
LAKE LINDSEY

Citrus/Hernando Waterways Restoration Council



KINGS BAY

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WEEKI WACHEE RIVER


TSALA APOPKA LAKE

Report to the Legislature 2011

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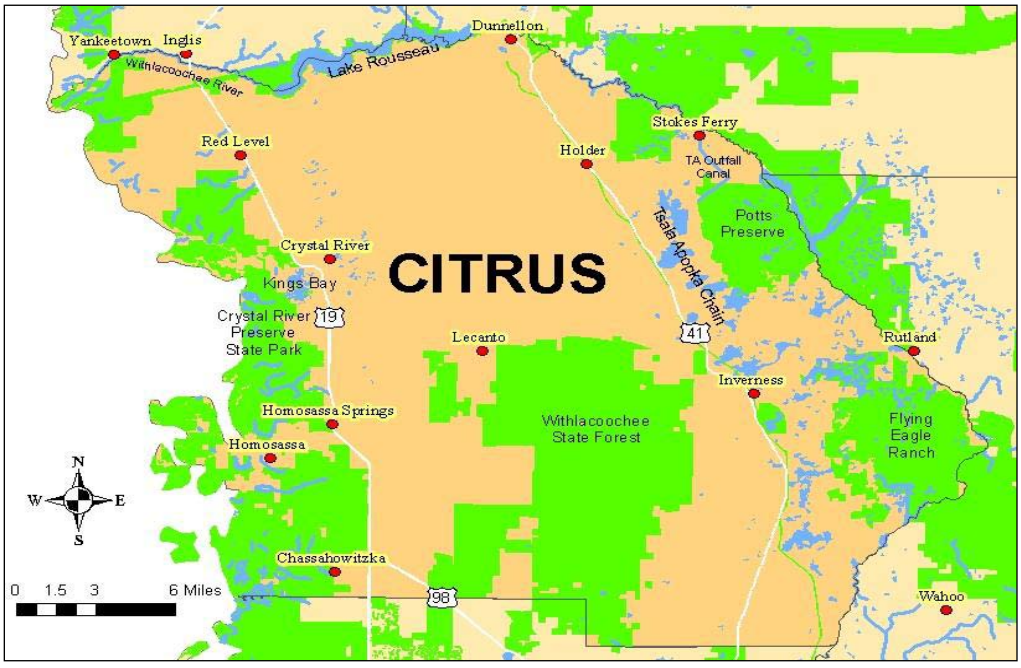
EXECUTIVE SUMMARY

The Florida Legislature passed House Bill 221 and Senate Bill 430 during the 2003 session creating the Citrus/Hernando Waterways Restoration Council (Council) in response to regional concerns for the health of Citrus and Hernando waterways. Provisions of the Legislation required the Council to form two separate County Task Forces to develop plans for the restoration of the Tsala Apopka Chain of Lakes and the Weeki Wachee River and Springs. This legislation was amended in 2006 to expand the focus of the Council and Task Forces to include all waterways within the two counties and to increase the membership of the Council and Technical Advisory Group (TAG). The Council is to develop, review, evaluate and/or recommend plans for lake and river restoration techniques and sport fish population recovery strategies, shoreline restoration, sand and other sediment control and removal, exotic species management, floating tussock management or removal, navigation, water quality, and fish and wildlife habitat improvement. The Legislation also requires that the Council report to the Legislature before November 25 of each year on the progress of the Citrus/Hernando Waterways restoration program and to develop any recommendations for the next fiscal year. This report represents the 2011 plan and recommendations of the Council.

Citrus County

The Council's Citrus County Task Force took public input, received presentations, and discussed shoreline restoration, sediment removal, navigation, water quality, floating tussock removal, and fish and wildlife habitat improvement as they relate to the Tsala Apopka Chain of Lakes, Lake Rousseau, and Crystal River/Kings Bay. The Citrus County Task Force developed goals and objectives and recommended actions for these systems.



Tsala Apopka

Lake Tsala Apopka is the largest freshwater resource in Citrus County. The system is comprised of an interconnected series of vast marshes and open water pools covering nearly 22,000 acres. The lake system is divided into three separate and hydrologically distinct "pools." While these pools are distinct, they are connected with the Withlacoochee River through a vast expanse of marsh lying between the pools and the Withlacoochee River. In 1989, the Withlacoochee River and Lake Tsala Apopka were designated as Outstanding Florida Waters (OFW) by the Florida Department of Environmental Protection (FDEP).

The name "Tsala Apopka" derives from the Seminole Indians and signifies "the lake where bass are eaten." This is an accurate description of the chain that is one of the most significant freshwater fisheries in the state. The fisheries resource, which reflects the health of the lake, is important not only to local residents, but historically supported a secondary economy including bait and tackle shops, guide services, motels and fish camps, which have declined through the years.

Tussock management and sediment accumulation have long been a concern in the Tsala Apopka system. Floating tussocks and organic sediments are excessive and are a fish and wildlife habitat concern because they preclude valuable rooted emergent and native submerged species and affect recreational user access. Increased tussock management and sediment removal activities will benefit the system by improving habitat for fisheries, native aquatic plant life, and recreational use.

Surface water quality in the Lake Tsala Apopka system is generally considered good, supporting a healthy ecosystem. However, increasing trends in nitrogen and phosphorus and gaps in the water quality data network resulted in the Council requesting and receiving funds from the Legislature for water quality monitoring. In 2006, SWFWMD initiated a comprehensive water quality monitoring network in 20 lakes using those funds.

Presently, numerous man-made canals, berms and structures greatly influence hydrologic functioning of the system. These alterations began as far back as the late 1800s and were mostly completed by the 1960s. Current man-made, inter-lake connections and structural features influence lake levels and flows primarily for the benefit of residential development and recreation. Water level goals that target maximum conservation and flood protection do not always provide long-term optimum fish and wildlife habitats, which are naturally dynamic involving benefits from both natural floods and droughts. Natural as well as artificial manipulation of water levels can also influence water quality and marsh vegetative communities. Before any permanent hydrologic reconnections can be made between Tsala Apopka and the Withlacoochee River, it is imperative that agencies gain a better understanding of not only how water historically moved through the system but what happens when these connections are restored, as many of these alterations serve as flood protection.

Historically, the marsh system between Tsala Apopka and the Withlacoochee River was principally comprised of emergent vegetation and lacked the “shrubby” component seen today. In the last 30 years, there has been an increase in woody/shrubby vegetation. The exclusion of deep penetrating fires and water level stabilization appear to be two factors influencing the change in the vegetative communities in the lake and marsh systems.

The Citrus County Task Force developed goals and objectives as well as recommendations for the Tsala Apopka Chain of Lakes to:

- Improve fisheries habitat and recreational user access;
- Maintain or improve water quality;
- Restore historic connections between the lakes and the Withlacoochee River to the greatest extent practicable; and
- Improve marsh habitat between the Tsala Apopka Chain of Lakes and the Withlacoochee River to encourage emergent herbaceous plants.

Crystal River/Kings Bay

Crystal River/Kings Bay is a complex network of more than 30 springs. The discharge from this first magnitude spring system accounts for 99 percent of the fresh water entering the 600-acre Kings Bay. Crystal River/Kings Bay is Florida's second largest spring system, discharging more than 975 cubic feet of water per second. Crystal River, which emerges from the northwest end of Kings Bay, travels westward approximately six miles before entering the Gulf of Mexico.

Recognizing the need to provide some protection of the waters, the state designated Crystal River/Kings Bay as an OFW in 1983. In 1988, SWFWMD designated the area as a Surface Water Improvement and Management (SWIM) Priority Water Body.

The 2000 Crystal River/Kings Bay SWIM Plan established the following goals: to achieve and maintain water clarity that will provide an annual average horizontal Secchi reading of 45 feet; to stabilize or remove the sediment from areas which have been demonstrated to contribute to reduced water clarity as a result of sediment resuspension; to re-vegetate denuded areas with desirable submerged aquatic vegetation; and restore vital aquatic habitat.

The Citrus County Division of Aquatic Services administered an aquatic plant control program which was designed to maintain navigation in canals and areas of highest use by recreational boaters. From October 2010 through July 2011, the County treated a total of 77 acres within Crystal River at a cost of $61,725.

Members of the Citrus County Task Force participated in meetings and heard public comments on the issues, concerns and needs of Kings Bay by various members of the public as well as interest groups including but not limited to the Crystal River Waterfronts Advisory Board and the Kings Bay Working Group. *Lyngbya*, nutrients, bottom sediments/detritus, brackish water intrusion and spring flow were identified to the Task Force as some of the major issues associated with Kings Bay.

The Citrus County Task Force heard a presentation by the Amy H. Remley Foundation on water quality degradation and nutrient loading to Kings Bay. A literature review, along with examination of aerial survey data and known geologic features, suggested locations of possible bedrock fracture sets in the region with inferred connections to groundwater flow. The investigation identified two possible major underground tributary flows to the river system, and may partially explain the variation in salinity data from different spring vents across the Bay.

SWFWMD, through its SWIM program for 2010 and 2011, is funding a study by the University of South Florida to examine sources of water contributing elevated nutrient concentrations to Kings Bay. The project will be completed in 2012. Results from the study will be used to prioritize management actions to reduce nitrate in spring discharge. Results may also contribute to truthing groundwater tributary paths suggested by the work of the Amy H. Remley Foundation.

Due to the severity of our concern for this, the Citrus County Task Force voted on September 14, 2009 to maintain Kings Bay as an agenda item to keep this issue under review, and to monitor and encourage progress towards effective protection of water quality in this OFW.

Lake Rousseau

Lake Rousseau is a man-made 4,163-acre impoundment of the Withlacoochee River formed by the construction of the Inglis Dam by the Florida Power Corporation in 1909. In the past, the system experienced many of the problems associated with a reservoir including excessive aquatic plant growth, algal blooms, lowered dissolved oxygen, and accumulated bottom sediments. In 1982 the Lake Rousseau State Recreation Area was designated an OFW.

Recent studies, however, have shown that Lake Rousseau's water quality is good and is comparable to other regional lakes. The system appears to be driven by spring outflows from Rainbow River (Blue Run) and the input of tannin stained water from the Withlacoochee River. Fish populations in Lake Rousseau are well into recovery. 2008 and 2009 electrofishing samples show excellent spawning success for bass, and 2010 electrofishing samples indicated that the bass population has stabilized. Natural recovery processes are producing a fishery optimal for this system. Since 1982, continued management of water hyacinth by the Florida Fish and Wildlife Conservation Commission (FFWCC) has resulted in a decrease in coverage from a maximum of 325 acres in 1984 to 0.1 acres in 2009 and active management of water lettuce has resulted in a decrease in coverage from a maximum of 586 acres in 1991 to 48 acres in 2009.

Hernando County

The Council's Hernando County Task Force took public input, received presentations, and discussed shoreline restoration, sediment removal, navigation, water quality, floating tussock removal, and fish and wildlife habitat improvement as they relate to Lake Lindsey, the Weeki Wachee River, Mountain Lake and Hunters Lake. The Hernando County Task Force developed restoration recommendations for these systems.



Lake Lindsey

Lake Lindsey, comprising approximately 137 acres, is located in Hernando County, Florida. The land adjacent to the northern and eastern shore of Lake Lindsey is made up of mostly single-family homes and a church. The land on the southern and western shore is owned by

the U.S. Department of Agriculture and the University of South Florida. There is a public boat ramp on the eastern side of the lake.

Stabilized water levels, exotic vegetation, and development on properties adjacent to Lake Lindsey have contributed to an increase of organic material (muck) deposition. Tussock formations on the southern and northern shores are problematic as well. The resulting accumulation of muck, formation of tussocks, and the encroachment of invasive vegetation on the lake necessitate its removal to enhance the quality of aquatic habitat for fish and wildlife. The organic material associated with tussocks and the encroachment of invasive plants reduces dissolved oxygen levels during decomposition, increases turbidity, promotes more tussock formation, impedes the successful growth of desirable native plants beneficial to fish and wildlife, impedes the successful spawning and recruitment of native fish species, and replaces valuable fish and wildlife habitat. In summer 2010 a small tussock removal project was proposed, implemented and completed by the FFWCC's Aquatic Habitat Resource Enhancement Section (AHRES). A total of 19 acres of tussock/spatterdock material was mechanically harvested for a cost of just under $50,000.00 and disposed of in borrow pits on nearby Chinsegut Wildlife Management Area.

Weeki Wachee River

The Seminole Indians named the Weeki Wachee River, which translates to "winding waters." This spring-fed river is located in southwestern Hernando County, where it flows approximately seven and one-half miles from its headspring to the Gulf of Mexico. Recognizing the need to provide some protection of the waters, the state designated the Weeki Wachee River as an OFW in 2003.

The headspring of the Weeki Wachee River discharges some of the clearest water in the world, and the Weeki Wachee River itself contains a healthy mixture of freshwater, estuarine and saltwater species of fish. The Weeki Wachee River is heavily used for recreation, especially in the summer and early fall. Approximately 30 percent of the Weeki Wachee River's shoreline is altered for waterfront housing, and most waterfront residents use the Weeki Wachee River for swimming, boating and fishing. Two boat ramps and a county park allow public access to the Weeki Wachee River. Shoreline alterations have allowed sand to accumulate within the Weeki Wachee River bed. The sand accumulation at times creates a navigational risk to the public and has altered/smothered natural riverine habitat and river bed contours.

Mountain Lake

Mountain Lake, a 127 acre public lake located near Spring Lake and once popular with local anglers, has been dry for several years because of a sinkhole and dewatering from drought conditions. Approximately three acres of water remain in the center of the lake basin with the remainder being vegetated with dog fennel, Para grasses, and other invasive terrestrial species common to disturbed or dewatered areas.

Hunters Lake

Hunters Lake, 302 acres, is located in the Spring Hill urbanized area of Hernando County. The lake is served by a public boat ramp and has provided a major recreational facility for the area. Access to the lake from the boat ramp has become impassable because of the increase of organic material (muck) in the channel and by reduced water levels due to drought. In 2009 the boat ramp parking area was closed to the public for safety reasons and to reduce vandalism. There has also been considerable tussock formation and encroachment of invasive vegetation surrounding the lake. The isolating channel surrounding the Audubon Society bird sanctuary has been compromised by bridging tussocks and invasive vegetation.

Several lakes within the county that once supported robust recreational opportunities for fishing and boating have become unusable due to the build-up of sediments, and proliferation of non-native plants. Therefore, the Hernando County Task Force recommended that three of the larger lakes in the county be restored for the purpose of improving the fisheries habitat and the Weeki Wachee River have sediment removed to restore fish and wildlife habitat and improve navigation.

Restoration Council Recommendations

The Council, both by itself and through its two component Task Forces, reviewed previous studies and reports done on several waterways within each county. The Council established that of the eight restoration issues identified in the enacting legislation, its primary objectives for the identified waterways are:

- fish and wildlife habitat improvement,
- water quality improvement, and
- organic sediment/sand removal

Priority Projects for the Citrus/Hernando Waterways Restoration Council

Project	County	2012 Legislative Funding Request	Details	Project Partner(s)
Kings Bay Restoration Initiative Phase I	Citrus	$250,000	Restoration Plan	TBD
Kings Bay Restoration Initiative Phase II	Citrus	$3,500,000	Pilot-Scale Sediment Removal	TBD
Point Lonesome Harvesting Phase I	Citrus	$150,000	Design and Permitting of Tussock Removal	FFWCC
Inverness and Hernando Pools Hydrologic Reconnection Feasibility and Alternatives Analysis	Citrus	$250,000	Hydrologic Reconnection Study	SWFWMD
Lake Lindsey Habitat Restoration	Hernando	$100,000	Hydraulic Dredging	FFWCC
Weeki Wachee River Fish and Wildlife Habitat Restoration	Hernando	$100,000	Hydraulic Dredging	FDEP and FFWCC
Mountain Lake Fish and Wildlife Habitat Restoration	Hernando	$100,000	Herbicide Treatment and Scraping	FFWCC and Hernando County
Hunters Lake Habitat Restoration	Hernando	$100,000	Organic Sediment Dredging and Tussock Removal	FFWCC and Hernando County
Total		**$4,550,000**		

CITRUS/HERNANDO WATERWAYS RESTORATION COUNCIL

Enacting Legislation

During the 2003 Florida Legislative Session, Chapter 2003-287, Laws of Florida was passed creating the Council. During the 2006 session, the Legislature revised the previous legislation by passing House Bill 341 and Senate Bill 496. The new language revised the membership, powers and duties of the Council. The Legislature, through the Act, required the following:

Representation

The act required the establishment of the Council. The Council consists of fourteen voting members as follows: two waterfront property owners from each county with one from each side of the county, an attorney from each county, a member from the Board of Directors of the Chamber of Commerce from each county, an environmental engineer from each county, an engineer from each county, and a person from each county with training in biology or another scientific discipline. Seven of the Council members are appointed by the President of the Senate and seven are appointed by the Speaker of the House of Representatives. The Council members from each county form two separate County Task Forces. In addition, an advisory group to each task force was formed. Members to the advisory group include a member of the FFWCC, FDEP, SWFWMD, Florida Department of Transportation (FDOT), County Public Works, and the United States Army Corps of Engineers (USACOE). All have training in biology or other scientific disciplines.

Table 1. Citrus/Hernando Waterways Restoration Council Members

Mr. Robert Christensen	Citrus County Task Force
Mrs. Sandra Clodwick	Citrus County Task Force
Mr. Michael Czerwinski	Citrus County Task Force
Mr. Al Grubman	Citrus County Task Force
Mr. Eric Latimer	Citrus County Task Force
Mr. Mike Moberley	Citrus County Task Force
Mr. Wayne Sawyer	Citrus County Task Force
Mr. James E. Adkins	Hernando County Task Force
Vacant	Hernando County Task Force
Mr. Charles H. Miller	Hernando County Task Force
Mr. Charles W. “Chuck” Morton	Hernando County Task Force
Mr. Nicholas Nicholson	Hernando County Task Force
Mr. Norman S. Pallot	Hernando County Task Force
Mr. James L. Polk	Hernando County Task Force

Table 2. Technical Advisory Group Members

Mr. Allen Martin	FFWCC
Mr. Paul W. Thomas	FFWCC
Mr. John Burnett	Hernando County
Mr. Mark Edwards	Citrus County
Colonel Alfred A. Pantano, Jr.	USACOE
Ms. Katasha Cornwell	FDOT
Mr. Chris Anastasiou	FDEP
Ms. Judy Ashton	FDEP
Mr. Philip Rhinesmith	SWFWMD
Mr. Chris Zajac	SWFWMD

Table 3. Southwest Florida Water Management District Administrative Support

Mark Hammond
Jennifer Noland
Veronica Craw
Mark Rials

Duties and Responsibilities

Chapter 2003-287 (amended) specifically charged the Council with the following powers and duties:

1. **Restoration Issues:** Review audits and all data specifically related to lake and river restoration techniques and sport fish population recovery strategies, including strategies for shoreline restoration, sand and other sediment control and removal, exotic species management, floating tussock management or removal, navigation, water quality, and fish and wildlife habitat improvement.

2. **Evaluate Existing Studies:** Evaluate whether additional studies are needed.

3. **Funding:** Explore all possible sources of funding to conduct the restoration activities.

4. **Report to Legislature:** Report to the Speaker of the House of Representatives and the President of the Senate before November 25 of each year on the progress of the program and any recommendations for the next fiscal year.

A copy of the enacting legislation is provided in Appendix A.

Progress of Restoration Program

The Council and its component Task Forces have been meeting on a regular basis since August 16, 2004. Each Task Force along with the respective TAG, met on a regular basis to take public input, receive presentations, and discuss shoreline restoration, sand and other sediment control and removal, floating tussock management or removal, navigation, water quality, and fish and wildlife habitat improvement as they relate to their respective counties. The Council's recommendations are intended to complement and enhance ongoing efforts by the FFWCC, FDEP, Citrus County, Hernando County, and SWFWMD as they relate to the Citrus/Hernando Waterways.

CITRUS COUNTY TASK FORCE RECOMMENDATIONS TO THE LEGISLATURE

Introduction

Citrus County is home to a wealth of outstanding and unique water resources that are both ecologically diverse and economically valuable. In order to maintain and/or improve the existing values of these waters, management actions are necessary. Currently, the Tsala Apopka Chain of Lakes, Kings Bay, and Lake Rousseau are all in need of management intervention. The Citrus County Task Force (CCTF) Recommendations report (Report) provides the background and basis for strategies and recommendations for improvements to each of these three water bodies. The Report addresses the four primary management goals adopted by the CCTF. These goals include improvements to: fish and wildlife habitats and navigation, water quality, restoration of hydrologic conveyances, and vegetation in marshes connecting the Tsala Apopka Chain of Lakes to the Withlacoochee River. The Reports emphasis is on fish and wildlife habitats and recreational navigation, water quality and surrounding natural systems.

The Tsala Apopka Chain of Lakes is the largest freshwater resource in Citrus County. The system is comprised of an interconnected series of freshwater marshes and open water pools covering nearly 22,000 acres. Lake Rousseau is an impounded reservoir of the Withlacoochee River that lies between Dunnellon and Inglis. This popular fishing lake, which is approximately 12 miles long and one mile wide, was created in the 1920s when the Withlacoochee River was dammed. Kings Bay is one of the highest discharge spring systems in Florida and forms the headwaters of the Crystal River. The bay is home to the largest wintering population of West Indian manatees on the west coast and attracts tourists from around the world.

Over the last seven years, the CCTF met on a regularly scheduled basis to take public input, review potential restoration projects, receive presentations, and discuss shoreline restoration, sediment removal, habitat management, navigation, water quality, floating tussock removal, and fish and wildlife habitat improvement. In 2005, the CCTF adopted a set of goals and objectives as a means to chart a course of action.

Goals

- Improve fisheries habitat and recreational user access;
- Maintain or improve water quality;
- Restore historic connections between lakes and the Withlacoochee River to the greatest extent practicable;
- Improve marsh habitat between the Tsala Apopka Chain of Lakes and the Withlacoochee River to encourage emergent herbaceous plants.

The CCTF, with extensive public input, placed priority on restoration of fish and wildlife habitat and recreational user access/navigation. Water quality, water level fluctuations and conveyance of water through marshes are all components of optimum fish and wildlife habitats; thus the critical need for goal integration involved in planning long-term management of Tsala Apopka Chain of Lakes.

Improve Fisheries Habitat and Recreational User Access

One of the primary goals and objectives of the CCTF is to improve fisheries habitat and recreational user access by controlling aquatic vegetation, reducing floating tussocks and removing accumulated bottom sediments that impact fish and wildlife habitat.

Kings Bay Background

Since 2009, increasing focus was placed upon water quality and habitat degradation in Kings Bay. Members of the Task Force participated in a joint meeting with the Kings Bay Working Group and the Crystal River Waterfronts Advisory Board in 2011 to hear about ongoing studies and needs in Kings Bay.

Kings Bay is an OFW, Federally Designated Critical Habitat for the West Indian Manatee, and a Manatee Refuge. The system continues to support an increasingly large population of wintering and a smaller number of year-round resident manatees as well as a wide variety of recreational uses, all of which are critical to the economy of Crystal River, Citrus County, and the Nature Coast. Over the past few decades, Kings Bay has experienced a significant degradation in water quality and water clarity, a significant reduction in the beneficial aquatic vegetation necessary to support good water quality, an increase in undesirable filamentous algae, namely *Lyngbya*, and an accumulation of mucky and detrital sediments. These changes are detrimental to both the Kings Bay ecosystem and the tourism industry it supports. Therefore, the CCTF of the Citrus-Hernando Waterways Restoration Council supports efforts to restore Kings Bay.

Degradation of water quality within Kings Bay is driven largely by nutrient enrichment of groundwater within its springshed, the area of land that contributes flow to a spring through groundwater recharge. Numerous studies have demonstrated links between nutrient enrichment and increases in *Lyngbya* algae. Thus, any strategy to restore Kings Bay should include provisions addressing the reduction of nutrient enrichment of the groundwater of its springshed.

Kings Bay Restoration Initiative

The CCTF supports development of a “Kings Bay Habitat Restoration Plan” to restore habitat and water quality by removing accumulated sediments, restoring closed spring vents, planting desirable submersed and shoreline aquatic vegetation, and increasing flushing or flow through the system. Such a plan would include a long-term maintenance and monitoring program. The Kings Bay Restoration Plan would be developed and executed in three phases:

- Phase I - Planning
- Phase II - Design, Permitting, and Pilot Project
- Phase III - Full Scale Restoration

Implementing the plan from start to finish will take an estimated 10-15 years. The first two phases, which are proposed for funding in this report, will cost an estimated $1.2-$3.75 million dollars and take 2-4.5 years to complete. The initiation of Phase II can be expedited so that it overlaps the completion of Phase I. Phase III, whose costs and timing are dependent on the results of Phases I and II, will be proposed for funding at a later date. Phases I and II are described below.

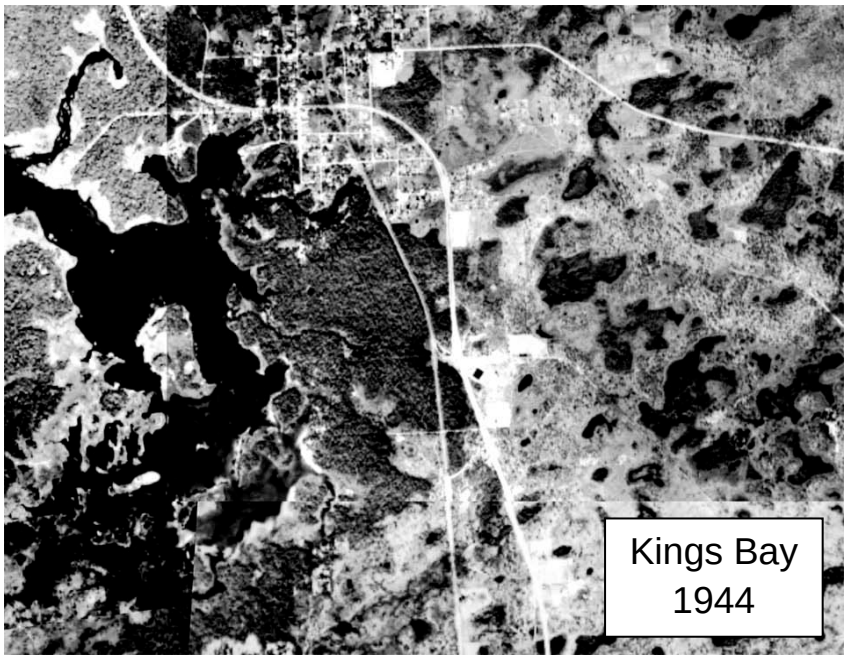
Phase I (12-18 months; estimated cost $200,000-$250,000)

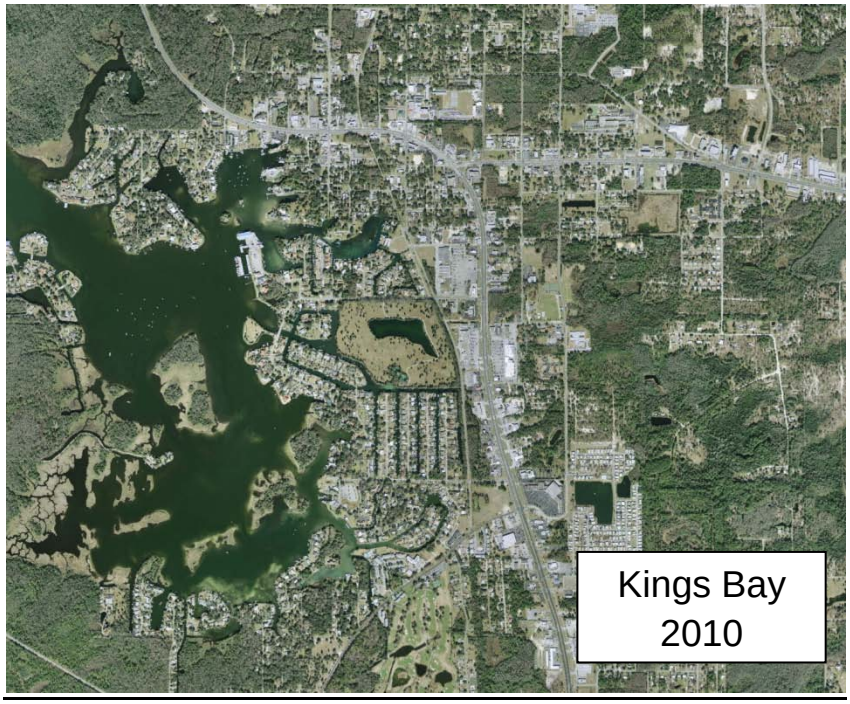
- Develop Restoration Plan
    - Review and incorporate existing MFL study information including bathymetry
    - Conduct sediment study
    - Develop *Lyngbya* treatment and control scenarios
    - Enhance *Hydrilla* control plan
    - Indentify conceptual submerged aquatic vegetation and shoreline treatment plans
    - Identify remaining stormwater inputs
    - Develop nutrient control study
    - Perform preliminary engineering design
    - Identify sediment disposal site(s)
- Develop agency coordination/funding partners
- Identify pilot project location and phasing
- Draft permit applications
- Hold public informational meetings as needed as part of the regularly scheduled CCTF meetings

Phase II (anticipated 12-36 months; cost developed during Phase I; preliminary estimate of cost is $1-$3.5 million, depending on size and scope)

- Complete final engineering design and permitting
- Finalize disposal sites, including agreements with landowners
- Conduct/implement pilot project
    - Sediment removal
    - Manatee exclusionary (submarine) fence
    - Rip-rap/hardened shoreline treatments
    - Submerged aquatic vegetation and shoreline vegetation plantings
- Generate Pilot Study Results Report-modify plan as necessary
- Hold public informational meetings as needed as part of the regularly scheduled CCTF meetings

It is anticipated that Phase II would begin in summer 2013.





Tsala Apopka Background

Tussock management and sediment accumulation have long been a concern in the Tsala Apopka Chain of Lakes. The Tsala Apopka Chain of Lakes Management Plan, funded by SWFWMD and Citrus County and completed by the University of Florida in 1999, recommended that aquatic vegetation control be increased to maintain navigation and improve fish habitat. The report also recommended removing muck/sediments to improve the presence of desirable native aquatic plants and thereby improve fish and wildlife habitat. Floating vegetation may

become dense and form a tussock; and vast acreages of dense *Hydrilla* contribute greatly to organic material within lakes. The CCTF performance measure is for the tussocks to occupy less than 10 percent of the open water inside the littoral zone and to increase the desirable littoral emergent/submerged aquatic vegetation to 30-50 percent native species.

In this system, floating tussocks and organic sediments are excessive and plans to reduce them are warranted. Extensive tussocks in marsh areas are a fish and wildlife habitat concern because they physically preclude valuable rooted emergent and native submerged species. Tussocks in open water lake areas are both habitat and navigation management issues.

One of the best ways to reduce future tussocks during drought is to be proactive by reducing their "nursery" or "grow out" areas and the organic detritus upon which the plants thrive and by replacing these areas with more desirable herbaceous emergent vegetation. Removal of these sediments during drought periods, when shoreline sediments are exposed, can be done more cost effectively and with little, if any, water quality concerns. These droughts present an opportunity to derive a great public benefit and one which has been a missed opportunity over the past few years of drought. The CCTF discussed the creation of a standardized permit program which would provide an expedited general permit for larger sediment/detritus removal programs when such sediments are exposed and the impacts expected to be minimal.

Citrus County and FFWCC are currently involved in tussock management and sediment removal activities in the Tsala Apopka Chain of Lakes. The County and FFWCC collaborated to address tussocks that interfere with navigation as part of the designated trail maintenance program. The Citrus County Division of Aquatic Services administered an aquatic plant control program funded by FFWCC which is designed to maintain navigation in canals and areas of highest use by recreational boaters. From October 2010 through September 2011, the County controlled a total of 2,111 acres of vegetation within the Tsala Apopka Chain of Lakes at a cost of $1,653,949.

FFWCC has harvested tussocks and scraped sediments in several areas where measurable fish and wildlife benefits could be expected. Increased tussock management and sediment removal activities in the Tsala Apopka Chain of Lakes will benefit the system by improving habitat for fisheries, native aquatic plant life, and recreational use. The additional tussock management and sediment removal activities recommended by the CCTF involve a more comprehensive and system-wide restoration program for the lakes in the three main pools. These actions are in addition to and complement the current activities conducted by Citrus County and FFWCC listed above.

The FFWCC completed a diagnostic study to map and quantify the acreage of tussocks and volume of sediment for each lake. Information obtained was used by a diverse group of FFWCC biologists, specializing in various fish and wildlife species, to prioritize specific lakes and locations within lakes for projects including tussock harvesting and dredging that would have potential benefits to fish and wildlife habitat. Sediment bathymetric mapping and the characterization component of the diagnostic effort provided the basis for prioritizing littoral shelf or deep lake locations, project scope, and disposal options. It was intended that sediment mapping and characterization within the near shore littoral zones will facilitate future (near shore detrital sediment removal) permitting and encourage less costly, non-hydraulic near shore sediment removal during drought/drawdown conditions.

Point Lonesome Harvesting

Point Lonesome Lake has organic sediments thicker than three feet in many deeper areas but a firmer bottom in shallow areas which are periodically exposed to drying conditions during severe droughts. The intent of this proposed project is to mechanically remove floating tussocks, primarily from deeper, central, previously open water portions of the lake.

Approximately 80-100 acres of floating tussock material is recommended to be removed from the central portion of the lake via mechanical harvester and deposited in an upland disposal site. Deep littoral areas and water fluctuation zones would be targeted. Due to the nature of the project and the time needed to complete it, the project has been phased as outlined below:

Phase I - $150,000

- Permits
- Survey/Engineering
- Secure disposal site (*cost could be substantially higher if potential adjacent disposal site is not secured*)

Phase II - $850,000 to $3,000,000

- Harvesting and disposal of tussock material *(cost dependent on location of the disposal site)*



<u>Lake Rousseau Background</u>

Lake Rousseau is one of the oldest impounded lakes in Florida, formed when the dam in Inglis was completed by the US Department of the Army in 1909 to provide electric power for equipment in the then thriving phosphate business. The lake is fed by the Withlacoochee and Rainbow Rivers and encompasses approximately 4,000 acres. It is 12 miles long and 1 mile wide at its widest boundaries.

Reservoir conditions change dramatically based on the percentage of water input from the Rainbow and Withlacoochee Rivers as determined by rainfall. During times of low rainfall, water entering the reservoir comes primarily from the clear, spring fed Rainbow River, resulting in very clear reservoir water that allows for rapid growth of submersed aquatic vegetation. During periods of high rainfall, water entering the reservoir comes primarily from the sometimes dark, tannin stained Withlacoochee River which originates from the Green Swamp. Under these conditions the water in the reservoir can be very dark in color which causes submersed aquatic vegetation to be shaded out and greatly reduced.

Ecologically, the lake is progressing toward a more marsh-like system, characterized at times by excessive aquatic plant growth, accumulated bottom sediments, and poor water circulation. Dense strands of the aquatic weed *Hydrilla* and floating islands of vegetation, called tussocks, can cover large areas of the reservoir. Water quality problems in shallow areas have resulted from shading and reduced circulation caused by the dense aquatic weeds. Flocculent organic sediments have accumulated in the reservoir, adversely affecting water quality and sportfish habitat.

As the first step toward environmental restoration, the CCTF will establish a set of public workshops in 2012 to develop a restoration plan for Lake Rousseau based on a stakeholder process. No funding is requested for this preliminary step.

Maintain or Improve Water Quality

The CCTF identified as a priority to maintain or improve water quality by implementing a water quality monitoring and assessment program and implementing water quality improvement projects as appropriate. The CCTF performance measures are:

Dissolved Oxygen*

- Not < 4.0 mg/l*
- Monthly average >5.0 mg/l *

Nutrients

- Total Nitrogen <0.3 mg/l
- Total Phosphorus <0.04 mg/L

*It is expected that during periods of high rainfall when river and swamp flows reduce dissolved oxygen, this goal may not be achievable.

Water Quality Background

There are currently 20 sampled lakes in the Tsala Apopka Chain of Lakes, 4 sampling sites on Lake Rousseau, 9 sampling sites on the Withlacoochee River, and 8 sampling sites on the Rainbow River. Data collected include temperature, total station depth, Secchi depth or distance (water clarity), clarity as a percentage of total station depth, total nitrogen, total phosphorus, dissolved oxygen, and chlorophyll-a.

The data were collected by several different agencies. Sampling for the Tsala Apopka Chain of Lakes (Tsala Apopka Water Quality Monitoring Network), Withlacoochee River (Stream Water Quality Monitoring Network), and the upstream and downstream entries for Lake Rousseau (Stream Water Quality Monitoring Network) is performed by SWFWMD staff. The Florida Department of Environmental Protection (FDEP) samples Lake Rousseau in the northeast, central, and southwest portions of the impoundment as part of their Total Maximum Daily Load

(TMDL) program, which runs on a 5-year cycle. Florida LAKEWATCH also samples Lake Rousseau, but only when volunteers are available. LAKEWATCH only tests for Secchi depth, total nitrogen, total phosphorus, and chlorophyll-a.

The Florida Trophic State Index was defined in the FDEP's 1996 305(b) report. The Index calculates algal biomass using chlorophyll-a levels, and potential algal growth using total nitrogen and/or phosphorus, the primary limiting nutrients. The result is a number without units that represents a combination of actual and potential primary production in the water column. An increase of ten in the Index represents a doubling of the actual/potential algal biomass. While lower numbers represent better water quality, lake health may be more properly gauged by comparison to natural, historical levels.

Tsala Apopka Chain of Lakes Water Quality Monitoring

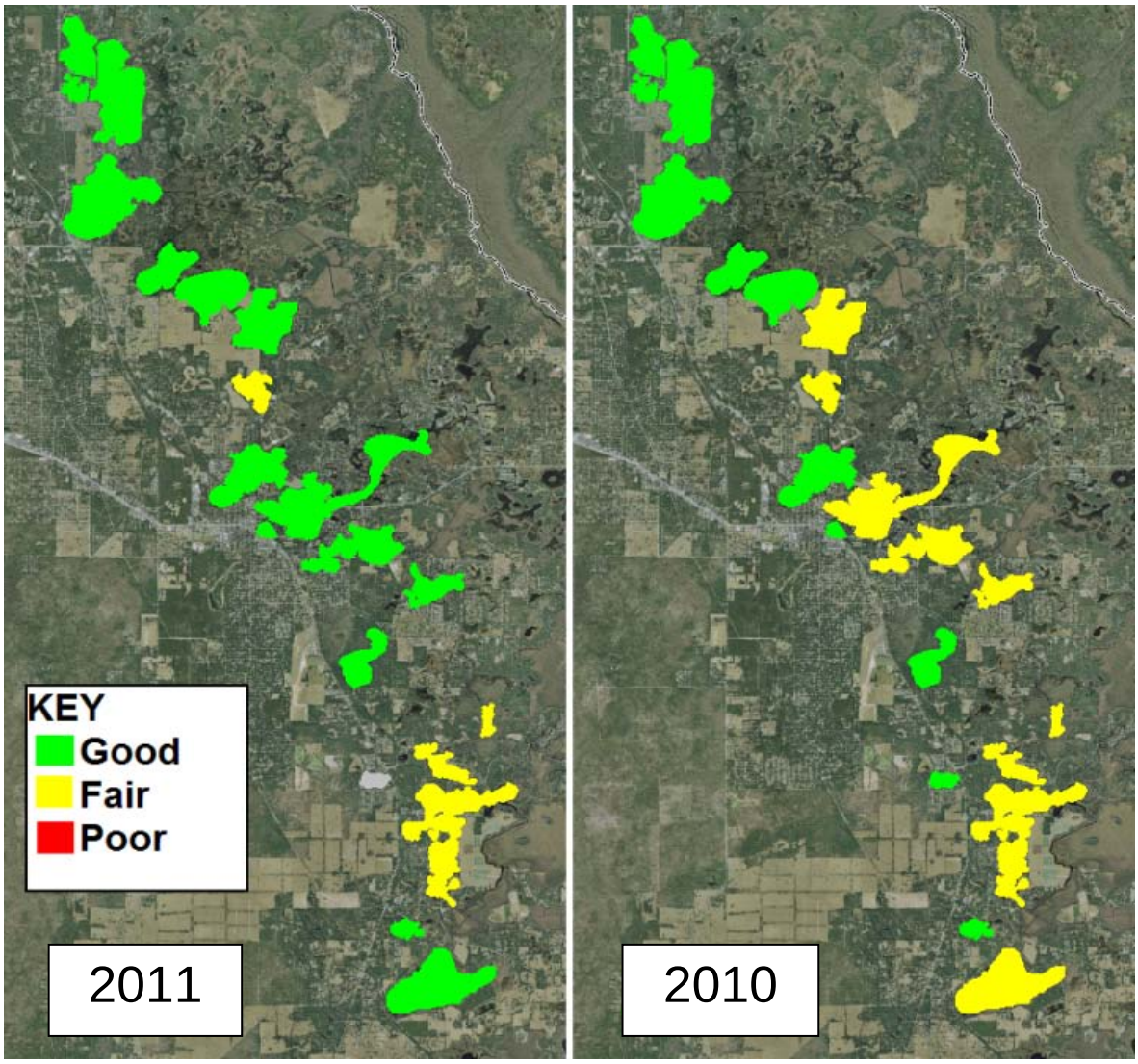
Previous reports and publications have included cursory assessments of water quality. When water quality data in the Tsala Apopka Chain of Lakes is combined into the three distinct systems of the Floral City, Inverness, and Hernando Pools, water quality can be assessed on a larger geographic scale. Therefore, water quality monitoring stations have been established at each of the major lakes within each of the three pools (20 lakes). The purpose of this data is to better quantify the inter-relationship between the river and the lakes of the Tsala Apopka Chain of Lakes. For example, values for water color and dissolved organic matter, indicative of the Withlacoochee River are highest in Floral City Pool and change as water moves north in the lakes through canals and/or through marshes. This influence is governed by rainfall and is relatively short in duration. The knowledge of this relationship is vital to understanding and recommending appropriate alterations to hydrologic conveyances.

Water quality in the Tsala Apopka Chain of Lakes continues to be a defining factor in the natural allure of east Citrus County. Water quality monitoring performed by SWFWMD aids in quantifying the status of waters in the three pools of the Tsala Apopka Chain of Lakes. This sampling is done on a bi-monthly basis and monitors a suite of parameters, including nutrients and suspended solids.

Results of 2011 samplings have been encouraging. The diagrams on the following page display Trophic State Index values for 2010 and 2011. Trophic State Index is a consolidation of nutrient and chlorophyll values that gives a reliable estimate of water clarity and nutrient levels in a water body. All lakes in both years met current state standards for water quality, and 2011 saw marked improvements in water quality, particularly in the Inverness pool.

SWFWMD will continue bi-monthly water quality monitoring in 20 lakes of the Tsala Apopka Chain of Lakes and continue efforts to correlate system-wide hydrology and water quality indicators. SWFWMD, FFWCC, FDOT, and Citrus County will continue to identify water quality improvement projects and implement projects which are feasible. Funding for implementation may come from several sources, including SWFWMD's cooperative funding program, local governments and state grants supported by the CCTF.

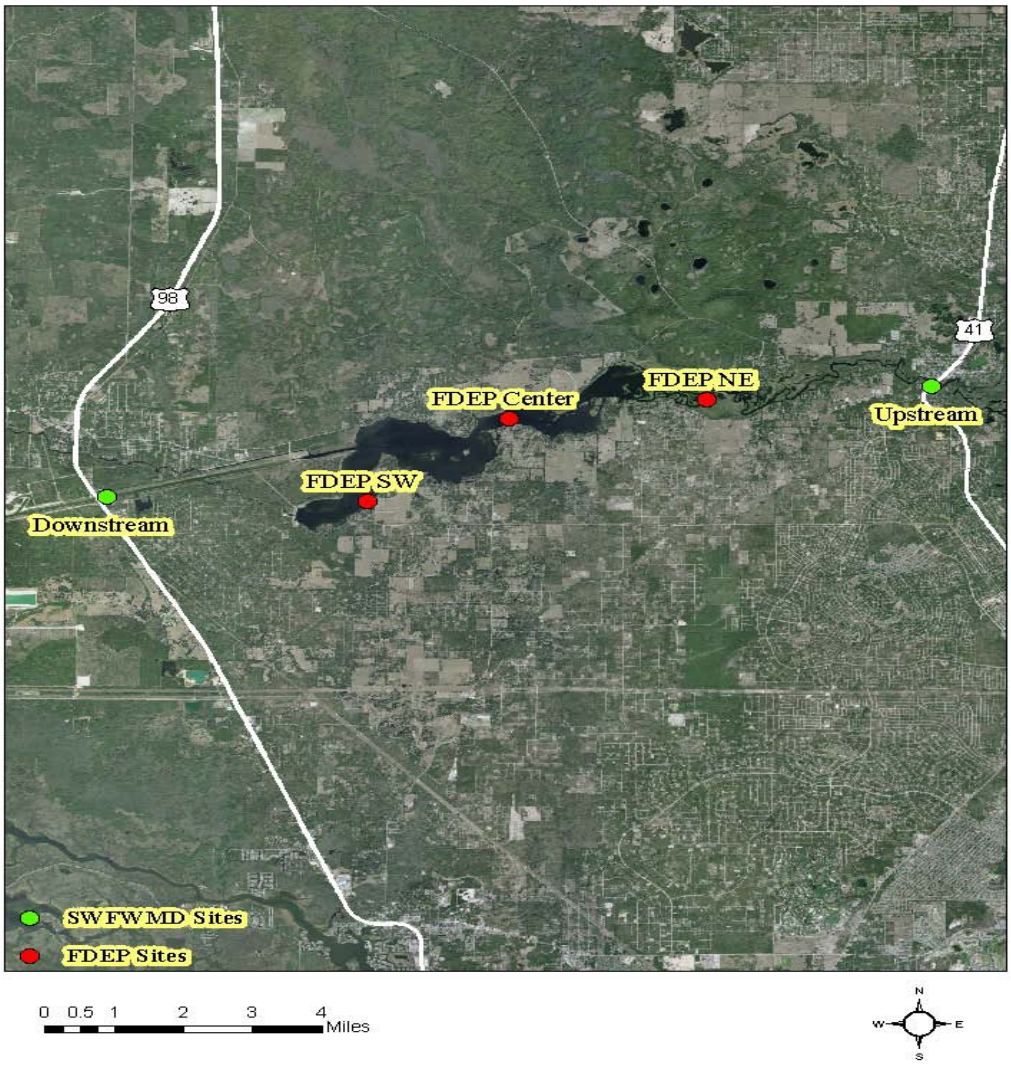
Tsala Apopka Chain of Lakes Trophic State Index



Lake Rousseau Water Quality Monitoring

The water chemistry of Lake Rousseau is strongly influenced by the Withlacoochee and Rainbow rivers, which are the sources of its water. As such, chemistry fluctuates between the wet and dry seasons due to variation in the proportion of water from the Rainbow and Withlacoochee rivers that is delivered to the reservoir. Overall, total nitrogen, total phosphorus, and chlorophyll-a averaged 1.27 mg/L, 0.049 mg/L, and 3.75 ug/L, respectively, in 2010. Using these data, a Trophic State Index (TSI) of 46 was calculated for Lake Rousseau, which means that the lake falls in the moderate range of productivity. However, this TSI value may underestimate productivity, considering the constant inflow of nutrients and the large amount of macrophyte biomass in the reservoir.

LAKE ROUSSEAU WATER QUALITY NETWORK



Restore Historic Connections between Lakes and Withlacoochee River to the Greatest Extent Possible

The CCTF identified the need to restore historic connections between the lakes and the Withlacoochee River to the greatest extent practicable as a goal. Many studies and documents exist on the historic hydrologic conditions of the lake system. A comprehensive investigation identifying historic hydrologic features was completed as part of the USACOE's Withlacoochee River Feasibility Study. A support document entitled "Lake Tsala Apopka Watershed Pre-settlement Surface Water Features and Vegetation" was completed by HDR Engineering Consultants on the hydrologic features and land cover prior to human intervention.

Withlacoochee River Background

Historically there were a total of eight discernable natural connections between the lake and the Withlacoochee River. Depending on the location within the lake system, these connections primarily conveyed water either into the lakes or out of the lakes, but in most all, flow records indicate movement in both directions depending on the Withlacoochee River conditions. The historic conveyances include: the location of the Orange State Canal between Bonnet Lake on the Withlacoochee River to Floral City, the location of the "north/south" berms on the Flying Eagle Property, Dead River/Kettle Island, Moccasin Slough, Long Arm Slough/Potts Preserve, North Turner Camp Road, Sumter/Citrus/Marion County lines and Two-Mile Prairie near Holder. Presently, numerous man-made canals, berms and structures greatly influence the hydrologic functioning of the system. These alterations began as far back as the late 1800s and were generally completed by the 1960s. Current man-made, inter-lake connections and structural features influence lake levels and flows primarily for the benefit of residential development and recreation. Water level goals that target maximum conservation and flood protection do not always provide long-term optimum fish and wildlife habitats, these habitats are naturally dynamic and receive benefits from both natural floods and droughts. Natural fluctuations also influence water quality and marsh vegetative communities.

Options to restore natural systems will be addressed through environmental and engineering analyses, specifically to determine the ability to mimic timing, extent and duration of historic surface water levels.

Several specific restoration projects to address these alterations have been completed by SWFWMD. These include the hydrologic restoration of Long-Arm Slough, Twin Pond Road, and Parsons Point in the Potts Preserve, the removal of 11 fill areas along the western dike road in Potts Preserve, and the installation of culverts along the east/west berm road of SWFWMD's Flying Eagle property (to rehydrate wetlands in the former MacGregor/Smith Boy Scout property). Culverts were installed in September 2007 in the north/south berm in the Flying Eagle property to temporarily reconnect the Floral City Pool with the Withlacoochee River through the Dead River flats and provide additional information on flows into and out of the lake.

Before any additional permanent hydrologic connections can be made between the lake and the Withlacoochee River, it is imperative that agencies gain a better understanding of not only how water historically moved through the system, but what happens when these connections are restored, as many of these alterations serve as flood protection. To achieve this, SWFWMD and FFWCC have committed to fund the Withlacoochee River Watershed Initiative, a multi-year project for the Withlacoochee River Watershed from the Green Swamp to the Gulf of Mexico. The information will be used to address flood protection, natural systems and water supply

issues in the basin which includes the Tsala Apopka Chain of Lakes. The project is scheduled to be complete by spring of 2012.

Inverness and Hernando Pools Hydrologic Reconnection Feasibility and Alternatives Analysis

SWFWMD is nearing completion of a multi-year Withlacoochee River Watershed Initiative. The Withlacoochee River Watershed Initiative will include a feasibility and alternatives analysis of options to restore a more natural hydroperiod in the marshes between the Withlacoochee River and the lakes and the increase the ability to move water through the Tsala Apopka Chain of Lakes.

The alternatives currently under consideration include the following:

1. Restore natural sheet flow across the Flying Eagle WMA currently restricted by the North-South Levy Road.
2. Investigate the culvert sizes and sediment infilling of canals that would restrict the movement of water between pools.
3. Investigate how the current alterations have affected water quality in the Lake.

Upon completion of the surface water modeling which includes the alternatives discussed above, the CCTF requests $250,000 to complete a feasibility and alternatives analysis that addresses alternative methods of moving water from the Withlacoochee River into the Inverness and Hernando Pools of the Tsala Apopka Chain of Lakes to raise levels in these pools. This investigation would explore the ability to move water via natural conveyances and by structural and/or mechanical means.

Improve Marsh Habitat between the Tsala Apopka Chain of Lakes and the Withlacoochee River to Encourage Herbaceous Plants and Improve Habitat

The goal of the CCTF is to improve marsh habitat between the Tsala Apopka Chain of Lakes and the Withlacoochee River and to encourage emergent herbaceous plants. The CCTF performance measure is that the overall hardwood and shrub component of marshes (primarily Carolina willow, red maple, wax myrtle during drought periods) be less than five percent.

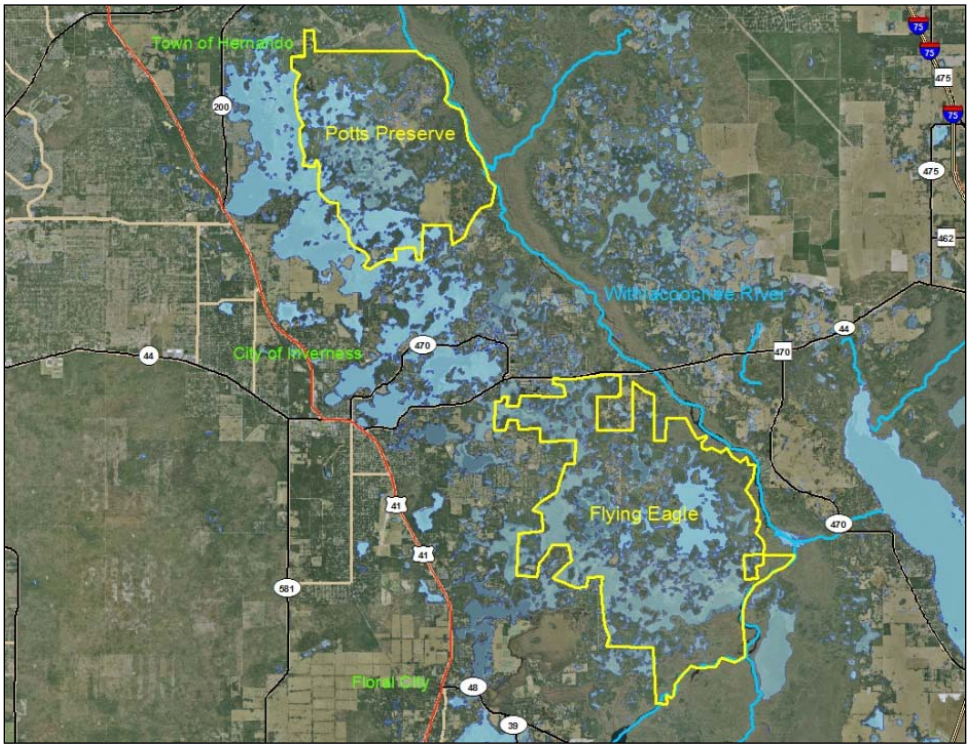
Tsala Apopka Marsh Background

Historically, the Tsala Apopka marsh system was comprised of emergent vegetation and lacked the forested component seen today. In the last 30 years, there has been an increase in woody/shrubby vegetation including species such as red maple, Carolina willow, and wax myrtle. There are two interrelated reasons for this change in vegetative composition in these marshes. The first and most important is the exclusion of deep penetrating fire from these systems and the second is water level stabilization of the lake.

Marsh or wetland fires are different from upland fires. Wetland systems can experience a "surface burn" when there is standing water or the underlying soils are saturated near the surface. In these cases, when the exposed vegetation is able to ignite, a fire will burn off the exposed vegetation, but the roots and the underlying organic sediments are left intact. The sediment or muck layer continues to build up over time and the change in bottom elevation allows different vegetation to dominate. Extreme fire events, those that are typically associated with extreme droughts and occur once in 100 years or more, not only eliminate the above ground vegetation, but also burn off the accumulated organic matter. These are often referred

to as “muck fires" and have been known to burn uncontrolled for years in such places as the Everglades. These events have been suppressed throughout Florida and in the lake system because of the potential harm to humans directly by fire and by the effects of smoke. Because of this, nature's major restoration tool has been eliminated. The selective removal of hardwood species, such as red maple in Flying Eagle, will improve access and recreational opportunities. Furthermore, the use of prescribed fire will assist in maintenance efforts to minimize the increase in woody species.

Much of the marsh interface (Potts Preserve and Flying Eagle) between the lake and the Withlacoochee River is owned by the State and managed by FDEP. SWFWMD, however, has an interest in maintaining the marshes in a natural state as it is vital to the health of the adjacent uplands. SWFWMD closely coordinates prescribed fire in these marshes with the Division of Forestry (the State agency that conducts burning) and the FFWCC. The current burn plan includes all the marshes (sovereign and submerged lands) within the boundaries of these SWFWMD owned lands.



SWFWMD conducted three prescribed burns at Flying Eagle totaling 1,300 acres from February 11, 2011 to February 24, 2011. These were predominantly marsh and good results were obtained. Marsh burns were also recently conducted at Potts Preserve on September 27, 2011 and September 28, 2011 that totaled 736 acres, also with good results.

The stabilization of water levels in the Chain of Lakes has increased the rate of colonization of the marshes by woody species in the lake fringing marshes. Other known alterations that reduce hydroperiods are dewatering activities such as ditching and berming. While it is difficult to determine and quantify exactly how much of this woody vegetation increase is due to dewatering practices, it is well understood how local man-made drainage features (Shinn Ditch) have led to an overall degradation of the system.

Management activities such as prescribed burning and reducing hardwoods would not by themselves necessarily have a benefit to fisheries habitat for the Tsala Apopka Chain of Lakes. An integrated approach to ecosystem management that included the restoration of marsh systems through large-scale improvements to historical flow rates and patterns would maintain optimum fisheries habitat in this typically shallow lake-marsh system. Drought conditions historically fostered the benefits of fire. Findings from the Withlacoochee River Watershed Initiative, including feasibility and alternatives analysis, will improve capability to manage these marshes.

Project Costs

Project	County	2012 Legislative Funding Request	Project Partner
Kings Bay Restoration Initiative Phase I	Citrus	$250,000	TBD
Kings Bay Restoration Initiative Phase II	Citrus	$3,500,000	TBD
Point Lonesome Harvesting Phase I	Citrus	$150,000	FFWCC
Inverness and Hernando Pools Hydrologic Reconnection Feasibility and Alternatives Analysis	Citrus	$250,000	SWFWMD
Total		**$4,150,000**	

Agency Accomplishments Consistent with Citrus County Task Force Mission

Gospel Island Harvesting (FFWCC and Citrus County)

Extensive floating tussock acreage can physically smother and/or shade and eliminate rooted emergent littoral species, block or inhibit water flow, and create vast areas of high biological oxygen demand and low dissolved oxygen. The intent of this project is to mechanically remove floating tussocks at a site adjacent to Gospel Island Road.

The work area covers approximately 65 acres. Approximately 10 acres of floating tussock material is present within this area. The floating tussock material will be removed from the site via mechanical harvesting and deposited in an upland disposal site. Harvesting is preferred over herbicide spraying in this situation because tussocks have a thick mud base which would persist and facilitate tussock reformation. Harvesting and removal is preferred over cookie-cutting because adding shredded tussock material to limnetic and littoral substrate is undesirable. Harvesting will be conducted in late fall of the year in order to minimize effects on nesting birds.

Estimated cost of initial harvesting and site maintenance for two additional years is $96,000. FFWCC Aquatic Habitat Restoration/Enhancement Section and Citrus County Aquatic Services will each provide $48,000 to fund the project.



Lake Spivey Enhancement (FFWCC and Citrus County)

Lake Spivey is located in the Inverness Pool of the Tsala Apopka Chain of Lakes. The lake has an open water central portion and an extensive littoral zone in coves located primarily on the west, north, and east sides of the lake. Historically, aquatic vegetation consisted primarily of maidencane, spatterdock, bladderwort, and coontail. These aquatic plants are considered valuable fish and wildlife habitat. The lake has unconsolidated organic sediments thicker than one meter in many deeper areas, but a firmer bottom in shallow areas which are periodically exposed to drying conditions during severe droughts. Subsequent to the 2001 drought, tussock formation greatly increased in Tsala Apopka Chain of Lakes as they refilled. Extensive coverage by floating tussocks can significantly alter shoreline plant communities by killing littoral species through blocking of photosynthetic activity and blocking or inhibiting water flow. It can also create areas of high biological oxygen demand and low dissolved oxygen with subsequent deleterious effect on fish and wildlife typically associated with rooted aquatic vegetation communities.

Approximately 12 acres of floating tussock material were removed from coves on the east side of the lake via mechanical harvester and deposited in an upland disposal site (Figure 1). The coves, which were completely covered with vegetation that limited water flow and made them inaccessible, now consist of a mix of open water and emergent vegetation including maidencane, lily pads, cattails, willows, etc. (Figures 2 and 3). The habitat improvements should benefit multiple fish and wildlife species including sportfish, waterfowl, and wading birds.

Initial harvesting was completed in December 2010 at a cost of $97,554 with FFWCC Aquatic Habitat Restoration/Enhancement Section (AHRES) and Citrus County Aquatics each providing $48,777 for the project. Citrus County Aquatics then funded two days of “clean up” harvesting in January 2011 and additional selective herbicide treatment of willows and cattails directed by FFWCC Division of Freshwater Fisheries Management, AHRES, and Invasive Plant Management Section staff.

The largemouth bass population was sampled three months after restoration on March 1, 2011, to determine immigration into the harvested areas. No prior population data is available as the restored areas were inaccessible for electrofishing, and the area was considered uninhabitable for largemouth bass. A comparison of spring 2011 data between the restored areas and two adjoining lakes revealed similar catch estimates, showing largemouth bass migration into the newly created habitat.

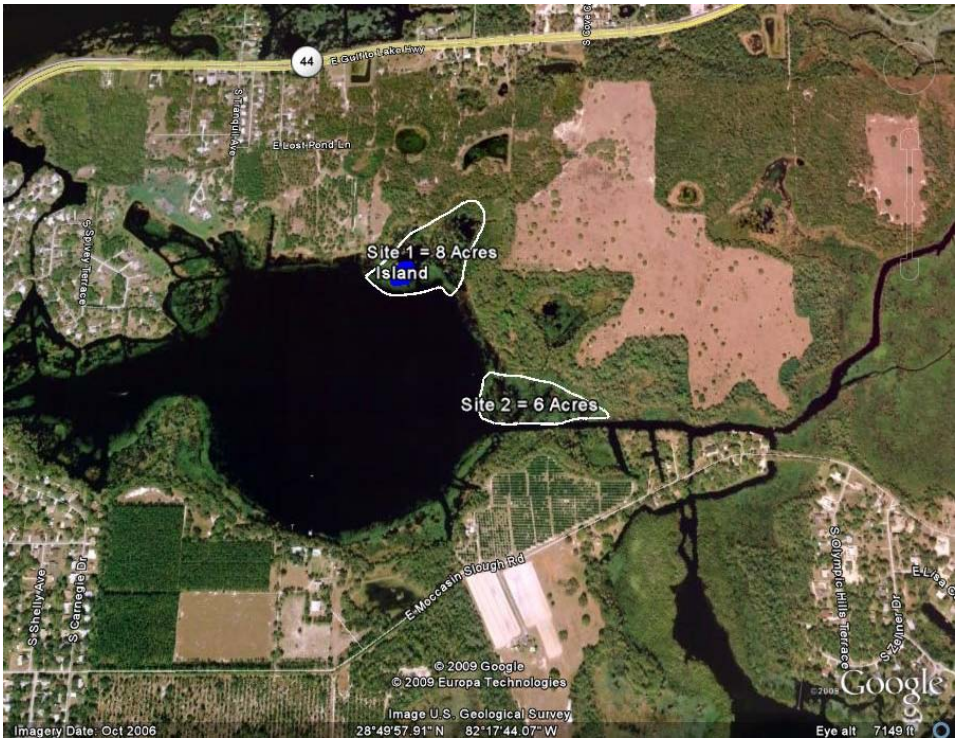


Figure 1. Location of Lake Spivey enhancement project sites, Citrus County, Florida.



Figure 2. Spivey Lake habitat before and after habitat enhancement.



Figure 3. Aerial photos of the Lake Spivey project sites before and after a habitat enhancement project.

Inverness Pool Creel Survey (FFWCC)

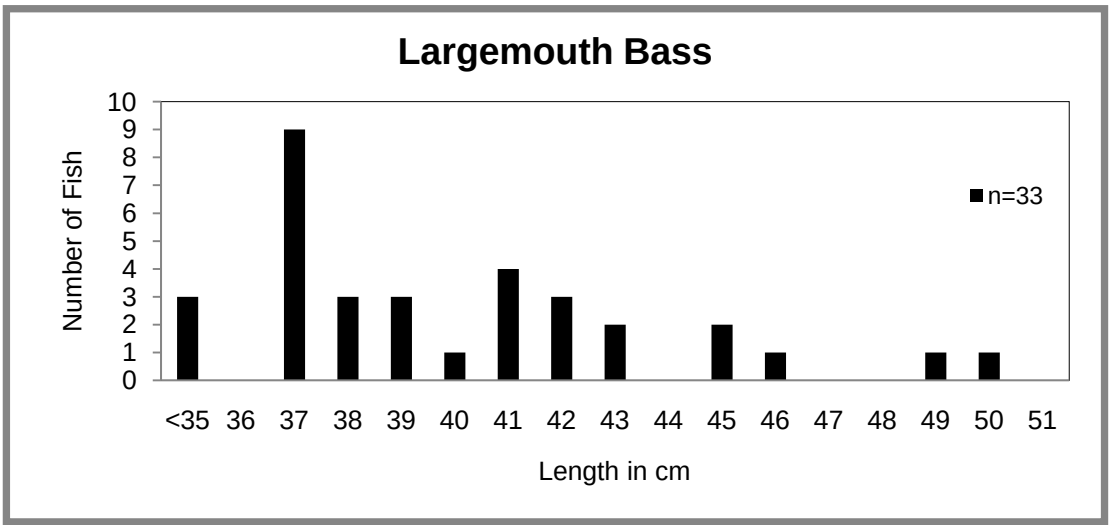
A roving creel survey was conducted on the Inverness Pool of the Tsala Apopka Chain of Lakes from January 13, 2011 to June 1, 2011. The survey area consisted of Big and Little Henderson lakes and Lake Tsala Apopka (Figure 4). The total of the three survey areas was 361 ha. State size and bag limits apply through the system for all species. The survey design followed standardized long-term monitoring (LTM) protocol guidelines. This year's survey results provided baseline data that aids in the better understanding of how this fishery is utilized.

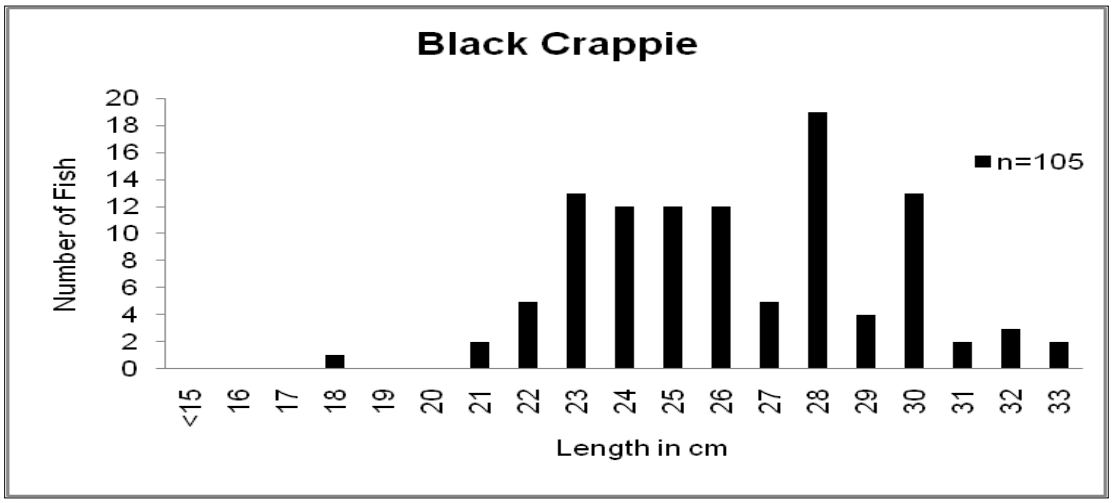
A total of 769 anglers were interviewed during the 16 week survey, and angler harvested fish were measured and enumerated (Figure 5). Florida residents comprised 87 percent of the interviewed anglers. Largemouth bass accounted for the greatest proportion of angling effort, followed by panfish *Lepomis spp.* and black crappie (Table 1). In Spring 2011 the largemouth bass (LMB) catch rate was 0.84 fish/hr compared to 0.69 fish/hr at Rodman Reservoir, 0.67 fish/hr at Orange Lake, and a statewide average of 0.53 fish/hr calculated from the LTM database. Lake Tsala Apopka drew the highest amount of angling effort with 6,957 angler-hrs and the highest catch success rate of 0.90 fish/hr.

Bass tournament anglers favored Lake Tsala Apopka with more than twice as much effort spent here compared to the other two lakes. Bass tournament interview data collected during the survey accounted for 8 percent of the total bass directed effort with a catch rate of 1.03 fish/hr.

The overall catch rate for panfish was 1.28 fish/hr compared to 3.05 fish/hr at Rodman Reservoir and 2.67 fish/hr at Orange Lake. Total harvest values were highest for panfish which consisted mostly of bluegill. Out of the three lakes, Lake Tsala Apopka had the highest panfish catch rates as well as the highest black crappie catch rates.

This survey has provided valuable fishery related data that can be correlated to fishery response relative to fluctuating water levels, habitat changes, and angler exploitation. The data should also be related to economic data to estimate the value of this fishery. The Tsala Apopka creel survey will continue according to the LTM monitoring project guidelines. The pool surveyed will rotate annually to ensure a creel survey on each pool every three years.





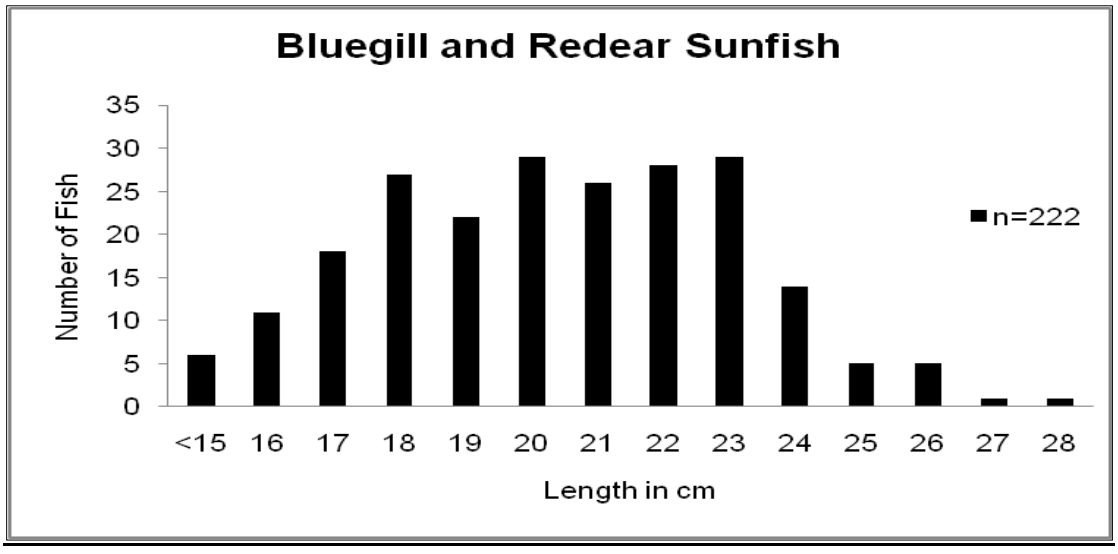


Figure 4. Length frequence of largemouth bass, black crappie, and bluegill/redear sunfish harvested during the Inverness Pool creel survey, January 13 to June 1, 2011.

Tsala Apopka Chain of Lakes Electrofishing (FFWCC)

The Tsala Apopka Chain of Lakes (Citrus Co. 7,689 ha.) consists of 21 named lakes in 3 interconnected pools (Floral City, Inverness and Hernando). The lakes in this chain are part of a complex lake-marsh ecosystem associated with the Withlacoochee River (Figure 5). Man-made canals, structures and berms have greatly altered this system in an attempt to stabilize water levels. Water levels are affected by droughts, flood events, and water control structure manipulations making habitats and fish populations very dynamic. Fish populations recently have been negatively impacted by periodic droughts and low water in 2001- 2002 and 2006-2009 (Figure 6). Water levels were above average for about a year and a half since July 2009 for all three pools, but have been below average since then.

Spring species specific electrofishing was conducted on keystone lakes (the main water body of each pool) and selected associated lakes targeting largemouth bass in February and *Lepomis spp.* in May. Fall community electrofishing was conducted on Lake Henderson to meet FFWCC LTM requirements. Additional fall community samples will be collected on other lakes in the chain as needed. One largemouth bass age-and-growth sample is collected annually on one of the keystone or associated lakes until all are completed. A largemouth bass age and growth sample was collected on Lake Henderson in spring 2011.

Spring 2011 largemouth bass and panfish data were collected in Hernando, Henderson, and Floral City lakes. Spring baseline data was established this year in Tussock, Davis and Todd/Dodd/Belamy lakes (Tables 2 and 3). Electrofishing catch rates of Quality-sized LMB were higher in Floral City Lake in 2011 than the previous two years, and Tussock Lake showed a favorable catch rate (0.62 fish/min) of Quality LMB compared to spring 2011 average for all six Tsala Apopka Chain of Lakes of 0.35 fish/min. The Floral City Pool continues to produce higher catch rates of Quality-sized bass compared with the other two pools. Catch rates of Quality LMB continue to remain low in the other lakes sampled. Spring 2011 Quality-sized bluegill catch rates continue to remain very low (0.08 to 0.28 fish/min) in the six lakes sampled, when compared with the regional average of 0.88 fish/min.

Largemouth bass otoliths were collected from a subsample of fish from Big Henderson Lake. An age/length key was then used to expand the subsample to the entire sample. The growth rate to attain “Quality size” (300 mm) was 3+ years for both males and females, indicating slow growth for both sexes (Table 4). “Preferred size” (380 mm) was not achieved by males and the growth rate to that size for females was considered slow. Growth rates were compared to statewide averages presented by Porak, et al. (1987). Catch-curve analysis estimated 40 percent annual mortality (Figure 7), and the year class frequency graph (Figure 8), indicated continual strong year classes for 2008 – 2010, but older fish quickly diminished.

The Tsala Apopka Chain of Lakes was added to the FFWCC Fish and Wildlife Research Institute LTM grant in FY2010-2011. As a requirement of the grant, an annual fall community electrofishing sample was conducted on Lake Henderson in fall 2010 (Table 5). Seventeen species were collected, resulting in an overall CPUE of 2.96 fish/min. Bluegill was the most abundant species by number, accounting for 36 percent of the total catch. Largemouth bass, golden shiner, and Florida gar accounted for 43 percent of the fish collected (19, 12, and 12 percent, respectively). Only one other species, redear sunfish (5 percent), accounted for 5 percent or more of the catch by number. Florida gar (36 percent) and largemouth bass (27 percent) dominated the catch by weight comprising 63 percent of the catch by weight. Lake chubsuckers (13.3 percent) were the only other species to comprise more than 10 percent of the sample by weight.

Several years of low water levels appear to have impacted the sportfish population in Croft and VanNess lakes of the Hernando Pool. Fall 2009 and 2010 community, and spring 2010 and 2011 LMB and panfish electrofishing samples were taken to assess the sportfish population to determine possible restocking needs. Spring 2010 samples indicated very low numbers of LMB (0.13 fish/min) and bluegill (0.60 fish/min). However in the fall 2010 community sample, LMB catch rate was 0.42 fish/min similar to adjoining Lake Hernando, and the bluegill estimate was 1.97 fish/min (Table 6). In fall 2009 community samples, largemouth bass relative abundance was 0.34 fish/min. and bluegill CPUE was 1.93 fish/min. These results were similar to the fall 2010 estimates, indicating successful bluegill reproduction was occurring. Stocking plans were discontinued because sufficient natural reproduction was observed.

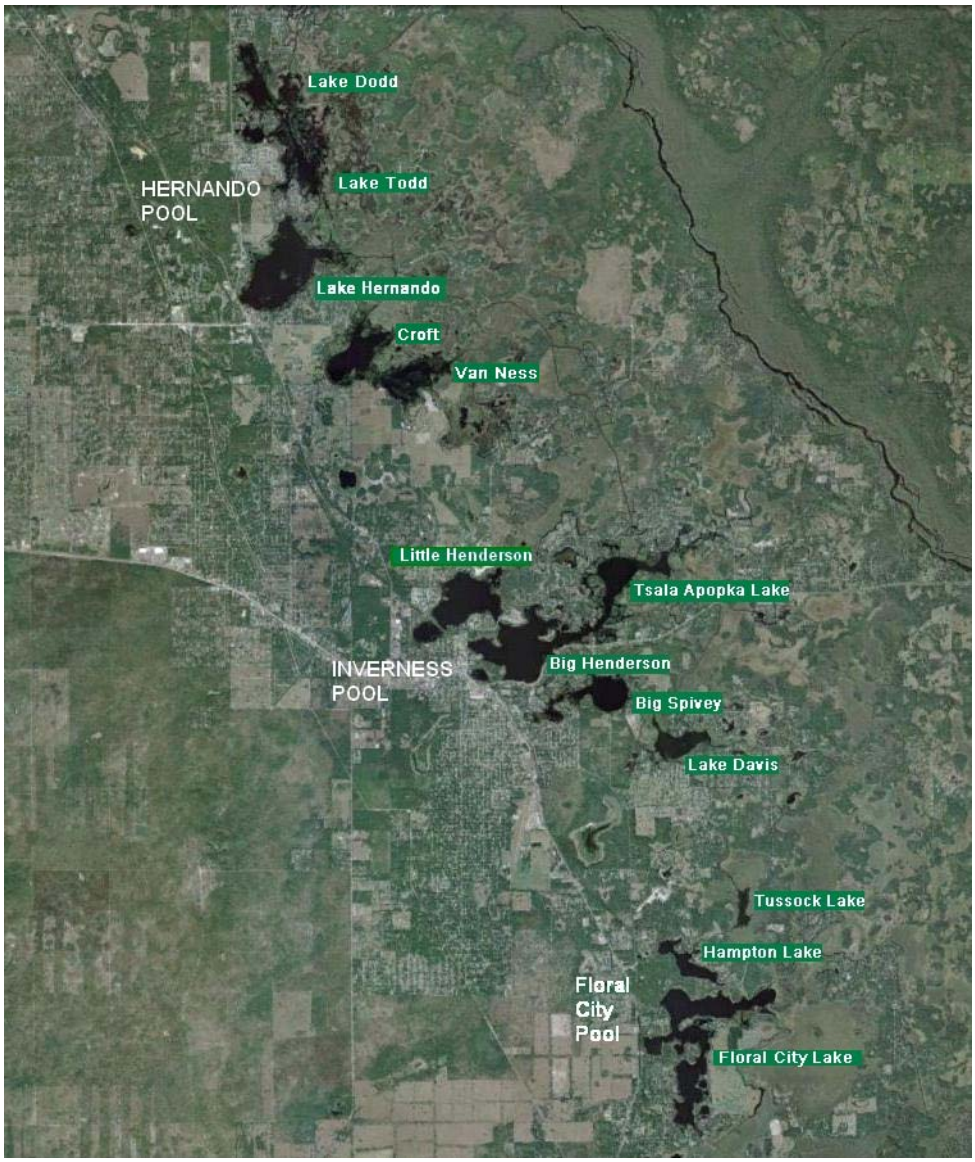
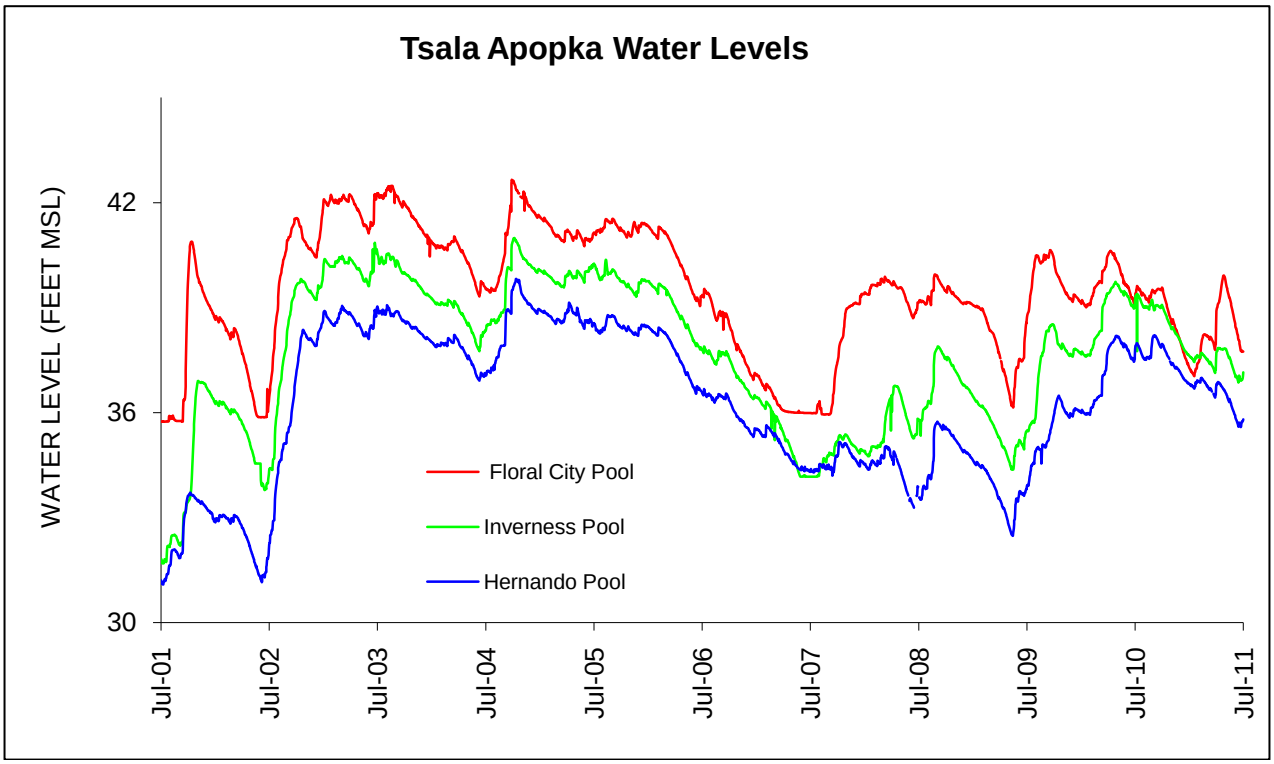


Figure 5. Locations of and Tsala Apopka Chain of Lakes electrofishing and water level monitoring stations.



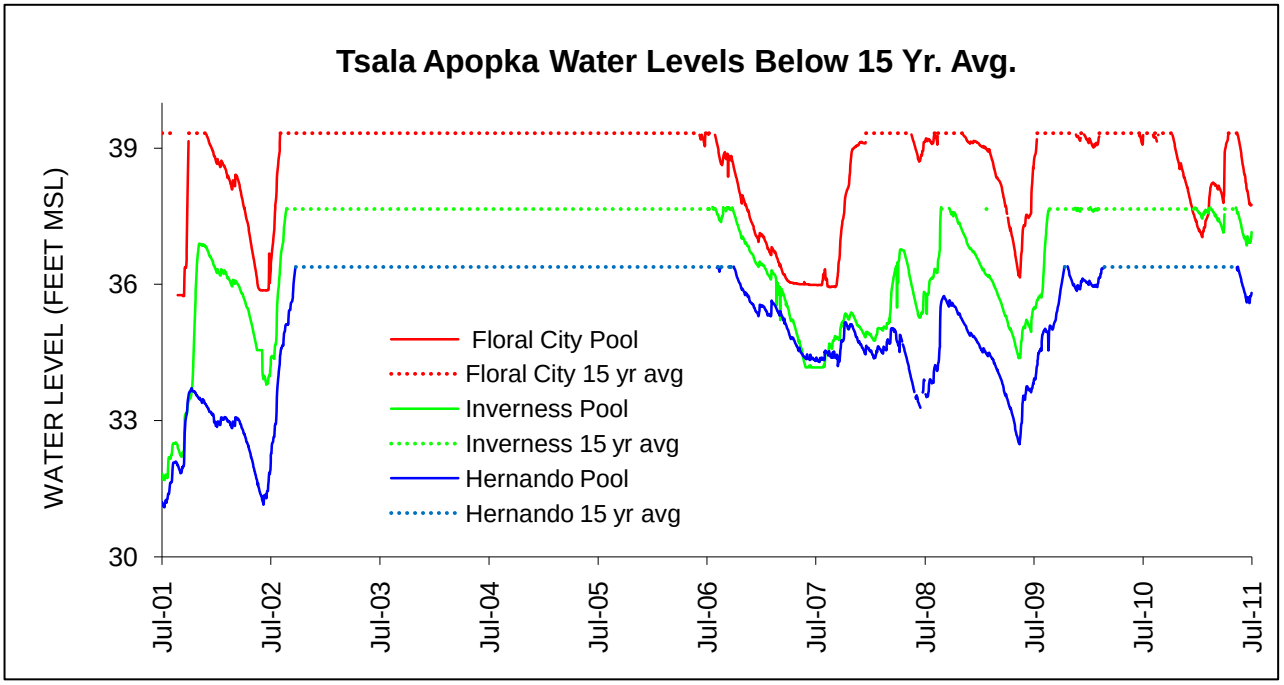


Figure 6. Water levels in the Tsala Apopka Chain of Lakes from July 2001 to July 2011.
MSL = feet above mean sea level.
Data provided by Southwest Florida Water Management District.

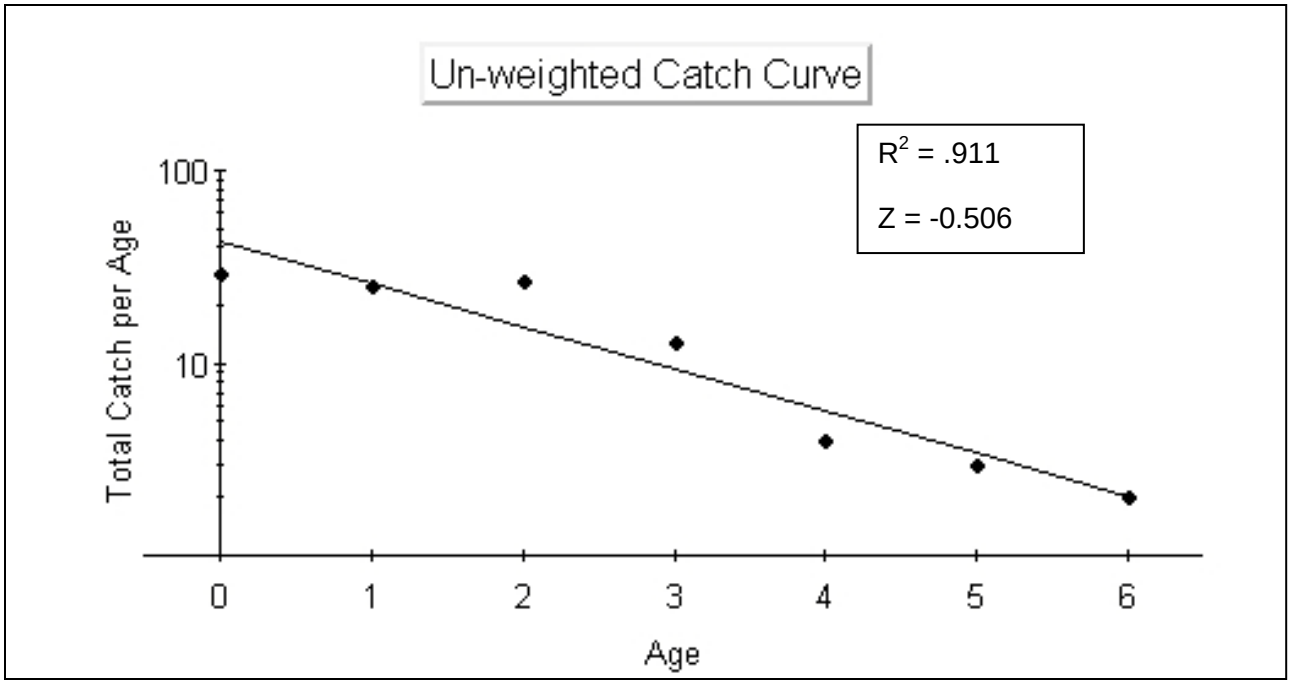


Figure 7. Unweighted catch curve of largemouth bass electrofishing data from Big Henderson Lake, March 2011.

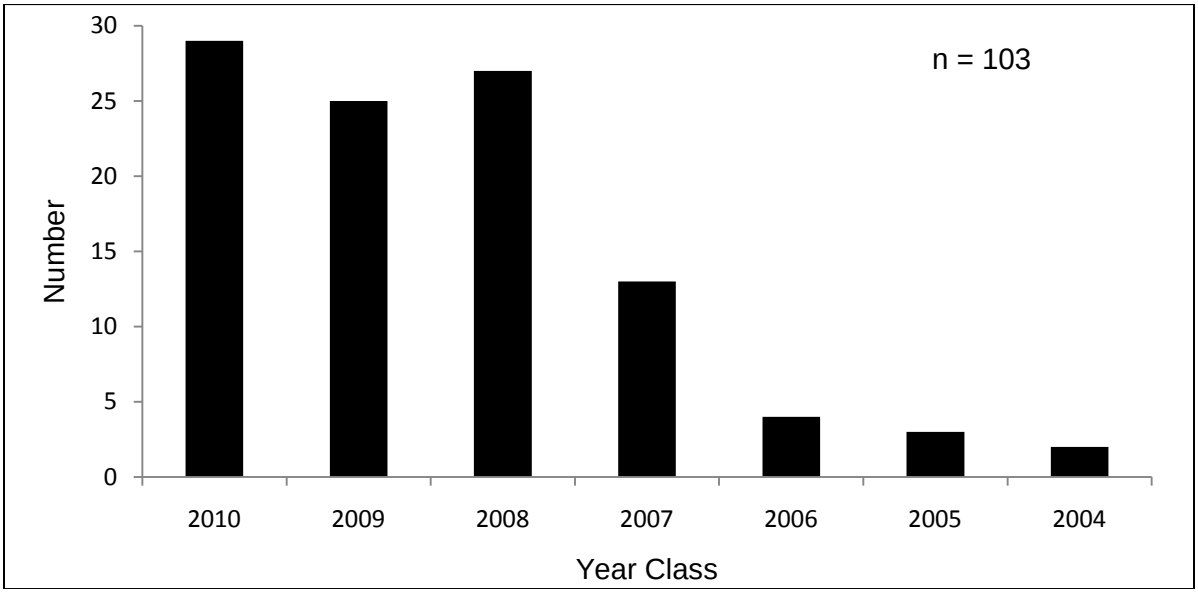


Figure 8. Year class frequency of largemouth bass from Big Henderson Lake, March 2011.

Fish Attractors, Tsala Apopka Chain of Lakes (FFWCC and Citrus County)

Knowledge of angler use patterns benefits both the FFWCC and Citrus County concerning future management decisions. Boat anglers were asked if they had fished in proximity to marked attractor locations in an effort to document catch rates associated with fish attractors, funded by Citrus County Aquatic Services. One attractor, located within Big Henderson, had been in place prior to the survey, while a second attractor in Little Henderson was constructed in early March. Overall, the combined catch rate on the fish attractors was 1.56 fish/hr (bass, panfish, and black crappie), compared to 2.90 fish/hr poolwide, however this estimate is based on inconsistant data and a small sample size. Each of these sites is one quarter acre in size and costs $6,299.99 each to deploy. The FFWCC provides the buoy, chain, shackles, and anchors needed for each site. The amount of angling effort on the attractors during the survey is shown in Figure 9.

There are a total of 5 attractor locations within the Tsala Apopka Chain of Lakes:

- 2 sites within Hernando Pool
    - Site 1, Lake Dodd, Lat/Long N28 56.857 W082 22.442, Material includes Christmas trees and oak limbs.
    - Site 2, Hernando Lake, Lat/Long N28 54.650 W082 22.046, Material includes Christmas trees and oak limbs.
- 2 sites within Inverness Pool
    - Site 1, Big Henderson, Lat/Long N28 50.369 W082 19.482, Material includes citrus trees
    - Site 2, Little Henderson East, Lat/Long N28 50.774 W082 19.997, Material includes oak limbs
- 1 site within Floral City Pool
    - Site 1, Floral City Lake South, Lat/Long N28 45.590 W082 17.025, Material includes Christmas trees and oak limbs.

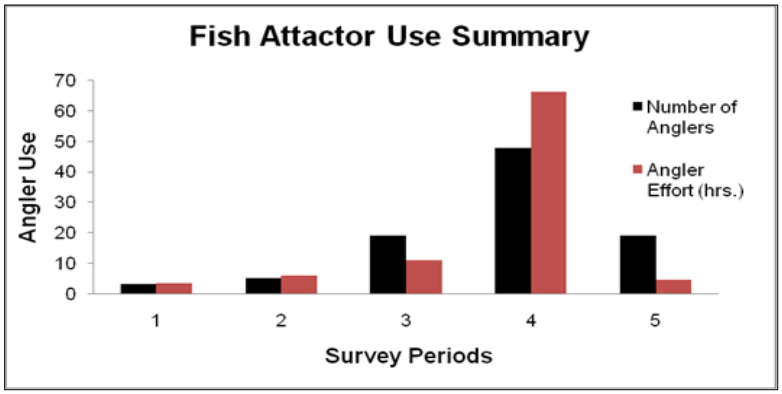


Figure 9. Number of anglers and angling effort expended on Inverness Pool fish attactors, January 13 to June 1, 2011.

Survey Periods:
1 = 13 Jan – 9 Feb
2 = 10 Feb – 9 Mar
3 = 10 Mar – 6 Apr
4 = 7 Apr – 4 May
5 = 5 May – 1 Jun

TABLES

Table 1. Effort, catch and success rates from Inverness Pool creel survey conducted January 13 to June 1, 2011

	Effort (man-hrs.)	Catch	Harvest	Catch Success (fish/man-hrs.)	Harvest Success (fish/man-hrs.)
Largemouth bass					
Big Henderson	5,448	4,930	127	0.79	0.02
Little Henderson	6,147	5,735	102	0.82	0.02
Tsala Apopka	6,957	6,150	483	0.90	0.08
Combined Totals	18,553	16,816	711	0.84	0.04
Panfish (Lepomis spp.)					
Big Henderson	1,821	1,706	1,572	0.93	0.73
Little Henderson	1,317	1,823	1,082	1.20	0.77
Tsala Apopka	941	1,591	1,157	1.98	1.41
Combined Totals	4,080	5,119	3,811	1.28	0.91
Black Crappie					
Big Henderson	807	272	81	0.51	0.12
Little Henderson	1,621	1,019	914	0.76	0.68
Tsala Apopka	785	944	815	1.13	0.31
Combined Totals	3,213	2,235	1,811	0.78	0.54
Bass Tournaments					
Big Henderson	0	0	0	0	0
Little Henderson	429	183	31	0.89	0.15
Tsala Apopka	1,060	691	229	1.07	0.34
Combined Totals	1,489	874	250	1.96	0.49
Survey Totals	27,335	25,044	6,583	4.86	1.98

Table 2. Spring 2009-2011 largemouth bass electrofishing samples in the Tsala Apopka Chain of Lakes. Per minute refers to pedal time. Quality size is 300mm.

Tsala Apopka Largemouth Bass--Spring 2010

Sample Size

		N	N Qual	Min.TL	Max. TL
Floral City Pool	Floral City	221	109	136	530
	Tussock	63	37	146	610
Inverness Pool	B.Henderson	148	33	110	520
	L.Davis	81	16	105	406
Hernando Pool	Hernando	73	26	93	488
	Todd/Dodd	121	45	82	564

Catch Rates

		N/min.			Nqual/min.			Wt (kg)/min.			Wt qual (kg)/min.		
		2009	2010	2011	2009	2010	2011	2009	2010	2011	2009	2010	2011
Floral City Pool	Floral City	1.19	0.72	1.34	0.26	0.32	0.66	0.46	0.38	0.48	0.42	0.32	0.38
	Tussock	-	-	1.05	-	-	0.62	-	-	0.56	-	-	0.47
Inverness Pool	B.Henderson	0.93	1.13	0.82	0.15	0.30	0.18	0.14	0.29	0.16	0.09	0.19	0.09
	L.Davis	-	-	0.90	-	-	0.18	-	-	0.15	-	-	0.09
Hernando Pool	Hernando	0.67	0.42	0.41	0.24	0.17	0.14	0.18	0.12	0.12	0.13	0.08	0.09
	Todd/Dodd	-	-	0.81	-	-	0.30	-	-	0.27	-	-	0.21

Stock Density Indices (95% CI)

		PSD			RSD-P			RSD-M			RSD-T		
		2009	2010	2011	2009	2010	2011	2009	2010	2011	2009	2010	2011
Floral City Pool	Floral City	89 (5)	50 (9)	68(109)	29 (7)	26 (8)	16(25)	4 (3)	5 (4)	2(3)			
	Tussock	-	-	64(37)	-	-	17(10)	-	-	7(4)			
Inverness Pool	B.Henderson	43 (12)	35 (8)	38(33)	2 (3)	8 (5)	1(1)	2 (3)	1 (2)	1(1)		NONE	
	L.Davis	-	-	50(16)	-	-	6(2)	-	-	0			
Hernando Pool	Hernando	62 (11)	52 (13)	47(26)	1 (3)	3 (5)	11(6)	1 (3)	0	0			
	Todd/Dodd	-	-	52(45)	-	-	14(12)	-	-	1(1)			

Mean Relative Weights

		Sub-Stock	Stock	Quality	Preferred	Memorable	Trophy
Floral City Pool	Floral City	83	89	84	87	91	
	Tussock	95	88	87	88	93	
Inverness Pool	B.Henderson	82	84	81	none	81	
	L.Davis	87	88	82	75		
Hernando Pool	Hernando	85	83	82	90		NONE
	Todd/Dodd	88	85	88	92		

Table 3. Catch rates and size parameters for bluegill and redear sunfish in the Tsala Apopka Chain of Lakes, spring 2011. Quality size is 150mm and 180mm for bluegill and redear sunfish, respectively.

Tsala Apopka Bluegill/Redear sunfish--Spring 2011

		N		N Quality		Min. TL		Max. TL	
Sample Size		Bluegill	Redear	Bluegill	Redear	Bluegill	Redear	Bluegill	Redear
Floral City Pool	Floral City	125	24	20	6	40	58	242	259
	Tussock	74	4	11	2	20	113	230	258
Inverness Pool	B.Henderson	582	27	19	3	30	52	177	226
	Davis	699	23	5	2	30	50	235	218
Hernando Pool	Hernando	355	36	17	1	49	54	230	185
	Todd/Dodd	259	21	20	4	50	71	270	233

		N/min.		N quality/min.				Wt (kg)/min.		Wt qual (kg)/min.			
				Bluegill			Redear			Bluegill			Redear
Catch Rates		Bluegill	Redear	2009	2010	2011	2011	Bluegill	Redear	2009	2010	2011	2011
Floral City Pool	Floral City	1.25	0.24	0.09	0.44	0.20	0.06	0.04	0.02	0.01	0.06	0.03	0.01
	Tussock	1.85	0.10	--	--	0.28	0.05	0.74	0.02	--	--	0.05	0.02
Inverness Pool	B.Henderson	5.82	0.27	0.10	0.13	0.19	0.03	0.06	0.01	0.01	0.01	0.01	0
	Davis	11.65	0.38	--	--	0.08	0.03	0.07	0.01	--	--	0.01	0.01
Hernando Pool	Hernando	3.55	0.17	0.19	0.08	0.17	0.01	0.05	0.01	0.02	0.003	0.02	0
	Todd/Dodd	2.59	0.21	--	--	0.20	0.04	0.06	0.02	--	--	0.02	0.01

		PSD		RSD-P		RSD-M		RSD-T	
Stock Density Indices (95% CI)		Bluegill	Redear	Bluegill	Redear	Bluegill	Redear	Bluegill	Redear
Floral City Pool	Floral City	43 (15)	40 (25)	21 (11)	7 (12)				
	Tussock	27 (14)	50 (50)	18 (11)	50 (50)				
Inverness Pool	B.Henderson	9 (4)	20 (20)	--	--		NONE		
	Davis	5 (4)	33 (38)	1 (2)	--				
Hernando Pool	Hernando	12 (5)	4 (7)	1 (2)	--				
	Todd/Dodd	15 (7)	22 (28)	3 (5)	11 (10)	1 (1)	--		

		Sub-Stock		Stock		Quality		Preferred		Memorable		Trophy	
Mean Relative Weights		Bluegill	Redear	Bluegill	Redear	Bluegill	Redear	Bluegill	Redear	Bluegill	Redear	Bluegill	Redear
Floral City Pool	Floral City	84	81	92	90	92	101	98	113				
	Tussock	108	0	94	91	91	0	101	116				
Inverness Pool	B.Henderson	122	79	83	86	84	95	--	--		NONE		
	Davis	133	97	90	93	91	113	106	--				
Hernando Pool	Hernando	100	73	79	85	84	92	82	--				
	Todd/Dodd	99	68	79	84	84	97	82	95	88	none		

Table 4. Largemouth bass age and growth data from Big Henderson Lake, March 2011. MTL = mean total length (mm).

	Female		*Male*		*Unknown*		*All LMB*	
Age	**n**	**MTL**	**n**	**MTL**	**n**	**MTL**	**n**	**MTL**
1	6	163			23	142	29	146
2	14	240	10	235	1	177	25	235
3	16	299	11	287			27	294
4	7	334	6	332			13	333
5			4	331			4	331
6	1	516	2	372			3	420
7			2	360			2	360
Total:	44		35		24		103	

Table 5. Fall 2010 community electrofishing data for Henderson Lake. Quality sizes are: largemouth bass (300mm), bluegill and warmouth (150mm), redear sunfish (180mm) and black crappie (200mm) TL.

Species	**No / min.**	**Weight kg/ Minute**	**Length cm Min.**	**Length cm Max.**	**% comp. by no.**	**% comp, by wt.**	**Quality no. / min.**	**Qual. wt. kg per min.**
Largemouth bass	0.55	0.10	9.4	44	18.6%	26.5%	0.08	0.05
Bluegill	1.06	0.02	1	20.9	35.8%	6.1%	0.08	0.00
Redear	0.14	0.01	7.1	24.1	4.8%	2.3%	0.03	0.00
Warmouth	0.04	0.00	7	17.5	1.4%	0.5%	0.02	0.00
Black crappie	0.09	0.02	15.5	28.4	3.1%	4.7%	0.09	0.02
Brown bullhead	0.01	0.01	40.1	40.1	0.3%	1.5%	0.01	0.01
Yellow bullhead	0.01	0.00	28.5	28.5	0.3%	0.7%	0.01	0.00
Chain pickerel	0.02	0.01	407	411	0.6%	1.7%	0.02	0.01
Longnose gar	0.01	0.00	40.4	40.4	0.3%	0.3%	0.00	0.00
Florida gar	0.36	0.14	27.2	63.7	12.1%	36.0%	0.13	0.07
Bowfin	0.01	0.02	59.8	59.8	0.3%	5.1%	0.01	0.02
Golden shiner	0.36	0.01	5.7	20.1	12.1%	1.3%	0.03	0.00
Lake chubsucker	0.20	0.05	17.7	33	6.8%	13.3%	0.15	0.05
Bluespotted sunfish	0.01	0.00	4	4	0.3%	0.0%		
Brook silverside	0.01	0.00	5.7	5.7	0.3%	0.0%		
Eastern mosquitofish	0.07	0.00	2	3	2.3%	0.0%		
Golden topminnow	0.03	0.00	2	4	0.8%	0.0%		
Total	2.96	0.38			100%	100%	0.64	0.23

Table 6. Fall 2010 community electrofishing data for Croft/VanNess lakes Lake. Quality sizes are: largemouth bass (300mm), bluegill and warmouth (150mm), redear sunfish (180mm) and black crappie (200mm) TL.

Species	No / min.	Weight kg/ Minute	Length cm Min.	Length cm Max.	% comp. by no.	% comp, by wt.	Quality no. / min.	Qual. wt. kg per min.
Largemouth bass	0.42	0.03	6.6	37.4	6.7%	13.1%	0.02	0.01
Bluegill	1.97	0.02	2	17	31.2%	10.5%	0.05	0.00
Redear	0.26	0.01	5	21.1	4.1%	5.6%	0.02	0.00
Warmouth	0.09	0.00	3.4	17.4	1.5%	0.9%	0.01	0.00
Black crappie	0.02	0.00	16.8	25.3	0.4%	1.7%	0.02	0.00
Brown bullhead	0.02	0.00	20.6	26.1	0.2%	1.2%	0.01	0.00
Chain pickerel	0.18	0.01	12.1	40.1	2.8%	5.1%	0.01	0.00
Redfin pickerel	0.01	0.00	14.5	14.5	0.1%	0.1%	0.00	0.00
Longnose gar	0.02	0.00	35.8	39.7	0.2%	0.6%	0.00	0.00
Florida gar	0.20	0.03	22.4	50.4	3.2%	15.6%	0.02	0.01
Bowfin	0.02	0.04	53.2	59.2	0.4%	21.7%	0.02	0.04
Golden shiner	2.32	0.01	4	24.5	36.8%	4.9%	0.02	0.00
Lake chubsucker	0.23	0.04	5.7	33.9	3.7%	18.3%	0.11	0.03
Bluespotted sunfish	0.03	0.00	3	3	0.5%	0.0%		
Brook silverside	0.28	0.00	2	9.6	4.5%	0.1%		
Dollar sunfish	0.03	0.00	4.5	10	0.5%	0.0%		
Eastern mosquitofish	0.04	0.00	2	3	0.6%	0.0%		
Golden topminnow	0.10	0.00	2	5.2	1.6%	0.1%		
Seminole killifish	0.02	0.00	8	10	0.4%	0.1%		
Threadfin shad	0.04	0.00	1	9	0.6%	0.3%		
Total	6.31	0.20			100.0%	100.0%	0.31	0.12

HERNANDO COUNTY TASK FORCE RECOMMENDATIONS TO THE LEGISLATURE

Introduction

Despite a great deal of growth, Hernando County still retains a rural character. Covered by coastal swamps, dense woodlands, lakes, rivers and pastures, the county is rapidly changing as residential development expands. Continued population growth in the county, fueled by the development of the Suncoast Parkway, will continue to create issues between land use and water resource conservation. Of paramount concern is the need to maintain the quality and biological health of the waters and aquatic resources within the county to ensure their continued use and enjoyment for current and future residents.

In 2003, the Florida Legislature enacted legislation which directed the Hernando County Task Force (HCTF), as members of the Council, to develop plans for the restoration of Hernando County waterways. As part of their plan development, the TAG presented information to the HCTF on the hydrologic conditions of the region, the status of the restoration of Weeki Wachee Springs, and activities related to shoreline stabilization, navigation and sand transport within the Weeki Wachee River.

At their July 2007 meeting, the HCTF solicited proposals for restoration projects from both the general public and federal/state/local agencies. In total, seven project proposals were received. The HCTF adopted four of the projects. The three remaining projects, which included bank stabilization in the Withlacoochee River, dredging of a water body with no public access, and improvements to an existing boat ramp, were rejected by the HCTF because they were found to be either on-going maintenance programs or were not public resources and therefore not candidates for public funding. No funding was received in 2008, 2009, 2010 or 2011 and no additional projects were identified. The HCTF agreed to resubmit the projects identified in 2007 to the legislature for funding in 2012. The FFWCC's AHRES section was able to fund a small tussock harvesting project in Lake Lindsey conducted during summer 2010.

This report summarizes goals, strategies, and specific projects designed to restore and/or protect the environmental health of selected waters in Hernando County.

Goals

- Shoreline restoration
- Sand and other sediment control and removal
- Exotic species management
- Floating tussock management or removal
- Navigation, water quality, and fish and wildlife habitat improvement

Lake Lindsey Habitat Restoration

Background

Lake Lindsey (137 acres) is located in Hernando County. The land adjacent to the northern and eastern shore of Lake Lindsey is made up of mostly single-family homes and a church. The land on the southern and western shore is owned by the United States Department of Agriculture. There is a public boat ramp on the eastern side of the lake.

Stabilized water levels, exotic vegetation and development on properties adjacent to the lake have contributed to an increase of organic material (muck) deposition. Tussock formations on the southern and northern shores are problematic as well. The resulting accumulation of muck, formation of tussocks, and the encroachment of invasive vegetation on the lake necessitate its removal to enhance the quality of aquatic habitat for fish and wildlife. The organic material associated with tussocks and the encroachment of invasive plants reduces dissolved oxygen levels during decomposition, increases turbidity, promotes more tussock formation, impedes the successful growth of desirable native plants, impedes the successful spawning and recruitment of native fish species, and replaces valuable fish and wildlife habitat. From July 26, 2010 through August 24, 2010 a small but successful tussock removal project was conducted in Lake Lindsey. Funded through the FFWCC's AHRES group, nearly $50,000 was spent mechanically harvesting and clearing 19 acres. Tussock material was hauled to nearby Chinsegut Wildlife Management Area and disposed of in old borrow pits.



Lake Lindsey before Tussock Removal



Lake Lindsey after Tussock Removal

In addition to the AHRES tussock removal, the HCTF recommends hydraulic dredging of organic sediments to restore fish and wildlife habitat to improve sport fish populations, spawning success and angling success with increased local economic benefits. There are approximately 221,000 cubic yards of organic sediment to be removed at a cost of $11-15 per cubic yard. Initial removal cost estimates range from $2,500,000-$3,500,000.

Weeki Wachee River Fish and Wildlife Habitat Restoration

Background

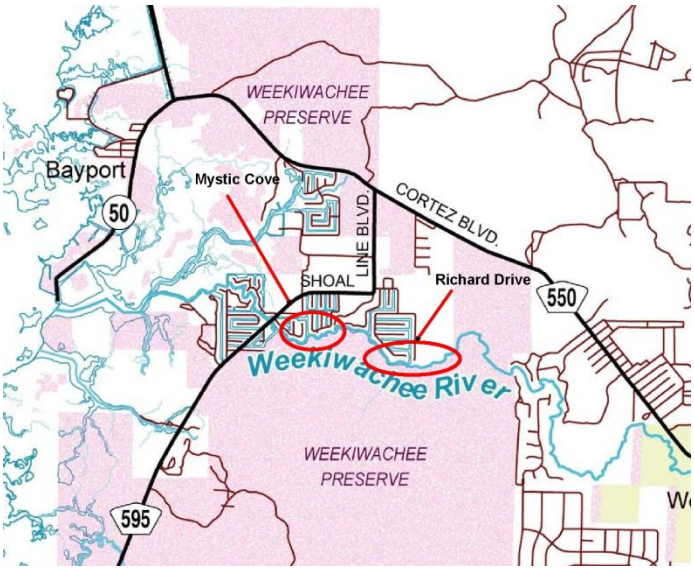
The Weeki Wachee River, located in western Hernando County, is a spring-fed system that originates in the Weeki Wachee Dune Field. This area, which typically has elevations of 66 feet or less, lies within a relic dune system comprised primarily of sand hill vegetation. Down river, the area transitions into a hardwood swamp, and ultimately into a coastal marsh complex. The river runs west approximately 7.5 miles from the main spring boil to the beginning of the associated coastal marsh complex and then another 3.1 miles to the Gulf of Mexico.

The SWFWMD, pursuant to Chapter 373.042 Florida Statutes, is required to establish minimum flows and levels (MFLs) for streams and rivers within its boundaries. MFLs identify the limit at which further withdrawals would be significantly harmful to the water resources or ecosystem of an area. A broad spectrum of ecological resources were identified and evaluated for sensitivity to reduced flows using numeric models and statistics. In consideration of the results, the MFL for the Weeki Wachee is a ten percent reduction in flows that have been corrected for pumpage impacts. The Weeki Wachee River MFL was adopted into SWFWMD rules (Chapter 40D-8, Florida Administrative Code) on May 10, 2009.

Several environmental problems have developed over time within the headspring and upper reaches of the Weeki Wachee River. The immediate area surrounding the headspring had become infested with *Lyngbya* algae. In addition, the introduction of silts and organics into the spring and river system via untreated stormwater runoff and other external sources have caused additional concerns due to their conveyance downstream.

A recurring complaint from members of the public is that the sand currently in the Weeki Wachee River is excessive, and impacts the navigability of the river for fish, wildlife, and people. Erosion of sand from the riverbanks has caused the river to become shallower than it would naturally be, and as such velocities have been reduced as well as the ability of submerged aquatic vegetation to establish. Aforementioned projects removed primary sources of sand and sediment; however, a significant volume remains within the lower river. In summer 2009, FFWCC Aquatic Habitat Conservation and Restoration Section personnel surveyed the river and found it adequate for manatee passage. They did note habitat restoration was needed in some areas however.

To improve navigation and fish and wildlife habitat the Hernando County Task Force recommends the removal of shoaling sand in the lower river which has smothered historical limerock river bottom substrate, and in some places impeded river flow.



Two locations including “Mystic Cove” and “Richard Drive” are proposed for study for hydraulic dredging of sand. The amount of sand accumulated is unknown but a reasonable starting cost for dredging based on visual estimates is $5,000,000.

Mountain Lake Fish and Wildlife Habitat Restoration

Background

A 127 acre public lake once popular with local anglers, Mountain Lake has been dry for several years because of a sinkhole and dewatering from drought conditions. Approximately 3 acres of water remain in the center of the lake basin with the remainder being vegetated with dog fennel, Para grasses, and other invasive terrestrial species common to disturbed or dewatered areas.

The HCTF recommends herbicide treatment of all terrestrial plant material followed by removal and scraping down to natural sand lake bottom by heavy equipment at a cost of approximately $2,000,000. Ongoing maintenance will need to be performed until historical water levels return.

Hunters Lake Habitat Restoration

Background

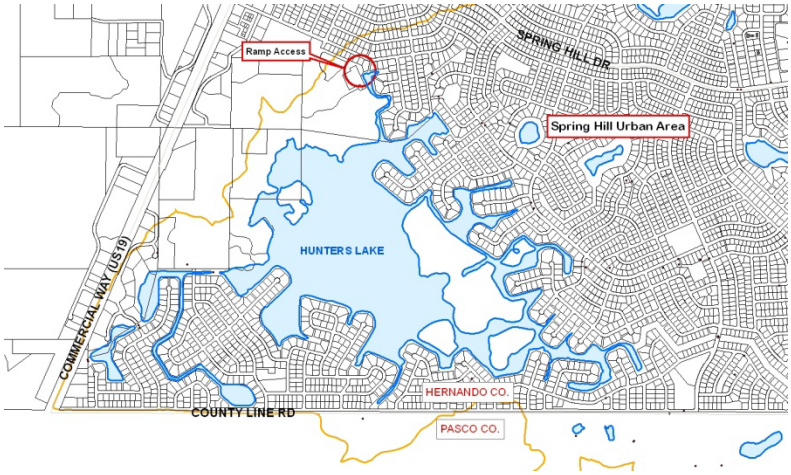
Hunters Lake (302 acres) is located in the Spring Hill urbanized area of Hernando County and lies within the Coastal Rivers Basin. The lake does have a public boat ramp which until recently provided access to a major aquatic recreational facility. Lake levels are monitored by SWFWMD on a monthly basis and water quality studies of the site have been undertaken by Florida LAKEWATCH.

Access to the lake from the boat ramp is no longer possible due to the increase of organic material (muck) in the channel and reduced water levels due to drought. In 2009, the ramp parking area was closed to the public for safety concerns and to reduce vandalism. There has also been considerable tussock formation and encroachment of invasive vegetation surrounding the lake. The isolating channel surrounding the Audubon Society bird sanctuary has been compromised by bridging tussocks and invasive vegetation.

The organic material associated with tussocks and the encroachment of invasive plants reduce oxygen levels during decomposition, increase turbidity, replace valuable fish and wildlife habitat, limit the growth of native plants which are desirable for fish and wildlife and impedes the successful spawning and recruitment of native fish species. Loss of access to this public lake has removed a valuable recreational outlet for the community.

The Hernando County Task Force recommends the dredging of organic sediments to restore the access channel from the boat ramp to the body of the lake and the removal of tussocks and encroaching invasive vegetation to restore fish and wildlife habitat and isolate the Audubon Society bird sanctuary.

The area of tussock growth is estimated at approximately 100 acres and approximately 12,000 cubic yards of organic sediments must be removed in the access channel. The project cost is estimated at $5,250,000. Ongoing maintenance will need to be performed until historical water levels return.



Restoration Issues

Ancillary costs for each project are dependent upon conditions identified during the first step of project implementation, the feasibility study. These conditions and associated costs include: material analysis (e.g., possible contaminants, composition, and volume determination), material marketability and handling, staging/spoil area(s), hauling and transportation, permitting processes and pre-applications, and determination of land acquisitions as needed.

Step two will include project design and permitting, which is broken down into surveys, hydrologic studies, geotechnical investigations, engineering, and other associated activities as they arise. Step three is project implementation, the construction phase.

Project Costs

Project	Expected Cost	2012 Legislative Funding Request	Project Partner
Lake Lindsey Habitat Restoration	$3,500,000	$100,000	FFWCC
Weeki Wachee Habitat Restoration	$5,000,000	$100,000	FDEP and FFWCC
Mountain Lake Restoration	$2,000,000	$100,000	FFWCC and Hernando County
Hunters Lake Restoration	$5,250,000	$100,000	FFWCC and Hernando County
Total	**$15,750,000**	**$400,000**	

CHAPTER 2003-287

House Bill No. 221

An act relating to water management; creating the Citrus/Hernando Waterways Restoration Council; providing for membership, powers, and duties; providing for separate county task forces; providing for a report to the Legislature; providing for an advisory group to the council; requiring the Southwest Florida Water Management District to act as lead entity for the purpose of providing staff and administrative support for the council; providing for a Citrus/Hernando Waterways restoration program; providing an effective date.

WHEREAS, the waterways of Citrus and Hernando Counties are of historic, hydrological, and ecological significance, and

WHEREAS, most of these Citrus/Hernando waterways are Outstanding Florida Waterways or are in the application process, and

WHEREAS, the Citrus/Hernando waterways are plagued by fluctuating water levels and sedimentation increasing nitrate levels and sand movement causing blockage of natural springs and excessive growth of aquatic plants, which are degrading their water quality and recreational value, and

WHEREAS, despite their current problems, the Citrus/Hernando waterways continue to provide wildlife habitat for fish, birds, and game and offer recreational opportunities for the residents of Citrus and Hernando Counties and visitors to the area, and

WHEREAS, the renewable economic potential of the Citrus/Hernando waterways is significant, and

WHEREAS, the Southwest Florida Water Management District and the Fish and Wildlife Conservation Commission, along with other state, regional, and local entities, have developed proposals to restore portions of the Citrus/Hernando waterways, NOW, THEREFORE,

Be It Enacted by the Legislature of the State of Florida:

Section 1. (1) The Citrus/Hernando Waterways Restoration Council.—There is created within the Withlacoochee and Coastal Rivers Basin Boards of the Southwest Florida Water Management District a council to be known as the Citrus/Hernando Waterways Restoration Council. The council shall be coordinated by representatives of the following agencies: the Florida Fish and Wildlife Conservation Commission, the Department of Environmental Protection, and the Southwest Florida Water Management District. The council is subject to the provisions of chapters 119 and 120, Florida Statutes.

(2) Members of the council shall consist of 12 voting members with 6 appointed by the President of the Senate and 6 appointed by the Speaker of the House of Representatives. The council shall consist of representatives as follows:

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(a) A waterfront property owner from each county.

(b) An attorney from each county.

(c) A member of the Board of Directors of the Chamber of Commerce from each county.

(d) An environmental engineer from each county.

(e) An engineer from each county.

(f) A person from each county with training in biology or another scientific discipline.

(3) The council members from each county are to form two separate county task forces from the council to review and make recommendations on specific waterways. The Hernando County Task Force shall develop plans for the restoration of the Weeki Wachee River and Springs. The Citrus County Task Force shall develop plans for the restoration of the Tsala-Apopka Chain of Lakes.

(4) There shall be a technical advisory group to the council and the two county task forces which shall consist of one representative each from the Southwest Florida Water Management District, the Department of Environmental Protection, the Department of Transportation, the Fish and Wildlife Conservation Commission, the Coastal Rivers Basin Board, the Withlacoochee River Basin Board, and the United States Army Corps of Engineers, each of whom shall be appointed by his or her respective agency and each of whom, with the exception of the representatives from the Withlacoochee River Basin Board and Coastal Rivers Basin Board, shall have had training in biology or another scientific discipline.

(5) Immediately after appointment, the council shall meet and organize by electing a chair, a vice chair, and a secretary, whose terms shall be for 2 years each. Council officers shall not serve consecutive terms. Each council member shall be a voting member. Additionally, the two county task forces shall elect a chair and a secretary, whose terms shall be for 2 years each.

(6) The council or the county task forces shall meet at the call of their respective chairs, at the request of six members of the council or of the respective task force, or at the request of the chair of the governing board of the Southwest Florida Water Management District.

(7) The council shall have the powers and duties to:

(a) Review audits and all data specifically related to lake and river restoration techniques and sport fish population recovery strategies, including data and strategies for shoreline restoration, sand and other sediment control and removal, exotic species management, floating tussock management or removal, navigation, water quality, and fish and wildlife habitat improvement, particularly as they may apply to the Citrus/Hernando waterways.

(b) Evaluate whether additional studies are needed.

(c) Explore all possible sources of funding to conduct the restoration activities.

(d) Report to the Speaker of the House of Representatives and the President of the Senate before November 25 of each year on the progress of the Citrus/Hernando Waterways restoration program and any recommendations for the next fiscal year.

(8) The Southwest Florida Water Management District shall act as lead entity for the purpose of providing staff and administrative support to assist the council in carrying out the provisions of this act.

(9) Members of the council shall receive no compensation for their services but are entitled to be reimbursed for per diem and travel expenses incurred during execution of their official duties as provided in section 112.061, Florida Statutes. State and federal agencies shall be responsible for the per diem and travel expenses of their respective appointees to the council, and the Southwest Florida Water Management District shall be responsible for per diem and travel expenses of other appointees to the council.

Section 2. The Citrus/Hernando Waterways restoration program.—

(1) The Fish and Wildlife Conservation Commission and the Southwest Florida Water Management District, in conjunction with the Department of Environmental Protection, pertinent local governments, and the Citrus/Hernando Waterways Restoration Council, shall review existing restoration proposals to determine which ones are the most environmentally sound and economically feasible methods of improving the fish and wildlife habitat and natural systems of the Citrus/Hernando waterways.

(2) To initiate the Citrus/Hernando Waterways restoration program recommended by the Citrus/Hernando Waterways Restoration Council, the Fish and Wildlife Conservation Commission, with assistance from the Southwest Florida Water Management District and in consultation and by agreement with the Department of Environmental Protection and pertinent local governments, shall develop tasks to be considered by those entities for the enhancement of fish and wildlife habitat. These tasks shall include the following:

(a) An evaluation of different methodologies for removing the extensive tussocks and buildup of organic matter along the shoreline and of the aquatic vegetation in the lake.

(b) The conduct of any additional studies as required by the Citrus/Hernando Waterways Restoration Council.

(3) Contingent on the Legislature's appropriating funds for the Citrus/Hernando Waterways restoration program and in conjunction with financial participation by federal, other state, and local governments, the appropriate agencies shall, through competitive bid, award contracts to implement the activities of the Citrus/Hernando Waterways restoration program.

Section 3. This act shall take effect upon becoming a law.

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Approved by the Governor July 14, 2003.

Filed in Office Secretary of State July 14, 2003.

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CHAPTER 2006-43

Senate Bill No. 496

An act relating to the Citrus/Hernando Waterways Restoration Council; amending section 1 of ch. 2003-287, Laws of Florida; revising the membership, powers, and duties of the council; revising the membership of the separate county task forces of the council; providing an effective date.

Be It Enacted by the Legislature of the State of Florida:

Section 1. Subsections (2), (3), and (4) of section 1 of chapter 2003-287, Laws of Florida, are amended to read:

Section 1.

(2) Members of the council shall consist of 14 ~~12~~ voting members with 7 ~~6~~ appointed by the President of the Senate and 7 ~~6~~ appointed by the Speaker of the House of Representatives. The council shall consist of representatives as follows:

(a) Two ~~A~~ waterfront property owners ~~owner~~ from each county, one of whom must be a property owner from the east side of the county and one of whom must be a property owner from the west side of the county.

(b) An attorney from each county.

(c) A member of the Board of Directors of the Chamber of Commerce from each county.

(d) An environmental engineer from each county.

(e) An engineer from each county.

(f) A person from each county with training in biology or another scientific discipline.

(3) The council members from each county are to form two separate county task forces from the council to review and make recommendations on specific waterways. The Hernando County Task Force shall develop plans for the restoration of the waterways in Hernando County ~~Weeki Wachee River and Springs~~. The Citrus County Task Force shall develop plans for the restoration of the waterways in Citrus County ~~Tsala-Apopka Chain of Lakes~~.

(4) There shall be a technical advisory group to the council and the two county task forces which shall consist of one representative each from the Southwest Florida Water Management District, the Department of Environmental Protection, the Department of Transportation, the Fish and Wildlife Conservation Commission, the Coastal Rivers Basin Board, the Withlacoochee River Basin Board, the public works department of each county, and the United States Army Corps of Engineers, each of whom shall be appointed by his or her respective agency and each of whom, with the exception

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of the representatives from the Withlacoochee River Basin Board and Coastal Rivers Basin Board, shall have had training in biology or another scientific discipline.

Section 2. This act shall take effect upon becoming a law.

Approved by the Governor May 30, 2006.

Filed in Office Secretary of State May 30, 2006.

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