



Harris Chain of Lakes Restoration Council

***2002 Report to the
Florida Legislature***

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Harris Chain of Lakes 2002 Report to the Legislature

Executive Summary

The Harris Chain of Lakes Restoration Council (Council) was established during the 2001 Legislative Session and, as required by the Legislature (Ch. 373.467 F.S.), has prepared this 2002 *Report to the Legislature*. The previous 2001 Report indicated the Council's intent to "carefully examine short-term projects that can provide immediate economic benefit to local communities."

During sixteen regular meetings and a workshop held from December 2001 through November 2002, the Council was provided technical information regarding impacts of historic and existing management practices on water quality, fisheries habitat, and recreational use of waterbodies in the Harris Chain of Lakes and associated watersheds in the Upper Ocklawaha River Basin.

Technical presentations were made by several state and local agencies, including the St. Johns River Water Management District (SJRWMD), Florida Department of Environmental Protection (FDEP), University of Florida, Florida Fish and Wildlife Conservation Commission (FFWCC), Lake County Water Authority (LCWA), City of Leesburg Environmental Services, and the Technical Advisory Group (TAG). Additional information was provided by private industry representatives and citizens.

After considering the information provided during the presentations and discussing the numerous restoration alternatives and issues facing the Harris Chain of Lakes, the Council convened a workshop and adopted the following restoration priorities.

1. in-lake dredging;
2. lake level fluctuation;
3. habitat, fisheries, and vegetation;
4. additional issues related to water quality; and
5. restoration of natural systems.

The Council also developed specific recommendations concerning several restoration initiatives that are listed and briefly described below.

Lake Level Fluctuation. To address concerns regarding lake access during low lake levels, the Council voted to adopt the lake level fluctuation program proposed by the SJRWMD with the following conditions:

- access dredging must be completed before the lake level fluctuation program is implemented; and
- the first lake level draw down should be a spring draw down.

Lake Alum Treatments. Due to issues regarding the effectiveness of alum treatments on lakes, the Council voted unanimously to exclude whole lake alum treatments as a recommended management action for the Harris Chain of Lakes at this time.

Marsh Flow Way Alum Treatments. Council voted to continue to review information and reports concerning the effectiveness of alum treatments on the marsh flow ways.

Phosphorus Removal by Marsh Flow Way Systems. The marsh flow way treatment systems have not been successful to date in the removal of phosphorus in the Harris Chain of Lakes. Continued scientific debate regarding the future success of the flow ways led the Council to request the following:

- flow way data collected by SJRWMD be independently analyzed;
- operational limitations be established for the flow ways; and
- the nutrient budget for Lake Apopka be updated and provided to the Council.

Rough Fish Harvest. The issue of whether rough fish harvest improves lake water quality was examined and the Council voted to support SJRWMD rough fish harvest activities and recommend continued review of relevant projects as well as additional research.

Contaminated Sediments. The Council recommended further review and evaluation of available sediment contamination information following review and discussion of potential contamination issues.

Vegetation Planting. Council recommended continued support of FFWCC revegetation activities currently underway. Council also recommended an additional \$100,000 to FFWCC for revegetation of the littoral zone of the Harris Chain of Lakes for fiscal year 2003 - 2004.

Potentially Toxic Algae. As a result of the potential health effects of cyanobacteria in lakes, Council recommended support of ongoing activities and monitoring relevant to this issue.

Industrial, Wastewater, and Stormwater Impacts. Based on evaluation of previous issues and more recent actions by the City of Leesburg, Council voted to formally commend the City of Leesburg on their continued efforts to reduce pollutant discharges and improve overall water quality in Lake Griffin.

PLRGs and TMDLs. Florida water policy requires the development of pollutant load reduction goals (PLRGs) for all waterbodies in the State. The Harris Chain of Lakes is included as a priority waterbody for the development of total maximum daily loads (TMDLs). Council recommended continued monitoring of the lakes in an effort to develop PLRGs and TMDLs for the Harris Chain of Lakes.

Aquatic Plant Management. Council voted to request \$150,000 from the Legislature in support of Lake County Mosquito and Aquatic Plant Control activities to address the anticipated increases in nuisance and exotic vegetation following lowered lake levels.

Funding. Proposed funding requests made by the Council are listed below. The Council may have additional funding requests for the 2003-2004 Florida Legislative Session.

- The Council has passed Resolution 2002-1 (Appendix 7) in support of the SJRWMD request for 4.2 million dollars for the Upper Ocklawaha River Basin (UORB) funding initiative for the fiscal year 2003-2004.
- The Council plans to submit a request for \$50,000 for administrative actions for the 2003-2004 fiscal year.
- Council plans to submit a request for \$150,000 from the Legislature for additional funding for the Lake County Mosquito and Aquatic Plant Control.
- Council plans to submit a request for an additional \$100,000 for revegetation of the littoral zone of Lake Beauclair for fiscal year 2003 - 2004.
- Council plans to submit a request for \$50,000 for cypress plantings on the Harris Chain of Lakes for the 2003-2004 fiscal year.

1.0 Establishment of the Harris Chain of Lakes Restoration Council

The environmental and economic importance of the Harris Chain of Lakes led to the creation of the Harris Chain of Lakes Restoration Council (Council) during the 2001 Florida Legislative Session (Chapter 373.467, Florida Statutes). A complete copy of the enacting legislation is provided in Appendix 1.

For the purposes of this Council, the Harris Chain of Lakes includes lakes and interconnecting waters from Lake Apopka north to Lake Griffin in primarily Orange and Lake counties (Figure 1). Harris Chain of Lakes also includes Lakes Beauclair, Dora, Eustis, Harris, Little Lake Harris, and Yale. Some proposed restoration projects in the watershed, such as Sunnyhill Farm, are located in south Marion County.

The Harris Chain of Lakes provides significant recreational opportunities and associated economic value, as well as abundant natural resources for Florida's fish and wildlife. The Harris Chain of Lakes is a federally designated navigable water under 33 CFR Part 329.11 and Lake Griffin State Recreational Area is designated an Outstanding Florida Water. However, declining water quality, habitat, and fisheries have resulted in economic losses to the community.

In 1988, the Upper Ocklawaha River Basin was designated by the SJRWMD as a Surface Water Improvement and Management (SWIM) Act priority water body in need of restoration and preservation. As part of the Lake Griffin restoration effort, the SJRWMD spent more than \$12.6 million to place 6,500 acres of former muck farms along Lake Griffin into public ownership. An overview of existing conditions in the Harris Chain of Lakes is provided in Appendix 2.

As required by the Legislature, the Council submitted its first annual report entitled *Harris Chain of Lakes Restoration Council Report to the Legislature, November 25, 2001*.

1.1 Representation

Membership on the Council was appointed by the Lake County Legislative Delegation, which is chaired by Senator Anna Cowin (R, District 11). The Council consists of nine voting members representing a broad spectrum of expertise and interest. The members of the Council and their affiliation or representation and duties on the Council are listed below.

S k i p (Chairman).....	G o e r n e r	Sport Fishing Industry
Don Nicholson.....		Waterfront Property Owners
R i c k P.G.....	P o w e r s ,	Environmental Engineering
H u g h (Secretary).....	D a v i s	Legal Profession (Attorney)
Thomas M.D.....	A . C o o k ,	Medical Profession (Physician)

Charles Clark.....	Biology or Related Science
Bill Pearce, P.E.....	Engineering Profession (Engineer)
Keith Farner.....	Member at Large
Thomas Brooks, CPA (Vice-chairman).....	Member at Large

The Legislation also provides for the creation of a Technical Advisory Group (TAG) to the Council for the purpose of providing scientific information and technical data as the Council deliberates the various issues that come before it. As of the date of this Legislative Report, the advisory group is comprised of the following individuals representing their respective agencies or entities:

St. Johns River Water Management District.....	Larry Battoe, Ph.D.
Florida Department of Environmental Protection.....	Jim Hulbert
Florida Fish and Wildlife Conservation Commission.....	Bill Johnson
Florida Department of Transportation.....	Steve Tonjes
U.S. Army Corps of Engineers.....	Pete Milam
University of Florida.....	Daniel E. Canfield, Jr. Ph.D.
Lake County Water Authority.....	Michael J. Perry
Ex-officio member appointed by Council.....	Bob Kaiser, P.E.

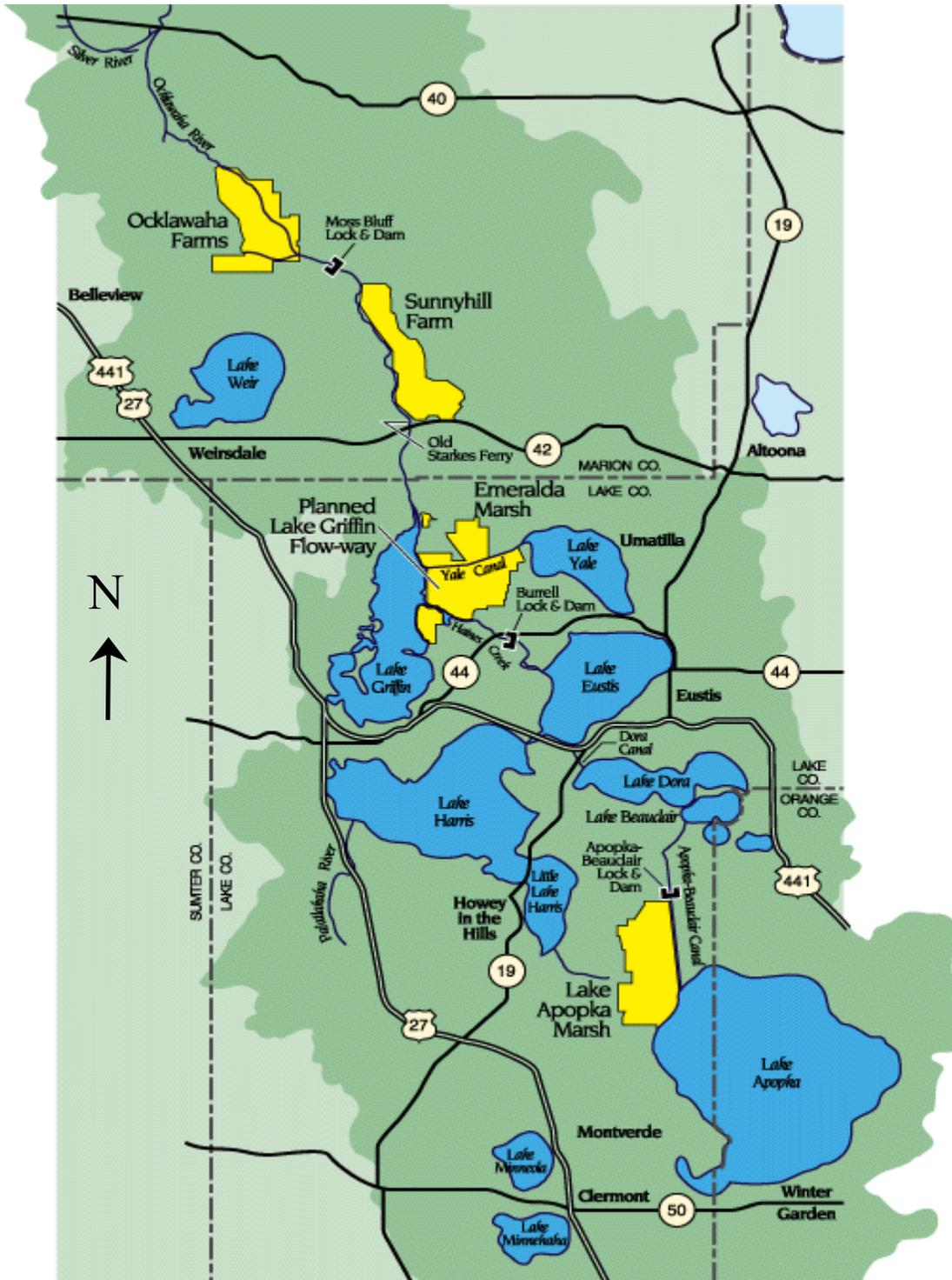
1.2 Duties and Responsibilities

Chapter 373.467, Florida Statutes, charged the Harris Chain of Lakes Restoration Council with several powers and duties. The Council has the power and duty to:

- (a) *Review audits and all data specifically related to lake restoration techniques and sport fish populations recovery strategies, including data and strategies for shoreline restoration, 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 Harris Chain of Lakes.*
- (b) *Evaluate whether additional studies are needed.*
- (c) *Explore all possible sources of funding to conduct restoration activities.*
- (d) *Report to the President of the Senate and Speaker of the House of Representatives before November 25 of each year on the progress of the Harris Chain of Lakes restoration program and any recommendations for the next fiscal year.*

Figure 1.

Location of the Harris Chain of Lakes in the Upper Ocklawaha River Basin, in Orange, Lake, and Marion counties, Florida.



2.0 Progress Report of the Harris Chain of Lakes Restoration Council 2002

Since the 2001 Report, the Council and TAG have been working to develop 2002 recommendations consistent with Chapter 373.467 (F.S.) for the Harris Chain of Lakes. During this time, previous and ongoing projects relevant to the Harris Chain of Lakes have been reviewed by the Council and used to develop management recommendations. The Council continues to meet and address management issues and recommendations relevant to the Harris Chain of Lakes.

2.1 Summary of 2002 Meetings

The Harris Chain of Lakes Restoration Council met for sixteen regular meetings and a workshop from December 2001 through November 8, 2002. During this time, the Council was presented with scientific and technical information related to lake health and potential restoration actions. The Council reviewed results of water quality, sediment, toxins, hydrology, fishery, vegetation, recreation, lake access, and lake management studies presented by state and local agencies to develop their recommendations. Private citizens also expressed concerns to the Council regarding economics and lake health. The Council discussed and evaluated the information provided to them and subsequently developed restoration recommendations for the Harris Chain of Lakes.

The Council was provided technical input regarding impacts of historic and existing management practices on water quality, fisheries habitat, and recreational use of waterbodies, including the Harris Chain of Lakes and associated watershed in the Upper Ocklawaha River Basin. Technical presentations were made by several state and local agencies. These include the SJRWMD, FDEP, University of Florida, FFWCC, LCWA, City of Leesburg Environmental Services, the TAG, and private industry representatives from Cutrale Citrus and Robinson Tree Farm (Seville, FL). A summary of the issues and actions addressed during the 2001-2002 Council sessions is provided in the following sections.

2.2 Management Issues and Recommended Actions

Since the first meeting of the Council in September 2001, several issues have been presented and discussed.

2.2.1 Lake Level Fluctuation

Issue: Lake access at low lake levels.

Action: Council passed a motion to expedite canal access dredging in support of the SJRWMD lake level fluctuation program to commence as soon as possible, no later than December 2002.

The importance of lake level fluctuation and the coupling of fluctuations with canal dredging activities were discussed extensively. Council and TAG agree to the importance of lake level

fluctuation to water quality and fisheries habitat. Council instructed the TAG to develop a short-term management plan for increased fisheries habitat on the lakes.

The SJRWMD has recommended a revised fluctuation program that more closely follows natural fluctuations as part of the restoration efforts aimed at the Harris Chain of Lakes and Lake Apopka. Funding requests submitted to the Florida Legislature specify that canal access dredging will be performed as part of a project to revise lake level regulation programs on the Ocklawaha River. Therefore, canal dredging may only be implemented as part of that project.

Canal access dredging is proposed to provide residents with a means to access and use the lakes. In contrast, in-lake dredging is a means of removing phosphorus from the lake by the removal of sediments. Additional engineering studies will be necessary to determine the amount of dredging and associated costs.

The SJRWMD presented the proposed lake level fluctuation program for Lake Griffin as a framework for management and indicated that the program would result in occasional lower water levels in the lake. The magnitude of high water levels would be unaffected (enhanced fluctuations below high water). The length of time required to return to higher water levels due to the implementation of the SJRWMD lake level fluctuation program was also addressed. The lake level fluctuation program proposed by the SJRWMD for Lake Griffin is provided in Appendix 3.

2.2.2 Alum Treatments

2.2.2.1 Lake Treatments

Issue: Effectiveness of alum treatments on lakes.

Action: Council voted unanimously to exclude whole lake alum treatments as a recommended management action for the Harris Chain of Lakes at this time.

Scientists from the SJRWMD presented information on the use of alum treatments as a means of reducing external and internal phosphorus loading to the lakes. Alum is applied to remove phosphorus from the water column and “cap” the sediments. The efficacy of the treatments is unknown and the TAG advised the Council not to consider alum treatments as a long-term restoration technique.

2.2.2.2 Marsh Flow Way Treatments

Issue: Effectiveness of alum treatments on marsh flow ways.

Action: None taken. Council will continue to review information and reports.

Alum is presently applied to marshes and flow ways in the watershed in an attempt to remove internal phosphorus that would otherwise flow into the lake. There is no evidence that the method is successful.

2.2.3 Marsh Flow Way Systems

Issue: Effectiveness of marsh flow ways in reducing phosphorus loadings to lakes.
Action: Council has requested that flow way data collected by SJRWMD be independently analyzed regarding the effectiveness of the flow ways. It is also requested that operational limitations be established at the flow way systems and that the 1995 nutrient budget for Lake Apopka be updated and provided to the Council.

Presentations on flow way design and operations were provided by the SJRWMD. Phosphorus is often the key limiting nutrient for algal growth, and restoration efforts in Lake Apopka and Lake Griffin have focused on limiting the amount of phosphorus entering the lake and removal of existing nutrients from the lake and marsh flow ways are intended to assist in these efforts.

One of the primary purposes of the marsh flow way systems is the removal of phosphorus from lake water and flow ways are monitored to measure the effects on lake water quality. Presentations on the operational results of the flow way water treatment system at Lake Griffin indicated that the flow way did not reduce phosphorus in the lake water (Appendix 4) and there has been a net discharge of phosphorus documented for the Lake Griffin flow ways. Scientific disagreement currently exists regarding the potential success of the flow ways in improving the health of the lakes and Council considers the flow ways experimental.

2.2.4 Rough Fish Harvest

Issue: Efficacy of using rough fish harvest to remove phosphorus.
Action: Support SJRWMD harvest activities and continue to review relevant projects. Additional research is recommended.

Gizzard shad are presently the dominant fish in lakes Griffin and Apopka, reflecting both poor water quality conditions and exacerbating those conditions by increasing the rate at which the phosphorus in the water is made available for algal growth. The removal of shad reduces the amount of phosphorus in the lake and the availability of the phosphorus, but makes up a relatively small portion of the overall phosphorus budget. In addition, removal of the shad helps to encourage the growth of zooplankton that feed on algae and reduce the biological disturbance of sediments and subsequent redistribution of phosphorus.

Rough fish, primarily plankton-feeding gizzard shad, are removed in an effort to reduce internal phosphorus loading in the lakes. Approximately 0.7% of the fresh weight of the gizzard shad is phosphorus. Over 900,000 pounds of gizzard shad, amounting to approximately 6,300 pounds (2858 kg) of phosphorus, have been harvested from Lake Griffin. Since 1993, a total of almost 4 million pounds of shad (containing 28,000 pounds (12,700 kg) of phosphorus) have been removed from Lake Apopka.

While the removal of phosphorus by rough fish harvest is documented, the relationship between shad harvest and changes in water quality have not been fully demonstrated. Council considers

this method experimental and recommends further evaluation of the effects of shad harvest in terms of improving the health of the lake.

2.2.5 Contaminated Sediments

Issue: Potential contamination of sediments.

Action: None taken. Council will continue to review and evaluate available information.

The issue of pesticides in sediments and potential problems with disposal of dredged sediments was raised. Although accumulated sediments may contain contaminants, there are no federal or state standards on what constitutes a definitive level of contamination in lake sediments.

There are standards for upland disposal of lake sediments and the disposal of sediments could be an issue. However, there is the possibility that sediments could be used in SJRWMD wetland restoration efforts along the lakes. The Council believes that placement of sediments on former muck farmlands may provide a solution to sediment disposal issues and assist in dredging and restoration projects for Lake Apopka and Lake Griffin. SJRWMD is investigating the use of the sediments for wetlands restoration as well as their use in capping contaminated soils in the Apopka muck farms.

2.2.6 Vegetation Planting

Issue: Revegetation as a means of improving fisheries habitat and water quality.

Action: Council recommended continuing support of revegetation activities currently underway with FFWCC. Council also recommended funding the FFWCC an additional \$100,000 for revegetation of the littoral zone of the Harris Chain of Lakes for fiscal year 2003 - 2004.

Vegetation plantings were described as a means of improving fisheries habitat and water quality. While planting cannot be accomplished in unconsolidated sediments, littoral zones can be replanted relatively easily during low lake levels. FFWCC projects underway in the UORB include vegetation planting. Many projects are partnerships with FDEP, SJRWMD, LCWA, and Lake County.

2.2.7 Potentially Toxic Algae

Issue: Potential health effects of cyanobacteria in lakes.

Action: Support ongoing activities and monitoring relevant to this issue.

Another issue presented to the Council was that of harmful algae blooms in the lakes, specifically potentially toxic cyanobacteria *Microcystis* and *Cylindrospermopsis*. The World Health Organization has guidelines for exposure to potentially toxic algae in both recreational and drinking water, but neither the United States nor Florida has adopted standards relevant to toxic algae. No recreation contact standards have been established and the possible health effects of cyanobacteria have yet to be determined. TAG members noted that these algae occur in most

lakes and do not appear to be an issue at this time. Florida Department of Health officials report no documented cases of cyanobacteria-related illnesses in the United States.

2.2.8 Industrial, Wastewater, and Stormwater Impacts

Issue: Discharges and subsequent impacts to lakes and human health.
Action: Council voted to formally commend the City of Leesburg on their continued efforts to improve the local wastewater treatment facilities (WWTF).

The City of Leesburg has a new “state of the art” WWTF located near the Florida Turnpike at Okahumpka, and an older facility on Canal Street north of U.S. 441 that is currently undergoing substantial upgrades. Old facilities and former staffing were identified as problems associated with complaints aimed at the City. A new city manager, wastewater treatment director, and plant operations manager, as well as several new key operations personnel, in addition to facility upgrades have alleviated many of the previously identified problems and the City of Leesburg continues to improve its facilities and services. A more detailed description of these efforts is provided in Appendix 5.

In addition, a representative of Cutrale Citrus processing explained that Cutrale has eliminated industrial discharges to waterbodies and now uses sprayfield irrigation.

2.2.9 PLRGs and TMDLs

Issue: Status of Harris Chain of Lakes regarding Total Maximum Daily Loads (TMDLs) and Pollution Load Reduction Goal (PLRG) programs.
Action: Continue to monitor status of lakes.

Florida water policy requires developing pollutant load reduction goals (PLRGs) for all waterbodies in the state and SWIM waterbodies are among the highest priority for development of PLRGs. PLRGs focus on phosphorus, and lake water quality modeling will be used to establish phosphorus loading limits to meet the water quality goals.

Representatives from FDEP addressed the development of PLRGs to provide application of TMDLs in the UORB. Cooperative efforts among FDEP, the SJRWMD, and other federal, state, and local agencies are underway to develop PLRGs. Because much of the data are collected as part of the Florida LakeWatch, a volunteer organization, additional water quality data may be necessary before TMDLs can be established. The Harris Chain of Lakes has been identified as a priority TMDL waterbody.

2.2.10 Aquatic Plant Management

Issue: Nuisance and exotic vegetation will increase when lakes are lowered.
Action: Council voted to request \$150,000 from the Legislature in support of Lake County Mosquito and Aquatic Plant Control activities.

Aquatic plants in the Harris Chain of Lakes are critical to the restoration of the area's fisheries. Non-native aquatic plants, e.g. *Hydrilla*, also occur in the lakes and have resulted in a severe aquatic weed problem in the past.

Once proposed water level fluctuation programs are initiated or if water clarity improves, the abundance of aquatic plants will increase and can be a problem. If these problems are not addressed quickly and definitively, public support for future fluctuation programs may change.

2.3 Summary of Council Recommended Actions and Consensus Items

2.3.1 Actions

Council voted to make recommendations to SJRWMD and the Florida Legislature, following review of materials presented to the Council and recommendations made by the TAG during the past year.

The Council voted to adopt the lake level fluctuation program proposed by the SJRWMD with the following conditions:

- access dredging must be completed before the lake level fluctuation program is implemented; and
- the first lake level draw down should be a spring draw down.

Council voted to recommend canal access dredging prior to lake level fluctuation implementation and that the first lake level draw down occur in the spring.

Council voted to accept the following list of priorities for the Harris Chain of Lakes restoration efforts:

1. in-lake dredging;
2. lake level fluctuation;
3. habitat, fisheries, and vegetation;
4. additional issues related to water quality; and
5. restoration of natural systems.

Council voted in support of two Resolutions during this past year (Appendix 7):

- Resolution acknowledging and commending the City of Leesburg, Florida, for its positive efforts in environmental protection and enhancement by reducing pollutant discharges into, and improving the overall water quality of, Lake Griffin; and
- Resolution in support of the Priority #1 project of the SJRWMD Upper Ocklawaha River Basin funding initiative for the fiscal year 2003-2004.

2.3.2 Consensus Items

By consensus, Council agreed to further examine two management alternatives for Lake Griffin that were developed by the TAG under direction of the Council. The management actions are short-term and intended to provide results in two to five years.

- Modified drawdown to approximately 55 feet, dredging for access, and “spot” dredging. Advantages: expose littoral zone, deepen areas prone to resuspension, and stimulate revegetation. Disadvantages: dredging experience limited, potentially prolonged lake level recovery, temporary vegetation management problems, will require repeating in absence of lake level fluctuations, disagreement within TAG as to potential success.
- Massive revegetation. Advantages: provides fisheries habitat, proven technology, can be implemented rapidly, and can include public involvement. Disadvantages: vegetation may be difficult to obtain, technology is limited to small areas of lakes, it is beyond the 3-5 year time frame, there may be feasibility issues, fisheries impacts not well documented.

The Council was asked to address costs, nutrient target levels, and time frames for a successful restoration effort. The control of *Hydrilla* and aquatic weeds in general, as opposed to eradication, should also be addressed as part of the overall restoration plan.

In general, TAG members agreed that lake level fluctuation is important to vegetation, fisheries habitat, water quality, and overall lake health. There is a difference in scientific opinion regarding the (1) effectiveness of flow ways on the reduction of external phosphorus loadings to the lakes and (2) the importance of internal and external nutrient cycling to lake health. However, TAG members reached consensus on recommended short-term management actions for the Harris Chain of Lakes (described in Section 2.3).

2.4 Requested Funding

The Harris Chain of Lakes Restoration Council received a combined total of \$27,390 in funding from Lake County, LCWA, and the SJRWMD for the 2001 – 2002 fiscal year for administrative costs. Recent and proposed funding requests are listed below.

Funding. Proposed funding requests are listed below. The Council anticipates possible additional funding requests for the 2003-2004 Florida Legislative Session.

- The Council has passed Resolution 2002-1 (Appendix 7) in support of the SJRWMD request for 4.2 million dollars for the Upper Ocklawaha River Basin (UORB) funding initiative for the fiscal year 2003-2004.
- The Council plans to submit a request for \$50,000 for administrative actions for the 2003-2004 fiscal year.
- Council plans to submit a request for \$150,000 from the Legislature for additional funding for the Lake County Mosquito and Aquatic Plant Control.

- Council plans to submit a request for an additional \$100,000 for revegetation of the littoral zone of Lake Beauclair for fiscal year 2003 - 2004.
- Council plans to submit a request for \$50,000 for cypress plantings on the Harris Chain of Lakes for the 2003-2004 fiscal year.

3.0 Appendices

Appendix 1 Enacting Legislation

Appendix 2. Overview of the Harris Chain of Lakes

Appendix 3. Lake level fluctuation program proposed by the SJRWMD for Lake Griffin.

Appendix 4. Graph of total phosphorus (TP) loading from flow way to Lake Griffin.

Appendix 5. Report on the Status of the City of Leesburg Wastewater Treatment Facility, submitted to the Harris Chain of Lakes Restoration Council by Bob Kaiser.

Appendix 6. Lake Apopka Forum as presented in the scientific journal Hydrobiologia.

Appendix 7. Resolutions voted upon by the Council during fiscal year 2002-2003.

Appendix 1. Enacting Legislation

The 2002 Florida Statutes/ Title XXVII

NATURAL RESOURCES; CONSERVATION, RECLAMATION, AND USE

CHAPTER 373 WATER RESOURCES

373.467 The Harris Chain of Lakes Restoration Council.--There is created within the St. Johns River Water Management District, with assistance from the Fish and Wildlife Conservation Commission and the Lake County Water Authority, the Harris Chain of Lakes Restoration Council.

(1)(a) The council shall consist of nine voting members, which include: a representative of waterfront property owners, a representative of the sport fishing industry, an environmental engineer, a person with training in biology or another scientific discipline, a person with training as an attorney, a physician, a person with training as an engineer, and two residents of the county who do not meet any of the other qualifications for membership enumerated in this paragraph, each to be appointed by the Lake County legislative delegation. No person serving on the council may be appointed to a council, board, or commission of any council advisory group agency. The council members shall serve as advisors to the governing board of the St. Johns River Water Management District. The council is subject to the provisions of chapters 119 and 120.

(b) There shall be an advisory group to the council which shall consist of one representative each from the St. Johns River Water Management District, the Department of Environmental Protection, the Department of Transportation, the Fish and Wildlife Conservation Commission, the Lake County Water Authority, the United States Army Corps of Engineers, and the University of Florida, each of whom shall be appointed by his or her respective agency, and each of whom, with the exception of the representatives from the Lake County Water Authority and the University of Florida, shall have had training in biology or another scientific discipline.

(2) 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.

(3) The council shall meet at the call of its chair, at the request of six of its members, or at the request of the chair of the governing board of the St. Johns River Water Management District.

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

(a) Review audits and all data specifically related to lake restoration techniques and sport fish population recovery strategies, including data and strategies for shoreline restoration, 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 Harris Chain of Lakes.

- (b) Evaluate whether additional studies are needed.
- (c) Explore all possible sources of funding to conduct the restoration activities.
- (d) Report to the President of the Senate and the Speaker of the House of Representatives before November 25 of each year on the progress of the Harris Chain of Lakes restoration program and any recommendations for the next fiscal year.
- (5) The St. Johns River Water Management District shall provide staff to assist the council in carrying out the provisions of this act.
- (6) 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 s. 112.061. State and federal agencies shall be responsible for the per diem and travel expenses of their respective appointees to the council, and the St. Johns River Water Management District shall be responsible for per diem and travel expenses of other appointees to the council.

History.--s. 1, ch. 2001-246.

Appendix 2. Overview of the Harris Chain of Lakes

The Harris Chain of Lakes (Figure 1) is located in the Upper Ocklawaha River Basin (UORB) in Lake, Orange, and south Marion counties in central peninsular Florida. Lake Apopka and the seven major lakes in Harris Chain of Lakes (listed below) dominate the UORB and together make up the Ocklawaha Chain of Lakes.

- Lake Beauclair
- Lake Dora
- Lake Eustis
- Lake Harris
- Little Lake Harris
- Lake Griffin
- Lake Yale

1.0 Introduction

Like many Florida lakes, water control structures on the Harris Chain of Lakes stabilize lake levels. This, combined with extensive draining of surrounding marshes for muck farming and increased nutrient enrichment from agricultural, municipal, commercial, and stormwater runoff, has contributed to the overall decline in fisheries habitat in these lakes.

Productivity in these lakes has increased to detrimental levels while the aesthetic, recreational, and commercial value have continued to decline. Subsequently, in 1998 the UORB was designated a priority water body in need of restoration and preservation under the Surface Water Improvement and Management (SWIM) Act.

2.0 Location and General Description

The headwaters of the Harris Chain of Lakes are located at Apopka Spring in Lake Apopka. The entire UORB includes 638 square miles and extends from the Apopka-Beauclair water control structure north of Lake Apopka to State Road 40 near Ocala. Flow into the Harris Chain of Lakes originates from the Palatlahaha River subbasin and the Lake Apopka subbasin.

Physiographically, the Harris Chain of Lakes and the UORB in which it occurs are part of the Florida Section of the Coastal Plain Physiographic Province. Here, the area of depositional limestone is referred to as the Florida Structure Platform and the dissolution of limestone determines the topographic relief (Fulton 1995, after Brooks 1982). Karst terrains also occur throughout the basin.

The Harris Chain of Lakes occurs primarily within the Central Lakes Subdivision of the Central Lake District. This is a large lowland area between the Mount Dora Ridge on the east and the Ocala Uplift District to the west, characterized by soluble calcareous bedrock and rich soils. In addition, the potentiometric surface intersects the ground surface in many areas, resulting in numerous springs and spring-fed lakes. Principal springs associated with the Harris Chain of Lakes include Bugg Springs (14 cfs), Blue Spring (5 cfs), and Holiday Springs (3 cfs), all of which discharge to the south side of Lake Harris via streams or channels.

Soils in the UORB are predominantly sandy and droughty (63.7%), followed by moderately well to poorly drained (18.8%) and poorly to very poorly drained (16.3%) soils. Well drained soils make up only 1.3% of the total area in the UORB. The Harris Chain of Lakes is in a large area of dissolution basins where there is little topographic relief and elevations range between 60 and 70 feet NGVD and a few hills exceeding 100 feet in height.

3.0 Hydrology

Water flowing through the Harris Chain of Lakes begins at Lake Apopka and flows through the Apopka-Beauclair Canal into Lake Beauclair. Lake Beauclair discharges into Lake Dora and then into Lake Eustis through the Dora Canal. However, the primary input to Lake Eustis is from Little Lake Harris and Lake Harris, which subsequently flow to Lake Griffin through Haines Creek. Lake Griffin flows to the Ocklawaha River.

Lake Yale is not directly connected to any of the lakes in the basin. Until the construction of the Apopka-Beauclair Canal control structure, water flowed from Lake Apopka into Little Lake Harris through Double Run Swamp. Flow from the Palatka River subbasin into the Harris Chain of Lakes is controlled by a series of structures operated by the LCWA.

The Apopka-Beauclair Lock and Dam is operated by SJRWMD and regulates water levels in Lake Apopka (Table 1). Lakes throughout Florida have water level fluctuations ranging from about 3 feet to over 32 feet. Historically, lake levels in the UORB had a fluctuation of 5 to 6 feet, compared with 1 to 1.5 feet under existing management.

Burrell Lock and Dam on Haines Creek is operated by SJRWMD to regulate water levels in lake Eustis. Water elevations in Lakes Harris, Little Harris, Dora and Beauclair are also affected by the Burrell structure. SJRWMD operates the Moss Bluff Lock and Dam in accordance with USACE to regulate water levels in Lake Griffin. The same structure affects water levels in Lake Yale.

Table 1

Control structures regulating lake levels in the Harris Chain of Lakes

Lake	Structure	Managing Agency
Apopka	Apopka-Beauclair	SJRWMD
Eustis, Harris, Little Harris, Dora, Beauclair	Burrell	SJRWMD
Griffin, Yale	Moss Bluff	USACE

4.0 Water Quality

Data collected by SJRWMD, FDEP, FFWCC, USGS, and Lake County Environmental Services were used to calculate a Trophic State Index (TSI) for lakes in the UORB, based on chlorophyll *a*, transparency, nitrogen, and phosphorus. The TSI is a means to rate the health of lakes. A TSI rating of 0-59 is considered good; 60-69 is rated fair; and 70-100 is considered poor. Based on

TSI, water quality in lakes Beauclair, Dora, and Griffin is poor, compared with fair water quality in lakes Harris-Little Lake Harris and Eustis, and good water quality in Lake Yale.

5.0 Fisheries

Creel surveys conducted by the FFWCC have been used to examine trends in the sport fishery in the Ocklawaha Chain of Lakes and have documented a declining largemouth bass fishery (Fulton 1995). In Lake Harris, bass harvest and catch success declined substantially in 1988, although total catch remained high through 1990, due to record fishing effort. Fishing effort and catch declined dramatically in 1991. In Lake Griffin, fishing effort, catch, and success for largemouth bass substantially increased following a 1984 drawdown. However, by 1989 bass fishing effort and catch had declined to the low pre-drawdown levels. The benefits of a single drawdown to fish recruitment are expected to be temporary. Management of habitat and water quality is necessary to maintain a healthy fishery.

6.0 Recreation

The Harris Chain of Lakes provides significant recreational opportunities and abundant natural resources for Florida's fish and wildlife. Notably, Lake Griffin State Recreational Area is a designated Outstanding Florida Water and the Harris Chain of Lakes is a federally designated navigable water under 33 CFR Part 329.11 (Definition of Navigable Waters of the U.S.).

Boating activity in the Harris Chain of Lakes is significant based on the numerous marinas and fish camps. Boating is especially popular in the Lake Griffin State Recreational Area, located in the southwest portion of Lake Griffin. Boating activity declined from about 1992, possibly a result of the decreased fishing activity and problems with lake access due to the drought. Lower boating activity in 1984 was likely a result of the Lake Griffin drawdown.

7.0 Management History

The lakes, rivers, and springs of the Harris Chain of Lakes were developed for tourism and then agricultural and commercial industry as barge and steamship traffic increased. Visitors were attracted to the region for its outstanding fishing and other aquatic related recreation. The construction of water control structures and channelization of the Ocklawaha River began as early as 1893 to facilitate navigation. The present configuration for locks and dams was completed in 1974.

Existing fluctuation programs were developed in the 1950s for flood control and navigation, not the health of rivers, lakes, and wetlands. The results were altered hydrologic regimes and commensurate loss of floodplain and aquatic habitat as well as reductions in water quality. Muck farms in the UORB contributed heavy sediment and nutrient loads and exacerbated the problems associated with controlled water levels. In addition, untreated sewage and industrial effluents historically discharged into the lakes. The result of these discharges was eutrophication of surface waters and declining regional water quality and loss of aquatic habitat.

In 1988, the UORB was designated by the SJRWMD as a Surface Water Improvement and Management (SWIM) Act priority water body in need of restoration and preservation. Efforts under the UORB SWIM program focus on reducing nutrients and other pollutants in basin water bodies, reestablishing more-natural water level fluctuations, restoring the original river channel, and restoring former "muck" farms to aquatic and wetland habitats. As part of the Lake Griffin restoration effort, the SJRWMD spent more than \$12.6 million between 1991 and 1993 to place 6,500 acres of former muck farms along Lake Griffin into public ownership. These areas are being restored to natural wetlands and uplands and now make up the Emerald Marsh Conservation Area.

8.0 Management Issues

Management issues addressed by the Harris Chain of Lakes Restoration Council were presented in the main body of the *2002 Report to the Florida Legislature*. Recommendations made by the Council regarding these issues were also presented. Management issues on the Harris Chain of Lakes can be summarized as follows:

1. Lake level fluctuations;
2. Lake and flow way alum treatments;
3. Flow ways;
4. Rough fish harvest;
5. Contaminated sediments;
6. Vegetation planting;
7. Potentially toxic algae;
8. Industrial, wastewater, and stormwater impacts;
9. Pollution load reduction goals (PLRGs) and total maximum daily loads (TMDLS); and
10. Aquatic plant management.

9.0 Relevant Literature

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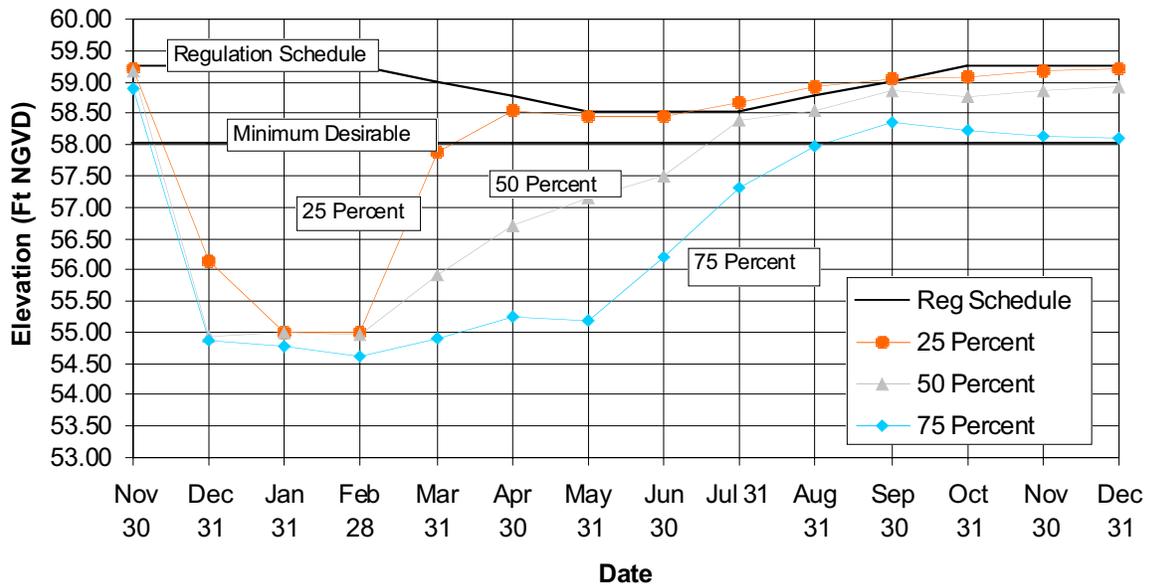
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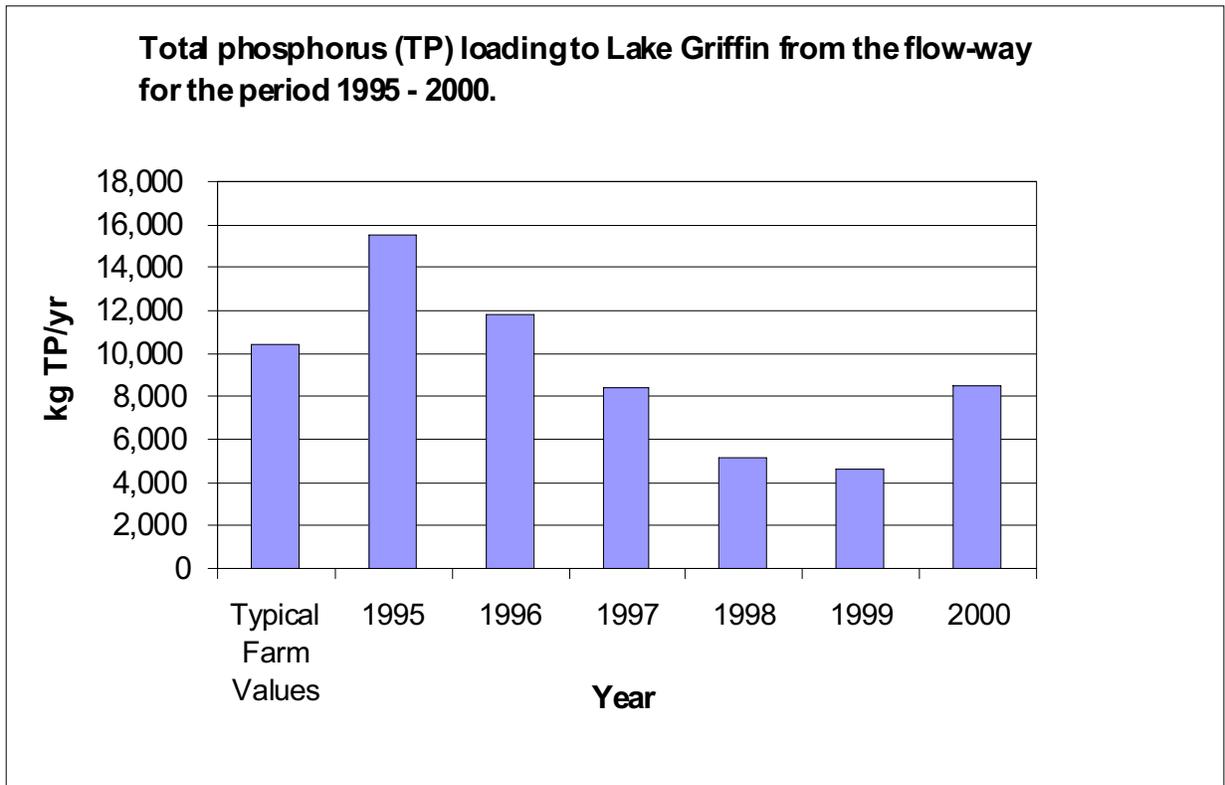
Southwest Florida Water management Disrict. 2000. Lake Panasoffkee Surface Water improvement and Management (S.W.I.M.) Plan.

Appendix 3. Enhanced lake level fluctuation program proposed by the SJRWMD for Lake Griffin.

Lake Griffin Enhanced Fluctuation, Eustis Storage to 63.25 Ft NGVD
(Starting December 1, With Target Elevation Of 55.0 Ft NGVD For 60 Days)



Appendix 4. Graph of total phosphorus (TP) loading from flow way to Lake Griffin (from SJRWMD 2002).



Appendix 5. Report on the Status of the City of Leesburg Wastewater Treatment Facility, submitted to the Harris Chain of Lakes Restoration Council by Bob Kaiser.

**ANNUAL REPORT
OCTOBER 9, 2002
LEESBURG WWTF
HARRIS CHAIN OF LAKES RESTORATION COUNCIL
LEGISLATIVE REPORT**

One series of events that prompted attention from this Council was an apparent string of lift station problems in the City of Leesburg.

Leesburg's Waste Water Treatment System includes two waste water treatment plants; one new facility located near the Florida Turnpike at Okahumka, and one old facility on Canal Street north of US 441 downtown. The new "Turnpike" facility is state of the art. The old facility on Canal Street is currently undergoing a major upgrade in equipment, operation, controls, capacity and maintenance features. These two facilities are designed to pump (or transfer) treated water back and forth to each. Their joint capability is far in excess of what is needed in 2002.

The remainder of the treatment and sewage handling systems are comprised of 96 lift stations of various ages and physical condition from new to deteriorated. Manholes in many cases were old and crumbling, or leaking groundwater. Groundwater intrusion in the entire sewage system was approaching the overwhelming state.

The City was being besieged by irate citizens and the local newspaper. One well-intentioned and slightly misdirected citizen was exceptionally troublesome to the City. This citizen filed Administrative complaints with DEP and other agencies. Leesburg lies on a lowland between Lake Harris and Lake Griffin and sewage spills are serious pollution problems.

The irony of the situation was borne out in the early futility of getting this fractionalized system under control by a new staff.

The City of Leesburg had hired a new City Manager, who in turn had hired a new Waste Water Treatment Director, a new Treatment Plant Operations Manager, and several new key operations personnel to purposely get this grossly neglected system under control. It appeared at the time they took charge that the worst of the problems manifested themselves. This, of course, created more public criticism before new programs could take effect.

Something needed to be done to rein in this escalating calamity, which was actually more panic conversation than reality.

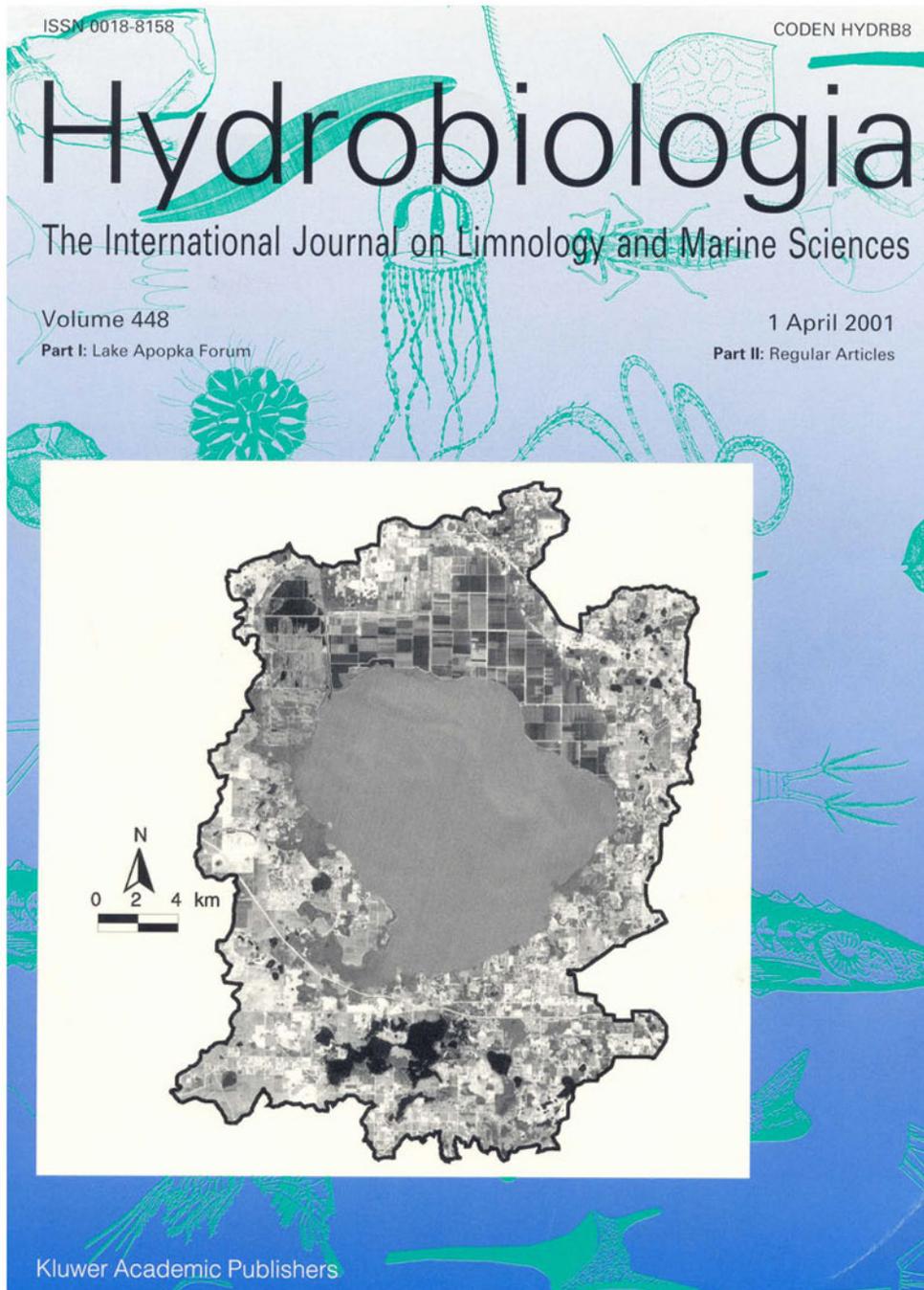
The Harris Chain of Lakes Restoration Council assigned a retired engineer (non-paid volunteer) to look into the matter. Through tact, engineering expertise, education of certain people and patience, this problem was brought under control in about three months.

The engineer files reports with the council each month, and keeps liaison with the Leesburg WWTF personnel. The public criticism has ceased, and the systems are being steadily improved. Additional grant money has been applied for by the Leesburg operations and received from LCWA, the state of Florida, and municipal bonds.

This existing city-wide system is at this writing an ideal model of operation, maintenance, continuing upgrades, future planning and personnel management.

The Water Facilities Manager and staff have done a remarkable job in one year, and deserve special commendation.

Appendix 6. Lake Apopka Forum as presented in the scientific journal *Hydrobiologia*.



Part I
Lake Apopka Forum

Model erroneously predicts failure for restoration of Lake Apopka, a hypereutrophic, subtropical lake

Claire L. Schelske, William F. Kenney

1-5

Sediment removal by the Lake Apopka marsh flow-way

Roger W. Bachmann, Mark V. Hoyer, Daniel E. Canfield Jr.

7-10

The restoration of Lake Apopka in relation to alternative stable states: an alternative view to that of Bachmann et al. (1999)

Edgar F. Lowe, Lawrence E. Battoe, Michael F. Coveney, Claire L. Schelske, Karl E. Havens, Erich R. Marzolf, K. Ramesh Reddy

11-18

Evaluation of recent limnological changes at Lake Apopka

Roger W. Bachmann, Mark V. Hoyer, Daniel E. Canfield Jr.

19-26

Appendix 7. Resolutions recommended by the Harris Chain of Lakes Restoration Council during the 2001-2002 fiscal year.

**HARRIS CHAIN OF LAKES
RESTORATION COUNCIL**

RESOLUTION No. 2002-1

A RESOLUTION OF THE HARRIS CHAIN OF LAKES RESTORATION COUNCIL SUPPORTING THE PRIORITY ONE PROJECT, AS LISTED HEREIN, OF THE ST. JOHNS RIVER WATER MANAGEMENT DISTRICT UPPER OCKLAWAHA RIVER BASIN FUNDING INITIATIVE FOR FISCAL YEAR 2003-2004

WHEREAS, the Harris Chain of Lakes Restoration Council (Council) has the responsibility under Chapter 2001-246, Laws of Florida, of recommending a restoration program for the Harris Chain of Lakes in Lake County, Florida; and

WHEREAS, the St. Johns River Water Management District (District) has prepared the Upper Ocklawaha River Basin (UORB) Funding Initiative for FY 2003-2004, which includes potential additional project partners, for the purpose of protecting natural resources and completing projects outlined in the Surface Water Improvement and Management (SWIM) Plan for the UORB and Lake Apopka; and

WHEREAS, said Funding Initiative has been presented to the Council at its October 11, 2002, meeting for review and recommendation; and

NOW, THEREFORE, BE IT RESOLVED that the Harris Chain of Lakes Restoration Council does hereby recommend and support the Enhanced Lake Level Fluctuation and Lake Management Project Listed as Priority Ranking #1 at a budget request of 4.2 million dollars within the District's UORB Funding Initiative.

A summary outline of the project include

- Restore more-natural lake level fluctuations to improve water quality and reduce loss of lakeshore fish and wildlife habitats
- Provide for dredging of canals on Lake Griffin to improve boat access during low water conditions
- Provide for the continued harvesting of gizzard shad from Lake Griffin

- Restore the historic flow of the Harris Bayou between Lakes Harris and Griffin to provide greater flexibility in managing lake levels in the Burrell sub-basin, and to provide conveyance for additional flood control
- Develop plans and specifications and obtain permits for modifications to increase flood conveyance through the Dora Canal

PASSED AND ADOPTED this 8th day of November, 2002.

Harris Chain of Lakes
Restoration Council

_____, Chairman
Skip Goerner

Date: _____

HARRIS CHAIN OF LAKES RESTORATION COUNCIL

RESOLUTION No. 2002-2

A RESOLUTION OF THE HARRIS CHAIN OF LAKES RESTORATION COUNCIL ACKNOWLEDGING AND COMMENDING THE CITY OF LEESBURG, FLORIDA, FOR ITS POSITIVE EFFORTS IN ENVIRONMENTAL PROTECTION AND ENHANCEMENT BY REDUCING POLLUTANT DISCHARGES INTO AND IMPROVING THE OVERALL WATER QUALITY OF LAKE GRIFFIN.

WHEREAS, the Harris Chain of Lakes Restoration Council (Council) was created under Chapter 2001-246, Laws of Florida, and has the responsibility of recommending a restoration program for the Harris Chain of Lakes in Lake County, Florida; and

WHEREAS, the City of Leesburg (City) has been aware of, and involved with, various environmental improvement and enhancement programs which are successfully serving to protect and preserve the water quality within the Harris Chain of Lakes in ways that benefit all the citizens of Leesburg and Lake County; and

WHEREAS, the City has worked to reduce pollutant discharges into the Harris Chain of Lakes through a variety of programs, projects, and actions directed specifically toward surface water quality improvement.

NOW, THEREFORE, BE IT RESOLVED that the Harris Chain of Lakes Restoration Council hereby commends the Mayor, City Commission, Staff, and Citizens of the City of Leesburg, Florida, for their tireless and positive efforts in achieving massive improvements to their Waste Water Treatment Facilities, and for the creation of an excellent public relations program which resulted in successful citizen involvement and interaction.

PASSED AND ADOPTED this 8th day of November, 2002.

Harris Chain of Lakes
Restoration Council

_____, Chairman
(Skip Goerner)

Date: _____