2016

LAKE WEIR MANAGEMENT PLAN STATUS UPDATE AND SUMMARY (Draft/Discussion)

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MCBCC

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Introduction and Background

Lake Weir has been an important economic driver for almost 200 years. Beginning in the mid-1800s through the 1980s, a vast majority of the surrounding area was in citrus production. Today, ecotourism, water sports, fishing and dining join agriculture as main economic draws in the area. Over time, the watershed has changed from predominantly citrus groves to single-family homes and as of 2009, human uses (residential, commercial, industrial and agricultural) made up approximately 60% of the total watershed. There is an ongoing flux of redevelopment and development in the area. For example, within the past eight months the BCC has considered three land use amendments for commercial and residential developments and approximately 20 ESOZ plans have been submitted.

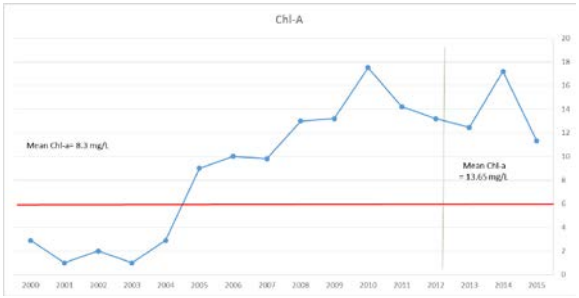
The Lake is approximately 5,600 acres, located in southeastern Marion County. It is the largest lake in the region and can be described by two distinct portions: Lake Weir proper and Sunset Harbor, which is a smaller section of the lake situated west of Lake Weir proper. The watershed is comparatively small, only about 7,313 acres surrounding the lake's perimeter, with elevations ranging from 125ft in the southern portions to 75 ft in the northern portion. Soils are well-drained sands overlying clayey sands and clays of the Hawthorn Formation (Messer, 1975). Lake Weir is a low color, low alkalinity lake, which indicates that it is not directly connected with the Floridan Aquifer. Average lake stage is 53.21 NGVD, equating to a mean depth of approximately 4.3 meters. Groundwater connections are likely through the sand and clay deposits in the surficial aquifer.

This plan focuses on three major, long-standing issues at Lake Weir: Water Quality, Water Quantity and Hydrology/Flow. Proposed action items fall in to five general categories: infrastructure improvements, restoration, public education, enforcement of existing rules and data collection. Meetings were held with stakeholders throughout the process along with coordination between County Departments and state agencies (FWC, SJRWMD and FDEP). Adequate funding will be necessary in order to implement the action items or further studies.

ISSUE: WATER QUALITY

Lake Weir water quality has been noticeably declining since the 1980s. Water quality degradation affects fisheries, recreation and property values.

- Aquatic Preserve Designation (1984-1998)
- Impaired Water Bodies List (1998)
- Numerous studies: Christman (1992), SWIM Plan (1995), PLRG (2004)
- TMDL Drafted in 2015 for TN and TP based on high Chl-a values



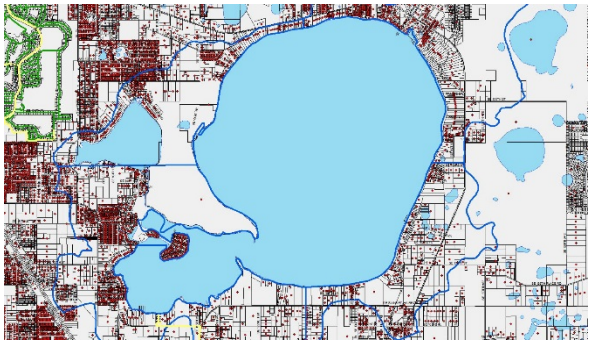
MEAN ANNUAL TN LOADING INTO LAKE WEIR, 2000–12 (KG/YR)					
VALUE	**ATMOSPHERIC DEPOSITION**	**SURFACE RUNOFF**	**GROUND WATER**	**SEPTIC LOAD**	**TOTAL**
Mean Annual	18,430	5,314	4,186	5,893	33,823
%	55%	16%	12%	17%	100%

MEAN ANNUAL TP LOADING INTO LAKE WEIR, 2000–12 (KG/YR)					
VALUE	**ATMOSPHERIC DEPOSITION**	**SURFACE RUNOFF**	**GROUND WATER**	**SEPTIC LOAD**	**TOTAL**
Long-Term Mean Annual	**816**	**272**	**692**	**974**	**2,754**
%	**30%**	**10%**	**25%**	**35%**	**100%**

PARAMETER	EXISTING LOADING	TARGET LOADING	REQUIRED LOAD REDUCTION	%REQUIRED LOAD REDUCTION
TN	33,823	27,432	6,391	19%
TP	2,754	1,667	1,087	39%

Management Measures: Water Quality

Sewer Infrastructure Expansion



There are 2,081 septic tanks in the 7,000 acre Lake Weir Watershed. Lack of sewer infrastructure is cited as a primary cause of water quality degradation in almost every study or pollution reduction document associated with Lake Weir. Septic loads make up almost the entire reduction required to achieve water quality targets based on the proposed TMDL.

Available wastewater capacity exists at the Stone Crest wastewater treatment facility for possible connection of up to 3,000 homes.

- ✓ Conduct a thorough cost analysis of connecting high-contributing areas such as Bird Island, Sunset Harbor and the northeast shores and establish a timeline for implementation.

Septic tank TN Load	NE	NW	SW	SE
(kg/yr)	1,336.11	1,114.26	2,598.31	843.81

Septic Tank Improvements

Over ½ of the 1,286 parcels that lie within 1,000 ft of the shore of Lake Weir were developed before 1984. These systems were not required to meet minimum separation of 24 inches to water table and are not required to be upgraded or maintained unless certain expansions occur. The Florida Department of Environmental Health recently completed a long-term study of passive, nitrogen enhancing systems that will be able to be permitted by year's end.

- ✓ Require septic tank inspection, repair and/or replacement for all redevelopment of lakefront properties.
- ✓ Require enhanced septic systems for all new development within the Lake Weir ESOZ.

Enforce and Encourage Shoreline Restoration

Shoreline vegetation provides habitat for spawning fish, and filters nutrients and sediment from stormwater, which decreases pollutant loads to the lake. State rules, and Marion County's Land Development Code prohibit clearing beaches entirely of vegetation and maintenance water ward of the safe upland line. However, no state or local agency is actively enforcing the rules.

- ✓ When ESOZ plans are submitted, coordinate with FWC and DEP and educate homeowners. Require affidavit.
- ✓ Request notification of FWC vegetation permits.
- ✓ Work with homeowners to restore shoreline vegetation. This could include workshops, planting events and/or monetary incentives.
- ✓ Establish management regime for County owned/managed abrogated roads.
- ✓ Promote establishing conservation areas with private citizens. (Hall, Scales)

Sunset Transfer of Development Rights Program within the Lake Weir Environmentally Sensitive Overlay Zone.

The intent of the TDR program is to preserve environmentally sensitive areas and incentivize increased densities where infrastructure is available. Its location in the ESOZ is in conflict with this purpose, particularly without sewer availability. Increased densities increase nutrient loading.

- ✓ Remove TDR area within the ESOZ or modify to only allow when sewer is available.

Studies

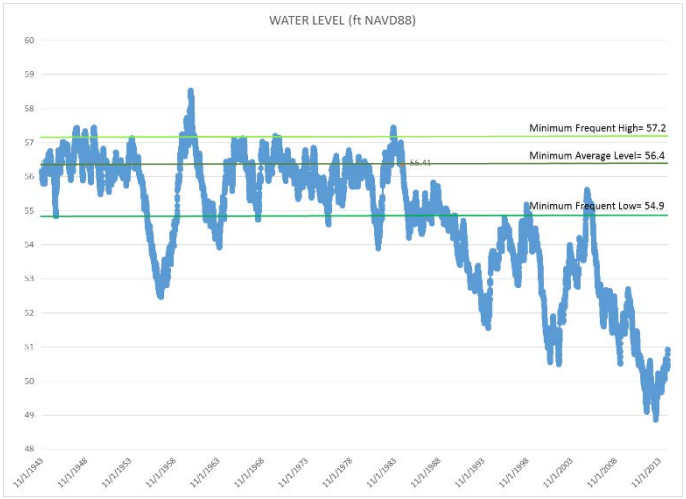
- * Sediment analysis to estimate internal loading. Mixing occurs throughout the water column, so internal nutrient loads may play a factor in water quality.
- * Increased water quality monitoring for fecal forms, e. coli, **sucralose and algal species**.

ISSUE: WATER QUANTITY

Lake Weir water levels have noticeably decreased, beginning in the 1980s. In 2000, the SJRWMD determined that the Minimum Average Level of Lake Weir should be 56.4ft NGVD (SOURCE). However the mean stage between 2000 and 2015 is 53.21. In fact, the lake has not reached 56.4ft for over 10 years.

A multi-decadal shift in rainfall patterns is considered the primary reason for reduced lake levels, but there is evidence that groundwater pumping has also contributed. In addition to a significant droughts and deviations from "normal" rainfall, population in the area has also increased, resulting in additional groundwater pumping. For example, In 1997 Consumptive Use Permits within a 2-mile radius totaled 921.8MG/Yr. In 2017, active wells with CUPs in the same vicinity totaled 1219 MG/Yr (a 136% increase). These figures do not include domestic wells that are not connected to a water utility, or small agricultural wells that would produce less than 100K gpd.

Current Scenario



A cursory review of SJRWMD data shows that public supply exceeds agricultural permits based on active wells (1.84MG/Yr vs. 1.25MG/Yr, respectively). The two public suppliers in the vicinity of Lake Weir are Sunshine Utilities and Marion County Utilities. SJRWMD estimates that from 2008-2012 daily per-capita water use was approximately 180 gallons for Sunshine Utilities and 246 gallons for Marion County Utilities customers. Both of these values exceed water use of 150 gpc commonly considered reasonable for domestic supply. Public utilities serve approximately 8,000 accounts within a two-mile radius of Lake Weir. There are approximately 11,700 built properties and a total of 19,097 parcels within the same area. These values show that the majority of parcels within the Lake Weir area are served by public supply (~ 70%), however, it should be noted that a number of properties also utilize wells for irrigation, which could more than double its water use.

Public utility providers are required to implement water saving practices such as public education programs and tiered rate structures. Marion County Utilities, the Water Resources Coordinator and UFIFAS Extension have actively worked with homeowners to educate them on proper irrigation and indoor water use, particularly in the 55+ communities served by MCU. A tired rate structure, in which higher fees are applied to higher water use, is also in effect. However, in some areas, homeowners counter this effort by utilizing irrigation wells, as previously discussed.

In addition to a comprehensive public education program and tiered rate structure, Marion County Utilities is maximizing availability of reclaimed water to offset groundwater withdrawals for golf course use by supplying approximately 225,000 gallons/day to Stonecrest Golf Course.

In terms of future planning, SJRWMD has developed a new surface water model. which includes wells that were not previously evaluated because they are either new, newly permitted, or were in a different water management district. The effort is expected to better evaluate whether or not there are impacts from current pumping on surface water levels of the lake and will assist in reevaluating the Minimum Flow and Level for the lake, should the SJRWMD decide to do so. The effort is expected to better evaluate whether or not there are impacts from current pumping on surface water levels of the lake. Marion County has also developed a water supply plan in an effort to reduce the potential for future withdrawals to impact our springs. A recommendation from that report is to explore the feasibility of using the Lower Floridan for future or existing wells. Lower Floridan wells are significantly more expensive to drill, typically need additional treatment infrastructure because of lower quality water (high TSS), and may not be viewed as "alternative" to Upper Floridan if there is not a significant confining layer present.

Management Measures: Water Quantity

Maximize Efficient Water Use Practices

Wasteful water use is an issue statewide, and Marion County is no exception. Studies have shown that landscape irrigation makes up more than ½ of total water use for many homes, particularly in deed-restricted communities. Various county departments have worked together to develop a comprehensive "Efficient Water Use" program that is administered countywide, with a focus on communities that have homeowners' associations, and often happen to be high water use areas. Some of the aspects of the program include: toilet rebate program, irrigation system evaluation, rebates for irrigation system improvements and community outreach.

Our land development code requires certain low volume and landscape irrigation practices for common areas of new communities, but this doesn't necessarily translate to the building and construction phase or for single family homes. Stricter enforcement of construction and irrigation practices could be included in the Lake Weir vicinity.

- ✓ Require Florida Friendly Landscaping for new single family homes.
- ✓ Require signed affidavit from irrigation contractors and homeowners when pulling permits, indicating that they will comply with LDC Sec. 6 Div. 9.
- ✓ Encourage new developments to prohibit irrigation wells as part of HOA rules.
- ✓ Enforce training and licensure requirements in Sec. 6. Div. 9.
- ✓ Require landscape and irrigation as part of ESOZ plan, when applicable.

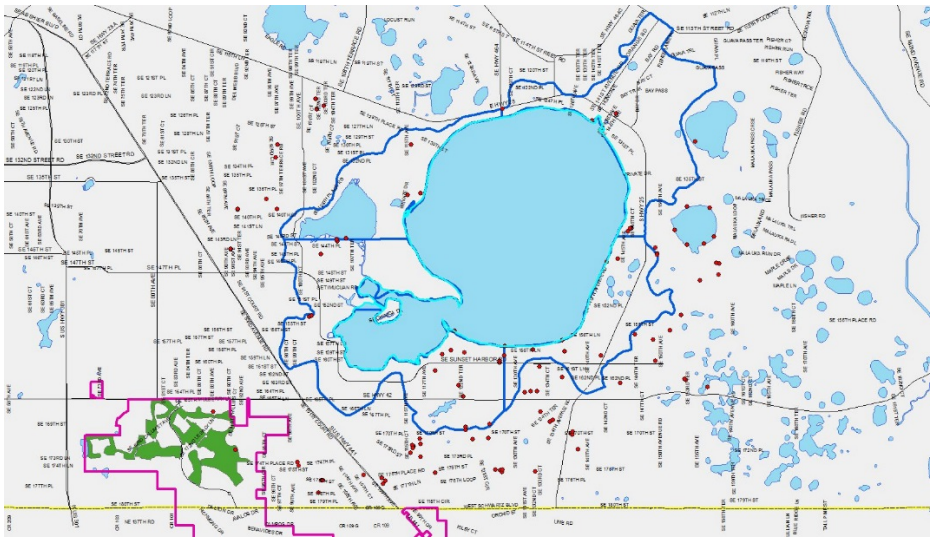
Revise the Lake Weir MFL

The SJRWMD has recently updated its surface water model for Lake Weir to include wells that weren't previously included in the vicinity of the lake. Additionally, staff has indicated that a review of the MFL may be warranted because the previous MFL did not consider these wells.

- ✓ Verify the effects of pumping on lake levels.
- ✓ Continue to coordinate with SJRWMD staff to monitor progress of the surface water model and promote review for the MFL.
- ✓ Work with a hydrogeological consulting firm (already under contract) to review the MFL.

Utilize Lower Floridan wells for new well fields, where feasible.

Marion County's 2015 WSP indicates that public supply wells in the vicinity of Lake Weir should be transferred to the Lower Floridan Aquifer in order to offset current and future impacts to springs and surface water bodies. This and other "alternative" water supplies, such as stormwater and wastewater reuse are encouraged and sometimes mandated through the state's water management districts. In order for this approach to be cost effective, funding should be obtained from SJRWMD to determine its feasibility.

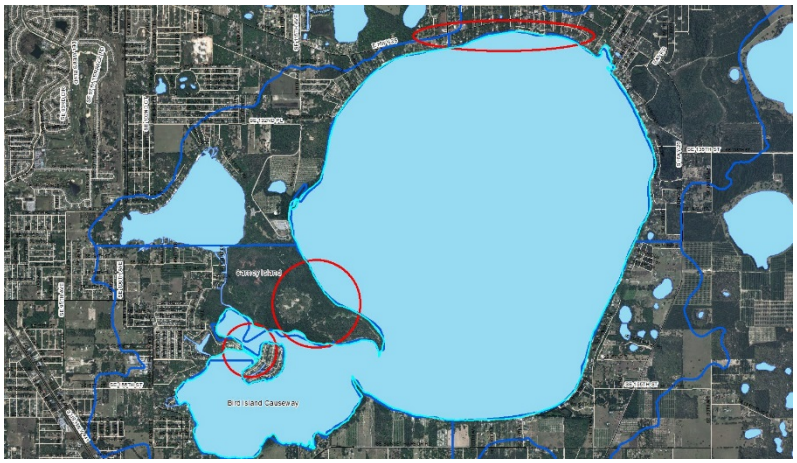


ISSUE: HYDRAULIC ALTERATIONS AND NAVIGATION

A number of hydraulic alterations have occurred at Lake Weir over the past 200 years. Low water levels over the past decade have hindered navigation through canals, and are blamed for an influx of nuisance vegetation, and muck build-up. This plan seeks to address portions of the lake's northwest shore, around Carney Island, Bird Island and the canal between Little and Big Lake Weir. Carney Island was historically a group of islands and wetlands, but was diked for citrus production. Bird Island is a densely populated "island" connected by a dry-bridge causeway. The invert of the causeway is above the mean water line at an elevation of 55.05 ft. Effects of this disconnect may be exacerbated by dredging or filling in the island for development.

Wetlands within Carney Island are thought to have been inundated, even during periods of low water levels.

- Wetlands provide water quality filtration and areas for deposition and subsequent mineralization of muck sediments.



Management Measures: Hydrology and Navigation

Evaluate feasibility of restoring flow through the Bird Island Causeway.

Prior to 1978 the causeway, presumably, did not inhibit flow around Bird Island. In its current condition, sediment and muck are able to build up behind and in front of the causeway. The muck creates a substrate for vegetation, which inhibits navigation and encourages woody vegetation that further degrades wetland functions of the lake……

- ✓ Determine the impact of the causeway on accretion rates and flow.
- ✓ Direct staff to provide feasibility and cost analysis for reconstruction of the causeway.

Restore historic wetlands at Carney Island

A management plan was developed at the time of acquisition of Carney Island.

- ✓ Review and implement restoration activities.
- ✓ Dedicate a funding source and seek grant funding.

Maintain navigation between Little and Big Lake Weir

Homeowners have historically been able to navigate between Big and Little Lake Weir. However, low water levels have led to a proliferation of woody and nuisance vegetation, as well as significant muck build up in the canal, so much so, that there are concerns that the canal won't be navigable even when water levels return.

- ✓ Develop a maintenance plan and agreement with Florida Fish and Wildlife for the canal.
- ✓ Dedicate a funding source for maintenance. This can be done within an agreed upon organization.
- ✓ Dredge the canal to the mineral soils level, which is allowed by FWC without permit in some cases.
- ✓ Educate homeowners of their responsibility and abilities for canal maintenance.

Coordination

It is imperative that coordination between agencies and internal departments continues to move forward. Navigating the roles of staff in state agencies has proven difficult at times, but relationships at the staff levels will allow us to take advantage of agency data, on-the-ground knowledge, and most importantly, funding.

- ✓ Quarterly coordination meetings with affected agencies should occur.

Funding

A number of funding sources exist for lake restoration and protection. However, most rely on matching allocations between 25% and 75%. Below is a list of potential governmental and NGO partners:

- Florida Lake Management Society: Love Your Lake, Shoreline Grants
- Florida Stormwater Association: Research Grants
- Save Lake Weir: potential partnerships for education, research and/or septic upgrades
- Marion County Stormwater: septic tank inspection and pump out grants.
- St. Johns River Water Management District: Cost Share Funding, Research opportunities, *Springs Funding.
- Florida Department of Environmental Protection: TMDL Grants, Clean Water State Revolving Fund, Section 319 Grants, Other funds may be available for specific projects. Communication with the Division of Environmental Assessment and Restoration is imperative.
- Florida Fish and Wildlife: Invasive Plant Management, Lake Restoration/Habitat Improvement
- Florida Department of Agriculture and Consumer Services: BMP Implementation for ag producers.

**Springs Funding: Lake Weir falls within the Silver Springs BMAP area and the Upper Ocklawaha BMAP area. Springs funds are distributed to DEP and the Water Management Districts. However, we could seek funding at the legislative level for specific projects. The fact that the watershed is within these BMAP areas should be advantageous for receiving funds.*