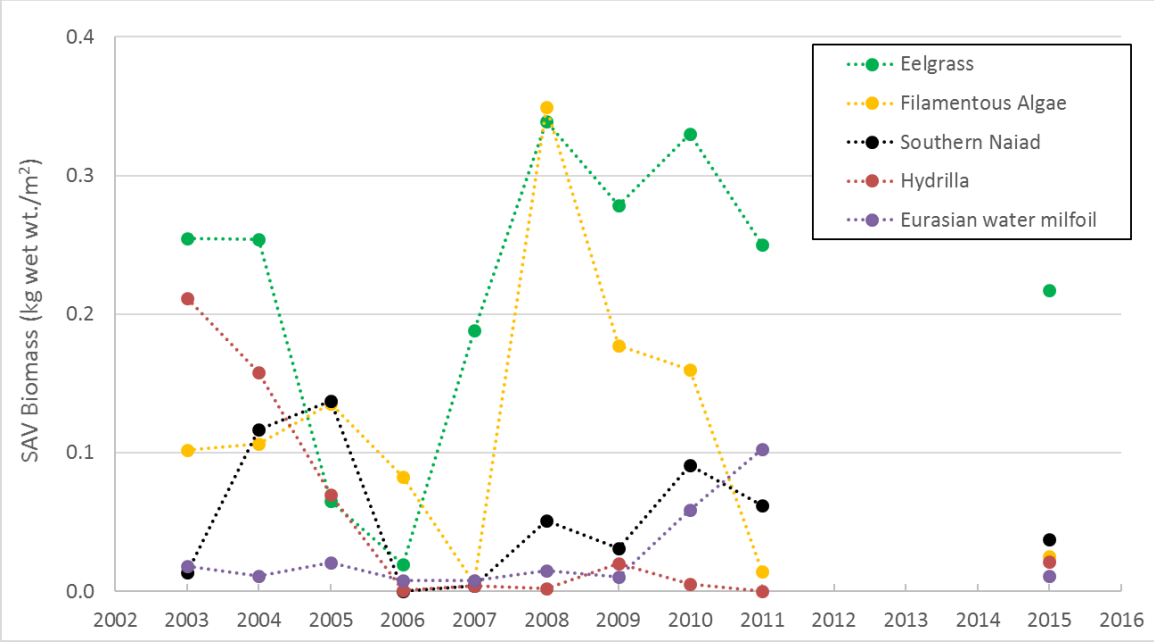



*Figure 29: SAV Biomass for Common Species in the Chassahowitzka River*

Changes in the SAV community have resulted from a complex series of events over the past half century, beginning with the introduction of exotic invasive species like hydrilla, in the early to middle part of the 20th century. These species gained a foothold in the Chassahowitzka River largely due to disturbance of the native habitat. Although shoreline development has been minimal in comparison to Crystal River/Kings Bay and Homosassa River, the dredging of canals upstream of the headspring as well as other human activities likely disturbed the native SAV community and allowed invasive species expansion. Fortunately, eelgrass remains fairly abundant in the upper portions of the Chassahowitzka River which limits the opportunities for invasive species expansion.

More recently, the primary driver of changes in the SAV community is salinity fluctuations. Over the last few decades salinity has fluctuated throughout the river due mainly to variation in freshwater discharge related to rainfall patterns. Low rainfall periods, such as 2000-2002 and 2008-2010, have corresponded to lower freshwater discharge and higher salinities (Figure 24). There has also been an increase in the severity of high-salinity pulsed events caused by storm tides. Generally, freshwater SAV species are sparse where salinity is above 3.0 parts per thousand (ppt) in the river (Hoyer et al. 2004). Presently, salinities in the lower portions of the Chassahowitzka River have increased to a level that is too high for freshwater SAV species and filamentous algae like Lyngbya to survive. More salt-tolerant species such as eelgrass and Eurasian water milfoil can survive in brackish conditions, but also cannot survive higher salinities. In the coming decades, sea-level rise is expected to lead to higher salinities throughout the Chassahowitzka River which will cause more substantial changes to the SAV community.

Another potential driver of SAV decline is herbivory by animals including manatees and turtles. In recent years, manatee populations have increased greatly in Crystal River/Kings Bay and Homosassa River (Kleen and Breland, 2014), but less so in the Chassahowitzka River. Manatees use the headsprings area as a natural warm water refuge during the winter and feed on SAV in the river and seagrass offshore. While the increase in manatee population is good for the future of the manatee, it could make it challenging to maintain eelgrass and other native SAV species in the Chassahowitzka River in the future.

Recreation also has some impact to fish and wildlife habitats in the Chassahowitzka River. Observations indicate that boat wakes are causing shoreline erosion and propellers are damaging SAV in some areas. Recreational boat use in the river is primarily from one public ramp and the private residences in the upstream canal system. Swimming and wading are popular activities near several of the spring vents and may be causing localized impacts to fish and wildlife habitats.

# 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 Chassahowitzka 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 always highlighted as priority actions, these actions are considered essential to the adaptive management of this complex system.

## Quantifiable Objectives

The Chassahowitzka 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 5 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 | >20 feet[1] |
| Water clarity – near the headspring | >40 feet[1] |
| Nitrate concentration in the springs | <0.23 mg/L[2] |
| Total nitrogen concentration in the river | <0.25 mg/L[2] |
| **Water Quantity** | |
| Minimum flow for the river system | >97% natural flow[3] |
| **Natural Systems** | |
| Coverage of desirable submerged aquatic vegetation in the river | >65%[4] |
| Coverage of invasive aquatic vegetation (including filamentous algae) in the river | <10%[4] |

[1] Based on data presented in Figure 22
[2] Dodson et al. 2014 – Nutrient TMDLs for Chassahowitzka Springs Group, Crab Creek Spring, Chassahowitzka River–Baird Creek, Baird Springs, Ruth Spring, and Beteejay Springs (WBIDs 1348Z, 1348D, and 1361B)
[3] Heyl et al. 2012 –Recommended Minimum Flows and Levels for the Chassahowitzka River System
[4] Based on data presented in Figure 28

## Water Quality

The water quality management actions for the Chassahowitzka River are primarily focused on reducing nitrogen loads in accordance with the BMAP being developed by FDEP. The TMDL for the springs that contribute to the Chassahowitzka River sets a target nitrate concentration of 0.23 mg/L, which would require up to a 67% decrease in concentration (Dodson et al. 2014). The SCSC recognizes that **Septic Tanks**, **Urban/Residential Fertilizer, and Agricultural Operations** are the priority Water Quality Management Action categories for the Chassahowitzka 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 Chassahowitzka River are intended to maintain spring flows for future generations. The SCSC recognizes that **Conservation** and **Minimum Flows and Levels** are the priority Water Quantity Management Action categories for the Chassahowitzka 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 Chassahowitzka River directly address fish and wildlife habitat. Habitats include those within the spring system itself (e.g. submerged aquatic vegetation) and those adjacent to the spring system (e.g. wetlands and uplands). The SCSC recognizes that **Monitoring and Research** and **Habitat Conservation** are the priority Natural Systems Management Action categories for the Chassahowitzka 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 Chassahowitzka 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, 10, and 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 Chassahowitzka 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**<br><br>Lead Entity: SWFWMD<br><br>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.<br><br>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.<br><br>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 Chassahowitzka.

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 Chassahowitzka. 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 Chassahowitzka 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**<br><br>Lead Entity: FDACS<br><br>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 (FDEP) 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.<br><br>Cost: TBD |
| **Central Florida Springs Region Agricultural BMP Cost-Share Program**<br><br>Lead Entity: FDACS<br><br>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.<br><br>Cost: TBD |
| **Septic Tanks** |
| **NONE** |

| Urban/Residential Fertilizer (includes Golf Courses) |
|---|
| **Development of Landscape Fertilizer BMPs**<br><br>Lead Entity: UF-IFAS/SWFWMD<br><br>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.<br><br>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.<br><br>Cost: $274,429 |
| **Education Campaign**<br><br>Lead Entity: SWFWMD<br><br>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.<br><br>Cost: $10,000 |
| **Wastewater Treatment Facilities** |
| **NONE** |
| **Stormwater** |
| **NONE** |
| **Septic/Sewage Solids Disposal** |
| **NONE** |
| **Atmospheric Deposition** |
| **NONE** |

*Water Quantity Projects*

*Table 10: Ongoing Water Quantity Projects*

| Monitoring & Research |
|---|
| **Managing Forests for Increased Regional Water Supply**<br><br>Lead Entity: FDACS/WMDs<br><br>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.<br><br>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.<br><br>Cost: $637,725 |
| **RADAR Rainfall Data Services**<br><br>Lead Entity: SWFWMD<br><br>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.<br><br>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 and non-WaterSense® approved appliances and fixtures indoors and 100 percent high-volume irrigation outdoors, which is traditionally seen in Florida homes. Quantified beneficial results are illustrated through the On Top of the World Communities in Marion County where FWS certified homes use 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)

**Rain Sensor Account Credit Program**

Lead Entity: Citrus County

F.S. 373.62 Water conservation; automatic sprinkler systems, indicates that any person who purchases and installs an automatic landscape irrigation system must properly install, maintain, and operate technology that inhibits or interrupts operation of the system during periods of sufficient moisture. This technology is most commonly a rain sensor. To encourage replacement of non-functioning rain sensors, customers are offered an account credit of $50. One hundred and fifty rain sensor credits are available each year.

Cost: $7,500 (annual cost)

**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)

**WaterSense® Labeled Faucet Aerator and Showerhead Distribution**

Lead Entity: Citrus County

WaterSense labeled sink faucet aerators use a maximum of 1.5 gallons per minute and can reduce a sink's water flow by 30 percent or more from the standard flow of 2.2 gallons per minute. Standard showerheads use 2.5 gallons of water per minute (gpm), while WaterSense labeled models must demonstrate that they use no more than 2.0 gpm. Products are disbursed at homeowner association events, picked up from the office, and delivered to customers, when feasible.

Cost: $1,300 (annual cost)

**WaterSense® Labeled Irrigation Controller Account Credit Program**

Lead Entity: Citrus County

Residential outdoor water use in the United States accounts for more than 9 billion gallons of water each day, mainly for landscape irrigation. Experts estimate that as much as 50 percent of this water is wasted due to over watering caused by inefficiencies in irrigation methods and systems. Irrigation control technologies can significantly reduce over watering by applying water only when plants need it.

Replacing a standard clock timer with a WaterSense labeled irrigation controller can save an average home nearly 8,800 gallons of water annually. The program requires customers to replace their standard clock timer with a WaterSense labeled model. Then, customers submit an application and itemized receipt to initiate an inspection. Once confirmed, customers receive a credit on their water bill.

Cost: $5,250 (annual cost)

**WaterSense® Labeled Toilet Account Credit Program**

Lead Entity: Citrus County

Provide financial incentive to utility customers that replace pre-1995 high-flush toilets with a WaterSense® labeled model. According to GIS data, Citrus County Utilities serves more than 10,000 homes that were built prior to 1995. Toilets are by far the main source of water use in the home, accounting for nearly 30 percent of an average home's indoor water consumption. Older, inefficient toilets can use as much as 6 gallons per flush. Recent advancements have allowed toilets to use 1.28 gallons per flush or less while still providing equal or superior performance. This is 20 percent less water than the current federal standard of 1.6 gallons per flush.

The program requires customers to replace a pre-1995 toilet with the more water efficient model. Then, customers submit an application and itemized receipt to receive a credit on their water bill.

Cost: $20,000 (annual cost)

**Water Star Certification Rebate**

Lead Entity: Citrus County

Provide a $1,000 rebate to residential and commercial sites certified to Florida Water Star standards. Florida Water Star is a water conservation certification program for new and existing homes and commercial developments. Standards and guidelines for water efficiency are included for Indoor fixtures and appliances, Landscape design and Irrigation systems.

Cost: $700 (per site)

**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**

**Suncoast Parkway II Water and Force Main Extension**

Lead Entity: Citrus County

The intent of this project is to construct a water and force main along the corridor of the parkway. The project will interconnect the Sugarmill Woods Water System with the Charles A Black system for the purpose of improving system reliability, help with water use permits and serve new growth areas. In addition to the project, a proposed reclaim water line will run the SC corridor for the purpose of transporting reclaim water to the Duke Energy Complex.

Cost: $7,500,000

**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**<br><br>Lead Entity: SWFWMD<br><br>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.<br><br>Cost: $3,208,319 |
| **Minimum Flows and Levels** |
| **Chassahowitzka River System MFL Re-evaluation**<br><br>Lead Entity: SWFWMD<br><br>Florida statute 373.042 requires that the District establish minimum flows and levels (MFLs) for water bodies on a priority list. The Chassahowitzka River system is a designated priority water body and this project is to provide technical information to support the re-evaluation of MFLs for the system. The MFLs were adopted in 2013 and their re-evaluation is required to be completed by 2019. The establishment of minimum flows for rivers requires the collection of extensive physical, chemical, and biological data to evaluate potential impacts to the ecological characteristics of the resource. This project provides funding for the collection and evaluation of this information.<br><br>Cost: TBD |

*Natural Systems Projects*

*Table 11: Ongoing Natural Systems Projects*

| Monitoring & Research |
|---|
| **Springs Coast Fish Community Assessment**<br><br>Lead Entity: FFWCC<br><br>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.<br><br>Cost: $185,620 (SWFWMD Funded) |
| **Habitat Conservation** |
| **Lakes, Rivers and Coastal Cleanup**<br><br>Lead Entity: Citrus County<br><br>This is county-wide cleanup to remove trash from waterways and land abutting water. The program is conducted annually the 3rd Saturday in September. The program addresses the physical removal of trash while raising awareness of local water quality issues.<br><br>Cost: $4,000 (annual cost) |
| **Habitat Restoration** |
| **NONE** |
| **Invasive Species Management** |
| **Cooperative Aquatic Plant Control Funded Program**<br><br>Lead Entity: FFWCC/SWFWMD<br><br>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.<br><br>Cost: $27,500 |

| |
|---|
| **FWC Aquatic Plant Control Permitting Program**<br><br>Lead Entity: FFWCC<br><br>Given that the Chassahowitzka River 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.<br><br>Cost: $10,000 |
| **Invasive Plant Management Educational Website**<br><br>Lead Entity: University of Florida<br><br>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.<br><br>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, 13, and 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 Chassahowitzka River.

### *Water Quality Projects*

*Table 12: Proposed Water Quality Priority Projects and Initiatives*

| **Monitoring & Research** |
|---|
| **NONE** |
| **Agricultural Operations (Cattle Farms, Horse Farms, Row Crops)** |
| **NONE** |
| **Septic Tanks** |
| **Community Outreach and Education Campaign for Wastewater Solutions**<br><br>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.<br><br>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:<br><br>1) Compile best practices from successful public education campaigns for onsite sewage system and develop an action list for implementing a public education campaign<br>2) Survey the community of interest to determine most effective methods of communication and determine community concerns<br>3) Implement a modified door-to-door inspection project in the area of interest<br>4) Compile data to update the Florida Water Management Inventory<br>5) Write draft and final project report, including lessons learned and a template public education campaign that can be used by other communities.<br><br>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

**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. 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, we have an opportunity to correct the problem at its source instead of addressing symptoms or funding more studies.

Cost: TBD

| |
|---|
| **Expand Education and Outreach/Fertilizer Best Management Practices**<br><br>The Master Planned Development of Sugarmill Woods offers an opportunity to reach out to nearly 4,000 homeowners about best practices for nutrient management in the landscape and will reduce nutrient loading in the Chassahowitzka watershed. This partnership with the University of Florida brings together educational outreach, social marketing expertise (The Center for Landscape Conservation and Ecology) and watershed management scientists (IFAS Regional Specialized Agents) to develop a targeted program that will result in behavior change and adoption of landscape best management practices. Water use and social marketing professionals will collaborate with landscape contractors, HOA board members and citizen groups in Sugarmill Woods through a community advisory board to develop a research based intervention that disseminates recommendations from the Citrus County fertilizer ordinance and other BMPs. Specifically, we will conduct focus groups, surveys and interviews with key stakeholder audiences (including fertilizer applicators) and provide the data to the community advisory board in order to develop the social marketing campaign. With help from all of the partners, we will decide on target audiences (such as retirees, part-time residents or active gardeners); specific behaviors (avoiding nitrogen fertilizer applications in the winter, using slow release products and eliminating opportunities for fertilizer run off into streets and curbs); and ways to make the behaviors easy, fun and desirable. The goal is to develop and implement a pilot campaign in selected HOAs within Sugarmill Woods.<br><br>Cost: $47,000 |
| **Wastewater Treatment Facilities** |
| **NONE** |
| **Stormwater** |
| **Neighborhood Swale Treatment**<br><br>Installation of a system to treat the first flush of stormwater from the streets and swales in neighborhoods without a common stormwater management system.<br><br>Cost: $120,000 |
| **Septic/Sewage Solids Disposal** |
| **NONE** |
| **Atmospheric Deposition** |
| **NONE** |

*Water Quantity Projects*

*Table 13: Proposed Water Quantity Priority Projects and Initiatives*

| Monitoring & Research |
|---|
| **NONE** |
| **Conservation** |
| **Adopt Landscape Irrigation Design and Maintenance Standards Similar to Florida Water Star Certification**<br><br>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.<br><br>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 as 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.<br><br>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. 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.<br><br>Cost: $20,000 (annual cost) |
| **Domestic Self-Supply Indoor Water Conservation Pilot Project**<br><br>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.<br><br>This program will conserve an estimated 5,200 gallons per day. With a cost effectiveness of $1.96 per thousand gallons saved.<br><br>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

**WaterSense® Labeled Irrigation Controller Contractor Installation**

Provide free installation of WaterSense® labeled irrigation controllers for customers using greater than 30,000 gallons per month. Residential outdoor water use in the United States accounts for more than 9 billion gallons of water each day, mainly for landscape irrigation. Experts estimate that as much as 50 percent of this water is wasted due to over watering caused by inefficiencies in irrigation methods and systems. Irrigation control technologies can significantly reduce over watering by applying water only when plants need it. Replacing a standard clock timer with a WaterSense labeled irrigation controller can save an average home nearly 8,800 gallons of water annually.

Cost: $4,350 (annual cost)

**WaterSense® Labeled Toilet Installation by Contractor**

Toilets are by far the main source of water use in the home, accounting for nearly 30 percent of an average home's indoor water consumption. Recent advancements have allowed toilets to use 1.28 gallons per flush or less while still providing equal or superior performance.

The WaterSense® labeled toilet installation program will provide free installation of approved toilets to utility customers with toilets installed prior to 1995. The first phase of the project will focus on pre-1982 toilets within high water use communities in the southwest region of the county. Pre-1982 toilets use an average of 5 to 7 gallons per flush. Based on GIS information, Citrus County Utilities provides service to approximately 1032 homes built before 1982 in the southwest region of the county with approximately 2049 toilets that may qualify for this program. Subsequent phases of the program will focus on other regions of the utility, and then graduate to replacing toilets installed between 1982 and 1994.

Cost: $512,250

| Alternative Water Supply |
| --- |
| **Potential Reclaimed Water User Study**<br><br>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.<br><br>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**<br><br>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.<br><br>Cost: $150,000 (recurring, annual) |
| **Habitat Conservation** |
| **Annutteliga Hammock Acquisition**<br><br>"The Annutteliga Hammock is part of one of the largest tracts longleaf pine forest remaining in Florida, and the acquisition of this tract would conserve remaining fragments between the Withlacoochee State Forest and the Chassahowitzka Wildlife Management Area. Conservation of the Hammock will enhance and protect water quality and recharge in the Chassahowitzka and Weeki Wachee springsheds, and will provide additional public benefit for protected species habitat, preservation of historical sites, and public recreation. The Annutteliga Hammock area, as updated by the Board of Trustees, reduced the project to 19,424 acres, with 8,036 acres remaining to be acquired. The redesign removed numerous small developed and vacant parcels, the majority of which are single family lots, with the intention of reserving the maximum acreage of high resource value land possible for future conservation. Annutteliga Hammock is a medium/high priority on the State's 2016-2017 Florida Forever Priority List (and has been on the list since 1995)."<br><br>**Cost: $TBD** |
| **Chassahowitzka River and Coastal Swamps Property Acquisition, Martha Blanche Yandle, Trustee**<br><br>Acquisition of this 25-acre undeveloped parcel will aid springs protection efforts by preserving forested wetlands adjacent to the Chassahowitzka River, a first-magnitude spring system and SWIM priority water body. The wetlands in this parcel provide water quality improvements to the springs, natural systems conservation, and flood protection for nearby residential areas. This parcel is also adjacent to existing public conservation lands. The parcel is identified in the SWFWMD 2014-16 Land Acquisition Playbook.<br><br>Cost: TBD |

**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

**Springs and Related Waterway Law Enforcement**

FWC Officer dedicated to enforcing existing (and new) regulations, laws, and ordinances related to these water bodies. 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 (annual cost)

**Chassahowitzka River and Coastal Swamps Property Acquisition, Roberts David Trustee**

Acquisition of this 0.41-acre parcel will aid springs protection efforts by preserving forested wetlands adjacent to the Chassahowitzka River, a first-magnitude spring system and SWIM priority water body. The wetlands in this parcel provide water quality improvements to the springs and natural systems conservation and include about 400 feet of shoreline adjacent to Chassahowitzka Spring #1. This parcel is also adjacent to existing public conservation lands.

Cost: TBD

**Chassahowitzka River and Coastal Swamps Property Acquisition, Shaw Ronald Eugene Parcel**

Acquisition of this 67.5-acre parcel will aid springs protection efforts by preserving forested uplands and wetlands adjacent to the Chassahowitzka River, a first-magnitude spring system and SWIM priority water body. The lands on this parcel provide water quality improvements to the springs, natural systems conservation, and flood protection for nearby residential areas. This parcel is bordered by conservation lands: along the west by the SWFWMD Chassahowitzka River and Coastal Swamps lands and along the north by the FDACS Withlacoochee State Forest, Homosassa Tract lands.

Cost: TBD

| |
|---|
| **Chassahowitzka River and Coastal Swamps Property Acquisition, Stephens Donald E Trustee et al.**<br><br>This acquisition project includes two adjacent tracts: a 2.89-acre parcel which contains a house, outbuildings, and boat slips and a 24.7-acre parcel which includes several yoga retreat cabins, but is otherwise undeveloped. The potential to utilize existing buildings for a Chassahowitzka River Research and Environmental Center exists. This property is adjacent to Crab Creek springs group, an important tributary spring run on the upper Chassahowitzka River, a SWIM priority water body. The wetlands in this parcel provide water quality improvement to the springs, natural systems conservation, and flood protection for nearby residential areas. This parcel is also adjacent to existing public conservation lands.<br><br>Cost: TBD |
| **Habitat Restoration** |
| **NONE** |
| **Invasive Species Management** |
| **NONE** |
| **Recreation Management** |
| **NONE** |

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# Appendix A: Technical Working Group Participant List

| Name | Title | Organization | Meeting Attendees | | |
|---|---|---|---|---|---|
| | | | 1/27/2016 Issues, Drivers, Quantifiable Objectives | 3/16/2016 Management Actions | 7/20/2016 Projects |
| Alys Brockway | | Hernando County | PRESENT | | |
| Andy and Terri Auner | | Homosassa River Alliance | | PRESENT | |
| Anne Birch | Marine Conservation Director | The Nature Conservancy | | | |
| Anne Holbrook | Staff Attorney | Save the Manatee Club | | | PRESENT |
| B.J. Jarvis | | | PRESENT | | |
| Beau Williams | Project Development & Consulting | AquaTech Eco Consultants, LLC | | | |
| Bernard Berauer | | | PRESENT | | |
| Beth Lewis | | The Nature Conservancy | | | |
| Bill Stevens | | Citrus County | | | |
| Bob Bonde | Research Biologist | USGS | | | |
| Bob Knight | Director | Florida Springs Institute | | | |
| Brad Rimbey | Citizen | | PRESENT | PRESENT | PRESENT |
| Brad Smith | | Hernando County | PRESENT | PRESENT | PRESENT |
| Chris Anastasiou | Chief Scientist | SWFWMD | PRESENT | | PRESENT |
| Chris Becker | | FDEP | | | |
| Chris Oliver | | FDEP | | | |
| Chris Zajac | FARMS Manager | SWFWMD | | | |
| Chuck Jacoby | | UF | | | |

| Name | Title | Organization | Meeting Attendees | | |
|---|---|---|---|---|---|
| | | | 1/27/2016 Issues, Drivers, Quantifiable Objectives | 3/16/2016 Management Actions | 7/20/2016 Projects |
| Chuck Morton | Member | HCTF | PRESENT | PRESENT | PRESENT |
| Clay Black | | Hernando County | | | |
| Dan Hilliard | | WAR | | | |
| Danielle Rogers | Environmental Science Project Lead | SWFWMD | PRESENT | PRESENT | PRESENT |
| Dave DeWitt | Chief Professional Geologist | SWFWMD | PRESENT | PRESENT | |
| Dawn Velsor | Lead Environmental Planner | Hernando County | PRESENT | PRESENT | |
| Debra Burden | Dept. of Water Resources | Citrus 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 | | | PRESENT |
| Emma Lopez | Student | USF | | | |
| Gary Ellis | President | Gulf Archaeological Research Institute | | | |
| George Foster | Member | HCTF | | | |
| Jamie Letendre | Environmental Specialist I | FDEP CAMA | | | |

| Name | Title | Organization | Meeting Attendees | | |
|---|---|---|---|---|---|
| | | | 1/27/2016 Issues, Drivers, Quantifiable Objectives | 3/16/2016 Management Actions | 7/20/2016 Projects |
| Jeff Harris | Environmental Biologist | Pasco County | | | |
| John Burnett | | Hernando County | PRESENT | PRESENT | PRESENT |
| Josh Madden | Environmental Scientist | SWFWMD | | PRESENT | |
| Justine Student | | | | | |
| Karen Van Sickle | | Rotary Club of Brooksville | | | |
| Katie Tripp | | Save the Manatee | PRESENT | | |
| Ken Cash | | | | | PRESENT |
| Kent Smith | Marine and Estuarine Habitat Leader, Habitat Species Conservation | FWC | | | |
| Kevin Coyne | | FDEP | | | |
| Kevin Grimsley | Supervisory Hydrologist | USGS | | PRESENT | |
| Kevin Love | Land Manager | Wildlands Conservation Inc. | | | |
| Kimberlee Tennille | Homosassa State Park | FDEP | | | |
| Laura Digruttolo | | FWC | | | |
| Laura Rankin | Student | USF | | | |
| Laura Rodriguez-Gonzalez | Student | USF | | PRESENT | |
| Lauren Greenfield | Environmental Manager, ERP | FDEP | | | |
| Katie Hallas | Environmental Administrator | FDACS | | | |
| Mahmood Nachabe | Professor | USF Civil & Environmental Engineering | | | |

| Name | Title | Organization | Meeting Attendees | | |
|---|---|---|---|---|---|
| | | | 1/27/2016 Issues, Drivers, Quantifiable Objectives | 3/16/2016 Management Actions | 7/20/2016 Projects |
| Maria Merrill | Biological Scientist | FWCC/Marine & Estuarine Subsection | | PRESENT | |
| Mariben Anderson | Natural Resources Technical Manager | Michael Baker International | | | |
| Mark Green | Springs & Environmental Flows Manager | SWFWMD | | | PRESENT |
| Mark Schroder | | Citrus County | PRESENT | | PRESENT |
| Mary Hartney | President | Florida Fertilizer & Agrichemical Association | | | |
| Mary Szafraniec | | AMEC | | | |
| Matt Warren | Environmental Specialist III, Office of Agricultural Water Policy | FDACS | PRESENT | PRESENT | |
| Megan Keserauskis | | FWC | | | |
| Michael Czerwinski | | | PRESENT | PRESENT | |
| Pam Wright | | Pasco County | | PRESENT | |
| Patricia Robertshaw | Environmental Scientist, FARMS | SWFWMD | | | |
| Quincy Wylupek | | Citrus County | | | |
| Robbie Lovestrand | | FWC | PRESENT | | PRESENT |
| Ron Basso | Chief Hydrologist, Resource Evaluation | SWFWMD | PRESENT | PRESENT | PRESENT |

| Name | Title | Organization | Meeting Attendees | | |
|---|---|---|---|---|---|
| | | | 1/27/2016 Issues, Drivers, Quantifiable Objectives | 3/16/2016 Management Actions | 7/20/2016 Projects |
| Ron Mezich | Biologist, Habitat Species Conservation | FWC | | | |
| Ron Shultz | | | | | |
| Samantha Whitcraft | | | | | |
| Sarina Ergas | Professor and Graduate Program Coordinator | USF Civil & Environmental Engineering | | | |
| Scott McBride | Hydrologist | USGS | | | |
| Sean King | Staff Engineer | SWFWMD | | PRESENT | PRESENT |
| Shannon Herbon | | FDEP | | | |
| Siobhan Gorham | Research Associate, FWRI | FWC | | PRESENT | |
| Sky Notestein | Senior Environmental Scientist | SWFWMD | PRESENT | PRESENT | PRESENT |
| Stephen Minguy | | | | | |
| Steven Davis | Citrus County Florida Yards and Neighborhoods | Citrus County | PRESENT | PRESENT | PRESENT |
| 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 | | | |

| Name | Title | Organization | Meeting Attendees | | |
|---|---|---|---|---|---|
| | | | 1/27/2016 Issues, Drivers, Quantifiable Objectives | 3/16/2016 Management Actions | 7/20/2016 Projects |
| Tina Malmberg | | Citrus County | | | |
| Tom Lynn | Student | USF | | | |
| Trevor Fagan | Environmental Scientist | SWFWMD | PRESENT | | |
| Warren Hog | | | | PRESENT | |
| Mary Szafraniec | | AMEC Foster Wheeler | | | |
| Dr. Xuenqing Gao | | | | | PRESENT |

# Appendix B: Permitted Point Sources

This appendix lists point sources and water use permits within the Chassahowitzka watershed and springshed. Point source permit information was obtained from the Southwest District office of the FDEP. Based on correspondence received from the FDEP on February 9, 2017, no facilities were operating without a permit, with a temporary permit or known to be violating effluent limits or standards or data was insufficient to make the determination, therefore, no timetable is provided to bring the facilities into compliance with FDEP Regulations. There are no permitted dry cleaners or permitted large quantity generators of hazardous waste on the FDEP website within the Chassahowitzka watershed and springshed boundaries as of August 11, 2016.

*Table 15: Wastewater Permits as of 8/11/2016*

| FACILITY ID | NAME | TYPE | PERMITTED CAPACITY (MGD) |
|---|---|---|---|
| FLA841846 | The Thomas Acres BLAS | Domestic Wastewater | 0.0000 |
| FLA012052 | AAA White's Septic Tank Service RMF | Domestic Wastewater | *320.00 |
| FLA012071 | Wesleyan Village | Domestic Wastewater | 0.0800 |
| FLG110761 | Argos USA - Brooksville CBP | Industrial Wastewater | 0.0000 |
| FLA560570 | Brooksville Chevron | Industrial Wastewater | 0.0000 |
| FLA011903 | Sugarmill Woods WWTF | Domestic Wastewater | 0.7000 |
| FLA011916 | Walden Woods MHP WWTF | Domestic Wastewater | 0.0990 |
| FLG110507 | CEMEX LLC - Cobb Rd CBP | Industrial Wastewater | 0.0000 |
| FLA012042 | Florida Power Development LLC | Domestic Wastewater | 0.0060 |
| FLA017105 | Cemex, Inc - Cement Plant | Industrial Wastewater | 0.0000 |
| FLA011852 | Chassahowitzka River Lodge | Domestic Wastewater | 0.0100 |
| FLA012073 | Cemex Construction Materials Florida LLC | Industrial Wastewater | 0.0000 |

*Unit is dry tons instead of MGD

*Table 16: Petroleum Sites as of 8/11/2016*

| FACILITY ID | NAME |
|---|---|
| 8503049 | HOMOSASSA 1 LLC |
| 8520231 | CEMEX-GREGG MINE |
| 8520239 | RING POWER CORP |
| 8520252 | ATLAS POWDER CO |
| 8520258 | FL ROCK INDUSTRIES INC |
| 8508753 | CITGO STATION |
| 8508782 | DES CHAMPS CORNER |
| 8508802 | COUNTRY EXPRESS INC |
| 8508859 | SHOP & SAVE DISCOUNT BEV & FOOD |
| 8508870 | BP-COUNTRY |
| 8626277 | SPEEDWAY #6529 |

| FACILITY ID | NAME |
|---|---|
| 8734175 | BELLSOUTH TEL INC #33055 |
| 8626846 | CIRCLE K #2726288 |
| 8626859 | HERNANDO CNTY FACILITY-FUTURE |
| 8626864 | GIANT OIL #123 |
| 8841242 | COOPERS LAWN SERVICE |
| 8841003 | CLOVER LEAF |
| 8841667 | J W GUIN |
| 8841327 | PRONTO CLEANERS & LAUNDRY |
| 8736440 | BROOKSVILLE QUARRY-VULCAN CONST MTRLS LLP |
| 8841448 | MONTGOMERY BULK EXPRESS INC |
| 8841499 | THOMAS ACRUS INC |
| 8943570 | CROAN TRUCKING |
| 8942642 | THOMAS WATERMELON GROWERS OF OAK GROVE |
| 8942864 | RINKER MATERIALS - TRI STATE CARRIERS INC |
| 8841851 | J O BATTEN FARMS |
| 8841857 | VERLIE R GARRETT |
| 8842197 | MILK-A-WAY FARMS INC |
| 8838203 | TWIN COUNTY UTILITY-SUGARMILL WOODS |
| 9101356 | CHASSAHOWITZKA CENTRAL OFF |
| 9101398 | ANDERSON COLUMBIA CO INC |
| 9101436 | ASPHALT PAVERS INC #3 |
| 9300140 | WORLD WOODS GOLF CLUB |
| 9300368 | SOUTHERN WOODS GOLF COURSE MAINT |
| 9202502 | HERNANDO CNTY-COURTHOUSE |
| 9202546 | HERNANDO CNTY-NORTHWEST LANDFILL |
| 9502443 | PRONTO CLEANERS |
| 9502846 | FLORIDA WATER SERVICES |
| 9802070 | LEVEL 3 COMMUNICATIONS LLC-CHASSAHOWITZKA STA |
| 9805613 | HERNANDO CNTY DEPT OF PUBLIC WRKS-FLEET COMPLEX |
| 9810040 | PUBLIX SUPER MARKET #1193 |
| 9809329 | BROOKSVILLE CITY-CITY HALL |
| 9809928 | BROOKSVILLE READY MIX PLANT |
| 9810011 | HERNANDO CNTY UTIL DEPT-THRASHER RD PUMP STAT |
| 9810012 | HERNANDO CNTY UTIL DEPT-SEVILLE PUMP STAT |
| 9813976 | CONSOLIDATED RESOURCE REC-BROOKSVILLE |
| 9814551 | SEVILLE WATER TREATMENT FACILITY |
| 9812388 | CEMEX-BROOKSVILLE |
| 9804938 | SHELL-HOMOSASSA #704 |
| 9807926 | SUGARMILL WOODS GOLF & COUNTRY CLUB |

*Table 17: Solid Waste Facilities as of 8/11/2016*

| FACILITY ID | NAME | STATUS |
|---|---|---|
| 40722 | HERNANDO COUNTY NORTHWEST LF | Active |
| 40773 | EWESON DIGESTER COMPOSTING FACILITY | Never Operated, Permit Never Used |
| 40776 | JIFFY IND. FERTILIZER PLANT (HERNANDO) | Nfa,No Further Action |
| 40777 | CEMEX BROOKSVILLE NORTH PLANT (FKA FM&M) | Inactive |
| 40778 | CEMEX BROOKSVILLE SOUTH PLANT (FKA FLORIDA CRUSHED STONE) | Active |
| 41062 | SPANKY'S ENTERPRISES | Closed, No Gw Monitoring |
| 93910 | OLD CITY OF BROOKSVILLE LF (COUNTY DATA) | Closed, No Gw Monitoring |
| 94585 | FLORIDA POWER DEVELOPMENT FUEL STAGING FKA NATURE COAST MRF | Nfa,No Further Action |
| 97796 | CRR-BROOKSVILLE FACILITY | Registered |
| 100640 | CITRUS CO DEBRIS STAGING SITE #2 | Proposed |
| 102270 | ERNIE WEVER YOUTH PARK DEBRIS MANAGEMENT SITE | Inactive |

*Table 18: Water Use Permits as of 8/11/2016*

| PERMIT NUMBER | NAME | PERMITTED QUANTITY (ANNUAL AVERAGE GPD) |
|---|---|---|
| 199 | Brooksville Quarry, LLC/Attn: Scott McCaleb | 111400 |
| 214 | 184 Stardust, LLC | 2100 |
| 215 | Cemex Construction Materials Florida, LLC/Attn: James Morris | 264350 |
| 259 | Gail Burry | 25260 |
| 2286 | Cemex, Inc/Attn: James S. Daniel | 2716000 |
| 2288 | Vulcan Materials Co & | 70000 |
| 2836 | United States Dept Of Agriculture | 21400 |
| 3673 | Flovicc & Company, Inc. | 456000 |
| 3993 | Evans Properties, Inc. | 600 |
| 4430 | Hernando County BOCC | 49400 |
| 5789 | Hernando County BOCC/Attn: Mark Morgan | 23299000 |

| PERMIT NUMBER | NAME | PERMITTED QUANTITY (ANNUAL AVERAGE GPD) |
|---|---|---|
| 5833 | George Alvarez | 3600 |
| 6797 | S A Williams Trust | 325900 |
| 7015 | Florida Power Development, LLC | 5410000 |
| 7018 | Maryann Stein | 57400 |
| 7627 | City of Brooksville | 2448000 |
| 8060 | Stewarts Tree Service, Inc. | 115500 |
| 8820 | Hernando County School Board/Attn: John L. Martin | 19900 |
| 8833 | New Seville 2011 Development LLC | 337700 |
| 9698 | La Hacienda Del Cielo LLC | 112900 |
| 9791 | Citrus County Board of County Commissioners | 2362100 |
| 10404 | Flovicc & Company, Inc./ Attn: Stan Cooke | 262410 |
| 11839 | GCP Walden Wds. One & Two, LLC, c/oAmerican Land Lease Inc. | 217900 |
| 12450 | Brooksville Mini Storage Warehouse, LLC/Attn: Alex Stewart | 1000 |
| 12626 | Hernando Christian Private Academy, Inc., Attn: Jeanie Parker | 5800 |
| 12815 | Croom Road Land Holdings, LLC | 800 |
| 12879 | Cemex Construction Materials Florida, LLC/Attn: Jason Jones | 30000 |
| 13279 | World Woods Corp | 782000 |
| 20043 | Joanne and Vance Wilder | 19500 |
| 20189 | Bell Fruit LLC / Attn: Powers Dorsett | 28300 |
| 20242 | The Cowgirl Company I LLC/Attn: Sarah Guthrie | 189600 |
| 20393 | Stardust Ranch LLC / Attn.: Fred Gregg | 112200 |
| 20604 | James Huntsman | 126700 |

*Table 19: Small Quantity Generators of Hazardous Waste as of 8/11/2016*

| HANDLER ID | SITE ID | NAME |
|---|---|---|
| FLR000021295 | 40185 | Roadside Garage |
| FLR000040774 | 6102 | Grubbs Construction |
| FLD072543010 | 16745 | CEMEX Construction Materials Florida LLC - Brooksville Plant |
| FLD981750177 | 37894 | Hilltop Chevron |
| FLR000089813 | 35882 | Sun Fiberglass Pools |
| FLR000021238 | 56553 | Becks Radiator Shop |
| FLD984227397 | 45407 | Tri State Carriers |

*Table 20: MS4 Permits as of 8/11/2016*

| PERMIT ID | PERMITTEE |
|---|---|
| FLR04E119 | City of Brooksville |
| FLR04E040 | Hernando County |

*Table 21: Permitted Power Plants as of 8/11/2016*

| SCO NUMBER | PLANT NAME | UTLITY NAME |
|---|---|---|
| PA 82-17 | Brooksville South Plant | CEMEX Construction Materials, LLC and Florida Power Development, LLC |

*Table 22: Stormwater Permits as of 8/11/2016*

| FACILITY ID | NAME | TYPE |
|---|---|---|
| FLR10KW62 | South Brooksville Vision Area Phase 3 | Stormwater - Small Construction (1-5 AC) |
| FLR04E119 | Brooksville, City of | MSE, < OR = 10K or Other |
| FLR05F898 | Bottling Group LLC | Stormwater - Multisector Generic Permit |
| FLR05F898 | Bottling Group LLC | Stormwater - Multisector Generic Permit |
| FLR04E040 | Hernando County | MS2, >50K |
| FLR04E040 | Hernando County | MS2, >50K |
| FLR05G675 | Brooksville Lumber Yard | Stormwater - Multisector Generic Permit |
| FLR10EP35 | US-98 - Milling & Resurfacing | Stormwater - Small Construction (1-5 AC) |
| FLR05G760 | J's Auto Salvage | Stormwater - Multisector Generic Permit |
| FLR05G760 | J's Auto Salvage | Stormwater - Multisector Generic Permit |
| FLRNEE212 | Dyno Nobel Inc | Stormwater - No Exposure Certification |
| FLR10CX57 | Alan's Roofing | Stormwater - Small Construction (1-5 AC) |
| FLR04E119 | Brooksville, City of | MSE, < OR = 10K or Other |

# Appendix C: Jurisdictional Authority

## FEDERAL

Federal jurisdiction in the Chassahowitzka 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 Chassahowitzka 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. The US Coast Guard also responds to and investigates oil/petroleum spills.

#### *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 Chassahowitzka River watershed and estuary. The Florida Department of Environmental Protection is the lead state agency in the protection and management of Chassahowitzka 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, 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*

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

### *Division of Water Resource Management*

The Southeast District Office in Tampa has responsibility for proprietary and regulatory permitting issues in the Chassahowitzka 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 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 former

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 former 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 Chassahowitzka 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 Chassahowitzka Rivers natural resources.

### *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 Chassahowitzka River watershed.

### *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

The primary local government within the Chassahowitzka springshed, is Citrus County and the City of Brooksville in Hernando County. These local governments play a role in the Chassahowitzka River through the daily management of their communities, the planning, zoning and other land use decisions, and the implementation and enforcement of local codes.

### *Citrus County*

Citrus County is responsible for the Coastal and Lakes Region of the Comprehensive Plan. Illicit Stormwater Discharge Ordinance, Fertilizer Ordinance, Conservation Element of Comprehensive Plan including Wetland Setbacks, Flood Mitigation Standards. Manatee Protection Plan Element of the Comprehensive Plan Future Land use element addresses allowable stormwater discharges. The County Land Development Code contains surface water quality protection standards required by development proposals proximate to waterbodies, or in the vicinity of springs, spring runs, and sinkholes open to the aquifer.

Code of Ordinances, Part II, Chapter 66, Article II:

- Division 1: Water Restrictions and Rain Shut Off Device, Sections 66-36 through 40
- Division 4: Fertilizer Use and Landscape Maintenance Practices, Sections 66-93 through 108

Administrative Regulation 12.10-1 Approved 4/26/2011

- Florida-Friendly Landscaping™ Green Industry Best Management Practices (FFL/GI-BMP) Educational Program

# Appendix D: List of Acronyms

| ABBREVIATION | DESCRIPTION |
|---|---|
| AES | Agriculture Environmental Services |
| BMAP | Basin Management Action Plan |
| BMP | Best Management Practices |
| CAMA | Office of Coastal and Aquatic Managed Areas |
| cfs | Cubic Feet Per Second |
| CPMIL | Center Pivot Mobile Irrigation Lab |
| CWA | Clean Water Act |
| DMR | Discharge Monitoring Reports |
| EPA | United States Environmental Protection Agency |
| ET | Evapotranspiration |
| FARMS | Facilitating Agricultural Resource Management Systems |
| FAWN | Florida Automated Weather Network |
| FDACS | Florida Department of Agriculture and Consumer Services |
| FDEP | Florida Department of Environmental Protection |
| FDOH | Florida Department of Health |
| FDOT | Florida Department of Transportation |
| FFBF | Florida Farm Bureau Federation |
| FFS | Florida Forest Service |
| FFWCC | Florida Fish and Wildlife Conservation Commission |
| FGS | Florida Geological Survey |
| FMRI | Florida Marine Research Institute |
| FSAID | Florida Statewide Agricultural Irrigation Demand |
| FWS | Florida Water Star |

| ABBREVIATION | DESCRIPTION |
|---|---|
| FYN | Florida Yards Neighborhoods |
| GFC | Game and Freshwater Fish Commission |
| GIS | Geographic Information System |
| GOES | Geostationary Operational Environmental Satellites |
| HCTF | Hernando County Task Force |
| HSC | Habitat and Species Conservation |
| HU | Housing Units |
| MFC | Marine Fisheries Commission |
| MFL | Minimum Flows and Levels |
| mgd | Million Gallons Per Day |
| NEP | National Estuary Program |
| NNC | Numeric Nutrient Criteria |
| NOAA | National Oceanic and Atmospheric Administration |
| NPDES | National Pollutant Discharge Elimination System |
| NRCS | Natural Resources Conservation Service |
| NSILT | Nitrogen Source Inventory and Loading Tool |
| NWR | National Wildlife Refuge |
| OAWP | Office of Agricultural Water Policy |
| OFMAS | Office of Fisheries Management and Assistance Services |
| OFW | Outstanding Florida Water |
| OSTDS | Onsite Sewage Treatment and Disposal Systems |
| ppt | Parts Per Thousand |
| RIB | Rapid Infiltration Basin |
| RWSP | Regional Water Supply Plan |
| SAV | Submerged Aquatic Vegetation |

| ABBREVIATION | DESCRIPTION |
|---|---|
| SCMC | Springs Coast Management Committee |
| SCSC | Springs Coast Steering Committee |
| SLER | Submerged Lands and Environmental Resources |
| SSL | Sovereign Submerged Land |
| SWFRPC | Southwest Florida Regional Planning Council |
| SWFWMD | Southwest Florida Water Management District |
| SWIM | Surface Water Improvement Management |
| TBRPC | Tampa Bay Regional Planning Council |
| TMDL | Total Maximum Daily Load |
| TWG | Technical Working Group |
| UF-IFAS | University of Florida - Institute of Food and Agriculture Sciences |
| UFA | Upper Floridan Aquifer |
| UFANMN | Upper Floridan Aquifer Nutrient Monitoring Network |
| USACE | United States Army Corps of Engineers |
| USCG | United States Coast Guard |
| USDA | United States Department of Agriculture |
| USDOI | United States Department of the Interior |
| USDW | Underground Sources of Drinking Water |
| USFWS | United States Fish and Wildlife Service |
| USGS | United States Geological Survey |
| WCAP | Water Compliance Assurance Program |
| WMIS | Water Management Information System |
| WRWSA | Withlacoochee Regional Water Supply Authority |
| 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 and 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 Chassahowitzka River and springs were adopted in 2013 and are scheduled for re-evaluation in 2019.

*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 .

*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 staff 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, the Division of Recreation and Parks manages and preserves Florida's natural treasures. The Chassahowitzka River Campground and Recreation Area contains the main spring for the Chassahowitzka River.

*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 Section 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 Coastal Office*

Florida Coastal Office (formerly Coastal and Aquatic Managed Areas) manages more than 4 million acres of the most valuable submerged lands and select coastal uplands. The Office manages 41 aquatic preserves, including the St. Martins Marsh Aquatic Preserve, a 23,000 acre preserve including submerged lands from the Crystal River to the Homosassa River along coastal Citrus County.

### 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.

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, together 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.

## Citrus County

### *Citrus County UF/IFAS Extension Service*

Citrus County Extension is a federal, state, and local partnership that provides research-based information from the University of Florida to the citizens of Citrus County. Citrus County Board of County Commissioners provides a place to work and the funding to carry out programs. Citrus County Extension serves as a link between university research and the local community by providing a wide variety of educational opportunities for adults and youth of Citrus County. Educational programs are directed at broad national and state concerns, as well as a focus on locally determined and citizen influenced priorities in areas such as lawns and gardens, nutrition and wellness, financial management, natural resources, Florida-friendly practices, and youth development (4-H).

### *Division of Aquatic Services*

The Division of Aquatic Services manages nuisance aquatic plants within the 25,000 surface acres of lakes and rivers in the County, and is also responsible for maintaining waterway signage, removal of derelict vessels (when funding is available), boating improvements, and artificial fishing reef projects.

### *Engineering Division*

The Engineering Division provides an adequate and safe County road system for public transportation through engineering processes and management. Citrus County Engineering provides information regarding topography, storm water drainage, specific watershed flood study data and specific county capital improvement project data.

### *Department of Planning and Development*

The Department of Planning and Development is comprised of the Divisions of Building, Code Compliance, Geographic Information Systems, and Land Development. The various Divisions implement programs and projects that guide the growth and development of the County, including, but not limited to, plans review, permitting, inspections, code enforcement, land use planning, environmental sciences, and historic preservation.

### *Utility Planning and Engineering Division*

The Utility Planning and Engineering Division manages utilities infrastructure projects, provides engineering and technical support to other governmental agencies, and participates in county wide planning to ensure compliance requirements are in place in advance of the development of projects.

### *Water Resources Department*

The Department of Water Resources is dedicated to providing safe drinking water and treating wastewater in full compliance with local, regional, state and federal requirements.

### Hernando County

The Hernando County Government sponsors and facilitates educational programs that encourage environmental stewardship and implementation of conservation best management practices that directly benefit springs protection and reductions of pollution loading within those systems. The County has acquired land in sensitive ecological areas and set these areas aside as preserves. The county has cooperated with SWFWMD to implement projects that reduce stormwater pollution and improve water quality before discharged to the aquifer.

### 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 Federation (FFBF)

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.

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

Draft potential projects and initiatives were provided by members of the TWG for review by the SCMC and SCSC. Tables 23-25 list projects and initiatives provided by members of the TWG that were not approved by the SCMC or SCSC to be included as a priority project or initiative.

## Water Quality

*Table 23: Draft Potential Water Quality Projects and Initiatives*

| **Monitoring & Research** |
|---|
| **Cleaning Canals with Aeration**<br><br>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. Cost would include consultant services to monitor and report results. 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.<br><br>Cost: $60,000 (Cost for implementation in Weeki Wachee, Homosassa, and Chassahowitzka) |
| **Conduct Synchronous Flow/Conductivity/Nitrate Concentration Measurements on All Springs Listed in the Chassahowitzka MFL**<br><br>Conduct synchronous water sampling of flows/conductivity/nitrate levels in all springs listed in the Chassahowitzka MFL. Compare the results to any hard (measured) data SWFWMD or anyone else can provide for any of these springs at any point in time.<br><br>Cost: TBD |
| **Legacy Nutrient Inventory and Management**<br><br>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.<br><br>Cost: $75,000 |
| **Agricultural Operations (Cattle Farms, Horse Farms, Row Crops)** |
| **NONE** |

| Septic Tanks |
| --- |
| **Hybrid Adsorption Biological Treatment (HABiTS) Biological Nitrogen Removal (BNR) Pilot Scale Study**<br><br>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:<br><br>1. Design and construction of HABiTS and conventional BNR systems at residential sites with septic systems.<br>2. Monitoring of system performance monthly over a two-year period.<br>3. Annual follow up to determine long term performance and maintenance requirements.<br><br>Cost: $150,000 |
| **Septic Tank Conversion Study**<br><br>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.<br><br>Cost: $140,000 |
| **Urban/Residential Fertilizer (includes Golf Courses)** |
| **NONE** |
| **Wastewater Treatment Facilities** |
| **Private Sewer Line Cost Sharing Program**<br><br>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.<br><br>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.<br><br>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.<br><br>Cost: $290,000 |
| **Stormwater** |
| **NONE** |
| **Septic/Sewage Solids Disposal** |
| **NONE** |
| **Atmospheric Deposition** |
| **NONE** |

## Water Quantity

*Table 24: Draft Potential Water Quantity Projects and Initiatives*

| |
|---|
| **Monitoring & Research** |
| **NONE** |
| **Conservation** |
| **NONE** |
| **Alternative Water Supply** |
| **NONE** |
| **Regional Water Supply Planning** |
| **NONE** |
| **Regulatory** |
| **NONE** |
| **Minimum Flows and Levels** |
| **NONE** |

## Natural Systems

*Table 25: Draft Potential Natural Systems Projects and Initiatives*

| Monitoring & Research |
|---|
| **Compliance Monitoring Technology Feasibility Study**<br><br>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.<br><br>Cost: $125,000 |
| **Habitat Conservation** |
| **NONE** |
| **Habitat Restoration** |
| **NONE** |
| **Invasive Species Management** |
| **NONE** |
| **Recreation Management** |
| **NONE** |