

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 Palatamaha 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 are operated by SJRWMD and regulate 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 ACoE 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	ACoE

4.0 Water Quality

Data collected by SJRWMD, FDEP, FWCC, 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 FWCC 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.).

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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 \$126 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 *2005 Report to the Florida Legislature*. Recommendations made by the Council regarding these issues were also presented in the report. Management issues on the Harris Chain of Lakes can be summarized as follows:

1. Enhanced Lake Level Fluctuation
2. Access Canal Dredging
3. Aquatic Plant Management and Weed Control
4. Revegetation of Aquatic Habitat and Cypress Tree Plantings
5. Sport Fish Restocking
6. Potentially Toxic Algae
7. Rough Fish Harvest
8. Lake Apopka Marsh Flow-way System
9. Total Maximum Daily Loads (TMDLs) and Pollution Load Reduction Goals (PLRGs)
10. Industrial, Wastewater, and Stormwater Impacts