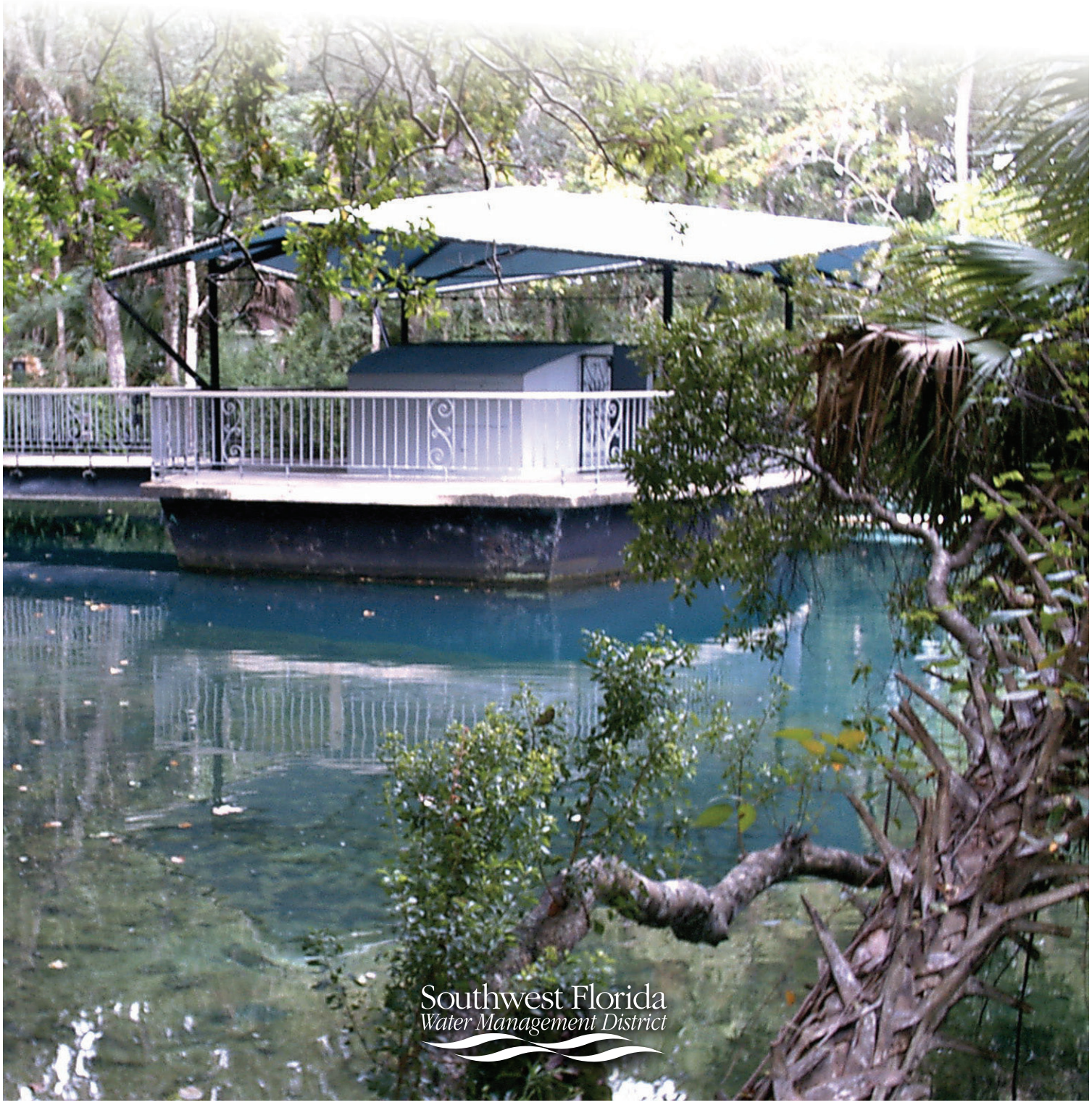
Homosassa River Surface Water Improvement and Management (SWIM) Plan

A Comprehensive Conservation and Management Plan

August 2017



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 Homosassa River.

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Executive Summary

The Homosassa River is located in western Citrus County approximately one mile west of the town of Homosassa Springs on U.S. Highway 19. The Homosassa River originates in the Homosassa Main Springs Pool in the Ellie Schiller Homosassa Springs Wildlife State Park and flows eight miles to the Gulf of Mexico. Over the past hundred years, the spring and river have experienced significant ecological shifts, caused by both natural variability and human activities.

In 1987 the Florida Legislature created the Surface Water Improvement and Management (SWIM) Act to protect, restore, and maintain Florida's highly threatened surface water bodies. Under this act, the state's five water management districts identify a list of priority water bodies within their authority and implement plans to improve them. In January 2014 the Governing Board of the Southwest Florida Water Management District (SWFWMD) approved the inclusion of the Homosassa 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 Homosassa 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 Homosassa 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 Homosassa 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 Homosassa 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
Water clarity – near the headspring	>40 feet[1]
Nitrate concentration in the river	<0.23 mg/L[2]
Water Quantity	
Minimum flow for the river system	>97% natural flow[3]
Natural Systems	
Coverage of desirable benthic habitat (SAV, oysters, etc.) in the river	>65%[4]
Coverage of invasive aquatic vegetation (including filamentous algae) in the river	<10%[4]
No net loss of shoreline in natural condition along the river	No net loss

[1] Based on data presented in Figure 17
[2] Bridger et al. 2014 – Nutrient TMDLs for Homosassa–Trotter–Pumphouse Springs Group, Bluebird Springs, and Hidden River Springs (WBIDs 1345G, 1348A, and 1348E)
[3] SWFWMD 2012 –Recommended Minimum Flows and Levels for the Homosassa River System
[4] Based on data presented in Figure 23

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 48 ongoing and 34 proposed projects that meet one or more management actions. Of the 34 proposed projects, the SCSC identified 21 proposed priority projects that are included in the body of this plan with the remaining 13 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 Homosassa River. This SWIM plan includes 14 ongoing and 6 proposed priority projects to address water quality issues in the Homosassa River (Figure 1).

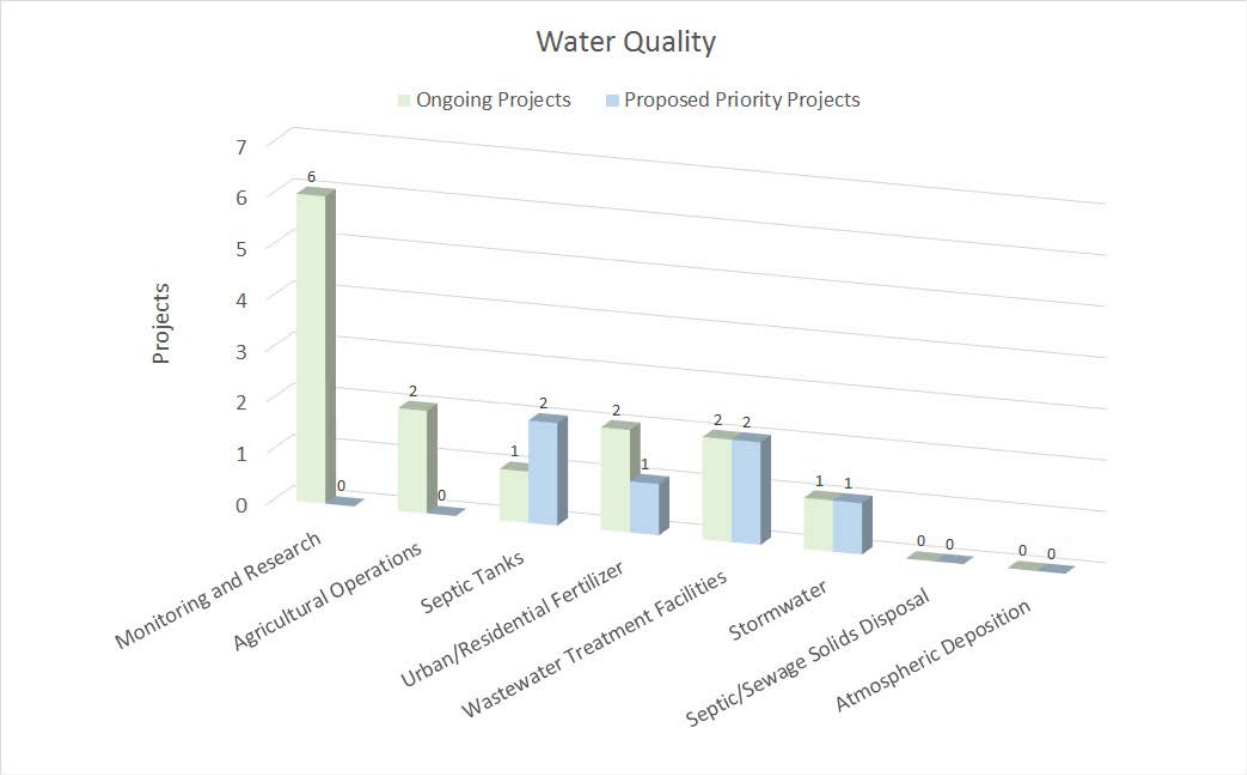


Figure 1: Water Quality Projects by Management Action Category

The water quantity management actions and projects are intended to protect and maintain flow in the springs that feed the Homosassa River. The SCSC recognizes that **Conservation** and **Minimum Flows and Levels** are the priority water quantity management action categories for the Homosassa River. This SWIM plan includes 26 ongoing and 7 proposed priority projects to address water quantity (Figure 2).

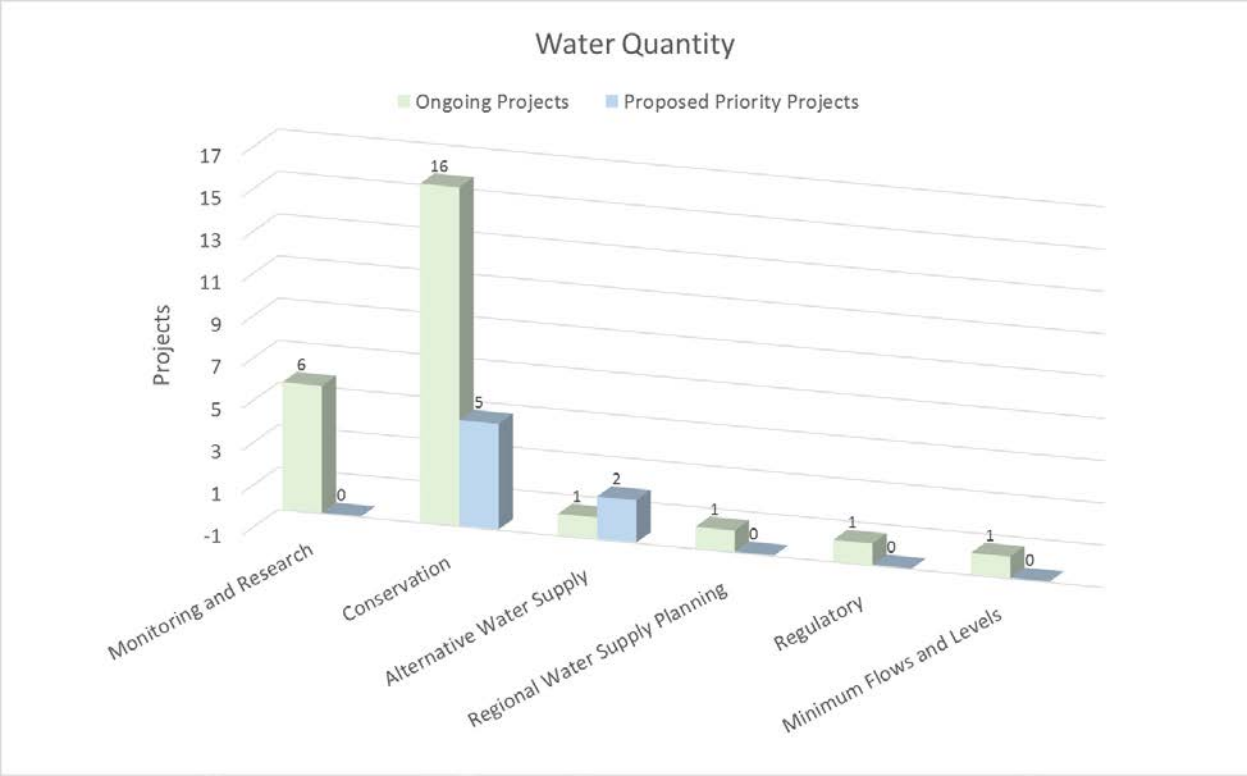


Figure 2: Water Quantity Projects by Management Action Category

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

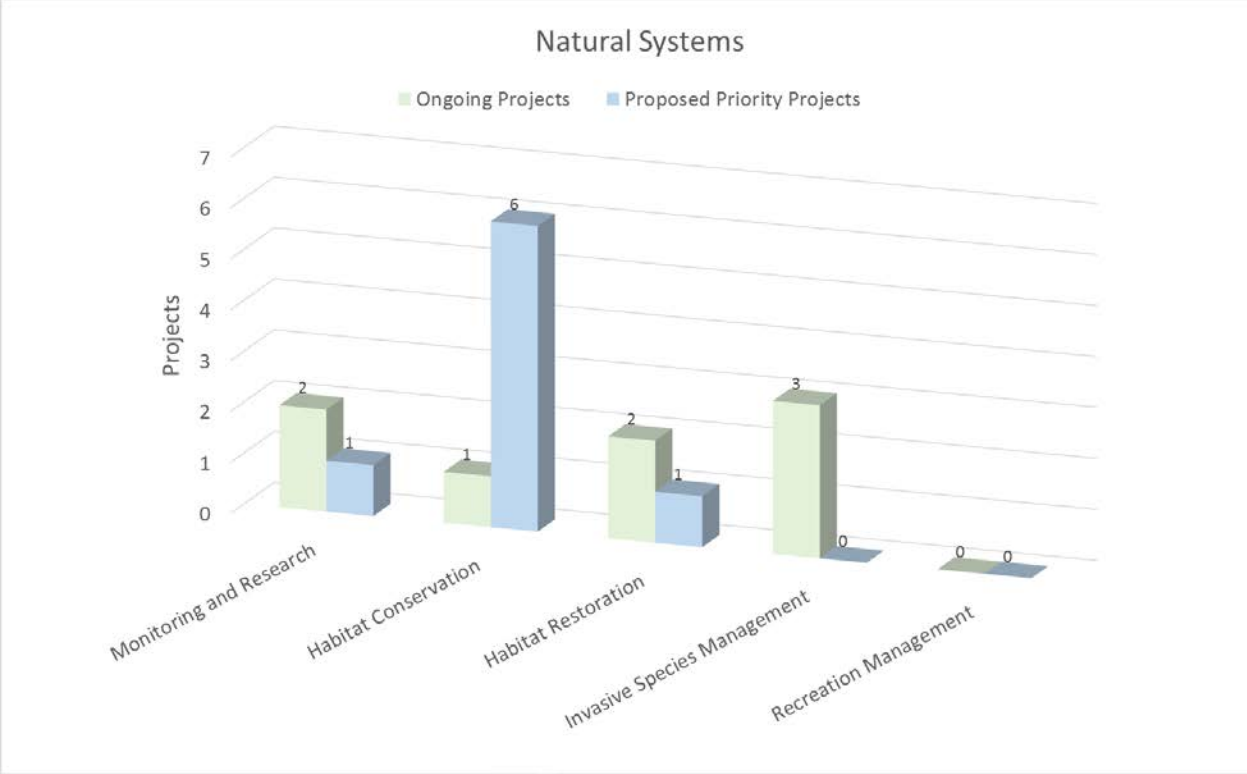


Figure 3: Natural Systems Projects by Management Action Category

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 are located in an area known as the Springs Coast and collectively discharge more than 800 million gallons per day.

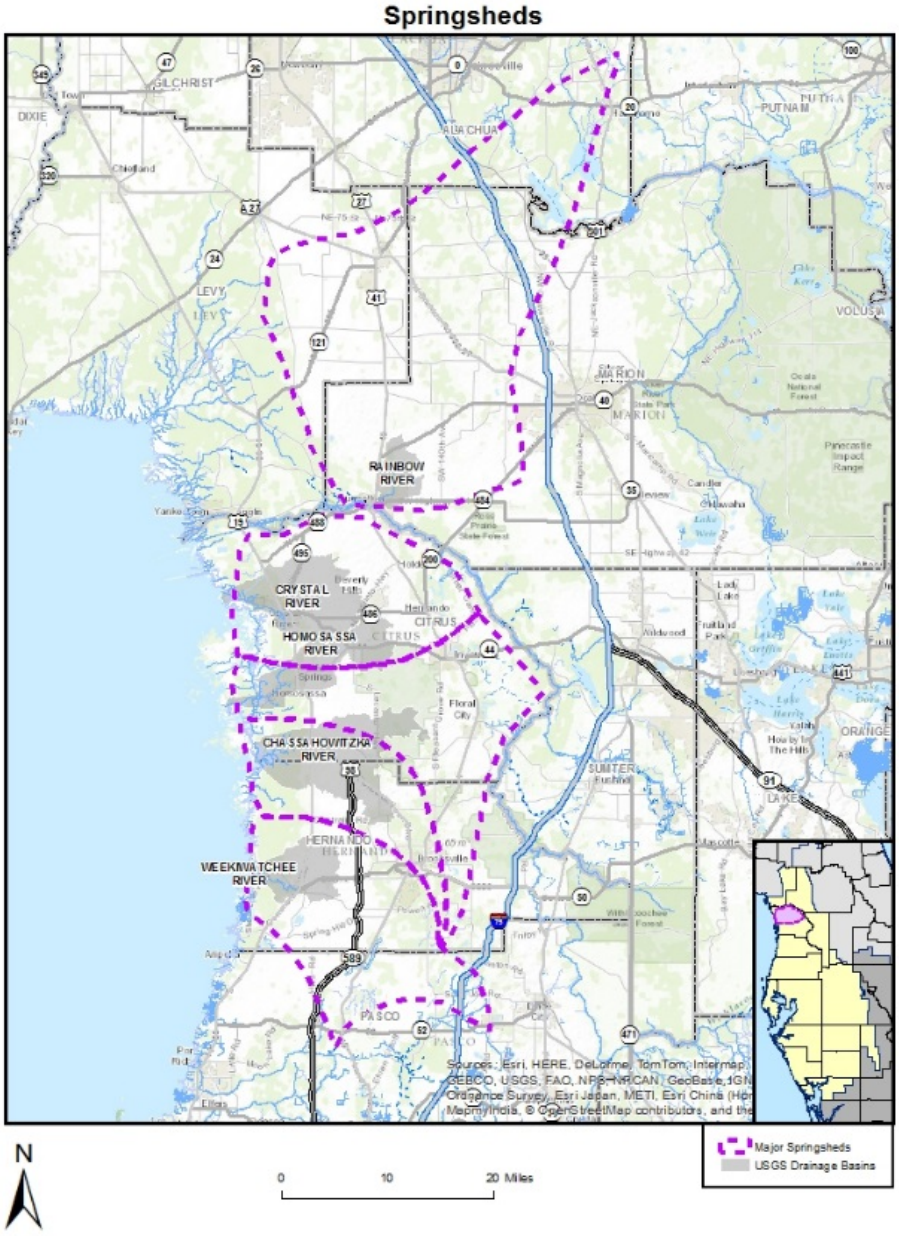


Figure 4: SWFWMD Major Springsheds

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

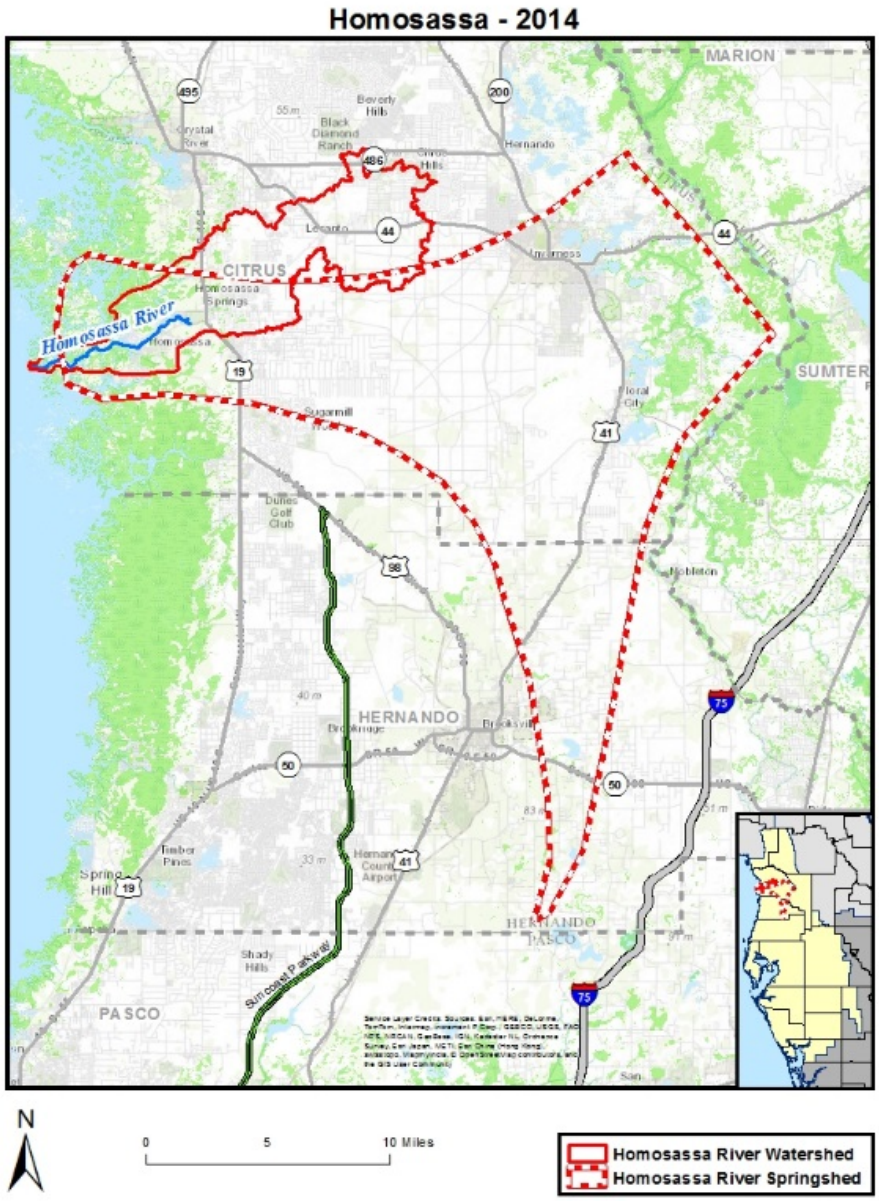


Figure 5: Homosassa Watershed and Springshed Boundaries

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

Springs Coast Steering & Management Committees

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

Table 2: Members of the Springs Coast Steering Committee

Organization	Representative	Title
City of Crystal River	Robert Holmes	City Council Member
Citrus County	Scott Carnahan	County Commissioner
Hernando County	Nick Nicholson	County Commissioner
Marion County	Kathy Bryant	County Commissioner
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, 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 the table 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 TWG 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 waterbodies 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 Homosassa River was named a SWIM priority water body in 2014.

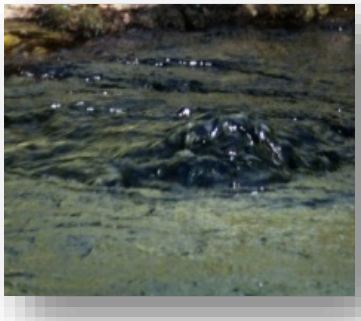
In accordance with the SWIM act, once a water body is selected, a SWIM plan must be adopted by the water management district's governing board and approved by the FDEP. Before the SWIM plan can be adopted, it must undergo a review process involving the required state agencies. The purpose of this Homosassa River SWIM plan is to set forth a course of action by identifying the quantity, scope, and required effort of projects appropriate for the system, while considering the levels of funding.

What Makes a Healthy Spring?

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

The quality of water is a key attribute of the ecology and aesthetics of the river, especially with regard to clarity, nutrients, and salinity. A defining characteristic of many Florida springs is exceptionally clear water, which is a primary driver of the productive aquatic vegetation that supports spring ecosystems. Nutrients control many ecological processes and may lead to imbalances of flora and fauna at elevated levels. 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 Homosassa River is designated by the state as a Class III surface water body, an Outstanding Florida Water (OFW), and a SWIM priority water body. The Homosassa River is located in western Citrus County approximately one mile west of the town of Homosassa Springs on U.S. Highway 19. The river originates from a complex of springs including a main spring which is fed by three large vents contained within a collapsed cavern feature and many smaller secondary vents dispersed over the surrounding four square miles (Jones et al. 1997). Near the main spring, the Homosassa River receives additional flow from secondary vents which create the southeast fork of the Homosassa River. About one mile downstream of the main spring the Homosassa River is joined by the Halls River, which is a spring-fed tidal creek that extends about three miles northeast.

Following the junction of the Halls River, the Homosassa River widens and is characterized by a shoreline with residential housing and canal systems, particularly along the north. At about 3.5 miles the lands surrounding the Homosassa River revert to largely undeveloped hydric hammock and then coastal marsh habitats. The extensive marsh complex has substantially reduced water clarity that improves with distance seaward of the mouth (Frazer et al. 2001). These marshes characterize the coastal region of Citrus and Hernando Counties and represent the estuarine zone that divides marine gulf waters from the low lying uplands to the east (Wolfe et al. 1990). At the 7-mile mark, the Homosassa River channel reaches the gulf, which in this area, is characterized by relatively thin sediments over limestone geology and oyster shell.

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 Homosassa Springs and the Homosassa 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 Homosassa 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 Homosassa Springshed area (Modified from Miller, 1986, Sacks and Tihansky, 1996)

<table>
<tr><th>Series</th><th>Stratigraphic Unit</th><th>Hydrogeologic Unit</th><th>Lithology</th></tr>
<tr><td>Holocene to Pliocene</td><td>Undifferentiated Surficial Deposits</td><td>Unsaturated zone, surficial aquifer or locally perched surficial aquifer</td><td>Sand, silty sand, clayey sand, sandy clay, peat, and shell</td></tr>
<tr><td>Oligocene</td><td>Suwannee Limestone</td><td rowspan="3">Upper Floridan aquifer</td><td>Limestone, cream to tan, sandy, vuggy, fossiliferous</td></tr>
<tr><td rowspan="3">Eocene</td><td>Ocala Limestone</td><td rowspan="2">Limestone, white to tan, friable to micritic, fine-grained, soft, abundant foraminifera</td></tr>
<tr><td rowspan="2">Avon Park Formation</td></tr>
<tr><td>Middle Confining Unit 2</td><td>Dolomite is brown, fractured, sucrosic, hard. Interstitial gypsum in MCU 2</td></tr>
<tr><td></td><td>Oldsmar Formation</td><td>Lower Floridan aquifer</td><td>Limestone and dolomite. Limestone is tan, recrystallized. Anhydrite and gypsum inclusions.</td></tr>
<tr><td>Paleocene</td><td>Cedar Keys Formation</td><td>Basal Confining Unit</td><td>Massive anhydrites</td></tr>
</table>

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 Homosassa 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 Homosassa 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 Homosassa springshed based on the average of the Brooksville and Inverness National Weather Service Stations (1901-2014) is 53.5 inches per year with the highest monthly rainfall in August.

Springsheds or spring recharge basins are catchment areas that contribute groundwater to a spring vent or spring group (FGS 2003). The boundaries of a springshed are mostly defined by groundwater potentiometric surface elevations as measured by water levels in monitoring wells. Similar to topographic drainage, groundwater elevation differences and other aquifer properties cause groundwater movement through the springshed to the spring. Springshed boundaries are relatively constant but can move slightly from year-to-year based on variations in rainfall and groundwater recharge. The Homosassa springshed covers a significant land area in northern Hernando County and central Citrus County. The Florida Geological Survey (FGS) estimated the springshed area for Homosassa Springs to be approximately 286 square miles (Figure 6).

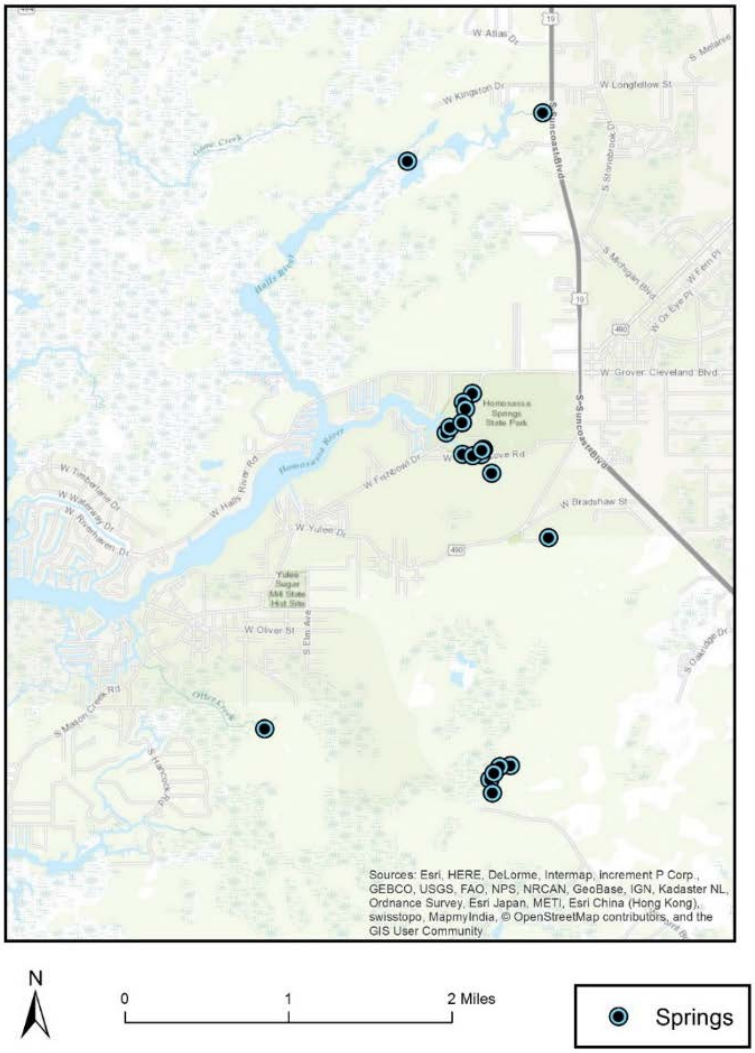


Figure 6: Homosassa Springs Locations

The hydrogeology in the Homosassa springshed includes a surficial aquifer, a discontinuous intermediate confining unit, and a thick carbonate Upper Floridan aquifer (UFA) (Figure 7). 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 UFA is unconfined over most of the 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 Homosassa 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.

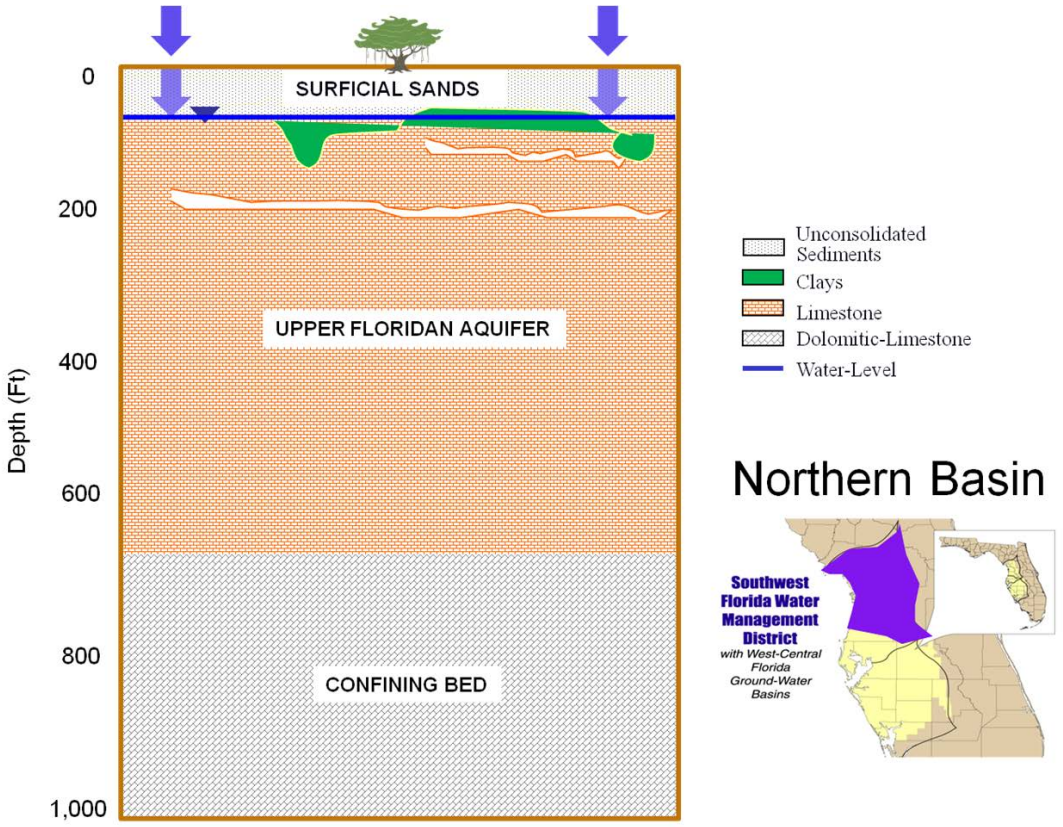


Figure 7: Generalized Hydrogeology of the Homosassa Springshed

The Homosassa springshed is located within the larger 4,600 square mile Northern West-Central Florida Groundwater Basin (SWFWMD 1987) one of eight regional groundwater basins located on the Florida peninsula. Similar to topographic divides that separate surface water drainage basins, groundwater basins are delineated by divides formed by high and low elevations in groundwater levels. Groundwater does not flow laterally between basins. Each basin also generally contains similar geology regarding the confinement of the UFA. In the Southwest Florida Water Management District there are three regional groundwater basins: The Northern, Central and Southern (Figure 7). The UFA is generally unconfined in the northern basin, semi-confined in the central basin, and well-confined in the southern basin. In well-confined basins, water level declines due to pumping are greatest and most widespread. In leaky or unconfined basins, water level declines are more localized and close to major pumping centers. This limits regional pumping impacts to within each basin or along their boundaries.

The UFA within the Homosassa 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 Citrus County with values ranging between 10 and 25 inches per year (Sepulveda 2002). Much of the flow to Homosassa 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 Homosassa 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 2004).

The Homosassa River springs system is located in southwest Citrus County. A large spring and numerous smaller springs provide flow to the Homosassa River, which winds through nearly seven miles of lowland swamps and discharges into the Gulf of Mexico. Freshwater flow to the Homosassa River is the result of discharge from Homosassa Springs, springs within the southeast fork of the Homosassa River, and springs within the Halls River (Knochenmus and Yobbi 2001). Mean annual discharge for the Homosassa River (primarily from the springs) averaged 211 cubic feet per second (cfs) or 138 million gallons per day (mgd) for the period 2004—2015.

Ecology

The first ecological record of the Homosassa River is from the early 1950's and focused on aquatic insects and submersed aquatic vegetation (SAV) (Sloan 1956). Around the main spring pool, the dominant rooted aquatic plants in order of abundance were eelgrass (*Vallisneria americana*), Sago pondweed (*Stuckenia pectinatus*) and southern naiad (*Najas guadalupensis*). As the water flowed from the pool into river, the SAV changed to predominantly Sago pondweed. Within 0.5 mile from the main spring, the SAV was mainly eelgrass with heavy epiphytic algal growth, and smaller amounts of Sago pondweed were in the deeper parts of the river. Below the Halls River where the width of the channel increases, the hardwood swamp through which the river flows rapidly gave way to sawgrass (*Cladium jamaicense*) marsh. Sloan (1956) noted that this was probably the most inland part of the river to show daily fluctuations in chloride concentration. At about this point, the water turbidity increased downstream and the bottom of the river was composed of fine black silt, probably organic in origin, accompanied by the odor of hydrogen sulfide. In this section, the dominant SAV were Sago pondweed and southern naiad. One mile downstream, the sawgrass was replaced by black needle rush (*Juncus roemerianus*) and the silt, which was found overlying a very soft mud bottom in the sawgrass area, was now underlain by marine shell deposits. Sago pondweed was still the dominant rooted aquatic but southern naiad and eelgrass were found in small patches. These conditions persisted for approximately two more miles and then the marine alga *Sargassum sp*. became common and rooted SAV disappeared. The historical estimate of SAV abundance ranged from 30 to 50% coverage in the spring pool and above the Halls River, 30 to 70% above the marsh, and 5 to 15% in the lower estuarine portion of the river (Sloan 1956).

By the late 1960s, the Homosassa River was reported to be invaded by the non-native Eurasian watermilfoil (*Myriophyllum spicatum*) (Blackburn and Weldon 1967). By 2000 this was no longer the case and SAV had become sparse with SAV absent from 47% of locations sampled in the river (Frazer et al. 2001). At those stations where SAV did occur, filamentous algae were most abundant and Eurasian watermilfoil remained the dominant vascular plant in the system. From 1998 to 2015 a total of 9 species of vascular SAV and several types of macroalgae were observed in the Homosassa River (SWFWMD 2016a). The 2006-2011 period was marked by further declines in all SAV and algal species compared to the 2003-2005 period. As of 2015, the Homosassa River has experienced about a 90% reduction in biomass and a 50% reduction in coverage compared to the 1998 to 2000 time period (SWFWMD 2016a).

Historic filamentous algae observations from Homosassa Springs were described in the 1950's as being composed of *Cladophora sp*., *Cocconeis sp*., and *Enteromorpha sp*. as consistent with other oligohaline springs in Florida (Whitford 1956). As part of a multi-spring study, the filamentous algae in the spring run area were surveyed during March and November of 2003 (Stevenson et al. 2007). During these events, algal mats ranged from 17% to 79% coverage with a corresponding average depth of 3 to 11 inches. In November, the most abundant algae species were *Chaetomorpha sp*. at 79% coverage followed by Bacillariophyta (16%), *Enteromorpha sp*. (4%), and *Spirogyra sp.* (7%); while in March only *Chaetomorpha sp*. and *Lyngbya sp*. were observed and exhibited about 12% and 5% coverage respectively (Stevenson et al. 2007). Filamentous algae mats in the Homosassa River have been managed by Citrus County using mechanical harvesters in recent years. In 2014-15, FWC reported about 15 acres of treated filamentous algae for the Homosassa River (FWC 2016).

Emergent plant species from the springs run include giant leather fern (*Acrostichum danaeifolium*), alligator weed (*Alternanthera philoxeroides*), water hemlock (*Cicuta maculata*), sawgrass (*Cladium jamaicense*), day flower (*Commelina sp*.), spider lily (*Hymenocallis sp*.), common reed (*Phragmites australis*), and sedge (*Scirpus sp*.); while floating species include water hyacinth (*Eichhornia crassipes*) and mosquito fern (Azolla *caroliniana*) (WSI 2010).

Riparian woody tree species noted by WSI (2010) include red maple (*Acer rubrum*), saltbush (*Baccharis halimifolia*), Florida dogwood (*Cornus foemina*), Dahoon holly (*Ilex cassine*), persimmon (*Diospyros virginiana*), southern red cedar (*Juniperus silicicola*), wax myrtle (*Myrica cerifera*), swamp bay (*Persea palustris*), water oak (*Quercus nigra*), live oak (*Quercus virginiana*), cabbage palm (*Sabal palmetto*), Carolina basswood (*Tilia caroliniana*), and tupelo (*Nyssa sp*.) ; while vine-like species include: climbing aster (*Aster carolinianus*), climbing hemp vine (*Mikania scandens*), poison ivy (*Rhus radicans*), and grape (*Vitis sp*.). Exotic upland plant species include Boston fern (*Nephrolepis exaltata*).

A detailed historical examination of the aquatic insect larvae utilizing the Homosassa River was provided by Sloan (1956) who collected between 5 and 10 species from the orders Diptera, Ephemeroptera, Trichoptera, Hemiptera, Coleoptera, Lepidoptera, and Odonata. Sloan (1956) concluded that oxygen and salinity gradients influenced the observed insect distributions. In 2009, emergent invertebrates were sampled, with a total of 2 orders (12 Diptera and 1 Trichoptera) of insects collected (WSI 2010).

Invertebrates have been characterized during the MFL evaluation of the Homosassa system (SWFWMD 2012) and by Grabe and Janicki (2010) who performed a characterization of the benthic macroinvertebrate community of Homosassa and Halls Rivers, which included samples from the spring run, Southeast Fork, Halls River, and through the mouth of the river. Within the Homosassa River the dominant taxa included the amphipods *G. bonnieroides* and *Ampelisca spp*., along with the polychaete worm *Mediomastus spp*. In a 2015 assessment, crustaceans were the dominant taxonomic group within all habitats (SAV, rock, macroalgae, and snag habitats), with the second and third dominant groups being molluscs and Diptera (midges). Annelida worms were the second dominant taxa in sediment. Although Ephemeroptera were rare across all habitats, they were most common in macroalgae samples. Collector-gatherer/deposit feeders were the most dominant functional feeding group in all habitats within the Homosassa River and the Halls River. Browser-grazers contributed substantially to the overall composition of the invertebrate communities from rock habitats within the Halls River (SWFWMD 2016b).

Marine fish congregate in the boil of Homosassa Springs and contribute to a relatively high fish diversity at this spring (Walsh and Williams 2003). Walsh and Williams (2003) collected 34 species of fish by electrofishing downstream of the park footbridge in October 2002. Combining these findings with previous collections by Herald and Strickland (1949), an estimated minimum of 47 species of fresh and salt water fishes have been collected from Homosassa Springs in and near the spring (Walsh and Williams 2003). Twenty-two species of fish were observed from snorkel surveys done in 2009 (WSI 2010). More recently, the fish community is being assessed by FWC using electrofishing and seines in both summer and winter seasons between 2014 and 2016. To date, FWC has collected 33 species of freshwater and saltwater fish. During the summer, the 64% of collected fish were freshwater species, while during the winter, 95% of the fish community was marine. Common freshwater species include spotted sunfish (*Lepomis punctatus*), bluegill *(L. macrochirus*) and largemouth bass *(Micropterus salmoides*). Common marine species include snook (*Centropomus undecimalis*), Crevalle jack (*Caranx hippos*), gray snapper (*Lutjanus griseus*), and striped mullet (*Mugil cephalus*).

Overall, the presence of reptiles and amphibians on the Homosassa system remain poorly described. American alligators (*Alligator mississippiensis*) and Florida cooter turtles (*Pseudemys floridana*) are

occasionally observed. Diamondback terrapin (*Malaclemys terrapin*) and sea turtles are present in the gulf waters, and loggerhead sea turtle (*Caretta caretta*) have been observed near the spring run (WSI 2010).

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

The Ellie Schiller Homosassa Springs Wildlife State Park has numerous birds and mammals as part of the attraction. The bacteriological impact of these captive animals has been a recognized water quality concern due to elevated coliform and fecal coliform concentrations in the spring run. Fecal bacterial concentrations (total and fecal coliforms, *Clostridium perfringens*, and enterococci) were measured as relative indicators of fecal contamination during 1997 and 1998 at a variety of locations in the park (Griffin et al. 2000). The highest concentrations of all fecal indicators were found at a station downstream of the animal holding pens while lowest concentrations of fecal indicators were observed in spring vents (Griffin et al. 2000). These results suggest that animal (indigenous and captive and not human sources were contributing to the microbial water quality (Griffin et al. 2000). The park has spent $1.1 million making improvements including connecting the park's wastewater discharge to a county wastewater treatment facility (WWTF) (FDEP 2005). FDEP has monitored water quality associated with the discharge from animal exhibits (FDEP 2014).

Because of the direct connection to the Gulf of Mexico, Homosassa Springs and the area where the southeast fork joins, locally known as Blue Waters, serves as an important Florida manatee (*Trichechus manatus latirostris*) warm water refuge. The spring pool and run are surrounded by a variety of park attractions and run about 400-feet downstream to a footbridge. Several captive manatees are kept in the spring pool/run for rehabilitation and education during the summer. Along the spring run, there is a footbridge with a metal barrier system which prevent manatee passage. There are two gates that can be opened in the winter to allow wild manatee access to the spring pool.

The number of manatees utilizing the upper river as warm water refuge has increased dramatically since surveys began in the late 1960s (Beeler and O'Shea 1988). Aerial surveys conducted by the US Fish and Wildlife Service include 127 manatees in December 2003 and 217 animals in February 2016 (J. Kleen, USFWS, pers. comm.). Taylor (2006) summarized historic manatee use of the Homosassa

Springs system with a record of one manatee in the Homosassa River from 1879 (Powell and Rathbun 1984), while a survey from 1967 to 1974 documented a range of 8 to 17 manatees (Hartman 1974). Manatee access to Homosassa Springs was enhanced by dredging to deepen the lower spring run area by the Army Corps of Engineers and the installation of gates that could be raised to allow wild manatee access to the spring run, both in 2006.

Historical Context

Homosassa has been a popular settlement as far back as 12,000 years prior to the arrival of Spanish explorers. In the 16th Century Hernando De Soto explored the area but it was the passage of the Armed Occupation Act of 1842 that spurred modern development. This act granted 160 acres to any head of family or single man over eighteen who was able to bear arms, could live on the land in a house fit for habitation during five consecutive years, and cultivate at least five acres. In 1846, David Levy Yulee established a 5,100 acre plantation and sugar mill (Figure 8).

During the Civil War, Homosassa's growth stopped while the community supported the Confederate war effort including successfully stopping an attempted raid by the Union Navy early in the war. David Yulee felt first-hand the effects of the war. In May of 1864, a Union Naval attack destroyed Mr. Yulee's mansion on Tigertail Island in the Homosassa River. The sugar mill was not destroyed, but never put to use again.

Figure 8: Ruins of the historic Yulee Sugar Mill in Old Homosassa

In 1887-1888, the Silver Springs, Ocala, and Gulf Railroad Company constructed from Dunnellon to Homosassa an extension of its Ocala to Dunnellon line, which was built in 1885-1887 (Figure 9). The train opened up trade and tourism between Homosassa and Ocala, and from Ocala to the northeast and the rest of the country. In 1941, the track and depot in Homosassa were discontinued.

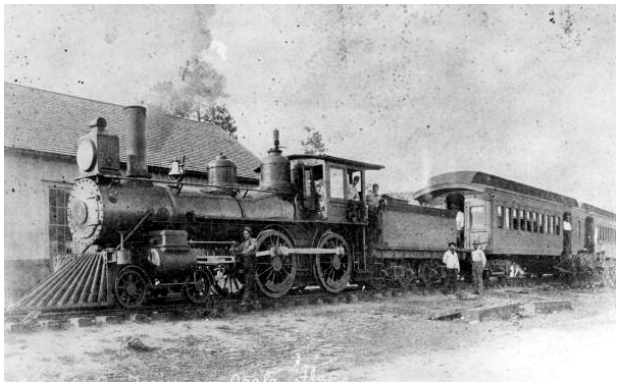


Figure 9: Silver Springs, Ocala, and Gulf Railroad Company Engine #2

By the 1920's, the West Coast Development Company was taking advantage of the public's fascination with Florida land and purchased thousands of acres, advertised heavily, brought in celebrities to attract prospects, and began ambitious building projects. In 1924, Mr. Bruce Hoover founded the Homosassa Development Company. The company purchased the land around the springs and surrounding acreage, which later became the community of Homosassa Springs. This was the early beginnings of significant residential growth around the tourist attraction known as "Nature's Fishbowl" and what is now Ellie Schiller Homosassa Springs State Park.

The Great Depression quickly ended any grand development plans, however the springs remained a popular attraction where the railroad would stop and let passengers off to walk the short trail to the first-magnitude headsprings.

In the 1940's, US Highway 19 was built but it wasn't until the 1960's when development really started to pick up once again with tourism as its central theme. In addition to fueling a post-WWII tourist economy, the area also saw development in lumber, citrus, and both commercial and recreational fishing.

At the headsprings of the Homosassa River a 50 acre site and surrounding 100 acres were purchased in the 1940s and operated as a small attraction. In 1964, the Norris Development Company bought the property and expanded it as Homosassa Springs "Nature's Own Attraction," with an emphasis on entertainment and with a variety of exotic animals and some native species (Figure 10).

Figure 10: Homosassa Springs has been a popular tourist attraction since the early 1900's

Ivan Tors Animal Actors housed their trained animals at the Homosassa Springs attraction for several years. These animals were trained for television shows and movies, and when they were not performing

they were kept at Homosassa Springs. One of the most popular of these animals was the bear Buck who was a stand-in for Gentle Ben in the famous television series. Lucifer the hippopotamus was one of the Ivan Tors animals and still resides at the park after being declared an honorary citizen of the State of Florida by then Governor Lawton Chiles. Norris owned the attraction until 1978 (Figure 11).

Figure 11: Lucifer "Lu" the Hippopotamus and Honorary Florida Citizen

From 1978 until 1984, the land went through several changes in ownership. Citrus County purchased the attraction to protect it as an environmentally sensitive area until the State of Florida could purchase the property as a Florida State Park.

Today, the Ellie Schiller Homosassa Springs Wildlife State Park attracts visitors from around the world. The park facilities are split between two locations, the first, adjacent to U.S. HWY 19, includes a restaurant, gift shop, and administrative offices. The second facility is located about one mile west and includes an underwater observation platform known as the fish bowl (Figure 12), and extensive animal and nature exhibits.

Figure 12: The "Fishbowl" as Ellie Schiller Homosassa Springs Wildlife Park

Homosassa Springs State Park is a popular destination for wildlife viewing, nature park programs, and general tourism. The park does not allow in-water recreation within park property. Swimming takes place outside the park, in the Homosassa River and in the limited spring run downstream of the park footbridge. Access to this swim area can be made from boats launched on the Homosassa River.

Ellie Schiller Homosassa Springs Wildlife State Park is also a designated manatee rehabilitation center and has been a participant in the United States Fish and Wildlife Service (USFWS) Manatee Rescue, Rehabilitation and Release Program for 30 years (Figure 13). Over that time period, the park has helped rehabilitate more than 40 injured manatees many of which have been successfully released back into the wild.

Figure 13: Manatee "Intensive Care Unit" at Homosassa Springs Wildlife Park

Land Use

Land use within the Homosassa springshed was characterized from aerial photography flown in 1989-91 (Jones et al. 1997). At that time, despite a great deal of growth since the 1950's, the area still contained a rural character, with coastal swamps, woodlands, lakes, and pastures. Corresponding to increased population growth trends, the amount of land utilized by low to medium density residential and commercial properties has also risen. Residential and commercial development along U.S. HWY 19 has been concentrated along the corridor between the coastal swamps and the upland forest of the Brooksville ridge.

Land use information for the Homosassa springshed is from the 2011 SWFWMD land use Geographic Information System (GIS) coverage (Table 5). In 2011, forest, urban land uses, and wetland areas covered most of the contributing area, covering 42%, 24%, and 18%, respectively. Agricultural areas were fourth, covering 13% of the Homosassa springshed. A significant forested area in the springs' contributing area is the nearly 50,000-acre Citrus Wildlife Management Area, managed by the FFWCC and located just west of Inverness. Urbanized areas increased from 56 square miles (mi^2) in 1988 to 70 mi^2 in 2011. Conversely, agricultural areas decreased from 48 mi^2 in 1988 to 38 mi^2 in 2011. Replanting efforts have maintained forested areas between these times, with estimated forested areas at 126 mi^2 in 1988 and 121 mi^2 in 2011 (Bridger et al. 2014).

Table 5: Percentages of major land uses in the spring contributing area in 2011 (from Bridger et al. 2014)

Code	Land Use	Square Miles	Acreage	% of Contributing Area
1100	Low-Density Residential	45	28,643	15.57%
1200	Medium-Density Residential	13	8,099	4.5%
1300	High-Density Residential	2	1,074	0.69%
1400	Commercial	2	1,493	0.69%
1500	Light Industrial	0	192	0%
1600	Extractive/Quarries/Mines	1	801	0.35%
1700	Institutional	1	848	0.35%
1800	Recreational (Golf Courses, Parks, Marinas, etc.)	1	670	0.35%
1900	Open Land	5	2,937	1.73%
2000	Agriculture	38	24,412	13.15%
3000	Rangeland	2	664	0.7%
4000	Forest/Rural Open	121	77,661	41.86%
5000	Water	5	3,441	1.73%
6000	Wetlands	51	32,517	17.65%
8000	Communication and Transportation	3	1,221	0.7%
-	**Total**	**289**	**185,200**	**100%**

The land use within the Homosassa springshed influences the water quality of the receiving spring (Figure 14). In 2011, approximately 20% of the Homosassa springshed was in residential land uses, and the most populated areas are in Citrus County close to the spring, mainly lying between U.S. Highways 19 and 41A. Anthropogenic sources of nitrate in the springshed include fertilizers (urban and agricultural) and waste (human and animal). In addition, a legacy nitrate load may exist in the soil and aquifer as a result of past agricultural activities (Jones et al. 1997, Bridger et al. 2014). Due to this relationship, implementing land use plans that minimize additional nitrogen loadings would substantially contribute towards improved spring and aquifer water quality.

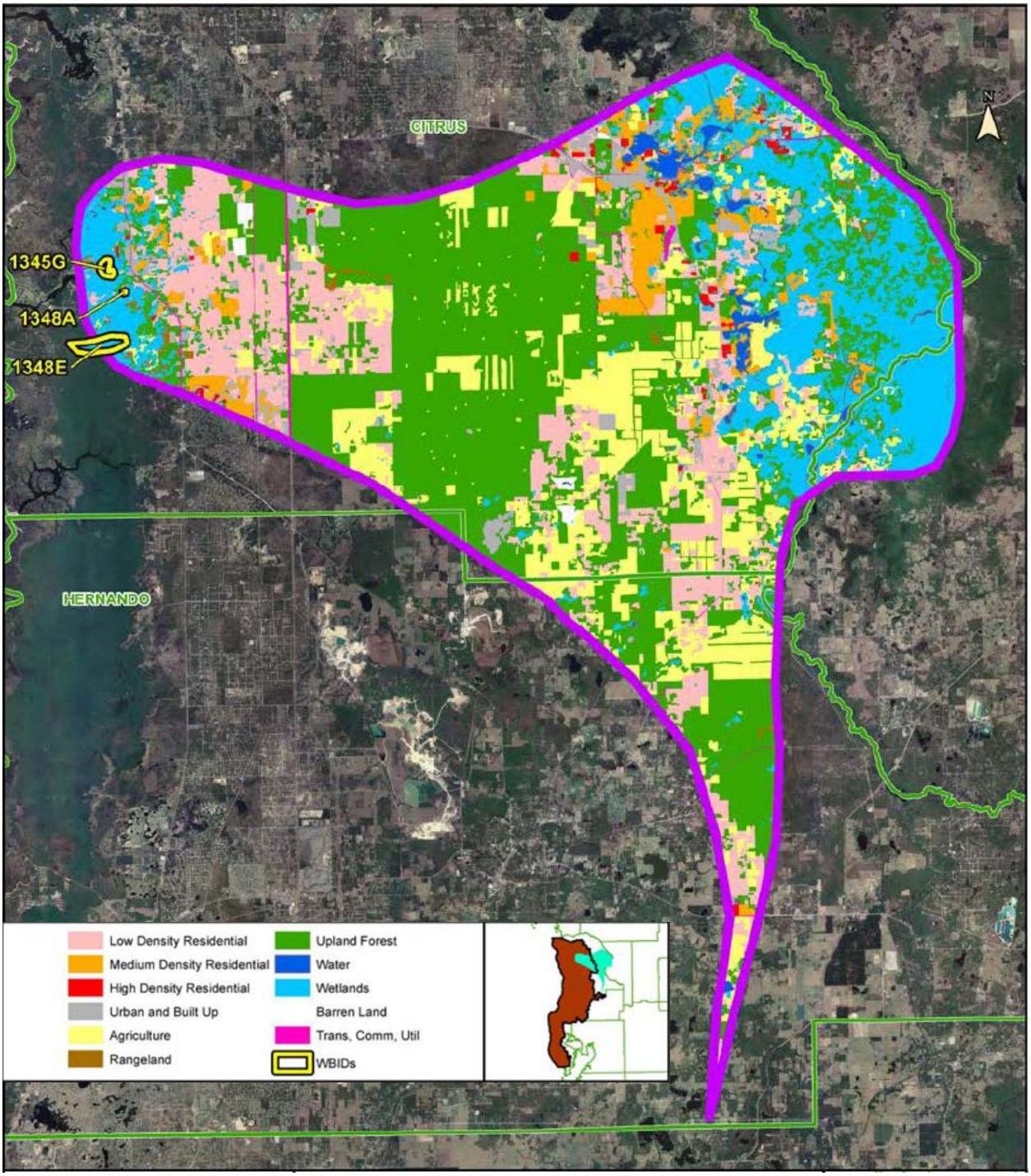


Figure 14: Land uses in the spring contributing area based on 2011 SWFWMD data (adapted from Bridger et al. 2014)

Issues and Drivers

Over the past hundred years, the Homosassa 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 Homosassa 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, Bridger et al. 2014). 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 (Figure 15). 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.

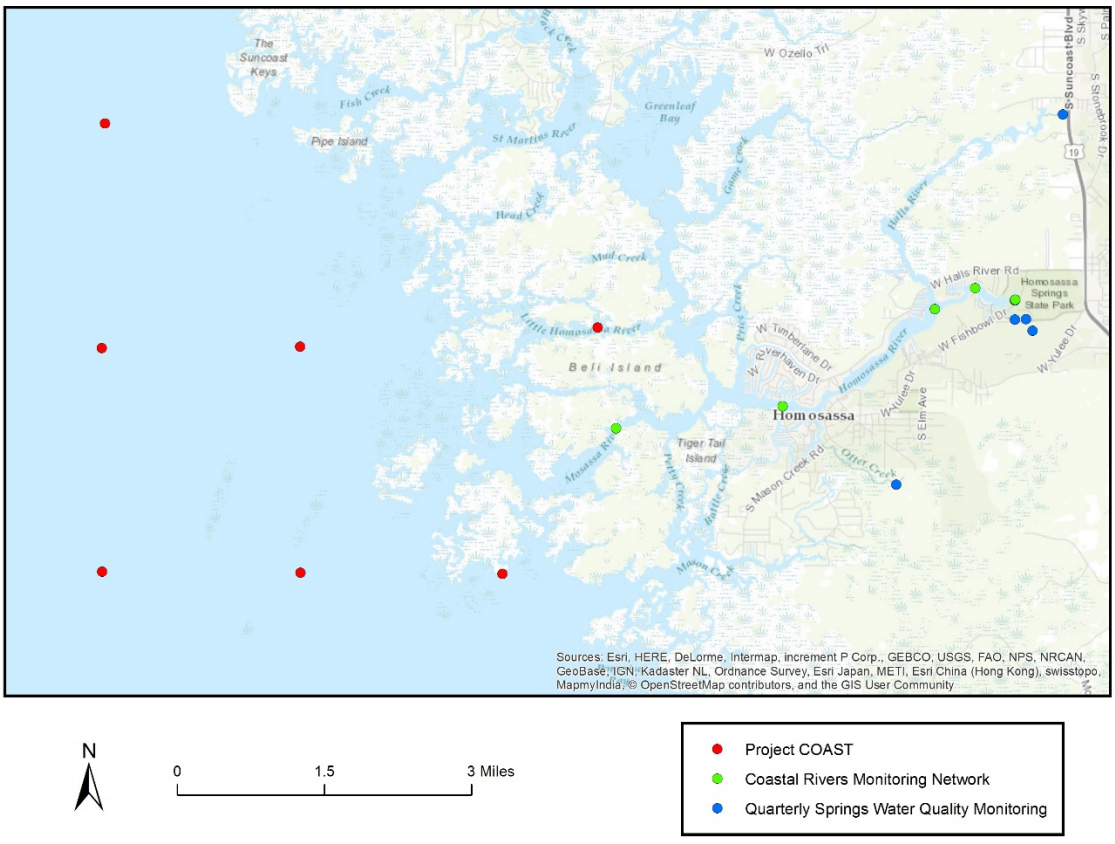


Figure 15: Homosassa River Water Quality Data Stations

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 Homosassa 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 Homosassa River (Figure 16) since at least 1972 (FGS 2004). Nitrate concentration averaged 0.7 mg/L in 2015, whereas the earliest measurement was 0.08 mg/L in 1955 (Odum 1957). Historical background nitrate concentration for springs is considered to be 0.1 mg/L or less (Rosenau et al. 1977).

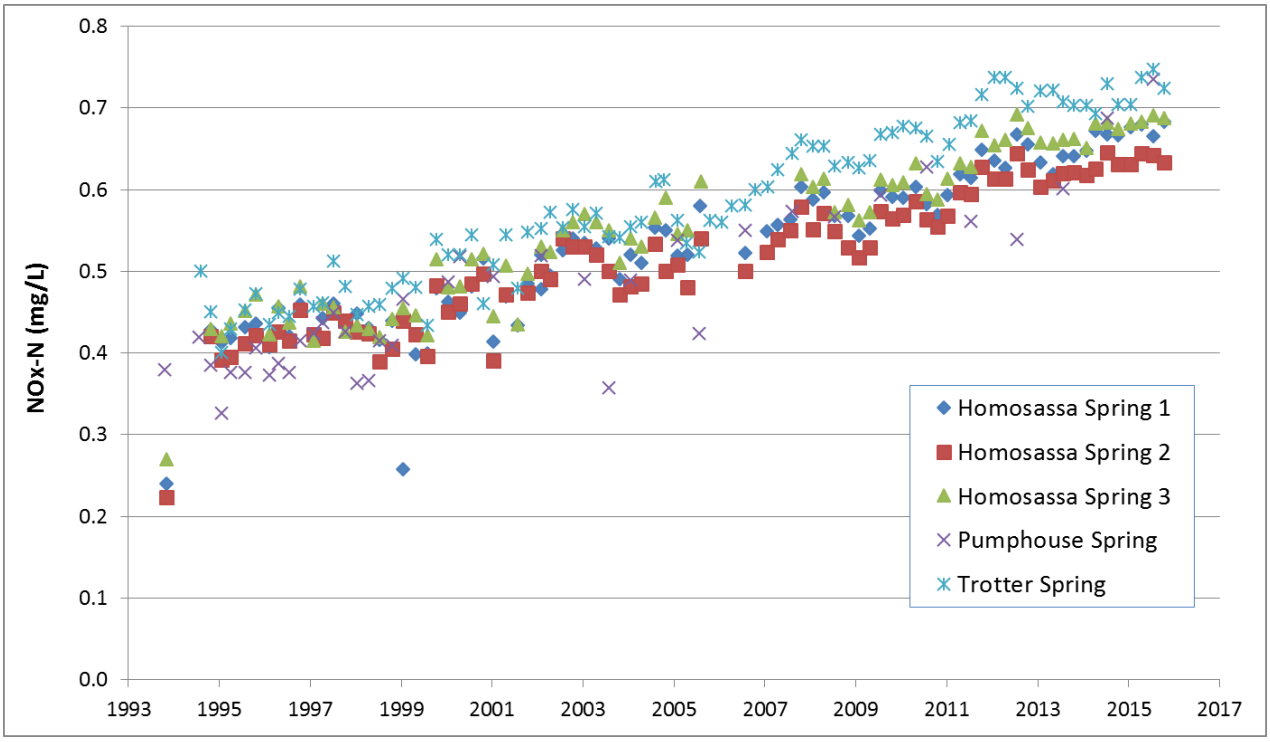


Figure 16: Nitrate Changes in Several Homosassa River Springs

In 2012, the FDEP adopted Homosassa Springs, Trotter Springs, and Pumphouse Springs (WBID 1345G), Hidden River Springs (1348E) and Bluebird Springs (WBID 1348A), 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 Homosassa 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 (Bridger 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 Homosassa River the annual average nitrate concentration TMDL target is 0.23 mg/L.

The Homosassa River springs TMDLs will require reductions in nitrate concentrations ranging from 63% to 76%. 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 Homosassa 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 Homosassa River BMAP area (42% total). Urban fertilizer was also a substantial source (24%). The other sources identified were septic tanks, atmospheric deposition, sports turf fertilizer, and wastewater treatment facilities (Figure 17). 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.

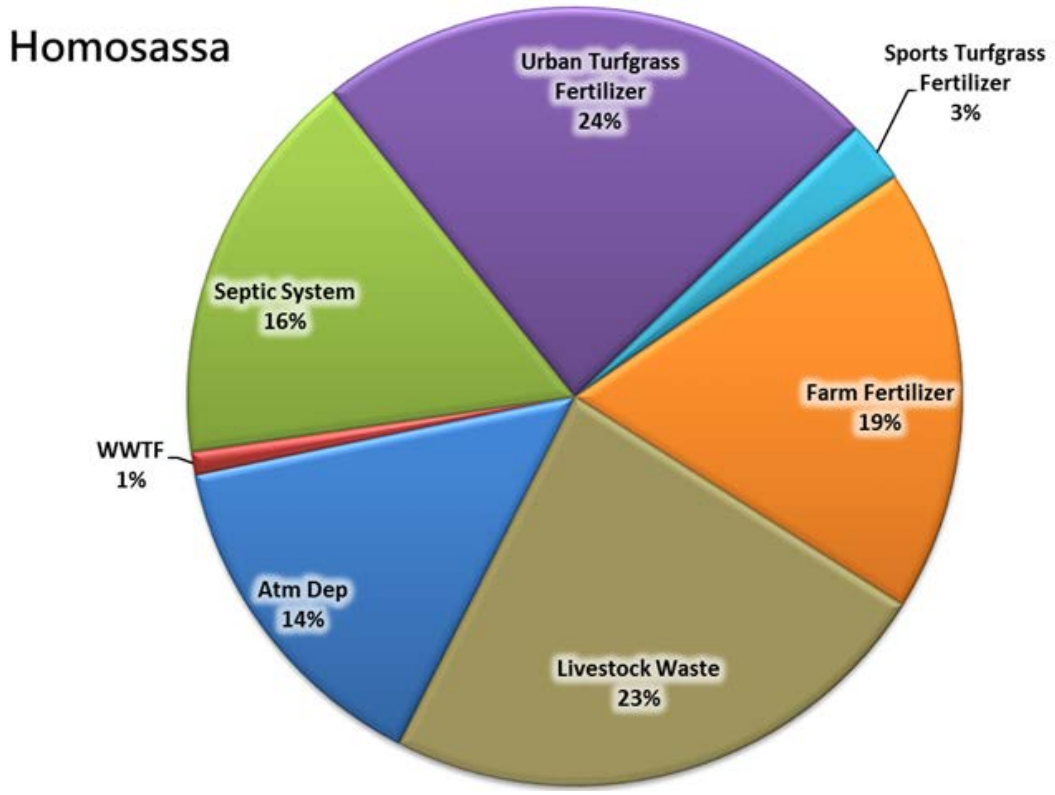


Figure 17: Nitrogen Inputs to Groundwater in the Homosassa River BMAP Area by Source Category (draft)

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

The springs of Florida are known for their exceptional water clarity (Duarte and Canfield 1990). High water clarity is important because it allows sufficient light penetration for the productive aquatic vegetation and beneficial algal communities that support spring ecosystems. Water clarity in the Homosassa 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 14 to 19 feet, with over 30 feet of visibility near the headspring and less than 6 feet of visibility in the lower river (Figure 18). 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.

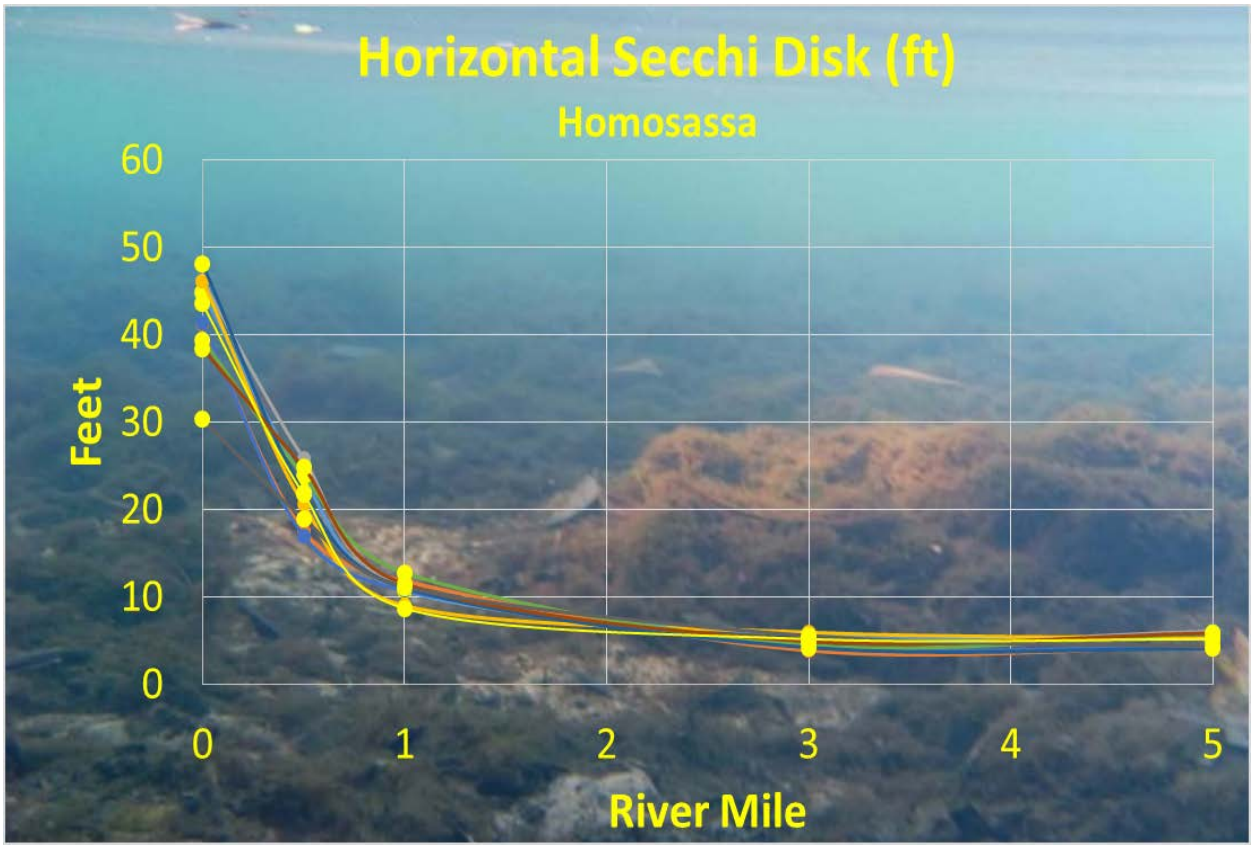


Figure 18: Water Clarity in the Homosassa River
Water clarity, as measured by a horizontal secchi disk, over time at the five fixed river stations. Clarity is affected by many factors including the amount of chlorophyll, tannins, and suspended sediment in the water column. The different colored lines represent annual averages for each station from 2006 to 2015.

Changing salinity is an emerging issue in the Homosassa 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 19). Salinity fluctuates throughout the Homosassa River system due to tides and variation in river flow; however monthly data collected since 1996 (Jacoby et al. 2014) suggest that salinity is increasing (Figure 20). The Gulf of Mexico has always exerted some influence on the Homosassa River and significant changes are expected in the coming decades due to continued sea-level rise.

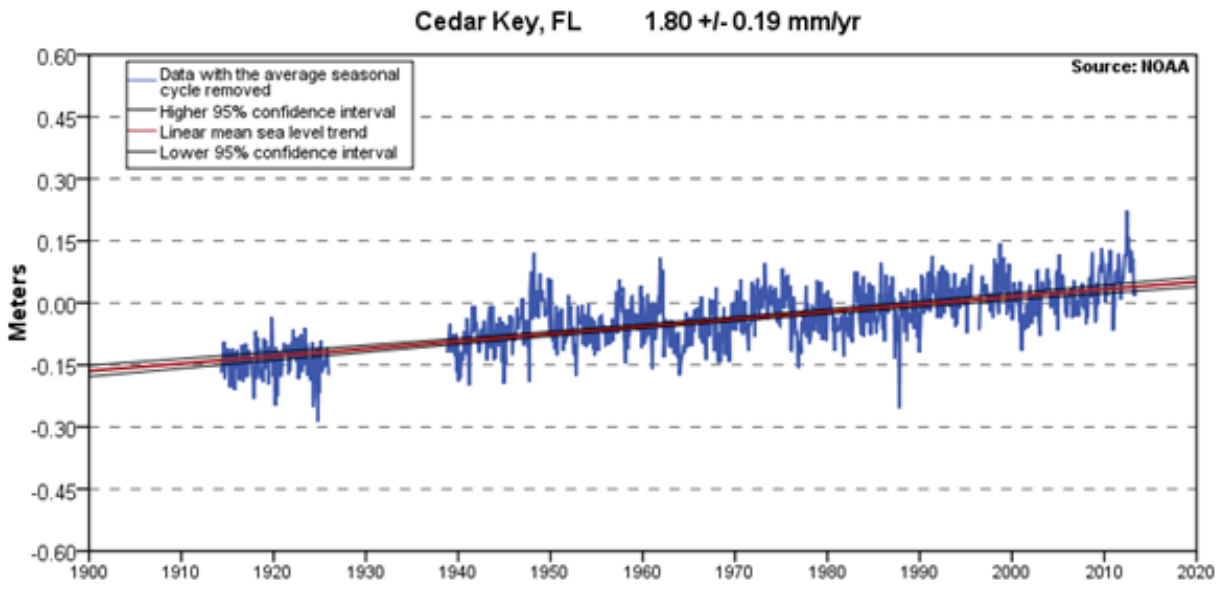


Figure 19: Sea Level Data from Cedar Key, Florida

Cedar Key is located north of the Homosassa 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).

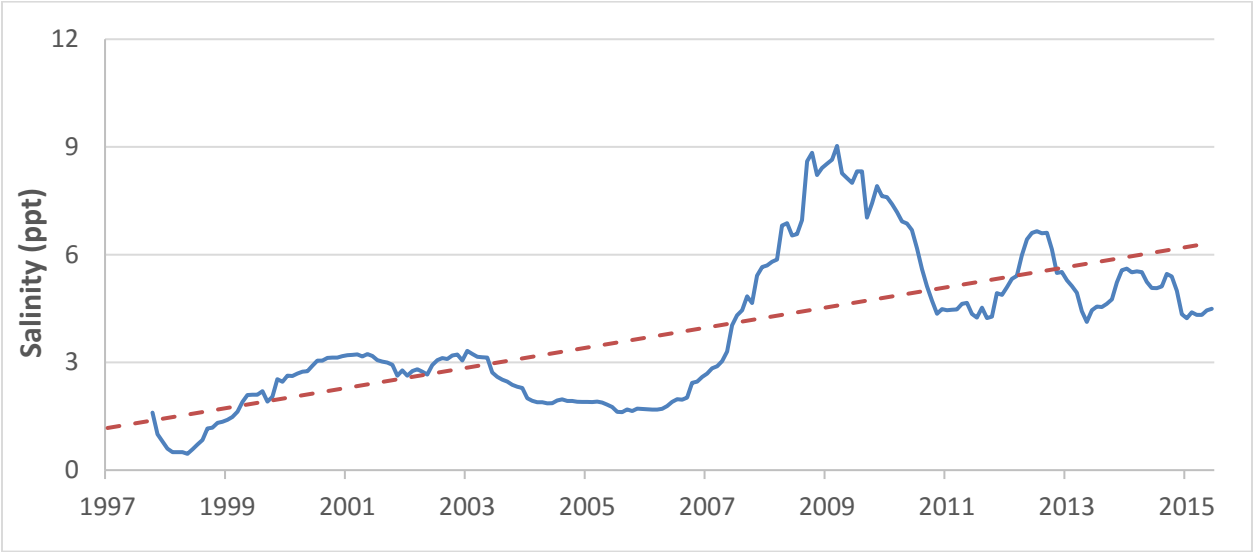


Figure 20: Salinity Changes in the Homosassa River
(blue solid line - 12-month moving average at Homosassa Citrus 5; orange dashed line – best fit trend line)

Water Quantity

The Homosassa River is a large first-magnitude spring system with an average flow of 211 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 in the river is a critical factor that interacts with multiple aspects of the ecosystem. In the Homosassa River and other west-central Florida spring systems lower flows are related to higher filamentous algal abundance (Hoyer et al. 2004, King 2014), likely due to reduced drag and downstream export. Another issue related to declining flow, along with other drivers, is increased sedimentation. As velocity decreases, particles begin to settle out of the water column, potentially smothering SAV and limiting light from reaching the river bottom. By smothering SAV beds, sedimentation also promotes the invasion of filamentous algae and other invasive species, further reducing native SAV cover.

Flow in the Homosassa River (downstream of the Halls River and the major springs) has been routinely measured by the USGS since 2004 (Figure 21). The lowest monthly average flow occurred in 2009 at 66 cfs and the highest monthly average flow peaked as a result of Hurricanes Frances and Jeanne in September 2004 at 403 cfs. This pattern of increasing and decreasing flow generally corresponds to periods of above average and below average rainfall.

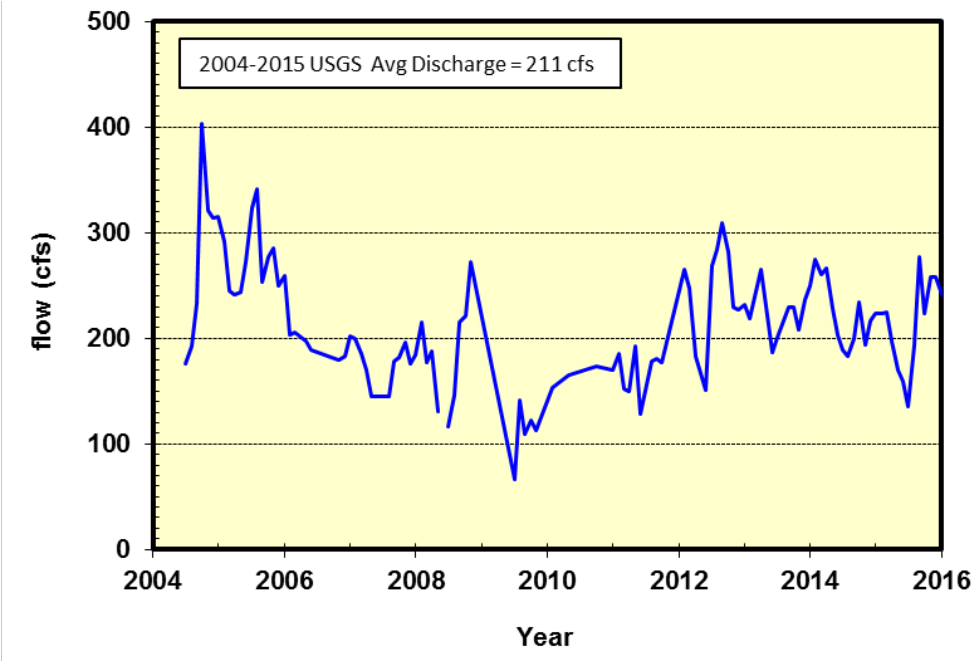


Figure 21: Monthly Average Flow Observed in the Homosassa River

Based on computer flow modeling and water budget results from the SWFWMD, the cumulative impact of groundwater withdrawals on Homosassa 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 2013, estimated and metered groundwater withdrawals from all use types in the springshed were equivalent to 0.6 in/yr, and using an average recharge rate of 13.4 inches per year, groundwater withdrawals made up 4.4 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 2.0 percent of average recharge (Marella 2008).

The SWFWMD maintains a metered and estimated water use database from 1992 through 2013. In the Homosassa springshed, groundwater withdrawals have declined from their recent peak of 11.4 mgd in 2006 (Figure 22). In 2013, groundwater withdrawals based on estimated and metered use were 8.4 mgd (approximately 90% of withdrawals are metered). Groundwater withdrawn in the springshed is about equal to what was withdrawn in the early-1990s. Public supply accounts for about 35% of groundwater use in the Homosassa springshed. Agriculture water use is second at 34% of all groundwater withdrawn in 2013 with lesser amounts used for domestic self-supply and recreation (e.g. golf courses) (Figure 23).

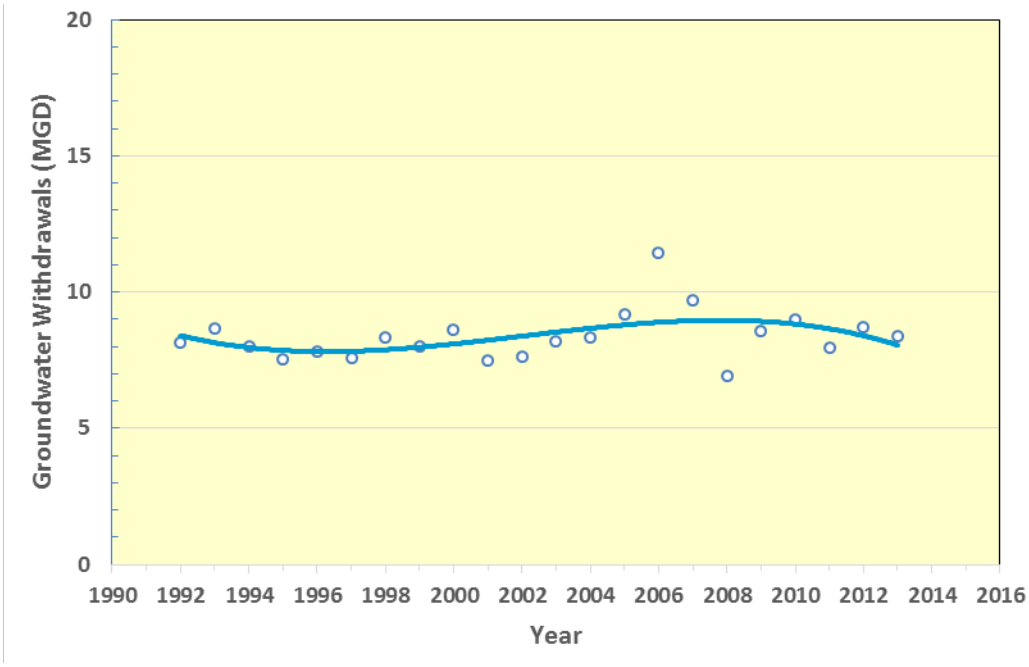


Figure 22: Groundwater Withdrawals within the Homosassa Springshed from 1992-2013

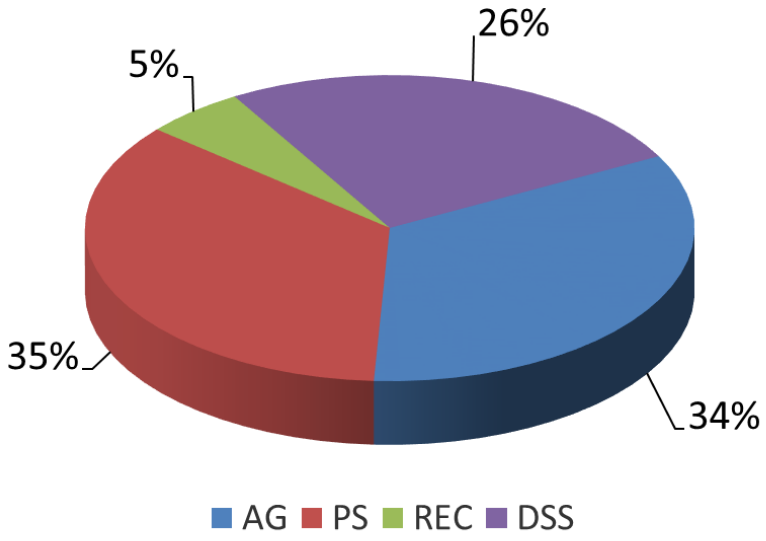


Figure 23: Groundwater Withdrawals by Category within the Homosassa Springshed
AG – Agriculture, PS – Public Supply, REC – Recreation, DSS – Domestic Self-Supply

While the hydrologic assessment by the SWFWMD indicates groundwater withdrawals currently have a small impact on Homosassa River spring flow, the expected increase in demand for water over the coming decades is being addressed through the development of water supply plans and Minimum Flows and Levels (MFLs). Both the SWFWMD and the Withlacoochee Regional Water Supply Authority (WRWSA) periodically publish water supply plans to address current and future demands on water resources. The SWFWMD's most recent regional water supply plan, published in accordance with Florida Statutes, includes an assessment of projected water demands and potential sources of water to meet these demands for the period 2010-2035 (SWFWMD 2015). The Homosassa River lies within SWFWMD's Northern Planning Region where the 2010-2035 increase in demand is projected to be 62.8 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 Homosassa River, as Outstanding Florida Springs and requires that MFLs be adopted for these systems by July 1, 2017. MFLs serve as a protective metric for making permitting and planning decisions regarding both surface and

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

The MFL for the Homosassa River was adopted in 2013. Resources evaluated for the MFL included: salinity-based habitats, planktonic and nektonic fish and invertebrates, system productivity, and thermal refuge habitat for manatees. After thorough evaluation of the relationships between these factors and flows in the Homosassa River, a MFL that maintains 97% of the natural flow, the flow that would exist in the absence of water withdrawals, was recommended (Leeper et al. 2012). The MFL is scheduled to be re-evaluated by 2019.

Natural Systems

The Homosassa River has experienced substantial changes to fish and wildlife habitats. Over recent decades, native SAV has become scarce and filamentous algae has become dominant, creating a highly altered aquatic plant community. Sediment and muck accumulation in the river has also caused impacts to SAV and other benthic habitat. Shoreline development has been extensive along portions of the river and has replaced the natural shoreline and adjacent wetlands in those locations, which previously filtered the water and provided habitat.

The primary issue regarding aquatic habitat in the Homosassa River is altered aquatic vegetation. In the early 1950s, the average SAV coverage was estimated at 30% and consisted of native species dominated by eelgrass, sago pondweed, and southern naiad (Sloan 1956). By 1998, filamentous algae (primarily the cyanobacteria Lyngbya), southern naiad, and Eurasian water milfoil had become the most abundant species in the river (Frazer et al. 2001). Records of SAV biomass began in 1998 and show a substantial decrease after 1999 (Figure 24), likely due to a decline in both macrophytes and filamentous algae in the lower river related to increased salinity (Frazer et al. 2001). Since 2003, average desirable and invasive SAV coverage were 5% and 11%, respectively. In 2015 filamentous algae continued to dominate the SAV community which also included sparse amounts of southern naiad and other SAV species (Figure 25).

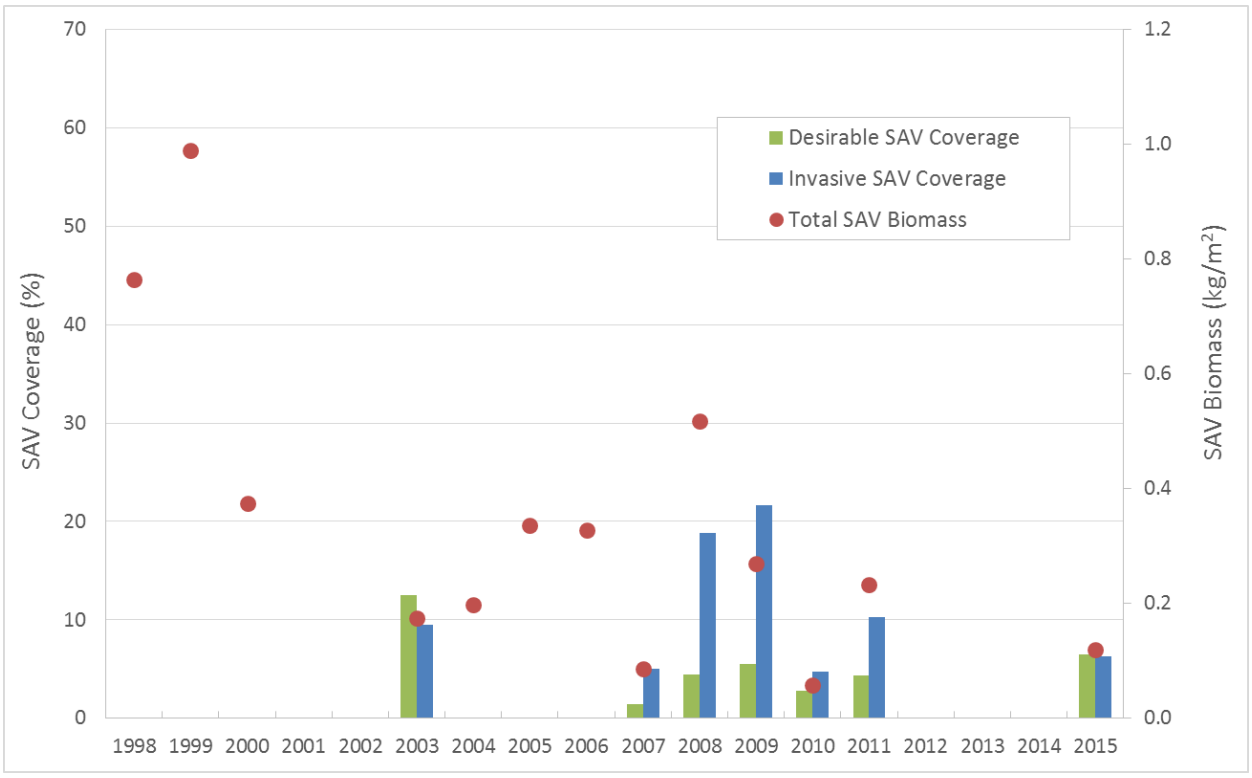


Figure 24: SAV Coverage and Biomass in the Homosassa River

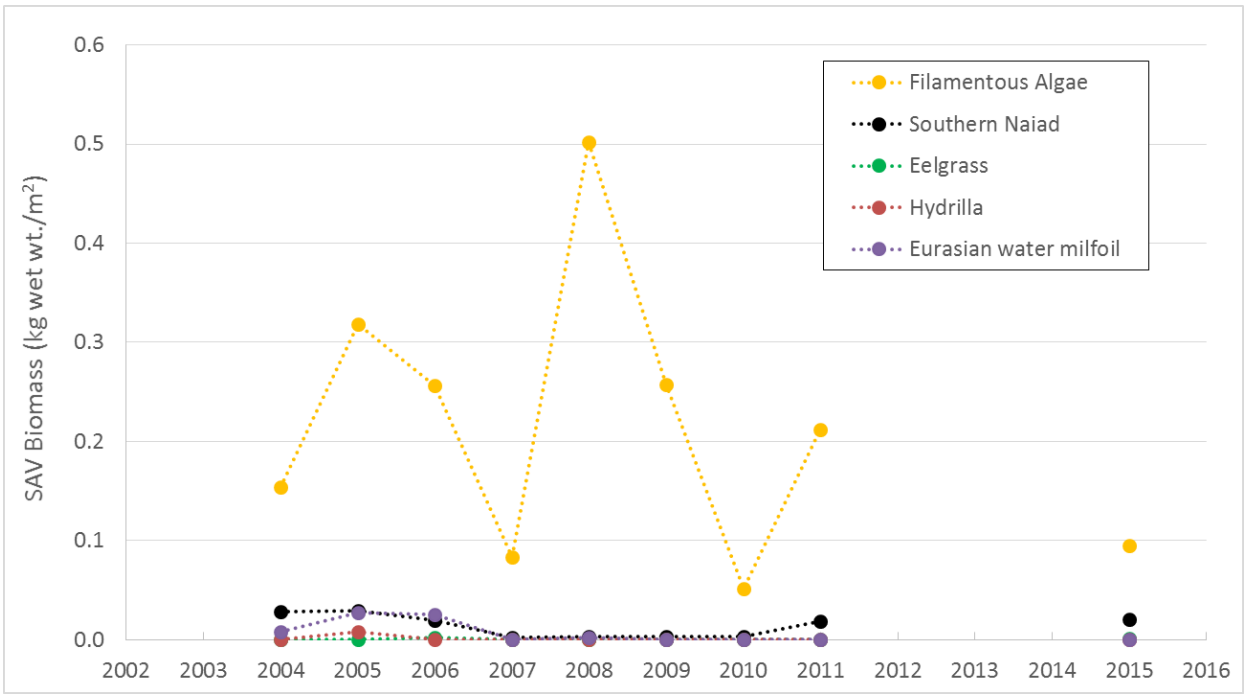


Figure 25: SAV Biomass for Common Species in the Homosassa River

Declines in SAV have resulted from a complex series of events over the past half century, beginning with the introduction of exotic invasive species like Eurasian water milfoil, in the early to middle part of the 20th century. These species gained a foothold in the Homosassa River largely due to disturbance of the native habitat. Like Kings Bay, land development along the Homosassa River disturbed the SAV communities opening the door to invasive species proliferation. Most filamentous algae, while invasive, are native to the river. Nevertheless, in the absence of stable SAV communities these algae will over time dominate the underwater landscape and prevent beneficial SAV like eelgrass from recovering.

Another important driver, especially in recent decades is the increase in salinity. Though the Homosassa River has always been characterized as an arm of the sea and brackish throughout, recently, average annual salinity has increased to a level that prevents the growth of many less salt tolerant SAV species. Salinity has increased from a combination of sea-level rise and reductions in freshwater discharge from long-term rainfall deficits. Generally, freshwater SAV species do not occur substantially where salinity is above 3.0 parts per thousand (ppt) in the river (Hoyer et al. 2004). There has also been an increase in the severity of high-salinity pulsed events caused by storm tides. Presently, salinity in most of the Homosassa River has increased to a level that is too salty for freshwater SAV species and filamentous algae like Lyngbya to survive. Eelgrass, on the other hand, can survive in saltier conditions.

A more recent driver of SAV abundance is herbivory by animals like manatee and turtles. In recent years, manatee populations in the Homosassa River have increased greatly as they have throughout Citrus County (Kleen and Breland, 2014). Prior to 1970, manatees were uncommon in the Homosassa River, however over 200 manatees now use the headsprings area as a natural warm water refuge during the winter. This increase in manatee population while good for the future of the manatee can make it challenging to revegetate the river with eelgrass and other native SAV species.

Another primary issue for the Homosassa River is sediment and muck accumulation, which alters the river channel morphology and can smother beneficial aquatic vegetation and other habitats. Most of the organic material (muck) is from dead and decaying aquatic plant material and algae that have accumulated over the past several decades. Sediment and muck accumulation is particularly problematic in portions of the river where the water slows down and suspended material settles out onto the river bottom. While some organic material may be beneficial to SAV and other wildlife, large amounts can decrease oxygen levels and make it difficult for plants to remain rooted in the sediments.

The filling and development of wetlands has substantially altered the shoreline and land surrounding the Homosassa River. These wetlands are vitally important to maintaining good water quality by acting like large treatment filters. The hardening of shorelines and increased sedimentation may also contribute towards changes in channel morphology that have been observed. In 1944, downstream from the confluence of the Homosassa and Halls Rivers, the channel appeared to be braided with shallow and deep areas, possibly related to dense SAV beds (Figure 26); however today this area is relatively uniform in depth which may have altered historic flow velocities and hydrology in general.

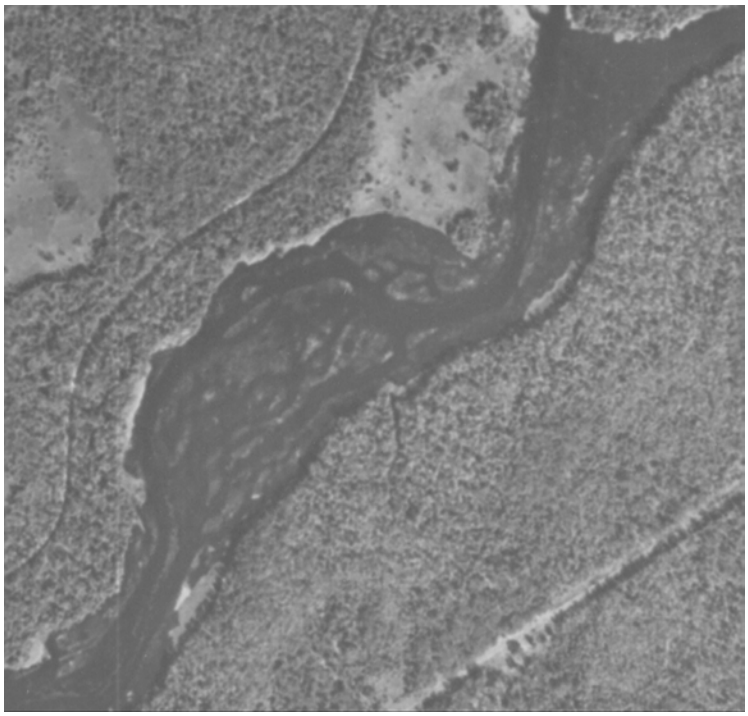


Figure 26: Braided Channel in the Homosassa River in 1944

Recreation and commercial fishing also have some impact to fish and wildlife habitats in the Homosassa River. Recreational boat use in the river is primarily from one public ramp, several marinas, and numerous private ramps and lifts. Recreation peaks include summer vacation, scallop season, and winter manatee watching. Despite high numbers of visitors to the Homosassa State Park, over 260,000 in 2002 (Bonn and Bell 2003), none of these visitors have in-water access. There are no public beaches or designated swimming areas, most boaters tour the river and springs or travel downstream to utilize gulf waters. Impacts of recreation on aquatic habitats may include littering, disposal of scallop shells, oil leaks, and disturbance of remaining SAV, and commercial fishing boats have been observed to contribute to oil spills.

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 to the Homosassa 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 Homosassa River SWIM plan includes numeric targets called quantifiable objectives (Table 6). If these objectives are achieved, the expected result is a healthy spring ecosystem. These are long term goals that are being used to develop and prioritize management actions and projects, thus promoting effective and efficient resource management. The table below describes the quantifiable objectives for each of the three focus areas: water quality, water quantity, and natural systems.

Table 6: Quantifiable Objectives

Water Quality	**Target**
Water clarity – river average	>20 feet
Water clarity – near the headspring	>40 feet[1]
Nitrate concentration in the river	<0.23 mg/L[2]
Water Quantity	
Minimum flow for the river system	>97% natural flow[3]
Natural Systems	
Coverage of desirable benthic habitat (SAV, oysters, etc.) in the river	>65%[4]
Coverage of invasive aquatic vegetation (including filamentous algae) in the river	<10%[4]
No net loss of shoreline in natural condition along the river	No net loss

[1] Based on data presented in Figure 17
[2] Bridger et al. 2014 – Nutrient TMDLs for Homosassa–Trotter–Pumphouse Springs Group, Bluebird Springs, and Hidden River Springs (WBIDs 1345G, 1348A, and 1348E)
[3] SWFWMD 2012 –Recommended Minimum Flows and Levels for the Homosassa River System
[4] Based on data presented in Figure 23

Water Quality

The water quality management actions for the Homosassa 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 Homosassa River sets a target nitrate concentration of 0.23 mg/L, which would require up to a 76% decrease in concentration (Bridger 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 Homosassa River. Table 7 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 7: 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 Homosassa 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 Homosassa River. Table 8 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 8: 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 Homosassa 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 Restoration** are the priority Natural Systems Management Action categories for the Homosassa River. Table 9 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 9: 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
Evaluate restoration of the original channel morphology
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 Homosassa 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 10, 11, and 12 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 Homosassa River.

Water Quality Projects

Table 10: Ongoing Water Quality Projects

Monitoring & Research
Evaluation of Nitrogen Leaching from Reclaimed Water Applied to Lawns, Spray Fields, and RIBs Lead Entity: SWFWMD This multi-year funded project will assess nitrogen leaching from reclaimed water application to lawns, spray fields, and rapid infiltration basins (RIBs). Several different types of soil amendments such as sawdust, tire crumbs, and limestone will also be evaluated to determine their ability to reduce nitrogen leaching from reclaimed water applied to RIBs. This project will determine typical nitrogen leaching rates from reclaimed water application to lawns, spray fields, and RIBs. This information can be used to refine estimates of nitrogen loading to the aquifer and springs, and identify the best reclaimed water disposal methods to minimize nitrogen loading to groundwater. The nitrogen reduction capabilities of several soil amendments will also be assessed to develop new best management practices (BMPs) to reduced nitrogen loading from RIBs to the groundwater. Implementation of these BMPs has the potential to improve water quality in the aquifer and springs. Cost: $294,000

Project COAST

Lead Entity: SWFWMD

Beginning in 1997, the Southwest Florida Water Management District has funded the University of Florida to collect and analyze monthly surface water quality data at 50 fixed stations along the coast of Hernando, Citrus, and Levy Counties. Project COAST represents the longest, most comprehensive water quality data set on the Springs Coast and was instrumental in FDEP/EPA's efforts to establish Springs Coast Numeric Nutrient Criteria (NNC).

Cost: $100,000 (annual)

Quarterly Springs Water Quality Monitoring

Lead Entity: SWFWMD

Quarterly to yearly water sample collection and analyses from 70 springs across the District including Homosassa.

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 Homosassa. 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 Homosassa River. This project supports key areas including:

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

Cost: $365,000 (annual)

Upper Floridan Aquifer Nutrient Monitoring

Lead Entity: SWFWMD

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

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

Cost: $120,000 (annual)

Agricultural Operations (Cattle Farms, Horse Farms, Row Crops)
Adopted Water Quality/Quantity BMP Implementation and Compliance Lead Entity: FDACS Agricultural nonpoint sources in a Basin Management Action Plan (BMAP) area are required by state law (Subsection 403.067[7], F.S.) either to implement Florida Department of Agriculture and Consumer Services (FDACS)-adopted best management practices (BMPs) or to conduct water quality monitoring prescribed by the Florida Department of Environmental Protection (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. Cost: TBD
Central Florida Springs Region Agricultural BMP Cost-Share Program Lead Entity: FDACS The Central Florida Springs Region Agricultural Best Management Practice (BMP) Cost-Share Program was established to promote water quality and water quantity BMPs that provide overall water resource benefits to commercial agricultural producers. Through this program, the Florida Department of Agriculture and Consumer Services (FDACS) will reimburse eligible producers, through the Hardee Soil and Water Conservation District, for selected agricultural practices that have potential sediment control, water conservation and/or water quality improvement benefits. It is anticipated that the program will provide farm managers and owners with economic incentives to facilitate implementation of FDACS-adopted BMPs. FDACS funding levels vary year-to-year dependent upon the State of Florida program allocations and are not currently adequate to keep up with demand. Cost: TBD

Septic Tanks
Garcia Pt. Sewer Project Lead Entity: Citrus County The intent of this project is to improve water quality by connecting up to 88 existing residential homes with onsite treatment and disposal systems which have been identified as a source for nutrient loading to the groundwater and surface waters of the Homosassa River, an Outstanding Florida Waterway. This river has also been deemed to be an impaired water body under Chapter 62-303 (d) FAC due to nutrient levels and associated algal mats. Design: 2016-2017 Construction: 2017 – 2020 Cost: $2,000,000
Urban/Residential Fertilizer (includes Golf Courses)
Development of Landscape Fertilizer BMPs Lead Entity: UF-IFAS/SWFWMD The objective of this project is to verify the accuracy of the Florida Yards and Neighborhoods (FYN) and Florida Green Industries best management practices (BMPs) fertilizer recommendations across a wide range of common landscape plants. Plant growth, biomass allocation, shoot nutrient status, foliar characteristics and aesthetic quality will be evaluated. This project represents a significant step to develop and implement accurate, science-based fertilizer BMPs for urban (residential and commercial) landscapes. This study aims to improve the quality of stormwater that leaves an urban landscape by influencing the amount of fertilizer that is applied to these landscapes. The results of the project will be applicable to ornamental plants grown in residential and commercial landscapes. This research will provide scientific data on the fertilizer needs of landscape plants and will improve the accuracy, credibility and long-term viability of statewide BMP programs, such as the FYN program. Cost: $274,429
Education Campaign Lead Entity: SWFWMD Existing communications products produced by the District's Public Affairs Bureau. Fertilizer campaign is in place, plan to expand the campaign to include septic system inspection and maintenance. Cost: $10,000

Wastewater Treatment Facilities
Hernando County's Package WWTP Connection Initiative (Countryside Estates) Lead Entity: Hernando County Countryside Estates, 7001 Tall Oaks Ln. Brooksville, FL 34601, is approximately 5 miles west of I-75. This a modular home community with over 120 residential lots/homes and a clubhouse. The purpose of the project is to connect the package plant located at Countryside Estates to the County's sewer system via a new force main and lift station. Package Plants are treatment facilities used to treat wastewater in small communities or on individual properties. This connection would improve water quality in the spring basin and surrounding surface waters. The project would redirect the flow to the County's Ridge Manor West Waste Water Treatment Plant (WWTP). The typical package plant generates secondary wastewater treatment which does not include the enhanced nitrogen removal capabilities that the county's larger WRF's can achieve. Improve and mitigate the impact of the package waste water treatment plant on water quality. It is estimated the load reduction would be 146 lbs per year based on effluent discharge limit of 7 mg/L nitrates. The County's Ridge Manor West WWTP is planned to be included in a joint project with the Southwest Florida Water Management District (SWFWMD) Springs Coast Wastewater Disposal Treatment Wetlands. Cost: $1,001,300
Southwest Regional WWTP Upgrade Lead Entity: Citrus County The intent of this project is to expand and upgrade the existing Sugarmill Woods WWTP from 750,000gpd to 1,500,000 gpd in order to meet public access reuse standards. Construction: 2016 – 2018 Cost: $18,500,000
Stormwater
Homosassa South Fork Phase 1 - Pond 2 Lead Entity: Citrus County The purpose of the Homosassa South Fork water quality improvement project is to provide treatment of stormwater runoff from areas north of Halls River Road (CR 490A). These areas discharge untreated stormwater into an existing mosquito control canal that flows directly into the headwaters of the Homosassa River, an Outstanding Florida Waterway. Cost: $1,903,000

Septic/Sewage Solids Disposal
NONE
Atmospheric Deposition
NONE

Water Quantity Projects

Table 11: Ongoing Water Quantity Projects

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

USGS Evapotranspiration Data Collection

Lead Entity: USGS/SWFWMD

This project allows for the operation of one mixed-forest wetland evapotranspiration (ET) station that directly measures actual ET. Funding also provides for District participation in a cooperative effort between the USGS and all five Florida Water Management Districts to map state-wide potential and reference ET using data measured from the Geostationary Operational Environmental Satellites (GOES). Data are available back to 1995 and are provided on the same grid system as the RADAR rainfall data, making them suitable to calibrate District groundwater and surface water models and improve permitting efforts. The cooperative data program between the District and the United States Geological Survey (USGS) provides data collection to support District regulatory and resource management initiatives. The costs for this data collection program are split between the District and the USGS. The data collected by the USGS complement the data from the District's data collection program, and provide independent verification of District data collection efforts. USGS data site locations are coordinated with District data site locations to ensure optimum data coverage. These USGS data are being made available to District staff through the Water Management Information System (WMIS), and to the public through the USGS Hydrologic Data Web Portal.

ET constitutes the largest water loss component in most water budgets for Florida watersheds. In Florida, approximately 50 percent of mean annual precipitation is returned to the atmosphere as ET. Lakes have been measured to return up to 110 percent of mean annual precipitation. The statewide ET project was initiated to quantify actual, not potential, ET to improve the accuracy of a wide range of hydrologic analyses. The intention of this project was to install eddy-correlation equipment in a variety of settings to develop reasonable estimations of ET that can be tied to land use/land cover information, thereby increasing the detailed input for watershed modeling purposes. Equipment would remain on-site for a few seasons to ensure the ET is quantified sufficiently, and then the equipment would be moved to another location to obtain information from a different land use. In this fashion, a dataset could be developed to improve model results.

The GOES ET program was initiated to develop a better tool for watershed modeling by developing a dataset of ET estimates using the same grid system utilized by the RADAR rainfall project. This provides both an estimated monthly rainfall value and estimated monthly ET value for every 2-kilometer-by-2-kilometer grid cell in the state. Datasets for the period 1995-2012 have been compiled and processed into computed values of evapotranspiration. They are available through WMIS.

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

Cost: $50,700 (recurring)

USGS Groundwater Data Collection

Lead Entity: USGS/SWFWMD

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

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

Cost: $100,000

USGS MFL Surface Water Data Collection Sites

Lead Entity: USGS/SWFWMD

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

Cost: $491,950 (recurring)

USGS Surface Water Data Collection

Lead Entity: USGS/SWFWMD

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

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

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

Conservation

Agricultural Water Supply Planning

Lead Entity: FDACS

The Florida Department of Agriculture and Consumer Services (FDACS) Office of Agricultural Water Policy (OAWP) compiles 20-year-demand projections for agricultural self-suppliers, using best available data. The OAWP provides these projections, in five-year increments, to each water management district during the development or revision of regional water supply plans. Section 373.709, Florida Statutes, requires the water management districts to consider this data in their planning and to explain any adjustment to or deviation from the data.

The FDACS OAWP has developed a central data repository for agricultural water use projections, called the Florida Statewide Agricultural Irrigation Demand (FSAID). The FSAID contains standardized statewide parcel-level GIS coverage of all agricultural and irrigated lands for 2015. It includes estimates of 2015 irrigated agricultural acreage by crop type or category, spatially for each county, and future projections of irrigated agricultural acreage to 2035. Future water supply demand projections are calculated both for an average year and a 1-in-10-year drought.

This effort is ongoing to update the data.

Cost: TBD

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

Lead Entity: SWFWMD

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

Cost: TBD

Center Pivot Mobile Irrigation Lab (CPMIL)

Lead Entity: SWFWMD

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

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

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

Cost: $25,000 (recurring)

District Utility Services Program

Lead Entity: SWFWMD

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

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

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

Enhanced Regional Irrigation System Evaluations and Conservation Incentive Program

Lead Entity: WRWSA

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

Cost: $200,000

FARMS Program: Facilitating Agricultural Resource Management Systems

Lead Entity: SWFWMD

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

The SWFWMD and FDACS also work cooperatively with the Mini-FARMS Program, which is a scaled down version of the FARMS Program for growers that are 100 irrigated acres or less to implement water quantity BMPs. The program cost shares at a rate of 75% up to a maximum reimbursement of $5,000. Examples of projects include irrigation conversions and soil moisture probes.

Cost: TBD

Florida Water Star Certification and Builder Education

Lead Entity: SWFWMD

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

Based on estimates, a home meeting Florida Water Star indoor and outdoor criteria uses approximately 54,287 gallons of water less per year compared to a home with non-Energy Star rated 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: $1,000 (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.

Cost: $150,000

Regulatory
SWFWMD Water Use Permitting Program Lead Entity: SWFWMD The purpose of this program is to implement the provisions of Part II of Chapter 373, F.S., and the Water Resource Implementation Rule set forth in Chapter 62-40, F.A.C. Additional rules relating to water use are found in Chapter 40D-3, F.A.C., entitled Regulation of Wells, Chapter 40D-8, F.A.C., entitled Water Levels and Rates of Flow, Chapter 40D-80, F.A.C., entitled Prevention and Recovery Strategies For Minimum Flows and Levels, Chapter 40D-21, F.A.C., entitled Water Shortage Plan, and Chapter 40D-22, F.A.C., entitled Year-Round Water Conservation Measures. In addition to permitting, the Water Use Program engages in a comprehensive compliance program that checks and verifies critical information such as monthly pumpage quantities and over pumpage. Cost: $3,208,319
Minimum Flows and Levels
Homosassa River System MFL Re-evaluation Lead Entity: SWFWMD Florida statute 373.042 requires that the District establish minimum flows and levels (MFLs) for water bodies on a priority list. The Homosassa 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. Cost: TBD

Natural Systems Projects

Table 12: Ongoing Natural Systems Projects

Monitoring & Research
FWC Annual Aquatic Plant Survey Lead Entity: FFWCC FWC Biologist surveys Homosassa River each year to track aquatic plant trends and plan for funded control work. In recent years invasive species have been recorded as acres present while only presence or absence has been recorded for native species. Cost: $300 (annual cost)
Springs Coast Fish Community Assessment Lead Entity: FFWCC Since 2013, FFWCC was allotted funds to sample fish communities in 5 spring-fed water bodies including the Rainbow, Chassahowitzka Homosassa and Weeki Wachee Rivers and Kings Bay. The purpose of the project is to obtain baseline information for fish communities as very little data has been previously reported. Habitat and flow data has also been collected during the project and will be included in fish community analyses. A final report will be submitted to the Southwest Florida Water Management District upon completion. The current project includes 8 sampling events on each of the spring-fed systems. However, to adequately document future trends and obtain current information, more monitoring is necessary. Cost: $185,620 (SWFWMD Funded)
Habitat Conservation
Lakes, Rivers and Coastal Cleanup Lead Entity: Citrus County 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. Cost: $4,000 (annual cost)

Habitat Restoration
Homosassa Springs Floating Wetland Project Lead Entity: SWFWMD This is a pilot project to deploy a floating wetland system in the upper Homosassa River within the Ellie Schiller Homosassa Wildlife State Park. Floating wetlands have been shown to improve water quality and provide aquatic habitat, however they have not been tested in spring systems with manatee exclusion barriers. This project includes permitting, floating wetland system installation, monitoring, and maintenance. If this pilot project is successful, then this approach may be expanded to other areas of the Homosassa River. Cost: $128,471
Homosassa Springs SAV Restoration Lead Entity: SWFWMD This is a pilot project to restore submerged aquatic vegetation in the upper Homosassa River. Two plots are scheduled to be planted with eelgrass and protected with temporary herbivory exclusion systems during plant establishment. This project includes design and permitting, site preparation, plant and exclusion system installation, monitoring, and maintenance. If this pilot project is successful, then this approach may be expanded to other areas of the Homosassa River. Cost: $150,000
Invasive Species Management
Cooperative Aquatic Plant Control Funded Program Lead Entity: FFWCC/SWFWMD SWFWMD cooperates with FFWCC pursuant to an existing agreement to manage aquatic plants on public waterbodies within the District. FFWCC drafts annual workplans for public waterbodies of the state that address the management objectives, target plant species, control acres, methods of control, etc. The District conducts the physical plant control. Cost: $42,650

FWC Aquatic Plant Control Permitting Program Lead Entity: FFWCC Given that the Homosassa 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. Cost: $10,000
Invasive Plant Management Educational Website Lead Entity: University of Florida UF/IFAS Center for Aquatic and Invasive Plants and FWC maintain the website https://plants.ifas.ufl.edu/manage/. This website is a mecca for plant identification, why we manage plants, Florida waterbodies, various methods of plant control that exist, how we develop management plans, research and outreach, etc. The website is currently under revision but is a great invasive plant management education tool. Cost: $63,424
Recreation Management
NONE

Proposed Priority Projects and Initiatives

Proposed priority projects and initiatives have been reviewed and approved by the SCMC and SCSC. Tables 13, 14, and 15 list the projects and initiatives that, if implemented, will support the overall objective of improving the water quality, water quantity, and natural systems aspects of the Homosassa River.

Water Quality Projects

Table 13: 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 Develop educational tools and provide education on wastewater solutions available for the area of interest. Each area will have unique needs, and public education should be targeted so that it will make the greatest positive impact. For several years, the Department of Health in Duval County has successfully implemented a door-to-door inspection project that has been funded for many years through EPA's nonpoint source pollution program. Inspectors go through a neighborhood looking for sanitary nuisances to ensure a healthier and safer community. This type of program increases public awareness and helps identify failing septic systems. This would also allow for ground-truthing of the wastewater treatment method and drinking water source from the Florida Water Management Inventory to increase confidence in the data. This project will evaluate at the Duval County model, enhance and expand on it as appropriate, and execute the program in the areas of interest. Tasks would include: 1. Compile best practices from successful public education campaigns for onsite sewage system and develop an action list for implementing a public education campaign 2. Survey the community of interest to determine most effective methods of communication and determine community concerns 3. Implement a modified door-to-door inspection project in the area of interest 4. Compile data to update the Florida Water Management Inventory 5. Write draft and final project report, including lessons learned and a template public education campaign that can be used by other communities. Cost: $188,000

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

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

1. Update for areas of concern
    a. Modify process, as needed, based on results and recommendations from the initial Florida Onsite Sewage Treatment and Disposal Systems Inventory project
    b. Update geodatabase with new parcel and tax roll parcel data sets from the Florida Department of Revenue (FDOR) for areas of concern
    c. Identify built/not-built parcels, for areas of concern
    d. Request, collect, and document receipt of data sets for areas of concern
    e. Respond to and follow-up with inquiries, correspondence, and workflow action items for areas of concern
    f. Perform data assessment and preparation for geodatabase import for areas of concern
    g. Update existing geodatabase with imported data for available drinking water and wastewater data for areas of concern
    h. Apply estimation methodology for drinking water and wastewater in areas of concern where no data exists (“unknown”) and where there is conflicting information (“undetermined”)
    i. Develop GIS maps illustrating, and summary tables detailing, parcels and known/estimated drinking water and wastewater data by county for areas of concern
    j. Identify recommendations for improvements/enhancements and limitations/challenges for subsequent statewide inventory work with the goal of a sustainable inventory cycle
2. Quality Management and Assurance
    a. Update quality management plan; document data to be assessed, update quality objectives and metrics, update methods to reconcile assessment results
    b. Perform quality audits, document quality deficiencies, and assign action items to project team
    c. Update process documents and data structure elements as needed
    d. Develop training materials for FDOH Environmental Health Program staff required to acquire, update, analyze, and maintain data
    e. Train FDOH Environmental Health Program staff and other stakeholders as well as present results of the project to various audiences
3. Analysis
    a. Identify areas with high septic system failure rates based on an analysis of data from the FDOH Environmental Health Database
    b. Identify areas with older septic systems with no record of repairs
4. Project Management and Reporting
    a. Develop and publish the project schedule
    b. Develop and maintain a project task list for day-to-day activities derived from the high-level tasks in the project schedule
    c. Upon approval of the project budget, provide regular reporting on planned versus actual expenditures

d. Prepare and publish project status reports quarterly including tracking baseline project milestones, executive summaries of completed work during the current reporting period, planned work for the upcoming reporting period, risks that require assessment and mitigation strategies, and issues that require intervention from the project owner, sponsors, or other executive leadership
e. Update the project website with maps and project data
f. Maintain and improve a web application to enhance access to project results
g. Coordinate outreach efforts to inform current and potential stakeholders on project goals and progress, seek out potential collaboration opportunities at the federal, state, and local levels, and make presentations to interested parties
h. Seek out potential new funding sources to enable the inventory to be continued in an ongoing, cyclical manner to fully realize the potential of data sharing with both public and private sector organizations and with the general public
i. Prepare draft final project report summarizing project accomplishments, recommendations for the future, lessons learned, and any deviations from the project schedule and task list for review by the Department and other interested parties
j. Prepare final project report summarizing project accomplishments

Cost: $245,000

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

Wastewater Treatment Facilities
Floral City Collection System The intent of this project is to construct a sanitary gravity collection system located along E. Orange Avenue and Old Floral City Road. This collection system will connect public and private facilities into the proposed gravity sewer, which then will be diverted to the newly constructed WWTF located at the Floral City Elementary School. This general area contains a restaurant, grocery store, bed & breakfast and approximately 35 homes. The project will consist of acquiring land for a lift station, lift station, 8-inch gravity sewer main (approximately 3,000 lf), 4-inch force main (approximately 1,500 lf), manholes (approximately 12), telemetry and controls. Design: start January 2017 Construction: end May 2020 Cost: $1,200,000
Mason Creek Private Package Plant Interconnection The intent of this project is to address water quality issues by connecting an existing private package plant in an environmentally sensitive area located adjacent to the Homosassa River, which has been deemed as an impaired water body under Chapter 62-303 (d) FAC due to nutrient levels and associated algal mats. Design: 2016-2017 Construction:2017 – 2019 Cost: $925,000
Stormwater
Kingston Drive/US19 Stormwater Treatment Provide treatment of US19 runoff that currently flows untreated to the Halls River. A large straight swale conveys US19 runoff directly to a canal on the Halls River. Within the limits of the swale construction of a series of sediment basins and a discharge structure to skim any oils and debris would provide a significant reduction in the sediment that is deposited in the Halls River and ultimately transported to the Homosassa River. Cost: $100,000
Septic/Sewage Solids Disposal
NONE
Atmospheric Deposition
NONE

Water Quantity Projects

Table 14: Proposed Water Quantity Priority Projects and Initiatives

Monitoring & Research
NONE
Conservation
Adopt Landscape Irrigation Design and Maintenance Standards Similar to Florida Water Star Certification Section 373.228, Florida Statutes, recognizes landscape irrigation as a significant source of water use (as much as 50% of total consumption in some areas) and directs local governments to improve landscape irrigation and design standards. Additionally, excessive amounts of water used by irrigation systems can cause nutrient run-off to flow from the irrigated land to nearby water resources, which can have an adverse effect on the environment and water quality. New construction offers the greatest opportunity for outdoor water savings with the least financial impact. Under current construction standards, new residential and commercial construction are often equipped with 100% high-volume irrigation in the irrigable landscape with no efficiency requirements to reduce water consumption. This project proposes the adoption of standards for new construction similar to those of the Florida Water Star program. The standards would require greater outdoor efficiencies, such 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. 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. Cost: $20,000 (annual cost)
Domestic Self-Supply Indoor Water Conservation Pilot Project District-led indoor water conservation program for Domestic Self Supply households. Financial incentives to domestic self-supply households for the replacement of conventional toilets with high-efficiency toilets which use 1.28 gallons per flush or less. This project will include rebates and program administration for the replacement of approximately 200 high flow toilets. In addition, 200 do-it-yourself water conservation kits will be distributed. These include educational materials, low-flow showerhead, an aerator, and leak detection dye tablets. Also included are program promotion and surveys as necessary to ensure the success of the program. This program will conserve an estimated 5,200 gallons per day. With a cost effectiveness of $1.96 per thousand gallons saved. Cost: $37,000

Springshed Water Conservation Incentive Program and Projects

Springshed water conservation incentive program will offer all residents the opportunity to participate in conservation programs. Currently, water conservation incentive programming is offered only through Hernando County Utilities Department (HCUD) with programs such as (but not limited to) low flow toilet replacement, rain sensor replacement, rain barrels, and sprinkler check-ups are only available to HCUD rate payers (customers). These programs offer financial incentives to make changes by replacing appliances or participating in programs that assist in the more efficient use of water indoors and outdoors. By broadening conservation incentives to include all residents within the springshed would heighten resource awareness and would save groundwater supplies for the future.

Cost: $200,000

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 Hire a consultant to complete an analysis that will identify users of groundwater that could feasibly utilize reclaimed water to offset the groundwater impacts, develop preliminary cost estimates for the additional infrastructure needed, and develop a prioritization matrix to assist developing projects for alternative water supply in the SWFWMD first magnitude springsheds. This project will address the priority management action of Water Conservation as well as be valuable in possible offset of fertilizer application by using recycled water in lieu. Cost: $200,000
Sugar Mill Woods Reclaimed Water Distribution System The intent of this project is to construct infrastructure in the residential area of Sugarmill Woods, possibly Oak Village, to utilize the reuse water being generated from SWRWRF for irrigation purposes. Project elements associated with supply include reclaimed water transmission main and distribution system totaling 41,000 linear feet (approximate), high service pump station, and electrical instrumentation. Cost: $5,963,000
Regional Water Supply Planning
NONE
Regulatory
NONE
Minimum Flows and Levels
NONE

Natural Systems Projects

Table 15: Proposed Natural Systems Priority Projects and Initiatives

Monitoring & Research
Aquatic Vegetation Mapping Evaluation This project will monitor aquatic vegetation throughout the Homosassa, Chassahowitzka, and Weeki Wachee Rivers. This project will use similar vegetation sampling methods previously conducted by the SWFWMD and the University of Florida so that change analysis can be performed to assess trends and support management strategies. Cost: $150,000 (recurring, annual)
Habitat Conservation
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)
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
Homosassa River and Springs Land Acquisition – Dylan Kramer Property This 57-acre parcel is immediately southeast and in close proximity to the Homosassa southeast fork of the headsprings and the Homosassa River. The property and surrounding areas are directly connected to groundwater through numerous shallow karst features, with the top of the Upper Floridan aquifer being at land surface. The parcel is contiguous to the west with a wetlands mitigation bank with a District regulatory conservation easement over it. Both surface water and groundwater resources are closely associated with the spring-fed southeast fork and Homosassa River headsprings. Cost: TBD

Homosassa River and Springs Land Acquisition – Joseph Moody Property

This 47-acre parcel consists of riparian forest with 1,200 feet of undisturbed shoreline on the south bank of the Homosassa River. The property provides benefits to maintaining water quality and clarity of the upper Homosassa River by preserving the shoreline and forested buffer in a natural state. Additional benefits include providing overland flood storage capacity of land adjacent to the river.

Cost: TBD

Homosassa River and Springs Land Acquisition – Parkway Towne Properties LLC Property

This 10-acre parcel is immediately adjacent to the Homosassa River, a SWIM priority water body. The property contains an existing mobile home and RV park with a canal and boat slips directly connected to the river. Acquisition of this parcel will allow for the disconnection and abandonment of the on-site sewage disposal systems associated with the residences, resulting in nutrient load reductions to the river. The site also has the potential to be used for shoreline restoration by the creation of a vegetative buffer along the canal and Homosassa River.

Cost: TBD

Homosassa River and Springs Land Acquisition – Yates Bleachery Property

This 33-acre parcel consists of forested riverfront with over 400 feet of shoreline on the south bank of the Homosassa River. The property benefits include maintaining water quality and clarity of the upper Homosassa River by preserving the shoreline and forested buffer in a natural state. Additional benefits include providing overland flood storage capacity of land adjacent to the river.

Cost: TBD

Habitat Restoration
Oyster and SAV Enhancement Both the Weeki Wachee and Homosassa Rivers have lost much of their submerged aquatic vegetation (SAV). Planting native SAV would improve water quality and clarity, stabilize the sediments, enhance fisheries habitat, and provide foraging habitat for a variety of fish and wildlife, including the Florida Manatee. Additionally, given changing salinity regimes, oyster recruitment in the lower reaches could provide an opportunity for the creation of oyster habitat. Similar to SAV, oyster reefs provide benefits including improved water quality and clarity, sediment stabilization, and important fish and wildlife habitat. In fact, establishment of oyster reefs has been shown to create conditions more suitable for seagrass recruitment and recovery. Propose identifying suitable locations for SAV plantings and oyster reef habitat creation and performing feasibility studies to inform subsequent scaled-up restoration and enhancement projects. The site suitability assessment will be conducted by a qualified contractor tasked with reviewing existing aerial and survey information to identify sites that have restoration/enhancement potential. The sites will then be ground-truthed and any locations that meet specifically identified criteria qualifying them as potential restoration sites will be categorized and ranked. Riparian issues (i.e., ownership) will be investigated for each potential restoration location and the owners will be contacted to learn their level of willingness to participate in future restoration or enhancement plans. The goal of this phase of the study is to identify properties that have habitat restoration potential. The next phase of this study will be to further investigate each of these locations and to develop restoration plans. Cost: $75,000
Invasive Species Management
NONE
Recreation Management
NONE

References

Beeler, I. E. and T. J. O'Shea. 1988. Distribution and mortality of the West Indian manatee (*Trichechus manatus*) in the Southeastern United States: A compilation and review of recent information. National Ecology Research Center Report No. 88-09. 2 Vol. 613 p.

Blackburn, R.D. and L.W. Weldon. 1967. Eurasian watermilfoil - Florida's new underwater menace. Hyacinth Contrrol Journal. 6:15.

Bonn, M.A. and F.W. Bell. 2003. Economic Impact of Selected Florida Springs on Surrounding Local Areas. Report prepared for the Florida Department of Environmental Protection. Tallahassee, FL.

Bridger, K., J. Dodson, and G. Maddox. 2014. Draft TMDL Report. Nutrient TMDLs for Homosassa - Trotter – Pumphouse Springs Group, Bluebird Springs, and Hidden River Springs. Ground Water Management Section, Division of Environmental Assessment and Restoration, Florida Department of Environmental Protection. Tallahassee, FL. 114 pp.

Cowell, B.C. and C.J. Dawes 2008. Sources of Chlorophyll a in the Kings Bay Embayment, Crystal River, FL. Final Report submitted to the Southwest Florida Water Management District. Prepared by University of South Florida. Tampa, Florida. 18 pp.

Duarte, C.M. and D.E. Canfield, Jr. 1990. Light absorption in Florida springs. Florida Scientist. 53(2): 118-122.

Florida Department of Environmental Protection (FEDP). 2005. Homosassa Springs Wildlife Stare Park Unit Management Plan. State of Florida, Department of Environmental Protection, Division of Recreation and Parks. 116 p.

Florida Department of Environmental Protection (FEDP). 2014. First Quarterly Sampling Update, Ellie Schiller Homosassa Springs Wildlife State Park, Wildlife Park Water Quality Assessment. Citrus County, Florida July 9, 2014. FDEP Ground Water Management Section Water Quality Evaluation & TMDL Program. Tallahassee, FL. 12 pp.

Florida Fish and Wildlife Conservation Commission (FWC). 2016. Invasive Plant Management web page (http://www.myfwc.com/wildlifehabitats/invasive-plants/)

Florida Geological Survey (FGS). 2003. Florida Spring Classification System and Spring Glossary. 2003. Special Publication No. 52. Compiled by Rick Copeland. Tallahassee, FL. 22 p.

Florida Geological Survey (FGS). 2004. Springs of Florida. FGS Bulletin No. 66. 342 p.

Frazer, T.K., E.J. Phlips, S.K. Notestein and C. Jett. 2002. Nutrient limiting status of phytoplankton in five Gul f coast rivers and their associated estuaries. Final Report. Southwest Florida Water Management District. 21 pp.

Frazer, T.K., M.V. Hoyer, S.K. Notestein, J.A. Hale and D.E. Canfield, Jr. 2001. Physical, chemical and vegetative characteristics of five Gulf coast river s. Final Report. Southwest Florida Water Management District. 357 p.

Grabe, S.A. and A. Janicki. 2010. Characterization of Macroinvertebrate Communities of the Homosassa & Halls Rivers. Prepared by Janicki Environmental, Inc. for Southwest Florida Water Management District. 107 pp.

Griffin, D.W., R. Stokes, J. B. Rose, and J. H. Paul III. 2000. Bacterial indicator occurrence and the use of F+ specific coliphage assay to identify fecal sources in Homosassa Springs, Florida. Microbial Ecology. 39: 56–64.

Harrington, D., G. Maddox., and R. Hicks. 2010. Florida Springs Initiative Monitoring Network report and recognized sources of nitrate. Florida Department of Environmental Protection. Tallahassee, FL. 113 pp.

Hartman, D. S. 1974. Distribution, status, and conservation of the manatee in the United States. Report to U.S. Fish and Wildlife Service, National Fish and Wildlife Lab, Contract Rep. No. 14-16-0008-748, National Tech. Inv. Serv. Publ. No. PB81-140725. 247 p.

Heffernan, J.B., D.M. Liebowitz, T.K. Frazer, J.M. Evans, and M.J. Cohen. 2010. Algal blooms and the nitrogen-enrichment hypothesis in Florida springs: evidence, alternatives, and adaptive management. Ecological Applications. 20(3): 816-829.

Herald, E.S. and R.R. Strickland. 1949. An annotated list of the fishes of Homosassa Springs, Florida. Quarterly Journal of the Florida Academy of Science 11(4): 99-109.

Hoyer, M.V., S.K. Notestein, T.K. Frazer, and D.E. Canfield, Jr. 2006. A comparison between aquatic birds of lakes and coastal rivers in Florida. Hydrobiologia. 567: 5-18.

Hoyer, M.V., T.K. Frazer, S.K. Notestein, and D.E. Canfield, Jr. 2004. Vegetative characteristics of three low-lying Florida coastal rivers in relation to flow, light, salinity and nutrients. Hydrobiologia. 528: 31-43.

Jacoby, C.A., T.K. Frazer, M.A. Edwards, and J.R. Frost. 2014. Water quality characteristics of the nearshore Gulf coast waters adjacent to Hernando, Citrus and Levy Counties – Project COAST 1997 – 2014. University of Florida. Prepared for the Southwest Florida Water Management District. 24 p.

Jones, G.W., S.B. Upchurch, K.M. Champion, and D.J. Dewitt. 1997. Revised 2011. Water-Quality and Hydrology of the Homosassa, Chassahowitzka, Weeki Wachee, and Aripeka Spring Complexes, Citrus and Hernando Counties, Florida – Origin of Increasing Nitrate Concentrations. Southwest Florida Water Management District. 187 p.

King, S.A. 2014. Hydrodynamic control of filamentous macroalgae in a sub-tropical spring-fed river in Florida, USA. Hydrobiologia. 734: 27-37.

Kleen, J.M. and A.D. Breland. 2014. Increases in Seasonal Manatee (Trichechus manatus latirostris) Abundance within Citrus County, Florida. Aquatic Mammals. 40(1): 69-80.

Knochenmus, L.A. and D.K. Yobbi. 2001. Hydrology of the Coastal Springs Ground-Water Basin and Adjacent Parts of Pasco, Hernando, and Citrus Counties, Florida. U.S. Geological Survey. Water-Resources Investigations Report 01-4230. Prepared in cooperation with the Southwest Florida Water Management District. 95 pp.

Leeper, D.A., M.S. Flannery, M.G. Heyl, and R. Basso. 2012. Recommended Minimum Flows for the Homosassa River System. Southwest Florida Water Management District. Brooksville, FL. 223 pp.

Marella, R. 2008. Water Use in Florida 2005, and Trends 1950-2005. United States Geological Survey Fact Sheet 2008-3080.

Mattson, R.A., M. Lehmensiek, and E.F. Lowe. 2007 Nitrate toxicity in Florida springs and spring-run streams: A review of the literature and its implications. St. Johns River Water Management District. Professional Paper SJ2007-PP1. Palatka, Florida. 31 p.

Miller, J.A. 1986. Hydrogeologic framework of the Floridan aquifer system in Florida and in parts of Georgia, Alabama, and South Caroline: U.S. Geological Survey Water-Resources Investigations Report. 84-4135. 69 p.

National Oceanic and Atmospheric Administration (NOAA). 2009 Seal Level Variations of the United States – 1854-2006. Technical Report NOS CO-OPS 053. 194 p.

Notestein, S.K., T.K. Frazer, M.V. Hoyer, and D.E. Canfield, Jr. 2003. Nutrient limitation of periphyton in a spring-fed, coastal stream in Florida, USA. Journal of Aquatic Plant Management. 41: 57-60.

Odum, H.T. 1957. Primary Production Measurements in Eleven Florida Springs and a Marine Turtle-Grass Community. Limnology and Oceanography 2:85-97.

Powell, J. A. and G. B. Rathbun. 1984. Distribution and abundance of manatees along the northern coast of the Gulf of Mexico. Northeast Gulf Sci. 7(1):1-28.

Rosenau, J.C., Faulkner, G.L., Hendry, C.W., Jr., and Hull, R.W. 1977. Springs of Florida: Florida Geological Survey Bulletin 31, Revised. 461 p.

Sacks, L. A. and A.B. Tihansky. 1996. Geochemical and isotopic composition of ground water with emphasis on sources of sulfate in the upper Floridan Aquifer and intermediate aquifer system in southwest Florida. U.S. Geological Survey WRI Report 96-4146. 54 p.

Sepulveda, N. 2002. Simulation of Ground-Water Flow in the Intermediate and Floridan Aquifer Systems in Peninsular Florida. U.S. Geological Survey WRI Report 02-4009. 130 p.

Sloan, W.C. 1956. The distribution of aquatic insects in two Florida springs. Ecology 37: 81–98.

Southwest Florida Water Management District (SWFWMD). 1987. Ground-water Resource Availability Inventory: Hernando County, Florida. 166 p.

Southwest Florida Water Management District (SWFWMD). 2012 Recommended Minimum Flows for the Homosassa River System. 223 pp.

Southwest Florida Water Management District (SWFWMD). 2015. 2015 Regional Water Supply Plan – Northern Planning Region. 166 p.

Southwest Florida Water Management District (SWFWMD). 2016a. Coastal Rivers Submerged Aquatic Vegetation Assessment. Prepared by Applied Technology and Management. 268 pp.

Southwest Florida Water Management District (SWFWMD). 2016b. Coastal Rivers Invertebrate Assessment. Prepared by Amec Foster Wheeler. 189 pp.

Stevenson, R.J., A. Pinowska, A. Albertin and J.O. Sickman. 2007. Ecological condition of algae and nutrients in Florida Springs. The Synthesis Report WM 858 Florida Department of Environmental Protection, Tallahassee, Florida. 58 pp. plus appendices.

Taylor, C.R. 2006. A Survey of Florida Springs to Determine Accessibility to Florida Manatees: Developing a Sustainable Thermal Network. Prepared for the U.S. Marine Mammal Commission by Wildlife Trust. St. Petersburg, FL. 66 pp.

Walsh, S.J. and J.D. Williams. 2003. Inventory of Fishes and Mussels in Springs and Spring Effluents of North-Central Florida State parks. Final Report submitted to the Florida Park Service. Prepared by the U.S. Geological Survey, Gainesville, Florida. 94 pp.

Wetland Solutions, Inc. (WSI). 2010. An Ecosystem-Level Study of Florida's Springs. Prepared for Florida Fish and Wildlife Conservation Commission, St. Johns River Water Management District, Southwest Florida Water Management District, Florida Park Service, Florida Springs Initiative, and Three Rivers Trust, Inc. FFWCC Project Agreement No. 08010. 236 p. plus appendices.

Whitford, L.A. 1956. The Communities of Algae in the Springs and Spring Streams of Florida. Ecology 37(3): 433-442.

Wolfe, S.H., R.W. Simons, R.E. Noss, J.A. Reidenauer, M.S. Flannery and M.J. Bland. 1990. An ecological characterization of the Florida Springs Coast: Pithlachascotee to Waccasassa Rivers. U.S. Fish and Wildlife Service Biological Report 90(21). 323 pp.

Appendix A: Technical Working Group Participant List

Name	Title	Organization	Meeting Attendees		
			1/22/2016 Issues, Drivers, Quantifiable Objectives	3/16/2016 Management Actions	6/1/2016 Projects
Andy and Terri Auner		Homosassa River Alliance	PRESENT	PRESENT	PRESENT
Anne Birch	Marine Conservation Director	The Nature Conservancy			
Anne Holbrook	Staff Attorney	Save the Manatee Club			PRESENT
B.J. Jarvis					
Beau Williams	Project Development & Consulting	AquaTech Eco Consultants, LLC			PRESENT
Bernard Berauer					
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	
Chris Anastasiou	Chief Scientist	SWFWMD	PRESENT		PRESENT
Chris Becker		FDEP			
Chris Oliver		FDEP			
Chris Zajac	FARMS Manager	SWFWMD	PRESENT		
Chuck Jacoby		UF			
Chuck Morton	Member	HCTF		PRESENT	

Name	Title	Organization	Meeting Attendees		
			1/22/2016 Issues, Drivers, Quantifiable Objectives	3/16/2016 Management Actions	6/1/2016 Projects
Clay Black		Hernando County			
Dan Hilliard		WAR			PRESENT
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	
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		
			1/22/2016 Issues, Drivers, Quantifiable Objectives	3/16/2016 Management Actions	6/1/2016 Projects
Jeff Harris	Environmental Biologist	Pasco County			
John Burnett		Hernando County	PRESENT	PRESENT	PRESENT
Josh Madden	Environmental Scientist	SWFWMD		PRESENT	
Justine Student					PRESENT
Karen Van Sickle		Rotary Club of Brooksville			
Kent Smith	Marine and Estuarine Habitat Leader, Habitat Species Conservation	FWC			
Kevin Coyne		FDEP	PRESENT		
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	PRESENT	
Lauren Greenfield	Environmental Manager, ERP	FDEP			
Katie Hallas	Environmental Administrator	FDACS			PRESENT
Mahmood Nachabe	Professor	USF Civil & Environmental Engineering			

Name	Title	Organization	Meeting Attendees		
			1/22/2016 Issues, Drivers, Quantifiable Objectives	3/16/2016 Management Actions	6/1/2016 Projects
Maria Merrill	Biological Scientist	FWCC/Marine & Estuarine Subsection		PRESENT	
Mariben Anderson	Natural Resources Technical Manager	Michael Baker International			
Mark Schroder		Citrus County	PRESENT		PRESENT
Mary Hartney	President	Florida Fertilizer & Agrichemical Association			
Mary Szafraniec		AMEC			PRESENT
Matt Warren	Environmental Specialist III, Office of Agricultural Water Policy	FDACS		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
Ron Basso	Chief Hydrologist, Resource Evaluation	SWFWMD	PRESENT	PRESENT	
Ron Mezich	Biologist, Habitat Species Conservation	FWC	PRESENT		
Ron Shultz					PRESENT

Name	Title	Organization	Meeting Attendees		
			1/22/2016 Issues, Drivers, Quantifiable Objectives	3/16/2016 Management Actions	6/1/2016 Projects
Samantha Whitcraft					
Sarina Ergas	Professor and Graduate Program Coordinator	USF Civil & Environmental Engineering			
Scott McBride	Hydrologist	USGS			
Sean King	Staff Engineer	SWFWMD	PRESENT	PRESENT	PRESENT
Shannon Herbon		FDEP			
Siobhan Gorham	Research Associate, FWRI	FWC	PRESENT	PRESENT	
Sky Notestein	Senior Environmental Scientist	SWFWMD	PRESENT	PRESENT	
Stephen Minguy			PRESENT		
Steven Davis	Citrus County Florida Yards and Neighborhoods	Citrus County		PRESENT	PRESENT
Terri Calleson	Co-Team leader, Project Consultations, Coastal and Marine	USFWS	PRESENT		
Terry Hansen	Environmental Consultant	FDEP	PRESENT	PRESENT	
Tim Jones	Environmental Specialist III, Office of Coastal and Aquatic Managed Areas	FDEP CAMA			
Tina Malmberg		Citrus County			PRESENT
Tom Lynn	Student	USF			

Name	Title	Organization	Meeting Attendees		
			1/22/2016 Issues, Drivers, Quantifiable Objectives	3/16/2016 Management Actions	6/1/2016 Projects
Warren Hog				PRESENT	
Mary Szafraniec		AMEC Foster Wheeler			

Appendix B: Permitted Point Sources

This appendix lists point sources and water use permits within the Homosassa River 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 June 20, 2016, 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. That correspondence also indicated there were no known surface water discharges. There are no permitted power plants or large quantity generators within the Homosassa watershed and springshed boundaries as of May 13, 2016.

Table 16: Small Quantity Generators of Hazardous Waste as of 5/13/2016

HANDLER ID	SITE ID	NAME
FLD032362162	52179	Nick Nicholas Ford Inc
FLD039682646	44512	Homosassa Tire
FLR000077222	34442	Carters Auto Recycling
FLD984234344	42197	Touch Of Quality Cleaners
FLD984197012	34500	M D Auto Clinic

Table 17: Solid Waste Facilities as of 5/13/2016

FACILITY ID	NAME	STATUS
39873	HOMOSASSA SPRINGS DUMP	Closed, No Gw Monitoring
39874	FLORAL CITY DUMP	Closed, No Gw Monitoring
39875	LECANTO DUMP	Closed, No Gw Monitoring
39909	INVERNESS CITY DUMP	Closed, No Gw Monitoring
40063	CITRUS SAND & DEBRIS II	Active
40118	RIP, INC C&D DISPOSAL FACILITY	Active
40146	MONEX (MONIER ASH) CLOSED CLASS 1 LANDFILL	Nfa,No Further Action
40150	CITRON INVESTMENT GROUP C & D LF	Closed, No Gw Monitoring
39859	CITRUS CENTRAL SLF	Active
40779	W CLYDE DANIEL CONST INC -MONDON HILL RD	Closed, No Gw Monitoring
41027	S A WILLIAMS CORP SITE #1 (C & D)	Closed, No Gw Monitoring
41069	S A WILLIAMS CORP SITE #2 (C & D)	Inactive
95155	DIRT BOYS, INC. PIT	Activity Not Permitted/Registered
99097	PRECISION GRADING & LAND DEVELOPMENT INC/ P & D HOLDINGS LLC	Complaint Under Investigation
102676	MAYLEN AVENUE	Inactive
101406	R&B FILL	Never Operated, Permit Never Used
100867	THERESA AND MARK NICOSIA WASTE TIRE SITE	Not Yet Determined

Table 18: Dry Cleaners as of 5/13/2016

FACILITY ID	NAME	STATUS
9501401	TOUCH OF QUALITY CLEANERS - POWELL SQUARE	OPEN
9811300	BEVERLY HILLS CLEANERS	OPEN
9501332	QUALITY CLEANERS	OPEN

Table 19: Petroleum Sites as of 5/13/2016

FACILITY ID	NAME
8503124	RACETRAC #195
8503143	SPEEDWAY #6528
8503159	RIVERHAVEN MARINA
8503058	CITGO-FLORAL CITY #164
8503079	HOMOSASSA SEAFOOD
8503082	CIRCLE K #2726183
8503085	HUDSON FOOD STORES #1575
8503113	QUICK SAVE II DISCOUNT BEVERAGE
8503168	CIRCLE K #2707211
8503170	TARA FOOD MART
8508798	LAKE LINDSEY GROCERY
8518723	MACRAE'S OF HOMOSASSA INC
8518731	CITGO-MAIN ST #180
8521248	CIRCLE K #7504
8520263	DIVISION OF FORESTRY-HQ SITE
8626537	FERRIS FARMS INC
8626547	INVERNESS CITY-WHISPERING PINES PK
8626567	HIGHLANDS COASTAL
8626580	NICK NICHOLAS FORD INC
8626584	INVERNESS CENTRAL OFF
8626586	COMO AUTO SALES & SERVICE INC
8625853	CIRCLE K #7497
8628513	MATERIAL EXCHANGE CORP
8733140	CITRUS MEMORIAL HOSPITAL
8732865	LECANTO ONE LLC
8628495	INVERNESS TRANSPORTATION
8732402	CITRUS CNTY-FLEET MGMT
8735892	EDDIE SKINNER
8735894	VALENTINE ROOKS
8736259	CENTRAL MATERIALS CO INC
8731795	LECANTO TRANSPORTATION
8736077	DEE RIVER RANCH
8734270	CHEVRON-LECANTO #177
8736154	SUNRISE FOOD MART #10
8735704	CHARLES A BLACK I WP
8737228	ESPEDECO ESTATES
8736633	INVERNESS GOLF & COUNTRY CLUB
8841370	KWIK STOP
8841544	STEWART'S TREE SERVICE INC
8840219	CHEVRON-INVERNESS #249
8840275	CIRCLE K #8623

FACILITY ID	NAME
8841501	MAURICE L BLACK
8841503	RICHARD R MATHEWS
8841674	ALBERT ROOKS
8839378	HOMOSASSA COUNTRY STORE
9046287	HOMOSASSA CENTRAL OFF
8944835	MAGIC MANATEE MARINA
9046664	DITTRICH CONSTRUCTION
8944545	BRADS FOOD & GAS
8842354	QUALITY #188
8945470	CITRUS CNTY-PUBLIC WORKS AIRPORT
9101948	FOUNTAIN MEMORIAL PARK
8945300	QUALITY #182
9200335	ECKERD YOUTH ALTERNATIVES INC CAMP E-NINI-HASSEE
9047542	TEXACO FOOD MART
9102745	INVERNESS FOOD MART
9103632	CITRUS CNTY-DETENTION FACILITY
9102651	INVERNESS CITY-WATER POLLUTION CTRL
9102653	INVERNESS CITY-CITRUS WTR PLT
9401278	LIFE CARE CENTER OF CITRUS CNTY
9402028	LOVE CHEVROLET
9500327	EDWARD F DONNERY INC
9501770	HOMOSASSA RIVERSIDE RESORT
9500750	LAUNDERLAND
9501009	KOIN KLEEN LAUNDRY
9501401	TOUCH OF QUALITY CLEANERS - POWELL SQUARE
9800785	CEMEX - LECANTO EAST READY-MIX PLANT
9800671	TOTAL ENVIRONMENTAL SRVCS
9800883	ST PETER SHELL
9800982	CYPRESS CREEK JUV OFFENDER CORRECTION CTR
9802090	SKYVIEW GOLF COURSE MAINT
9804962	MOSQUITO CONTROL HDQTRS
9805817	INVERNESS CITY 581 WATER PLT
9808634	MOBIL-LECANTO #702
9811300	BEVERLY HILLS CLEANERS
9811889	RACETRAC #97
9810169	PUBLIX SUPER MARKET #518
9810877	CITRUS CNTY SCHOOL BD-CITRUS HS
9810740	CITRUS CNTY BOCC-EMERGENCY OPER CTR
9810742	CITRUS COUNTY LECANTO GOVERNMENT/ DOH BLDG
9811762	RENAISSANCE CENTER
9813787	PUBLIX SUPER MARKET #1448
9813966	HPH HOSPICE CITRUS CNTY CARE CTR
9814558	FLORAL CITY WATER ASSOCIATION INC. PLANT #3
8518732	CRYSTAL RIVER QUARRIES
9815066	BLACK DIAMOND ALLIGATOR TANNERY LLC
9804940	CRYSTAL RIVER QUARRIES INC-MAYLEN MINE

Table 20: Water Use Permits as of 5/13/2016

PERMIT NUMBER	NAME	PERMITTED QUANTITY (ANNUAL AVERAGE GPD)
4490	Groudas Neff Lake	22,800
3993	Evans Properties, Inc.	600
208	Ferris Farms	302,400
4406	Homosassa Special Water District	960,000
6797	S.A. WILLIAMS TRUST	325,900
2836	CHINSEGUT HILL NATIONAL WILDLIFE REFUGE	21,400
872	Inverness Village Condominium Association	36,500
8147	OAK POND LLC A FLORIDA LLC	11,600
12288	M & B PRODUCTS	497,277
6971	FLYING W FARMS	30,900
20248	Goldsmith Road Property	26,030
9329	KAY-DAWSONS LP GAS	1,000
6291	ROSEMONT/ROLLING GREEN	52,000
8997	Inverness Golf and Country Club	49,000
2708	CITRUS COUNTY FAIR ASSOCIATION	2,800
8747	SOUTHEAST ESTATES	2,900
7879	OAK FOREST	73,200
8562	FOX RUN	36,100
12058	LIMESTONE QUARRY	67,300
8060	Stewarts Tree Service Property	115,500
12974	D & J BLUEBERRY FARMS	19,700
4753	CONSTATE UTILITIES	81,200
7823	LECANTO CAMPUS SITE	19,100
3228	CITRUS HILLS INVESTMENT PROP INC	613,900
8627	CHARLES D. TUTTLE	29,500

PERMIT NUMBER	NAME	PERMITTED QUANTITY (ANNUAL AVERAGE GPD)
1273	Post Creek Ranch, LLC	61,500
6873	BROOKSVILLE GOLF AND COUNTRY CLUB	206,400
7784	Water Oaks Treatment Plant	40,500
4368	Citrus County - Lecanto School Complex	87,000
191	Howard B. Banes	14,300
9097	Tarawood Utilities	99,600
1108	ZELLNER GROVES	99,000
2226	Edwin O'Neal	27,450
20188	Bell Groves Goldsmith Grove	43,200
20189	Bell Fruit Riviere Grove	28,300
6691	CINNAMON RIDGE UTILITIES	223,000
3416	NRCS - Brooksville Plant Materials Center	31,500
12059	Moorings at Point O'Woods	27,600
296	Ray A. Morris	11,300
7295	Citrus County Utilities Division	27,000
355	Adams Property (fka McManus)	16,300
7805	Skyview Golf Course	1,148,400
419	City of Inverness	1,535,000
1118	Floral City Water Association	545,000
4231	Brooksville Ridge Blueberries LLC	117,200
1609	V.J. Robinett	11,650
10621	Olivia V Mills	23,800
20379	Hicks Grove Blueberries LLC	52,200

PERMIT NUMBER	NAME	PERMITTED QUANTITY (ANNUAL AVERAGE GPD)
20520	Long Branch II	43,800
12565	pH-Farms	237,800
13100	Spring Lake Blueberries	15,000
5091	Toby John & Joanna Caulfield	300
20046	Pinewoods Plantation Nursery	123,160
7687	Crystal River Quarries - Lecanto Mine WUP	73,900
5789	Hernando County Water System	23,299,000
8849	Lecanto WTP	2,000
12876	Homosassa Springs Wildlife State Park	13,000
199	BROOKSVILLE QUARRY	21,400
12049	Citrus County Fire Wells	2,500
1345	Royal Oaks of Citrus HOA, Inc.	66,800
729	Point O' Woods	80,000
4582	Mary L Harrison Trustee	24,900
2882	T J Smith and Son Dairy	121,400
8758	Our Lady of Fatima Church	13,300
9791	Sugarmill Woods Water System	2,362,100
3467	The Fountains Memorial Park	45,400
13360	Henke Ranch	223,500
8395	Withlacoochee Forestry Center	10,800
20545	Blueberry Well	50,500

Table 21: Wastewater Permits as of 5/13/2016

FACILITY ID	NAME	TYPE	PERMITTED CAPACITY (MGD)
FLA011839	Floral City Elementary School WWTF	Domestic Wastewater	0.0060
FLA011847	Inverness, City of - WWTF	Domestic Wastewater	1.5000
FLA011853	Aunt Vera's Antique Store	Domestic Wastewater	0.0060
FLA011857	Manatee Campground & Marina	Domestic Wastewater	0.0100
FLA011864	Moonrise Resort	Domestic Wastewater	0.0130
FLA011879	Oak Pond Mobile Home Estates	Domestic Wastewater	0.0100
FLA011880	Stoneridge Landing	Domestic Wastewater	0.0280
FLA011883	Stonebrook MHP WWTF	Domestic Wastewater	0.0351
FLA011884	Floral Oaks Apartments WWTF	Domestic Wastewater	0.0100
FLA011891	Singing Forest MHP WWTF	Domestic Wastewater	0.0240
FLA011893	Point O Woods	Domestic Wastewater	0.0580
FLA011898	Harbor Lights Mobil Home Resort WWTF	Domestic Wastewater	0.0100
FLA011899	Cedar Lakes MHP WWTF	Domestic Wastewater	0.0140
FLA011900	Royal Oaks Manor	Domestic Wastewater	0.0710
FLA011901	Bell Villa MHP	Domestic Wastewater	0.0125
FLA011902	Palm Terrace Village WWTF	Domestic Wastewater	0.0200
FLA011904	Oasis MHP WWTF	Domestic Wastewater	0.0075
FLA011907	Evanridge MHP	Domestic Wastewater	0.0200
FLA011914	Greenbriar Of Citrus Hills	Domestic Wastewater	0.0480
FLA011924	Lecanto Hills MHP WWTF	Domestic Wastewater	0.0120
FLA011927	Tarawood Adult Community	Domestic Wastewater	0.0200
FLA011942	Mr & Mrs Sudsy's Car Wash	Industrial Wastewater	0.0000
FLA011949	Citrus Wash & Dry Laundromat LLC	Industrial Wastewater	0.0000
FLA012046	Brooksville Golf & Country Club WWTF	Domestic Wastewater	0.0105
FLA012062	Countryside Estates WWTF	Domestic Wastewater	0.0200
FLA309052	Crystal River Quarries Inc - Lecanto Mine	Industrial Wastewater	0.0000
FLA500526	Signet Investments Nick Nicholas Ford	Industrial Wastewater	0.0000
FLA869929	Rooks BLAS	Residuals Application Facility	0.0000
FLG110009	CEMEX LLC - Lecanto East CBP	Concrete Batch GP	0.0000
FLG110488	CEMEX LLC - Lecanto West RM Plant	Concrete Batch GP	0.0000
FLG110541	Gulf Coast Ready Mix CBP	Concrete Batch GP	0.0000

Table 22: MS4 Permits as of 5/13/2016

PERMIT ID	PERMITTEE
FLR04E040	Hernando County

Appendix C: Jurisdictional Authority

FEDERAL

Federal jurisdiction in the Homosassa 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 Homosassa 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 Homosassa River watershed and estuary. The Florida Department of Environmental Protection is the lead state agency in the protection and management of Homosassa 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 Ellie Schiller Homosassa Springs Wildlife State Park contains the main spring for the Homosassa River. On December 30, 1988, the Board of Trustees of the Internal Improvement Trust Fund of the State of Florida purchased the park lands from Citrus County.

Division of Water Resource Management

The Southeast District Office in Tampa has responsibility for proprietary and regulatory permitting issues in the Homosassa 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 Homosassa 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 Homosassa 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 Homosassa 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 governments within the Homosassa watershed, are several cities- Lecanto, Inverness, and Floral City in Citrus County and the City of Brooksville in Hernando County. These local governments play a role in the Homosassa 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

Hernando County

For all areas of Hernando County that fall within the Springs Coast springsheds the County implements and enforces the requirements of the National Pollutant Discharge Elimination System and County ordinances for riverine protection, groundwater protection, wellhead protection, development, and flood damage protection which encourages the preservation of wetlands and natural recharge areas. Additional ordinances implement specific regulations that benefit natural systems. All development is permitted through the County, with review for compliance with County development code and industry BMPs and SWFWMD regulations where appropriate. The County Stormwater protection ordinance requires protective measures for all land disturbing activities.

Appendix D: List of Acronyms

ABBREVIATION	DESCRIPTION
AES	Agriculture Environmental Services
BMAP	Best 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
MFC	Marine Fisheries Commission
MFL	Minimum Flows and Levels
mgd	Million Gallon 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
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
SCMC	Springs Coast Management Committee
SCSC	Springs Coast Steering Committee

ABBREVIATION	DESCRIPTION
SLER	Submerged Lands and Environmental Resources
SWFRPC	Southwest Florida Regional Planning Council
SWFWMD	Southwest Florida Water Management District
SWRWRF	Southwest Regional Water Reclamation Facility
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
WSI	Wetland Solutions Incorporated
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 Homosassa River System 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 their 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 Ellie Schiller Homosassa Springs Wildlife State Park contains the main spring for the Homosassa 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.

Homosassa River Alliance

The Homosassa River Alliance is a local non-profit 501(c)3 organization created to prevent the abuse and overuse of our coastal rivers and wetlands, focusing on the Homosassa River and springshed. Members are actively involved in education, conservation, monitoring, community support, and recovering mangroves/other aquatic species.

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

Draft potential projects and initiatives were provided by participants of the TWG for review by the SCMC and SCSC. Tables 23, 24, and 25 list projects and initiatives provided by participants of the TWG that were not approved by the SCMC or SCSC to be included as a priority project or initiative.

Water Quality

Table 23: Draft Potential Water Quality Projects and Initiatives

Monitoring & Research
Cleaning Canals with Aeration Develop and evaluate methods to improve water quality and circulation in canals by using aeration to create vertical movement of sediments. Place pond aerators in "dead End" canal systems to create water movement. One is presently in use on Mound canal at the end between Arbordale and Richard Drive, Weeki Wachee FL. Another aerator will be installed at the north end of John's Canal after baseline water clarity data is obtained courtesy of Chuck Morton, the adjacent property owner. 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. Cost: $60,000 (Cost for implementation in Weeki Wachee, Homosassa, and Chassahowitzka)
Legacy Nutrient Inventory and Management Develop ground-truthed estimates of existing legacy nutrients, accumulation rates, and resuspension risk factors. Identify areas where management of nutrient inputs has been effective, and/or where resuspension of legacy nutrients from sediment is a leading cause of water quality deterioration. Use these findings to develop a legacy nutrient management plan involving careful planning and permitting of suction dredge operations to remove muck and algae from areas where such actions would have significant long-term impacts. Cost: $75,000
Agricultural Operations (Cattle Farms, Horse Farms, Row Crops)
NONE

Septic Tanks
Hybrid Adsorption Biological Treatment (HABiTS) Biological Nitrogen Removal (BNR) Pilot Scale Study Carry out a full scale pilot study at residential sites to compare the effectiveness of a 2-stage passive nitrogen reducing system incorporating ion exchange media with conventional 2-stage passive biological nitrogen removal systems for onsite wastewater treatment. Tasks would include: 1) Design and construction of HABiTS and conventional BNR systems at residential sites with septic systems. 2) Monitoring of system performance monthly over a two-year period. 3) Annual follow up to determine long term performance and maintenance requirements. Cost: $150,000
Old Homosassa Septic to Sewer Project This project will connect up to 600 homes within the Old Homosassa area. The majority of the residences are directly adjacent to environmentally sensitive surface waters. Availability of sewer service to the area would eliminate the potential for nutrient pollution posed by septic tank effluent. This project is proposed to be a phased construction project over a 5-year timeframe and requires multiyear funding. Cost: $40,000,000
Septic Tank Conversion Study Develop GIS map of springshed septic systems and conduct dye trace groundwater travel studies and necessary additional geologic and hydrologic research to determine localities where conversion from septic to municipal sewage would most alleviate nutrient inputs to groundwater. Develop plan to reduce septic inputs by one third over 5 years. Cost: $140,000
Urban/Residential Fertilizer (includes Golf Courses)
NONE

Wastewater Treatment Facilities

Private Sewer Line Cost Sharing Program

Aged private commercial and residential sewer laterals, are often in poor condition. Laterals are the portions of the sewer network connecting private property to the public sewer system. Newer laterals are generally installed with polyvinyl chloride (PVC) pipe, but old private laterals can also be made of vitrified clay pipe (VCP). Both older PVC and VCP are victim to root intrusion, cracks, joint misalignment and general leakage. Private laterals are significant contributors to a utility system's infiltration and inflow and are difficult to manage with no means to address the I & I source. High levels of I & I can have possible negative environmental impacts due to sanitary system overflows that may happen during storm events. Additionally, according to the EPA's Guide for Estimating Infiltration and Inflow, in some cases, high levels of infiltration can also lower groundwater levels and can cause significant hydrologic impacts to nearby streams.

The proposed initiative would first create regulation that incentivizes the certification of a private lateral being leak free. For example, such certification could require a lateral be certified leak free when the property is bought or sold, or if a remodel/expansion exceeds a set dollar amount.

The second aspect to the initiative is to provide funding assistance when a lateral fails certification, i.e. is found to be leaking. The funding would provide 50% reimbursement (up to a maximum of $5,000) for full lateral replacement. The program would not provide funding for rehabilitation of leaking laterals, only replacement.

Cost: $290,000

Stormwater

US 19 Gravity Sewer Project

This project is driven by the effort of the Florida Department of Transportation (FDOT) planning for the widening of US 19. The FDOT work requires relocation, upsizing and expansion of gravity and force main sewer infrastructure in the area prior to, or in conjunction with FDOT.

Cost: $1,250,000

Homosassa South Fork Phase 2 – Pond 1 and 3

After the completion of Pond 2 (listed in Ongoing Projects section), design and construction of two additional ponds. Pond 1 would be designed to capture 100% of the stormwater runoff from 1-inch events or less. Nutrient removal from Pond 1 is estimated to be 50 lbs of TN/year and 11 lbs of TP/year.

Pond 3 construction would connect it to Pond 2. The combined treatment yields approximately 450 lbs of TN and 65 of TP annually for a 450 acre drainage area comprised of commercial, wetland, and wetland forest land uses. The creation of Pond 3 would allow added permanent pool volume and increased residence time.

Cost: $TBD

Septic/Sewage Solids Disposal
Spreading Bio-Solids in the Homosassa River Springshed Evaluate the ongoing practice of spreading bio-solids on lands above unconfined aquifers and its contribution to nitrate pollution and the continuing biologic collapse of the Homosassa River. Cost: TBD
Atmospheric Deposition
NONE

Water Quantity

Table 24: Draft Potential Water Quantity Projects and Initiatives

Monitoring & Research
Grout Injections and Spring Flow Study This project is to perform a study on the effects of grout injection near a head-spring. Sinkhole stabilization companies use large amounts of grout to stabilize sinkholes under homes. This study will assess whether operations such as injecting grout cause changes to or blockage of spring flow. If these types of operations can alter spring flow the study will make recommendations on permitting required near a head-spring and alternative methods of stabilization in these areas. Background: Based on observations by local residents, flow through the "Blue Water" section of the Homosassa has decreased significantly. Water used to flow out of the blue water section of the Homosassa River at all times, even during incoming tides. Flow strong enough to cause ripples could be seen during an outgoing tide. This is no longer the case. At least 2 homes have been grouted within 2000 feet of the main Homosassa spring vent, with estimates of over 80 cement trucks used. Cost: $150,000
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 Identify efficiencies that can be gained by implementing various technologies to monitor and report compliance issues within the spring system. Study would recommend an implementation plan and provide an alternatives analysis regarding the effectiveness of the technology implementation and establish a baseline to compare success criteria with. Given the cost of an enforcement officer on the rivers: salary, benefits, management, equipment and operating costs of some $100K per year we need to find technological alternatives. All enforcement of the large number of rules and laws is not practical so a determination of which have the highest priority and then research and test technological systems to meet those specific tasks. Cost: $125,000
Homosassa Springs and River Wildlife Assessment Conduct annual wildlife assessments to track the ecosystem health of the spring and river system. Counts would include invertebrates, as well as birds, fish, and mammals. Macrofauna counts conducted biannually to assess winter migration patterns. Cost: $250,000
Habitat Conservation
NONE
Habitat Restoration
Eelgrass Expansion The submerged aquatic vegetation in the Homosassa River has declined over the past 10 years to the point where minimal eelgrass exists. SWFWMD is testing a new variety of eelgrass that is more tolerant of adverse conditions in limited sections of the Homosassa River. This project would expand the existing SWFWMD project of planting of eelgrass to larger portions of the river, similar to the effort currently underway in Crystal River/Kings Bay. Planting native SAV (Submerged Aquatic Vegetation) such as eelgrass would improve water quality and clarity, stabilize the sediments, enhance fisheries habitat, and provide foraging habitat for a variety of fish and wildlife, including the Florida Manatee. Cost: TBD
Invasive Species Management
NONE
Recreation Management
NONE