



**SURFACE WATER
IMPROVEMENT AND MANAGEMENT
PROGRAM
(SWIM)**

2009 Annual Report

**Covering the period
January 1, 2009 to December 31, 2009**

June 2, 2010

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Southwest Florida Water Management District

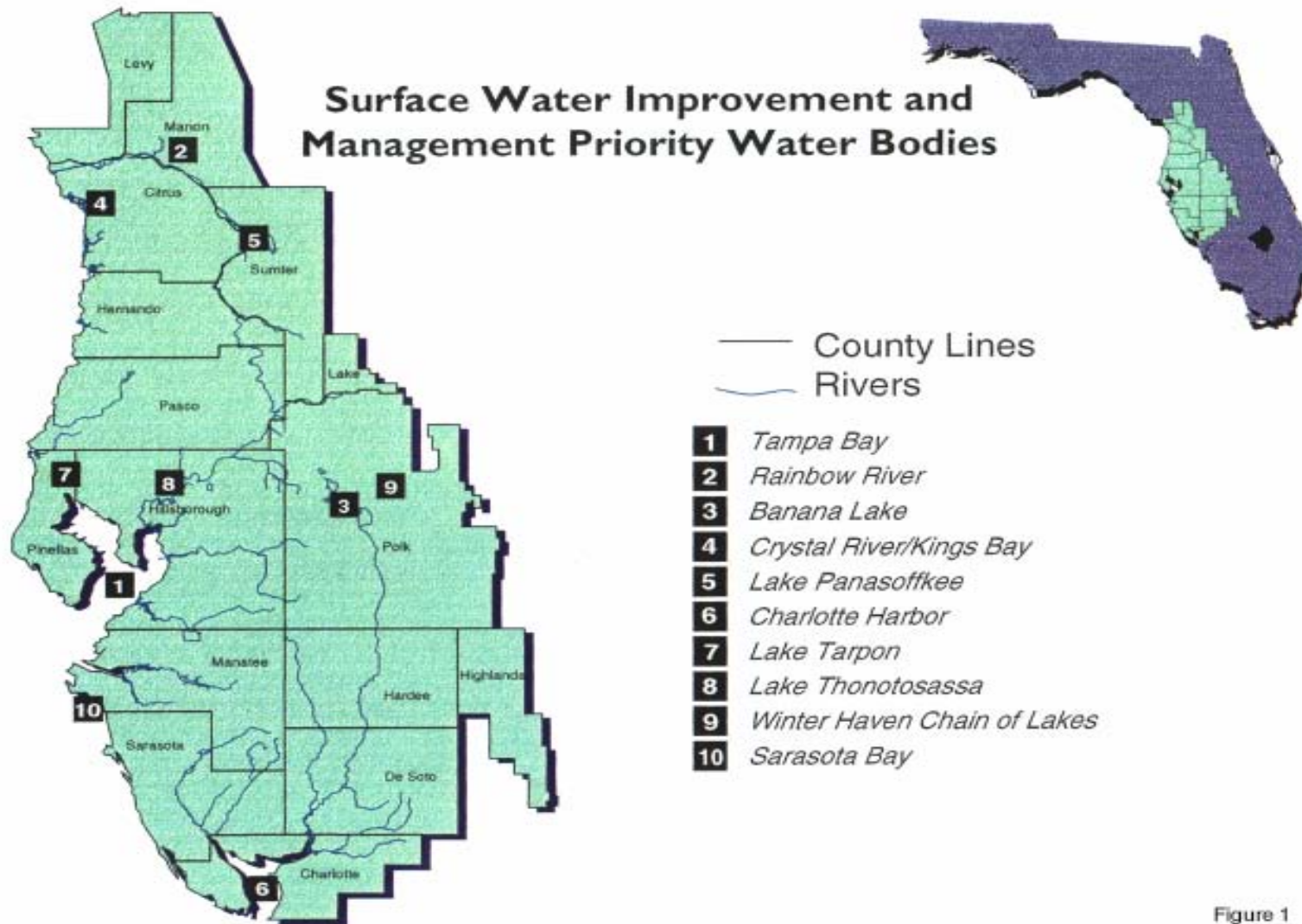


Figure 1

Purpose

This report provides a summary of the District's Surface Water Improvement and Management (SWIM) Program activities for the calendar year 2009.

Introduction

In 1987, the Florida Legislature enacted the Surface Water Improvement and Management (SWIM) 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.

The Southwest Florida Water Management District has identified, and the state has approved plans for ten priority water bodies. They are Tampa Bay, Rainbow River, Banana Lake, Crystal River/Kings Bay, Lake Panasoffkee, Charlotte Harbor, Lake Tarpon, Lake Thonotosassa, the Winter Haven Chain of Lakes, and Sarasota Bay (Figure 1). 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. The District's land acquisition program, through Florida Forever, is essential in preserving water bodies and in obtaining areas for restoration activities. 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, 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, and the Port of Tampa is the nation's third largest port, in terms of domestic tonnage. Mean population estimates indicate that the bay is home to nearly 500 bottlenose dolphins. Up to 350 manatees were observed in the bay during the winter of 2007 and approximately 175 are found in the bay during the summer. The mangrove islands are home to as many as 40,000 breeding pairs of various shorebirds.

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 habitats. Since 1989, projects completed by the SWIM Program resulted in the restoration of more than 2,400 acres of habitat (i.e. estuarine and fresh water wetlands, uplands).

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. Although nitrogen loads to the bay decreased approximately 60 percent between 1976 and the early 1990's, present loads are still at least twice the level seen in the 1930's. During the 1980's and 1990's, much of the reduction in nitrogen loading appears to be associated with improvements to wastewater treatment. In response to these and other nutrient load reductions, water quality has measurably improved in most parts of the bay over the past 20 years, and Tampa Bay as a whole has more seagrass acreage in 2009 than it had in 1982.

Notable Accomplishments for Tampa Bay in 2009

Summarizing 1989-2009, the SWIM Program and its cooperators have completed 78 restoration projects for Tampa Bay for a total of 2433 acres of restored coastal habitats. During 2009, SWIM and its cooperators completed four projects for a total of 108.2 acres of restored coastal habitats:

- Cotanchobee/Ft Brooke Park Shoreline Restoration – a 0.2 acre shoreline restoration in cooperation with the City of Tampa.
- Eagle Lake Park – a 20 acre habitat restoration and stormwater treatment project in cooperation with Pinellas County.
- Terra Ceia Uplands Restoration – a 47.9 acre coastal upland habitat restoration project in cooperation with the Florida Department of Environmental Protection (a phase of the overall 900+ acre ecosystem restoration project for the Terra Ceia tract); this 47.9 acre pine flatwoods restoration project replaced Australian pine and Brazilian pine forests that dominated the site.
- Marsh Creek Phase 2 – a 40.1 acre tidal creek restoration project involving the removal of all

non-native vegetation from the site, implementation of quarterly site maintenance program, and the use of 85 volunteers to remove 20,200 pounds of debris from two linear miles of the creek and its banks.

- City of Tampa Urban Lake Rescue – Completed design, permitting and construction of habitat and water quality improvement project for Lake Edna, Lake Kipling and Lake Roberta.

In addition, the previously completed 149.3 acres of Phases 1 and 2 Upland Restoration of the Terra Ceia Preserve Ecosystem Restoration Project were enhanced via the planting of thousands of additional native plants and renewed three years of quarterly site maintenance to control non-native vegetation.

The following restoration projects were ongoing in 2009:

- Terra Ceia Ecosystem Restoration – Drafting of a Request for Bid for the final phase of upland restoration for the Terra Ceia tract. With restoration slated for 2010, this 158 acre effort will restore various coastal upland communities and provide three years of quarterly site maintenance. This phase is one of several incremental phases being performed for the overall 900+ acre project and is being conducted in cooperation with the Florida Department of Environmental Protection.
- Terra Ceia – Continued with the joint USGS-FDEP-District hydrodynamic modeling study of Frog Creek, a critical component of the overall Terra Ceia ecosystem restoration.
- Clam Bayou – The Request for Bids was drafted and released for this interdisciplinary ecosystem restoration/stormwater treatment project; project construction is scheduled to begin by spring 2010.
- Clam Bayou – Design and permitting of ecosystem restoration projects and two stormwater projects were completed in 2008. In 2009 completed design and permitting of an additional stormwater treatment project and prepared bid documents for all restoration and stormwater components. Bids will be received early 2010, construction is anticipated to extend through the remainder of the year.
- Rock Pond Ecosystem Restoration – Completed design of the preliminary concept plan for the site, involving approximately 400 acres of estuarine and freshwater habitats and 600 acres of various coastal uplands (total project footprint $\geq$ 1000 acres).
- River Tower Shoreline Restoration – Completed 90% design for the 13 acre project, which involves shoreline stabilization and stormwater treatment components.
- Rivergarden Shoreline Restoration – Secured a contractor for the FY2010 Phase II construction of the 2.0 acre project.
- Mobbly Bayou Wilderness Preserve – Permitted and secured a contractor for 180 acres of intertidal and coastal upland habitat.

- Ekker Property Restoration – Began wetland and continued upland construction of this 85 acre project; includes a low salinity tidal creek, freshwater wetlands, and upland communities.
- City of Tampa Urban Lake Rescue – Completed design, permitting and construction of habitat and water quality improvement project for Lake Edna, Lake Kipling and Lake Roberta.
- Stewart Middle School Shoreline Restoration – Completed exotic plant removal and commenced construction on this 1,700 ft section of Hillsborough River shoreline.
- Cotanchobee Park Shoreline Restoration – Commenced construction of a 500 foot section of shoreline along the Hillsborough River in cooperation with the City of Tampa.
- MacDill Air Force Base Phase 3 – Completed drafting of a preliminary concept plan for 100+ acres of wetland enhancement/restoration for the southeastern reaches of the base.

The following water quality projects were either ongoing or completed in 2009:

- McIntosh Park Enhanced Stormwater Treatment Wetland Project – Construction of this project was completed in 2007. Operational training was conducted in 2007. Post construction water quality monitoring and BMP efficiency reporting was completed in 2009. Project treats runoff from a 6000-acre basin with sediment sump, wetland system and aluminum sulfate (alum) injection treatment system.
- City of Anna Maria – Implementation of BMPs – Completed construction of Phase I and commenced construction for Phase II to address level of service protection and water quality improvements within the Lower Tampa Bay Watershed.
- Hillsborough County Estimation of Pollution Loads and Yields – Completed the 2009 Annual Technical Report which summarizes water quality and streamflow data and provides estimates of pollutant loads and yields at 22 monitoring sites in the Hillsborough River Basin, Northwest Hillsborough Basin, and the Alafia River Basin.
- Old Tampa Bay Safety Harbor Restoration – Complete evaluation of the accumulation of muck in Safety Harbor and surrounding area to determine the source of the muck and to develop potential restoration plans in coordination with the Tampa Bay Estuary Program.
- Tampa Bay Shallow Water Quality Evaluation – Completed the 24 month sampling project for Middle Tampa Bay's Wolf Branch area. The project's intent is to characterize the environmental conditions in waters of 6 feet or less and provide the data as model input.
- Shore Acres Stormwater Vaults - Continued design and permitting for 10 Flood Protection vaults in the City of St. Petersburg low lying Shore Acres.
- Jean Park Ponds Stormwater Improvement Project – Completed the design and permitting of best management practices within three interconnected ponds in an effort to reduce nutrient concentrations in Cedar Lake East.

- Lake Carroll Stormwater Management Plan – Completed research to determine the source of pollution discharge to Lake Carroll and recommendations of the best pre-treatment system to reduce or eliminate pollution discharges to the lake and possible ways to alleviate flooding due to increased development, lack of maintenance and inadequate stormwater pipes.
- FDOT North Dale Mabry Highway Stormwater Retrofit/Wetland Restoration – Design and permitting are ongoing to improve water quality and restore habitat in the Sweetwater Creek basin by enlarging and enhancing a stormwater pond for an 80 acre drainage basin, removing nuisance vegetation, and restoring wetland hydro periods on a FDOT 11 acre site.
- Pinellas Park – Implementation of BMPs for Homeland Basin/Sawgrass – Initiated design to address level of service protection and water quality improvements within the Sawgrass Lake Watershed.
- Clearwater Tropic Hills Drainage Improvements – The City of Clearwater initiated design for drainage and water quality improvements in the downstream-most segment of the Tropic Hills watershed, a 246 acre drainage basin. The project provides water quality benefits to Tampa Bay by providing stormwater treatment and reducing downstream erosion by stabilizing the flow way.
- Implementation of BMPs at Hillsborough River State Park - Final design and permitting was completed in February 2009 and construction of project elements was substantially complete by December 2009. Impervious parking areas were replaced with interlocking pavers to increase infiltration of runoff, grass swales and a dry retention pond provide treatment before runoff enters the Hillsborough River and ultimately, Tampa Bay.
- A Feasibility Study was completed which identified projects to restore habitat, improve water quality and to mitigate the erosional effects of the increased flow of water resulting from the channelization of the Palm River. Design and permitting has begun on the shoreline restoration project along McKay Bay on the western edge of the spoil disposal sites.

Outreach - Volunteer Events, Presentations and Education

- SWIM, in collaboration with fourteen organizations, helped coordinate nine volunteer events for Tampa Bay; these events involved 616 volunteers donating over 2696 hours to help restore the bay; volunteer events included the removal of 20,200 pounds of debris from two miles of Marsh Creek (Ruskin) shoreline as well as the installation of 29,630 marsh and mangrove plugs at three coastal restoration sites.
- At the request of various educational institutions and regional, national, and international groups, SWIM staff provided five presentations and field tours of various Tampa Bay restoration projects to various parties including delegations from the University of London [England], National Oceanic and Atmospheric Administration, the Florida State Subcommittee on Managed Marshes, the Sarasota Chapter of the Florida Native Plant Society, and renowned non-native plant expert Dr. Ken Langeland of the University of Florida.

- In addition, SWIM staff provided 13 invited presentations to various local, regional, national, and international groups, workshops, and conferences including the International Conference of the Coastal and Estuarine Research Federation, the (Tampa) Bay Area Scientific Information Symposium (aka "BASIS 5), Annual Conference of the Florida Ornithological Society, Tampa Bay Estuary Program Seagrass Working Group, Hillsborough County Citizens Environmental Action Committee, Tampa Bay Association of Environmental Professionals, Tampa Bay Regional Planning Commission, the Florida Aquarium, and the Tampa Electric Company.
- SWIM projects for Tampa Bay garnered at least 41 published newspaper, newsletter, and internet articles, as well as 1 radio segment. Local cable-access television stations continued to repeatedly air the Tampa Bay Estuary Program's award winning documentary "Tampa Bay: Living Legacy", a film which highlights various SWIM restoration projects and personnel.
- Assisted District's Land Resources Department with the planning and implementation of the Fourth Annual SWFWMD Volunteer Appreciation Day (replete with award presentations to seven volunteer groups that worked with SWIM during 2009, participating in eight volunteer marsh plantings involving at least 403 volunteers installing over 25,090 marsh and upland plants at three Tampa Bay restoration projects - a total of over 1505 hours of volunteerism valued at \$29,362 of service).
- SWIM, through its support of Tampa Bay Regional Planning Council's quarterly news journal Bay Soundings, reaches a per-issue readership of 25,000. The publication highlights news and issues affecting the bay, with one FY2009 article featuring the McKay Bay/Eastshore Commerce Park stormwater retrofit project, which is partially funded by SWIM and the Hillsborough River Basin Board. SWIM staff provides technical information for the publication.
- Continued Tampa Bay Watch's field trip program, Estuary EDventures. 5,215 elementary and middle school students and teachers, as well as community members, learned about estuarine science and being empowered to act as stewards of the Tampa Bay estuary. This was accomplished by combining classroom curriculum with 156 hands-on field trip experiences for students to the Tampa Bay Watch facilities, 4 teacher trainings, school outreach courses, and youth summer camps.
- Continued the Hillsborough Community College (HCC) field trip program, which includes field expeditions for elementary, middle and high school students in Hillsborough, Pinellas and Polk counties to one of four sites: English Creek, Upper Tampa Bay, Cockroach Bay or Hillsborough River State Park. A total of 97 field expeditions and 3 teacher trainings were conducted by HCC professionals, reaching 2,451 students and 117 educators with water resources education.
- Reached more than 5,000 residents through the Mayor's Beautification Program's Hillsborough River Watershed Education program, which included a litter reduction program, the annual Hillsborough River Cleanup and the Hillsborough River Stakeholder Tour. Nearly 20,000 volunteer hours were dedicated to removing 400 tons of trash and 15 tons of invasive plants.

Awards

During 2009, the District, along with its cooperator Manatee County, received first place in the Environment Category of the 17th Annual Future of the Region Awards Program of the Tampa Bay Regional Planning Council; the first place award was presented honoring the Robinson Preserve Restoration Project. Since 1987, the District has received 48 awards for its SWIM Program projects.

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. About 220,000 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 22 cubic meters per second (m³/s), 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 190 square kilometer (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 clarity, and native plant and animal communities are the major management issues.

The water quality of the river is good, based on the State of Florida's Water Quality Index. Phosphorus concentrations along the river are typically found to be at or near background levels. However, nitrate concentrations in the groundwater discharging from the springs have steadily increased over the last hundred years. Average nitrate concentrations in the headspring area are above 1.0 mg/L. Nitrate concentrations measured in the 1950's have been as low as 0.08 mg/L. It is generally accepted that background nitrate concentrations in the Floridan aquifer are at or below 0.01 mg/L. The nitrate values at the station closest to the headspring complex have averaged above 1.77 mg/L in samples collected in 2009. Increases in nutrients, like nitrate, can cause harmful algal blooms and enhance the growth of nuisance species, such as *Lyngbya* and *Hydrilla* under laboratory conditions and in many estuarine systems. Work is being conducted to determine the impacts, if any, increased nitrogen loads may be having on spring fed Rainbow River.

In the Rainbow River, the water clarity decreases rapidly, from approximately 60 meters at the headspring to 20 meters about two kilometers downstream. 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, nine kilometers from the headsprings, water clarity is about 8 meters. It is not known whether this pattern of declining water clarity, from the headsprings to the mouth, is a natural phenomenon, a result of anthropogenic impacts, or a combination of both. Furthermore, there is little historical information available to relate present water clarity conditions with past conditions. Understanding the factors affecting water clarity is an important issue in the Rainbow River and will continue to be addressed.

By virtue of its exceptional water clarity and good water quality, 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, and stabilize sediment. In the lower reaches of the river, native species are almost completely absent and the river is dominated by the nuisance vegetation *Hydrilla verticillata* and *Lyngbya* sp. Previous efforts in both Rainbow River and Kings Bay to re-establish native 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 the Rainbow River in 2009

In 2009, several projects were either initiated or ongoing to aid in developing and implementing protection and management strategies for the Rainbow River. These include several cooperative funding initiatives with Marion County and the City of Dunnellon. Accomplishments are as follows:

- Continued water quality monitoring;
- Continued and expanded the Crystal River, Kings Bay and Rainbow River Watershed Education program to directly impact 36,000 residents with information on ways to protect local springsheds.
 - The “Don’t over-fertilize. You want your lawn green, not your water” campaign targeted local residents, retail store managers and landscape professionals via newspaper, radio, billboard, movie theatre advertising and direct mail. The campaign’s average gross impressions totaled 4,055,994.
 - Presentations to local clubs and environmental groups provided information on how to help protect local springs from pollution.
 - Planned and implemented Springs Awareness Week.
 - Worked with Community and Legislative Affairs staff to have the Coastal Rivers and Withlacoochee River Basin Boards, along with Marion County and the cities of Crystal River and Dunnellon, proclaim March 14–21 as Springs Awareness Week.

- Partnered with Citrus County and Marion County UF/IFAS Extension offices and the Rainbow Springs State Park to provide a series of events and springshed tours that educated 10,000 residents about the impact of fertilizer on local springs.
- Continuation of the Rainbow Springs Basin Working Group comprised of representatives from the public and local, state and federal government agencies responsible for managing the ecological resources in the Rainbow Springs Basin. The purpose of this group is to improve coordination of management activities in the Rainbow Springs Basin.
- Continuation of the Marion County Springs Protection Program cooperative funding project. This project includes the development of a non-point source pollutant load model, the development and implementation of a long-term education and outreach program and a scientific research project to examine nutrient transport in stormwater management systems.
- Continuation of the Blue Run Stormwater Management Project cooperative funding project. This project will involve retrofitting an existing stormwater management system and the stabilization of a severely eroded foot traffic area adjacent to the Rainbow River. The project will also involve the development and installation of educational exhibits to be placed within the park located along the bank of the Rainbow River.
- Completion of the CR 484 Stormwater Outfall Retrofit at Rainbow River cooperative funding project. This project improved stormwater treatment prior to discharge into the Rainbow River by implementing stormwater BMPs. The project resulted in the construction of a new bioretention pond on the west side of the river. The bioretention pond captures and treats stormwater from the Dr. Curtis Nelson Bridge and the west side approach. The project was identified as part of the Dunnellon Watershed Management Plan that was also cooperatively funded by the District and Marion County in 2004.
- Initiation of the Rainbow River Stormwater Retrofit – Pennsylvania Avenue cooperative funding project. This project will improve stormwater treatment prior to discharge into the Rainbow River by implementing stormwater BMPs.

Banana Lake

Banana Lake was identified as having the poorest water quality out of 573 lakes studied in 1984. In the early 1980's the lake's Trophic State Index (TSI) was in excess of 100. Subsequently, in 1988, Banana Lake was selected as the third ranked water body in the District's SWIM Priority Water Body List. Banana Lake is one of the major inflows to Lake Hancock and it has long been recognized that discharges from Lake Hancock impact drinking water supplies in the lower part of the Peace River basin.

Banana Lake has a surface area of 250 acres and is located near the City of Lakeland in Polk County. In the 1950's, the lake's immediate watershed and part of the lake was mined for phosphate. This resulted in the hydraulic connection of two very deep pits to the lake. Surface water enters Banana Lake from Stahl Canal through the North Pit. The only surface water outflow is through Banana Creek. Treated wastewater effluent was discharged into Stahl Canal and ultimately Banana Lake until 1987. The City of

Lakeland's diversion of this discharge set the stage for implementation of additional restoration strategies.

In 1989, when the first SWIM Plan for the lake was prepared, the lake had a maximum water depth of about four (4) feet. This was due to the build-up of organic muck, which in some areas exceeded thicknesses of seven (7) feet. Polk County and the Florida Fish and Wildlife Conservation Commission identified sediment removal as the primary method for completing restoration of the lake. This strategy was included in the 1989 SWIM Plan and in 1990/1991 approximately 800,000 cubic yards of sediment was dredged.

The 1995 update of the Banana Lake SWIM Plan noted although water quality could still be considered poor based on the in-lake algae concentrations (TSI values averaged 81 between 1993 to 1996), in-lake nutrient concentrations had decreased. Additionally, between 1985 and 1992, the number of fish species had increased from 9 to 21 and the biomass had shown a measurable increase.

An evaluation of the pollutant loading necessary to reduce the lake's TSI to about 60 (considered to be indicative of good water quality) indicated pollutants would have to be reduced by 90 percent. A reduction of 80 percent would be required just to reduce the TSI below the range of hypereutrophic. From a practical standpoint, those historically calling for the restoration have stated their satisfaction with the dredging project; and the Banana Lake Restoration Committee no longer meets. Considering the practical and fiscal constraints of reducing the nutrient loading by 80-90 percent, no further restoration efforts are proposed to improve water quality, other than those that are proposed to improve water quality in the watershed as it relates to the Peace River and Charlotte Harbor another SWIM waterbody. The District is working with Polk County and the City of Lakeland to identify water quality and habitat improvement projects and around Banana Lake.

The following water quality project was ongoing in 2009:

- Elizabeth Place Water Quality and Natural Systems Enhancement – Completed design on a project which includes land and easement acquisition to restore and enhance an existing wetland system to provide water quality treatment and increase flood storage.

Crystal River/Kings Bay

The Crystal River/Kings Bay complex is classified by the state as a Class III surface water and an Outstanding Florida Water (OFW). Within the Crystal River/Kings Bay watershed, 21 species of amphibians, 47 species of reptiles, 191 species of birds, and 22 species of mammals have been documented by the Florida Fish and Wildlife Conservation Commission (FFWCC), including 26 state or federally listed species. The FFWCC survey also resulted in first time sightings of Cope's Gray Treefrog (*Hyla chrysoscelis*), Little Grass Frog (*Pseudacris ocularis*), and a non-native species, the Brown Anole (*Anolis sagrei*) within Citrus County. Accordingly, recreational activities involving the natural resources of Crystal River/Kings Bay contribute substantially to the local economy.

The Kings Bay embayment makes this system unique to all other springs in Florida. Approximately 600 acres in surface area, the tidally influenced bay encompasses 30 springs discharging from the Floridan Aquifer. Collectively, the springs have an average discharge of 630 million gallons per day (mgd) and

form the headwaters of Crystal River. A shallow system, depth measurements in Kings Bay vary from approximately three to ten feet, with water temperatures ranging from 66 degrees Fahrenheit in the winter to 76 degrees Fahrenheit in the summer. With the exception of conservation lands to the southwest, much of the shoreline along the bay has been altered through recreational and residential development.

Reductions in water clarity and the proliferation of *Lyngbya* sp., a nuisance cyanobacterium, are the major management issues for the Crystal River/Kings Bay system. Water clarity in Kings Bay is primarily affected by phytoplankton in the water column. However, the abundance of aquatic vegetation can also affect water clarity by diminishing, through competition, clarity reducing algae present in the water column. Factors reducing the coverage of aquatic vegetation may incidentally act to increase clarity reducing algae and other nuisance species such as *Lyngbya* sp. In recent years, this filamentous blue-green algal species has increased in areas of Kings Bay causing habitat destruction and navigational/recreational use impairment.

Management strategies to improve water clarity and reduce nuisance plant and algal species in Crystal River/Kings Bay may be interrelated. One study completed under the original plan indicated that the aquatic plant community in Kings Bay responded to reductions in nutrients, while no response was observed in the filamentous alga, *Lyngbya* sp. Additional work determined chlorophyll and nutrient concentrations to be weakly related, with total phosphorus and total nitrogen accounting for only eight percent and four percent of the variance in chlorophyll concentrations respectively. Both results may indicate greater uptake of nutrients by aquatic plants than algal species in Kings Bay. For the Crystal River/Kings Bay system, inorganic, algal, and detrital material suspended in the water column all affect water clarity. Therefore, increasing aquatic plant coverage in the bay might act to reduce the occurrence of nuisance algal species and the resulting impact of algal cells on water clarity. An interim goal for suspended solids, based on available data, would be to reduce the suspended sediment component in the water column by 50 percent to allow for an annual average horizontal Secchi reading of 45 feet.

Based on these management issues the Crystal River/Kings Bay SWIM Plan of July 2000, established the following goals:

- Achieve and maintain water clarity, which will provide an annual average horizontal Secchi reading of 45 feet;
- Stabilize or remove sediments from areas, which have been demonstrated to contribute to reduced water clarity as a result of sediment resuspension;
- Revegetate denuded areas with desirable submerged aquatic vegetation; and,
- Restore vital aquatic habitat.

Notable Accomplishments for Crystal River in 2009

- Continued coordination of the Kings Bay Working Group (formerly Kings Bay Advisory Group), comprised of representatives from the public and local, state and federal government agencies responsible for managing the ecological resources in Crystal River/Kings Bay system. The purpose of this group is to improve coordination of management activities for Crystal River/Kings Bay and take advantage of opportunities to partner on restoration projects.

- Continued and expanded the Crystal River, Kings Bay and Rainbow River Watershed Education program to directly impact 36,000 residents with information on ways to protect local springsheds.
 - The “Don’t over-fertilize. You want your lawn green, not your water” campaign targeted local residents, retail store managers and landscape professionals via newspaper, radio, billboard, movie theatre advertising and direct mail. The campaign’s average gross impressions totaled 4,055,994.
 - Presentations to local clubs and environmental groups provided information on how to help protect local springs from pollution.
 - Planned and implemented Springs Awareness Week.
 - Worked with Community and Legislative Affairs staff to have the Coastal Rivers and Withlacoochee River Basin Boards, along with Marion County and the cities of Crystal River and Dunnellon, proclaim March 14–21 as Springs Awareness Week.
 - Partnered with Citrus County and Marion County UF/IFAS Extension offices and the Rainbow Springs State Park to provide a series of events and springshed tours that educated 10,000 residents about the impact of fertilizer on local springs.
- The first annual Springs Awareness Week campaign was held March 14 – 21, 2009 and included a District-sponsored educational tour of the Kings Bay springshed and springs
- Completed a sixth year of water quality monitoring to assess factors affecting water clarity and aquatic plants. This data will be used to assess spatial and temporal trends in Kings Bay water quality and to investigate, in concert with vegetation data, factors that can lead to improved health of submerged aquatic vegetation and greater water clarity.
- A watershed management plan for the City of Crystal River was completed in 2009. The plan is being used to address flood protection and water quality issues in the City of Crystal River watershed, which discharges to Kings Bay. An additional watershed management plan for the unincorporated portion of Crystal River is under development and is scheduled to be completed in May 2010.
- Installed a Continuous Deflection Separation (CDS) device that will intercept sediments and other solid pollutants in stormwater runoff from the Kings Bay Plaza shopping center and surrounding area. Prior to installation of the CDS unit, untreated stormwater from this area flowed into a canal that discharged directly to Kings Bay.

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 area of approximately 3,200 acres and 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. As of March 2007, in-lake TSI was 49.

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 Council was charged by the Legislature to identify strategies to restore the lake and was required to report to the Legislature by November 25 of each year on the progress of the Lake Panasoffkee Restoration Plan and provide recommendations for the next fiscal year. 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* and are the guidance documents for directing restoration projects for the lake. The Restoration Plan for Lake Panasoffkee consists of a multi-step dredging plan to improve fisheries habitat, restore the historic shoreline and facilitate navigation.

Notable Accomplishments for Lake Panasoffkee in 2009

- Following the completion of the dredging, the District initiated a long-term monitoring program for Lake Panasoffkee. The monitoring includes tracking 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. Natural fluctuation of lake levels is important to the continued recovery and long term health of the Lake.

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 (*Centropomus undecimalis*) was caught in the southern portion of the Harbor, and hundreds of tarpon (*Megalops 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*). The overall economic impact to Charlotte Harbor of both recreational and commercial fishing, as well as a growing shellfish aquaculture industry, was estimated by the Southwest Florida Regional Planning Council to be in excess of one billion dollars annually.

Water quality in Charlotte Harbor proper is considered "good," according to the state's trophic state index. However, portions of the Peace and the Myakka Rivers are characterized as having only "fair" or even "poor" water quality. Various sub-basins within the upper reaches of the Peace River have been found to contain elevated concentrations of nutrients and total suspended solids. Analyses of data collected over the past 20 years suggest that the water quality in Charlotte Harbor proper is highly variable but not trending. The reason for this high variability in water quality is due mostly to seasonal variations in freshwater inflow from the Peace and the Myakka Rivers.

Much of the research being conducted in the Charlotte Harbor watershed has been directed toward understanding the impacts of hydrologic alterations to the Charlotte Harbor and its watershed. Most of this research has been focused on the upper Peace River and its tributaries. Although reduced wet season (June to September) rainfall appears to be the reason for the majority of flow reductions in the middle and lower reaches of the Peace River, human activities have had a significant effect on streamflow in the upper Peace River. Conversely, the upper portion of the Myakka River has experienced significant increases in dry season (October to May) flow, which has been attributed to the alteration of Flatford Swamp, a once bottomland hardwood forest in the headwaters of the Myakka River.

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 mangrove habitats have been drained and filled and replaced by residential housing in finger-fill canal communities.

Notable Accomplishments for Charlotte Harbor in 2009

Summarizing 1989-2009, the SWIM Program and its cooperators have completed 13 coastal restoration projects and seven ecological studies for Charlotte Harbor for a total of approximately 1083 acres of restored coastal habitats. These accomplishments are listed below.

The following projects were either ongoing or completed in 2009:

- Lake Hancock Outfall Treatment System – Continue design and permitting of the approximate 1,000-acre treatment wetland continued. Sixty percent design was completed in February 2009.
- Coral Creek Habitat Restoration Project – Completed 30% design plans for two projects within the 2,600 acre project, which will include exotic plant species removal and hydrologic restoration.
- Cape Haze Pioneer Trail – Completed design of a hydrologic restoration project on the East Branch of Coral Creek.
- Water Quality monitoring in the Peace and Myakka Basins, Charlotte Harbor, and Lemon Bay - Continued a collaborative effort with Charlotte County and the Florida Fish and Wildlife Conservation Commission to monitor water quality in Charlotte Harbor. Monthly samples were collected, analyzed, and data made available to the public via a website maintained by the Charlotte Harbor Environmental Center.
- Peace and Myakka River Water Quality Monitoring - Completed year 2009 water quality sampling for the Peace and Myakka River Water Quality Monitoring Projects. Data management activities are ongoing. Water year 2010 sampling efforts began on October 1, 2009.
- Completed design and permitting of a stormwater treatment pond to improve water quality in Hatchett Creek and to restore 200 linear feet of intertidal shoreline on Hatchett Creek. Completed preliminary site work to clear the area for construction of the stormwater pond.
- Continued the Charlotte Harbor/Lemon Bay Watershed Education project in partnership with the Charlotte Harbor Environmental Center. The project provides water quality education in the Charlotte Harbor area encouraging residents to adopt behaviors to protect water resources. In FY2009, the District reached more than 4,000 residents through this project, which included volunteer water quality monitoring, Journey Through the Estuary boat trips, land-based hiking trips, speaking engagements, estuary wading trips, a SWIM Water School, educational lectures, distribution of the Lemon Bay DVD and various events.
- Continued the Peace River Watershed Education project in cooperation with the Charlotte Harbor Environmental Center. The project provides watershed education outreach to residents. In FY2009, the District reached more than 5,000 residents through the Charlotte Harbor Environmental Center's Peace River Watershed Education project, which included volunteer river monitoring, speaking engagements, distribution of "Keeping the Peace" booklet, community events, educational web pages and upriver and downriver bus tours.

- Participated in a school project with a student from L.A. Ainger Middle School in the Lemon Bay watershed. Student conducted an on-camera interview with a District Environmental Scientist on the problems impacting water quality and activities that the average person could implement to protect Lemon Bay.
- Continued cooperative project with Sarasota County to develop a watershed management plan for Lemon Bay focusing on water resources and opportunities to improve water quality within the watershed and the Lemon Bay estuary.

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. 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, lead Pinellas County to develop the Lake Tarpon Watershed Management Plan. This Plan was incorporated into the most recent revision of the Lake Tarpon SWIM Plan 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.

Notable Accomplishments for Lake Tarpon in 2009

- Began construction of the Water Quality Area 6 alum enhanced stormwater treatment system in the Lake Tarpon watershed in cooperation with Pinellas County.
- Continued evaluating design alternatives for two alum enhanced stormwater treatment systems (Water Quality Area 23, and 63) in the Lake Tarpon watershed in cooperation with Pinellas County.

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.

Analyses of sediment cores taken from the lake bottom indicate the historical Trophic State Index (TSI) of Lake Thonotosassa was approximately 60. It appears the lake was naturally nutrient-enriched (moderately eutrophic), due to the presence of phosphate deposits in regional geologic formations and soils, prior to the advent of widespread development in the watershed. As of the mid-1990's, the lake had a TSI exceeding 75, indicating extremely nutrient-enriched (hypereutrophic) conditions brought about by anthropogenic nutrient loadings discharged from the watershed. Historically, these excess loadings resulted in episodic blooms of undesirable (and potentially toxic) blue-green algae leading to occasional fish kills. The water quality target proposed by SWIM for restoration is a TSI of 60. This value is consistent with historical conditions, would provide adequate water quality to support native wildlife populations and desirable recreational uses, and would assist in the reduction of nutrient loadings in the City of Tampa drinking water reservoir.

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. In 2006, 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. This study is scheduled to be complete in 2009. BMPs recommended in the study may be implemented through the District's SWIM program.

Notable Accomplishments for Lake Thonotosassa in 2009

- Lake Thonotosassa Refinement of Nutrient Budget and Specific Water Quality Targets – Compiled all historical data for the Lake and its inflows and outflows and did preliminary statistics on the data to select a method to develop the hydrologic and nutrient budget.

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 combined surface area of the 19 lakes is approximately 7,000 acres. The watershed of the Chain of Lakes is approximately 32 square miles and 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 bluegreen algae blooms during the summer. It is postulated the Trophic State Index (TSI) for the lakes was probably around 50; however, due to extreme hydrologic changes to the lakes and the high degree of urbanization of the watershed, TSI values in the slightly eutrophic range are the best that can be reasonably expected (i.e., TSI's from 50 to 60). A target TSI of 60 is proposed for the Chain as a whole.

A 25 percent reduction in non-point loading of phosphorus will be required to lower the TSI ten units; this is consistent with a target TSI of 60 for most of the lakes on the Chain. Further, it has been estimated a 25 percent reduction in non-point source loading will require a 50 percent reduction in stormwater phosphorus loading. In the case of the Southern Chain of Lakes, this equates to an annual load reduction of 4,000 pounds of phosphorus, and for the Northern Chain, approximately 1,000 pounds. Using typical wet detention systems, this will require the equivalent of 20 to 25 retrofit projects on the highest loading sub-basins. As a result, the SWIM plan for the Winter Haven Chain of Lakes identifies stormwater treatment as a high priority.

Notable Accomplishments for the Winter Haven Chain of Lakes in 2009

- South Lake Conine Watershed Restoration – Commenced design and permitting of the approximate 34-acre treatment wetland and upland habitat restoration project, which will provide stormwater treatment.
- Winter Haven Chain of Lakes Sediment Removal Feasibility Study for Lakes May, Shipp and Lulu – The City completed additional data collection to support the conclusions that sediments are contributing to degraded water quality. A final report is due in early 2010.
- The Evaluation of Existing Information Phase (Phase 1) and the Summary and Data Collection Report was completed and an Interim Report defining potential BMPs will be drafted in the next phase of the Winter Haven Chain of Lakes Water Quality Management Plan project.

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. Projects completed by the SWIM Program and other agencies have restored tidal wetlands and created bay bottom habitat. Since 1988, seagrasses have increased 14 percent and the total number of continuous acres recorded has also increased. Seagrass coverage documented in 2009 was 12,641 acres, the highest recorded acreage since inception of the monitoring program.

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 of pollution (i.e. stormwater runoff) are necessary to offset population increases.

Notable Accomplishments for Sarasota Bay in 2009

- Sarasota Bay Spoil Islands Restoration – Construction of the Bird Colony Islands phase of the project was completed by Sarasota County and the Sarasota Bay Estuary Program in 2009. Design and permitting commenced on the second phase of the project, Palmer Point, in 2009. This project will restore approximately 10 acres of habitat which has been impacted by dredge spoil disposal.

- Nicholson Drainage Channel Stormwater Treatment Project – Completed construction of this project, in cooperation with Manatee County, which has both stormwater quality treatment and flood protection benefits. The Nicholson drainage channel is a tributary of Bowlees Creek, which discharges into Sarasota Bay.
- Sarasota County – Implementation of BMPs for Coastal Basin Beach Road - Completed request for proposals process, selected a consulting firm and completed design for stormwater treatment project to address level of service protection and improve water quality from biological contamination natural systems enhancement.
- Little Sarasota Bay Water Quality Management Plan – the District and Sarasota County entered into an agreement for this fiscal year 2009 cooperative project to develop a management plan for Little Sarasota Bay and its watershed. The County advertised for, reviewed and ranked proposals for a consultant to implement the project. Negotiations with the top ranked firm will begin in January 2010.
- Sarasota Bay Water Quality Management Plan – the District and Sarasota County entered into an agreement for this fiscal year 2009 cooperative project to develop a management plan for Sarasota Bay and its watershed. The County advertised for a consultant to implement the project. Review, ranking, and negotiations with the top ranked firm will begin in February 2010.
- Continued cooperative project with Sarasota County to develop a watershed management plan for Roberts Bay focusing on water resources and opportunities to improve water quality within the watershed and the Roberts Bay estuary. It is scheduled to be completed in fiscal year 2010.

APPENDIX

Maps of District Watersheds

Tampa Bay

Rainbow River

Banana Lake

Crystal River/Kings Bay

Lake Panasoffkee

Charlotte Harbor

Lake Tarpon

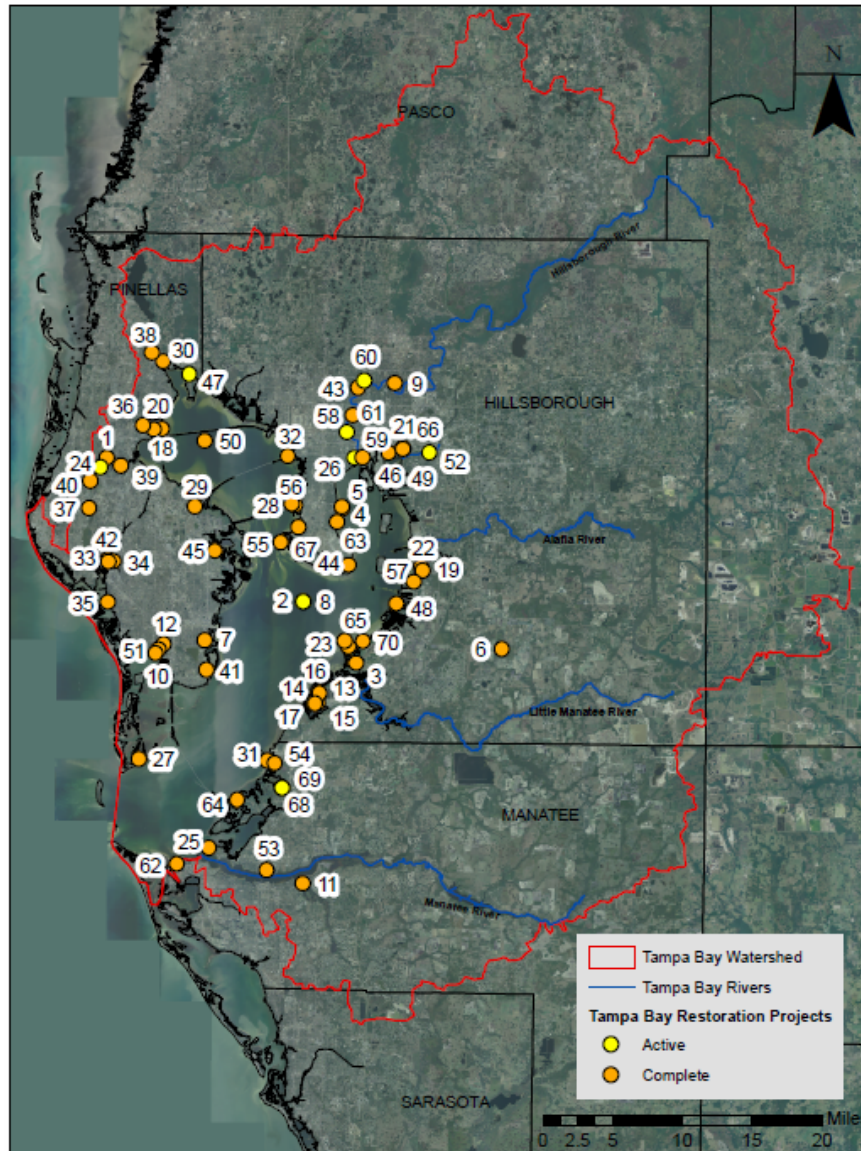
Lake Thonotosassa

Winter Haven Chain of Lakes

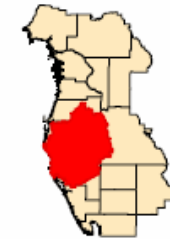
Sarasota Bay

Tampa Bay Restoration Projects

2008



Pasco, Pinellas,
Hillsborough, Polk
and Manatee Counties

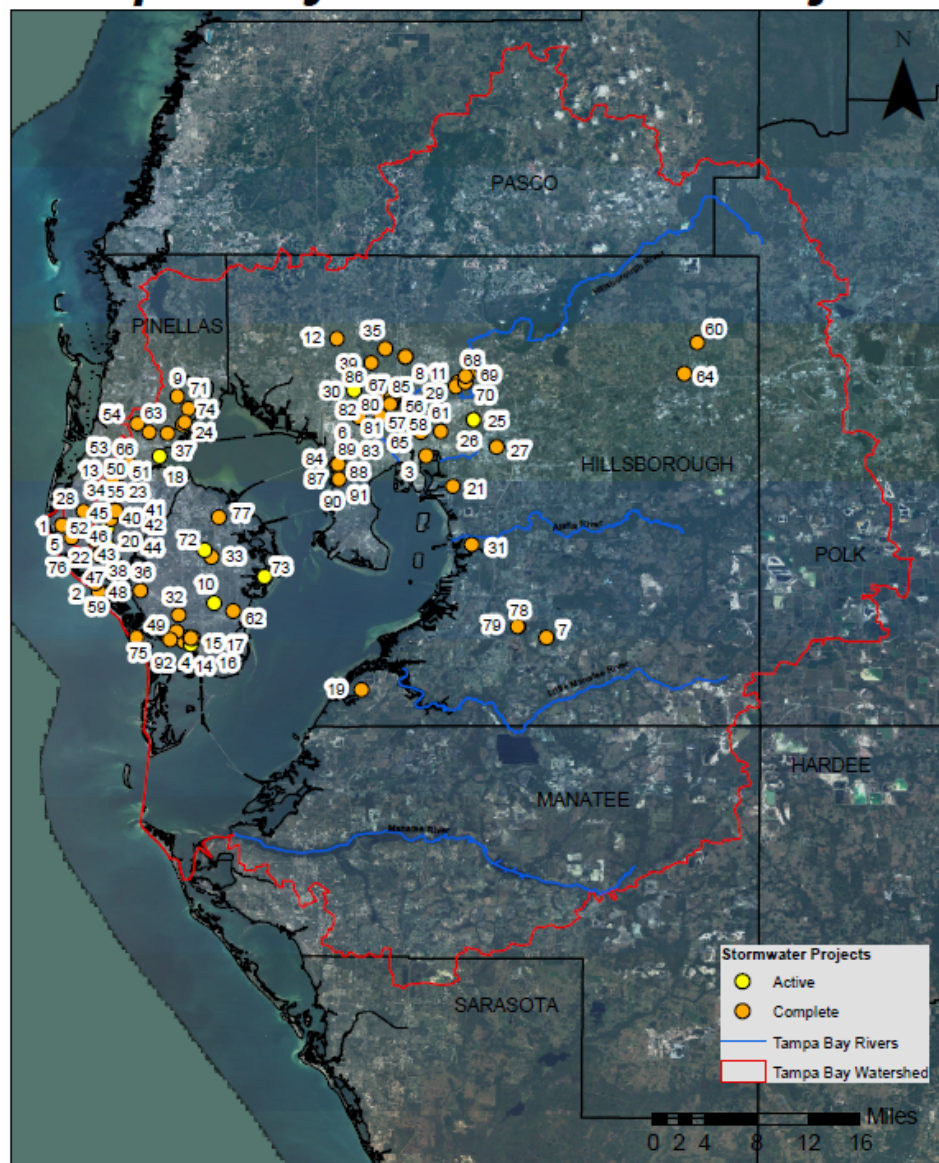


PROJECT LEGEND

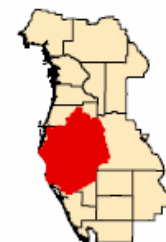
- | | |
|---|---|
| 1 Allen's Creek | 36 Kapok Wetland/Floodplain Restoration |
| 2 Assessment of the Benthic Habitat Status | 37 Lake Seminole Aquatic Life Enhancement |
| 3 Bahia Beach | 38 Lake Tarpon Outfall Canal Phase 1 and 2 |
| 4 Ballast Point Park Seawall Enhancement | 39 Lancaster Tract |
| 5 Ballast Point Park Phase 1 | 40 Largo Central Park Wetland Enhancement |
| 6 Balm Road Marsh | 41 Little Bayou |
| 7 Bartlett Park | 42 Long/Cross Bayou |
| 8 Biennial Seagrass Mapping | 43 Lowry Park |
| 9 Blackwater Hammock Park Shoreline Restoration | 44 MacDill Air Force Base Phase 1A, 1B and 2 |
| 10 Boca Ciega Phase 1, 2 and 3 | 45 Mangrove Bay Phase 1, 2 and 3 |
| 11 Braden River 1 and 2 | 46 McKay Bay Nature Preserve |
| 12 Clam Bayou Phase 2a and 2b | 47 Mobley Bay Phase 1 and 2 |
| 13 Cockroach Bay Phase 1A1, 1A2, 1B1, 1B2 | 48 North Apollo Beach |
| 14 Cockroach Bay Braided Tidal Creek | 49 Northeast McKay Bay |
| 15 Cockroach Bay Freshwater Wetlands | 50 Old Tampa Bay/Safety Harbor Restoration |
| 16 Cockroach Bay Phase C | 51 Osgood Point (Clam Bayou Phase 1) |
| 17 Cockroach Bay Uplands Phase 1 and 2 | 52 Palm River Restoration |
| 18 Cooper's Point | 53 Palmetto Estuary |
| 19 Davis Tract | 54 Peanut Lake |
| 20 Del Oro | 55 Picnic Island |
| 21 Desoto Park Addition Shoreline Restoration | 56 Polaris Park |
| 22 Dug Creek | 57 Port Redwing/Schultz Preserve |
| 23 E. G. Simmons Park Phase 1 and 2 | 58 Reed Property |
| 24 Eagle Lake Park | 59 Ribbon of Green |
| 25 Emerson Point 1 and 2 | 60 River Tower |
| 26 Fort Brooke Park Shoreline Restoration | 61 Rivergarden |
| 27 Ft. Desoto Park Recirculation Project | 62 Robinson Preserve |
| 28 Gandy Park | 63 South Bayshore |
| 29 Gateway Tract | 64 South Skyway |
| 30 Harbor Palms Park | 65 Tampa Bay Water Quality |
| 31 Hendry Delta | 66 Tampa Shoreline Restoration Initiative |
| 32 Howard Frankland East | 67 Tappan |
| 33 Joe's Creek 1 | 68 Terra Ceia Freshwater Wetland |
| 34 Joe's Creek School Site | 69 Terra Ceia Uplands Phase 1, 2, 3 and 4 |
| 35 Jungle Prada Park | 70 Wolf Branch Creek, Enhancement and Uplands |

Tampa Bay Stormwater Projects

2008



Pasco, Pinellas,
Hillsborough, Polk
and Manatee Counties

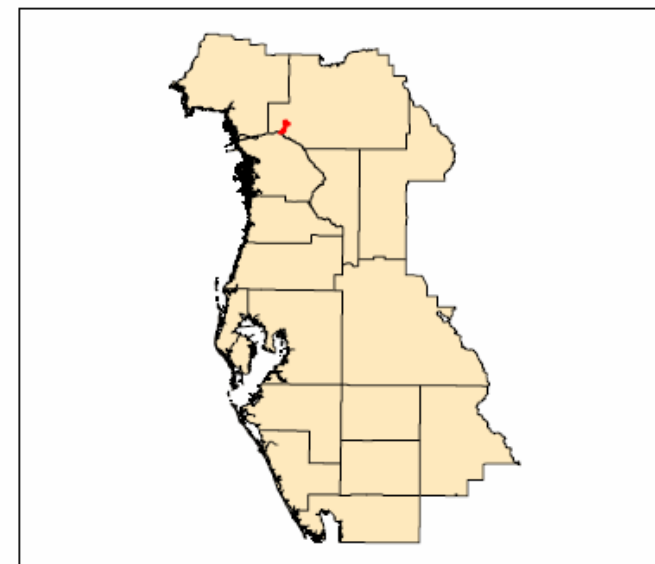
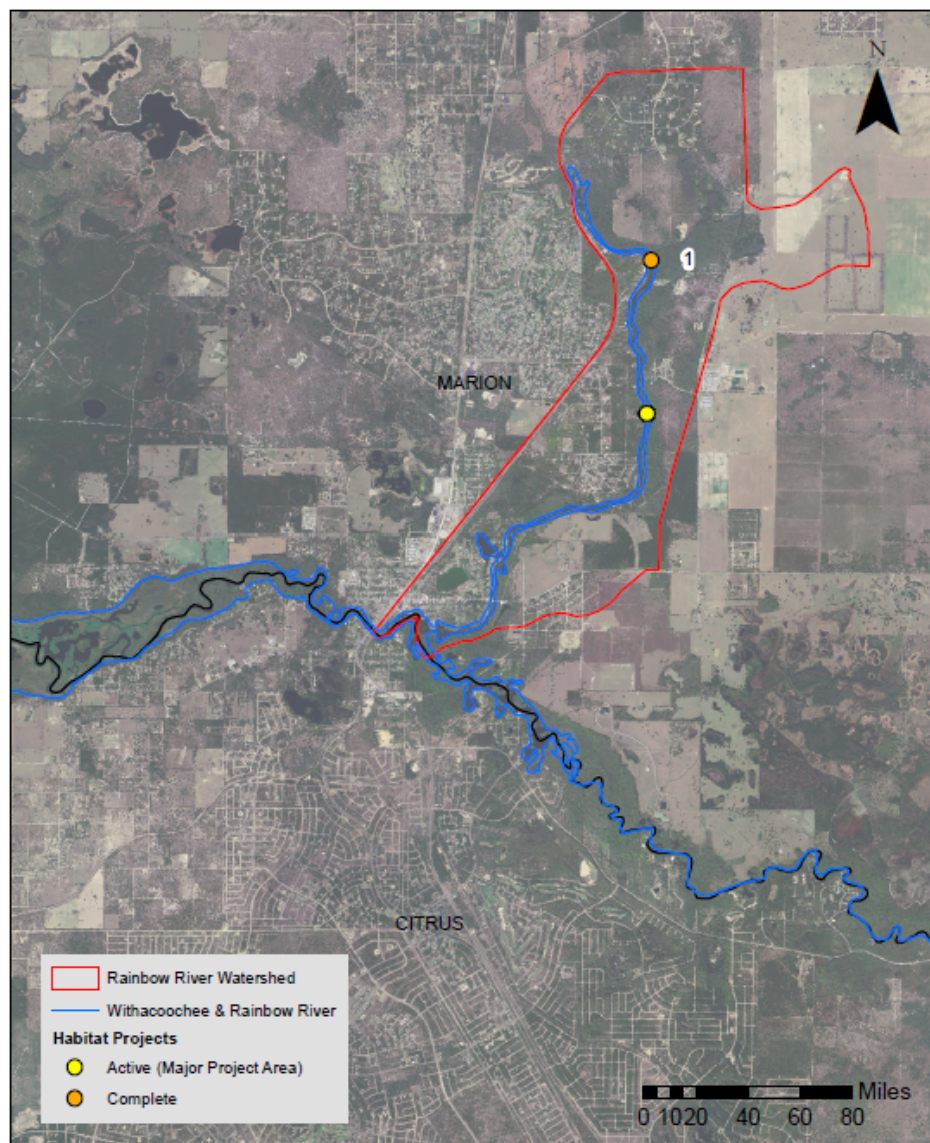


PROJECT LEGEND

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|---|--|
| 1 102nd Avenue Pond Enhancement Project | 47 Lake Seminole Weir Replacement |
| 2 141st Avenue Stormwater Retrofit | 48 Lake Seminole Weir Stage/Flow Device |
| 3 30th Street Baffle Box | 49 Lake Tomlinson Restoration |
| 4 49th Street Stormwater Retrofit System | 50 Largo Regional Outfall Modification |
| 5 94th Avenue Stormwater Pond Enhancement | 51 Largo Regional Stormwater Treatment Facility |
| 6 Al Lopez Park Stormwater Retrofit | 52 Largo ST Quality retrofit - 101st St. |
| 7 Balm Road Marsh | 53 Largo Stormwater Retrofit Project - CDS Units |
| 8 Bath Club Concourse Stormwater Retrofit | 54 Logan Street Pond |
| 9 Bishop Creek Streambank | 55 Long Bayou |
| 10 Booker Lake Regional Stormwater Retrofit | 56 Lowry Park (East) |
| 11 Broadway Outfall Stormwater Retrofit | 57 Lowry Park (West) |
| 12 Brushy Creek Wetland Treatment | 58 Lowry Park Stormwater (Cascading pond system) |
| 13 City of Largo CDS Unit | 59 Madeira Public Works Yard Stormwater Retrofit |
| 14 Clam Bayou Retrofit Basin U3 | 60 McIntosh Park Enhanced Stormwater Treatment Wetland |
| 15 Clam Bayou Retrofit Basins D & U1 | 61 Melbourne Pond Stormwater Retrofit |
| 16 Clam Bayou Retrofit Basins Z & E | 62 Mirror Lake Stormwater Retrofit |
| 17 Clam Bayou Stormwater Pond | 63 Old Coachman (Channel H) Stormwater Retrofit |
| 18 Clearwater Tropic Hills Drainage Improvements | 64 Pistol Range Stormwater Retrofit |
| 19 Cockroach Bay Stormwater Pond | 65 Pond 58 |
| 20 Creation Pond Stormwater Enhancement | 66 Red Maple Swamp (Allen's Creek) |
| 21 Delaney Creek Wetland Treatment | 67 River Tower |
| 22 Dogleg Pond Stormwater Enhancement | 68 Riverhills Drive Outfall No. 1 Stormwater Retrofit |
| 23 Downtown Largo Regional Stormwater Treatment Facility | 69 Riverhills Drive Outfall No. 2 Stormwater Retrofit |
| 24 East Gate Drainage Improvements | 70 S. Glen Arven Avenue Outfalls Stormwater Retrofit |
| 25 East Lake Outfall Project | 71 Safety Harbor (Public Works) Stormwater Retrofit |
| 26 East Lake Outfall Water Quality Improvement | 72 Sawgrass Lake Restoration |
| 27 East Shore Commerce Regional Stormwater Treatment Facility | 73 Shore Acres Stormwater Vaults |
| 28 EMS Pond Stormwater Enhancement | 74 South Green Springs Stormwater Retrofit |
| 29 FDOT 56th Street Outfall Stormwater Retrofit | 75 St. Pete Beach Public Works Facility Stormwater Retrofit Improvements |
| 30 FDOT Dale Mabry Hwy Stormwater Retrofit/ Wetland Restoration | 76 St. Pete Junior College Stormwater Retrofit |
| 31 Gibsonton on the Bay | 77 St. Petersburg Public Works Retrofit |
| 32 Gulfport-49th Street Drainage Improvements | 78 Sumner Road Stormwater Management Improvement- Wet Detention |
| 33 Haynsworth Tract Regional Stormwater Treatment Facility | 79 Sumner Road Stormwater Management Improvement- Sediment Sump |
| 34 Highland Avenue Retrofit Project | 80 Tampa Filtration Devices (Diana St. at River Blvd.) |
| 35 Jean Park Ponds/Cedar Lake Water Quality Improvement Study | 81 Tampa Filtration Devices (Fern St. at Lynn Ave.) |
| 36 Jungle Lake Enhancement Project | 82 Tampa Filtration Devices (Jean St. at Lynn Ave.) |
| 37 Kapok Wetland/Floodplain Restoration | 83 Tampa Filtration Devices (Lambright St. at Lynn Ave.) |
| 38 Lake Carroll (70th Avenue) Pond Enhancement | 84 Tampa Filtration Devices (Neptune Way at Shore Crest Dr.) |
| 39 Lake Carroll Stormwater Management Plan | 85 Tampa Filtration Devices (North St. at Lynn Ave.) |
| 40 Lake Seminole Basin 1 Retrofit | 86 Tampa Filtration Devices (Otis Ave. at River Blvd.) |
| 41 Lake Seminole Basin 2 Retrofit Phase 2 | 87 Tampa Filtration Devices (Shore Crest Sr. at Swann Ave.) |
| 42 Lake Seminole Basin 3 Retrofit | 88 Tampa Filtration Devices (Swan Ave. at Bayside Dr.) |
| 43 Lake Seminole Basin 6 Retrofit | 89 Urban Lake Rescue-Lake Edna |
| 44 Lake Seminole Basin 7 Retrofit Phase 2 | 90 Urban Lake Rescue-Lake Kipling |
| 45 Lake Seminole Bypass Canal Treatment Facility | 91 Urban Lake Rescue-Lake Roberta |
| 46 Lake Seminole Weir Creation | 92 Wood Ibis Park Stormwater Retrofit |

Rainbow River Watershed

2008

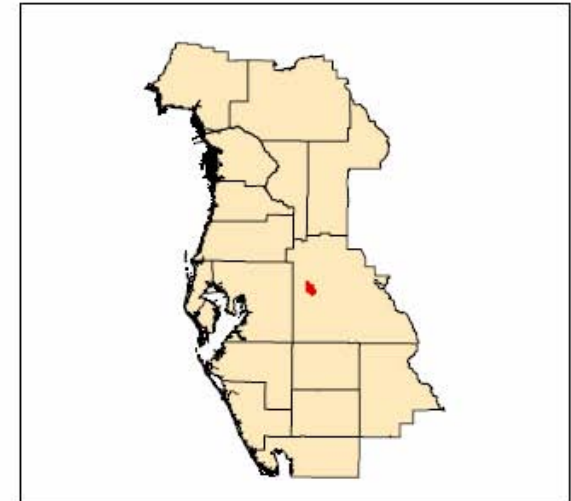
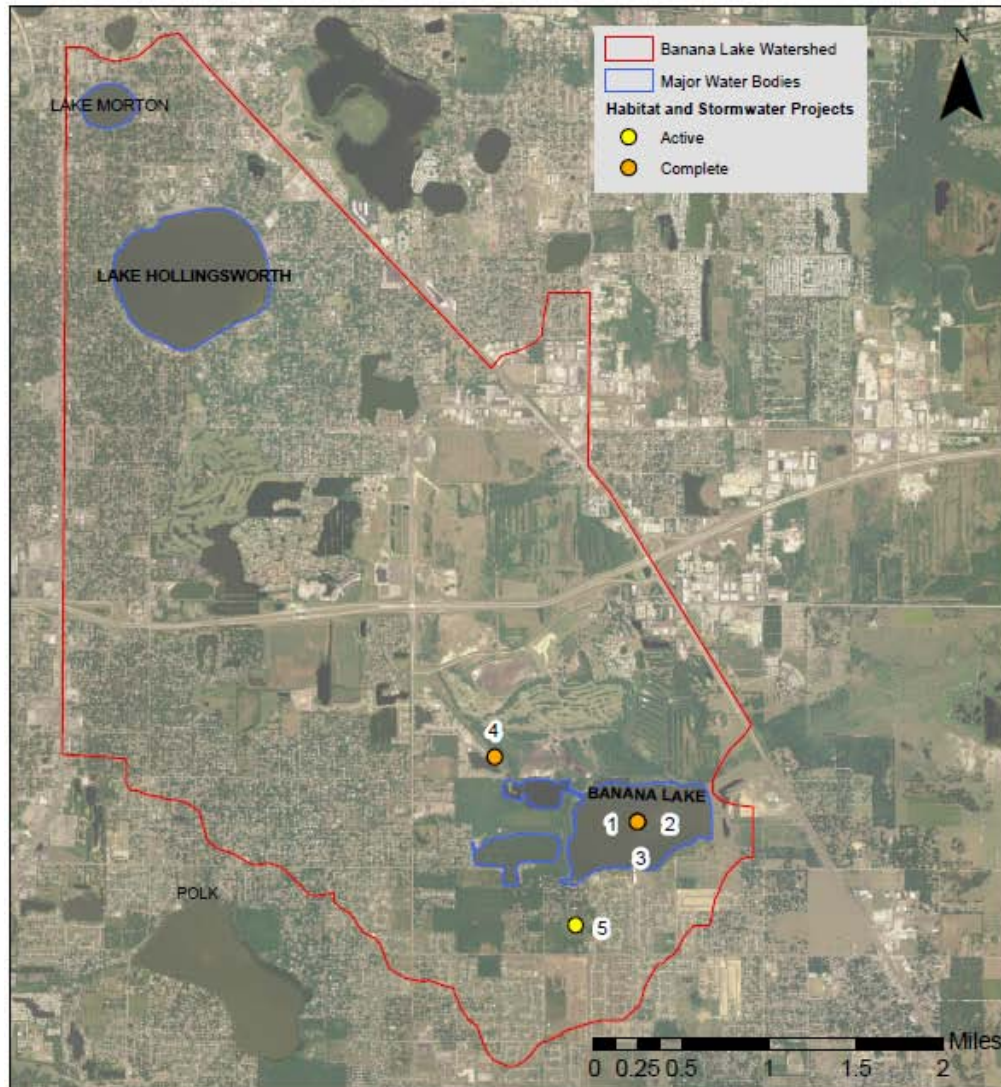


PROJECT LEGEND

1 Devils Elbow Revegetation	Complete
<i>Major Projects Within River:</i>	
☐ Development of Water Nutrient Budget	Active
☐ Dunnellon SE Quadrant Outfall Mitigation Study	Complete
☐ Habitat Maintenance Enhancement and Restoration	Complete
☐ Lyngbya Bioassessment	Complete
☐ Lyngbya Removal and Revegetation	Complete
☐ Optical Model Development	Complete
☐ Sediment Mapping and Evaluation	Active
☐ Vegetation Mapping	Complete
☐ Water Lettuce Biocontrol	Complete
☐ Water Quality Status and Trends	Complete

Banana Lake Watershed

2008



PROJECT LEGEND

Habitat Restoration:

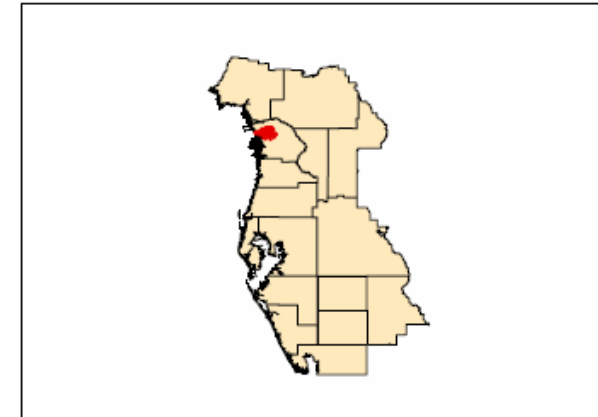
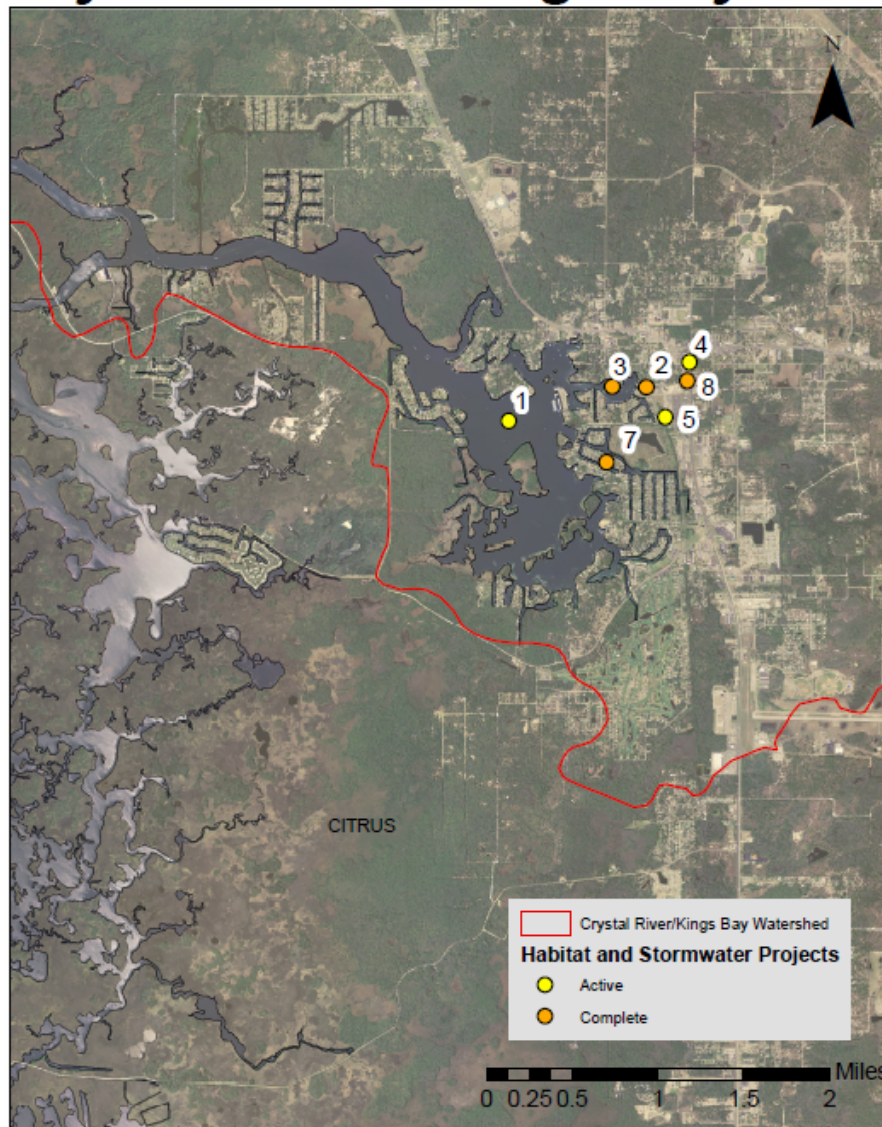
1 Banana Lake Dredge Project	Complete
2 Post Restoration Water Quality Evaluation	Complete
3 Shoreline Revegetation Project	Complete
4 Stahl Canal Restoration	Complete

Stormwater Projects:

5 Elizabeth Place Water Quality and Natural Systems Enhancements	Active
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Crystal River/ Kings Bay Watershed

2008

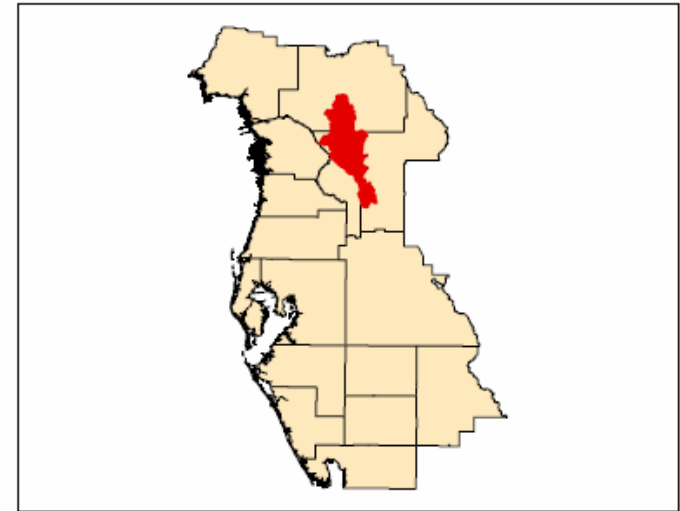
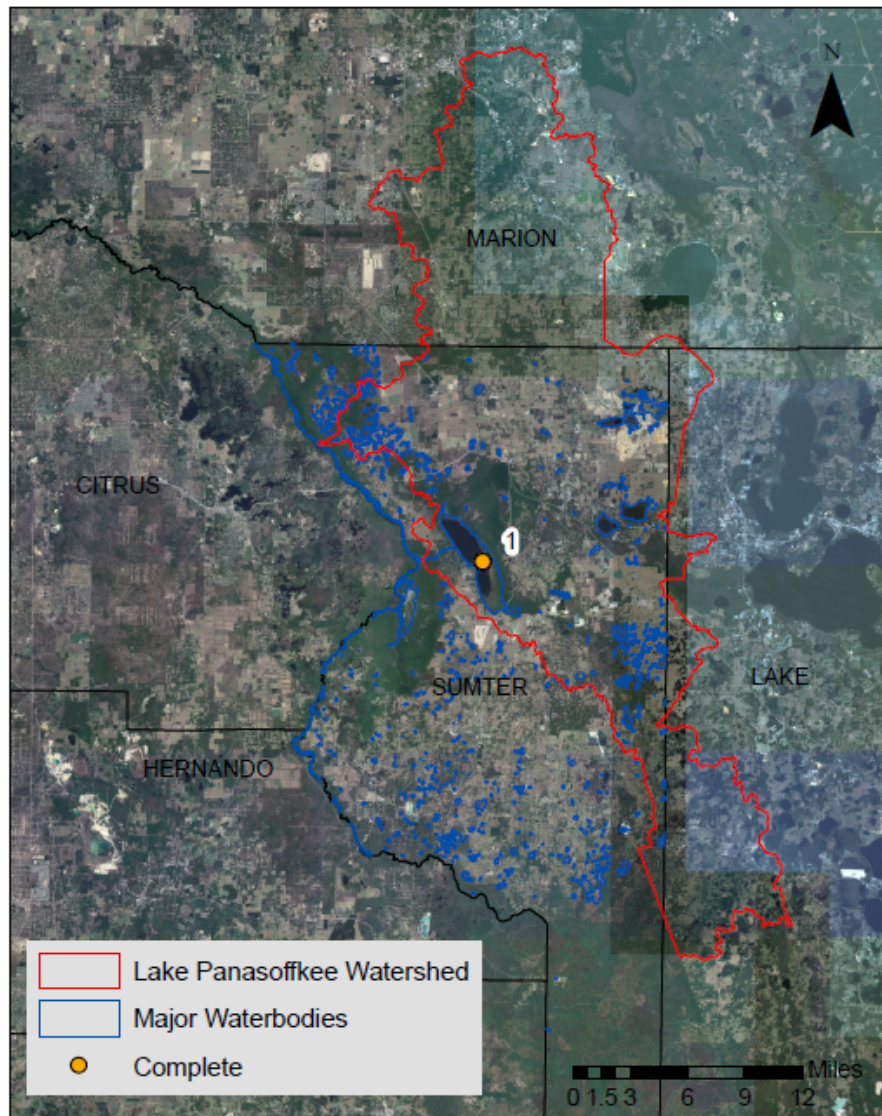


PROJECT LEGEND

1	City of Crystal River Watershed Management Plan	Active
	Crystal River/ Kings Bay/ Vegetation Evaluation and Mapping	Active
	Crystal River/ Kings Bay/ Water Quality Evaluation	Active
	Crystal River/ Kings Bay/ Vegetation Evaluation and Mapping	Active
	Kings Bay Canal Water Quality Monitoring	Active
	Five rivers Nutrient Assimilation	Complete
	Lyngbya Removal and Revegetation Pilot Project	Complete
	Pilot Vallisneria Project	Complete
	Project COAST Nutrient Limitation Study	Complete
	Sediment Evaluation 1993	Complete
	Sediment Evaluation 2005	Complete
	Sediment Resuspension Study	Complete
	Tidal Fluctuation	Complete
	Volunteer Water Quality Monitoring	Complete
<i>Other Habitat and Stormwater Projects</i>		
2	Hunters Spring (various)	Complete
3	Hunters Spring Park Stormwater Rehab	Complete
4	Installation of CDS Unit	Active
5	Kings Bay Stormwater Runoff Management	Active
6	Crystal Center Stormwater Run off Mitigation	Active
7	Palm Island Stormwater Rehab	
8	US19 Stormwater Improvements	

Lake Panasoffkee Watershed

2008



PROJECT LEGEND

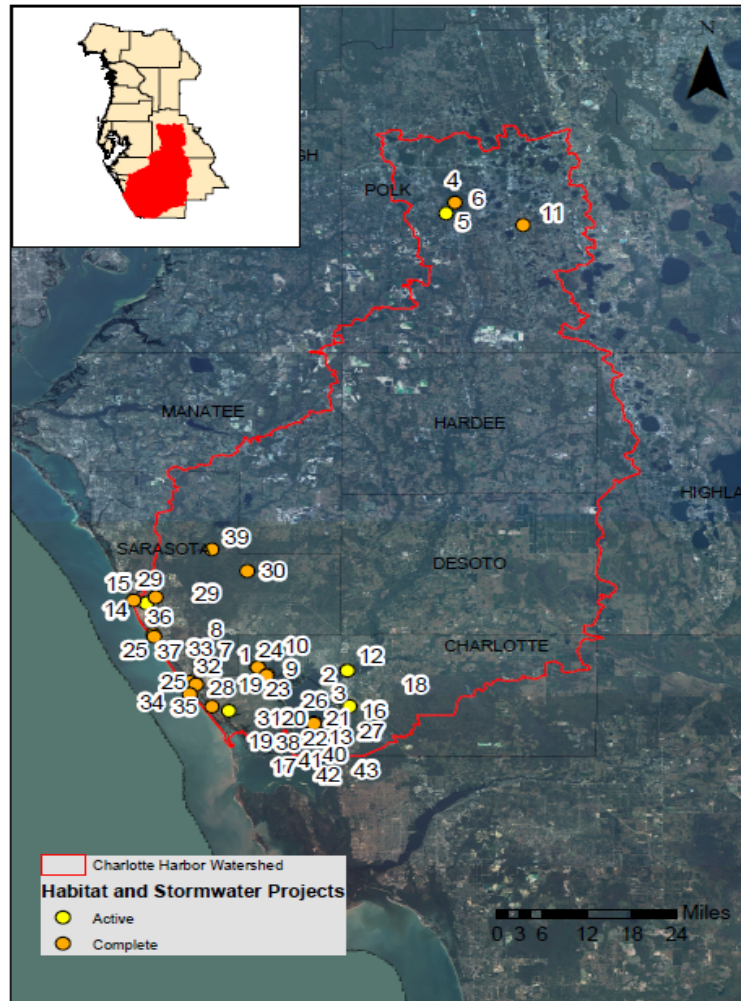
1 Lake Panasoffkee

Major Projects Within Lake Panasoffkee:

☐ Bathymetric Mapping	Complete
☐ Biological Hydrilla Control	Complete
☐ Coleman's Landing Pilot Dredging	Complete
☐ Lake Panasoffkee Restoration Project	Complete
☐ Submerged Aquatic Vegetation Mapping	Complete
☐ Lake Panasoffkee Restoration	Complete

Charlotte Harbor Watershed

2008

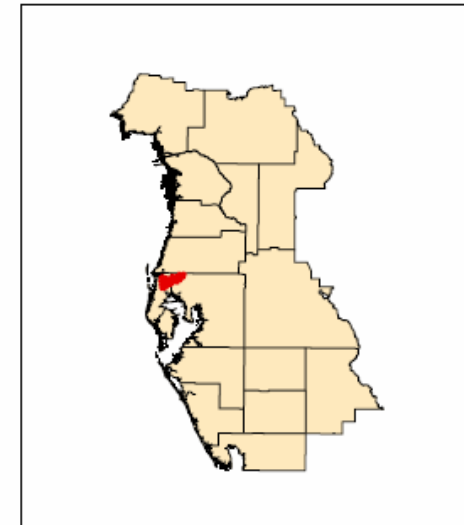
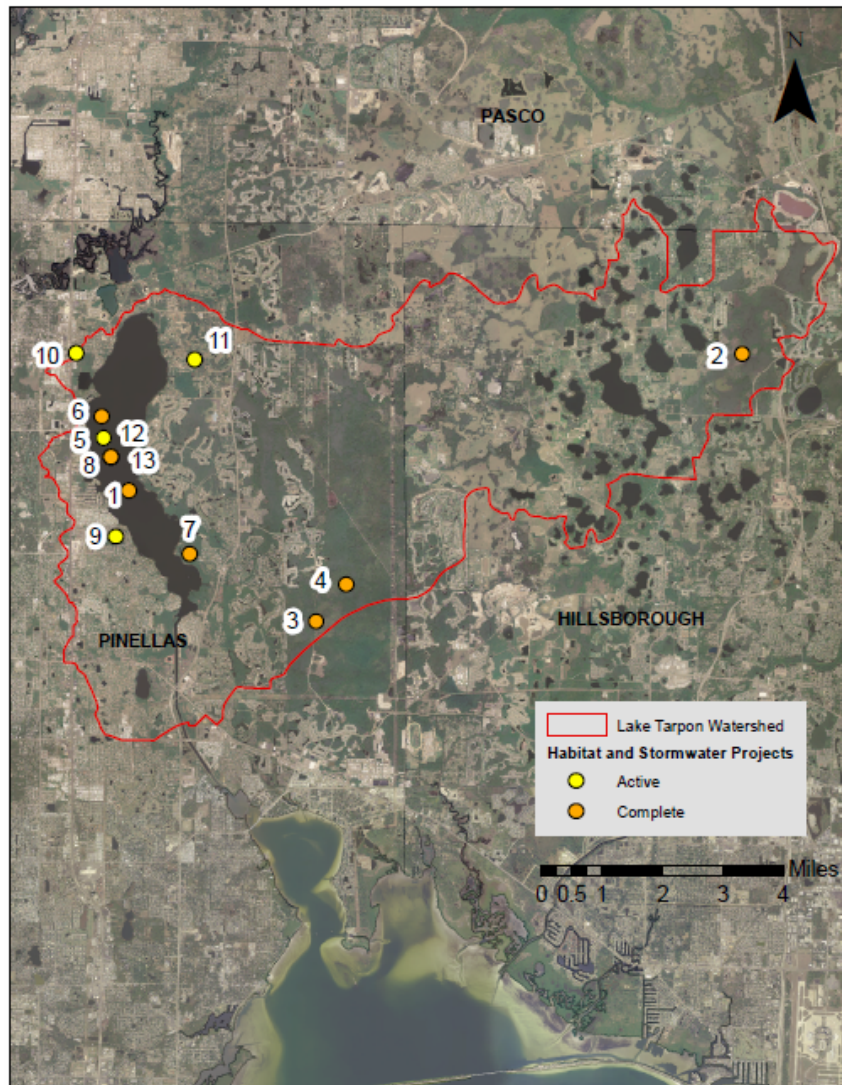


PROJECT LEGEND

1	Charlotte Harbor Environmental Center Myakka River Water Quality Monitoring and Analysis	Complete
2	Charlotte Harbor Environmental Center Peace River Water Quality Monitoring and Analysis	Complete
3	Charlotte Harbor Water Quality Monitoring	Active
4	Lake Hancock Historical Water Quality	Complete
5	Lake Hancock Outfall Treatment Project	Active
6	Lake Hancock Water and Nutrient Budget	Complete
7	Lemon Bay Nutrient/ Water Quality/ Seagrass Study	Complete
8	Lemon Bay Pollutant Reduction Assessment	Complete
9	Myakka River Water Quality	Active
10	Myakka River Watershed Initiative	Complete
11	Peace River Canal Watershed Restoration	Complete
12	Peace River water Quality	Active
13	Seasonal and Spatial Patterns of Hypoxia	Complete
14	Venice Hatchett Creek Stormwater Retrofit	Active
15	Venice/ Laguna Drive Water Quality Improvement	Complete
16	Water Quality for Microbial Pathogens	Complete
17	Water Quality in the Peace River and Myakka Basins, Charlotte Harbor and Lemon Bay	Active
18	Alligator Creek	Active
19	Amberjack Slough	Complete
20	Annual Report and Summary Analysis of Peace and Myakka Rivers	Active
21	Assessment of the Historical Hypoxia in Charlotte Harbor	Complete
22	Biennial Seagrass Mapping	Complete
23	Cattle Dock Point Phase 1	Complete
24	Cattle Dock Point Phase 2	Complete
25	Cedar Point restoration	Complete
26	Characterizing Seagrass Communities of Eastern Charlotte	Active
27	Coastal Charlotte Harbor Benthic Habitat Map	Active
28	Coral Creek	Active
29	Curry Creek	Complete
30	Deer Prairie Slough	Complete
31	Determination of Seagrass Loss Offshore Punta Gorda Isles	Complete
32	Don Pedro Phase I	Complete
33	Don Pedro Phase II	Complete
34	Don Pedro Phase III	Complete
35	Don Pedro Phase IV	Complete
36	Lemon Bay Ecosystem Restoration	Complete
37	Lemon Bay Site Enhancement	Complete
38	Light Requirements of Seagrass	Complete
39	Myakka Island Ecosystem Restoration	Complete
40	Oligohaline Vegetation Mapping	Complete
41	Responses of Seagrass Meadows to Nutrient Enrichment and Water Quality Degradation	Complete
42	Restoration Needs Assessment	Complete
43	Seagrass Transect Analysis in Charlotte Harbor	Complete

Lake Tarpon Watershed

2008

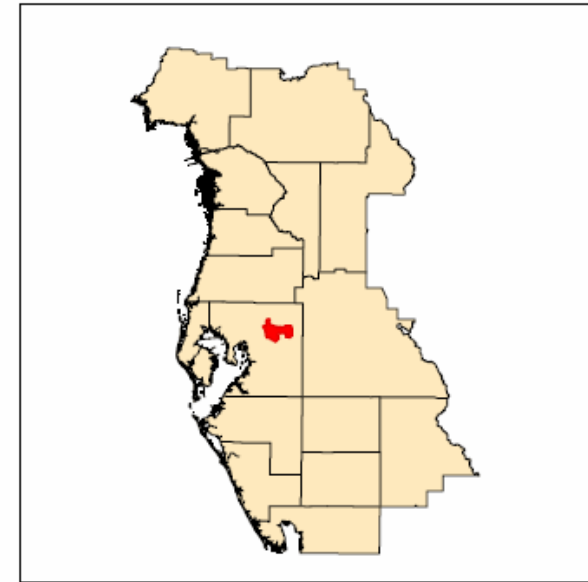
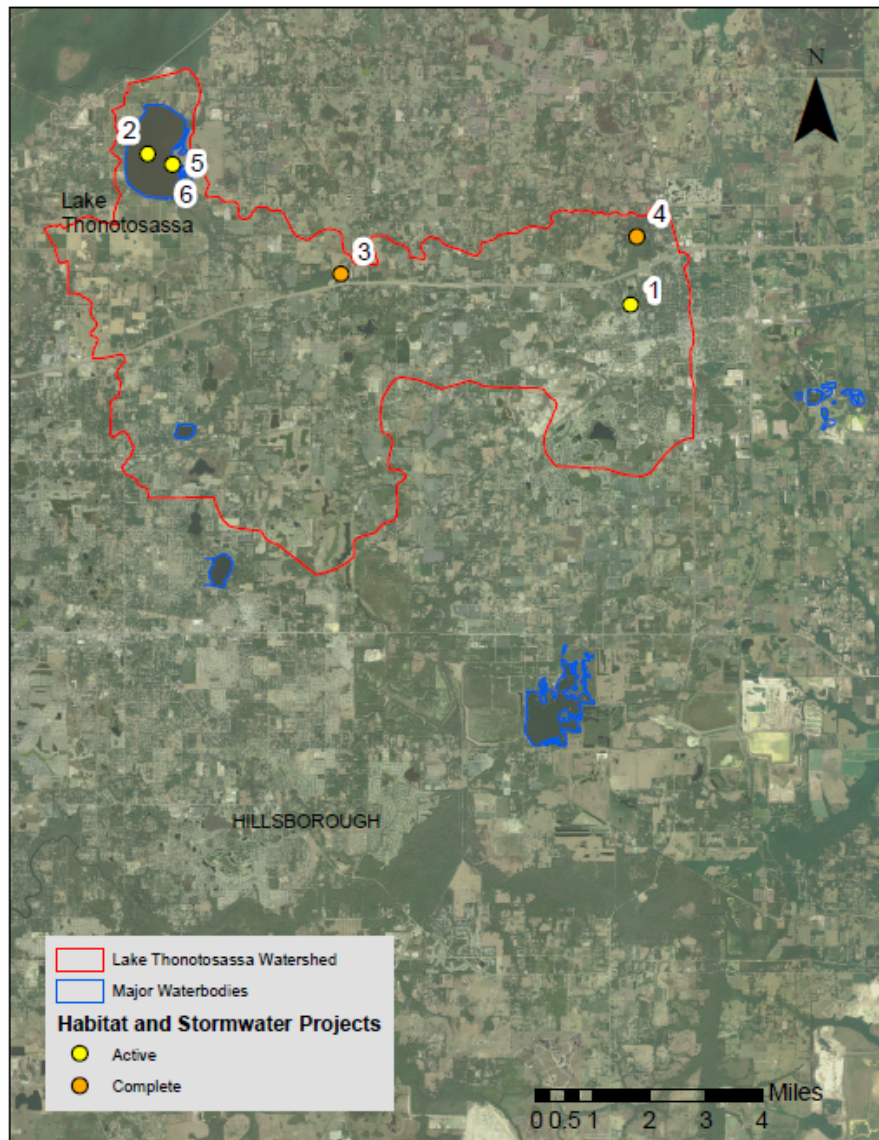


PROJECT LEGEND

1	Aquatic Vegetation Study in Lake Tarpon	Complete
2	Brooker Creek ELAPP Site Restoration	Complete
3	Brooker Creek Hydrologic Restoration on Channel "F"	Complete
4	Brooker Creek Hydrologic Site Restoration on Channel "L"	Complete
5	Environmental Education and Public Awareness Programs	Active
6	Evaluation of Vegetative Communities within Lake Tarpon	Complete
7	Chestnut Park Stormwater Feasibility Study	Complete
8	Effects of Water Fluctuations on Fisheries of Lake Tarpon	Complete
9	Lake Tarpon Area 23	Active
10	Lake Tarpon Area 6	Active
11	Lake Tarpon Area 63	Active
12	Lake Tarpon Groundwater Nutrient Study	Complete
13	Water Quality and Pollutant Load Reduction	Complete

Lake Thonotosassa Watershed

2008

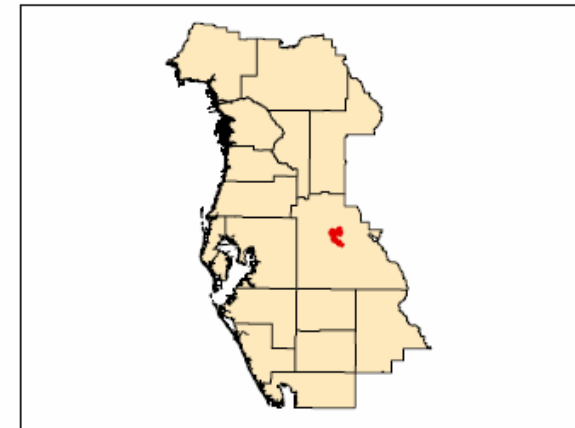
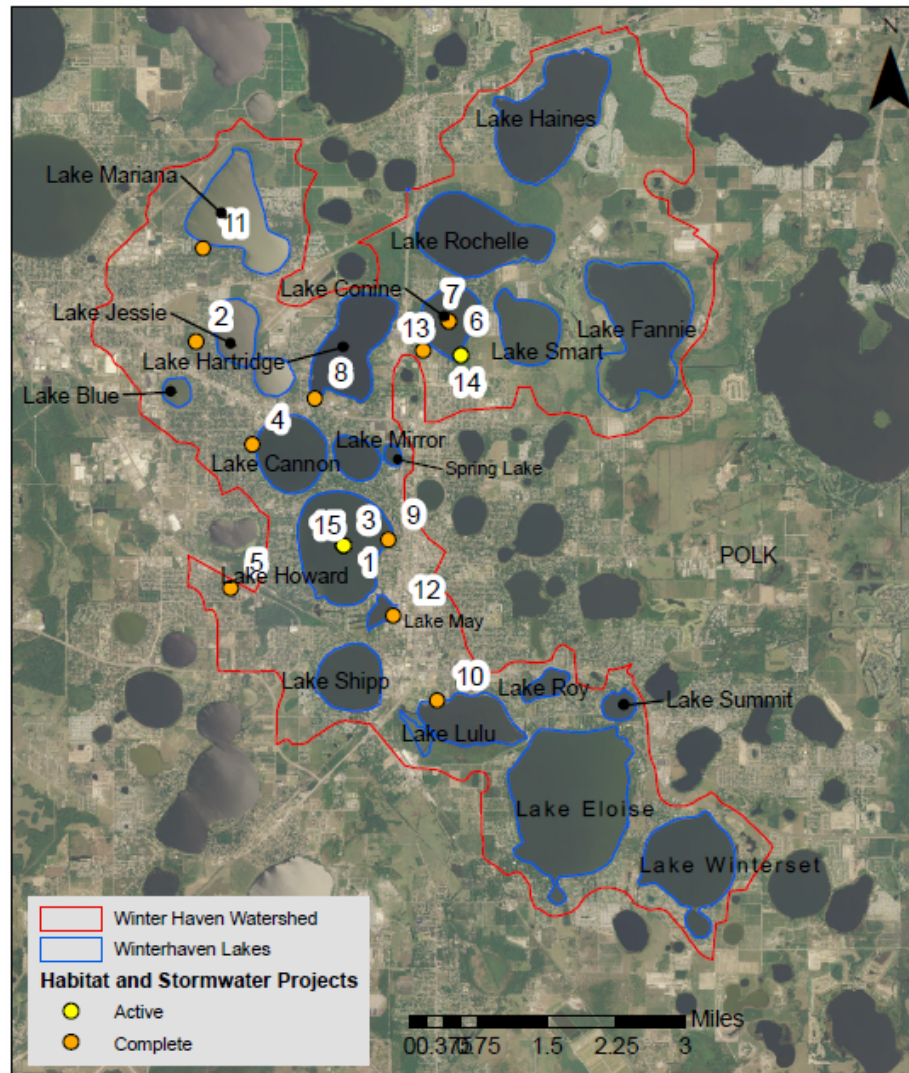


PROJECT LEGEND

1	Lake Thonotosassa Diagnostic Assessment and Water Quality Treatment	Active
2	Lake Thonotosassa Refinement of Nutrient Budget and Specific Water Quality Targets	Active
3	Pemberton Creek and Baker Creek Erosion Management	Complete
4	Plant City West Side Canal Stormwater Treatment/Pistol Range	Complete
5	Lake Thonotosassa Marsh Restoration	Active
6	Submergent Aquatic Plant Revegetation	Complete

Winter Haven Chain of Lakes and Watershed

2008

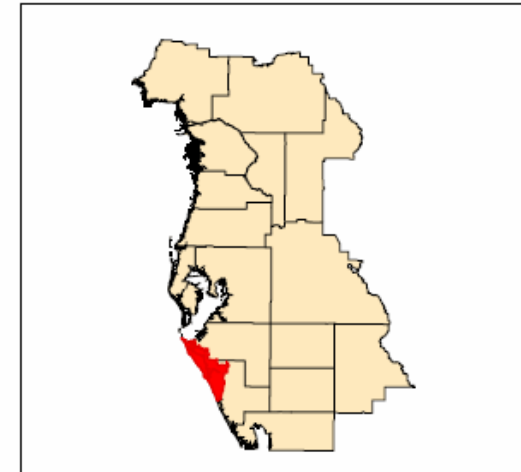
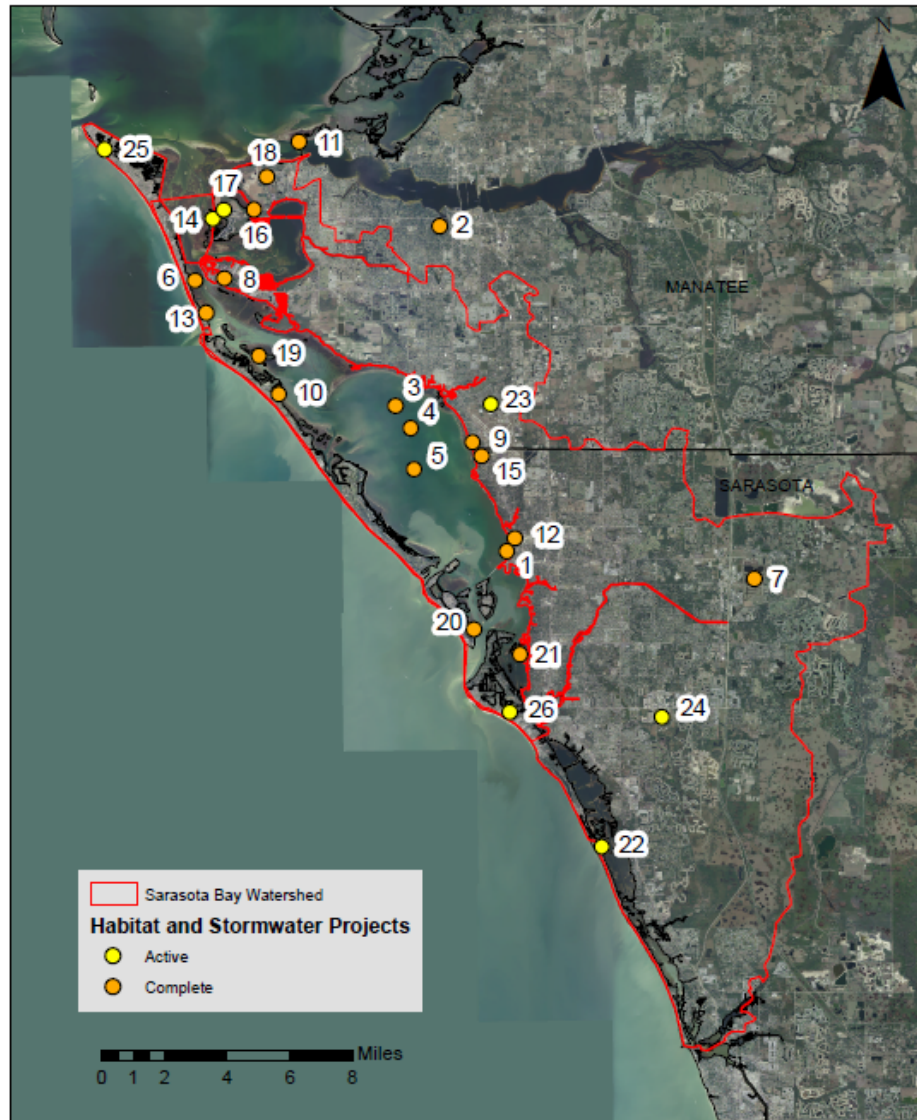


PROJECT LEGEND

1	Chain of Lakes Water Quality Management Plan	Active
2	Derby Ditch Retrofit	Complete
3	Howard, May, Shipp & Lulu-Sed. Removal Feasibility	Active
4	Inwood Ditch Alum Injection Project	Complete
5	Jan Phyl Stormwater Treatment Project	Complete
6	Lake Conine Alum Evaluation	Complete
7	Lake Conine Whole Lake Alum Treatment	Complete
8	Lake Hartridge Stormwater Treatment Project	Complete
9	Lake Howard Alum Injection	Complete
10	Lake Lulu Stormwater Treatment Project	Complete
11	Lake Mariana	Complete
12	Lake May Stormwater Management Project	Complete
13	Periphyton Filter Project	Complete
14	South Lake Conine Watershed Restoration Project	Active
15	Winter Haven Nutrient Budget	Complete

Sarasota Bay Watershed

2008



PROJECT LEGEND

1	6th Street Canal	Completed	14	Neal Preserve	Active
2	Ballard	Completed	15	New College	Completed
3	Bayshore North	Completed	16	Perico Bayou	Completed
4	Bayshore South	Completed	17	Perico Preserve	Active
5	Biennial Seagrass Mapping	Completed	18	Robinson Preserve	Completed
6	Bradenton Beach Pier	Completed	19	Sister Keys	Completed
7	Celery Fields	Completed	20	South Lido	Active
8	Cortez Schoolhouse	Completed	21	Spoil Islands - Bird Colony	Completed
9	Crosley Estate	Completed	22	Spoil Islands - Palmer Point	Active
10	Durante Park	Completed	23	Nicholson Drainage Channel Stormwater Treatment Project	Completed
11	Emerson Point	Completed	24	Catfish Creek	Active
12	Hog Creek	Completed	25	City of Anna Maria Implementation of BMPs	Active
13	Leffis Key	Completed	26	Basin Beach Rd	Active