2015 ANNUAL PROGRESS REPORT

for the Upper Ocklawaha River Basin Management Action Plan

prepared by the

Division of Environmental Assessment and Restoration

Watershed Restoration Program

Florida Department of Environmental Protection

Tallahassee, FL 32399

in cooperation with the

Upper Ocklawaha River Basin Working Group

November 2015

ACKNOWLEDGMENTS

This *2015 Annual Progress Report for the Upper Ocklawaha River Basin Management Action Plan* was prepared as part of a statewide watershed management approach to restore and protect Florida's water quality. It was prepared by the Florida Department of Environmental Protection in cooperation with the Upper Ocklawaha River Basin Working Group.

Upper Ocklawaha River Basin participants

Responsible Stakeholders	Responsible Agencies	Other Interested Stakeholders
Lake County Lake County Water Authority Lake Soil and Water Conservation District Marion County Orange County Polk County Apopka Clermont Eustis Fruitland Park Groveland Howey-in-the-Hills Lady Lake Leesburg Mascotte Minneola Montverde Mount Dora Tavares Umatilla Winter Garden Ocoee	Florida Department of Agriculture and Consumer Services Florida Department of Environmental Protection Florida Department of Health Florida Department of Transportation St. Johns River Water Management District Florida Fish and Wildlife Conservation Commission Florida Department of Economic Opportunity (previously Florida Department of Community Affairs)	Agriculture Ocklawaha Valley Audubon Society Andreyev Engineering B&H Consulting Applied Sciences BCI Engineering Boyle Engineering Brown and Caldwell Eustis Chamber of Commerce Green Consultants HCBassMasters Jones Edmunds PEAR Professional Engineering Consultants (PEC) Picciola Island Homeowners Association Stormwater 360 Trout Lake Nature Center

For additional information on the watershed management approach in the Upper Ocklawaha River Basin, contact:

Mary Paulic, Basin Coordinator
Florida Department of Environmental Protection
Watershed Restoration Program, Watershed Planning and Coordination Section
2600 Blair Stone Road, Mail Station 3565
Tallahassee, FL 32399-2400
Email: mary.paulic@dep.state.fl.us
Phone: (850) 245–8560

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LIST OF ACRONYMS AND ABBREVIATIONS

BMAP	Basin Management Action Plan
BMP	Best Management Practice
BOD	Biochemical Oxygen Demand
CR	County Road
DEP	Florida Department of Environmental Protection
EPD	Environmental Protection Division (of Alachua County)
FDACS	Florida Department of Agriculture and Consumer Services
FDOT	Florida Department of Transportation
lbs	Pounds
lbs/yr	Pounds Per Year
kg/yr	Kilograms Per Year
LCWA	Lake County Water Authority
mg/L	Milligrams Per Liter
MSTU	Municipal Serving Taxing Unit
NALMS	North American Lake Management Society
NOI	Notice of Intent
NuRF	Nutrient Removal Facility
OAWP	Office of Agricultural Water Policy
sf	Square Feet
SJRWMD	St. Johns River Water Management District
SR	State Road
STORET	Florida Storage and Retrieval
TMDL	Total Maximum Daily Load
TN	Total Nitrogen
TP	Total Phosphorus
TSS	Total Suspended Solids
USGS	U.S. Geological Survey
WAV	Watershed Action Volunteers
WBID	Waterbody Identification
yr	Year

SUMMARY

Total Maximum Daily Loads (TMDLs)

The Florida Department of Environmental Protection (DEP) adopted the TMDLs for the Upper Ocklawaha River Basin in September 2003 and the Trout Lake TMDL in 2006. The TMDLs target total phosphorus (TP), total nitrogen (TN), and biochemical oxygen demand (BOD). However, TP is identified as the priority pollutant for loading reductions.

The Phase I Upper Ocklawaha River Basin Management Action Plan (BMAP) for Lake Apopka, Lake Beauclair, Lake Carlton, Lake Dora, Lake Eustis, Trout Lake, Lake Harris (including Little Lake Harris), Palatlakaha River, Lake Griffin, and Lake Yale; and associated tributaries, connecting canals, and streams was adopted in August 2007 to implement these TMDLs. The Phase II BMAP was adopted in July 2014. The Phase II BMAP has a priority goal of identifying management actions and projects that will result in larger reductions in nutrient loading to Lake Yale, Lake Carlton, Lake Harris, Trout Lake, and the Palatlakaha River. Draft nutrient TMDLs for Lake Denham, Lake Roberts, and Marshall Lake were presented at public meetings in early 2015 but have not been adopted.

This 2015 Annual Progress Report for the Upper Ocklawaha River BMAP describes the major accomplishments and issues identified during the reporting period from January 1, 2014, through June 30, 2015. Provisional management strategies for the three draft TMDLs are included in this report.

Major Accomplishments

An additional 14 projects were added to the BMAP for a total of 220 active, completed, or proposed projects. The TP credit for Ocoee's street sweeping was adjusted during this reporting period to reflect only that portion of Ocoee in the Upper Ocklawaha Basin. That adjustment removed 469 pounds per year (lbs/yr) of TP credit previously reported. The TP reduction for a Umatilla project (YALE04) was recalculated resulting in a decrease of 36.4 lbs/yr credited to that project. Even with these corrections, basinwide an additional net reduction of 340 lbs/yr of TP in loading from urban stormwater contributed from the watershed is achieved for this reporting year. This total does not include loading reductions from in-lake nutrient reductions (gizzard shad harvest) or the direct remediation of historical muck farm areas.

New projects started or completed over the reporting period (**Appendix A**) include street sweeping, educational outreach, sewer repair, water quality restoration, stormwater retrofits, and engineering studies for Trout Lake and Lake Yale. Clermont added three retrofit projects that will prevent 19 lbs/yr of TP and 56 lbs/yr of TN from entering the Palatlakaha River. Florida Department of Transportation (FDOT) street sweeping throughout the Upper Ocklawaha Basin removes 380 lbs/yr of TP and 592 lbs/yr of TN. Lake County public works started targeted best management practice (BMP) education and outreach efforts for select business sectors (automotive, landscaping, and food service) and construction and erosion control training for private and public employees.

The hybrid wetland treatment system proposed for Trout Lake is in permitting with a tentative start date for construction in early 2016. The City of Eustis contributed the land needed for the construction of the project to treat the discharge from Hicks Ditch and a former muck farm (Pine Meadows). That system, when complete, may remove as much as 2,600 lbs/yr of TP from Hicks Ditch. This potential reduction was not included in the current total credited TP loading reductions. During periods when there is no discharge from Hicks Ditch, the system will pull in water from a canal connected to Trout Lake to remove TP and return the treated water to the lake.

The results of water quality studies (two projects) started by the Lake County Water Authority (LCWA) in 2014 will provide additional management actions for Trout Lake and Lake Yale in subsequent reporting years. Orange County is collaborating with the LCWA to initiate a similar evaluation of Lake Carlton.

Several projects adopted with the Phase II BMAP were completed over the reporting period. Orange County completed the Lake Roberts nutrient and hydrologic loading study. The study recommends the remediation of in-lake loading through sediment TP inactivation, with the potential to remove more than 1,500 lbs/yr of TP loading from the lake. This potential reduction was not included in the current total credited TP loading reductions. The county is pursuing funding for this project. The City of Mount Dora completed the 7th Avenue underground stormwater treatment system in February 2015. This project was funded with support from the DEP Section 319 grant program and the LCWA. The project will prevent 20 lbs/yr of TP and 125 lbs/yr of TN from entering Lake Dora. Umatilla is preparing to start the Southwest Orange Avenue exfiltration project, which will prevent approximately 19 lbs/yr of TP from entering Lake Eustis. The project is partially funded through a DEP TMDL water quality grant. Lake

County Public Works Department completed the Washington Avenue drainage improvement project located in the Lake Yale Basin in 2015. This project prevents 173 tons of sediment from entering surface waters.

Landowners signed 116 agriculture Notices of Intent (NOIs) agreeing to implement applicable BMPs on their enrolled properties, resulting in an additional 3,959.6 acres covered by NOIs. In the Upper Ocklawaha River Basin, the Florida Department of Agriculture and Consumer Services (FDACS) Office of Agricultural Water Policy (OAWP) has a Phase II five-year enrollment goal of 62,947 acres (60% of the total acreage). As of June 2015, for both Phase I and Phase II of the BMAP, producers throughout the basin have submitted a total of 404 NOIs representing 15,962 acres, or 15.2% of the adjusted total agricultural acreage (see **Table 4**). FDACS staff will work to enroll the remaining 46,985 acres in the next few years to meet the 60% goal.

Water levels were high enough in Lake Apopka for the St. Johns River Water Management District (SJRWMD) to circulate water through the marsh flow-way, but there was not enough to release water to downstream lakes. During the reporting period, the flow-way removed 8,000 lbs of TP and 205,000 lbs of TN, and the gizzard shad harvest removed an additional estimated 8,749 lbs TP and 22,298 lbs of TN. These loading reductions address the internal recycling of legacy loading within the lake.

The SJRWMD received a technical merit award from the North American Lake Management Society (NALMS) for the Lake Griffin nutrient restoration project.

Water Quality Trends

Evaluation of concentrations of TN, TP, and chlorophyll *a* are used to assess progress made in achieving TMDLs in the basin. Annual averages of TN, TP, and chlorophyll *a* concentrations were compared with the TMDL baseline period (1991–2000), and the following evaluation periods: the Phase I BMAP assessment period (2001–12), the most recent ten-year period (2005–14), and the annual means for 2014. The TN, TP and chlorophyll *a* annual averages for all three evaluation data periods were lower than the baseline period. Improvements in water quality that had previously been achieved are being maintained.

In general, progress in reducing TP and TN concentrations is continuing. The 2014 annual TP average was lower for all lakes, with the exception of Lake Yale, Lake Apopka, and the Palatlakaha River. The

TN and chlorophyll *a* annual averages for the 2005 to 2014 data period were similar to or slightly lower than the Phase I BMAP assessment period, with the exception of Lake Yale and Trout Lake, which had slightly higher annual averages. The TP annual averages for the recent ten-year data period (2005–14) were similar to or slightly lower than the Phase I BMAP assessment period, with the exception of Lake Yale, which was higher.

SECTION 1: INTRODUCTION

1.1 PURPOSE OF THE REPORT

This is the first Annual Progress Report for the second phase of the Upper Ocklawaha River Basin Management Action Plan (BMAP). It provides an update of activities that are under way or planned and those that have been completed during the reporting period from January 1, 2014, through June 30, 2015. **Section 2** and **Section 3** describe the water quality monitoring in the basin and observations of changes in water quality that occurred during the reporting period. **Section 4** describes the projects and activities carried out during the reporting period. **Section 5** outlines activities and issues that will be undertaken in the next reporting period from July 1, 2015, through June 30, 2016.

1.2 TOTAL MAXIMUM DAILY LOADS (TMDLS) FOR THE UPPER OCKLAWAHA RIVER BASIN

The TMDLs for these waterbodies were adopted by the Florida Department of Environmental Protection (DEP) in September 2003, with the exception of Trout Lake in 2006. The Upper Ocklawaha River BMAP addresses the total nitrogen (TN), total phosphorus (TP), and biochemical oxygen demand (BOD) TMDLs for the following segments with waterbody identification (WBID) numbers: WBID 2835A, WBID 2835B, WBID 2835C, WBID 2834C, WBID 2837B, 2831A, WBID 2831B, WBID 2817A, WBID 2817B, WBID 2819A, WBID 2838A, WBID 2838B, WBID 2832, WBID 2817C, WBID 2839, WBID 2814A, WBID 2807A, and WBID 2807. Details of these TMDLs can be found in the Phase II BMAP. Three draft nutrient TMDLs (Lake Denham, Lake Roberts, and Marshall Lake) were presented at public meetings in early 2015 but have not been adopted. Provisional management strategies for these three TMDLs are included in this 2015 annual report.

1.3 AREA COVERED BY BMAP

Figure 1 shows the Upper Ocklawaha River Basin boundary and the locations of the impaired waterbodies addressed by this BMAP.

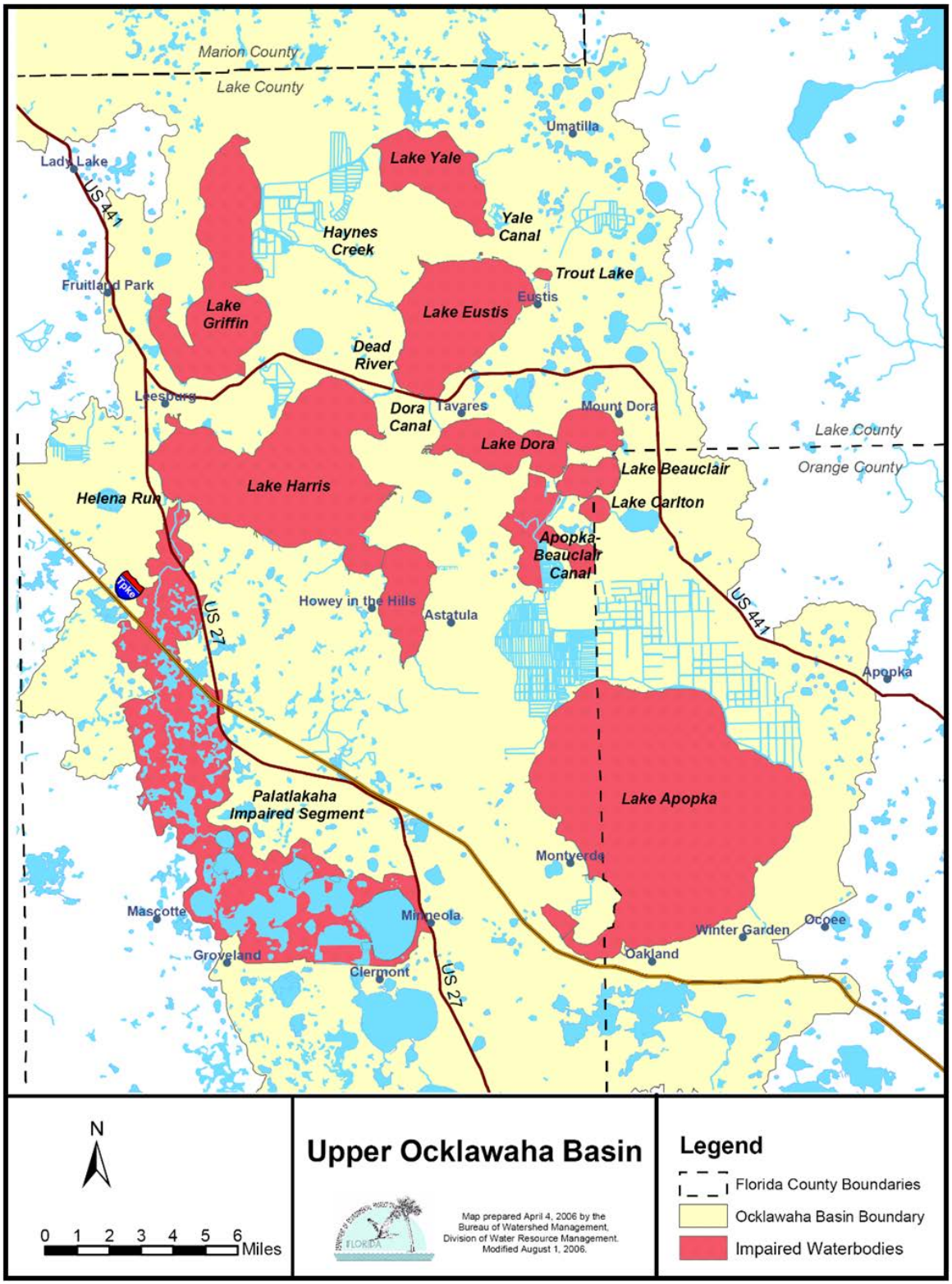

Figure 1: Upper Ocklawaha River Basin boundary and location of impaired waterbodies with adopted TMDLs

SECTION 2: WATER QUALITY MEASUREMENTS

2.1 WATER QUALITY MONITORING

Active sampling networks are in place for ambient water quality and phytoplankton community composition, loading sources, and discharge and/or water elevations. The primary monitoring agencies in the basin are Lake County Water Resource Management and the St. Johns River Water Management District (SJRWMD), supplemented by the Orange County Environmental Protection Department (EPD) for Lake Apopka, Lake Carlton, and Lake Beauclair, and supplemented by Florida LakeWatch for Lake Carlton and Trout Lake. **Appendix B** contains details on the monitoring stations and their status, and lists the analytes monitored at each station.

Minor adjustments were made to the monitoring plan adopted with Phase II of the BMAP (see **Appendix B**) because of changes in the resources available for monitoring or because stations were no longer needed for assessment purposes. Lake County Adopt-a-Lake stopped monitoring at the Little Lake Harris west shoreline station (LLHarrisWSh), the Lake County Watershed Action Volunteers (WAV) stopped monitoring at the Johns Lake northwest shoreline station (Johns Lake NW-WAV), and Polk County stopped monitoring at the Lake Lowery center station (LKLowery1). Lake County Resource Management changed the frequency of sampling from monthly to quarterly for Station HarrisSSh. Orange County EPD removed seven stations in Lake Apopka because of duplication with the SJRWMD but continues to sample Lake Carlton. The SJRWMD stopped monitoring three stations on the north shore of Lake Apopka because they were no longer needed for assessment. It also reduced the frequency of phytoplankton sampling for TMDL lakes and eliminated the collection of zooplankton data.

Data upload to the Florida STOrage and RETrieval (STORET) Database on at least an annual basis is critical to the success of water quality evaluations. Lake County, with assistance from the Lake County Water Authority (LCWA), has reinstated its agreement with the University of South Florida for a water atlas that includes data upload to Florida STORET.

2.2 MONITORING RECOMMENDATIONS

The technical working group will review the monitoring adjustments outlined in **Section 2.1** to confirm that adequate monitoring in support of the BMAP is still taking place. Three additional lakes (Denham,

Roberts, and Marshall) will be added to the BMAP monitoring plan in anticipation of the adoption of TMDLs for these lakes.

SECTION 3: WATER QUALITY OBSERVATIONS

3.1 PRECIPITATION AND HYDROLOGIC CONDITIONS

Figure 2 shows the annual rainfall totals calculated for the period from 1990 to 2014. The figure covers the same data period over which water quality data were measured. Annual rainfall amounts for each year represent an average of annual data collected from four stations managed by the SJRWMD (Station 18403130 Blue House at Starkes Ferry, Station 30053150 Lake Harris at Leesburg, Station 28765084 Lake Louisa State Park, and Station 30093061 Lake Joanna). Several recent periods of low rainfall—including 2000 and 2006 as well as 2011 to 2013—are important for the interpretation of water quality.

When water levels are low, discharges may not be made from Lake Apopka, Lake Griffin, or the Clermont Chain of Lakes (Palatlakaha River). **Table B-4** in **Appendix B** lists the water level and discharge monitoring locations. To maintain water levels in Lake Apopka, water has not been discharged from the Apopka–Beauclair Dam to downstream lakes since early 2012, as displayed in **Figure 3** (data courtesy of the U.S. Geological Survey [USGS]). This benefits downstream lakes by reducing the loading from upstream sources but may limit the flushing of those lakes, resulting in longer residence times that enhance biological productivity.

Discharge patterns similar to the Apopka–Beauclair Lock and Dam with limited or no discharge from 2012 to 2014 are also observed at the Palatlakaha River M-1 structure, Burrell Lock and Dam, and Moss Bluff Lock and Dam. **Appendix C** displays the discharge graphs for these structures. Annual rainfall rose in 2014 and appears to be returning to a period of higher annual rainfall amounts. With the exception of the Apopka–Beauclair Lock and Dam, water was released from control structures to downstream in early 2015 (**Figure C-1**, **Figure C-2**, and **Figure C-3**).

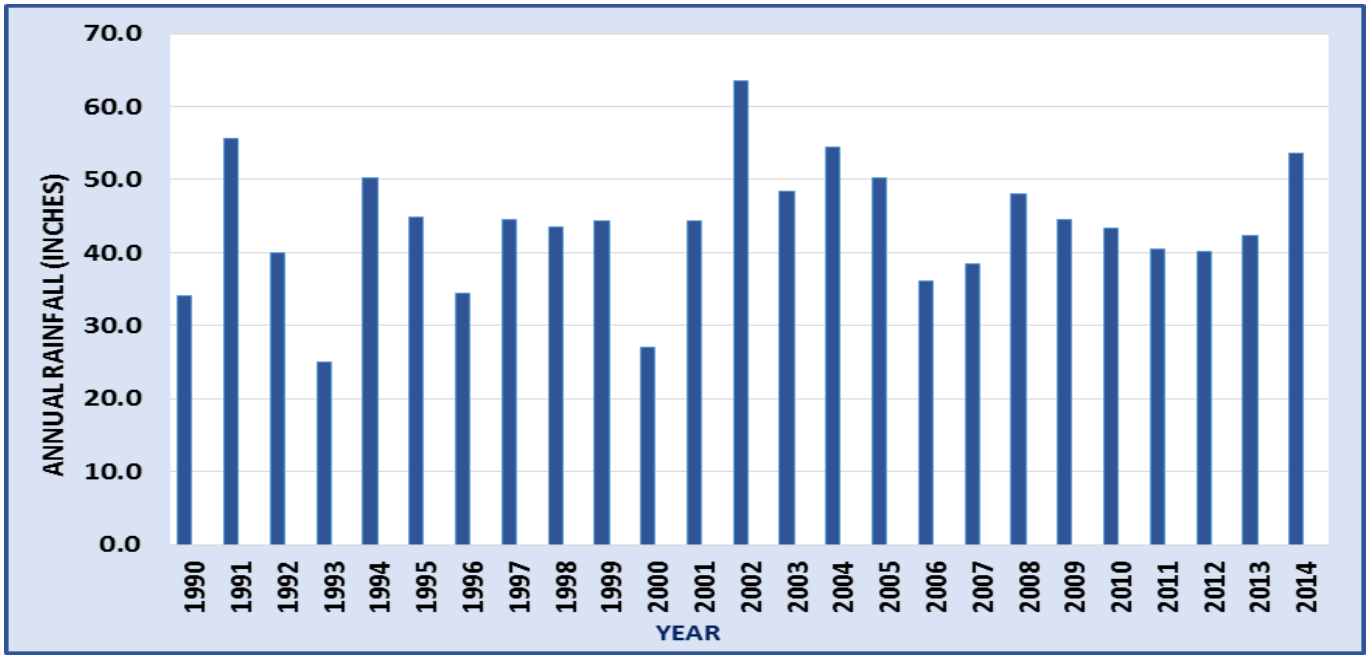

Figure 2: Annual rainfall totals

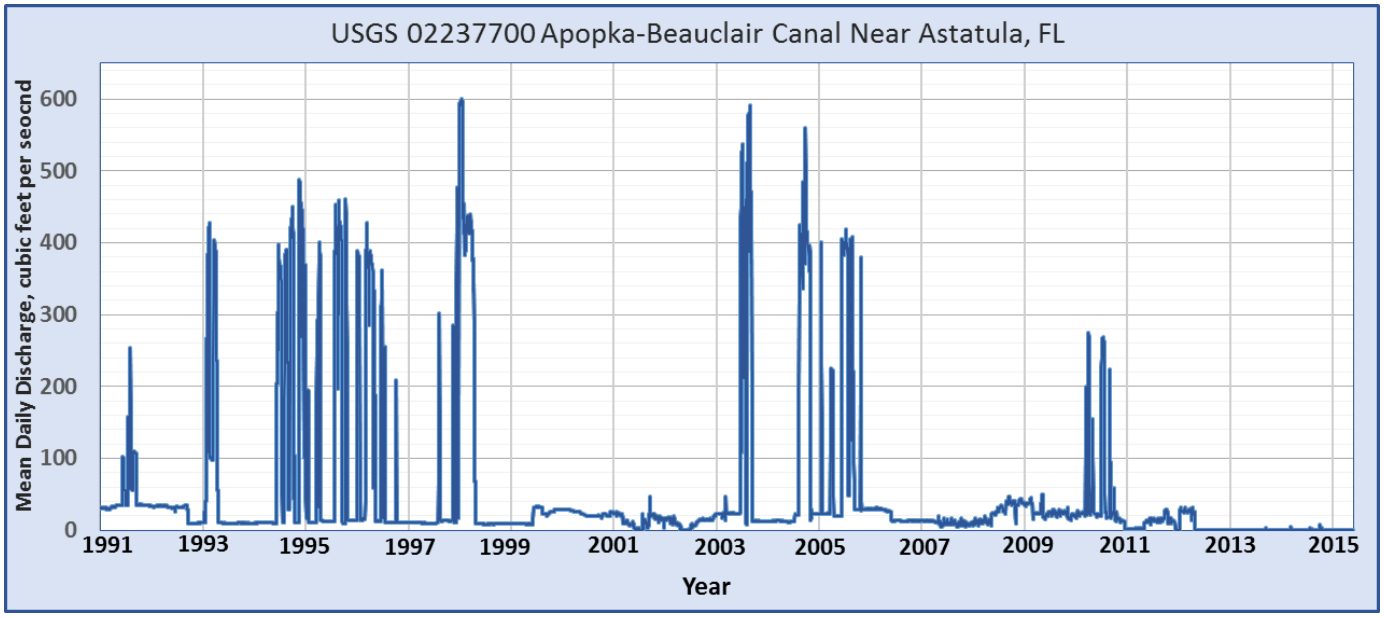

Figure 3: Discharge at Apopka–Beauclair Canal Lock and Dam

3.2 Nutrient Water Quality Observations for Lakes

The annual evaluation of concentrations of TN, TP, and chlorophyll *a* levels is used for assessing progress towards achieving the TMDLs in the basin. Long-term annual averages of TN, TP, and chlorophyll *a* data were compared with the baseline (1991–2000), the Phase I BMAP assessment period (2001–12), and the most recent ten-year period (2005–14) (see **Figure 4**, **Figure 5**, and **Figure 6**,

respectively). The 2014 annual average was also compared with the baseline period and TP targets (**Table 1**). The long-term mean for a given period is the average of the annual means. Annual averages are calculated from seasonal averages.

The 2014 TP annual means for the lakes are lower than the baseline period but still higher than the TP target concentration, with the exception of Lake Eustis. Except for Lake Yale, Trout Lake, and Lake Apopka, the 2014 annual TP mean was the same or lower than the long-term average for the 2005 to 2014 period.

Table 1: Comparison of annual TP means

mg/L = Milligrams per liter

Data Period	Lake Apopka (mg/L)	Lake Beauclair (mg/L)	Lake Carlton (mg/L)	Lake Dora (mg/L)	Lake Eustis (mg/L)	Lake Griffin (mg/L)	Little Lake Harris (mg/L)	Lake Harris (mg/L)	Trout Lake (mg/L)	Lake Yale (mg/L)
1991–2000 Baseline Mean	0.183	0.171	0.079	0.090	0.043	0.089	0.043	0.038	0.186	0.028
2014 Mean	0.16	0.064	0.052	0.045	0.023	0.040	0.029	0.030	0.262	0.042
2005–14 Mean	0.113	0.076	0.052	0.048	0.034	0.047	0.035	0.032	0.250	0.030
TP Target	**0.055**	**0.032**	**0.032**	**0.031**	**0.025**	**0.032**	**0.026**	**0.026**	**0.028**	**0.020**

The TN and chlorophyll *a* annual averages for the 2005 to 2014 period were similar to or slightly lower than the Phase I BMAP assessment period, with the exception of Lake Yale and Lake Apopka, which had slightly higher annual averages. The TP annual average for the 2005 to 2014 data period, compared with the Phase I BMAP assessment period, was higher for Lake Yale and the Palatlakaha River but lower for Trout Lake.

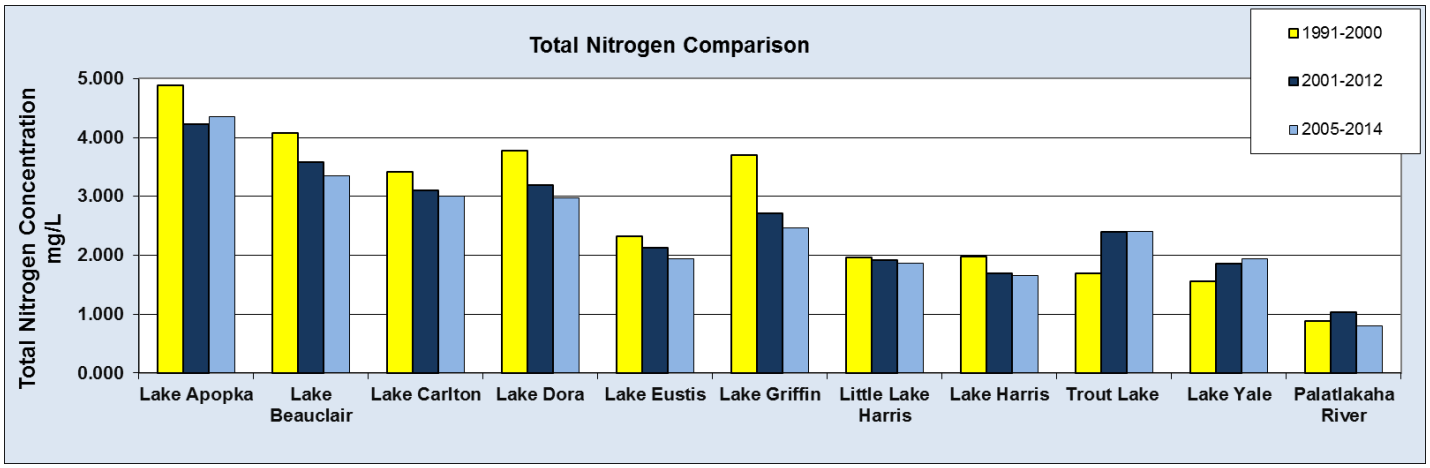

Figure 4: Comparison of long-term annual average TN concentrations

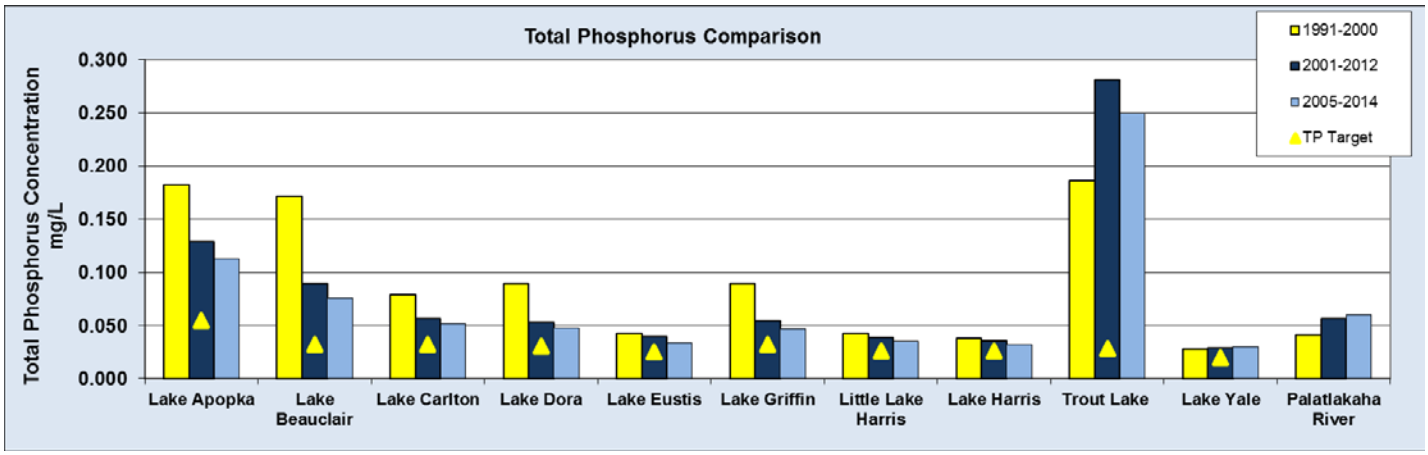

Figure 5: Comparison of long-term annual average TP concentrations

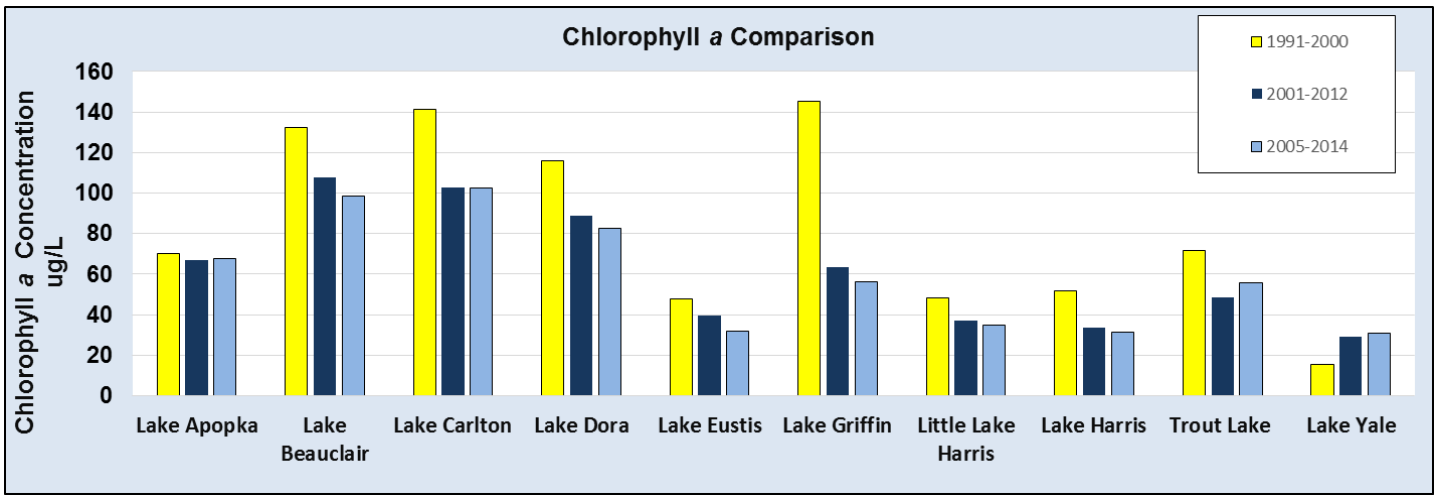

Figure 6: Comparison of long-term annual average chlorophyll *a* concentrations among lakes

SECTION 4: PROJECT DESCRIPTIONS

This section describes the status, modification, or addition of BMAP projects. Fourteen additional projects have been added (see **Appendix A**) over the reporting period and since the adoption of the Phase II BMAP in 2014. **Table 2** summarizes the type of projects adopted with each BMAP phase as well as the new projects. Overall, 59 projects were undertaken during Phase II (including new projects) and a total of 229 projects for both BMAP phases.

Of the 229 total projects, nine projects were cancelled, modified, or replaced because easements could not be obtained to construct the project, funding was not obtained, or design specifications changed enough that it is now considered a different project. The total number of active, proposed, and completed projects is 220. Land ownership of the Pine Meadows restoration project (originally listed as TROUT01 and EUS05) was transferred to Lake County Parks and Trails Division from the SJRWMD. Both projects are consolidated into one project, with the purpose changed from restoring water quality to providing recreational opportunities.

A number of educational and regulatory projects initiated in Phase I require continuation through Phase II to be effective. The Florida Department of Agriculture and Consumer Services (FDACS) developed agricultural best management practices (BMPs) during Phase I, and that activity was tracked as part of BMAP implementation. For Phase II, only the acreage enrolled in BMPs will be inventoried. There are seven projects listed (envisioned and pending categories) that currently have no funding or insufficient funding to complete. **Section 4.1** through **Section 4.13** describe the accomplishments by individual entities in the Upper Ocklawaha River Basin over the past year and a half**.**

Table 2: Number of projects by category

BMAP Phase	Completed	On Hold	Ongoing	In Permitting	Envisioned (Conceptual, No Design, No Funding)	Pending, Designed But Not Funded	Planned and Funded	Cancelled/ Replaced/ Modified
Phase I	116	1	45					7
Phase II	29		12			3		2
New Projects	3		6	1	2		1	
Totals	**149**	**1**	**63**	**1**	**2**	**3**	**1**	**9**

Table 3: Number of projects by BMAP phase and type

Types of Projects	Phase I BMAP	Phase II BMAP	New Projects
Agricultural BMPs	1	1	
Stormwater management program implementation	20	3	
Education and outreach efforts	9	4	2
Regulations, ordinances, and guidelines	14		
Restoration and water quality improvement project	14		1
Special studies and planning efforts	17	3	3
Structural BMPs—load reductions not quantified	26	21	
Structural BMPs—quantifiable load reductions	66	14	7
Wastewater infrastructure management			1

4.1 FDACS

During this reporting period, landowners signed 116 notices of intent (NOIs) agreeing to implement applicable BMPs on their enrolled properties, resulting in an additional 3,959.6 acres covered by NOIs. In the Upper Ocklawaha River Basin, the FDACS Office of Agricultural Water Policy (OAWP) has a five-year enrollment goal of 62,947 acres (60% of the total acreage). As of June 2015, for both Phase I and Phase II of the BMAP, producers throughout the basin submitted a total of 404 NOIs representing 15,962 acres, or 15.2% of the adjusted total agricultural acreage (see **Table 4**). More than half of the NOIs were established for citrus BMPs. FDACS staff will work to enroll the remaining 46,985 acres in the next few years to meet the 60% goal.

The Florida Forest Service manages the implementation and evaluation of silviculture BMPs. There are 50,641.5 acres of forest in the Upper Ocklawaha Basin covered by silviculture NOIs. A large part of this acreage is in the Ocala National Forest and managed by the U.S. Forest Service.

4.2 FLORIDA DEPARTMENT OF TRANSPORTATION (FDOT)

FDOT completed three stormwater projects in the Lake Griffin Basin associated with road improvements on State Road (SR) 500/U.S. Highway 441. An additional stormwater project was completed for SR 50 in the Lake Apopka Basin. FDOT street sweeping in the basin removed 380 lbs of TP and 592 lbs of TN.

4.3 LAKE COUNTY

Lake County Public Works Department completed the Washington Avenue drainage improvement project in the Lake Yale Basin in March 2015. This project included paving dirt roads, installing grass swales on bare ground, and placing ditch blocks. The completed project prevents up to 173 tons of sediment per year from reaching surface waters in the Lake Yale Basin. The county also completed the Lake Saunders outfall improvement project.

The ownership of the Pine Meadows Restoration Area was transferred from the SJRWMD to Lake County Parks and Trails Division. The change in ownership resulted in the merging of projects TROUT01 and EUS25 into one project. The SJRWMD continues to monitor water quality and loadings originating in the restoration area. Plans for the area include dredging the Main Canal, breaching the berm that separates the Main Canal from open water, and restoring wetland habitat. The Florida Fish and Wildlife Conservation Commission will carry out the work.

Lake County Public Works started or completed several public education initiatives. The Lake Joanna project is complete. This project included invasive exotic plant removal, habitat restoration, and public education. A targeted business sector BMP educational program was started in 2013 that targets automotive services, landscapers, and food services. County staff visit representative businesses and inspect them for appropriate stormwater management BMPs and provide appropriate BMP educational materials. A construction erosion control education and inspection program was initiated in 2014. The erosion control program makes the DEP-approved erosion control inspector training and certification exam available to private construction employees and local government staff.

4.4 ORANGE COUNTY

Orange County EPD completed the Lake Roberts nutrient and hydrologic loading study. The study recommended the sediment inactivation of TP (using alum), with the potential for removing an estimated 1,500 pounds per year (lbs/yr) of TP. The county is collaborating with the LCWA to prepare a second study for Lake Carlton and its watershed that will identify potential sources and remediation options for this priority waterbody. The county is considering alum treatment in Lake Roberts to deactivate sediment phosphorus. The county is pursuing funding for Lake Roberts and the Lake Carlton water quality improvement study.

4.5 MARION COUNTY

The county continues its Clean Farms educational outreach program. While the county does not have a pet waste ordinance, waste management outreach targeted at horse farms is conducted by a Marion County extension staff person supported in part with county funding. A similar outreach position is under consideration for Fiscal Year (FY) 2015/2016 to target cow/calf operations.

The Marion County Lake Griffin Basin watershed management plan is 70% complete, with the expected delivery of a capital projects report in FY 2018/2019. The county uses these plans to identify water quality issues and prioritize efforts for correction. Retrofit projects identified by the county can be incorporated into the third BMAP phase, which starts in 2019. The digital elevation model, watershed evaluation, modeling parameterization, model development and verification, and floodplain analysis and delineation have been completed. The remaining work, the floodplain level of service and the surface water resource assessment report, are scheduled for FY 2016/2017 and 2017/2018.

4.6 SJRWMD

Water levels were high enough in Lake Apopka to circulate water through the marsh flow-way, but not adequate to release water to the downstream lakes. For the reporting period, the flow-way removed 8,000 lbs of TP and 205,000 lbs of TN.

The gizzard shad harvest from Lake Apopka removes substantial amounts of nutrients from the lake. An estimated 8,749 lbs of TP and 22,297 lbs of TN were removed through fish harvesting over the reporting period. Gizzard shad harvests in Lake Griffin, Lake Dora, and Lake Beauclair were completed in 2012.

The SJRWMD received a technical merit award from the North American Lake Management Society (NALMS) for the Lake Griffin nutrient restoration project. The award is described in the NALMS publication *LakeLine* 34(4): 11–12. A description of the restoration work was recently published in *Hydrobiologia* 753: 243–263.

The SJRWMD provides a variety of public education and outreach programs to local communities that cover water regulations, water conservation, and landscaping. Local participation in 2014 through 2015 for Lake County, Orange County, and south Marion County in the district's online education programs (the Great Water Odyssey, the Water Conservation Challenge, and the Springs Protection Challenge) included 41 schools, 76 teachers, and 3,185 students.

The Florida Water Star Program, a water conservation certification program for new and existing homes and commercial development, began partnering with the Florida-Friendly Landscaping recognition program in early 2014. The joint recognition program may add property value to individual homes as well as contribute to homeowner awareness of the appropriate amounts of fertilizer, pesticide, and water to use for landscaping.

4.7 LCWA

The LCWA contracted with Environmental Research and Design, Inc. and started evaluation studies of potential water quality improvements for Trout Lake and Lake Yale in late 2014. The purpose of these studies is to identify other sources of nutrients that were not considered in TMDL modeling and propose restoration or remediation projects based on the study findings.

The Nutrient Removal Facility (NuRF) has not been operational since FY 2012/2013 because of low or no discharge from Lake Apopka. **Figure 3** shows water releases for the Apopka–Beauclair Lock and Dam.

4.8 CITY OF CLERMONT

Clermont completed the 12th Street and Lakeshore Drive stormwater improvement project in 2014. This project prevents 7.2 lbs/yr of TP and 45.63 lbs/yr of TN from entering the Palatlakaha River. The project included removing 3,500 square feet of impervious area and constructing a dry retention pond.

The city started a second project to improve water quality in Lake Winona through a treatment train approach that uses source control (street sweeping) and a nutrient-separating baffle box, followed by retention.

4.9 CITY OF EUSTIS

Eustis contributed the land needed for the construction of a hybrid wetland treatment system to treat the discharge from Hicks Ditch and a former muck farm (Pine Meadows). This system, when complete, may remove as much as 2,600 lbs/yr of TP from Hicks Ditch and Trout Lake. During periods when there is no discharge from Hick Ditch, the system will pull water from the canal into Trout Lake to remove TP and return the treated water to the lake. The system is in the permit phase with construction expected to start in late 2015 or early 2016.

The city began replacing damaged sewer lines upstream from Lake Eustis in 2014. Repairing these lines will reduce the potential for loading of TN through ground water seepage into Lake Eustis.

Eustis modified Project EUS29 from the construction of a stormwater pond to the construction of a conveyance system. An engineering re-evaluation determined that the stormwater pond was not needed.

4.10 CITY OF LEESBURG

Leesburg initiated the design of two projects: the Lake Griffin stormwater improvement project and the Heritage Estates stormwater improvement project. These projects will prevent 35.5 lbs/yr of TP from entering Lake Griffin and 19.9 lbs/yr of TP from entering Lake Harris.

4.11 CITY OF MT. DORA

Mount Dora completed the 7th Avenue underground stormwater treatment system in February 2015. This project was funded with support from the DEP Section 319 grant program and the LCWA. The project will prevent 20 lbs/yr of TP and 125 lbs/yr of TN from entering Lake Dora.

4.12 CITY OF LADY LAKE

Lady Lake is in the design phase of the Skyline Drive drainage improvement project. This project will improve stormwater quality and the conveyance of stormwater. The project needs additional funding before construction can be started.

4.13 CITY OF UMATILLA

Umatilla received a TMDL water quality grant from DEP in 2013 as well as a legislative appropriation in 2015 for the installation of a stormwater collection and conveyance system within Lake Yale Subbasin Four. The project design was completed in 2014. The project involves retrofitting the city's wastewater treatment plant facility's rapid infiltration basins into a stormwater wet detention pond to treat stormwater before discharge into wetlands. It will remove approximately 21.8 lbs/yr of TP when completed but was previously credited with 58.2 lbs/yr of TP before calculations were refined. The project is in the permitting phase.

The Southwest Orange Avenue exfiltration project is projected to be in construction later this year. DEP provided partial funding for the project. This system will reduce stormwater discharge into Lake Eustis and when complete will remove approximately 19 lbs/yr of TP.

Table 4: Agricultural acreage, BMP enrollment, and future enrollment goals for the Upper Ocklawaha River Basin

N/A = Not applicable
[1] FDACS staff-adjusted acreage for purposes of enrollment is based on a review of more recent aerial imagery in the basin and local staff observations.
[2] See the discussion on BMP enrollment goals (**Section 4.1**)
[3]Acreage enrolled may be larger than indicated by 2009 land use mapping. Reasons for this are transitions of agriculture land use between the types of agriculture and land identified in 2009 with nonagricultural land use have transitioned to active agriculture.

2009 SJRWMD Land Use	Acres	FDACS-Adjusted Acres[1]	Related FDACS BMP Programs	Acreage Enrolled[3]	Related NOIs
Pasture and Rangeland	62,313.3	62,313.3	Cow/Calf; Future (hay)	1,717.8	10
Row/Field/Mixed Crops	14,166.7	14,166.7	Vegetable/Agronomic Crops	1,197.9	5
Horse Farm	2,826.6	2,826.6	Equine	23.9	1
Citrus	19,841.8	19,841.8	Ridge Citrus; Flatwoods Citrus	8,525.4	245
Fruit Orchards/Other Groves	256.6	256.6	Specialty Fruit and Nut	477.7	19
Abandoned Tree Crops	492.8	0.0	No enrollment needed	N/A	N/A
Nurseries and Vineyards, Ornamentals, Tree Nurseries, Ferns, Floriculture	4,838.0	4,838.0	Nursery	3,497.6	121
Sod Farms	396.1	396.1	Sod	521.3	3
Specialty Farms	87.3	87.3	Conservation Plan Rule		
Dairies	128.1	128.1	Conservation Plan Rule/ Lake Okeechobee Protection Program		
Cattle Feeding Operations	22.8	22.8	Conservation Plan Rule		
Poultry Feeding Operations	34.7	34.7	Conservation Plan Rule		
Other Open Lands – Rural	101.9	0.0	No enrollment needed	N/A	N/A
Fallow Cropland	42.8	0.0	No enrollment needed	N/A	N/A
Total	**105,549.5**	**104,912.0**		**15,961.5**	**404**

5-Year Enrollment Goal (60%) **62,947.2 FDACS-adjusted acres**
Acreage Enrolled (as of June 2015) **15,961.5 FDACS-adjusted acres**
Remaining Acres to Enroll[2] **46,985.7 FDACS-adjusted acres**

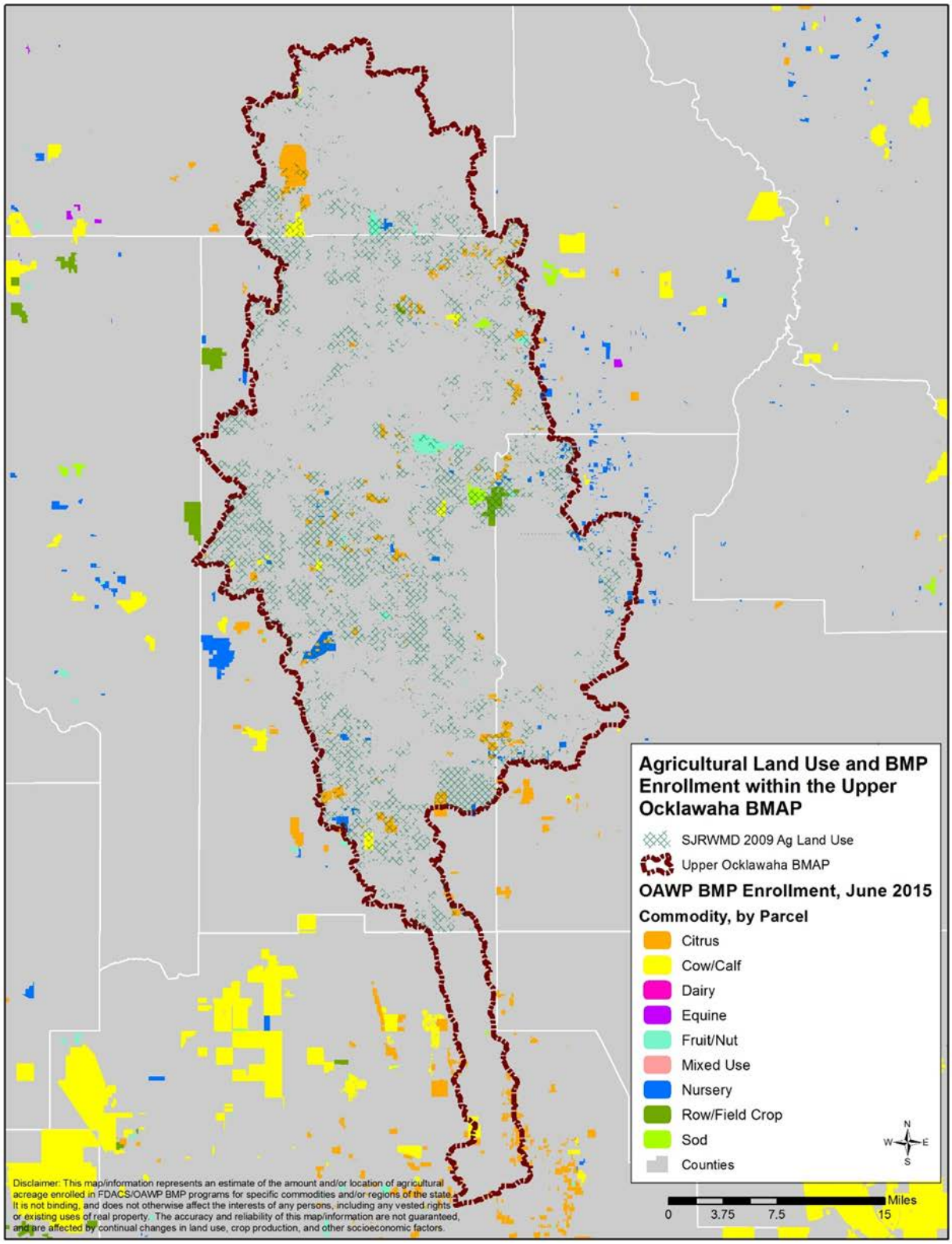

Figure 7: BMP enrollment in the Upper Ocklawaha Basin as of June 30, 2015

4.14 SUMMARY OF ACCOMPLISHMENTS

TP loading reduction is the focus of restoration efforts in the Upper Ocklawaha Basin. Basinwide, a net increase of 340 lbs/yr of TP loading reduction was achieved for urban stormwater management. This net reduction included a correction of -469 lbs/yr of TP applied to street sweeping for Ocoee and the recalculation of TP removal for a Umatilla project (YALE04) that resulted in a credit reduction of 36.4 lbs/yr. Street-sweeping reductions credited to Ocoee were erroneously assigned 100% credit instead of 30% for the project area in the Upper Ocklawaha Basin.

An error was discovered in the modeling calculations used to estimate stormwater runoff in the TMDLs. It does not affect the TMDL target concentrations and loading targets modeled for each waterbody. However, it requires the recalculation of the baseline loading, resulting in an adjustment to the total loading reduction needed to meet the TMDLs. The loading models for the five priority waterbodies are also being updated to reflect 2009 land use loading and septic system loading.

Table 5: Summary of progress toward achieving the TMDLs

TBD = To be determined.

Waterbody/WBID	TMDL Parameter	TMDL (lbs/yr)	TMDL Baseline Loading (lbs/yr)	Loading Reduction Needed (lbs/yr)	Total Loading Reductions Achieved (lbs/yr)	Remaining Loading (lbs/yr)
Lake Apopka/ 2835 A,C,D	TP	35,052	137,451	102,399	TBD	TBD
Lake Beauclair/2834C	TP	7,056	46,672	39,616	TBD	TBD
Lake Carlton/2837B	TP	195	477	282	TBD	TBD
Lake Dora/2831A,B	TP	13,230	39,646	26,416	TBD	TBD
Lake Eustis/ Haynes Creek/ 2817A,B	TP	20,286	35,503	15,217	TBD	TBD
Trout Lake/2819A	TP TN	521 9,733	2,604 24,165	2,083 14,432	TBD	TBD
Lake Harris, Little Lake Harris/ 2838A,B, 2832,2817C	TP	18,302	26,864	8,562	TBD	TBD
Palatlakaha River/2839	BOD TN TP	43,042 16,696 2,207	49,351 17,604 2,350	6,309 908 143	TBD	TBD
Lake Griffin/2814A	TP	26,901	77,881	50,980	TBD	TBD
Lake Yale– Lake Yale Canal/ 2807A, 2807	TP	2,844	3,158	314	TBD	TBD

SECTION 5: SUMMARY, ISSUES, AND ACTIVITIES FOR THE UPCOMING YEAR

Progress was made toward reducing the inputs of watershed nutrient loadings that have resulted in water quality impairments in the basin. The TP credit for Ocoee's street sweeping was adjusted during this reporting period to reflect only that portion of Ocoee in the Upper Ocklawaha Basin. The adjustment removed 469 lbs/yr of TP credit previously reported. TP loading reductions were recalculated for a Umatilla project, resulting in a reduction of 36.4 lbs/yr of credit assigned to that project.

Even with these corrections, basinwide an additional net reduction of 340 lbs/yr of TP loading from urban stormwater contributed from the watershed is achieved for this reporting year. Loading reductions from in-lake nutrient reductions (gizzard shad harvest) or the direct remediation of historical muck farm areas are not included in this total.

Agricultural enrollment increased by 3,961 acres and the number of NOIs by 116. This translates to 15.2% of the basin's agricultural acreage now covered by an NOI. Operation of the Lake Apopka marsh flow-way reduced internal lake loading by 8,000 lbs/yr of TP.

The improvements in water quality that were previously achieved are being maintained. The TN, TP, and chlorophyll *a* annual averages for all three data evaluation periods were lower than the baseline period.

In general, progress toward reducing TP and TN concentrations is continuing. The 2014 annual TP average was lower for all lakes, with the exception of Lake Yale and Lake Apopka. The TN and chlorophyll *a* annual averages for the 2005 to 2014 data period were similar to or slightly lower than the fifth-year assessment period, except for Lake Yale and Trout Lake, which had slightly higher annual averages. The TP annual averages for the recent ten-year data period (2005–14) were similar to or slightly lower than the fifth-year assessment period, with the exception of Lake Yale, which was higher.

The estimates of loading reductions need improvement. Some of the stormwater projects in the basin do not have estimated loading reductions. These projects include street sweeping, baffle boxes, sediment trapping, and older structural BMPs. Dry or wet weights of material collected or volume of material collected through street sweeping or baffle boxes can be used to estimate nutrient removal for those types of projects. Better approximations of the amount of material collected and better estimates of its

nutrient content are needed for the next annual report. If necessary, methods will be developed to assist local governments with collecting or estimating this information.

Watershed planning, evaluation, and modeling activities by local governments and the LCWA are providing a foundation for the identification of management actions that will reduce nutrient loading in the priority waterbodies. Finding solutions to further reduce loadings in the priority waterbodies is the immediate focus of activity in the basin. However, progress in improving water quality for the other waterbodies in the basin still has to be maintained. Water quality remediation studies are in progress for Trout Lake and Lake Yale. Orange County has proposed a second water quality study for Lake Carlton in cooperation with the LCWA to identify potential nutrient sources and identify remediation actions. A critical issue for the next year is obtaining adequate funding for the scoping and design of the water quality improvement projects recommended by these studies.

APPENDICES

APPENDIX A: ADDITIONAL BMAP PROJECTS

Table A-1 lists the status of projects added to the BMAP between January 1, 2014, and June 30, 2015. Some projects do not have a completion date because their continued operation is necessary to maintain annual reductions in loading. Projects that are categorized as "envisioned" are conceptual strategies that do not have funding or complete project details to predict when or how they could be implemented.

Table A-1: New projects

Project Number/ Project Name	Waterbody Name/ WBID	Lead Entity/ Project Partners	Cost of Project	Start Date/ Completion Date	Source of Funds	General Location/ Project Description and Benefits	TP Loading Reduction (lbs/yr)	TN Loading Reduction (lbs/yr)	Area treated (acres)	Project Category/ Project Type	Project Status
PAL25/ 12th Street and Lakeshore Drive Stormwater Improve-ments	Palatlakaha River	City of Clermont/ LCWA	$227,000	2014/2014	City of Clermont storm-water utility and LCWA	12th Street at Lakeshore Drive / Project includes removing 3,500 square feet (SF) of impervious area subject to vehicular traffic and construction of dry retention pond to treat stormwater discharges from 8.72-acre contributing basin.	7.20	45.63	8.7	Stormwater BMPs/ treatment train	Com-plete
PAL26/ Lake Winona Stormwater Improve-ments	Palatlakaha River	City of Clermont/ LCWA	$512,357	2015/2016	City of Clermont storm-water utility and LCWA	Lake Avenue and Linden Street north of Lake Winona / Proposed project will provide treatment of runoff from two subbasins, prior to discharge to Lake Winona using treatment train. Proposed treatment train includes source control (street sweeping), and nutrient-separating baffle box, followed by retention (underground storm chambers at one outfall, and dry retention pond at second outfall).	1.80	10.50	25.6	Stormwater BMPs/ treatment train	Ongoing

Project Number/ Project Name	Waterbody Name/ WBID	Lead Entity/ Project Partners	Cost of Project	Start Date/ Completion Date	Source of Funds	General Location/ Project Description and Benefits	TP Loading Reduction (lbs/yr)	TN Loading Reduction (lbs/yr)	Area treated (acres)	Project Category/ Project Type	Project Status
PAL27/ Disston Avenue Stormwater Improve-ments	Palatlakaha River	City of Clermont/ LCWA	$442,550	2010/2011	City of Clermont storm-water utility and LCWA	Lake Minnehaha, Disston Avenue south of Minnehaha Avenue, Clermont / Project consists of 50 underground concrete chambers that hold stormwater, allowing it to percolate through sand, thus entering lake laterally. Sand filter removes nutrients. Underground chambers are preceded by baffle boxes, which remove floatables such as trash, leaves, grass, and sand. Combination of underground structures sufficiently cleans stormwater before it enters lake. Total suspended solids (TSS) removed is 1,991 lbs/yr.	10.00	Not available	11.6	Stormwater BMPs/ Treatment train	Com-plete
CARL01/ Lake Carlton Nutrient and Hydrologic Assessment	Lake Carlton	Orange County EPD/ LCWA	$150,000	2015/2017	General fund	Lake Carlton watershed / Nutrient and hydrologic assessment of lake and identification of possible nutrient reduction projects.	Not applicable	Not applicable	N/A	Special studies and planning efforts/ other	Envi-sioned (concep-tual), but not funded
ROB01/ Lake Roberts Sediment Inactivation	Lake Roberts	Orange County EPD	$231,225	2016/2016	General fund	Lake Roberts / Sediment inactivation on entire lake surface.	1,511.00	Not applicable	112 acres of lake surface	Stormwater BMPs/ alum injection	Envi-sioned (concep-tual), but not funded

Project Number/ Project Name	Waterbody Name/ WBID	Lead Entity/ Project Partners	Cost of Project	Start Date/ Completion Date	Source of Funds	General Location/ Project Description and Benefits	TP Loading Reduction (lbs/yr)	TN Loading Reduction (lbs/yr)	Area treated (acres)	Project Category/ Project Type	Project Status
LAP38/ Lake Clarice Pond	Lake Apopka	Orange County	Unknown	2015/2016	General fund	Lake Clarice Estates / Bold and Gold filter added to discharge of wet pond.	0.9	Not available	0.6	Stormwater BMPs/ treatment train	+Planned and funded
DOT01/ FDOT Street Sweeping (E5Q71 Contract No)	Upper Ocklawaha Basin	FDOT	Not available	2014/ Ongoing	Legisla-tive	Basinwide/ removal of TN and TP from street sweeping activities along state roadways throughout Upper Ocklawaha Basin.	380 FSA-MS4 load reduction tool	592 FSA-MS4 load reduction tool	Varies	Stormwater BMPs/ street sweeping	Ongoing
TROUT08/ Hicks Ditch Hybrid Wetland	Trout Lake	City of Eustis/ FDACS		June 2015/2017	FDACS, plus Eustis provided land	Hicks Ditch Road/ Hybrid wetland treatment system will remove TN and TP loading to Hicks Ditch and Trout Lake. In dry season will also be used to treat water in canal connected to lake and circulate it through system.	Not available	Not available		Restoration and water quality improve-ment project/ alum injection	Design phase
EUSTIS04/ Sewer Line Replacement	Lake Eustis	City of Eustis		2014/2016	City funds	Idlewilde Drive, Lakeshore Drive, Mary St. / Project will replace all damaged sewer lines, removing TN seepage upstream from Lake Eustis.	Not available	Not available		Wastewater infra-structure manage-ment/ other	Started

Project Number/ Project Name	Waterbody Name/ WBID	Lead Entity/ Project Partners	Cost of Project	Start Date/ Completion Date	Source of Funds	General Location/ Project Description and Benefits	TP Loading Reduction (lbs/yr)	TN Loading Reduction (lbs/yr)	Area treated (acres)	Project Category/ Project Type	Project Status
DORA43/ Lake Saunders Outfall Improve-ments	Lake Dora	Lake County Public Works	$775,000	June 2012/ February 2015	Storm-water Munici-pal Serving Taxing Unit (MSTU)	Between Lake Saunders and Lake Dora, Mount Dora / Tavares paralleling right of way of Bay Rd. / Project addressed deteriorating pipe, ditch, and outfall from Lake Saunders to Lake Dora. Pipe upsizing reduced flood stage in Lake Saunders. Ditch improvements included raised/ditch block area to provide treatment. Project also included drainage improvements for commercial area adjacent to Bay Road, which previously had no treatment and caused drainage complaints.	Not available	Not available		Stormwater BMPs/ swales with blocks or raised culverts	Com-plete

Project Number/ Project Name	Waterbody Name/ WBID	Lead Entity/ Project Partners	Cost of Project	Start Date/ Completion Date	Source of Funds	General Location/ Project Description and Benefits	TP Loading Reduction (lbs/yr)	TN Loading Reduction (lbs/yr)	Area treated (acres)	Project Category/ Project Type	Project Status
LC07/ Targeted Business Sector BMP Education	Upper Ocklawaha Basin	Lake County Public Works	$1,200	April 2013/ Ongoing	Storm-water MSTU	Throughout unincorporated Lake County / Site visits to targeted business sectors (automotive service, landscape, and food service) throughout unincorporated Lake County. Inspection for BMPs to protect stormwater quality and distribution of educational flyers on water quality. Project aids in preventing future loadings and illicit discharges.	Not available	Not available		Education and outreach efforts/ other	Ongoing

Project Number/ Project Name	Waterbody Name/ WBID	Lead Entity/ Project Partners	Cost of Project	Start Date/ Completion Date	Source of Funds	General Location/ Project Description and Benefits	TP Loading Reduction (lbs/yr)	TN Loading Reduction (lbs/yr)	Area treated (acres)	Project Category/ Project Type	Project Status
LC08/ Construction Erosion Control-Education and Inspection	Upper Ocklawaha Basin	Lake County Public Works	$1,500	April 2014/ Ongoing	Storm-water MSTU	Throughout unincorporated Lake County / Provide DEP Erosion Control Inspector Training and Certification exam to private construction and local government employees through qualified county staff for free annually. Conduct ongoing site inspections for use of erosion control BMPs at all construction sites throughout un-incorporated Lake County. Education of contractors and municipal employees on construction erosion control measures aids in reduction of sediment and TSS loading to waterbodies throughout county.	Not available	Not available		Education and outreach efforts/ other	Ongoing
TROUT09 / Water Quality Investigation	Trout Lake/ 2819A	LCWA		2014/2016	LCWA	Trout Lake watershed / Water quality investigation of sources contributing to impairment of Trout Lake. Contract with Environmental Research and Design, Inc.	Not applicable	Not applicable	Unknown	Special studies and planning efforts	Ongoing

Project Number/ Project Name	Waterbody Name/ WBID	Lead Entity/ Project Partners	Cost of Project	Start Date/ Completion Date	Source of Funds	General Location/ Project Description and Benefits	TP Loading Reduction (lbs/yr)	TN Loading Reduction (lbs/yr)	Area treated (acres)	Project Category/ Project Type	Project Status
YALE05	Lake Yale/	LCWA		2014/2016	LCWA	Lake Yale watershed / Water quality investigation of sources contributing to impairment of Trout Lake. Contract with Environmental Research and Design, Inc.	Not applicable	Not applicable	Unknown	Special studies and planning efforts	Ongoing

APPENDIX B: WATER QUALITY MONITORING

Table B-1: Ambient water quality monitoring stations in the Upper Ocklawaha River Basin

Subbasin	Entity	Station Identification	Station Description	Latitude	Longitude	Sampling Frequency	Waterbody	Status 2015
Lake Griffin	Lake County Adopt-a-Lake	HaynesCkEus	Haynes Creek at Lake Eustis	-81.75645100	28.85250400	Monthly	Haynes Creek	Active
Lake Griffin	Lake County Adopt-a-Lake	HaynesCkMFL	Haynes Creek @ MFL	-81.77830000	28.86730000	Monthly	Haynes Creek	Active
Lake Griffin	Lake County Adopt-a-Lake	HaynesCkMFL	Haynes Creek @ MFL	-81.77830000	28.86730000	Monthly	Haynes Creek	Active
Lake Apopka	Lake County Adopt-a-Lake	JohnsWSh	Johns Lake northwest shoreline - Adopt-a-Lake	-81.66010000	28.53890000	Monthly	Johns Lake	Active
~~**Lake Harris**~~	~~Lake County Adopt-a-Lake~~	~~LLHarrisWSh~~	~~Little Lake Harris on west shoreline~~	~~-81.76500000~~	~~28.72430000~~	~~Monthly~~	~~Little Lake Harris~~	~~Inactive~~
Lake Harris	Lake County Adopt-a-Lake	PlRvHaw	Palatlakaha River @ Hawthorne	-81.87500000	28.74805556	Monthly	Palatlakaha River	Active
Lake Yale	Lake County Adopt-a-Lake	Yale	Yale Lake center	-81.73840000	28.91610000	Monthly	Lake Yale	Active
Lake Eustis	Lake County Water Resource Management	DeadRvDk	Dead River dock at restaurant south of bridge	-81.76205200	28.81476800	Monthly	Dead River	Active
Lake Harris	Lake County Water Resource Management	HarrisSSh	Harris Lake S Shore at The Springs	-81.82756700	28.74910500	~~Monthly~~ Quarterly	Lake Harris	Active
Lake Beauclair	Lake County Water Resource Management	ORA2	Apopka Beauclair Canal @ Structure	-81.68527778	28.72333333	Quarterly	ABC	Active
Lake Beauclair	Lake County Water Resource Management	ORA5	Beauclair Lake Center	-81.66111111	28.77222222	Quarterly	Lake Beauclair	Active
Lake Dora	Lake County Water Resource Management	ORA6	Dora Lake East Lobe Center	-81.66111111	28.79444444	Quarterly	Lake Dora	Active
Lake Dora	Lake County Water Resource Management	ORA8	Dora Lake West Lobe Center	-81.71944444	28.79166667	Quarterly	Lake Dora	Active
Lake Harris	Lake County Water Resource Management	ORB2	Little Lake Harris North	-81.75277778	28.73333333	Quarterly	Lake Harris	Active
Lake Harris	Lake County Water Resource Management	ORB3	Harris Lake South Lobe Center	-81.80277778	28.76111111	Quarterly	Lake Harris	Active
Lake Harris	Lake County Water Resource Management	ORB4	Harris Lake West Lobe Center	-81.85474900	28.77675600	Quarterly	Lake Harris	Active
Lake Harris	Lake County Water Resource Management	ORB5	Harris Lake North	-81.79444444	28.80555556	Quarterly	Lake Harris	Active
Lake Eustis	Lake County Water Resource Management	ORB7	Eustis Lake South Center	-81.74166667	28.83055556	Quarterly	Lake Eustis	Active

Subbasin	Entity	Station Identification	Station Description	Latitude	Longitude	Sampling Frequency	Waterbody	Status 2015
Lake Eustis	Lake County Water Resource Management	ORB9	Eustis Lake North Center	-81.71666667	28.86111111	Quarterly	Lake Eustis	Active
Lake Griffin	Lake County Water Resource Management	ORC1	Haynes Creek @ Structure	-81.78250000	28.87138889	Quarterly	Haynes Creek	Active
Lake Griffin	Lake County Water Resource Management	ORC6	Haynes Creek @ Mouth to Lake Griffin	-81.82916667	28.89027778	Quarterly	Haynes Creek	Active
Palatlakaha River	Lake County Water Resource Management	ORD5	Ocklawaha River @ County line	-81.83071600	28.93371900	Quarterly	Ocklawaha River	Active
Palatlakaha River	Lake County Water Resource Management	PRA2	Big Creek @ State Park Gage Station	-81.74055556	28.44778000	Quarterly	Big Creek	Active
Palatlakaha River	Lake County Water Resource Management	PRA3	Little Creek @ Lake Nellie Rd. Gage Station	-81.75750000	28.46111000	Quarterly	Little Creek	Active
Palatlakaha River	Lake County Water Resource Management	PRB1	Palatlakaha River @ Hwy 50 Bridge	-81.78388889	28.55555556	Monthly	Palatlakaha River	Active
Palatlakaha River	Lake County Water Resource Management	PRC3	Cherry Lake@ Center	-81.81444444	28.59722000	Quarterly	Cherry Lake	Active
Palatlakaha River	Lake County Water Resource Management	PRC5	Palatlakaha River @ Hwy 19 Bridge	-81.85611111	28.57972222	Monthly	Palatlakaha River	Active
Palatlakaha River	Lake County Water Resource Management	PRC8	Palatlakaha River @ Bridges RD Structure	-81.88527778	28.67972222	Monthly	Palatlakaha River	Active
Lake Harris	Lake County Water Resource Management	SPBLUE	Blue Springs aka Yahala	-81.82777778	28.74861000	Quarterly	Blue Springs	Active
Lake Harris	Lake County Water Resource Management	SPDOUBLERUN	Double Run Spring	-81.74222222	28.67972000	Quarterly	Double Run Spring	Active
Lake Harris	Lake County Water Resource Management	SPHOLIDAY	Holiday Spring	-81.81777778	28.74055556	Quarterly	Holiday Spring	Active
Lake Harris	Lake County Water Resource Management	SPSANDY	Sandy Spring	-81.81000000	28.74500000	Quarterly	Sandy Spring	Active
Lake Harris	Lake County Water Resource Management	SPSUNEDEN	Sun Eden Spring	-81.82000000	28.74444000	Quarterly	Sun Eden Spring	Active
Lake Griffin	Lake County WAV	Haynes Creek-WAV	Haynes Creek near shoreline	-81.77830000	28.86730000	Monthly	Haynes Creek	Active
Lake Apopka	Lake County WAV	Johns Lake NW-WAV	Johns Lake northwest shoreline	-81.66010000	28.53890000	Monthly	Johns Lake	Inactive
Lake Yale	Lake County WAV	Lake Yale-WAV	Yale Lake at north shore	-81.74240000	28.92590000	Monthly	Lake Yale	Active
Lake Harris	Lake County WAV	Little Lake Harris-WAV	Little Lake Harris on west shoreline	-81.76500000	28.72430000	Monthly	Little Lake Harris	Active
Trout Lake	Lake County WAV	LKTROUTEUS	Trout Lake Eustis @ Nature Center Pier	-81.68416667	28.86888889	Monthly	Trout Lake	Active

Subbasin	Entity	Station Identification	Station Description	Latitude	Longitude	Sampling Frequency	Waterbody	Status 2015
Lake Carlton	Orange County EPD	A29	Center of Lake OLA	-81.63392000	28.75390000	Quarterly	Lake Ola	Active
Lake Beauclair	Orange County EPD	A48	Lake Beauclair	-81.65482000	28.77472000	Quarterly	Lake Beauclair	Active
Lake Carlton	Orange County EPD	A49	Lake Carlton	-81.65849000	28.75854000	Quarterly	Lake Carlton	Active
Lake Apopka	Orange County EPD	A50E	Center of John's Lake East Lobe	-81.63555000	28.53285000	Quarterly	Johns Lake	Active
Lake Apopka	Orange County EPD	A50W	Center of John's Lake West Lobe	-81.66056000	28.52964000	Quarterly	Johns Lake	Active
	~~Orange County EPD~~	~~LA10~~	~~Lake Apopka (west)~~	~~-81.65027778~~	~~28.57111111~~	~~Quarterly~~	~~Lake Apopka~~	~~Inactive~~
	~~Orange County EPD~~	~~LA12~~	~~Lake Apopka (south)~~	~~-81.63000000~~	~~28.56333333~~	~~Quarterly~~	~~Lake Apopka~~	~~Inactive~~
	~~Orange County EPD~~	~~LA17~~	~~Lake Apopka (east)~~	~~-81.58472222~~	~~28.63250000~~	~~Quarterly~~	~~Lake Apopka~~	~~Inactive~~
	~~Orange County EPD~~	~~LA19~~	~~Lake Apopka (east-central;)~~	~~-81.64333333~~	~~28.61972222~~	~~Quarterly~~	~~Lake Apopka~~	~~Inactive~~
	~~Orange County EPD~~	~~LA20~~	~~Lake Apopka (north)~~	~~-81.63416667~~	~~28.64666667~~	~~Quarterly~~	~~Lake Apopka~~	~~Inactive~~
	~~Orange County EPD~~	~~LA21~~	~~Lake Apopka(southeast)~~	~~-81.58388889~~	~~28.57916667~~	~~Quarterly~~	~~Lake Apopka~~	~~Inactive~~
	~~Orange County EPD~~	~~LA5~~	~~Lake Apopka (northeast)~~	~~-81.59416667~~	~~28.66777778~~	~~Quarterly~~	~~Lake Apopka~~	~~Inactive~~
~~**Palatlakaha River**~~	~~Polk County Natural Resources Division~~	~~LKLowery1~~	~~Lake Lowery Center~~	~~-81.67700000~~	~~28.13000000~~	~~Quarterly~~	~~Lake Lowery Center~~	~~Inactive~~
Lake Griffin	SJRWMD	02238000	Haynes Creek at Lisbon	-81.78396111	28.87193611	Monthly	Haynes Creek	Active
Palatlakaha River	SJRWMD	20020321	Cherry Lake @ Center	-81.81404167	28.59873056	Bimonthly	Cherry Lake	Active
Lake Eustis	SJRWMD	20020368	Lake Eustis center	-81.73315000	28.84306667	Monthly	Lake Eustis	Active
Lake Griffin	SJRWMD	20020381	Lake Griffin, center of lake near Treasure Island	-81.84978056	28.86335833	Monthly	Lake Griffin	Active
Lake Apopka	SJRWMD	APOPKA SPRING	Center of Apopka Springs in Gourd Neck	-81.67722222	28.56667000	Quarterly	Gourd Neck Spring	Active
Lake Beauclair	SJRWMD	BCE	Canal Entrance to Lake Beauclair	-81.67184222	28.77068806	Monthly	ABC	Active
Lake Harris	SJRWMD	Blue Spring Yale Run	Blue Springs near Yalaha	-81.82805556	28.74861000	Biannually	Blue Springs	Active
Lake Harris	SJRWMD	Bugg Spring Run	Bugg Spring Run below chain link fence	-81.90166667	28.75250000	Biannually	Bugg Spring	Active
Lake Carlton	SJRWMD	CARL	Lake Carlton, center	-81.65778056	28.76007800	Bimonthly	Lake Carlton	Active

Subbasin	Entity	Station Identification	Station Description	Latitude	Longitude	Sampling Frequency	Waterbody	Status 2015
Lake Apopka	SJRWMD	CLA	Lake Apopka Center Station	-81.62490833	28.62497250	Monthly	Lake Apopka	Active
Lake Denham	SJRWMD	DNEY	Lake Denham E end in center of lake	-81.90636222	28.76592300	Bimonthly	Lake Denham	Active
Lake Eustis	SJRWMD	DOR	Lake Dora, center lobe	-81.69767861	28.78937028	Monthly	Lake Dora	Active
Lake Harris	SJRWMD	Double Run Spring	Howey Height trib at Double Run road	-81.74194444	28.67889000	Biannually	Double Run Spring	Active
Lake Eustis	SJRWMD	HAR	Lake Harris center	-81.80594722	28.77013056	Monthly	Lake Harris	Active
Lake Harris	SJRWMD	Holiday Springs Dstm	Holiday Springs in Yalaha	-81.81805556	28.73167000	Biannually	Holiday Springs	Active
Lake Apopka	SJRWMD	JOHNSLK	Johns Lake outlet	-81.37135400	28.33056200	Contingency, when discharges to Apopka	Johns Lake	Active
Lake Griffin	SJRWMD	LBIA	Lowrie Bown; South Pool	-81.82101750	28.88030220	Bimonthly	Emeralda Marsh Conservation Area, Area 4	Active
Lake Griffin	SJRWMD	LGLHCAC	Lake Griffin LHCA Canal	-81.83628300	28.82488300	Contingency	SN Knight Leesburg (Harris Bayou)	Active
Lake Griffin	SJRWMD	LGNA	Lake Griffin, N end, midway E and W	-81.84336528	28.92156500	Bimonthly	Lake Griffin	Active
Lake Griffin	SJRWMD	LGS	Lake Griffin, center of S pool 1000 yds W of Picciola Point	-81.86046472	28.83230400	Bimonthly	Lake Griffin	Active
Lake Griffin	SJRWMD	LYC	Lake Yale, center	-81.73430000	28.91530000	Bimonthly	Lake Yale	Active
Ocklawaha River	SJRWMD	MBU	At Moss Bluff; upstream of the lock	-81.88142778	29.07886389	Monthly	Ocklawaha River	Active
Lake Apopka	SJRWMD	NLA	Lake Apopka North	-81.60470083	28.66171250	Monthly	Lake Apopka	Active
~~**Lake Apopka**~~	~~SJRWMD~~	~~NSPMP1~~	~~North Shore Restoration Area Unit 1 pump into Lake Level Canal at Interceptor Road~~	~~-81.63372369~~	~~28.71288000~~	~~Contingency~~	~~North Shore Restoration Area~~	~~Inactive~~
~~**Lake Apopka**~~	~~SJRWMD~~	~~NSPMPSFE~~	~~North Shore Restoration Area Sand Farm Pump East side site~~	~~-81.63424444~~	~~28.71403000~~	~~Contingency~~	~~North Shore Restoration Area~~	~~Inactive~~
Lake Apopka	SJRWMD	NSLNGSCCN	Ditch between Long & Scott Farm and Zellwin Sand Farm at entrance to McDonald Canal.	-81.65842600	28.70550100	Contingency	North Shore Restoration Area	Active

Subbasin	Entity	Station Identification	Station Description	Latitude	Longitude	Sampling Frequency	Waterbody	Status 2015
Lake Apopka	SJRWMD	NSWEIRE	North Shore Restoration Area at Duda Weir East Site	-81.66151139	28.68285000	Contingency	North Shore Restoration Area	Active
Lake Apopka	SJRWMD	NSWEIRW	North Shore Restoration Area at Duda Weir West Site	-81.67111111	28.72194000	Contingency	North Shore Restoration Area	Active
Lake Apopka	SJRWMD	NSZSFOUT	Discharge from Sand Farm wet area into McDonald Canal.	-81.658231	28.705466	Contingency, if flow	North Shore Restoration Area	Active
Lake Apopka	SJRWMD	NSZPT	North Shore Restoration Area Unit 2 alum injection site. North Shore Restoration Area Unit 2 post alum injection site.	-81.59182222	28.66904000	Only in high-water conditions	North Shore Restoration Area	Active
Lake Apopka	SJRWMD	NURFIN	Apopka Beauclair Canal 75 yards upstream of the NuRF Inlet structure	-81.41037304	28.43134441	Monthly	ABC	Active
Lake Beauclair	SJRWMD	NURFOUT	Outflow site of the Nutrient Removal Facility (NURF) located on Apopka–Beauclair Canal	-81.41075250	28.43252030	Monthly	ABC	Active
Lake Eustis/ Trout Lake	SJRWMD	PINEMW	Pine Meadows W side at discharge to Hicks Ditch (record staff gauge)	-81.66469889	28.88728000	Bimonthly	Pine Meadows	Active
Lake Harris	SJRWMD	PRVR	Palatlakaha River at Hwy 48 bridge	-81.87485250	28.74803300	Bimonthly	Palatlakaha River	Active
Lake Apopka	SJRWMD	SLA	LK Apopka East of Gourd Neck Spgs., Mouth of Gourd	-81.65060250	28.56743667	Bimonthly	Lake Apopka	Active
Lake Griffin	SJRWMD	SNKLCW	SN Knight Leesburg Canal Weir Sampled at LHCA side of Canal Weir	-81.82841000	28.82314000	Contingency	SN Knight Leesburg (Harris Bayou)	Active
Lake Griffin	SJRWMD	SNKLNE	SN Knight Leesburg Northeast Sampled at Northeast Pool of LHCA	-81.81502800	28.82047200	Bimonthly	SN Knight Leesburg (Harris Bayou)	Active
Lake Griffin	SJRWMD	SNKNA	SN Knight N, center of site in open water	-81.81032000	28.91169000	Bimonthly	Emeralda Marsh Conservation Area, Area 2	Active

Subbasin	Entity	Station Identification	Station Description	Latitude	Longitude	Sampling Frequency	Waterbody	Status 2015
Lake Griffin	SJRWMD	SNKSWA	East Pond serpentine path, North of bridge	-81.80108300	28.88275000	Quarterly	Emeralda Marsh Conservation Area, Area 3	Active
Lake Griffin	SJRWMD	SNKSWPOND	GFW W Pond at culverts to serpentine path on W pond side of culverts	-81.80160000	28.88219000	Contingency	Emeralda Marsh Conservation Area, Area 3	Active
Trout Lake	SJRWMD	TRTL	Trout Lake, Center	-81.68293389	28.86640200	Bimonthly	Trout Lake	Active
~~**Lake Apopka**~~	~~SJRWMD~~	~~WQDC2~~	~~West Marsh discharge into C2 canal~~	~~-81.70099167~~	~~28.68146000~~	~~Contingency, if flow~~	~~West Marsh~~	~~Inactive while NURF operating~~
Lake Apopka	SJRWMD	WQPNA	Demo Marsh Pump Station Intake Marsh Side	-81.68047220	28.67358330	Weekly if flow	Demo Marsh	Active

Table B-2: Core water quality indicators

Core Water Quality Indicators	Lakes	Canals	Palatlakaha River
BOD			√
Chlorophyll *a*	√	√	√
Dissolved Oxygen			√
Stream Condition Index			√
TN	√	√	√
TP	√	√	√
Trophic Condition, per Trophic State Index	√		
Lake Vegetation Index	√		
Phytoplankton Enumeration and Identification	√		

Table B-3: Supplemental water quality indicators

Supplemental Water Quality Indicators	Lakes	Canals	Palatlakaha River
Algal Biomass	√		
Alkalinity	√	√	√
BOD			√
Clarity, Measured as Secchi Depth	√	√	√
Color	√		
Conductivity	√	√	√
Dissolved Oxygen	√	√	
pH	√	√	√
Temperature	√	√	√
Total Organic Carbon	√	√	
TSS	√	√	√
Turbidity	√	√	√
Unionized Ammonia	√	√	√
Field Conditions during Sampling	√	√	√

Table B-4: Discharge and water level monitoring stations in the Upper Ocklawaha River Basin

Subbasin	Entity	Station ID	Station Description	Latitude	Longitude	Station Type	Frequency	Status 2015
Lake Apopka	SJRWMD	30003000	Lake Apopka at Oakland	283341.94	813826.104	Water Level	Hourly	Active
Lake Dora	SJRWMD	30013010	Lake Dora at Mount Dora	284746.67	813838.67	Water Level	Hourly	Active
Lake Eustis	SJRWMD	30083018	Lake Eustis at Eustis	285105.3	814126.02	Water Level	Hourly	Active
Lake Harris	SJRWMD	30053040	Lake Harris at Leesburg	284837.19	814855.96	Water Level	Hourly	Active
Lake Griffin	SJRWMD	60326049	Griffin Flow-Way Site Q West (1)	285418.558	814931.964	Water Level	Hourly	Active
Lake Yale	SJRWMD	02940933	Lake Yale at Grand Island	285545.58	814542.21	Water Level	Hourly	Active
Lake Apopka	USGS/SJRWMD	02237700	Apopka–Beauclair Canal near Astatula, FL	28°43'20"	81°41'06"	Discharge, Water Level	Daily	Active
Lake Eustis	USGS/SJRWMD	02238000	Haynes Creek at Lisbon, FL	28°52'14"	81°47'02"	Discharge, Water Level	Daily	Active
Lake Griffin	USGS/SJRWMD	02238500	Ocklawaha River at Moss Bluff, FL	29°04'52"	81°52'51"	Discharge, Water Level	Daily	Active
Lake Apopka	SJRWMD	15804854	Apopka Spring at Oakland	283359.77	814050.41	Discharge, Water Level	Discharge monthly, water level hourly	Active
Lake Harris	LakeWatch/SJRWMD	10840068	Bugg Spring at Okahumpka discharge	284510.24912	815404.29915	Discharge, Water Level	Discharge variable (daily to monthly), water level hourly	Active

APPENDIX C: DISCHARGE DATA

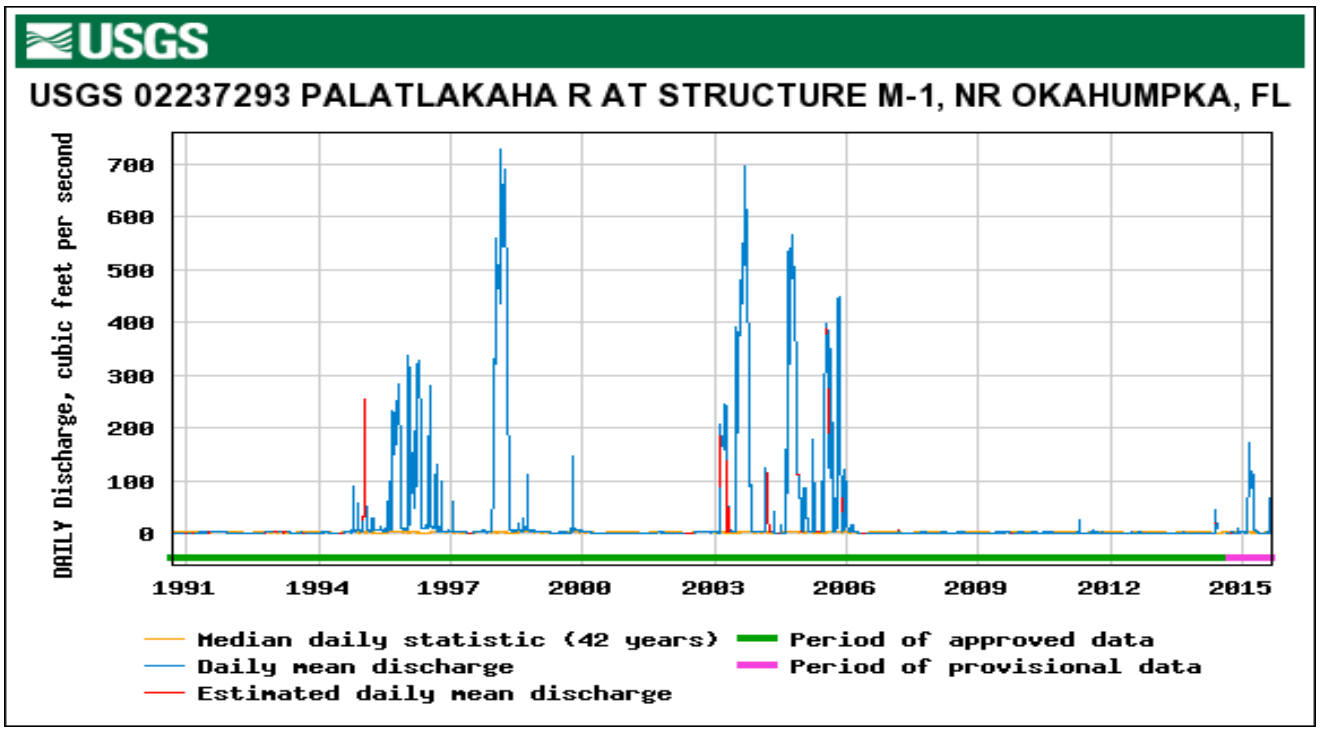

Figure C-1: Discharge from the Palatlakaha River at the M-1 Structure upstream of Lake Harris

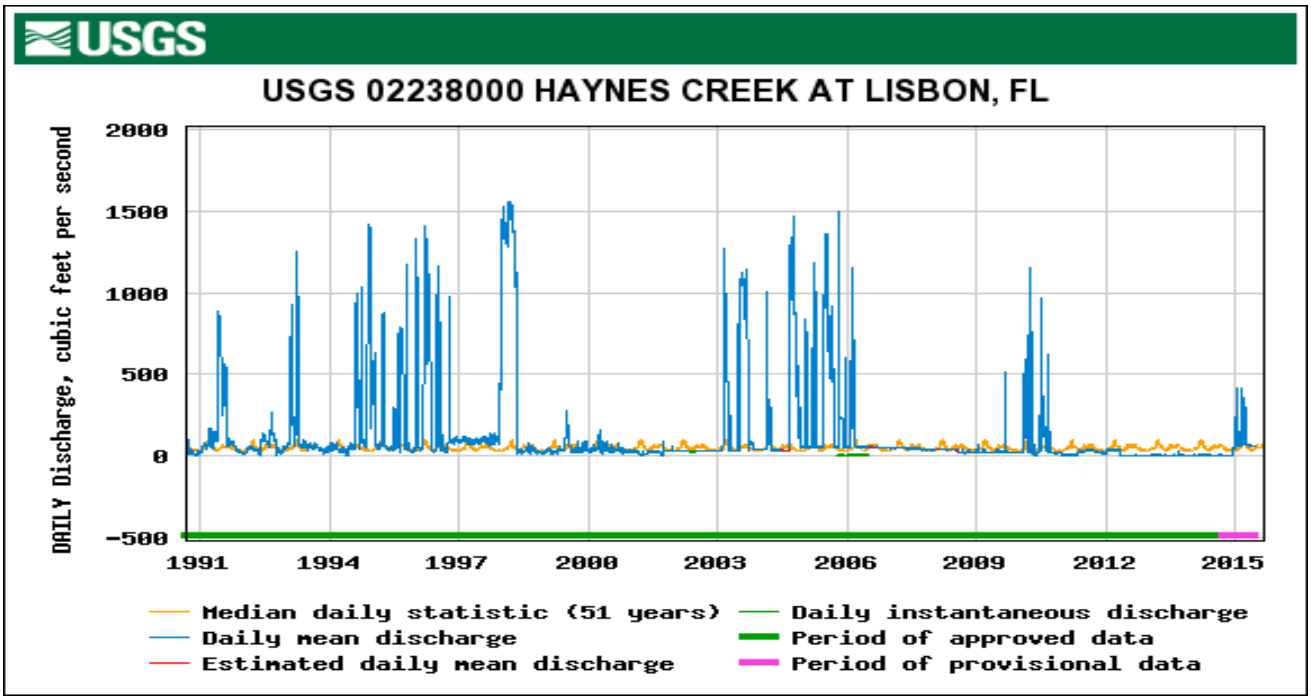

Figure C-2: Discharge at the Burrell Lock and Dam

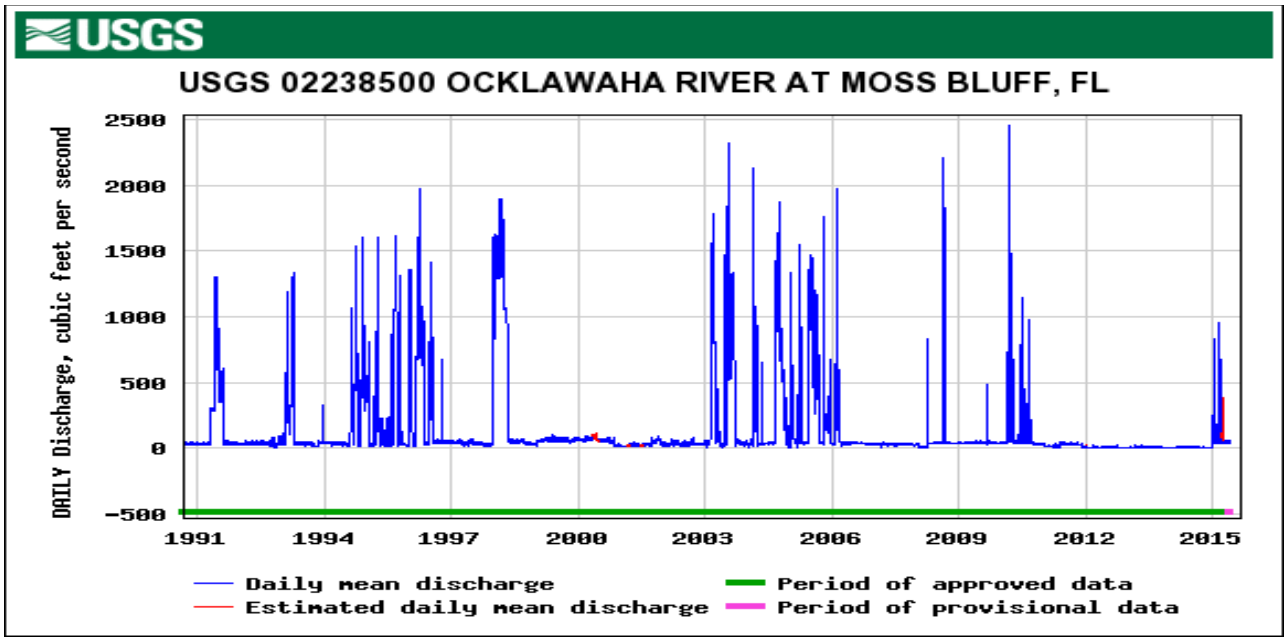

Figure C-3: Discharge to the Ocklawaha River at Moss Bluff Dam

REFERENCES

Fulton, R.S. III, W.F. Godwin, and M.H. Schaus. 2015. Water quality changes following nutrient loading reduction and biomanipulation in a large shallow subtropical lake, Lake Griffin, Florida, USA. *Hydrobiologia* 753:243–263.

Paulic, M. November 2013. *Draft Upper Ocklawaha River Basin Management Action Plan five year water quality review*. Tallahassee, FL: Florida Department of Environmental Protection, Division of Environmental Assessment and Restoration, Water Quality Restoration Program, with cooperation from the Upper Ocklawaha Basin Working Group.