Surface Water Improvement and Management Program

(SWIM Program)

2016 Annual Report

Covering the period
January 1, 2016 to December 31, 2016

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Purpose

This report provides a summary of the Southwest Florida Water Management District Surface Water Improvement and Management (SWIM) Program activities for the calendar year 2016.

Introduction

In 1987, the Florida Legislature enacted the Surface Water Improvement and Management Act (Sections 373.451-373-4595, Florida Statutes). They recognized water quality in surface water bodies throughout the state had degraded or were in danger of being degraded and important functions, once performed by associated natural systems, were no longer being provided. The functions to be maintained or improved are identified in the SWIM Act and include providing aesthetic and recreational pleasure for the states citizens; habitat for native plants and animals, including endangered and threatened species; and safe drinking water for the state's growing population as well as attracting visitors and accruing other economic benefits. The Act requires each water management district identify and maintain a priority list of water bodies of regional or statewide significance, and develop plans and programs for the improvement of those water bodies. Water bodies identified by the districts are approved by the state including the addition of new water bodies or the removal of existing ones.

In, 2015, the District's Governing Board and the Florida Department of Environmental Protection approved twelve SWIM priority water bodies. They are Tampa Bay, Rainbow River, Crystal River/Kings Bay, Lake Panasoffkee, Charlotte Harbor, Lake Tarpon, Lake Thonotosassa, the Winter Haven Chain of Lakes, Sarasota Bay, Homosassa River, Chassahowitzka River, and Weeki Wachee River. Goals and objectives were developed for each water body and are used to guide programs and projects for maintaining or improving water quality, natural systems, and the other functions consistent with the SWIM Act. Essential to carrying out the District's SWIM Program is the cooperation of local governments and agencies in developing and implementing effective SWIM Plans.

Other Programs

The District has a wide-range of programs, initiatives, and actions that complement and enhance the objectives of the SWIM Act. The programs include planning, regulation, land acquisition, public education, and a cooperative funding program, and provide the framework for the District to accomplish the objectives of the SWIM Act. Regulation plays a key role in preserving water quality and habitat by regulating development and water use. This ensures that stormwater is properly treated, wetland impacts are minimized, and effects to the aquifer are monitored. Public education is a critical element because of the need for public support for these activities. And finally, the District's cooperative funding program provides a significant incentive to local governments and others by funding activities that help protect and restore these water bodies.

Tampa Bay

Tampa Bay has been declared an estuary of national significance through its inclusion in the U.S Environmental Protection Agency's National Estuary Program. Tampa Bay is Florida's largest open water estuary at 373 square miles. The contributing watershed is approximately 2,200 square miles, and includes portions of Hillsborough, Manatee, Pasco and Pinellas counties, as well as the cities of Clearwater, St. Petersburg and Tampa. More than two million residents live in the Tampa Bay watershed. Three seaports are located along Tampa Bay's borders. The largest of these, the Port of Tampa, consistently ranks among the busiest ports in the nation. Combined, the three ports contribute an estimated $15 billion to the local economy and support 130,000 jobs. Tampa Bay is also a focal point of the region's premier industry – tourism. The bay and surrounding barrier islands attract nearly 5 million visitors a year. Sport fishing, boating, kayaking and wildlife watching are increasingly popular activities among both visitors and residents. Today, about 40,000 pairs of wading and shore birds of 25 species nest annually on protected islands in the bay; one-sixth of the Gulf Coast population of Florida manatees spend the winter near power plants bordering the bay; and more than 200 species of fish spend some part of their lives within the Tampa Bay estuary. Since 1950, approximately 50 percent of the bay's natural shoreline has been lost to development. Most of the wetland loss occurred before 1970, prior to more stringent protection efforts. The combination of wetlands protection, wetlands restoration projects, and improved water quality is responsible for recent increases in coverage estimates for these important fish and wildlife habitats. Since 1989, 123 individual restoration projects have been completed by the SWIM Program, resulting in the restoration of more than 5,615 acres of habitat (i.e., estuarine and freshwater wetlands, uplands). This is the equivalent of 8.75 square miles of restored coastal habitats.

Schultz Preserve, above, is one of the gems of restoration in Tampa Bay.

In addition to direct impacts to salt marsh and mangrove habitat, seagrass meadows declined approximately 40 percent between 1950 and 1982. Much of this loss was due to indirect impacts associated with degraded water quality primarily resulting from nitrogen over-enrichment, and related increases in algae concentration, causing light limitation to seagrass survival and growth. In 1980, all municipal wastewater treatment plants were required to provide Advanced Wastewater Treatment (AWT) for discharges directly to the bay and its tributaries. In addition to the significant reductions in nitrogen loadings from municipal wastewater treatment plants, stormwater

regulations enacted in the 1980's also resulted in reduced nitrogen loads to the bay. Estimates for average annual total nitrogen loadings to Tampa Bay for 1976 are more than 2.5 times as high as current estimates. Since the early 1990's the District, working with local governments, has completed more than 100 water quality improvement projects that are providing treatment for nearly 75,000 acres of watershed. In response to these projects and other nutrient load reductions, water quality has measurably improved in all segments of the bay over the past 25-plus years and Tampa Bay as a whole has more seagrass acreage than it had in 1982.

Notable Accomplishments for Tampa Bay in 2016

During 2016, SWIM and its cooperators completed four projects for a total of 27.6 acres of restored coastal habitats and completed six water quality improvement projects providing treatment for 555 acres of watershed. The SWIM Program's biennial seagrass mapping program released the 2016 mapping results that documented Tampa Bay contains 41,655 acres of seagrass, achieving and surpassing the Estuary Program's seagrass target for the bay of 38,000 acres set in the 1990's. The bay now contains seagrass coverage similar to that of the 1950's.

The following restoration projects were either ongoing or completed in 2016

- **Rock Pond Ecosystem Restoration** – Phase 2 of the Rock Ponds project was completed in cooperation with Hillsborough County providing 779 acres of various coastal habitats. The project is in the quarterly maintenance phase until 2018.
- **Balm Boyette Habitat Restoration –** Restoration of approximate 80 acres of wetland and upland habitats from partially reclaimed landscapes comprised of wide linear open water pits, steep slopes, and rolling upland terrain. The project will include restoration of a portion of historic stream valley for Pringle Branch, a tributary of Fishhawk Creek and the Alafia River. Final design was completed in 2016. Construction is expected to commence in 2017.
- **Terra Ceia Ecosystem Restoration Phase 2 –** With design completed during 2015 for a habitat restoration project on approximately 400 acres, covering three parcels in the Terra Ceia area of Tampa Bay, a Request for Bid was issued soliciting for upland project construction. Wetland permitting applications are being handled by SWIM staff and will be submitted for environmental resource permits during 2017. Upland restoration will commence during 2017.
- **Rocky Creek Preserve –** The District and Hillsborough County amended their agreement to control non-native plants on the Rocky Creek Preserve to include both the 350-acre Rocky Creek Preserve and the adjacent Bower Tract which is approximately 1,600 acres. Non-native plant removal on the Rocky Creek Phase of the project was completed in 2015. The District completed the initial non-native plant control and removal on the Bower Tract in February 2015 and is now in the quarterly maintenance phase through 2018.
- **River Tower Shoreline Restoration –** This

cooperative project with City of Tampa and Florida Department of Transportation (FDOT) involves shoreline stabilization and stormwater treatment components.

- **Feather Sound Tidal Wetland Restoration Phase II –** Construction was completed for this cooperative project between the District, the Tampa Bay Estuary Program, and Pinellas County, which involved exotic plant removal, spoil mound hydroblasting, and native vegetation plantings. This SWIM initiative restored hydrology to the southern portions of Feather Sound and promotes saltern habitat establishment.
- **Palmetto Estuary Habitat Restoration Phase 2A –** Design was completed for Phase 2A of the Palmetto Estuary Habitat Restoration Project. Phase 2A consists of several berm breaches along the northern edge of the property that will enhance on-site hydrology, as well as exotic vegetation removal and native plantings.
- **Ft. DeSoto Ecological Enhancement/Recirculation Phase 2 –** Construction was completed on this cooperative project with Pinellas County to construct a small span bridge crossing to restore east-west circulation to semi-enclosed embayments of Ft. DeSoto Park, improving ecosystem health.
- **Palm River Restoration –** Design was completed on a water quality improvement and natural systems enhancement project located just south of the spoil disposal areas. This project was selected to receive RESTORE Act funding. Construction is expected to commence in 2018.
- **Old Tampa Bay Tidal Tributaries –** The Tampa Bay Estuary Program and the District embarked on a project in April 2011 to identify and rank the feasibility of removing salinity barriers on tidal tributaries in Old Tampa Bay. In 2014, a pilot study for removal of salinity barriers on Channels A & G commenced to identify the natural systems and water quality benefits. In 2016, follow-up one-year monitoring commenced.
- **Robinson Preserve Phase 2 –** This cooperative project with Manatee County will enhance the Phase I restoration by restoring an additional 150 acres through creation of a large estuarine and freshwater wetland, exotic vegetation removal and native planting. The initial phase of construction has been completed. The next phase will commence in 2017.
- **Newman Branch Phase III –** This cooperative project with Ecosphere Restoration Institute and the Tampa Electric Company involved shoreline, upland, and estuarine wetland restoration on a 15-acre site. Construction was completed in 2016.
- **Hillsborough River Water Quality Improvement Project –** This cooperative project with the City of Tampa involves shoreline restoration and water quality improvements at the 150-acre Rogers Golf Course, which lies directly on the Hillsborough River.
- **Tampa Bay Hard Bottom Mapping** – Hydrologic data collection was conducted in 2015 as the source data for characterizing hard bottom benthic habitats in portions of Old Tampa Bay, Middle Tampa Bay, Hillsborough Bay and Lower Tampa Bay. Mapping was ongoing in 2016.

The following water quality projects were either ongoing or completed in 2016

- **Lake Magdalene BMPs** – This cooperative project with the Lake Magdalene Special Dependent District includes the construction of stormwater BMPs to treat 80 acres of highly urbanized stormwater runoff. Construction will begin in 2017.
- **Anna Maria BMPs Phase 3** – This project with the City of Anna Maria includes upgrading storm sewers and outfalls as well as installing various BMPs to improve water quality to Tampa Bay. The city completed construction on BMPs in three watersheds, Phase 1 in July 2014, Phase 2A and 2B in December 2015 with the final phase completion in 2016.
- **Robles Park Water Quality Improvement and Natural Systems Enhancement Project –** In cooperation with the City of Tampa and FDOT, completed design of a water quality and natural systems improvement project to the Robles Park pond and the outfall area to the Hillsborough River in September 2013. Construction of the project began in November 2014 and was completed in 2016.
- **Sawgrass Lake Restoration Project –** Completed construction on this District initiative to remediate lead contamination from a portion of the 385-acre Sawgrass Lake Park Water Management Area, dredge the lake to hard bottom, and provide water quality improvements that will treat runoff from an estimated 3,587 acres of older, intensely developed and predominantly untreated land that drains into Sawgrass Lake and Tampa Bay. The project is in the maintenance phase until 2020.
- **Lowry Park Zoo Water Resources Master Plan** – This cooperative project with the City of Tampa developed a plan that identified feasible projects that maximize efficiency of Zoo operations in handling animal wastewater and stormwater, maximize water reuse, and minimize pollutant loading to Hamilton Creek.
- **Pinellas County Integrated Water Management Plan** – This cooperative project with Pinellas County developed a comprehensive plan to improve water resources operated by or the responsibility of the County. Reuse expansion, septic tank removal, stormwater retrofits, and surface water management were evaluated to determine the most cost effective and sustainable improvement options.
- **East Lake Nutrient Source Evaluation** – Hillsborough County began a nutrient source tracking and BMP evaluation study for East Lake and the surrounding 1,381-acre drainage basin. The project began in 2015 and is expected to be complete in 2017.
- **Joe's Creek Watershed Improvement Plan** – Pinellas County completed development of a comprehensive watershed management plan for the 9,526-acre drainage basin.
- **Palmetto MLK Park Low Impact Development and Wetland Restoration** – The City of Palmetto in cooperation with the District completed construction of a

stormwater improvement project to improve water quality and restore surface water features in Carr Drain which ultimately drains to the Manatee River.

- **Egan Park BMPs –** St. Petersburg Beach completed construction of a cooperative funding project to include stormwater improvement BMPs for a 5-acre drainage basin.
- **Madeira Beach Boca Ciega Drive BMPs -** Madeira Beach completed design of a stormwater retrofit project to treat 48 acres of coastal urban watershed in 2015. Construction began in 2016 and is ongoing.
- **Rex Place BMPs -** Madeira Beach completed design of a stormwater retrofit project to treat 5.8 acres of coastal urban watershed in 2016 and is ongoing.
- **City of Anna Maria North Island BMPs** – City of Anna Maria began design of a stormwater retrofit project to treat 77 acres and is ongoing.
- **Implementation of BMPs Sawgrass Lake Watershed -** The City of Pinellas Park completed construction of a stormwater retrofit cooperative funding project to treat an urbanized watershed in 2016.
- **49th Street Outfall Treatment Project –** The City of Gulfport commenced construction of a stormwater treatment project that will treat runoff from approximately 169 acres along 49th Street in Gulfport and St. Petersburg.
- **20th Avenue Stormwater Improvements -** Construction commenced on this cooperative funding project with the City of Indian Rocks Beach. Two nutrient separating baffle boxes will be installed to treated approximately 8 acres of stormwater runoff before entering Clearwater Harbor.
- **34th Avenue Northeast Water Quality Improvements** – The City of St. Petersburg began design of LID BMPs to treat 4.7 acres of urbanized stormwater runoff before entering Tampa Bay. Construction expected to commence in 2017.

Outreach – Volunteer Events, Presentations and Education

- SWIM, in collaboration with 11 organizations, helped coordinate 11 volunteer events for Tampa Bay; these events involved 493 volunteers donating over 1999 hours to help restore the bay. Of the 11 volunteer events, 10 involved marsh plantings that installed 35,110 marsh plugs at the Rock Ponds and Feather Sound Ecosystem Restoration Projects. The various volunteer marsh plantings involved SWIM working with Tampa Bay Watch to coordinate events involving middle and high school groups, the Florida Fish and Wildlife Commission, and the public. In addition, SWIM in coordination with the Tampa Bay Estuary Program implemented a "Give-a-Day-for-the-Bay" event where 40 citizen volunteers performed a shoreline cleanup along 0.6 miles of waterfront for the Rock Ponds Project. At the request of various civic organizations, educational institutions, governmental groups, and regional/national groups, SWIM staff provided 20 presentations and field tours of

various Tampa Bay restoration projects to various parties including: American Water Resources Association, National Conference on Ecosystem Restoration, Regional Ocean Conference for Students (Florida Aquarium), Florida Water Stewardship Program, Tampa Bay Estuary Program, National Audubon Society, and the Florida Chief Financial Office of the Florida Department of Environmental Protection. SWIM projects for Tampa Bay garnered at least 34 published newspaper, newsletter, and internet articles. In addition, two television news stories were aired concerning restoration projects.

- Funded hands-on field trip programs where students learned first-hand about the importance of the Tampa Bay watershed and local water resources. Programs took place in Hillsborough, Pinellas and Manatee Counties.
- In Hillsborough County, 14,953 sixth-grade students attended a three-day field trip program at Nature's Classroom. The facility is located along the banks of the Hillsborough River in the District's Lower Hillsborough Wilderness Preserve. Also at Nature's Classroom, 882 elementary school students participated in a field trip and 160 students attended a water-resources summer camp. Further down the river sits Lettuce Lake Park where the District funded a field trip program for 1,668 students in grades 3–5. More than 1,100 teachers and chaperones attended these programs.
- In Pinellas County, more than 6,488 fourth-grade students and 1,000 teachers and chaperones attended field trip programs at either the John Anderson Environmental Education Center at the District's Sawgrass Lake Park or the Brooker Creek Environmental Education Center at the Brooker Creek Preserve. Students experience one of these watersheds by learning about the flora and fauna as well as participating in water quality testing, dip netting and more.
- In Manatee County, 1,495 fifth-grade students and 180 teachers and chaperones learned about the Tampa Bay watershed through field trip programs at Emerson Point Park, Fort De Soto Park and Anna Maria Island. Activities included dip netting, water quality testing, nature walks and more.

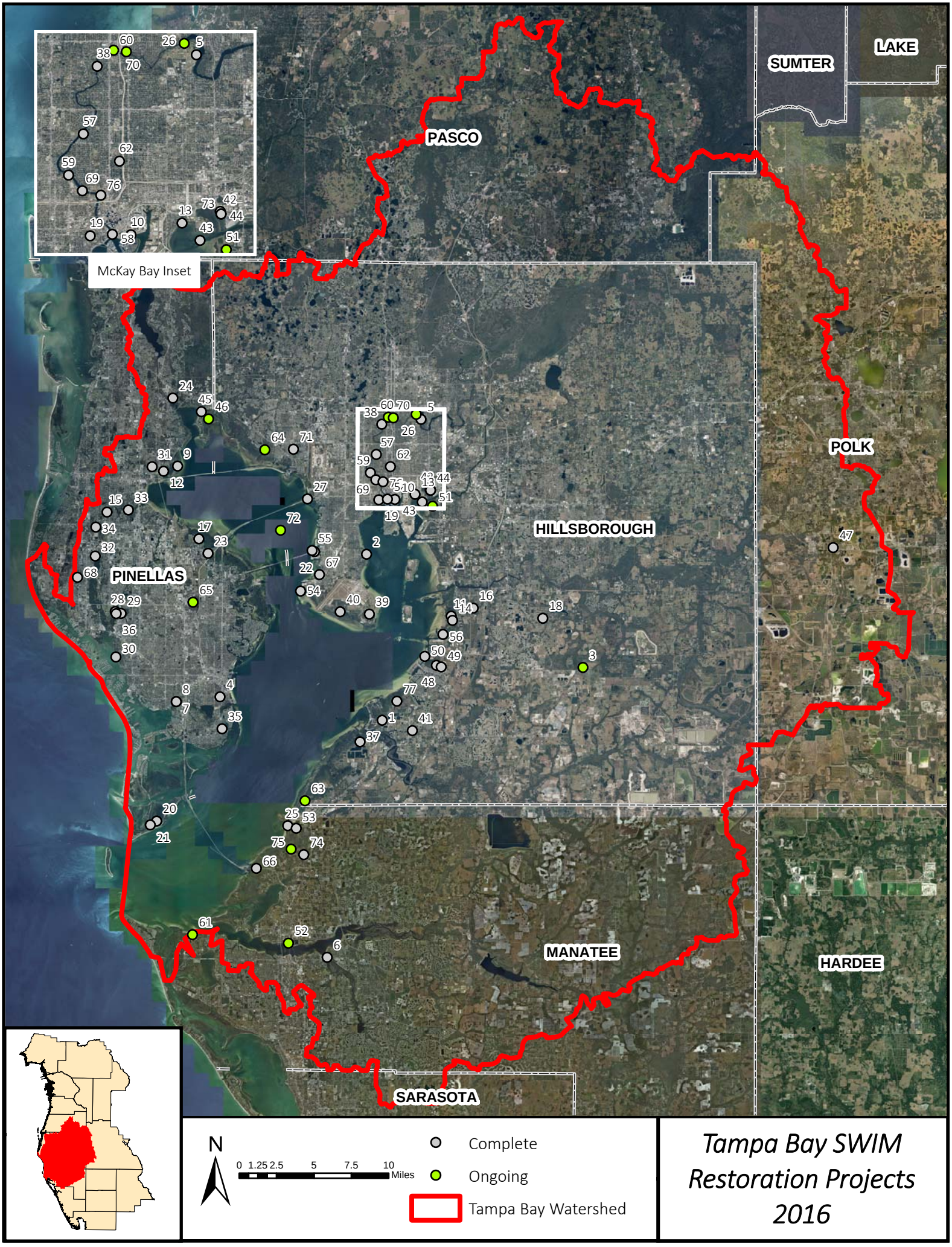
Awards

- During 2016, the Newman Branch Phase 2 Restoration Project (in cooperation with the Ecosphere Restoration Institute and the Tampa Electric Company) won Second Place in the Environmental Category of the 24th Annual Future of the Region Awards Program of the Tampa Bay Regional Planning Council.
- Since 1987, the District has received a total of 61 awards for its SWIM Program projects and personnel.

The following studies are either ongoing or were completed prior to 2016

- Biennial Seagrass Mapping (ongoing)
- Old Tampa Bay Tidal Tributaries (ongoing)
- Assessment of the Benthic Habitat Status (complete)

- East Lake Nutrient Source Evaluation (ongoing)
- Old Tampa Bay Water Quality and Habitat Assessment (ongoing)
- Hard Bottom Mapping and Characteristics for Restoration Planning in Tampa Bay (complete)
- Old Tampa Bay Safety Harbor Restoration (complete)
- Tampa Bay Protection Planning – Hard Bottom Field Verification (complete)
- Joe's Creek Watershed Improvement Plan (complete)
- Lake Carroll Surface Water Management Plan (complete)
- Lake Manatee Watershed Management Plan (complete)
- Lowry Park Zoo Water Resources Master Plan (complete)
- Pinellas County Integrated Water Management Plan (complete)
- Tampa Bay Water Quality and Habitat Assessment (complete)


McKay Bay Inset
PASCO
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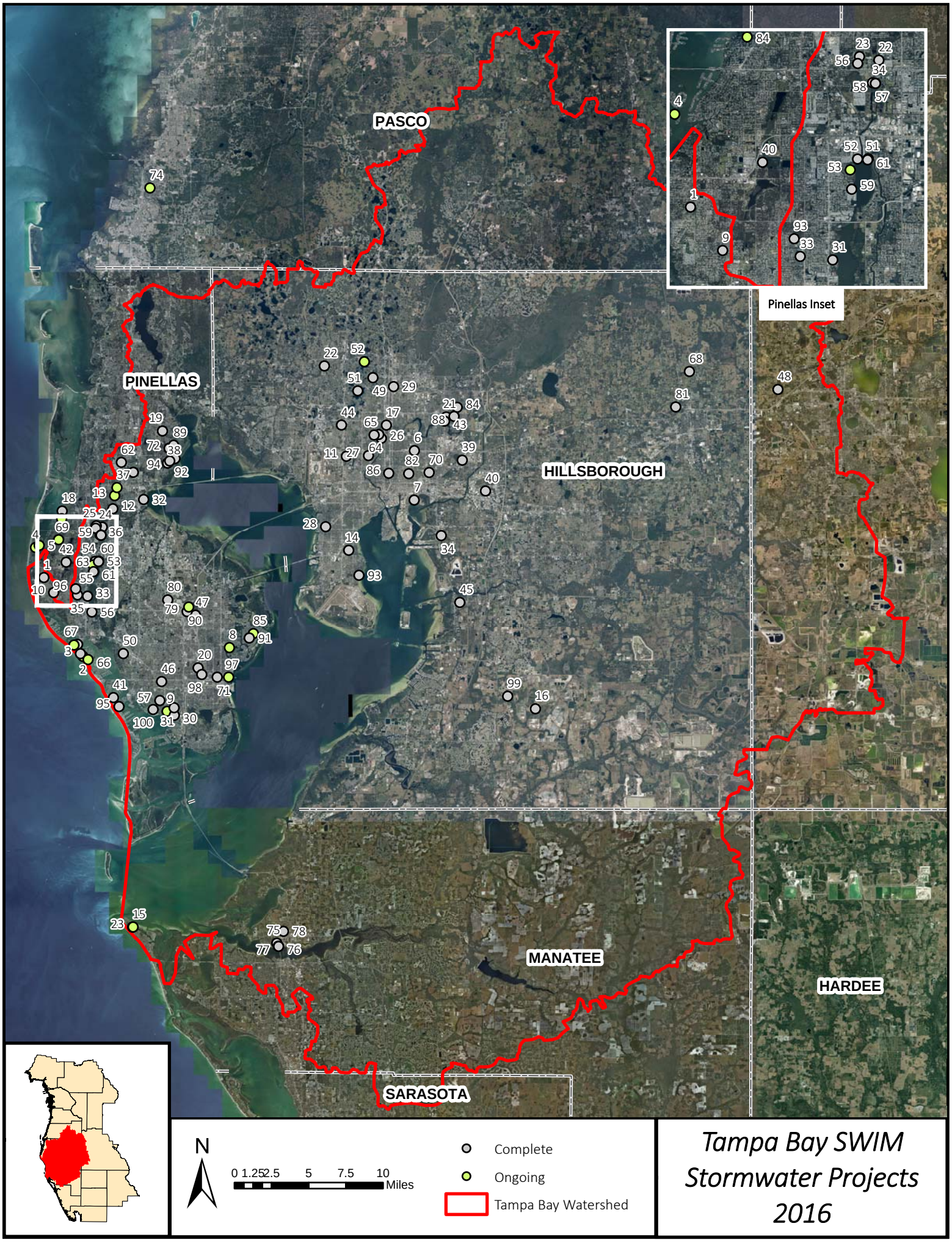
HILLSBOROUGH
PINELLAS
MANATEE
HARDEE
SARASOTA
N
0 1.25 2.5 5 7.5 10
Miles
Complete
Ongoing
Tampa Bay Watershed
Tampa Bay SWIM Restoration Projects 2016

Tampa Bay Restoration Projects

Map Number	Project Name	Status
1	Bahia Beach Habitat Rest	Complete
2	Ballast Point Park (2 Projects)	Complete
3	Balm Boyette Habitat Rest	Ongoing
4	Bartlett Park	Complete
5	Blackwater Hammock Park Shoreline Rest	Complete
6	Braden River (2 Projects)	Complete
7	Clam Bayou (3 Projects)	Complete
8	Clam Bayou Phase 3	Complete
9	Cooper's Point	Complete
10	Cotanchobee Fort Brooke Park	Complete
11	Davis Tract	Complete
12	Del Oro	Complete
13	Desoto Park Addition Shoreline Rest	Complete
14	Dug Creek	Complete
15	Eagle Lake	Complete
16	Ekker Preserve	Complete
17	Feather Sound Tidal Wetland Rest	Complete
18	Fish Hawk Creek Preserve Habitat Rest	Complete
19	Fort Brooke Park Shoreline Rest	Complete
20	Ft. DeSoto Park Ecological Enhancement/Recirculation Phase 2	Complete
21	Ft. DeSoto Park Recirculation Phase 1	Complete
22	Gandy Park	Complete
23	Gateway Tract	Complete
24	Harbor Palms Park	Complete
25	Hendry Delta	Complete
26	Hillsborough River WQ IMP Project	Ongoing
27	Howard Frankland East	Complete
28	Joe's Creek 1	Complete
29	Joe's Creek School Site	Complete
30	Jungle Prada Park	Complete
31	Kapok Wetland/Floodplain Rest	Complete
32	Lake Seminole Aquatic Life Enhancement	Complete
33	Lancaster Tract	Complete
34	Largo Central Park Wetland Enhancement	Complete
35	Little Bayou	Complete
36	Long/Cross Bayou	Complete
37	Lost River Preserve	Complete
38	Lowry Park	Complete
39	MacDill Air Force Base Phase 3	Complete
40	MacDill Air Force Base: Mangrove Rest	Complete
41	Marsh Creek	Complete
42	McKay Bay - East Shore Commerce Park Parcel SW Retrofit	Complete
43	McKay Bay Dredge Hole Rest	Complete
44	McKay Bay Nature Preserve	Complete
45	Mobbly Bay	Complete
46	Mobbly Bayou Wilderness Preserve	Ongoing
47	Mulberry - NE 4th Ave Alafia Wetlands Rest (REDI)	Complete
48	Newman's Branch (2 Projects)	Complete
49	Newman's Branch Phase III	Complete
50	North Apollo Beach	Complete
51	Palm River Rest (2 Projects)	Ongoing
52	Palmetto Estuary Habitat Rest (2 Projects)	Ongoing
53	Peanut Lake	Complete
54	Picnic Island	Complete
55	Polanis Park	Complete
56	Port Redwing/Schultz Preserve	Complete
57	Reed Property	Complete
58	Ribbon of Green	Complete
59	River Garden	Complete
60	River Tower Shoreline Rest	Ongoing
61	Robinson Preserve Phase 2	Ongoing
62	Robles Park WQ and Natural Systems IMP	Complete
63	Rock Ponds Rest	Ongoing
64	Rocky Creek Preserve Rest	Ongoing
65	Sawgrass Lake	Ongoing
66	South Skyway	Complete
67	South Tampa Greenway/Tappan Site	Complete
68	St. Petersburg College Natural Park Habitat Rest	Complete
69	Stewart Middle Magnet School	Complete
70	Sulphur Rest	Ongoing
71	Sweetwater Creek	Complete
72	Tampa Bay Environmental Rest Fund	Ongoing
73	Tampa Shoreline Rest Initiative	Complete
74	Terra Ceia Isles Habitat Rest	Complete
75	Terra Ceia Phase 2 Project	Ongoing
76	Ulele Spring	Complete
77	Wolf Branch Creek Habitat Rest:	Complete


PASCO
PINELLAS
HILLSBOROUGH
MANATEE
HARDEE
SARASOTA
Pinellas Inset
N
0 1.25 2.5 5 7.5 10
Miles
Complete
Ongoing
Tampa Bay Watershed
Tampa Bay SWIM
Stormwater Projects
2016

Tampa Bay Stormwater Projects

Map Number	Project Name	Status
1	102nd Ave Pond Enhancement	Complete
2	137th Ave Circle BMPs	Ongoing
3	141st Ave SW Retrofit	Complete
4	20th Ave SW IMPs	Ongoing
5	30th St and Hillsborough Ave. SW IMP	Complete
6	30th St Baffle Box	Complete
7	34th Ave NE WQ IMPs	Ongoing
8	49th St Outfall Treatment	Ongoing
9	94th Ave SW Pond Enhancement	Complete
10	Al Lopez Park SW Retrofit	Complete
11	Allen's Creek Red Maple Swamp Rest	Complete
12	Alline Ave. SW IMP	Complete
13	Anna Maria BMPs	Complete
14	Balm Road Marsh	Complete
15	Bath Club Concourse SW Retrofit	Complete
16	Bayview Drive Drainage IMPs	Complete
17	Bishop Creek Streambank	Complete
18	Booker Lake Regional SW Treatment Facility	Complete
19	Broadway Outfall SW Retrofit	Complete
20	Brushy Creek Wetland Treatment	Complete
21	City of Anna Maria - North Island BMPs	Ongoing
22	City of Largo Allen's Creek and McKay Creek Inlet	Complete
23	City of Largo CDS Unit	Complete
24	City of Tampa SW Filtration Devices	Complete
25	City of Tampa Urban Lake Rescue: Edna	Complete
26	City of Tampa Urban Lake Rescue: Kipling	Complete
27	City of Tampa Urban Lake Rescue: Roberta	Complete
28	Clam Bayou SW IMPs	Complete
29	Clam Bayou SW Pond	Complete
30	Clearwater Tropic Hills Drainage IMPs	Complete
31	Creation Pond SW Enhancement	Complete
32	Delaney Creek Wetland Treatment	Complete
33	Dogleg Pond SW Enhancement	Complete
34	Downtown Largo Regional SW Treatment Facility	Complete
35	Druid Road SW IMP Area	Ongoing
36	East Gate Drainage IMPs	Complete
37	East Lake Outfall WQ IMP	Complete
38	East Shore Commerce Regional SW Treatment Facility	Complete
39	Egan Park Best Management Practices	Complete
40	EMS Pond SW Enhancement	Complete
41	FDOT 56th St Outfall SW Retrofit	Complete
42	FDOT North Dale Mabry Hwy Retrofit & Rest	Complete
43	Gibsonton on the Bay	Complete
44	Gulfport-49th St Drainage IMPs	Complete
45	Haynsworth Tract Regional SW Treatment Facility	Complete
46	Itchepackesassa Creek Regional SW System	Complete
47	Jean Park Ponds/Cedar Lake WQ IMP Study	Complete
48	Jungle Lake Enhancement Project	Complete
49	Lake Carrol SW Retrofit	Complete
50	Lake Magdalene BMPs	Ongoing
51	Lake Seminole Bypass Canal Treatment Facility	Complete
52	Lake Seminole SW IMPs	Complete
53	Lake Seminole Watershed SW Pollution Reduction	Ongoing
54	Lake Seminole Weir Stage and Flow Devicce	Complete
55	Lake Tomlinson Rest	Complete
56	Largo Highland Ave Retrofit Project	Complete
57	Largo Regional Outfall Modification	Complete
58	Largo Regional SW Treatment Facility	Complete
59	Largo ST Quality Retrofit - 101st St.	Complete
60	Logan St Pond	Complete
61	Long Bayou	Complete
62	Lowry Park East & West	Complete
63	Lowry Park SW	Complete
64	Madeira Beach - Boca Ciega Drive BMPs	Ongoing
65	Madeira Public Works Yard SW Retrofit	Complete
66	McIntosh Park SW Treatment Wetland	Complete
67	Melbourne Pond SW Retrofit	Complete
68	Mirror Lake SW Retrofit	Complete
69	Mullet Creek	Complete
70	Old Coachman (Channel H) SW Retrofit	Complete
71	Orange Lake Rest	Ongoing
72	Palmetto 5th St LID	Complete
73	Palmetto CRA Riverside Boat Ramp	Complete
74	Palmetto Gateway LID	Complete
75	Palmetto MLK Park Low Impact Design and Wetland Rest	Complete
76	Pinellas Park IMP of BMPs for Homeland Basin/Sawgrass	Complete
77	Pinellas Park Implementation of BMPs Sawgrass Lake Watershed	Complete
78	Pistol Range SW Retrofit	Complete
79	Pond 56	Complete
80	Rex Place SW BMPs	Ongoing
81	Riverhills Drive Outfall 1 & 2 SW Retrofit	Complete
82	Riviera Bay Snell Island Vaults	Ongoing
83	Robles Park	Complete
84	Rosery Road BMPs	Ongoing
85	S. Glen Arven Ave. Outfalls SW Retrofit	Complete
86	Safety Harbor Public Works SW Retrofit	Complete
87	Sawgrass Lake Rest	Ongoing
88	Shore Acres SW Vaults	Complete
89	South Bayshore Blvd in Safety Harbor	Complete
90	South Bayshore BMPs	Complete
91	South Green Springs SW Retrofit	Complete
92	St. Pete Beach Pubic Works Facility SW Retrofit IMPs	Complete
93	St. Pete Junior College SW Retrofit	Complete
94	St. Petersburg Public Works Storage Yard SW Retrofit Project	Complete
95	Sumner Road SW Management IMP	Complete
96	Wood Ibis Park SW Retrofit	Complete

Rainbow River

The Rainbow River is an important natural resource to the people of the state of Florida. From an ecological perspective, the river has an abundance of diverse plant communities providing excellent habitat for many different types of fish and wildlife. It is this natural beauty that also makes the river an important recreational resource. Over 200,000 people visit the river annually to dive, swim, boat, and fish. Of the 33 first magnitude springs in the State of Florida, Rainbow Springs, forming the headwaters of the Rainbow River, is the fourth largest in terms of discharge. The Rainbow River discharges an average of 763 cubic feet per second (cfs), or 493 million gallons of water per day (mgd) into the Withlacoochee River, just upstream of Lake Rousseau. The Rainbow River, because of exceptional scenic beauty and its ecological significance, has been designated by the State to be an Outstanding Florida Water (OFW), an Aquatic Preserve, and a SWIM priority water body. Also, in 1972, Rainbow Springs was designated a National Natural Landmark by the National Park Service.

Overall, the Rainbow River is an ecologically healthy system. However, the river should not be thought of as being pristine. Past human activities over the last one hundred and fifty years have significantly altered the character of the river, especially in the lower reaches. Land use immediately surrounding the Rainbow River has slowly transitioned from mining and agriculture to mostly residential. Although most of the 73.4 square mile watershed is still largely rural, parts of the watershed are rapidly losing their rural character. Future residential and commercial development throughout the Rainbow River watershed is expected to increase and could compromise the status of the river and its many springs. In order to ensure that the Rainbow River remains an ecologically healthy system, specific issues concerning impacts to water quality, water quantity, water clarity, and native plant and animal communities are the major management issues. Rainbow Springs Group and Rainbow Springs Group run have been listed as impaired for nutrients by the Florida Department of Environmental Protection. Phosphorus concentrations along the river are typically found to be at or near background levels. However, nitrate (a nitrogen compound) concentrations in the groundwater discharging from the springs have steadily increased over the last hundred years. Background nitrate concentrations in the Floridan aquifer are typically below 0.1 mg/L.

The fourth largest spring in the state of Florida, Rainbow Springs discharges into the Withlacoochee River.

The nitrate values from samples collected nearest to the headsprings complex averaged 2.55 mg/L in 2016. Increases in nutrients, like nitrate, can enhance the growth of aquatic plants, including nuisance species, such as Lyngbya and Hydrilla. Increased nitrate-nitrogen loads discharged from the Rainbow River have the potential to stimulate eutrophication in receiving water bodies as well.

Water clarity in the Rainbow River, as measured by underwater horizontal visibility, varied widely in 2016. Near the headsprings, water clarity averaged 236 feet of visibility and by approximately 1 mile downstream, clarity averaged 91.24 feet. Water clarity continues to decline throughout the rest of the river run, but at a much slower rate. Just upstream of the confluence of the Rainbow River and the Withlacoochee River, nearly 6 miles from the headsprings, water clarity averaged 27 feet. This pattern of declining water clarity, from the headsprings to the mouth is a largely a natural phenomenon caused by particulate material and planktonic life forms (phytoplankton and zooplankton) that accumulate as the river water travels downstream. Human impacts, in the form of nutrient enrichment and recreational activities, contribute to the decline in water clarity. Understanding the factors affecting water clarity is an important issue in the Rainbow River and will continue to be addressed.

The Rainbow River is home to diverse plant and animal communities. The submerged aquatic vegetation (SAV), along with the emergent macrophytes, provide critical habitat for fish and wildlife, help maintain water clarity by allowing particles to settle out, and stabilize sediment. Native aquatic vegetation is most abundant in the upper reaches of the river. In the lower reaches of the river, the abundance of native aquatic plant species is reduced while less desirable aquatic plant species, like Hydrilla (non-native) and Lyngbya (filamentous algae) become more common. Previous efforts in both Rainbow River and Kings Bay to re-establish native desirable SAV in areas where they had been lost resulted in little or no long-term success. Therefore, it is very important that adequate measures are taken to protect the existing native SAV beds and to prevent further increases in nuisance species. Vegetation loss can also cause an increase in suspended sediment that could lead to a further decline in water clarity. Issues regarding changes in vegetation coverage, especially with respect to SAV, and ways in which to maintain and/or improve vegetation coverage, are the subjects of both ongoing and future work.

Notable Accomplishments for Rainbow River in 2016

In 2016, several projects were either initiated or ongoing to aid in developing and implementing protection and management strategies for the Rainbow River. A notable accomplishment was the formation of the Springs Coast Steering and Management Committees which produced a comprehensive management plan for Rainbow Springs and River. In addition, the District working with Marion County through cooperative funding initiatives, has ongoing projects that are providing stormwater treatment in the watershed. Since 2008, the District, working with local governments, has completed 10 water quality improvement projects that are providing treatment for nearly 3,750 acres of watershed.

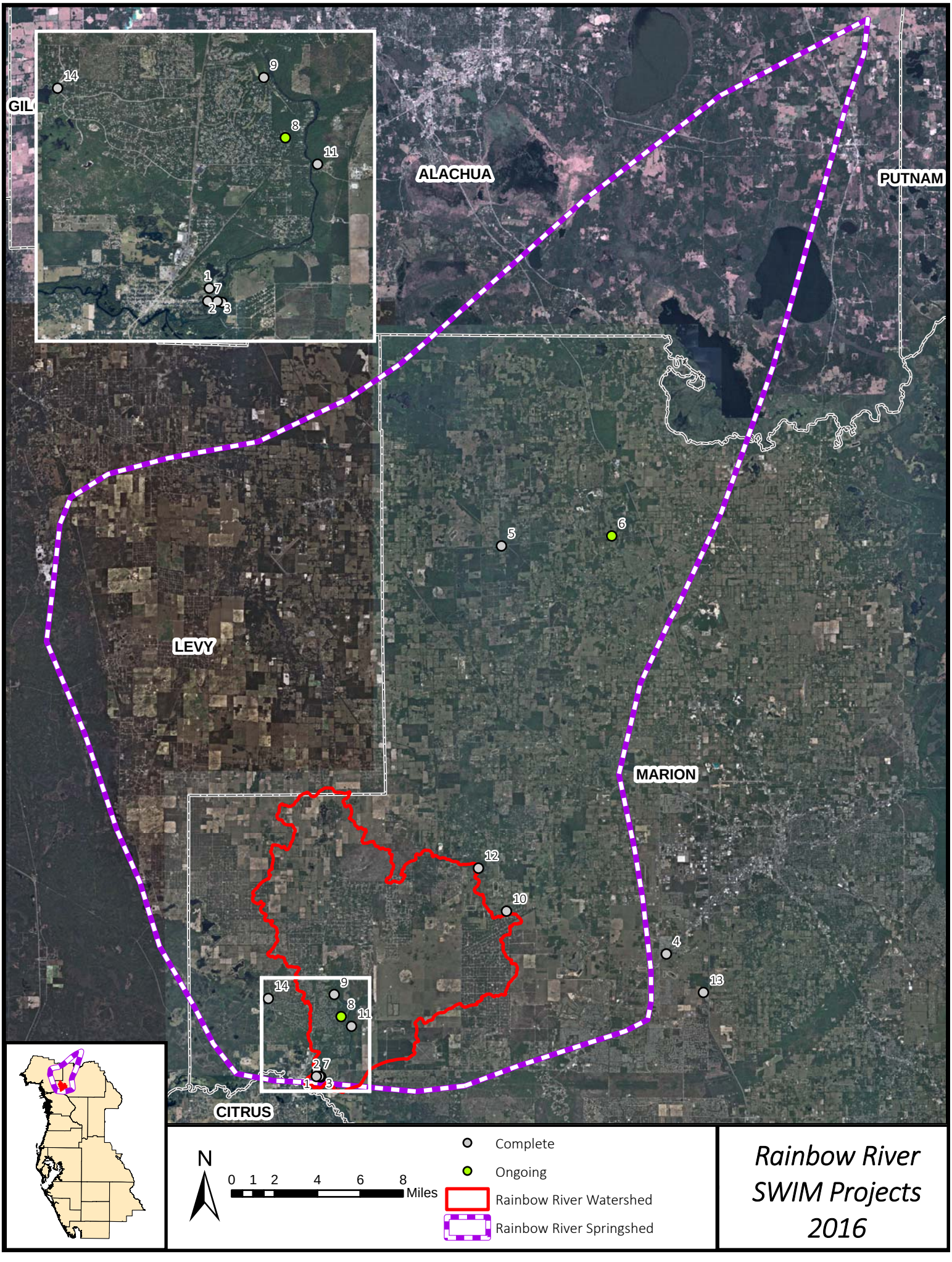
Notable accomplishments for Rainbow River in 2016

- The Springs Coast Steering Committee (SCSC), a group comprised of representatives from local, regional and state agencies adopted an updated SWIM plan for Rainbow River. This plan identifies priority management issues for water quantity, water quality, and natural systems. Goals of the 2015 SWIM plan include developing a Minimum Flows and Level, reducing nitrate concentrations, and reducing undesirable aquatic plant abundance.
- Continued to implement and construct cooperative funding projects with Marion County to improve stormwater treatment by implementing stormwater BMPs. These projects will reduce nutrient loads within the Rainbow Springs springshed.
- Continued a multi-year study to investigate the relationships between water chemistry, river sediments and aquatic plants. Sediments in the river will be examined to determine if they are a nutrient source contributing to algae in the lower river. The project will also investigate factors that contribute to algae accumulation in the river. The final report for this study will be completed in 2017.
- Funded a multi-year study with the Florida Fish and Wildlife Conservation Commission (FWC) to characterize and quantify the fish community of Rainbow River. In addition to characterizing the current fish community, the findings will improve understanding between the preference of fish for stream flows and habitat types.
- Completed a project to map and characterize the aquatic vegetation along Rainbow River. Aquatic vegetation mapping has been conducted about every five years since 1996. Mapping efforts document aquatic vegetation conditions and help direct management actions that support desirable aquatic vegetation.
- Initiated a flow mapping project to better understand nutrient cycling and the distribution of submerged aquatic vegetation in the Rainbow River.
- Initiated Phase 1 of a groundwater quality source evaluation for the Rainbow Springs Group. This project will use available data sources, such as existing monitoring wells and water quality data, to identify the most probable primary source areas of nutrients and related recharge water from within the springshed and develop strategies for cost effective improvement of the quantity and quality of the system.
- Coordinated the third year of a three-year campaign to gain community support and inform the public that the District is committed to improving the health of the springs and has the scientific knowledge to do so. After the campaign, staff completed the third year of a public perception survey to better understand the public's opinions, knowledge, attitudes and beliefs regarding the health of the springs and the District's efforts to restore them.
- Sponsored and hosted booths at Marion County's Run for the Springs 5K and the Florida Springs Fest. Staff also gave two presentations about this spring system.

- District staff participated in a Marion County educator's event at the Rainbow Springs State Park to increase awareness among public school teachers.
- Enhanced the webpage for Rainbow Springs to include near real time water quality data.
- Created a project webpage for the Rainbow River Algae and Sediment Assessment Project.
- Added nitrate sensors to existing data collection platforms that are operated in conjunction with the US Geological Survey (USGS), this allows nitrate values to be reported near the mid-river and lower river at 15 minute intervals.
- The District funded a field trip program for 211 students and ten teachers to visit Rainbow Springs State Park and learn first-hand about this vital resource.

The following studies are either ongoing or were completed prior to 2016

- DEP Monitoring – Flow Mapping (ongoing)
- Dunnellon Southeast Quadrant Outfall Mitigation Study (complete)
- Habitat Maintenance Enhancement and Restoration (complete)
- Lyngbya Bioassessment (complete)
- Lyngbya Removal and Revegetation (complete)
- Marion County's Springs Protection Program (complete)
- Non-point source pollutant loading model (WAMView) (complete)
- Optical Model Development (complete)
- Phase 1 Groundwater Quality Source Evaluation Rainbow Springs Group (ongoing)
- Rainbow River Algal/Sediment Study (ongoing)
- Rainbow River Environmental Study (complete)
- Rainbow River Groundwater Quality Source Evaluation (ongoing)
- Rainbow River Management Plan update (complete)
- Rainbow River Sediment Survey (complete)
- Rainbow River SWIM Plan Development & Administration (ongoing)
- Rainbow River Vegetation Mapping & Evaluation (complete)
- Rainbow River Water Quality Monitoring (ongoing)
- Rainbow Springs Surface Water Retrofit (complete)
- Rolling Hills Surface Water Improvement (complete)
- Springs Coast Treatment Wetland Creation Feasibility Study (complete)
- Water Lettuce Bio-control (complete)
- Water Quality Status and Trends (complete)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Miles
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Ongoing
Rainbow River Watershed
Rainbow River Springshed
Rainbow River SWIM Projects 2016

Rainbow River Projects Legend

Map Number	Project Name	Status
1	Blue Cove Lake-Implementation of BMPs	Complete
2	Blue Run Park SW Management Project	Complete
3	C.R. 484 SW Outfall Retrofit	Complete
4	Marion County Utilities Toilet Rebate Program	Complete
5	NW 119th Ave SW Retrofit	Complete
6	NW HWY 225 SW Retrofit	Ongoing
7	Pennsylvania Ave. SW Retrofit	Complete
8	Rainbow River Springshed SW Retrofits	Ongoing
9	Rainbow Springs County Club Estates SW Retrofit	Complete
10	Rolling Hills SW Retrofit	Complete
11	Sa-Te-Ke Village SW Retrofit	Complete
12	SW 16th and SW 14th SW Retrofit	Complete
13	SW 85th St & SW 40th Ave-Implementation of BMPs	Complete
14	Village of Rainbow Springs SW Retrofit	Complete

Crystal River/ Kings Bay

The Crystal River/Kings Bay complex is designated by the state as an Outstanding Florida Water (OFW) and a SWIM Priority Water Body. Kings Bay is a spring-fed shallow waterbody with an average depth of 3-10 feet and forms the headwaters of the Crystal Bay in the Gulf of Mexico.

Collectively, King Bay's numerous springs and countless seeps form the sixth largest spring system in Florida, by discharge. With over 70 documented springs within the 600-acre Kings Bay, and a mean water temperature range of 66-76 degrees Fahrenheit. Kings Bay forms the largest natural warm water refuge for the Florida Manatee in the United States. In recent years, record numbers of manatee have called Kings Bay home not only to escape the colder Gulf waters but also during the summer months. In January 2016, over 700 manatee were counted in Kings Bay and over 100 animals were observed over the summer. Not surprisingly, Crystal River/Kings Bay has become one of the largest tourist destinations for manatee viewing in the nation. In addition, scalloping, diving, snorkeling, fishing, and recreational boating contribute to the area economy.

While the system is best known for manatee, it is also home to a rich diversity of other species. The Florida Fish and Wildlife Conservation Commission (FFWCC) observed 21 species of amphibians, 47 species of reptiles, 191 species of birds, and 22 species of mammals, including 26 state or federally listed species.

Crystal River/Kings Bay has been subjected to human disturbance for nearly a hundred years resulting in the reduction in water clarity, overall loss of submerged aquatic vegetation (SAV), and the increased occurrence of algae. Poor water clarity, or visibility, is a function of phytoplankton algae in the water column, turbidity, and residence time.

A proxy to measure the amount of phytoplankton in the water column is the chlorophyll concentration which is measured throughout the Crystal River/Kings Bay system and the adjacent Gulf coastal waters as part of the District's Water Quality Monitoring Program (WQMP). While suspended solids (turbidity) and colored dissolved organic matter (CDOM) also reduce, visibility, it is phytoplankton-derived chlorophyll that absorbs much of the blue and red light causing the water to appear green.

Up until 2013, Bay-wide chlorophyll concentrations were on the rise due in large part to the prolonged drought conditions that resulted in decreased spring flow and increased residence time. With the return of more normal rainfall patterns beginning in 2013 and continuing throughout 2014, the Bay has seen a significant

reduction in chlorophyll concentration and a noticeable improvement in water visibility. The absence of SAV like Eelgrass (Vallisneria) and Hydrilla have also contributed to the increase in phytoplankton abundance. That's why in 2013, the District initiated its re-vegetation project for Hunters Cove in northeast Kings Bay. In 2014, in partnership with Duke Energy, the first crop of "Rock Star" Eelgrass was installed in a grow-out pond at the Duke Energy Crystal River Energy Complex Mariculture Center using a novel technique developed by University of Florida IFAS. In October 2015, three 0.25-acre plots were constructed in the Hunters Cove area of northeastern Kings Bay where eelgrass being grown at the Duke Energy Mariculture Center was planted. The purpose of this experiment is to learn how best to revegetate the bay. Effective bay-wide restoration must include steps focused on (1) maximizing beneficial SAV coverage and (2) minimizing nuisance algae. Any chance of long-term success is directly dependent on ensuring proper site suitability prior to re-vegetation. Site suitability is, among other things, a function of (1) light quality, (2) sediment quality, and (3) grazing pressure.

(1) **Light Quality –** adequate light is extremely important to SAV survivability, and must be determined prior to any re-vegetation project. Areas in Kings Bay targeted for re-vegetation should have plenty of light. (2) **Sediment Quality –** like soil in a garden, proper sediment conditions are critical to SAV survival, and ultimately overall restoration success. Determining sediment suitability is a complex process involving detailed geotechnical and chemical analysis. Selective dredging in targeted restoration areas may be necessary prior to re-vegetation.

(3) **Grazing Pressure –** re-vegetation projects must include some means to exclude grazing animals, such as manatees, until SAV has successfully been established. The construction of the three fenced plots in Hunters Cove is one method of protection from herbivory.

The Crystal River/Kings Bay SWIM Plan of July 2000, established the following goals:

- Maintain and, where possible, improve the water clarity throughout the bay.
- Remove sediments from areas, which have been demonstrated to contribute to reduced water clarity as a result of sediment resuspension;
- Revegetate suitable areas with desirable submerged aquatic vegetation; and, restore vital aquatic habitat.

The draft 2015 Crystal River/Kings Bay SWIM Plan is completed and was finalized in early 2016.

Since 2003, the District and its cooperators have completed 5 water quality improvement projects that are providing treatment for over 150 acres of watershed, including one water quality project that was completed, treating 13 acres, in 2015.

Notable Accomplishments for Crystal River in 2016

- Through the Springs Coast Steering Committee, Springs Coast Management Committee, and Technical Working Group, the draft 2015 Crystal River/Kings Bay SWIM Plan was completed. The plan was approved by the Springs Coast Management Committee and forwarded to the Springs Coast Steering for final adoption in January

2016. This plan is a major revision of the 2000 Crystal River/Kings Bay SWIM Plan and represents not only the Water Management District but the eight elected and appointed officials of the Springs Coast Steering Committee and the 16 staff level experts on the Technical Working Group. The Springs Coast Steering Committee was formed in August 2014 and follows the National Estuary Program model of using a unified approach to developing goals, management actions, and projects with input from all stakeholders.

- Monitoring of the Hunters Cove Re-vegetation project continued in 2016. Eelgrass are an ecologically important species of submerged aquatic vegetation that once dominated Kings Bay. Early results from this initial planting are very positive.
- The District completed construction of the Three Sisters Springs Treatment Wetland project located on the Three Sisters Springs property in 2015. Monitoring of the Treatment Wetland continued in 2016. The treatment wetland will capture stormwater runoff from approximately 100 acres of mixed-use development within the City of Crystal River and treat it before entering Kings Bay. The project also includes a one-acre hydric hammock restoration adjacent to the treatment wetland constructed by filling that portion of an old borrow pit with excavated material from the treatment wetland construction.
- A Kings Bay Sediment Removal Feasibility Study was completed in 2016. This study evaluated the type of material, volume of material, disposal options, resource benefit, design options, and estimate of probable cost of sediment removal within Magnolia Cove, Cedar Cove, and Hunter Springs.
- A Three Sisters Springs Sediment Removal project was designed and will be implemented in the Summer of 2017.
- The Three Sisters Bank Stabilization project was completed in November 2016. This project addressed shoreline erosion of the Three Sisters Springs by backfilling eroded and undercut areas with soil bags and reinforcing the shoreline with limestone rock.
- The Hunter Springs Cove Living Shoreline project was completed in 2016. This project constructed living shorelines at Hunter Springs Park, on Kings Bay, which coincided with renovation of the park by the City of Crystal River. This project restored shoreline habitat (emergent and submerged aquatic vegetation) where the shoreline was degraded, and will improve water quality by reducing erosion and nutrient loads to Kings Bay.
- Springs Coast Seagrass Mapping, a District initiative for mapping and monitoring of the expansive Springs Coast seagrass area from Tarpon Springs to Waccasassa Bay and out over 20 miles offshore was completed in 2016. Covering an area of over 400,000 acres, the Springs Coast is the second largest seagrass habitat in the United States and is home to several commercially and recreationally important species including bay scallops, grouper, snook, and tarpon, among others. This seagrass area is incredibly diverse with a healthy community of macro-algae, sponges, and coral interspersed with the seagrass.
- Completed the fourteenth year of water

quality monitoring at twelve fixed stations located throughout Kings Bay to monitor the status and trends in bay-wide water quality.

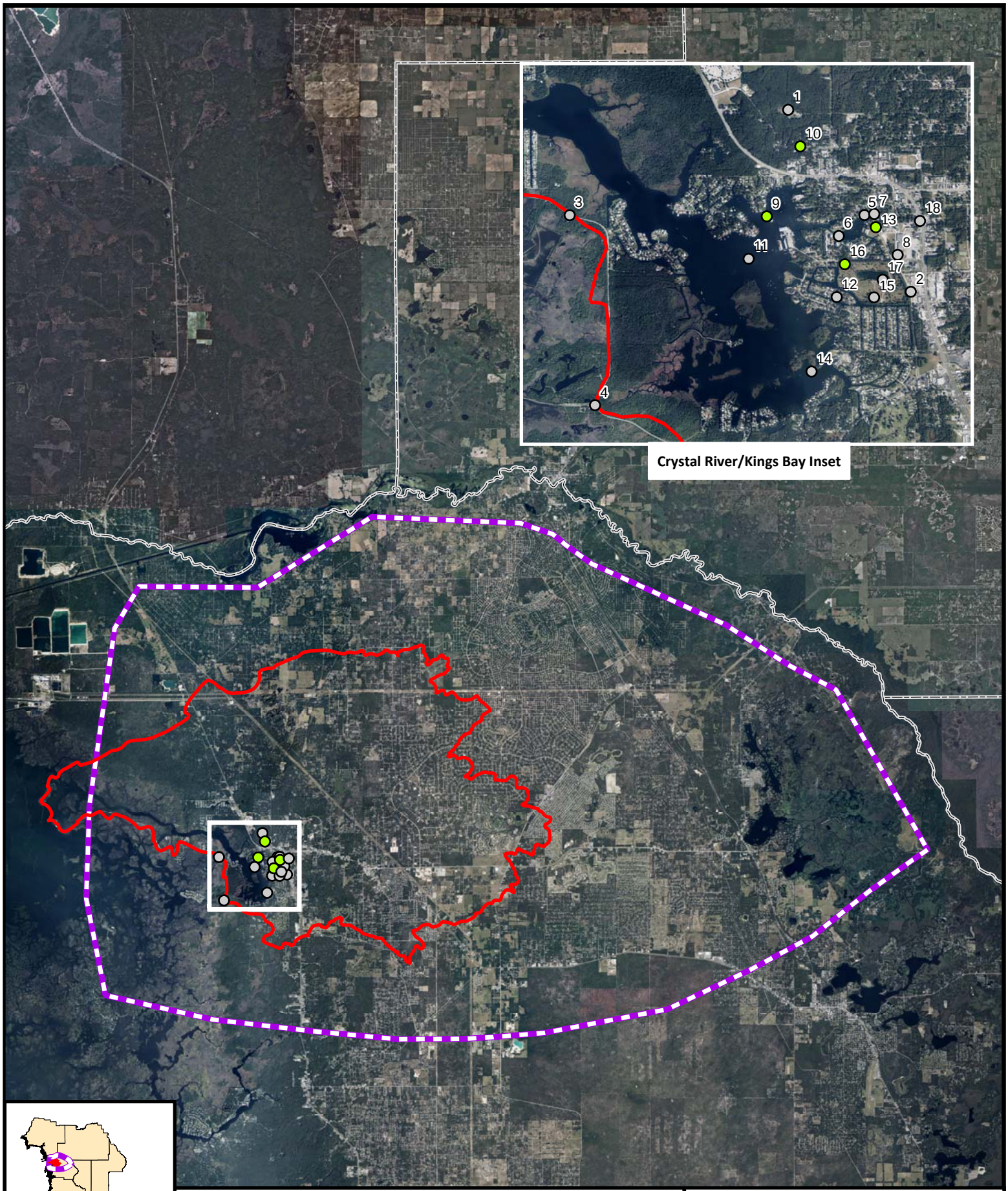
- Completed second full year of the revised Project COAST water quality monitoring of the nearshore coastal waters off Crystal River. This project builds upon an existing dataset of fixed stations along the Springs Coast collected by the University of Florida since 1998. The revised Project COAST reduced the number of stations sampled while increasing the suite of water quality parameters being analyzed resulting in a more analytically comprehensive product at a reduced overall cost.
- Coordinated the third year of a three-year campaign to gain community support and inform the public that the District is committed to improving the health of the springs and has the scientific knowledge to do so. After the campaign, staff completed the third year of a public perception survey to better understand the public's opinions, knowledge, attitudes and beliefs regarding the health of the springs and the District's efforts to restore them.
- The District hosted two educational boat tours about the District's restoration work in Kings Bay, one as part of Citrus County's annual Save Our Water's Week (SOWW) and one at the Citrus County Water School.
- The District also sponsored Citrus County Water School.
- Staff gave seven presentations on this springs system and hosted springs outreach booths at four events. Approximately 600 people visited these booths.
- Designated educational signage about Crystal River/Kings Bay for display along the Three Sisters Springs boardwalk and purchased a groundwater model as an educational tool to be presented to people waiting to be shuttled to Three Sisters Springs from the Citrus County's Visitor's Center.
- Funded hands-on field trip programs where students learned first-hand about the importance of Crystal River/Kings Bay and local water resources while visiting the Citrus County Marine Science Station. The program reached 958 fourth-grade students, 640 seventh-grade students, 424 high school students, and 74 teachers and funded an educational summer camp reaching 80 students.

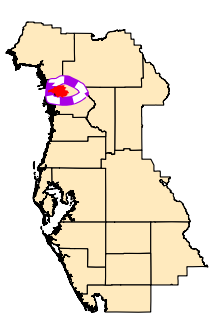
The following studies are either ongoing or were completed prior to 2016

- Citrus County Toilet Rebate Program (complete)
- City of Crystal River BMP Alternatives Analysis (ongoing)
- City of Crystal River Watershed Management Plan (complete)
- DEP Monitoring – Water Quality and Flow Mapping (ongoing)
- Five Rivers Nutrient Assimilation (complete)
- Identifying Water Sources to King's Bay using CDOM Optical Properties (complete)
- Kings Bay Algal Grazer Evaluation (complete)
- Kings Bay Canal WQ Monitoring (complete)
- Kings Bay Park Lagoon Restoration (complete)
- Kings Bay Pilot Vallisneria Project (complete)
- Kings Bay Sediment Feasibility Study

(complete)

- Lyngbya Removal and Revegetation Pilot Project (complete)
- Project Coast DCB Internal Data Collection (ongoing)
- Project COAST Nutrient Limitation Study (complete)
- Seasonal Cycles of Phytoplankton in Kings Bay (complete)
- Sediment Distribution 2005 (complete)
- Sediment Evaluation 1993 (complete)
- Sources of Chlorophyll-a in the Kings Bay Embayment (complete)
- Spring Discharge/Groundwater Monitoring (complete)
- Springs Coast Fish Community Assessment (ongoing)
- Springs Coast Seagrass Mapping (complete)
- Springs Coast Treatment Wetland Creation Feasibility Study (complete)
- Tidal Fluctuation (complete)
- Vegetation Evaluation and Mapping 2004-2006 (complete)
- Vegetation Evaluation and Mapping 2012-2013 (complete)
- Volunteer Water Quality Monitoring (complete)
- Water Quality Evaluation (ongoing)
- Watershed Education (ongoing)





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Complete

Ongoing

Crystal River Watershed

Crystal River/Kings Bay Springshed

Crystal River/Kings Bay SWIM Projects 2016

Crystal River and Kings Bay Projects Legend

Map Number	Project Name	Status
1	City of Crystal River to Duke Energy Reclaimed Water Project	Complete
2	Crystal Center SW Runoff Mitigation	Complete
3	Fort Island Trail Force Main	Complete
4	Fort Island Trail Wastewater Force Main Project	Complete
5	Hunter Springs Cove Living Shoreline	Complete
6	Hunter Springs Dredging Project	Complete
7	Hunter Springs SW Treatment Pond Expansion	Complete
8	Kings Bay Plaza SW Runoff Management	Complete
9	Kings Bay Sediment Removal	Ongoing
10	Kings Bay SW IMP Projects Phase I	Ongoing
11	Kings Bay SW Projects	Complete
12	Palm Island SW Rehab	Complete
13	Springs Aquatic Vegetation Rest: Hunters Cove/Kings Bay	Ongoing
14	Tarpon Hole Dredging Project	Complete
15	Three Sisters Bank Stabilization Project	Complete
16	Three Sisters Springs Sediment Removal Project	Ongoing
17	Three Sisters Springs Wetland Treatment Project	Complete
18	US 19 SW IMPs	Complete

Homosassa River

The Homosassa River is a first-magnitude spring system and is designated by the state as an Outstanding Florida Water (OFW) and a SWIM Priority Water Body. The Homosassa River is a slow-moving tidal river that flows eight miles from the headsprings to the Gulf of Mexico at Homosassa Bay in Citrus County, Florida. The Homosassa River springshed, which contributes groundwater to the brackish Homosassa Springs, is approximately 270 square miles of urbanized and agricultural lands, forested uplands and wetland. This springshed covers portions of Citrus and Hernando counties. The springs have been a tourist attraction since the early 1900s, when trains would stop to let rail passengers rest at the springs. The headspring is located in the area now known as the Homosassa Springs State Wildlife Park, which serves as a wildlife rehabilitation center including orphaned or injured manatees. These marine mammals, along with many freshwater and saltwater fish, can be seen year-round at the park's fishbowl observatory.

As with many spring systems in Florida, increasing nitrate-nitrogen concentrations have been observed in the Homosassa River. These increasing nitrate concentrations are a result of human activities within the springshed, such as fertilizer use and wastewater disposal, and have the potential to stimulate algal growth in the river. The Homosassa River is a heavily impacted system with extensive shoreline development, reduced water clarity, limited submerged aquatic vegetation (SAV), and proliferation of filamentous and planktonic algae. Decreasing water clarity is largely attributed to increases in phytoplankton

algae. An indicator of the amount of phytoplankton in the water column is chlorophyll concentration which is measured quarterly as part of the District's ambient water quality monitoring program. Other factors which reduce water clarity in the river are suspended sediments (turbidity) and colored dissolved organic matter (CDOM). Reductions in spring and river discharge reduce the flushing rate and increase the residence time of the waters, allowing an increase in phytoplankton abundance. The absence of SAV like Eelgrass (Vallisneria) has contributed to the loss of water clarity because SAV stabilize sediments and filter particles and nutrients from the water column.

Part of the District's springs protection outreach goals is to increase the public's awareness and knowledge of issues related to the Homosassa Springs and River, as well as change the public's attitudes and behaviors that negatively affect the health of the springs and river.

The Homosassa River SWIM Plan will be finalized in 2017.

Notable Accomplishments for Homosassa River in 2016

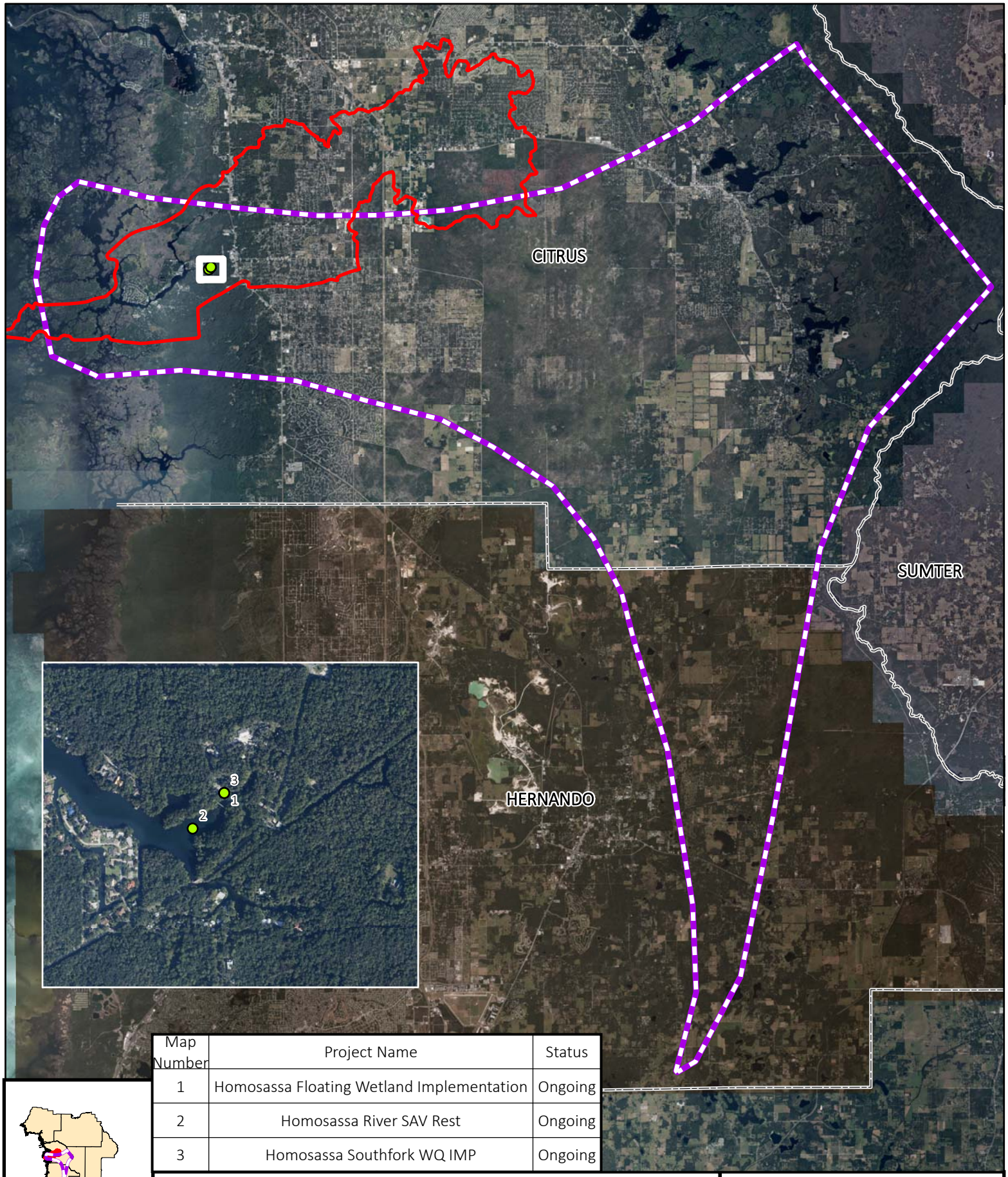
- Continued working with the Springs Coast Steering Committee (SCSC) to develop management plans for the five first-magnitude spring systems within the District
- A project was initiated to provide water quality treatment of stormwater runoff from the directly connected areas north of Halls River Road (CR490A) and east of U.S. Highway 19. By treating the stormwater before entering Pepper Creek and the South Fork of the Homosassa River, the improvements will directly benefit the Homosassa River and the Homosassa River Wildlife State Park and reduce pollutant loading to the springs.
- Continued design for a pilot project to install floating wetland systems in Homosassa Springs State Wildlife Park. Floating wetland systems are proven technologies to remove nutrients from the water column and provide wildlife habitat. The project will be the first to test these systems in a tidally influenced, spring-fed river. This project will be implemented in 2017.
- An evaluation of the benthic ecosystem was conducted throughout the Homosassa River. Submerged aquatic vegetation, invertebrates, and sediment characteristics were measured to better understand the ecology of the river.
- Springs Coast Seagrass Mapping, a District initiative for mapping and monitoring of the expansive Springs Coast seagrass area from Tarpon Springs to Waccasassa Bay and out over 20 miles offshore was completed in 2016. Covering an area of over 400,000 acres, the Springs Coast is the second largest seagrass habitat in the United States and is home to several commercially and recreationally important species including bay scallops, grouper, snook, and tarpon, among others. This seagrass area is incredibly diverse with a healthy community of macro-algae, sponges, and coral interspersed with the seagrass.
- Coordinated the third year of a three-year campaign to gain community support and inform the public that the District is committed to improving the health of the springs and has the scientific knowledge to do so. After the campaign, staff completed the third year of a public perception survey to better understand the public's opinions, knowledge, attitudes and beliefs regarding the health of the springs and the District's efforts to restore them.
- Staff hosted a spring's outreach booth at Homosassa Springs State Park during an Earth Day event where more than 150 people visited the booth. Staff also gave two presentations on this spring system.

The following studies are either ongoing or were completed prior to 2016

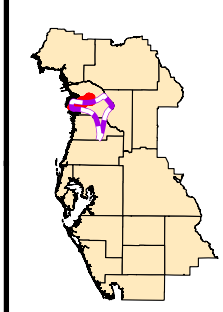
- Citrus County Toilet Rebate Program (complete)
- Coastal Rivers Aquatic Vegetation Analysis (complete)
- Coastal Rivers Invertebrate Analysis

(complete)

- Coastal Rivers Sediment Analysis (complete)
- DEP Monitoring - Water Quality and Flow Mapping (ongoing)
- Homosassa River - Water Quality Treatment CR 490A and 19 (ongoing)
- Springs Coast Fish Community Assessment (ongoing)
- Springs Coast Seagrass Mapping (complete)
- Springs Coast Treatment Wetland Creation Feasibility Study (complete)



Map Number	Project Name	Status
1	Homosassa Floating Wetland Implementation	Ongoing
2	Homosassa River SAV Rest	Ongoing
3	Homosassa Southfork WQ IMP	Ongoing



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Ongoing

Homosassa River Watershed

Homosassa River Springshed

Homosassa River SWIM Projects 2016

Chassahowitzka River

The Chassahowitzka River is a first-magnitude spring system and is designated by the state as an Outstanding Florida Water (OFW) and a SWIM Priority Water Body. The Chassahowitzka River is a tidal river that flows 6 miles from the headsprings to the Gulf of Mexico at Chassahowitzka Bay in Citrus County, Florida. The Chassahowitzka River is a spring fed system that originates from multiple spring vents and numerous spring fed creeks that join the river as it flows towards the Gulf. Aquatic plant life can be abundant in the upper river, and numerous wildlife, bird, and fish species are found in this coastal river. The Chassahowitzka River springshed, which contributes groundwater to the Chassahowitzka Springs, is approximately 190 square miles of upland forests, urbanization, agricultural activities and wetland forests. This springshed covers portions of Citrus and Hernando counties. The lower half of the Chassahowitzka River is part of the more than 31,000-acre Chassahowitzka National Wildlife Refuge. While the river's shoreline is mostly natural, the headsprings area contains a small marina with a public boat ramp. A nearby residential community is connected to the headsprings through a canal system.

As with many spring systems in Florida, increasing nitrate-nitrogen concentrations have been observed in the Chassahowitzka River. This is a result of human activities within the springshed such as fertilizer use and wastewater disposal, and have the potential to stimulate algal growth in the river. The Chassahowitzka River is a moderately impacted system, with most of the degradation occurring in the upper river near the main spring vents. The main spring vent area had filled in with algae, muck, and sediment over past decades, leading to reduced water clarity and aesthetics. In addition, residential canals drain into the main spring area, carrying nutrients, algae, and sediments. In 2013, the main spring area was dredged to remove the accumulated algae, muck, and sediments with the goal of restoring the benthic habitat. Downstream of the main springs, the river typically supports abundant submerged aquatic vegetation (SAV) dominated by native species including Eelgrass (Vallisneria). Periodically this SAV has been observed to die back, likely due to pulses of high salinity water during storm events, and then recovers over the following year. Epiphytic algae also tend to colonize the SAV and can completely cover the SAV leaves by the end of the growing season.

Part of the District's springs protection outreach goals is to increase the public's awareness and knowledge of issues related to the Chassahowitzka

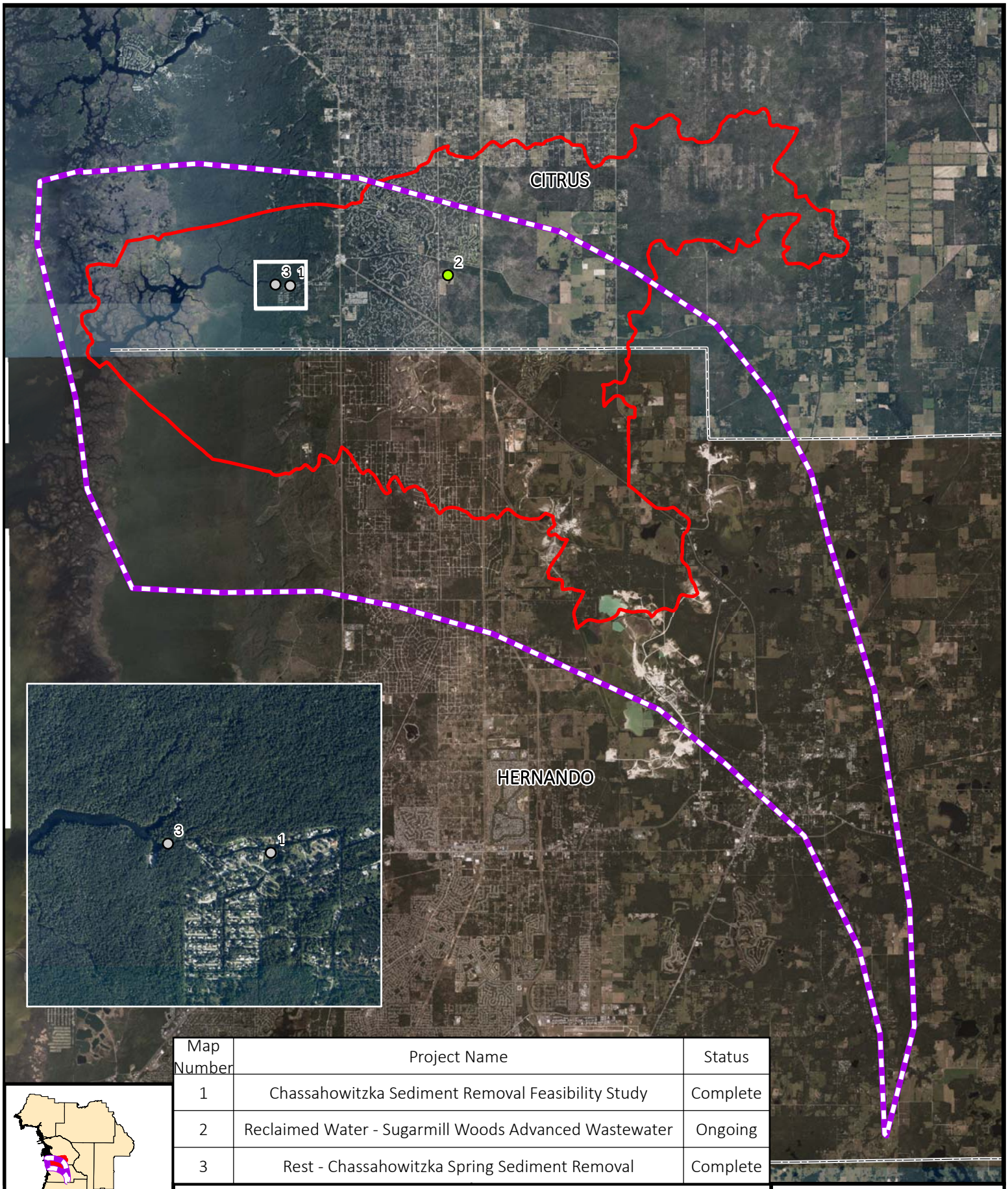
Springs and River, as well as change the public's attitudes and behaviors that negatively affect the health of the springs and river.
The Chassahowitzka River SWIM Plan is projected to be finalized in 2017.

Notable Accomplishments for Chassahowitzka River in 2016

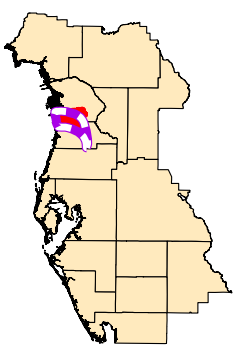
- Continued working with the Springs Coast Steering Committee (SCSC) to develop management plans for the five first-magnitude spring systems within the District.
- Completed a feasibility study project to assess sediment removals from a section of the upstream canal system to provide additional sediment storage in the canals and improve water quality and clarity in the river. This is the next phase of the sediment removal project that was completed in the main spring area in 2013.
- An evaluation of the benthic ecosystem was conducted throughout the Chassahowitzka River. Submerged aquatic vegetation, invertebrates, and sediment characteristics were measured to better understand the ecology of the river.
- Springs Coast Seagrass Mapping, a District initiative for mapping and monitoring of the expansive Springs Coast seagrass area from Tarpon Springs to Waccasassa Bay and out over 20 miles offshore was completed in 2016. Covering an area of over 400,000 acres, the Springs Coast is the second largest seagrass habitat in the United States and is home to several commercially and recreationally important species including bay scallops, grouper, snook, and tarpon, among others. This seagrass area is incredibly diverse with a healthy community of macro-algae, sponges, and coral interspersed with the seagrass.
- Coordinated the third year of a three-year campaign to gain community support and inform the public that the District is committed to improving the health of the springs and has the scientific knowledge to do so. After the campaign, staff completed the third year of a public perception survey to better understand the public's opinions, knowledge, attitudes and beliefs regarding the health of the springs and the District's efforts to restore them
- Staff hosted a spring's outreach booth that more than 200 people visited at the Citrus County Water Conservation Expo held in the springshed of this SWIM water body.

The following studies are either ongoing or were completed prior to 2016

- Citrus County Toilet Rebate Program (complete)
- Coastal Rivers Aquatic Vegetation Analysis (complete)
- Coastal Rivers Invertebrate Analysis (complete)
- Coastal Rivers Sediment Analysis (complete)
- DEP Monitoring - Water Quality and Flow Mapping (ongoing)
- Springs Coast Fish Community Assessment (ongoing)
- Springs Coast Seagrass Mapping (complete)
- Springs Coast Treatment Wetland Creation Feasibility Study (complete)



Map Number	Project Name	Status
1	Chassahowitzka Sediment Removal Feasibility Study	Complete
2	Reclaimed Water - Sugarmill Woods Advanced Wastewater	Ongoing
3	Rest - Chassahowitzka Spring Sediment Removal	Complete



N

0 0.5 1 2 3 4 Miles

Complete

Ongoing

Chassahowitzka River Springshed

Chassahowitzka Watershed

Chassahowitzka SWIM Projects 2016

Weeki Wachee River

The Weeki Wachee River is a first-magnitude spring system and is designated by the state as an Outstanding Florida Water (OFW) and a SWIM Priority Water Body. The Weeki Wachee River is a fast-moving river that flows over 7 miles from the headspring to the Gulf of Mexico at Bayport in Hernando County, Florida. The majority of river discharge is derived from the head spring, however, Twin Dees, Salt and Mud River springs contribute to the overall river discharge. The river is relatively narrow and stream like, in the upper portion, and gradually widens as it reaches the Gulf. The Weeki Wachee River springshed, which contributes groundwater to Weeki Wachee Springs, is approximately 260 square miles of urbanized areas, agricultural lands and forested uplands. This springshed covers portions of Hernando and Pasco counties. The headspring is home to Weeki Wachee Springs State Park, which features a water park and the famous underwater mermaid show.

As with many spring systems in Florida, increasing nitrate-nitrogen concentrations have been observed in the Weeki Wachee River. These increasing nitrate concentrations are a result of human activities within the springshed, such as fertilizer use and wastewater disposal, and have the potential to stimulate algal growth in the river.

The Weeki Wachee River is a moderately impacted system with a mix of developed and undeveloped shoreline. The upper and middle portions of the river have more natural lands and riparian cover, while the lower river has an extensive canal system with associated development. Submerged aquatic vegetation (SAV) dominated by Eelgrass (Vallisneria) is abundant in the upper river. Filamentous algae is prevalent near the main spring vent and at certain locations downstream. Erosion and sedimentation is an issue in parts of the river and has been observed to smother SAV and other habitats. In 2009, the District completed a project to remove algae and muck from the main spring area and re-vegetate with Eelgrass. This project was largely successful and Eelgrass continues to thrive in much of this area, although filamentous algae remains a problem. In 2013, a volunteer algae cleanup program was initiated to manually remove algae and maintain the native SAV.

Part of the District's springs protection outreach goals is to increase the public's awareness and knowledge of issues related to the Weeki Wachee Springs and River, as well as change the public's attitudes and behaviors that negatively affect the health of the springs and river.

The Weeki Wachee River SWIM Plan will be finalized in 2017.

Notable Accomplishments for Weeki Wachee River in 2016

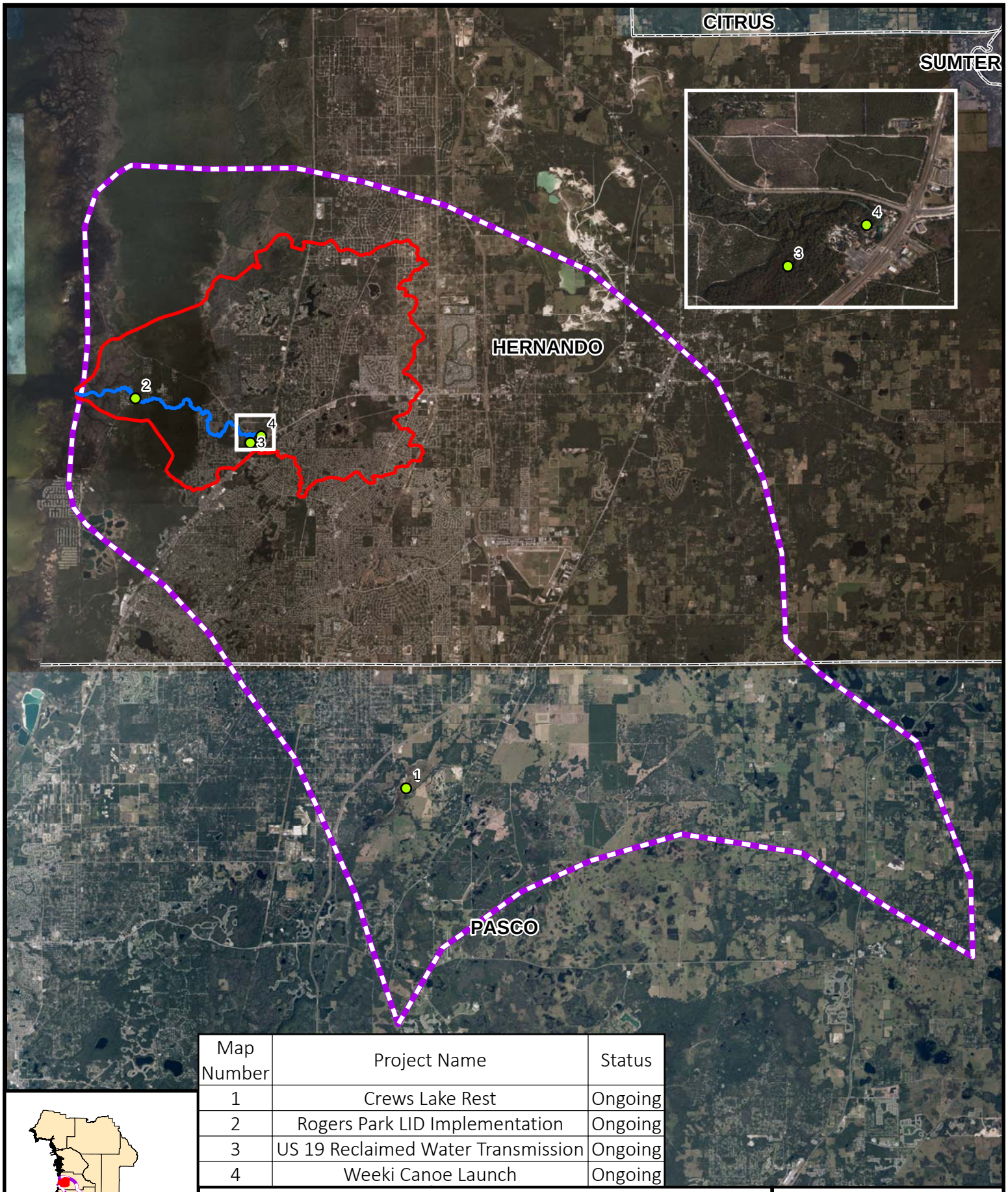
- Continued working with the Springs Coast Steering Committee (SCSC) to develop management plans for the five first-magnitude spring systems within the District.
- Completed design and permitting for a low impact development (LID) stormwater project at Rogers Park. Rogers Park is located several miles downstream along the Weeki Wachee River and is a highly used area for swimmers and boaters. The park currently has minimal stormwater infrastructure and periodically stormwater runoff carrying sediments and other pollutants flows into the river.
  This project will improve water quality in the river by adding pavement and bioswales to capture and treat stormwater. This project is projected to be completed in 2017.
- Completed design of a stormwater project at Weeki Wachee Springs State Park to improve the canoe launch area. Currently stormwater carries sediments into the river at this location. This project will redesign the canoe launch to reduce erosion and stormwater inputs and improve water quality in the river. Construction will be completed in 2017.
- A sedimentation assessment project was initiated for the Weeki Wachee River. The river has historically had issues with erosion due to human activities, which has detrimentally impacted the downstream ecosystem. The assessment will determine the sources of sand and other sediments, the rate of sedimentation, the extent of sand deposition, and rate of downstream sediment export.
- An evaluation of the benthic ecosystem was conducted throughout the Weeki Wachee River. Submerged aquatic vegetation, invertebrates, and sediment characteristics were measured to better understand the ecology of the river.
- Springs Coast Seagrass Mapping, a District initiative for mapping and monitoring of the expansive Springs Coast seagrass area from Tarpon Springs to Waccasassa Bay and out over 20 miles offshore was completed in 2016. Covering an area of over 400,000 acres, the Springs Coast is the second largest seagrass habitat in the United States and is home to several commercially and recreationally important species including bay scallops, grouper, snook, and tarpon, among others. This seagrass area is incredibly diverse with a healthy community of macro-algae, sponges, and coral interspersed with the seagrass.
- The District participated in the "Springs into Action" springs protection workshop organized by Hernando County. District staff led a volunteer effort to plant Eelgrass in the Weeki Wachee River headspring.
- Coordinated the third year of a three-year campaign to gain community support and inform the public that the District is committed to improving the health of the springs and has the scientific knowledge to do so. After the campaign, staff completed the third year of a public perception survey to better understand the public's opinions,

knowledge, attitudes and beliefs regarding the health of the springs and the District's efforts to restore them.

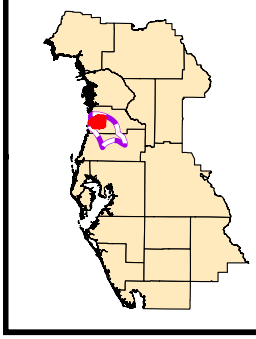
- Funded hands-on field trip programs where students learned first-hand about the Weeki Wachee River. Participants included 1,509 second-grade, 1,535 fourth-grade, 1,170 sixth-grade and 135 high school students along with 284 teachers and adult chaperones.

The following studies are either ongoing or were completed prior to 2016

- Coastal Rivers Aquatic Vegetation Analysis (complete)
- Coastal Rivers Invertebrate Analysis (complete)
- Coastal Rivers Sediment Analysis (complete)
- DEP Monitoring - Water Quality and Flow Mapping (ongoing)
- Springs Coast Fish Community Assessment (ongoing)
- Springs Coast Seagrass Mapping (complete)
- Springs Coast Treatment Wetland Creation Feasibility Study (complete)
- Weeki Wachee Sand Assessment (ongoing)



Map Number	Project Name	Status
1	Crews Lake Rest	Ongoing
2	Rogers Park LID Implementation	Ongoing
3	US 19 Reclaimed Water Transmission	Ongoing
4	Weeki Canoe Launch	Ongoing



N

0 0.75 1.5 3 4.5 6 Miles

Ongoing

Weeki Wachee River

Weeki Wachee Watershed

Weeki Wachee Springshed

Weeki Wachee SWIM Projects 2016

Lake Panasoffkee

Lake Panasoffkee, a District's SWIM Priority Waterbody and an Outstanding Florida Water (OFW), is the largest lake in Sumter County. Historically, the lake has supported a nationally renowned sport fishery, especially for redear sunfish. An estimate of angler expenditures on Lake Panasoffkee conducted in 1998 yielded a value of approximately $2.0 million. This fishery, along with the natural resource values of the lake, makes Lake Panasoffkee important to the local and regional economy and the environment.

The lake has a surface water area of approximately 3,200 acres and the total area of the lake can be at least 4,500 acres. The lake is considered shallow with a maximum depth of approximately ten feet. Direct surface water inflows to Panasoffkee include Big Jones and Little Jones Creeks on the northern end and Shady Brook on the southern end, however, much of this surface water flow is attributed to spring discharges in the stream channels. Therefore, groundwater accounts for more than 40 percent of the lake's inflows. The only discharge from the lake is the Outlet River, which flows from the western shore of the lake to the Withlacoochee River.

Due to the substantial influence of groundwater on the lake, water quality in Lake Panasoffkee has been considered good since the initial Lake Panasoffkee SWIM Plan was drafted in 1989. The Trophic State Index (TSI) remained relatively unchanged since 1977. The target rating for Lake Panasoffkee is 50, where values greater than 50 are categorized as exceedances. Data provided by the USGS from 1977 and 1990 indicated TSI was 45. Additional water quality studies conducted by the District's SWIM Program in 1991 and 1992 indicated the TSI was 47. The average TSI for 2015 was 48.

Lake Panasoffkee is the third largest lake (4,820 acres) in west central Florida.

While water quality in Lake Panasoffkee has been considered good, diagnostic studies completed by the SWIM Program in 1995 provided evidence that aesthetic and recreational uses of the lake had been impacted. Concerned for the health of Lake Panasoffkee, the Legislature passed Chapter 98-69, Laws of Florida, creating the Lake Panasoffkee Restoration Council (Council) within the District. The *Lake Panasoffkee Restoration Council, November 25, 1998 Report to the Legislature* identified sediment accumulation and encroachment of emergent vegetation as the primary issues threatening the lake.

This report, which established the Restoration Plan for Lake Panasoffkee, was incorporated into the April 2000 update of the *Lake Panasoffkee SWIM Plan.*

The Restoration Plan consisted of a multi-step dredging plan to improve fisheries habitat, restore the historic shoreline and facilitate navigation. The restoration project, which was completed in 2008, restored approximately 175 acres of historic fish bedding areas, restored the historic lake shoreline, increased open water area of the lake by 37%, and removed an approximated 8.3 million cubic yards of sediment.

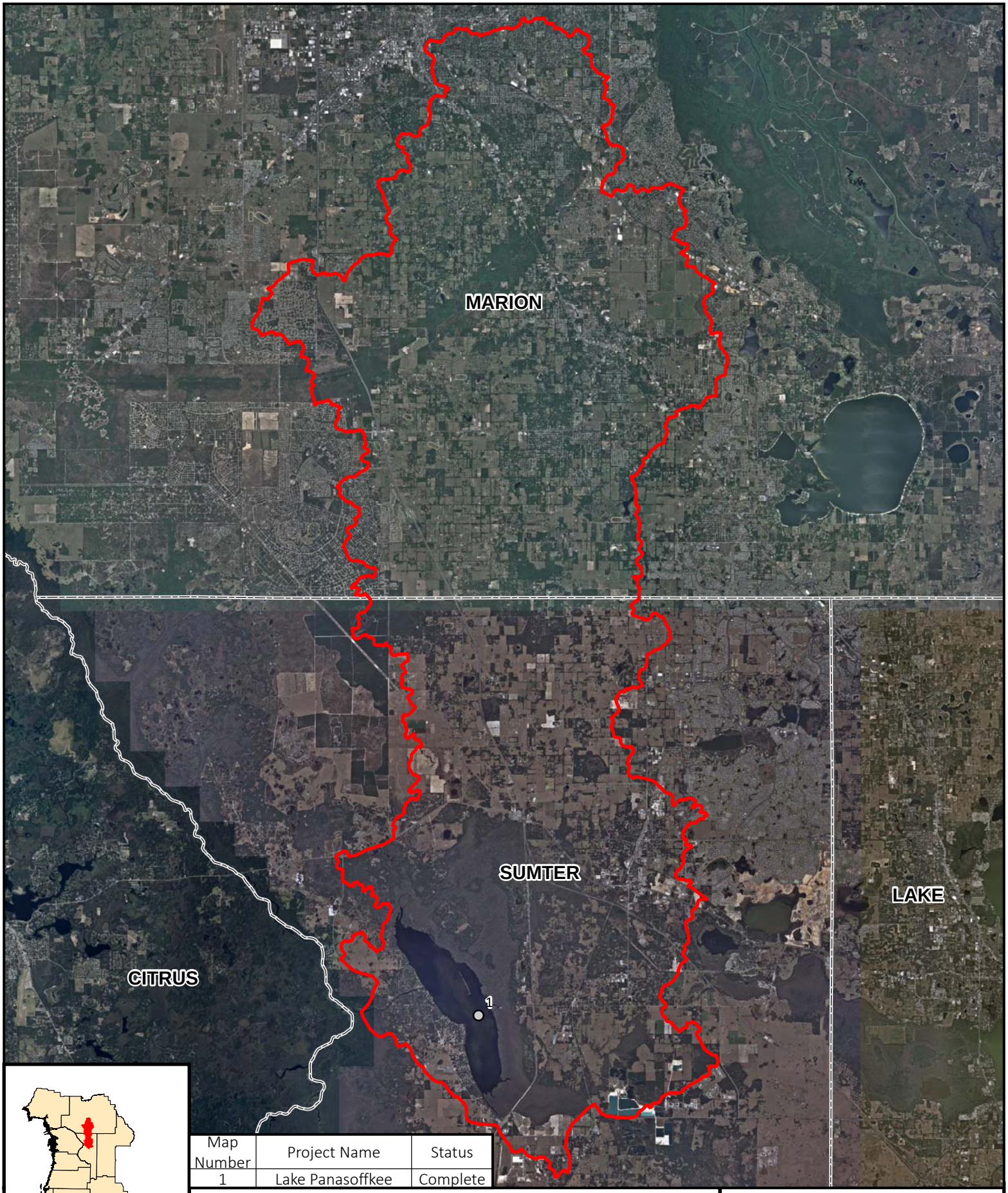
Summarizing 1989-2014, the SWIM Program and its cooperators have completed 2 restoration projects for Lake Panasoffkee for a total of approximately 1,744 acres of restored habitats.

Notable Accomplishments for Lake Panasoffkee in 2016

- Following the completion of the dredging in 2008, the District initiated a long-term monitoring program for Lake Panasoffkee. The District continued to track water quality and water clarity changes and native vegetation recruitment in the dredged areas. This data is used to support decisions to regulate surface water levels by operating the Wysong-Coogler Water Conservation Structure.
- The District's Springs and Environmental Flows Section continues to monitor discharge of the Outlet River and water quality within the lake on a bi-weekly basis and maintains suitable lake discharges through the Outlet River in order to promote optimal water quality conditions and fisheries
- As part of their long-term monitoring program, the Florida Fish and Wildlife Conservation Commission conducts bi-yearly surveys to monitor the health of the fish communities including; spring sampling for largemouth bass and sunfish followed by fall sampling for fisheries community structure.
- The District hosted a teacher training for Sumter County middle school teachers to learn about the restoration work and how it can be incorporated into a lesson with water quality testing and dip-netting at the Marsh Bend County Park on the Panasoffkee Outlet.

The following studies are either ongoing or were completed prior to 2016

- Bathymetric Mapping (complete)
- Biological Hydrilla Control (complete)
- Coleman's Landing Pilot Dredging (complete)
- Lake Panasoffkee Rest Project (complete)
- Lake Panasoffkee Water Quality Monitoring (ongoing)
- SAV Recruitment/Water Clarity Monitoring (ongoing)
- Shady Brook-Jones Creek Nutrient Monitoring (complete)
- Submerged Aquatic Vegetation Mapping (complete)



Map Number	Project Name	Status
1	Lake Panasoffkee	Complete

N

0 0.5 1 2 3 4 Miles

Complete

Lake Panasoffkee Watershed

Lake Panasoffkee SWIM Projects 2016

Charlotte Harbor

Charlotte Harbor is a District SWIM Priority Waterbody, and has also been declared an estuary of national significance through its inclusion in the U.S. Environmental Protection Agency's National Estuary Program. Charlotte Harbor proper covers 270 square miles and is Florida's second largest open water estuary. It is considered one of the most productive estuarine systems on the west coast of Florida. Because of its productivity, Charlotte Harbor has become a world-class destination for recreational fishing. The state's largest snook (*Centropomis undecimalis*) was caught in the southern portion of the Harbor, and hundreds of tarpon (*Megal ops atlanticus*) are caught each year in Boca Grande Pass. The extensive seagrass flats fringing the Harbor are home to schools of redfish (*Sciaenops ocellatus*) and spotted seatrout (*Cynoscion nebulosus*).

Charlotte Harbor and its watershed, which together cover more than 4,400 square miles, is home to more than forty species of animals listed by the state as either endangered, threatened, or of special concern. Significant habitat losses within the Harbor and its watershed have been documented and have been attributed to a variety of human activities. In the headwaters of the Peace and Myakka Rivers, large tracts of pine flatwoods, sandhill scrub, and other habitat types have been converted to agricultural land uses. In the Upper Peace River, much of the watershed has also been converted to phosphate mines. In the lower Peace and Myakka Rivers, once large expanses of salt marsh and expanses of salt marsh and mangrove habitats have been drained and filled and replaced by residential housing in finger-fill canal communities.

Charlotte Harbor is Florida's second largest open water estuary.

Water clarity data and seagrass acreage have been collected since at least 2002 by the Coastal Charlotte Harbor Monitoring Network and the District, respectively. In August 2009, the Charlotte Harbor National Estuary Program (CHNEP) adopted seagrass targets for each of the segments in Charlotte Harbor. In May 2011, the CHNEP adopted water clarity targets for each of the segments.

Water clarity measures how much light is lost through the water column. This parameter is important in promoting seagrass stability and expansion. Through each segments period of record, Lemon Bay, Tidal Peace, Tidal Myakka and Charlotte Harbor have shown an improving trend in water clarity. Only the Dona and Roberts Bay segment has shown no change during its period of record and its water clarity is designated as "cautionary" which means that it is not meeting its seagrass or water clarity targets.

After much work by the CHNEP, with cooperative funding from the District, the CHNEP proposed Numeric Nutrient Criteria to the Florida Department of Environmental Protection (FDEP), for each of the segments within the Southwest Florida Water Management District. The FDEP adopted these criteria by rule in June 2012 and the US Environmental Protection Agency's (USEPA) approved these rules in November 2012. The CHNEP along with the Tampa Bay and Sarasota Bay Estuary Programs continued a project to develop water quality criteria for tidal streams to supplement the estuarine Numeric Nutrient Criteria.

From 1989-2016, the SWIM Program and its cooperators have completed 15 coastal restoration projects and 12 ecological studies for Charlotte Harbor for a total of approximately 4,412 acres of restored coastal habitats. Since 2004, the District and its cooperators have completed 5 water quality improvement projects that are providing treatment for nearly 94,537 acres of watershed. The SWIM Program's biennial seagrass mapping program released the 2016 mapping results that documented Charlotte Harbor experienced a 1.9% increase in seagrass coverage from 2014. The Harbor contains 20,280 acres of seagrass, while Lemon Bay contains 3,225 acres of seagrass, a 1.4% decrease in coverage since 2014.

The following projects were either ongoing or completed in 2016

- **Lake Hancock Outfall Treatment System** Completed construction of a large-scale treatment wetland. The objective of the project is to treat surface water discharging from the lake to South Saddle Creek and ultimately, the Peace River. Operation in 2015 was focused on establishing a dense stand of emergent marsh wetland. Vegetation monitoring continued in 2016 with the objective of operating the system once acceptable coverage is achieved. The completed project will improve water quality in the Upper Peace River and reduce nitrogen loading to Charlotte Harbor.
- **Alligator Creek Habitat Restoration Project** – Design and permitting are completed for Phase III within the 1,600-acre project area. This phase includes approximately 120 acres and includes hydrologic restoration, exotic species removal, and stormwater polishing on the eastern shores of Charlotte Harbor. Construction commenced in 2016 and will be complete in 2017.
- **Coral Creek Pre-Construction Fisheries Monitoring –** Pre-construction fisheries monitoring was conducted for this habitat restoration project to determine baseline fish utilization of the site prior to restoration. This was a cooperative project with the Charlotte Harbor National Estuary Program and the Florida Fish and Wildlife Conservation Commission. Sampling was conducted for twelve months in 2014/2015 and the final report was completed in 2016. The data collected will be compared to data collected following completion of the habitat restoration project.
- **Coral Creek Habitat Restoration Project –** Design and permitting of Phase II, covering a 300-acre portion of the 2,600-acre site is ongoing. This phase includes re-contouring of freshwater and estuarine finger canals.

Construction is expected to commence in 2017.

- **Water Quality monitoring in the Peace and Myakka Basins, Charlotte Harbor, and Lemon Bay –** Monthly samples continue to be collected, analyzed, and data made available to the public via the District's WMIS system and FDEP's STORET database. Sampling and coordination responsibilities with FFWCC and Charlotte County were performed by CHNEP.
- **Upper Myakka Flatford Restoration Feasibility and Prioritization Project –** Continued ecosystem evaluation on background surface water quality, soil biogeochemistry and high-resolution vegetation mapping of Flatford Swamp. This project will determine the ecological integrity of the system and will identify the feasibility of short and long term restoration alternatives that could be implemented in conjunction with the upcoming hydrologic restoration project.
- **Lemon Bay Habitat Restoration Project** – Design and permitting are completed for the 80-acre project area. This project includes freshwater and estuarine wetland restoration, exotic species removal, and stormwater polishing. Construction is expected to commence in 2017.
- **South Venice Waterway Restoration** – Sarasota County completed pilot testing various plants and shoreline stabilization techniques on man-made waterways to determine cost efficient environmentally sustainable canal restoration practices that will be implemented in the next phrase of the project. The County completed the construction procurement process and began construction in 2016. Construction expected to be complete in 2017.

Outreach - Volunteer Events, Presentations and Education

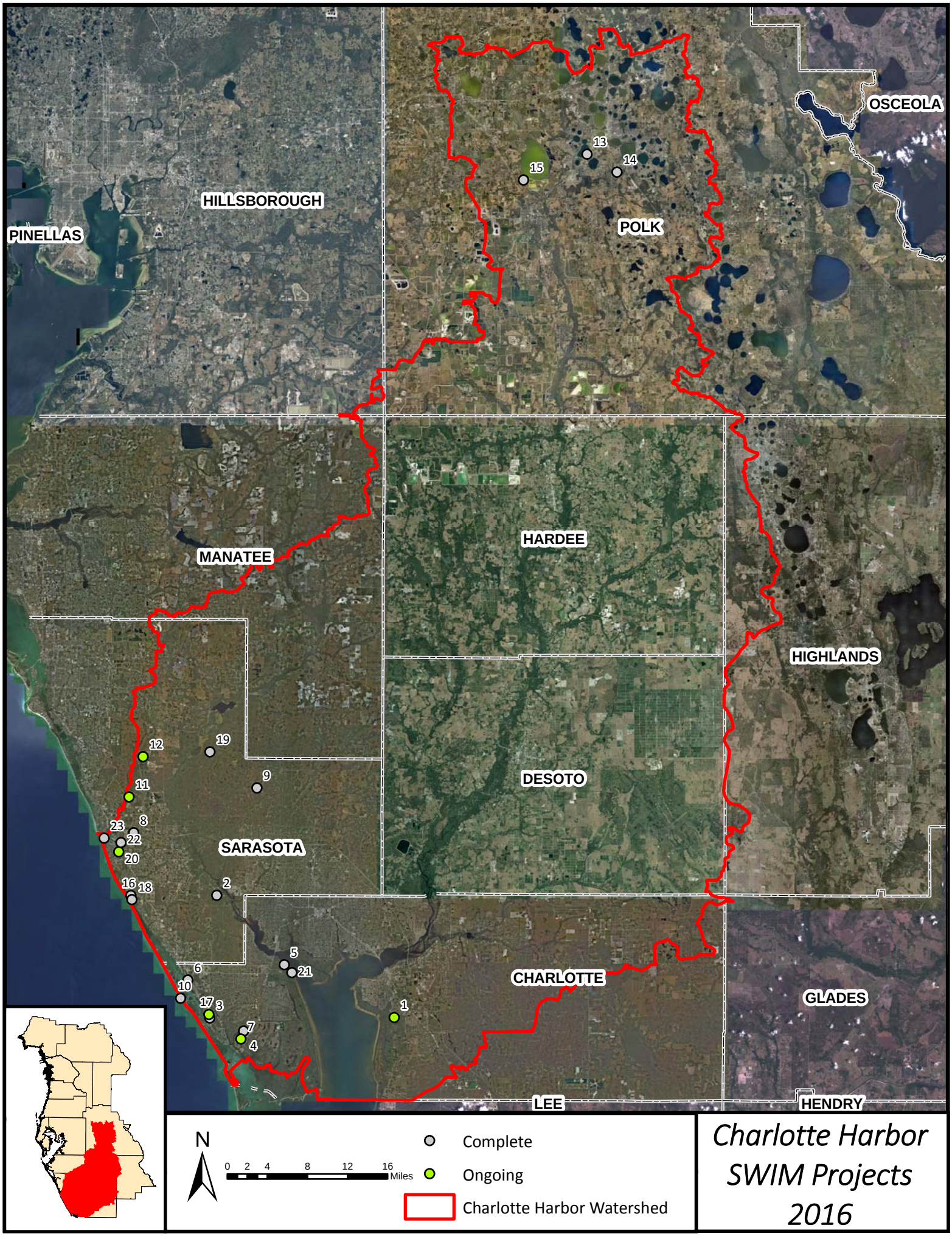
- The Southwest Florida Water Management District, along with the Shell, Prairie and Joshua Creek Stakeholders Group completed and submitted the Fifth Performance Monitoring Report to the Florida Department of Environmental Protection, pursuant to the Shell Creek and Prairie Creek Watersheds Management/Reasonable Assurance Plan. The specific goal of the stakeholders group was to improve water quality within the Shell and Prairie Creek watersheds to meet Class 1 surface water quality criteria for chloride, specific conductance and total dissolved solids. With the submittal of this report, the District requested and the FDEP concurred that Prairie Creek be delisted as impaired for mineralized parameters. Shell and Prairie Creek are tributary streams in the Peace River watershed which is part of the larger Charlotte Harbor watershed.
- District SWIM staff gave several presentations on the many management actions implemented by the District FARMS Section and agricultural stakeholders as well as the extensive data collection efforts by the District and other agencies to monitor the improvements related to the implemented management actions in the Shell Creek and Prairie Creek Watersheds.

Notable Accomplishments for Charlotte Harbor in 2016

- Numerous tours of the Lake Hancock Outfall Treatment Wetland were conducted. Several bird counts were conducted by Audubon at the project site, including the 2017 Christmas Bird Count.

The following studies are either ongoing or were completed prior to 2016

- Annual Report and Summary Analysis of Water Quality Conditions for Peace and Myakka Rivers (complete)
- Assessment of 2008 Seagrass Maps in Charlotte Harbor and Lemon Bay (complete)
- Assessment of Historical Hypoxia in Charlotte Harbor (complete)
- Characterizing Seagrass Communities of Eastern Charlotte Harbor (complete)
- Charlotte Harbor Environmental Center Myakka River Water Quality Analysis and Reporting (complete)
- Charlotte Harbor Environmental Center Peace River Water Quality Analysis and Reporting (complete)
- Charlotte Harbor Flatwoods Initiative Support (complete)
- Charlotte Harbor Water Quality Monitoring (complete)
- CHEC Reporting of Water Quality Data Peace, Myakka, Charlotte Harbor & Lemon Bay (ongoing)
- Coastal Charlotte Harbor Historic Benthic Habitat Map (complete)
- Coastal Charlotte Harbor Monitoring (ongoing)
- Coral Creek Pre-Construction Fisheries Monitoring (complete)
- Determination of Seagrass Loss Offshore Punta Gorda Isles (complete)
- Lake Hancock Historical Water Quality (complete)
- Lake Hancock Water and Nutrient Budget (complete)
- Lemon Bay Nutrient Evaluation (complete)
- Lemon Bay Pollutant Reduction Assessment (complete)
- Light Requirements of Seagrass (complete)
- Myakka River Water Quality Monitoring (complete)
- Myakka River Watershed Initiative (complete)
- Oligohaline Vegetation Mapping (complete)
- Peace Creek Canal Watershed Rest (complete)
- Peace River Water Quality Monitoring (complete)
- Responses of Seagrass Meadows to Nutrient Enrichment and Water Quality Degradation (complete)
- Restoration Needs Assessment in the Charlotte Harbor and Lemon Bay Basins (complete)
- Seagrass Transect Analysis in Charlotte Harbor (complete)
- Seasonal and Spatial Patterns of Hypoxia (complete)
- Sunshine Lake Nutrient Source Evaluation (complete)
- Water Quality for Microbial Pathogens (complete)



Charlotte Harbor SWIM Projects 2016

Charlotte Harbor Projects Legend

Map Number	Project Name	Status
1	Alligator Creek	Ongoing
2	Alligator Creek In-Stream Rest	Complete
3	Amberjack Slough	Complete
4	Cape Haze Pioneer Trail	Complete
5	Cattle Dock Point (2 Projects)	Complete
6	Cedar Point Rest	Complete
7	Coral Creek (2 Projects)	Ongoing
8	Curry Creek Preserve Rest	Complete
9	Deer Prairie Slough	Complete
10	Don Pedro (4 Projects)	Complete
11	Dona Bay Conveyance System	Ongoing
12	Dona Bay Surface Water Storage Facility	Ongoing
13	Eagle Lake Bingham St SW Retrofit	Complete
14	Lake Gwyn Surface Water Rest	Complete
15	Lake Hancock Outfall Treatment Project	Complete
16	Lemon Bay Ecosystem Rest	Complete
17	Lemon Bay Habitat Rest	Ongoing
18	Lemon Bay Site Enhancement	Complete
19	Myakka Island Ecosystem Rest	Complete
20	South Venice Waterway Rest Project	Ongoing
21	Upper Myakka Flatford Rest Feasibility and Prioritization Project	Complete
22	Venice Hatchett Creek SW Retrofit	Complete
23	Venice/Laguna Drive WQ IMP	Complete

Lake Tarpon

Lake Tarpon, an Outstanding Florida Water (OFW), is also a waterbody on the District's SWIM Priority List. Due to its reputation as a largemouth bass sport fishery, the lake was designated as a State Fish Management Area by a Special Resolution of the Pinellas County Board of County Commissioners in 1963. This sport fishery, along with historically good water quality and the existence of two regional County parks on its shore made Lake Tarpon a significant environmental, economic, and recreational resource in the Tampa Bay area.

With a surface area of approximately 2,534 acres, Lake Tarpon is the largest freshwater lake in the three county (Pinellas, Hillsborough, Pasco) Tampa Bay area. The lake is relatively shallow with a mean depth of about seven (7) feet. The major source of surface water inflow is through Brooker Creek, which enters the lake at its lower southeastern corner. The Lake Tarpon Outfall Canal and Structure serves as the only surface water outfall for the lake. This canal and structure operated and maintained by the District connects the southernmost end of the lake with Old Tampa Bay and is intended to provide flood control for the Lake Tarpon watershed.

The first indication of degraded water quality in Lake Tarpon was a blue-green algae bloom in 1987. Subsequently, the first Lake Tarpon SWIM Plan was prepared in 1989. This first SWIM Plan focused on diagnostic/feasibility studies to evaluate water quality in the lake and identify potential sources of nutrients. Water quality appeared to improve after the algae bloom, and in 1988 the Trophic State Index (TSI) was 55.

Lake Tarpon is the largest freshwater lake in the Tampa Bay area.

However, in the 1990's, water quality as measured by the TSI, appeared to be worsening. The TSI in 1995 was 58 and in 1999 it was 61. These conditions, along with Pinellas County's Growth Management Plan requirements, led Pinellas County to develop the Lake Tarpon Watershed Management Plan. This Plan was incorporated into the Lake Tarpon SWIM Plan Update completed in 2001.

The 2001 Lake Tarpon SWIM Plan recognizes declining water quality (specifically with regard to algae and nutrients) as the primary concern with Lake Tarpon. Declining water quality can lead to the increase of undesirable blooms of algae, loss of more desirable rooted aquatic plants and negative impacts to sport fish populations. The 2001 Lake Tarpon SWIM Plan identifies strategies to improve and protect water quality, which are

aimed at reducing internal and external sources of nutrients.

Additionally, the 2001 SWIM Plan includes projects to restore hydrology and habitat in the Brooker Creek watershed.

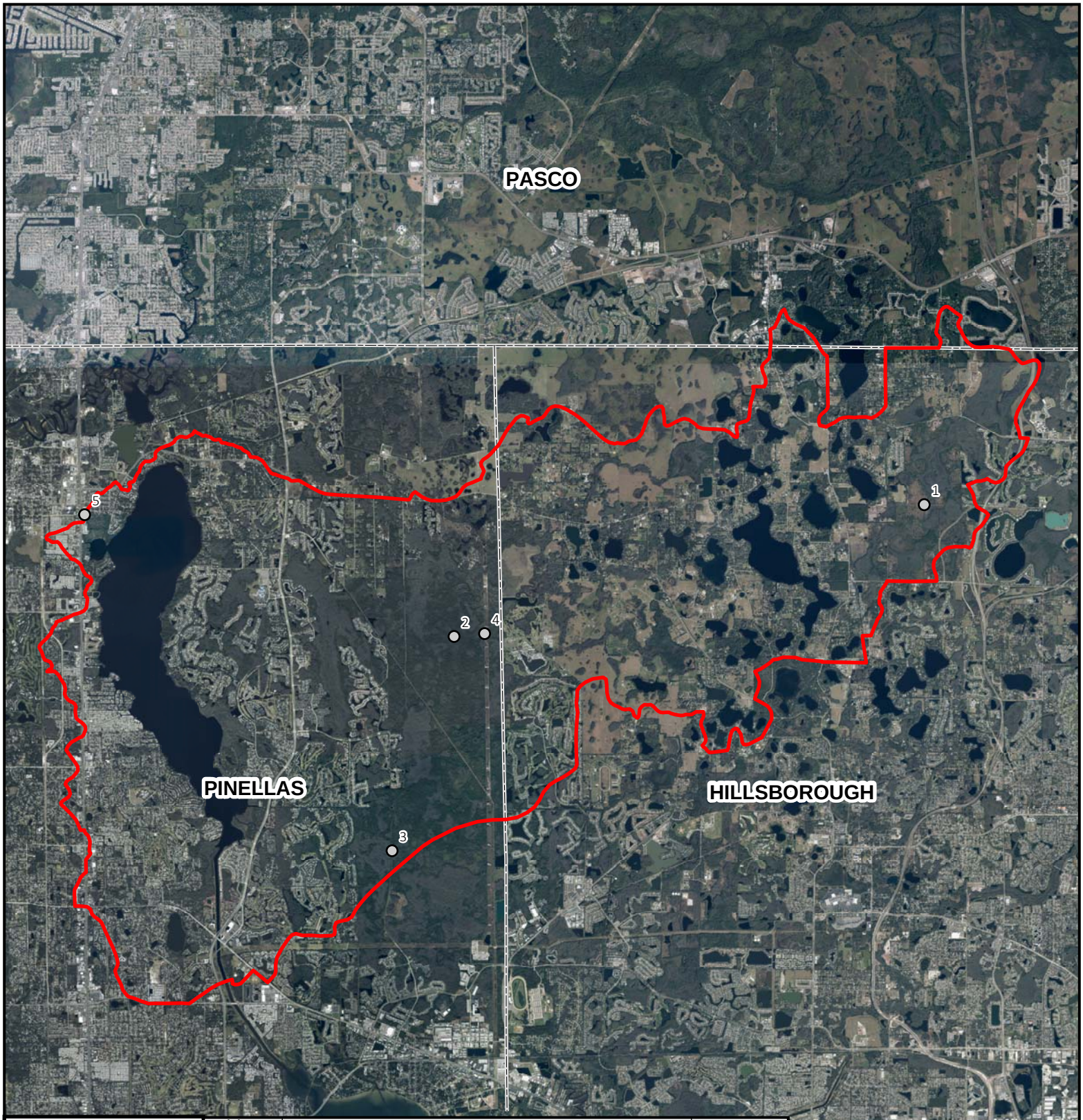
Summarizing 1989-2016, the SWIM Program and its cooperators have completed 3 restoration projects and 3 ecological studies for Lake Tarpon for a total of approximately 29.2 acres of restored habitats. Since 2011, the District and its cooperators have completed a water quality improvement project that is providing treatment for nearly 360 acres of watershed.

The following projects were either ongoing or completed in 2016

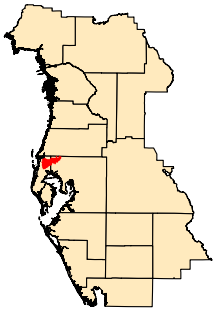
- **Lake Tarpon Water Quality Management Plan** – The final draft report for the cooperative project between Pinellas County and the District was completed in 2016. Initial results show that Lake Tarpon is meeting FDEP Numeric Nutrient criteria for total nitrogen and total phosphorus, and chlorophyll-a values exceeded the numeric nutrient criteria. Pinellas County and the District are finalizing recommendations from the report which will be complete in 2017.

The following studies are either ongoing or were completed prior to 2016

- Aquatic Vegetation Study in Lake Tarpon (complete)
- Chestnut Park Surface Water Feasibility Study (complete)
- Effects of Water Level Fluctuations on Fisheries of Lake Tarpon (complete)
- Environmental Education and Public Awareness Programs (ongoing)
- Evaluation of Vegetative Communities within Lake Tarpon (complete)
- Lake Tarpon Groundwater Nutrient Study (complete)
- Lake Tarpon Water Quality Management Plan (ongoing)
- Water Quality and Pollutant Load Reduction (complete)



Map Number	Project Name	Status
1	Brooker Creek ELAPP Site Rest	Complete
2	Brooker Creek Hydrologic Rest	Complete
3	Brooker Creek Hydrologic Rest on Channel "F"	Complete
4	Brooker Creek Hydrological Rest on Channel "L"	Complete
5	Lake Tarpon Area 6	Complete



N

0 0.4 0.8 1.6 2.4 3.2 Miles

Complete

Lake Tarpon Watershed

Lake Tarpon SWIM Projects 2016

Lake Thonotosassa

Lake Thonotosassa is the largest natural lake in Hillsborough County with a surface area exceeding 800 acres. Due in large part to nutrient-rich point source discharges, which occurred over a period of several decades, it is also one of the county's most degraded surface water bodies. In recognition of the lake's regional significance, its highly impacted water quality, and the fact it discharges to a segment of the Hillsborough River which provides the municipal water supply for the City of Tampa, Lake Thonotosassa was designated a SWIM priority waterbody in 1988. Development of a SWIM plan was initiated in 1989, and the initial plan was approved by the Florida Department of Environmental Regulation and adopted by the District in 1990. A second, more detailed plan was completed and approved in 1996.

During the late 1980's and early 1990's, pollutant loading to the lake consisted of approximately 60 percent non-point and 40 percent point source discharges. The strategy for improving water quality within the lake was to first focus on eliminating point source discharges within the watershed, then concentrate on non-point sources. Two major point source discharges were removed in the 1990's.

In 1992, a seafood packing plant that discharged to Baker Creek ceased operation. In 1997, the City of Plant City Wastewater Treatment Plant discharge was redirected away from the lake to the East Side Canal and some of the discharge was reused through the implementation of the City's reuse system, partially funded through the District's New Water Sources Initiative Program. During the latter half of the 1990's, the SWIM Program began working with several cooperators to implement stormwater improvement projects to treat non-point source pollution within the watershed. One significant project completed in 1999 is the Lake Thonotosassa Marsh Restoration Project. This 51-acre marsh system is designed to treat inflow water from Baker Creek prior to its discharge into the lake. Other water quality improvement projects include the Plant City Pistol Range Stormwater Treatment Project and the three-phased Hillsborough County Baker/Pemberton Creek Erosion Control Project. Each of these projects addresses non-point source pollution entering Lake Thonotosassa. The SWIM Program commenced a study to refine the water and nutrient budgets for the lake and develop a linked watershed/waterbody model to evaluate and recommend Best Management Practices (BMPs) to best achieve the identified pollutant load reduction goals.

Lake Thonotosassa is the largest natural lake in Hillsborough County.

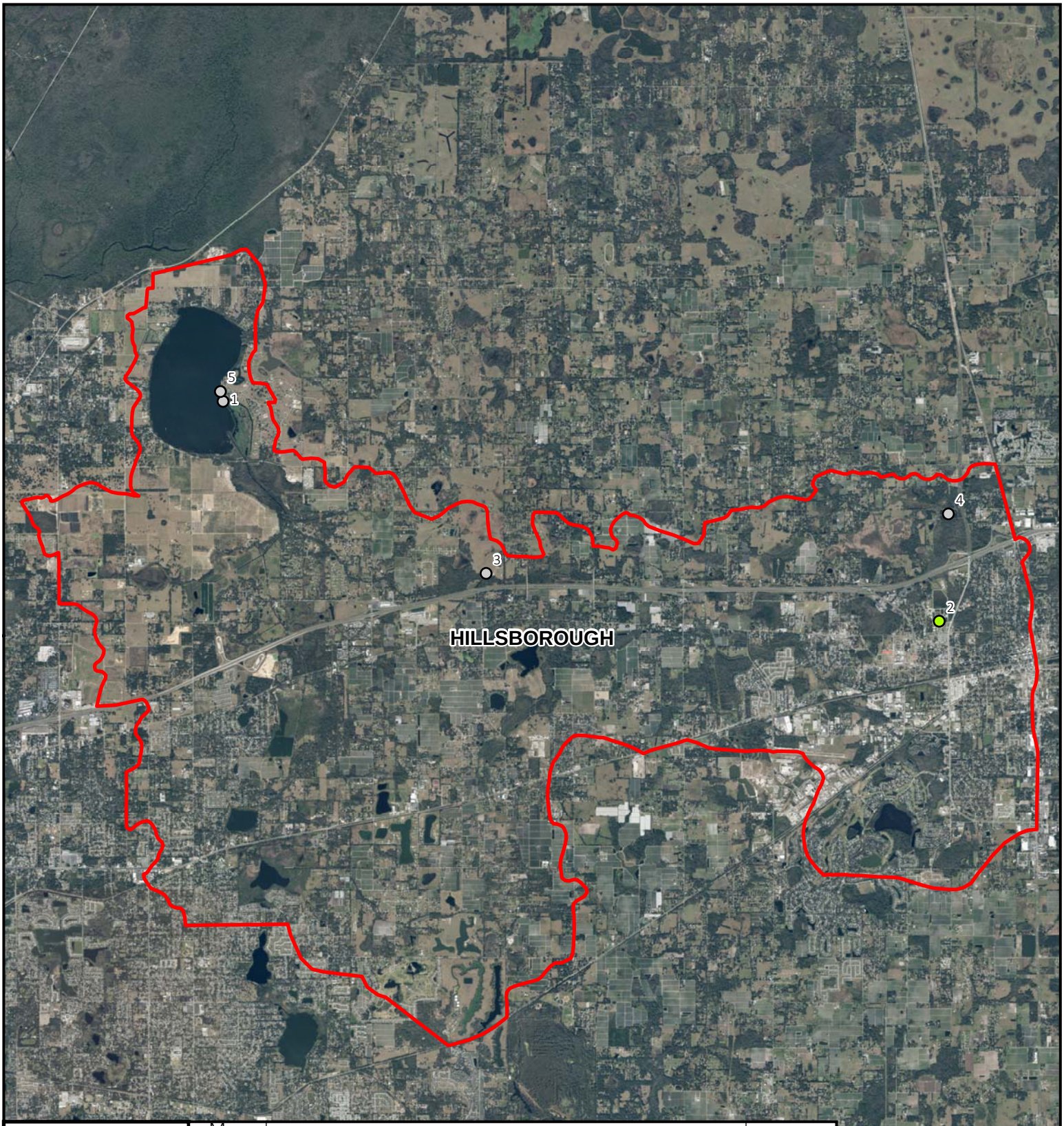
This study was completed in 2012. BMPs recommended in the study may be implemented through the District's SWIM program.

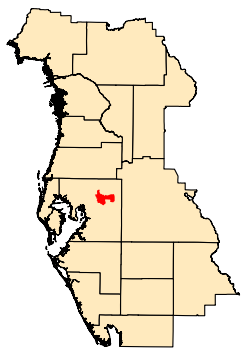
Notable Accomplishments for Lake Thonotosassa in 2016

- **Lake Thonotosassa Source Tracking Study -** The District and the County entered into a cooperative agreement to implement the study.
  This study is aimed at looking for specific sources of phosphorus in the watershed and identifying potential BMP's to address phosphorus loading at the source. The County completed sampling and began preparation of the draft final report. The final report will be complete in early 2017.
- Designated educational signage about the marsh restoration project was installed at the lake.

The following studies are either ongoing or were completed prior to 2016

- Lake Thonotosassa Diagnostic Assessment and Water Quality Treatment (complete)
- Lake Thonotosassa Refinement of Nutrient Budget (complete)





Map Number	Project Name	Status
1	Lake Thonotosassa Marsh Rest	Complete
2	Lake Thonotosassa Source Tracking/Implementation	Ongoing
3	Pemberton/Baker Creek Erosion Management	Complete
4	Plant City Pistol Range-Westside Canal SW Treatment	Complete
5	Submerged Aquatic Plant Revegetation	Complete

N

0 0.3 0.6 1.2 1.8 2.4 Miles

Complete

Ongoing

Lake Thonotosassa Watershed

Lake Thonotosassa SWIM Projects 2016

Winter Haven Chain of Lakes

The Winter Haven Chain of Lakes is comprised of 19 interconnected lakes located within and around the City of Winter Haven in north-central Polk County. The Chain consists of two "chains" of lakes – the Southern and Northern Chains. The watersheds of the Southern and Northern Chains make up approximately 18 and 14 square miles, respectively, of the total 32 square mile watershed. The watershed of the Chain of Lakes includes portions of the cities of Winter Haven, Lake Alfred, and Auburndale.

Water quality in the Chain of Lakes varies from lake to lake and between the northern and southern chains. Pollution sources present by 1949 included wastes from chemical fertilizer plants, citrus packing, citrus and vegetable canning, soft drink production, milk bottling, and untreated municipal waste. Considerable improvement occurred in the management of these industries by 1970. More recent improvements were the elimination of the City of Winter Haven's wastewater treatment plant discharge to Lake Conine in 1992; however, non-point sources such as urban stormwater pollution and septic tank seepage still need to be addressed for all lakes on the Chain.

An investigation of lake sediment cores from five lakes on the Chain was conducted to evaluate historical changes in water quality. Sediments dated to about 1860 indicated the lakes were historically in the mesotrophic to eutrophic range (slightly to moderately nutrient enriched) with a lack of blue green algae blooms during the summer.

The Winter Haven Chain of Lakes comprises 19 interconnected lakes.

In 2010, a study (Winter Haven Chain of Lakes Water Quality Management Plan, PBS&J) was completed that characterized water quality and prioritized restoration projects to address water quality issues in the Chain of Lakes. It was found that the majority of the lakes in the Chain are impaired for nutrients. Among the impaired lakes, five exhibit improving trends in water quality, while the remaining 16 exhibit declining or no trends in water quality. Of the unimpaired lakes three had declining trends in water quality and none had improving trends.

Stormwater treatment projects have been implemented for seven lakes (Howard, May, Lulu, Hartridge, Jessie, Cannon, and Mariana) in the Chain to reduce nutrient loads to the lakes. Of these seven lakes, Lake Hartridge is the only lake not impaired due to high nutrient levels. Of the other six of the seven lakes with past projects, all but Cannon and Jessie exhibit improving trends in water quality.

While traditional stormwater treatment projects can successfully reduce external nitrogen and

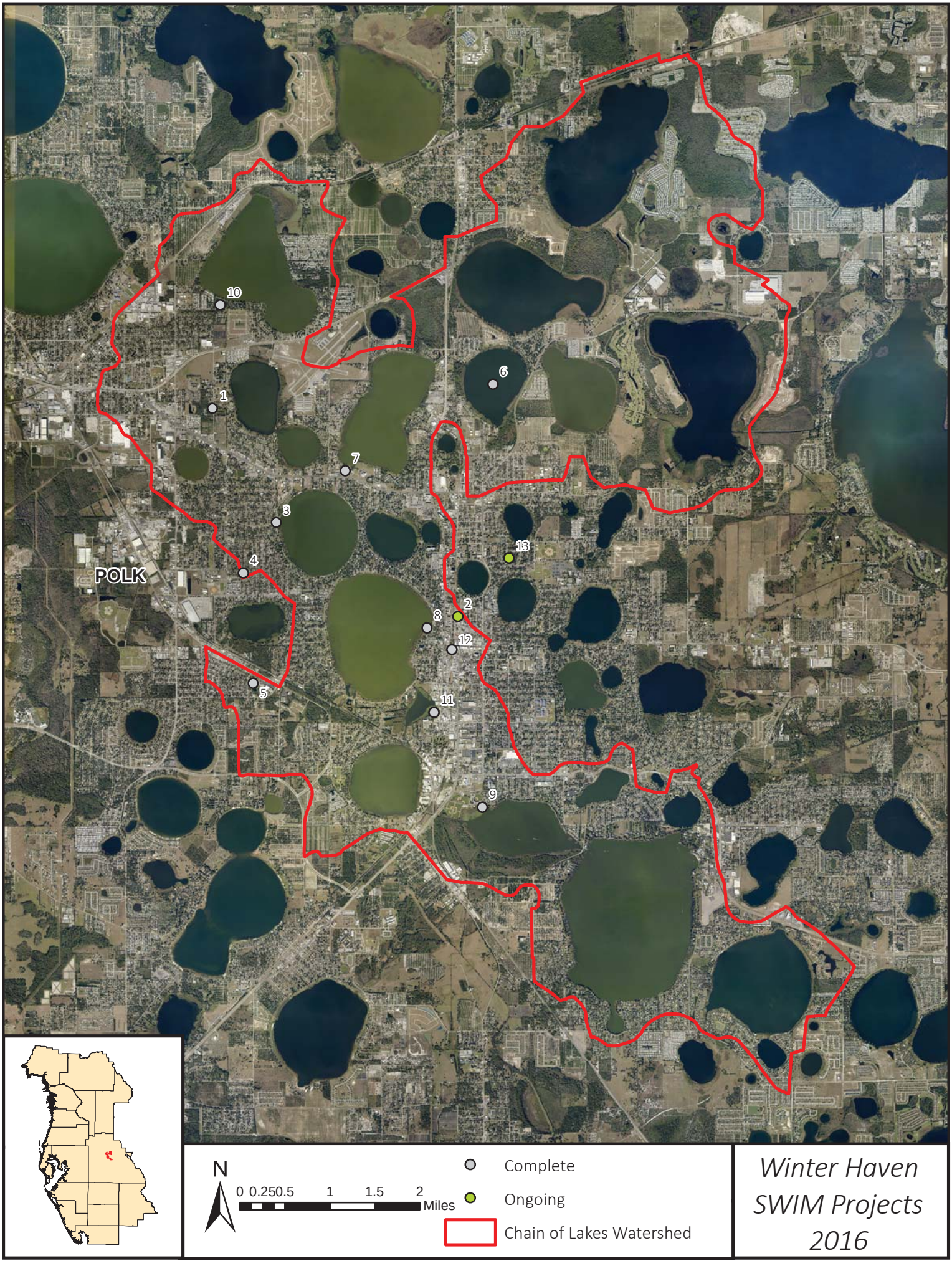
phosphorus loadings to the lakes, historic point and nonpoint source runoff and subsequent sediment accumulation in some lakes resulted in internal phosphorus loads that existing stormwater projects cannot treat. Consequently, both traditional and non-traditional water quality management projects are proposed to address both external and internal phosphorus loading to the Chain of Lakes. Since 1992, the District and its cooperators, have completed 12 water quality improvement projects that are providing treatment for nearly 3,350 acres of watershed.

The following projects were either ongoing or completed in 2016

- **Winter Haven Ridge LID BMPs** – This project will result in the construction of thirty low impact design (LID) BMPs that will treat approximately 5.4 acres of stormwater runoff in the Winter Haven Ridge area. The project will improve stormwater treatment through the installation or creation of rain gardens, improved swales and other passive treatment methods to reduce nutrient loading to the Chains of Lakes and improve surficial aquifer recharge within the area. Construction expected to commence in 2017.

The following studies are either ongoing or were completed prior to 2016

- Chain of Lakes Water Quality Management Plan (complete)
- Lake Conine Alum Evaluation (complete)
- Periphyton Filter Project (complete)
- Winter Haven Nutrient Budget (complete)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Miles
Complete
Ongoing
Chain of Lakes Watershed
Winter Haven
SWIM Projects
2016

Winter Haven Projects Legend

Map Number	Project Name	Status
1	Derby Ditch Retrofit	Complete
2	Downtown Winter Haven SW IMP	Ongoing
3	Inwood Ditch Alum Injection Project	Complete
4	Inwood WQ SW Retrofit	Complete
5	Jan Phyl SW Treatment Project	Complete
6	Lake Conine Whole Lake Alum Treatment	Complete
7	Lake Hartridge SW Treatment Project	Complete
8	Lake Howard Alum Injection	Complete
9	Lake Lulu SW Treatment Project	Complete
10	Lake Mariana: Construction of Wet Detention Pond	Complete
11	Lake May SW Management Project	Complete
12	Winter Haven LIDs	Complete
13	Winter Haven Ridge LID BMPs	Ongoing

Sarasota Bay

In 1987, Sarasota Bay was identified as an estuary of national significance in the Water Quality Act of 1987. The District was the initial local program sponsor and played a major role in shaping the restoration plan. Subsequent to approval of the Comprehensive Conservation and Management Plan (CCMP) in 1995, Sarasota Bay was added to the District's SWIM Priority List.

The Sarasota Bay restoration strategy focuses on improving juvenile fish habitat and restoring wetlands and seagrasses that were lost as a result of the historic dredge and fill operations and pollution. Since its inception, the SWIM Program and its cooperators have completed 39 habitat restoration projects for a total of 925 acres. Projects completed by the SWIM Program and other agencies have restored tidal and freshwater wetlands; created coastal upland habitats; and created bay bottom habitat

Advances in the treatment and disposal of wastewater in the watershed appear to be responsible for documented improvements in water quality in much of the Bay. Approximately 50 percent of the wastewater currently generated in the Sarasota Bay area is now reclaimed for alternative uses, with plans for further reclamation. Associated with these improvements in wastewater treatment practices and increased re-use of treated effluent, nitrogen loading to the Bay has been reduced by approximately 90 percent. While much progress has been made to improve water quality, most has been associated with point source reductions. Reductions from non-point sources are necessary to offset population increases.

Sarasota Bay covers 52 square miles of coastal waters off Sarasota and Manatee counties.

Since 2007, the District and its cooperators, have completed 17 water quality improvement projects that are providing treatment for nearly 38,000 acres of watershed.

Notable Accomplishments for Sarasota Bay in 2016

- The SWIM Program's biennial seagrass mapping program released the 2016 mapping results that documented Sarasota Bay contains 13,469 acres of seagrass, a 1.4% increase in coverage from 2014. The Bay now contains more seagrass coverage than recorded for the 1950s.

The following projects were either ongoing or completed in 2016

- **Bradenton Beach Stormwater Retrofits** - The project includes implementing BMPs such as bioswales and infiltration trenches to treat stormwater runoff before it is discharged to Sarasota Bay. Construction of all three phases was completed prior to 2016.
- **North Water Tower LID BMPs** – This Sarasota County project includes stormwater improvement BMPs in the North Water Tower Park for a 98-acre drainage basin. Design began in 2015 and construction is expected to begin in 2018.
- **10th Street Outfall BMPs –** The City of Sarasota completed design and permitting of a stormwater BMP for the 10th Street Outfall. Construction is expected to commence in mid-2017.
- **Hudson Bayou In-stream Restoration and Water Quality Improvement –** Sarasota County completed design and permitting of an urban upland and channel shoreline restoration and BMP water quality improvements project. Construction is expected to begin in mid-2017.
- **Holmes Beach Implementation of BMPs –** This project with the City of Holmes Beach includes upgrading storm sewers and outfalls as well as installing various BMPs to improve water quality discharging to Sarasota Bay. The City completed construction in 2016.
- **23rd Street North to 25th Street North BMPs–** Bradenton Beach began design of stormwater improvement LID BMPs to treat 26 acres of highly urbanized drainage basin draining to Anna Maria Sound. Construction expected to commence in 2017.
- **Central Holmes Beach BMPs–** Holmes Beach began design of stormwater improvement LID BMPs to treat 127 acres of highly urbanized watershed draining to Sarasota Bay in 2016. Construction is expected to commence in 2017.

Outreach – Volunteer Events, Presentations and Education

- The District hosted educational booths at the First Annual Sarasota Bay Seagrass Fest, and two other local events.

The following studies are either ongoing or were completed prior to 2016

- Biennial Seagrass Mapping (ongoing)
- Little Sarasota Bay Water Quality Management Plan (complete)
- Roberts Bay Water Quality Management Plan (complete)
- Sarasota Bay Water Quality Management Plan (complete)
- Lemon Bay Water Quality Management Plan (complete)
- Dona Bay Water Quality Management Plan (complete)
- Flatford Swamp Restoration – Geospatial Vegetation Mapping (complete)

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Miles
Complete
Ongoing
Sarasota Bay Watershed
Sarasota Bay SWIM Projects 2016

Sarasota Bay Restoration Projects

Map Number	Project Name	Status
1	10th St Outfall BMPs	Ongoing
2	23rd St North to 25th Street North BMPs - Bradenton Beach	Ongoing
3	6th St Canal	Complete
4	Ballard Rest	Complete
5	Bay Walk Creek	Complete
6	Bayfront Park	Complete
7	Bayshore North-Artificial Reef	Complete
8	Bayshore South-Artificial Reef	Complete
9	Blackburn Point Park Addition Rest	Complete
10	Bowlees Creek Island	Complete
11	Bradenton Beach Pier-Artificial Reef	Complete
12	Bradenton Beach SW Retrofits	Complete
13	Catfish Creek	Complete
14	Catfish Creek SW Facility	Complete
15	Celery Fields Rest	Complete
16	Central Holmes Beach WQ BMPs	Ongoing
17	City of Anna Maria - Implementation of BMPs	Complete
18	Coastal Basin Beach Road	Complete
19	Cortez Preserve Rest	Complete
20	Cortez Schoolhouse Rest	Complete
21	Crosley Estates Rest	Complete
22	Durante Park	Complete
23	FISH Preserve Phase I	Complete
24	Herb Dolan Park Living Shoreline	Complete
25	Hog Creek	Complete
26	Holmes Beach SW IMPs CIP	Ongoing
27	Holmes Beach SW Retrofits	Complete
28	Hudson Bayou In-Stream Rest and WQ IMP	Ongoing
29	Joan Durante Park	Complete
30	Leffis Key	Complete
31	Neal Preserve	Complete
32	New College	Complete
33	Nicholson Drainage Channel SW Treatment Project	Complete
34	North Lido Park	Complete
35	North Water Tower Park LID BMPs	Ongoing
36	Pelican Cove SW Retrofit	Complete
37	Perico Bayou Rest	Complete
38	Perico Preserve	Complete
39	Phillipi Creek In-Stream Rest	Complete
40	Quick Point Phase I	Complete
41	Red Bug Slough Rest	Complete
42	Robinson Preserve	Complete
43	Runaway Bay - Shoreline Rest	Complete
44	Sarasota Bay Habitat Rest	Complete
45	Sister Keys	Complete
46	South Creek Floodplain Rest	Complete
47	South Lido Rest	Complete
48	Spoil Islands - Bird Colony	Complete
49	Tom Bennett Park	Complete
50	Ungarelli Preserve	Complete