

# **HARRIS CHAIN OF LAKES RESTORATION COUNCIL**

## **2009 REPORT TO THE FLORIDA LEGISLATURE**

In Compliance with Chapter 373.467 Florida Statutes

**Issued By:**

### **Harris Chain of Lakes Restoration Council**

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Edward M. Schlein, M.D.  
Jon VanderLey

**Prepared By:**

Patrick F. Hunter, LEP  
Hunter Environmental Consulting, Inc.

**November 25, 2009**

# **Harris Chain of Lakes Restoration Council 2009 Report to the Florida Legislature**

## **~ Executive Summary ~**

### **Statutory Authority**

The Harris Chain of Lakes Restoration Council (Council) was established by the Florida Legislature in 2001 (Chapter 373.467 Florida Statutes) with the powers and duties to: a) review and audit all data specifically related to lake restoration techniques and sport fish population recovery strategies; b) evaluate whether additional studies are needed, and; c) explore all possible sources of funding to conduct restoration activities. The Legislature also established the Harris Chain of Lakes Restoration Program (Chapter 373.468 Florida Statutes) which directed the Fish and Wildlife Conservation Commission and the St. Johns River Water Management District, in conjunction with the Florida Department of Environmental Protection, pertinent local governments, and the Harris Chain of Lakes Restoration Council; to review existing restoration proposals to determine which ones are most environmentally sound and economically feasible methods of improving the fish and wildlife habitat and natural systems of the Harris Chain of Lakes. Chapter 373.467 Florida Statutes is provided as [Appendix 1](#) and Chapter 373.468 Florida Statutes is provided as [Appendix 2](#) of this report.

### **Summary of 2009 Meetings and Presentations**

During the period of November 2008 through October 2009 the Council convened eight (8) regular monthly meetings, convened one (1) Public Workshop for community input on priorities, expectations and ideas; and attended one (1) meeting of the SJRWMD Governing Board – Projects and Land Committee. Throughout the year, the Council was presented scientific information and data, which included water quality, aquatic habitat, fisheries status, and restorative measures as they relate to the Harris Chain of Lakes. The analytical data and scientific information reviewed addressed; water quality and toxicology, littoral vegetation and fish habitat, fish restocking to provide economic benefits to the region, fish harvests as they relate to water quality, lake access canal dredging, along with other lake management issues. The Council also reviewed previous, on-going, and future projects in the Upper Ocklawaha River Basin that relate to water quality and aquatic habitat. The information received was reviewed and discussed by the Council in detail, and was then used as the basis for developing recommendations of restorative measures and management practices for the Harris Chain of Lakes. Copies of the meeting minutes, including discussion of technical information received, and the presentations given for the period of November 2008 through October 2009, are provided as Appendix 3 of this report.

During the monthly meetings, the Council was provided technical information regarding impacts of historic and existing management practices on the Harris Chain of Lakes and the Upper Ocklawaha River Basin. Technical presentations were made and information was provided by several state and local agencies including the St. Johns River Water

Management District, Florida Department of Environmental Protection, Florida Fish and Wildlife Conservation Commission, Lake County Water Authority, University of Florida-Institute of Food and Agricultural Sciences, and the Technical Advisory Group to the Council. Below is a list of the technical presentations made to the Council during the 2009 reporting period:

- 1/9/09 Jim Stivender, Director of the Lake County Department of Public Works provided an overview of Lake County Stormwater Fees and Projects.
- 2/6/09 Dave Walker, Upper Ocklawaha River Basin Program Manager with the St. Johns River Water Management District provided an update on restoration efforts at the Lake Apopka North Shore Restoration Area and Emeraldal Marsh during a Governing Board – Projects and Land Committee meeting. ([Appendix 3A](#))
- 3/6/09 Eric Nagid, a Biologist with the Florida Fish and Wildlife Conservation Commission gave a presentation on Water Level Fluctuation and Fish at Rodman Reservoir; and Hydrilla Management at Orange Lake and Lochloosa Lake. ([Appendix 4](#))
- 4/4/09 The Council held a Public Workshop to discuss Lake Restoration Issues.
- 6/5/09 David Fisk, Assistant Director of the St. Johns River Water Management District gave a presentation on the relationship with the Natural Resources Conservation Service pertaining to Lake Apopka and the North Shore Restoration Area restoration efforts.
- Bruce Jagers of the Florida Fish and Wildlife Commission gave a presentation on the status of the Lowrie Brown restoration efforts within the Emeraldal Marsh. ([Appendix 5](#))
- Michael Hodges of Genesis Fluid Solutions, LLC gave a presentation on Rapid Dewatering Dredging Technologies for potential use with the Lake Beauclair Dredging Project. ([Appendix 6](#))
- 9/11/09 Barron Moody, a Regional Fisheries Administrator with the Florida Fish and Wildlife Conservation Commission gave a presentation on the Lake Trafford Dredging Project. ([Appendix 7](#))
- Dr. Daniel Canfield of the University of Florida-Institute of Food and Agricultural Sciences and Chairman of the Technical Advisory Group provided a Summary of Restoration Technologies discussed by the Technical Advisory Group during a meeting held on August 24, 2009. ([Appendix 8](#))
- 10/9/09 Dr. Daniel Canfield of the University of Florida-Institute of Food and Agricultural Sciences gave a presentation on the Restoration of Fish Habitat in the Harris Chain of Lakes. ([Appendix 9](#))

Throughout the year the Technical Advisory Group provided technical information, presentations, and regular updates to the Council in support of water quality and restorative issues being reviewed for the Harris Chain of Lakes. Copies of the presentations made before the Council are provided as appendices to this report as noted. All appendices and the complete report are provided digitally on the CD which accompanies this report or may also be accessed via the Council website at <http://harrischaincouncil.ifas.ufl.edu/>.

In 2009 the Technical Advisory Group Members include:

Daniel E. Canfield Jr., Ph.D.	University of Florida-Institute of Food and Agricultural Sciences (Chairman)
Barbara Bess	Ex-officio Member – Senior Environmental Consultant
Christianne Ferraro	Florida Department of Environmental Protection
Walt Godwin	St. Johns River Water Management District
Bill Johnson	Florida Fish and Wildlife Conservation Commission
Peter Milam	U. S. Army Corps of Engineers
Michael J. Perry	Lake County Water Authority
Stephen Tonjes	Florida Department of Transportation

In April 2009, the Council in order to expedite the Harris Chain of Lakes Restoration Program (Chapter 373.468 Florida Statutes) sponsored a Public Workshop hosted by the Florida LAKEWATCH program, which included a diverse group of citizens living along the Harris Chain of Lakes. The meeting was designed to assess citizen input of the current restoration programs and restoration projects being advanced by the Council.

After debating many of the issues previously discussed before the Council, the citizens also concluded that they believed new restoration strategies were needed for the Harris Chain of Lakes. The citizens recommended five approaches:

1. Build artificial fish habitat that can assist with the restoration of the fisheries and aquatic plant habitat,
2. Reconnect the marshes to the lakes as soon as possible,
3. Continue the wild-adult bass stocking program,
4. Support dredging of Lake Beauclair, and
5. Initiate dredging of canals around other lakes for access at low water. These recommended approaches were put forth at the May 2009 meeting of the Council and adopted as guidelines for future restoration activities.

## **Findings and Recommendations**

In the 2008 Report to the Florida Legislature, the Council, after reviewing decades of scientific reports, concluded that the restoration of the entire Harris Chain of Lakes shall be delayed unless alternative restoration strategies are implemented under Legislative direction. The Council was especially concerned with the restoration approaches being followed by the

St. Johns River Water Management District because the approaches focus on phosphorus control and the Council has concluded that the phosphorus criterion of 55 parts per billion established by the Legislature (Chapter 373.461 Florida Statutes) will be difficult to obtain for the long term.

After hearing presentations and receiving information from numerous scientific professionals, and holding numerous public meetings for the last eight years, the Council further concludes that the current overall existing restoration strategy for the Harris Chain of Lakes is not effective and that many individual restoration projects are not producing significant results. In some instances, incremental progress can be demonstrated but in the collective opinion of the Council, the timeframes that will be required to achieve “restoration” are unacceptably long and in the end will not represent a cost effective use of Florida tax dollars.

Throughout the course of the 2009 reporting period, the Council developed specific recommendations concerning issues associated with the restoration initiatives and lake management practices being used at the Harris Chain of Lakes. An evaluation of total phosphorus, total nitrogen, and chlorophyll concentrations at Lake Apopka as well as water clarity as measured by Secchi disc, demonstrated average annual nutrient and chlorophyll concentrations for the first six months of 2009 remained above the long-term averages established from 1978 to present, and that water clarity is below the long-term average. The Council, therefore, stands firmly behind the recommendations in its 2008 Report to the Legislature.

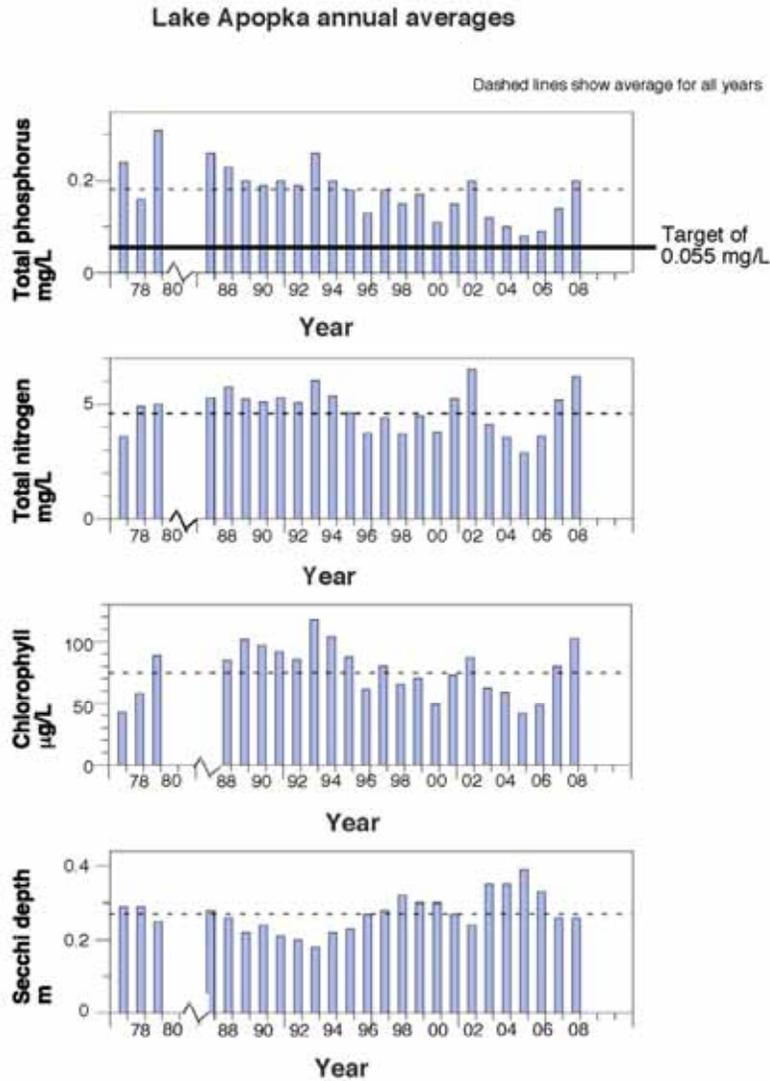
Because the Council strongly believes that restoration of the entire Harris Chain of Lakes shall be further delayed unless alternative restoration strategies are implemented under direction of the Florida Legislature, the 2009 report advances the initial aspects of the Harris Chain of Lakes Restoration Program (Chapter 373.468 Florida Statutes). The Council hereby requests that legislators evaluate the cost and benefits of current restoration activities on the Upper Ocklawaha River Basin. Furthermore, the Council concludes the following:

- Restoration budgets are limited, thus constraining restoration efforts,
- Inefficient and ineffective projects should be suspended and the funds reallocated to more productive uses, and
- Long-term research focused on minimally effective restoration programs should be terminated and refocused on new initiatives with greater potential to achieve restoration in the next 20 years.

## **Council Recommendations**

The Council has long recognized that many Harris Chain of Lake Restoration strategies have been linked to water quality at Lake Apopka. The following graph of annual averages provides, in part, the basis for the Council’s decision to adopt new restoration strategies. The graphs include 30 years of water quality data collected at Lake Apopka and indicate that although there has been an overall reduction in phosphorus, other key water quality

parameters have had limited response. The Council concludes that restoration efforts which focus on phosphorus only, are not having the desired effect on the lake as a whole.



\*Data provided by the St. Johns River Water Management District

**Lake Apopka and North Shore Restoration**

Based on review of available data, the Council recommends suspension of most of the current restoration strategy for Lake Apopka and the former farmland on the north shore of Lake Apopka, until further evaluation of their effectiveness can be completed. Restoration projects at Lake Apopka have been ongoing for over 20 years, beginning with the purchase of the farmland and while there has been some intermittent improvement in water clarity, recent data indicates that minimal if any improvements in water quality or sport fishing opportunities at Lake Apopka. The prospect of success in the next few decades even by the lead State Agency forecast is not much better. Government agencies should be looking for ways to reduce spending, especially where results have been less than desirable. The Council commends some aspects of the work of the St. John’s River Water Management District to

date. However, the Council also believes it is time to “re-think” the current restoration approach and strive to develop a comprehensive restoration plan that can return Lake Apopka to a viable recreational and economic resource in the next 20 years.

### **Restoration of the Lake Apopka North Shore Farmlands to Wetlands**

During the June 2009 meeting of the Council, David Fisk, Assistant Director of the St. Johns River Water Management District explained that the District had discussions with the Natural Resources Conservation Service and there was a written agreement in principle, to release the conservation easement in-place on north shore properties at Lake Apopka and essentially the St. Johns River Water Management District will become the sole owner of the property at the north shore, on behalf of the public. Mr. Fisk also informed the Council that restoration activities at the Lake Apopka North Shore Restoration Area should begin to move along more quickly. Furthermore, he explained that once other environmental issues are resolved, there will be the potential to reconnect the marshes of the north shore to Lake Apopka.

At the September 2009 meeting, the Council heard a presentation by Barron Moody, a Regional Fisheries Administrator with the Florida Fish and Wildlife Conservation Commission on the Lake Trafford dredging project in the Florida Everglades. The Council then discussed the potential for dredging nutrient-rich, fluid sediments at different locations in Lake Apopka and depositing the sediments on portions of the former farmlands at the north shore area, in an effort to advance the reconnection of the lake to the north shore marshes. The Council will pursue discussions on limited dredging projects with the St. Johns River Water Management District.

During the October 2009 meeting, Mr. Fisk announced that the conservation easement formerly held by the Natural Resources Conservation Service on the north shore property at Lake Apopka, had been released and the St. Johns River Water Management District was continuing to move forward with restoration activities. The Council is encouraged by this development and look forward to reconnection of Lake Apopka to the north shore marshes. The Council awaits further information on the proposed remediation / reconnection plan for the North Shore Restoration Area, by the St. Johns River Water Management District.

The primary objective behind purchasing the farms was to eliminate the discharge of water containing excess nutrients and sediments into the lake, both of which continue today. Additionally, there has been an ongoing controversy about proposed removal of water from Lake Apopka to supplement municipal irrigation. The Council recommends that no application for permits to withdraw water from any lakes in the Harris Chain should be considered, until such time that the minimum flows and levels have been established for the lakes.

The Council recommends that members of the Technical Advisory Group develop a strategy to create a reservoir on the north shore, which can be a resource for local municipalities and provide an alternative to the detrimental discharge of nutrient-rich

waters into Lake Apopka. The strategy would be to improve water storage capacity, along with fish and wildlife habitat to potentially lower the management costs than currently being expended.

### **Lake Apopka Restoration**

The restoration of Lake Apopka is paramount to the restoration of downstream lakes in the Harris Chain. The objectives that need to be met for Lake Apopka to again become an asset to the citizens whose taxes fund restoration include:

1. Stabilization or removal of suspended sediments and solids that hinder water clarity;
2. Reducing the external nutrient load discharged to the lake from the former farmlands of the north shore;
3. Removal or reducing the internal nutrient load, and;
4. Creation of habitat in the form of aquatic vegetation and increased fish populations.

As discussed during the March 2009 Council meeting, the successful management strategy at Orange Lake ([Appendix 4](#)) provides a relevant, local example of the benefits from allowing a limited amount of hydrilla to grow which include; providing desirable habitat for sport fish, improvement of water clarity, and increases the opportunity for other vegetation to become established. Based on the success at Orange Lake, the Council will investigate the potential use and management of hydrilla be evaluated as an alternative, cost effective restoration strategy for Lake Apopka that will provide faster results and make funds available for other restoration activities.

### **Dredging as a Tool for Restoration**

The Council continues to support access canal dredging as a viable lake management/restoration tool on the Harris Chain of Lakes. With the successful completion of canal dredging at Lake Griffin, the Council will continue to review canal access concerns at other lakes to determine if and where additional access dredging is needed to improve navigability during periods of lowered water levels; as maintaining navigation is critical to foster public support for enhanced lake level fluctuations. Through Legislative appropriations, the Council provided \$2,350,000 in funding for support of the Lake Griffin access canal dredging project.

### **Lake Beauclair and Apopka-Beauclair Canal Dredging**

The Council supports the efforts of the Lake County Water Authority, Florida Fish and Wildlife Conservation Commission, and St. Johns River Water Management on the planned project to dredge approximately 1.5 million cubic yards of muck from Lake Beauclair and the Apopka-Beauclair Canal. A significant amount of this material originated from Lake Apopka during the 2004 hurricane season and has setback the restoration of fish and wildlife habitat in Lake Beauclair. The estimated cost of this project is approximately \$10,000,000. **The Council recommends a Legislative**

**appropriation of \$5,000,000 to provide a 50/50 cost share with the Lake County Water Authority for this important project.**

### **Lake Apopka Dredging**

As part of the Harris Chain of Lakes Restoration Program (Chapter 373.468 Florida Statutes), the Council recommends funding be provided to the Florida Fish and Wildlife Conservation Commission to conduct research dredging projects that utilize advanced dewatering and sediment reuse systems that do not require massive amounts of land for sediment disposal. The focus should be on access canals because newly dredged canals are providing fish spawning habitat in the Harris Chain of Lakes. **An initial funding of \$1,000,000 would provide a viable test of the main dredging processes investigated by the Council.**

The Council further recommends that state and local agencies evaluate the dredging of a sump area in Lake Apopka near the entrance of the Apopka-Beauclair Canal in an effort to reduce the movement of fluid sediments downstream through the canal during periods of increased flow due to storm events.

### **Reconnecting Marshes to the Lakes**

The Council supports the efforts of the St. Johns River Water Management District and the Florida Fish and Wildlife Conservation Commission to reconnect Lake Griffin to its adjoining marshes. The Council urges the agencies to identify issues that are delaying the complete reconnection and to expedite the process.

The Council strongly supports the reconnection of portions of the former north shore farmlands to Lake Apopka, as originally proposed by the St. Johns River Water Management District, to act as a “kidney” to naturally filter the waters and provide improved fish and wildlife habitat. Reconnection requires increasing the elevation of the former farmlands, so they are not permanently flooded when the existing dikes are removed. The most readily available soils for elevating some portions of the marshes are the bottom sediments of Lake Apopka.

The Council recognizes the role bottom sediments play in influencing water quality and fish/plant habitat in Lake Apopka. The Council, therefore, recommends that the Florida Fish and Wildlife Conservation Commission be funded to conduct a research/demonstration project using dredging techniques that can determine how much and what type of sediment can be removed from a single site in Lake Apopka, and how some land elevations in the former farmlands could be elevated with the construction of wetland islands, similar to those the Commission has constructed at other lakes.

The Council supports further investigation into dredging “sump areas” which would allow fluid sediments to migrate towards the sumps and therefore reducing the costs and efforts required for removing the loose sediments. The project would also provide the opportunity to determine which materials can be sold to offset dredging costs. **The estimated cost for a**

research/demonstration project is \$1,000,000 for an area near Magnolia Park, in Orange County.

### **Shoreline and Aquatic Habitat Restoration**

The Council supports the proven efforts of the Florida Fish and Wildlife Conservation Commission, University of Florida Department of Fisheries, and Florida LAKEWATCH to establish near shore artificial habitat to create areas for spawning, fish cover and vegetation establishment resulting in improved sport fishing opportunities, which can be accessed from shorelines, public docks, and/or fishing boats. Improved fishing is an economic boost for communities and the emphasis on shoreline and dock habitat enhancement increases the opportunities for youth education programs such as the LAKEWATCH Fishing for Success, and those of the 4-H Club, Scout groups, and others to utilize the lakes in positive ways.

#### **Near Shore Artificial Habitat**

The Council is partnering with the Florida Fish and Wildlife Conservation Commission and Florida LAKEWATCH to implement a major fish/plant restoration program using limestone, concrete, or woody debris to provide artificial fish habitat and barriers for aquatic plant protection. To quickly enhance the restoration of the sport fishery and the establishment of Spatterdock or native water lilies (*Nuphar lutea*), **the Council requests that the Florida Legislature reallocate state and federal environmental trust funds to provide \$250,000 per year for five years**, to put in place substantial structural-complexes. Additionally, the Council has committed the balance of its existing funds received through Legislative appropriations to this effort.

The first effort shall include the establishment of rock bottom near public fishing piers to enhance bank fishing in the Harris Chain of Lakes. After establishing the public fishing areas, rock reefs shall be established to enhance the survival of young-of-the-year fish and provide cover for adult fish that currently inhabit open-water. These fish are unavailable to many anglers and rock reefs, by breaking up wave action, will also aid the establishment of new aquatic plant beds. This approach will reinvigorate near-shore (littoral zone) aquatic re-vegetation efforts on the Harris Chain of Lakes.

### **Mechanical Harvesting of Nuisance Aquatic Vegetation**

In January 2007, the Council completed the purchase of a mechanical harvester utilizing \$25,000 in Legislative appropriations. The harvester is maintained and operated by Florida LAKEWATCH volunteers, and used to remove near-shore, invasive aquatic vegetation at the request of property owners and homeowner associations throughout Lake County. This program has been very successful at maintaining waterways and based on the high demand for its services, has proven to be very popular with the citizens of the County. This method of aquatic weed control not only removes nutrients from the water but also maintains boating access for local residents. Herbicide applications while lower in application costs, introduce nutrients and particulate matter into the water as targeted plants decay. The Council supports

the efforts of Florida LAKEWATCH volunteers and continued use of the mechanical harvester to remove nuisance aquatic vegetation when and where it is economically feasible.

### **Sport Fish Restocking**

The Council and the citizens attending the April 2009 Public Workshop strongly support the adult, largemouth bass stocking program conducted by the University of Florida and Florida LAKEWATCH, as vital to the Harris Chain of Lakes Restoration Program (Chapter 373.468 Florida Statutes), and strongly supports continued funding of the program.

The Council also supports the efforts of the Florida Fish and Wildlife Conservation Commission to begin a sunshine bass / hybrid striped bass stocking program in Lake Apopka. Utilizing fingerling bass developed at the Florida Bass Conservation Center at Richloam, the program is designed to balance the predator – prey relationship, in an effort to reduce the gizzard shad populations and nutrient recycling in the lake. This research / demonstration project predicts the sunshine bass will outgrow shad in their first year and will be well suited to graze on the shad fry in the Spring.

The Council continues to support the ongoing research and stocking programs of the Florida Fish and Wildlife Conservation Commission, University of Florida Department of Fisheries, and Florida LAKEWATCH as ways to improve both water quality, and provide recreational and economic opportunities associated with sport fishing. A thesis written by a University of Florida graduate student (K.W. Larson, 2009) on the economic activity at Lake Griffin as a result of the wild-adult bass stocking program, produced angler expenditure estimates in Lake County as high as \$6 million per year. A copy of that thesis is provided as [Appendix 26](#). This is an important economic stimulus at a time which is very beneficial to Lake County and its residents.

The Council recognizes that restoration of the Harris Chain of Lakes will take decades and believes funding the transfer of fish from private waters to the Harris Chain of Lakes is, until habitat can be restored, the most cost-effective measure to maintain the economic vitality of the largemouth bass fisheries in the lakes. Since 2004, the Legislative appropriations for support of sport fish restocking in the Harris Chain of Lakes have provided a positive economic benefit to Lake County (non-local anglers). The stocking program has also enhanced the total number of adult fish in the stocked lakes, where the ability of the adult bass to spawn is an important link to the recovery of the sport fish populations in the Harris Chain of Lakes. The stocking also assists in restoring the balance between predator and prey fish. **The Council, therefore, recommends an annual appropriation of \$150,000 for the continuation of the restocking program on the Harris Chain of Lakes being conducted through the University of Florida and Florida LAKEWATCH.**

### **Gizzard Shad Harvesting**

Gizzard shad have been identified as an abundant species of fish that affects water quality within key lakes of the Harris Chain. The potential is that rough fish harvest would provide phosphorus reduction by removal of the fish. The primary lake management issue with gizzard shad is that they are benthivorous or bottom feeders and consume sediments in search

of other food. The sediments contain large quantities of phosphorus and other nutrients that have settled to the bottom, which are then resuspended by foraging.

The mass harvest of gizzard shad to remove phosphorus is a controversial restoration strategy employed by the St. Johns River Water Management District. After multiple years of evaluation, studies have concluded that the current level of gizzard shad harvest is not sufficient to impact phosphorus concentrations in Lake Dora or the other lakes in the Harris Chain. It has been determined that increasing the gizzard shad harvesting efforts would adversely affect populations of black crappie (specks), which is one of the major sport fish species in the Harris Chain of Lakes. Additionally, the Florida Fish and Wildlife Commission has estimated the gizzard shad harvesting program in Lake Apopka will remove approximately 10,000 of the sunshine bass stocked in the lake, as a natural predator to the shad.

The Council stands firmly behind its recommendations in the 2008 Report to the Legislature and continues to conclude that commercial harvest of gizzard shad will not significantly improve water quality unless netting is conducted at a level that would be extremely detrimental to sport fish populations, which is not acceptable. The Council supports efforts by other agencies including the Florida Fish and Wildlife Conservation Commission, to increase sport fish populations, which serve as predators of gizzard shad.

## **Summary**

In summary, this Council recommends the Legislature begin funding the Harris Chain of Lakes Restoration Program (Chapter 373.468 Florida Statutes) by redirecting trust fund monies to the Florida Fish and Wildlife Conservation Commission for projects recommended by the Council. The programs shall be more effective and an efficient use of tax dollars focused on the timely restoration of our surface water bodies to viable recreational and ecological resources. Timely restoration of the Harris Chain of Lakes will benefit Florida's economy, residents, businesses and visitors.

## List of Appendices

- Appendix 1 Enacting Legislation, Chapter 373.467 F.S.
- Appendix 2 Harris Chain of Lakes Restoration Program; Chapter 373.468 F.S.
- Appendix 3 Monthly Meeting Minutes November 2008 – October 2009
- Appendix 3A Summary of update on restoration efforts at the Lake Apopka North Shore Restoration Area and Emeralda Marsh by Dave Walker, Upper Ocklawaha River Basin Program Manager with the St. Johns River Water Management District; February 2009
- Appendix 4 Presentation on Water Level Fluctuation and Fish at Rodman Reservoir; and Hydrilla Management at Orange Lake and Lochloosa Lake by Eric Nagid of the Florida Fish and Wildlife Conservation Commission; March 2009
- Appendix 5 Presentation on the status of the Lowrie Brown restoration efforts within the Emeralda Marsh by Bruce Jagers of the Florida Fish and Wildlife Commission; June 2009
- Appendix 6 Presentation on Rapid Dewatering Dredging Technologies for Lake Beauclair Project by Michael Hodges of Genesis Fluid Solutions, LLC; June 2009
- Appendix 7 Presentation on the Lake Trafford dredging project by Barron Moody, a Regional Fisheries Administrator with the Florida Fish and Wildlife Conservation commission; September 2009
- Appendix 8 Meeting summary of the Technical Advisory Group discussions on various restoration technologies and projects; September 2009
- Appendix 9 Presentation on the Restoration of Fish Habitat in the Harris Chain of Lakes by Dr. Dan Canfield of the University of Florida / Institute of Food and Agricultural Sciences; October 2009
- Appendix 10 Presentation of Nutrient Loading Estimates for the Harris Chain of Lakes by Walt Godwin, Environmental Scientist VI with the SJRWMD; November 2008
- Appendix 11 Scientific review paper entitled “Control of Lacustrine Phytoplankton by Nutrients: Erosion of the Phosphorus Paradigm” written by the University of Colorado and Utah State University researchers; 2008
- Appendix 12 Science Magazine article entitled “Controlling Eutrophication: Nitrogen and Phosphorus” published by the American Association for the Advancement of Science; February 2009
- Appendix 13 Water Quality Graphs for the Harris Chain of Lakes Presented by Dr. Daniel Canfield; October 2009
- Appendix 14 Report on the Total Maximum Daily Load for Total Phosphorus in Lake Apopka, Florida Department of Environmental Protection; September 2003
- Appendix 15 Total Maximum Daily Loads – Chapter 62-304, F.A.C., Florida Department of Environmental Protection; March 2009
- Appendix 16 Upper Ocklawaha River Basin – Basin Management Action Plan, Florida Department of Environmental Protection; August 2007
- Appendix 17 Technical Support Document: Development of Numeric Nutrient Criteria for Florida Lakes and Streams by the Florida Department of Environmental Protection; June 2009

- [Appendix 18](#) Estimated results on the lakes after implementation of the Basin Management Action Plan, Florida Department of Environmental Protection; August 2007
- [Appendix 19](#) Presentation on Coarse Woody Debris Habitat by Jason Dotson of the Florida Fish and Wildlife Conservation Commission; March 2008
- [Appendix 20](#) Emerald Marsh Conservation Area Map, St. Johns River Water Management District; June 2003
- [Appendix 21](#) Status of the Harris Bayou Project, Dave Walker of the St. Johns River Water Management District; August 2007
- [Appendix 22](#) Presentation on Brush Pile Habitat Enhancement Project by Adam Charlton of the Florida Fish and Wildlife Conservation Commission; June 2008
- [Appendix 23](#) Presentation on Plant Management in Florida Waters by Nathalie Visscher of the Florida Department of Environmental Protection; March 2007
- [Appendix 24](#) Update on the Lake Griffin Bass Stocking Project by Wes Porak of the Fish and Wildlife Conservation Commission; February 2008
- [Appendix 25](#) “Will Sunshine Bass Recapture Lake Apopka’s Glory Days?” Orlando Sentinel; February 2009
- [Appendix 26](#) “Stocking Wild-Adult Largemouth Bass to Improve Fishing and Associated Economic Activity at Lake Griffin” a thesis by University of Florida graduate student K.W. Larson; August 2009
- [Appendix 27](#) “Effects of Stocking Wild-Adult Largemouth Bass on the Fishery at Lake Griffin” a thesis by University of Florida graduate student Darren J. Pecora; August 2009
- [Appendix 28](#) Presentation on Biomanipulation Impacts on Gizzard Shad Population Dynamics on Lake Water Quality and a Recreational Fishery, Dr. Mike Allen of the Fisheries and Aquatic Sciences Department at the University of Florida; October 2007
- [Appendix 29](#) Presentation on the Nutrient Effects of Gizzard Shad Biomanipulation in Upper Ocklawaha River Basin Lakes, Lake Apopka North Shore Restoration Area, and Water Quality by Maynard Schaus, Ph.D., Associate Professor of Biology at Virginia-Wesleyan College; February 2008

All appendices are included on the CD that accompanies this report or may also be accessed via the Council website at <http://harrischaincouncil.ifas.ufl.edu/>.

## **Acknowledgements**

The cover photographs of the fishermen and the White Pelicans are courtesy of the Bass Anglers Sportsman Society (BASS) and Bassmasters magazine. The photograph of Spatterdock (*Nuphar lutea*) is courtesy of University of Florida / Institute of Food and Agricultural Sciences – Center for Aquatic and Invasive Plants.