# *2016 Progress Report for the Orange Creek Basin Management Action Plan*

**Division of Environmental Assessment and Restoration**
**Florida Department of Environmental Protection**

**April 2017**

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# Acknowledgments

This 2015 Orange Creek BMAP progress report 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 Orange Creek Basin Working Group:


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# List of Acronyms and Abbreviations

| | |
|---|---|
| ACEPD | Alachua County Environmental Protection Department |
| BMAP | Basin Management Action Plan |
| BMP | Best Management Practice |
| cfs | Cubic Feet Per Second |
| cfu | Colony-Forming Units |
| DEP | Florida Department of Environmental Protection |
| EPD | Environmental Protection Division (of Alachua County) |
| FDACS | Florida Department of Agriculture and Consumer Services |
| FDOH | Florida Department of Health |
| FDOT | Florida Department of Transportation |
| FFS | Florida Forest Service |
| FWC | Florida Fish and Wildlife Conservation Commission |
| GIS | Geographic Information System |
| GRU | Gainesville Regional Utilities |
| IA | Implementation Assurance |
| lbs/yr | Pounds Per Year |
| MFL | Minimum Flows and Levels |
| ml | Milliliter |
| NNC | Numeric Nutrient Criteria |
| NOI | Notice of Intent |
| NPDES | National Pollutant Discharge Elimination System |
| OAWP | Office of Agricultural and Water policy |
| OSTDS | Onsite Sewage Treatment and Disposal System |
| SJRWMD | St. Johns River Water Management District |
| SWAP | Save Water, Add Plants |
| TMDL | Total Maximum Daily Load |
| TN | Total Nitrogen |
| TP | Total Phosphorus |
| UF | University of Florida |
| WBID | Waterbody Identification |

# Section 1: Introduction

## 1.1 Purpose of the Report

This is the second annual progress report for the second phase Orange Creek Basin Management Action Plan (BMAP). It provides an update of activities that are underway or planned and those that have been completed during the reporting period from July 1, 2015, through June 30, 2016. **Section 2** describes hydrologic and water quality observations in the basin and changes in water quality that occurred during the reporting period. **Section 3** describes the projects and activities that occurred during the reporting period. **Section 4** outlines activities and issues that will be undertaken between July 1, 2015, and June 30, 2016.

## 1.2 Total Maximum Daily Loads (TMDLs) for the Orange Creek Basin

The total nitrogen (TN) TMDLs for these waterbodies were adopted by the Florida Department of Environmental Protection (DEP) in September 2003. The Orange Creek BMAP addresses the TN, total phosphorus (TP), and fecal coliform TMDLs for the following segments with waterbody identification (WBID) numbers: WBID 2705B, WBID 2749A, WBID 2741, WBID 2720A, WBID 2698, WBID 2718A, WBID 2711. **Table 1** lists the TMDLs and pollutant load allocations adopted by rule for the watershed.

**Table 1. Orange Creek Basin TMDL**

NPDES = National Pollution Discharge Elimination System; lb/yr = pounds per year; mL = milliliters; cfu = colony-forming units

| WBID | Parameter | TMDL Baseline Loading (lbs/yr) | TMDL (lbs/yr or Maximum Concentration (cfu/100mL) | Wastewater Wasteload Allocation (lbs/yr or cfu/100mL) | Wasteload Allocation for NPDES Stormwater (% reduction) | Load Allocation (lbs/yr) | Load Allocation (% reduction) |
|---|---|---|---|---|---|---|---|
| Newnans Lake 2705B | TN | 315,510 | 85,470 | 3,104 | | 82,366 | 74 |
| Newnans Lake 2705B | TP | 25,732 | 10,924 | 386 | | 10,538 | 59 |
| Orange Lake 2749A | TP | 27,889 | 15,262 | | | 15,262 | 45 |
| Lake Wauberg 2741 | TN | 4,064 | 2,062.2 | | | 2,062.4 | 51 |
| Lake Wauberg 2741 | TP | 748 | 374 | | | 374 | 50 |
| Alachua Sink 2720A | TN | 462,557 | 256,322 | 41,003 | 45 % | 215,319 | 45 |
| | | | | | | | |
| Hogtown Creek 2698 | Fecal Coliform | | 800 | | 51 % | 51 % | 51 |
| Tumblin Creek 2718A | Fecal Coliform | | 800 | | 74 % | 74 % | 74 |
| Sweetwater Branch 2711 | Fecal Coliform | | 800 | 2.27E +11 | 70 % | 70 % | 70 |

## 1.3 Area Covered by BMAP

The Orange Creek Basin boundary and impaired waterbodies addressed by this BMAP are displayed in **Figure 1**. The impaired waterbodies are located in Marion County and Alachua County, but currently not in Putnam County.

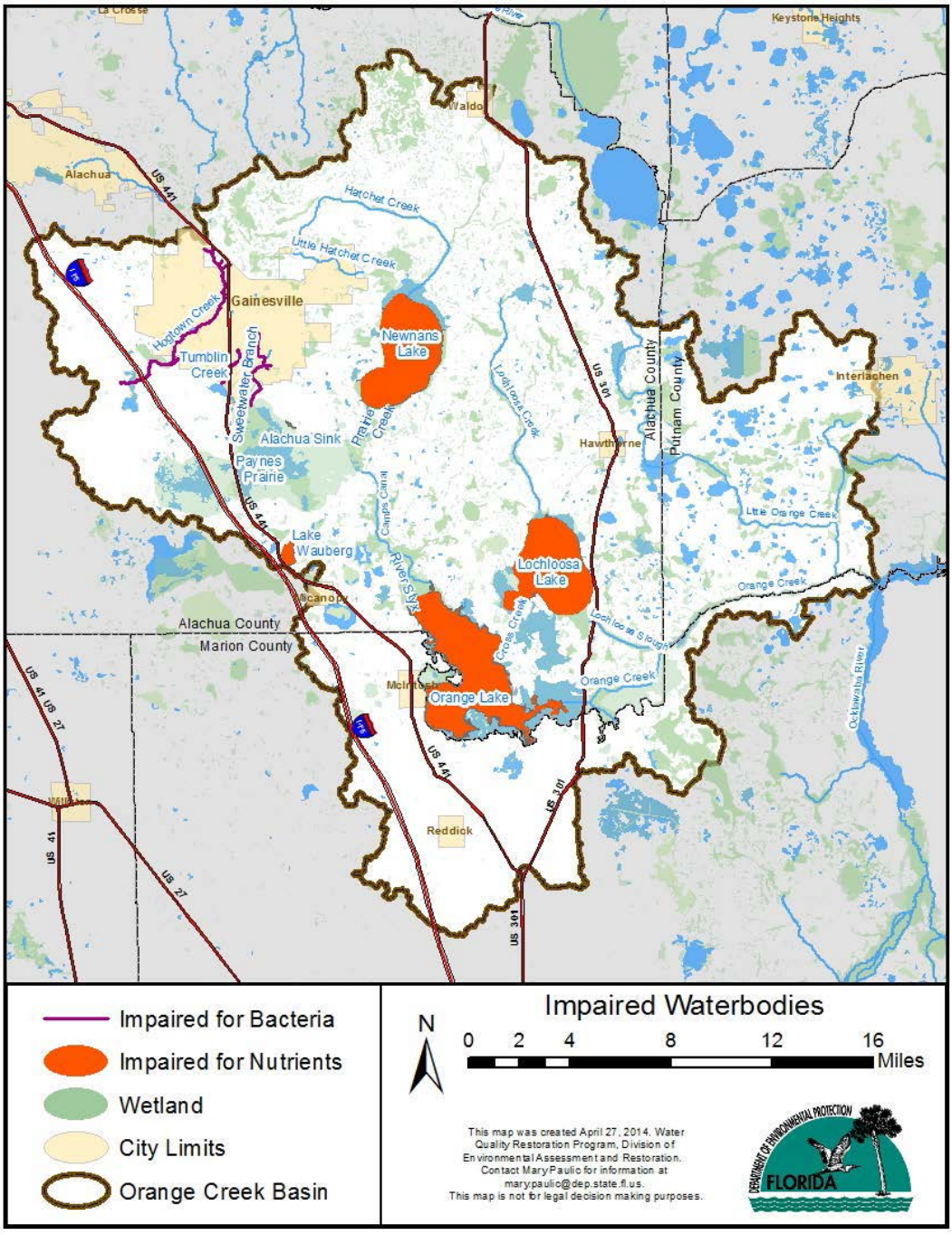


**Figure 1. Orange Creek Basin boundary and location of impaired waterbodies**

# Section 2: Water Quality Observations

## 2.1 Hydrologic Conditions

Daily mean lake levels increased starting in late 2012 (**Figure 2**, **Figure 3**, and **Figure 4**), but starting in late 2015 through early 2017 lake levels began declining. Orange Lake's water level has been below or close to the U.S. 301 weir notch elevation since late 2016, reducing or eliminating discharge from the lake.

Low annual rainfall amounts in addition to reducing lake elevation also may reduce or eliminate discharge of water from that lake. Measured data indicate this occurred for Newnans and Lochloosa Lakes during the April/May 2011 to June 2012 period. Orange Lake experienced low lake levels with minimal (<1.0 cubic feet per second [cfs]) or no discharge (at U.S. 301) from May 2006 to February 2014. Limited lake discharge reduces flushing and increases residence time in the lake, enhancing internal lake biological productivity. The reduction in volume of water has some effect on concentrating pollutants.

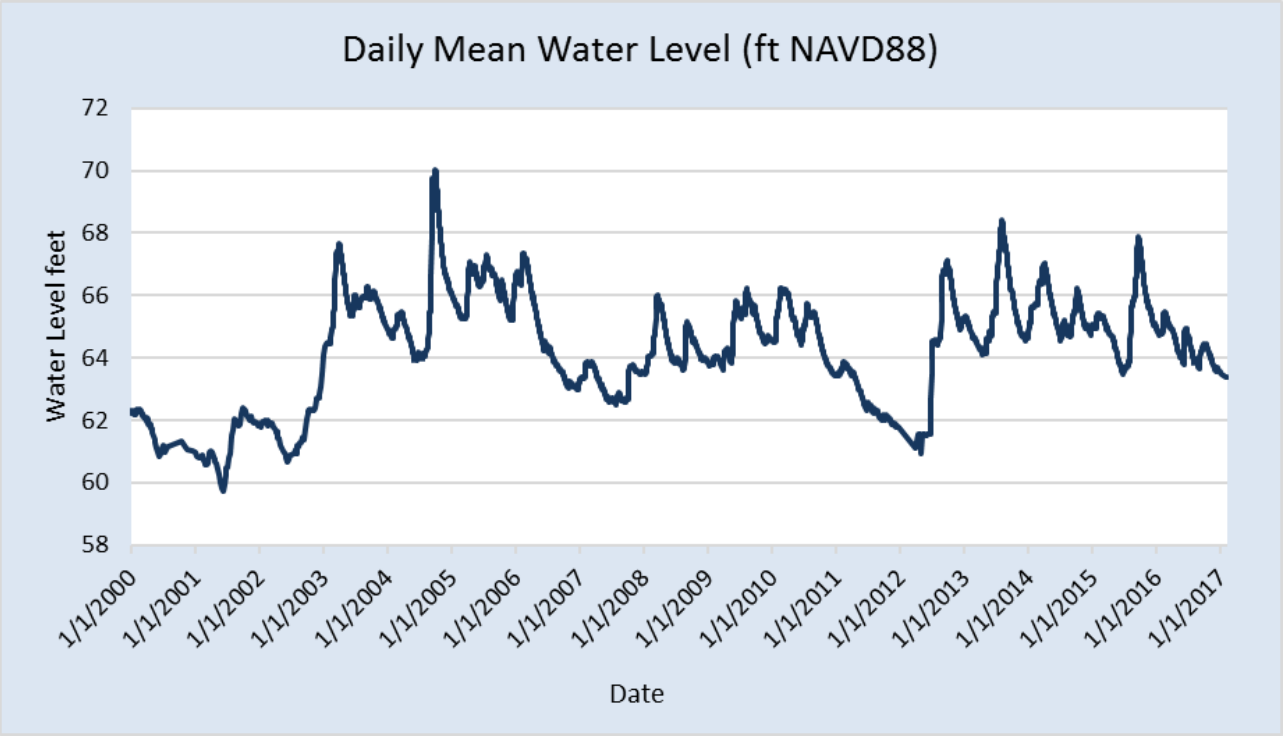


**Figure 2. Newnans Lake mean daily water level**

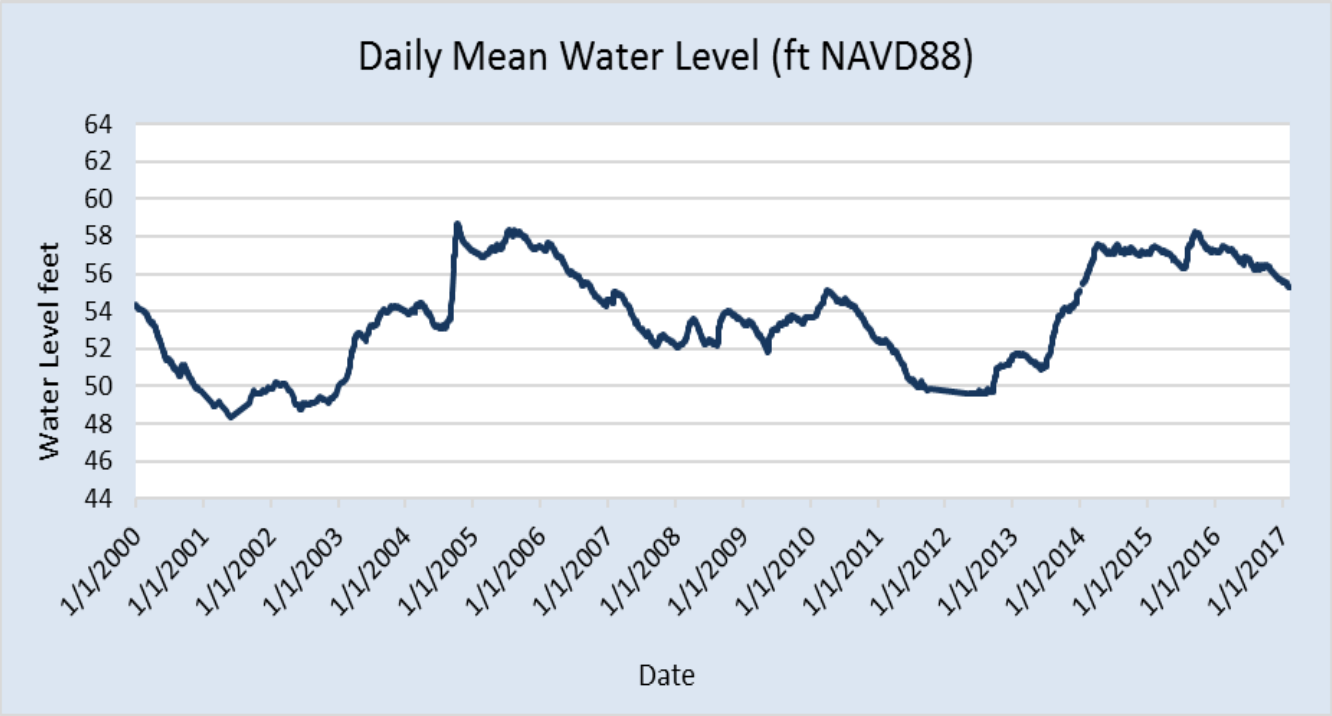


**Figure 3. Orange Lake mean daily water level**

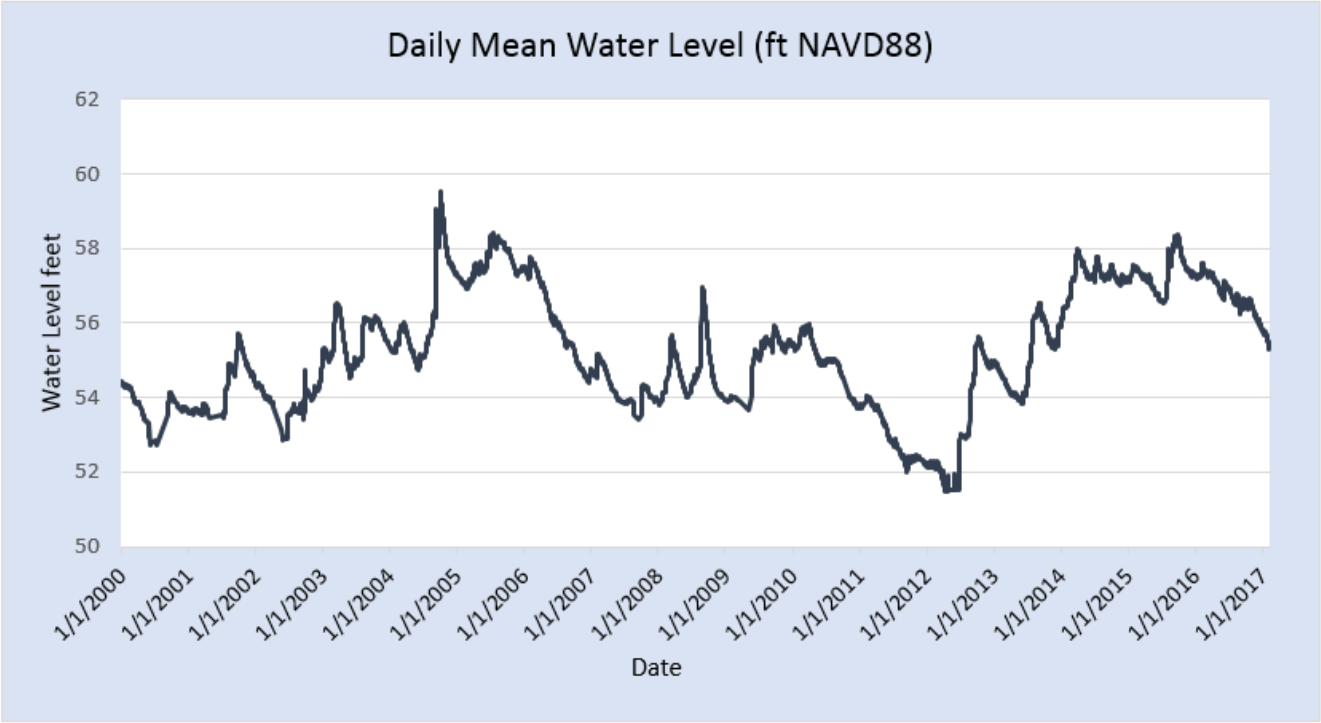


**Figure 4. Lochloosa Lake mean daily water level**

## 2.2 Nutrient Water Quality Observations for Lakes

Periodic evaluation of concentrations of TN and TP levels is the BMAPs tool for assessing progress made in implementing TMDLs in the basin. The long-term annual average TN, TP, and chlorophyll *a* concentrations were compared for Lochloosa Lake, Lake Wauberg, Orange Lake, and Newnans Lake between the TMDL development period (1995–2000) and more recent periods of 2008–2014 and 2009–2015 (**Figure 5**, **Figure 6**, and **Figure 7**). The annual average is calculated from four seasonal averages, and then each year of the data period is averaged together for the long-term average with the exception of Lochloosa Lake. The TMDL targets and long-term averages for Lochloosa Lake are geometric means, because the numeric nutrient criteria (NNC) being used for TMDL development require the application of geometric means. As the BMAP moves forward, a year of data is added to calculations and the oldest year is dropped. This creates a long-term rolling annual average that compares data between periods while allowing for water quality improvement from management actions to take effect and reducing the effect of hydrologic variations between years. TP and TN concentrations continue to be higher in the 2009–2015 period compared with the TMDL targets. Compared with the 2008–2014 average concentrations for TP, TN, and chlorophyll *a* are similar or lower with the exception of a higher TP average for Orange Lake (**Figure 6**). TP and TN lake concentrations in 2008–2014 and 2009–2015 are higher than or about the same as concentrations observed during the TMDL development period (1995–2000), with the exception of total nitrogen in Newnans Lake.

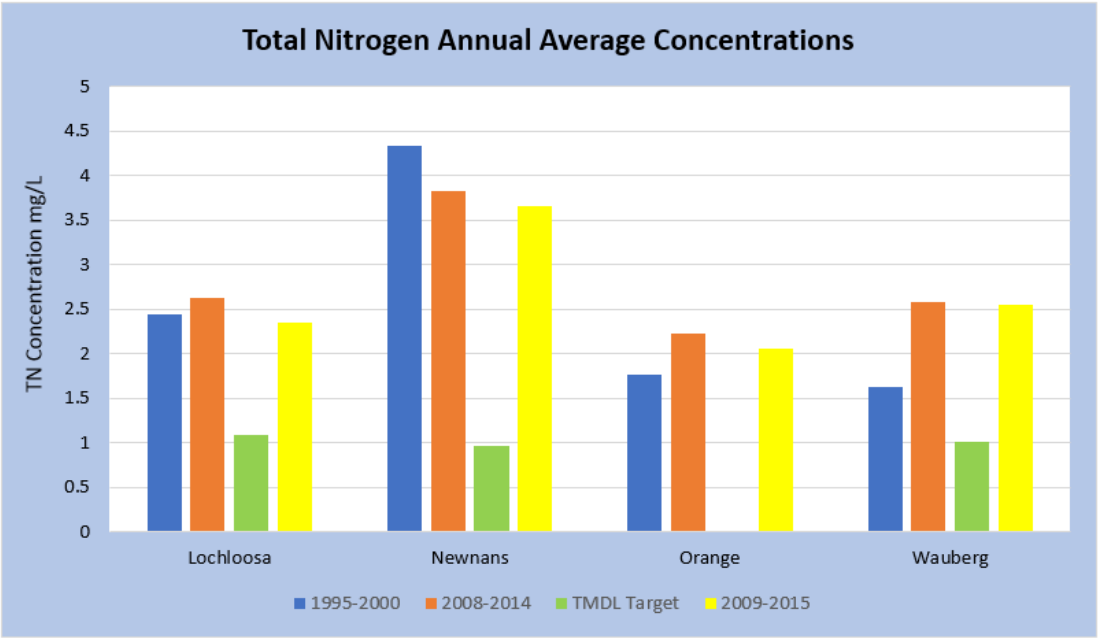


**Figure 5. Comparison of long-term annual average TN concentrations among lakes**

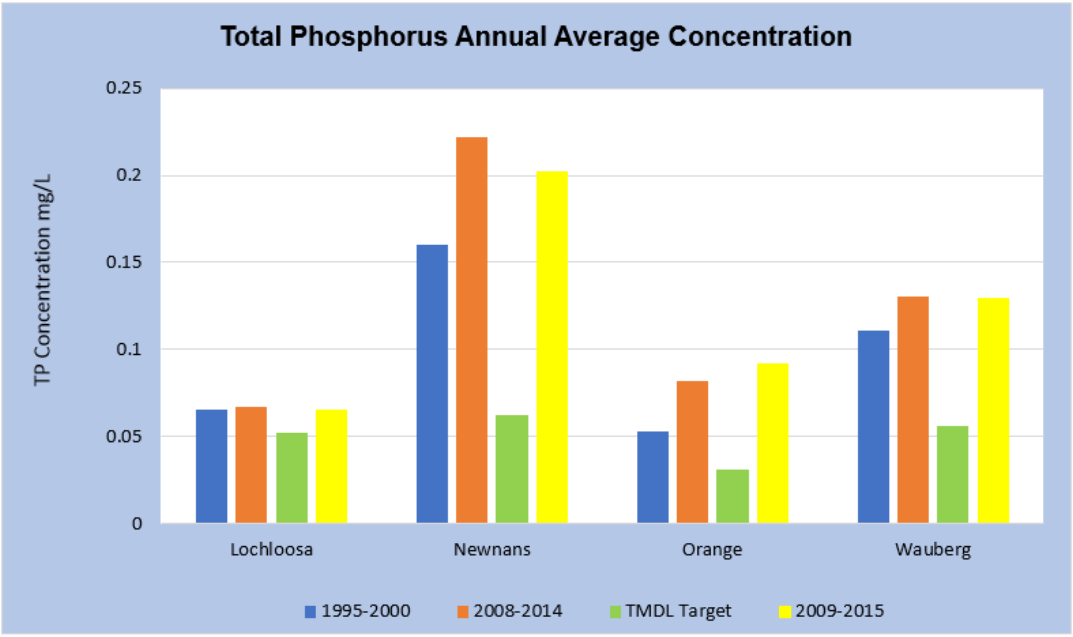


**Figure 6. Comparison of long-term annual average TP concentrations among lakes**

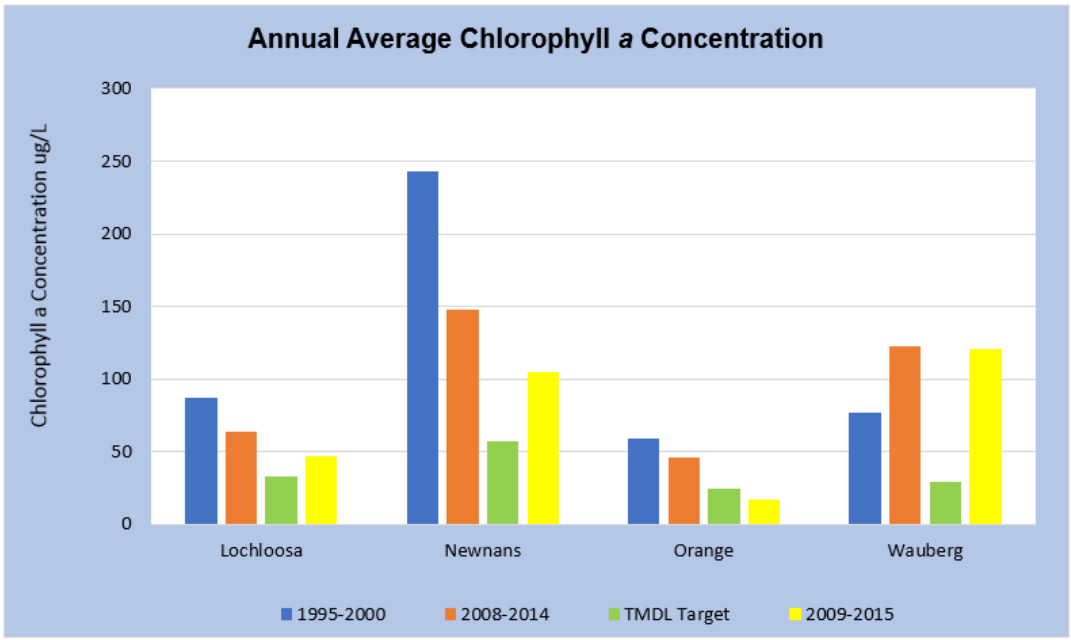


**Figure 7. Comparison of long-term annual average chlorophyll *a* concentrations among lakes**

## 2.3 Fecal Coliform Observations in Urban Streams

The three urban streams—Sweetwater Branch, Tumblin Creek, and Hogtown Creek—have adopted TMDLs for fecal coliform bacteria. **Table 2** summarizes the data for the 2009–2015 period. Rates of exceedance of the daily fecal coliform standard of 800 cfu/mL for each stream

are lower than the rates determined for the TMDL development data period, but the exceedance rate for Tumblin Creek has increased compared with the 2007–2013 data period. There are still occurrences of high values greater than 2,000 cfu/100mL (range of data). **Figure 8** displays the annual medians for each stream. Annual median values continue to decline for Tumblin Creek and Sweetwater Branch from a peak in 2012, but are increasing in Hogtown Creek.

**Table 2. Comparison of fecal coliform data between streams for the post-BMAP adoption period**

| Stream Name | Data Period | Number of Samples | Median (cfu/100mL) | Range (cfu/100mL) | % Exceedance | TMDL % Exceedance |
|---|---|---|---|---|---|---|
| Hogtown Creek | 2008–2014 | 185 | 540 | 32–24,000 | 29.7 | 89 |
| Sweetwater Branch | 200–2014 | 437 | 616 | 1–48,800 | 39.6 | 48.4 |
| Tumblin Creek | 2008–2014 | 206 | 800 | 24–60,000 | 49.5 | 75 |

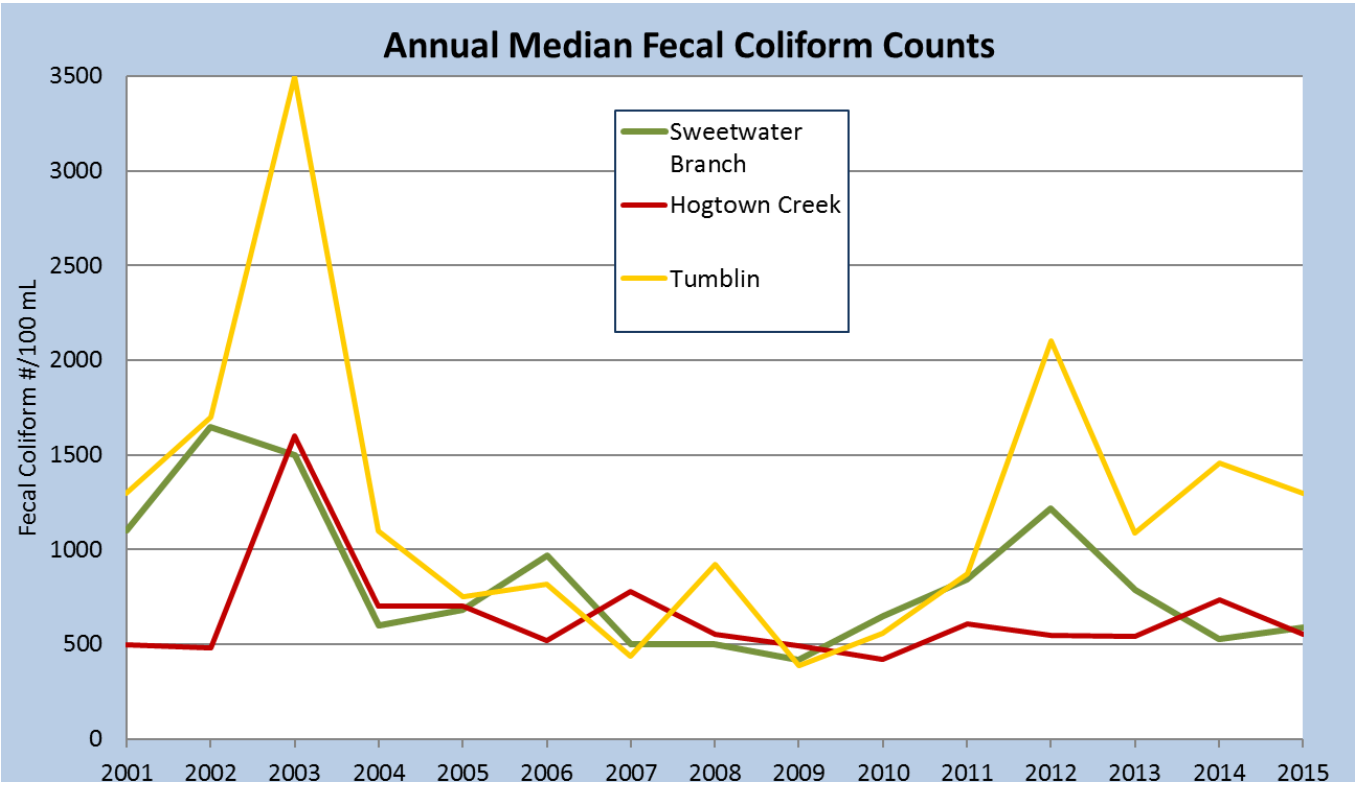


**Figure 8. Annual median fecal coliform counts for urban streams**

# Section 3: Project Summary

Project status is summarized in **Table 3** for both phases of the BMAP. An additional 11 projects have been added (**Appendix B**) since July 2015. **Table 4** summarizes the type of projects adopted with each BMAP phase as well as the new projects. Overall, 71 projects have been undertaken during Phase 2 and 187 projects for both BMAP phases. Phase 1 projects included the development of seven best management practices (BMPs) by the Florida Department of Agriculture and Consumer Services (FDACS) for agriculture; for BMAP Phase 2 they will not be counted as separate projects, instead enrollment of acreage under NOIs will be inventoried. There are 10 projects listed (envisioned and pending categories) that currently do not have funding or adequate funding to complete. The accomplishments by individual entities in the Orange Creek Basin over the past year and a half are described in **Section 3.1.1** through **Section 3.1.3**.

**Table 3. Summary of project status**

| BMAP Phase | Completed | On Hold | Ongoing | Ongoing, Behind Schedule | Envisioned (Conceptual) | Pending, But Not Funded | Cancelled/ Replaced/ Modified |
|---|---|---|---|---|---|---|---|
| Phase 1 | 75 | 2 | 37 | | | | 1 |
| Phase 2 | 30 | | 25 | 4 | 3 | 6 | 1 |
| New Projects | 5 | | 5 | | 1 | | |
| **Totals** | **110** | **2** | **67** | **4** | **4** | **6** | **2** |

**Table 4. Summary of project types**

*Include nine ongoing maintenance in Phase 2

| Types of Projects | Phase 1 BMAP | Phase 2 BMAP | New Projects |
|---|---|---|---|
| Agricultural BMPs (includes development) | 8 | | |
| Stormwater management program implementation | 7 | 20 | |
| Conservation land acquisition | 13 | 9 | 2 |
| Education and outreach efforts | 5 | 8 | |
| Regulations, ordinances, and guidelines | 1 | 1 | |
| Restoration and water quality improvement project | 15 | 12 | 5 |
| Special studies and planning efforts | 34 | 19 | 2 |
| Structural BMPs–Load reductions not quantified | 8 | 2 | |
| Structural BMPs–Quantifiable load reductions | 7 | | 3 |
| Wastewater infrastructure management* | 14 | | |
| Other land purchases (required for structural BMP) | 4 | | |
| Expansion of wastewater service area | | | 1 |

## 3.1 Major Accomplishments

### *3.1.1 Agriculture*

In 2015, FDACS Office of Agricultural Water Policy (OAWP) adopted a revised vegetable and agronomic crop manual that includes specific nutrient and irrigation management BMPs for plastic mulch, bare ground, sugar cane, hay/silage, and greenhouse production systems. In early 2016, FDACS adopted a dairy manual that targets dairies that do not have DEP-issued NPDES permits. A poultry manual is also under development, and adoption is anticipated by the end of 2016. The FDACS BMP manuals are located here: http://www.freshfromflorida.com/Divisions-Offices/Agricultural-Water-Policy/Enroll-in-BMPs/BMP-Rules-Manuals-and-Other-Documents.

As of June 30, 2016, 13,457.8 acres of the Orange Creek Basin were covered by 95 agricultural BMP notices of intent (NOIs) issued by the FDACS OAWP. This enrollment figure is an increase of 6,785.7 acres since the last annual report for a total of 23.7 % of the agricultural acreage in the Orange Creek Basin covered by the FDACS BMP Program. **Table 5** lists the BMPs and the acreage covered by NOIs.

FDACS has undertaken efforts to inform and engage local producers in BMP requirements. FDACS and DEP commenced a BMP compliance process in the Orange Creek Basin. The purpose of this process is to ensure agricultural producers are aware of their statutory responsibility to implement BMPs within the BMAP area. FDACS initiated a broad mail-out (approximately 220 letters) to landowners with property of 50 acres or more with a county agricultural tax classification and all nurseries with greater than 1,000 plants. Recipients of the letter were asked to contact FDACS to enroll in its BMP program or to verify that they are not eligible for enrollment in the FDACS BMP Program. This effort has increased BMP enrollment of agricultural operations in the basin. A list of nonresponders within the Orange Creek Basin was provided to DEP, which then contacted those nonresponders to provide two options in order to avoid enforcement action: the landowner will enroll in the FDACS BMP Program or the landowner will be required to conduct water-quality monitoring under a plan approved by DEP or the St. Johns River Water Management District (SJRWMD).

The Implementation Assurance (IA) Program was enhanced in 2016 pursuant to Chapter 2016-1, Laws of Florida. Among its provisions, this law requires the enhancement and formalization of OAWP IA policies and procedures through rulemaking. Rulemaking will be initiated prior to January 1, 2017. Once rulemaking is completed, FDACS will implement the enhanced IA Program and more detailed reporting as prescribed by the legislation, including onsite visits and surveys, will be provided on an annual basis. The enhanced IA Program, as a component of the FDACS BMP Program, will be designed to do the following:

- To provide accurate and timely information on the status of BMP enrollments.
- To provide accurate and timely information on the extent of BMP implementation.

- To provide the information from which reports on BMP enrollment and implementation can be made to BMAP stakeholders and to the annual report required by Chapter 2016-1, Section 34, Laws of Florida.

- To inform educational, research, and technical assistance efforts targeted to strengthen BMP implementation and effectiveness.

- To guide review and potential revision of BMP manuals.

### *3.1.2 Stormwater and Wastewater Management*

The Paynes Prairie Sheetflow Restoration Project began operation and maintenance efforts in March 2016. Gainesville Regional Utilities (GRU) is evaluating the feasibility of connecting two onsite sewage treatment and disposal systems (OSTDS) located along Hogtown Creek to the utilities central sewer system. Hogtown Creek has a TMDL for fecal coliform bacteria. Connection of OSTDS to central sewer would help reduce fecal coliform bacteria and nutrient loading.

Alachua County Environmental Protection Department (ACEPD) with the aid of contractors completed water quality and sediment evaluations for Gum Root Swamp and Little Hatchett Creek which drain into Newnans Lake. The lake has a TMDL for nutrients. These projects furthered the understanding of the impact these tributary systems have on the quality of water and nutrient loading into Newnans Lake. Results were presented at a BMAP-sponsored Newnans Lake workshop in June 2016. The county also received legislative funding in 2016 that will aid the agency in designing and evaluating strategies for improving water quality in Little Hatchett Creek and Hatchett Creek over the coming year.

DEP and the Florida Department of Health (FDOH) investigated OSTDS located in Paynes Prairie Preserve State Park and the University of Florida (UF) Lake Wauberg Recreation Area. Both the state park and the recreation area are located along the shores of Lake Wauberg, which is impaired for nutrients. The OSTDS in the state park are older systems approaching their design life, and the park is evaluating designs for their replacement. Potential drainfield failure was noted for the recreation area, and UF has corrected the problem.

### *3.1.3 Habitat Management*

The Florida Fish and Wildlife Conservation Commission (FWC) completed a draft Habitat Management Plan for Orange Lake, available at https://orangecreekbasin.wordpress.com/. DEP, along with FWC and other member agencies of the Orange Creek Basin Interagency Working Group, sponsored an educational workshop about the geology of Orange Lake and the Orange Creek Basin in November 2015.

## Table 5. Agricultural acreage, BMP enrollment, and future enrollment goals for the Orange Creek 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 It is important to note that not all of the acreage listed below is commercial agriculture. FDACS will gain a better understanding of the land uses through the compliance assistance process.

| 2009 SJRWMD Land Use | Acres | FDACS Adjusted Acres[1] | Related FDACS BMP Programs | Acreage Enrolled | Related NOIs |
|---|---|---|---|---|---|
| Pasture and Mixed Rangeland | 38,345.4 | 36,654.3 | Cow/Calf; Vegetable/Agronomic Crops (Hay) | 8,979.8 | 51 |
| Row/Field/Mixed Crops | 10,805.2 | 10,402.4 | Vegetable/Agronomic Crops | 2,718.6 | 18 |
| Horse Farm | 7,496.9 | 7,496.9 | Equine | 476.4 | 8 |
| Citrus | 131.8 | 131.8 | Statewide Citrus | | |
| Fruit Orchards/Other Groves | 1,104.5 | 1,507.3 | Specialty Fruit and Nut | 1,131.5 | 12 |
| Abandoned Tree Crops | 15.1 | 0.0 | No enrollment needed | N/A | N/A |
| Nurseries and Vineyards, Ornamentals, Tree Nurseries | 306.6 | 306.6 | Nursery | 63.2 | 4 |
| Specialty Farms | 12.7 | 12.7 | Conservation Plan Rule | | |
| Dairies | 71.2 | 71.2 | Conservation Plan Rule/Dairy | 88.3 | 2 |
| Cattle Feeding Operations | 53.2 | 53.2 | Conservation Plan Rule | | |
| Poultry Feeding Operations | 12.0 | 12.0 | Conservation Plan Rule | | |
| Other Open Lands – Rural | 48.0 | 0.0 | No enrollment needed | N/A | N/A |
| Fallow Cropland | 108.4 | 0.0 | No enrollment needed | N/A | N/A |
| **Total** | **58,511.0** | **56,648.4** | **N/A** | **13,457.8** | **95** |
| **Acreage Enrolled (as of June 30, 2016)** | **N/A** | **13,457.8** | **N/A** | **N/A** | **N/A** |
| **Remaining Acres to Enroll[2]** | **N/A** | **43,190.6** | **N/A** | **N/A** | **N/A** |

FWC completed two vegetation removal projects to restore deep marsh habitat in Orange Lake and one project to establish fish and wildlife corridors between shallow and deep marsh habitats. These projects remove dense woody vegetation and organic sediment to allow the expansion of marsh habitat as well as increase the concentration of oxygen within the water column. FWC haadditional habitat and plant management projects for Orange Lake planned for late 2016 into 2017.

## 3.2 Summary of Accomplishments

Progress made by stakeholders toward achieving nutrient load reductions is illustrated in **Table 6**. Both TP and TN reductions were calculated for all lakes including those with TMDLs for only TP or TN. The greatest loading reductions were achieved for Alachua Sink (Paynes Prairie Sheetflow Restoration Project), followed by Lochloosa Lake and Orange Lake. Reductions in nutrient loading were greater for this reporting period for Newnans Lake, Orange Lake, and Alachua Sink compared with the 2014–2015 reporting period. Reductions for lakes other than Alachua Sink were achieved through stormwater BMPs (structural BMPs and street sweeping) and the cessation of fertilizer use on state road rights-of-way. Loading reductions achieved with agricultural BMPs were not considered and should further reduce nutrient loading. Agriculture acreage enrolled in BMPs has doubled over the past year and now represents 23.8 % of the estimated total agricultural acreage in the basin.

**Table 6. Summary of progress toward achieving TMDLs**

| Waterbody / WBID | TMDL Parameter | TMDL (lbs/yr as TN or TP) | TMDL Baseline Loading (lbs/yr) | Loading Reduction Needed (lbs/yr) | Total Loading Reductions achieved (lbs/yr) | Remaining Loading (lbs/yr) |
|---|---|---|---|---|---|---|
| Newnans Lake / 2705B | TN | 85,470 | 315,510 | 233,144 | 3,841.1 | 229,411 |
| Newnans Lake / 2705B | TP | 10,924 | 25,732 | 14,808 | 699.3 | 14,152.3 |
| Orange Lake / 2749A | TP | 15,262 | 27,889 | 12,623 | 2,988 | 12,569 |
| Orange Lake / 2749A | TN | No TMDL | | | 4,655.1 | |
| Lake Wauberg / 2741 | TN | 2,062.2 | 4,064 | 2,001.8 | 163.6 | 1,838.5 |
| Lake Wauberg / 2741 | TP | 374 | 748 | 374 | 34.4 | 339.6 |
| Alachua Sink / 2720A | TN | 256,322 | 462,557 | 206,235 | 126,258.8 | 81,129.2 |
| Alachua Sink / 2720A | TP | No TMDL | | | 3,800.3 | |
| Lochloosa Lake / 2738A | Draft TN | 172,318 | 416,561 | 244,243 | 5,824.2 | 238,418.8 |
| Lochloosa Lake / 2738A | Draft TP | 9,932 | 16,744 | 6,812 | 1,032.8 | 5,779.2 |

# Section 4: Summary, Issues, and Activities for the Upcoming Year

Progress has been made toward reducing the nutrient loadings that have resulted in water quality impairments. The Paynes Prairie Sheetflow Restoration Project is operational and open for recreational use. The polishing wetland along with urban stormwater retrofits and good stormwater management practices is estimated to remove more than 126,000 lbs/yr TN that was impacting Alachua Sink and Paynes Prairie wetlands as well as contributing TN loading to the Floridan aquifer. The project removes 60 % of the TN loading from urban stormwater and wastewater exceeding the TMDL requirement of a 45 % reduction.

Smaller reductions in nutrient loading have been made for the other lakes. The Phase 2 BMAP has as a goal the identification of management actions that will result in larger reductions in nutrient loading to Newnans Lake, Orange Lake, and Lake Wauberg. A large source of loading for Newnans Lake and Lochloosa Lake is internal recycling and nitrogen fixation making this a complicated issue to address. Remediation of nutrient loading in Newnans Lake will also be a positive benefit for Alachua Sink/Paynes Prairie. The Newnans Lake watershed is one of the sources of nutrient loading to Paynes Prairie.

Watershed planning, evaluation, and modeling activities by local government are providing a foundation for the identification of management actions that will reduce nutrient loading. A critical issue for the next year is obtaining adequate funding for the scoping and designing of water quality improvement projects, particularly for Newnans Lake.

# Appendices

## Appendix A: Important Links

The following lists the complete addresses for websites in the order in which they appear in the document:

- **Cover page:** DEP homepage– www.dep.state.fl.us
- **Acknowledgments:** Mary Paulic email address – mary.paulic@dep.state.fl.us
- **Section 3:** FDACS BMP manuals – http://www.freshfromflorida.com/Divisions-Offices/Agricultural-Water-Policy/Enroll-in-BMPs/BMP-Rules-Manuals-and-Other-Documents
- **Section 3:** FWC draft Habitat Management Plan for Orange Lake – https://orangecreekbasin.wordpress.com/

# Appendix B. Additional BMAP Projects

The BMAP project table below lists the status of additional projects as of June 30, 2016. The schedule to implement each of the projects is included in the table. 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 full project details to predict when or how they could be implemented.

**Table B-1. New projects**

| Project Number | Waterbody Name | Lead Entity | Project Name | Project Description | Project Cost | Status | End Date | Acres Treated | TN Reduction (lbs/yr) | TP Reduction (lbs/yr) |
|---|---|---|---|---|---|---|---|---|---|---|
| HOG31 | Hogtown Creek | GRU | Hogtown Creek Improvements | Abandon two creek side OSTDS and connect to GRUs sanitary sewer system and reduce fecal coliform and nutrient loading. | $32,000 | Ongoing | September 2017 | | | |
| NEW39 | Newnans Lake | Alachua County | Newnans Lake Shoreline Sediments Nutrient Sampling | Conduct shoreline sampling of sediments to evaluate nutrient hotspots and chemical makeup of surface sediments in an effort to better understand the sediment surface interactions along the Newnans Lake shoreline. | | Envisioned, but not funded | | | | |
| NEW40 | Newnans Lake | ACEPD | Newnans Lake Improvement Initiative | This project will identify and prioritize cost effective restoration strategies to improve water quality in the headwaters of Newnans Lake. The project intends to perform pre-design studies, one at Little Hatchet Creek and one at Gum Root Swamp, within the Newnans Lake Area, in order to identify projects that will best address external phosphorus loading to Newnans Lake. | $456,000 | Ongoing | September 2017 | 11,410 | | |
| OR24 | Orange Lake | FWC | Cypress Island ShallowDeep | The landowner adjacent to this site received a cost-share grant from the U.S. Fish and Wildlife Service | $120,000 | Complete | April 2016 | 60 | | |

| Project Number | Waterbody Name | Lead Entity | Project Name | Project Description | Project Cost | Status | End Date | Acres Treated | TN Reduction (lbs/yr) | TP Reduction (lbs/yr) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Marsh Restoration | Partners for Wildlife program to control woody shrub encroachment into herbaceous marsh zone during and extended drawdown. | | | | | | |
| OR25 | Orange Lake | FWC | Establishing Corridors between Shallow and Deep Marsh for Fish and Wildlife and public Access | The objective of this project is remove floating vegetation and dense shrub canopies in order to increase the amount of area within the fringing marsh that is suitable for the establishment of rooted macrophytes, thus improving dissolved oxygen concentrations and connectivity among ecotones from open water to near shore wetlands of Orange Lake. | $108,000 | Complete | June 2016 | 54 | | |
| OR26 | Orange Lake | Florida Department of Transportation (FDOT), District 5 | Fertilizer Cessation | Fertilizer contract cessation that reduced nutrients (TN, TP) from entering the Orange Creek Basin. | | Complete | | 186.5 | 2,707 | 2,707 |
| OR27 | Orange Lake | FDOT, District 5 | Swales | Swale Systems which capture runoff and enhance infiltration. | | Complete | | 842 | 227 | 1,691 |
| OR28 | Orange Lake | FWC | Orange Lake Habitat Enhancement Site Maintenance | Objective is to prevent encroachment of floating marsh/tussocks in order to maintain predominance of rooted emergent and submersed aquatic vegetation, thus promoting a more favorable dissolved oxygen profile and functional connectivity between limnetic and littoral habitats. Total area monitored for maintenance needs is approximately 800 acres. Only a small fraction of that area will require treatment. | $150,000 | Ongoing | June 2017 | | | |
| OR29 | Orange Lake | FWC | Orange Lake woody shrub | The Orange Creek Basin Working Group, which comprises FWC | $180,000 | Ongoing | Jun-17 | 113 | | |

| Project Number | Waterbody Name | Lead Entity | Project Name | Project Description | Project Cost | Status | End Date | Acres Treated | TN Reduction (lbs/yr) | TP Reduction (lbs/yr) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | management and shallow marsh reclamation | biologists representing a variety of fish and wildlife taxa, has provided recommendations for habitat composition of Orange Lake that is intended to yield suitable conditions for the broadest array of fish and wildlife resources | | | | | | |
| OR30 | Orange Creek Basin | FWC | Orange Creek Basin Littoral Vegetation Mapping | Aerial photography and geographic information system (GIS) analysis of aquatic vegetation covering the primary Orange Creek Basin lakes. FWC collects and analyzes aquatic habitat composition data every three years to inform management decision making process. FWC has developed habitat guidelines for management of these resources and periodic aerial mapping is used to track trends in vegetation cover and assess management needs for optimal fish and wildlife habitat. | $75,000 | Ongoing | June 2017 | 26,000 | | |
| NEW41 | Little Hatchet Creek | City of Gainesville | Pleasant Acres Storm Sewer | Provides compensating treatment for redevelopment site. | $70,176 | Complete | Complete | | | |

# Appendix C. Water Quality Monitoring

## Table C-1. Ambient water quality monitoring stations in the Orange Creek Basin

**Note:** Boldface type and red highlighting with a strikethrough identify information that is no longer applicable. Boldface type and red highlighting identify new or updated information.
*ACEPD field parameters: pH, dissolved oxygen, conductivity, turbidity, Secchi depth (lakes only), depth of collection, depth of water column, air temperature, weather, cloud cover (lakes only), wind speed (lakes only), wind direction (lakes only), water temperature.
*ACEPD surface water chemistry: Laboratory analytes include TP, total Kjeldahl nitrogen (TKN), TN, ammonia nitrogen, nitrate plus nitrite nitrogen, orthophosphate (dissolved), total organic carbon (TOC), total suspended solids (TSS), total dissolved solids (TDS) chloride, sulfate, alkalinity, potassium, hardness, calcium, magnesium, sodium, and iron.
ACEPD bacteria: Sampling and analyses includes both fecal coliform and Escherichia coli (E. coli).

| Sub-basin | Entity | Station Identification | Station Description | Lat. | Long. | Sampling Frequency | Year Site Est. | Sampling Parameters * | WBID | Status 2016 |
|---|---|---|---|---|---|---|---|---|---|---|
| Newnans Lake and Hatchet Creek | SJRWMD | NEW | Newnans Lake Center | 29.6453 | -82.22 | Bi-Monthly | 1994 | Field parameters; Water chemistry; Chlorophyll *a*; Light attenuation | 2705B | Active |
| Newnans Lake and Hatchet Creek | SJRWMD | LFC329B | Lake Forest Creek at 329B | 29.6517 | -82.2511 | Bi-Monthly | 1998 | Field parameters; Water chemistry | 2709 | Active |
| Newnans Lake and Hatchet Creek | SJRWMD | HAT26 | Hatchet Creek at SR 26 | 29.68783 | -82.2063 | Bi-Monthly | 1994 | Field parameters; Water chemistry | 2688 | Active |
| Newnans Lake and Hatchet Creek | SJRWMD | LHT26E | Little Hatchet Creek East | 29.68805 | -82.22063 | Bi-Monthly | 1994 | Field parameters; Water chemistry | 2695 | Active |
| Newnans Lake and Hatchet Creek | SJRWMD | LHAT26 | Little Hatchet Creek | 29.67963 | -82.23443 | Bi-Monthly | 1994 | Field parameters; Water chemistry | 2695 | Active |
| Newnans Lake and Hatchet Creek | SJRWMD | LHTNB | North branch of Little Hatchet Creek, Downstream of Airport Industrial Park | 29.69322 | -82.26565 | Bi-Monthly | 1996 | Field parameters; Water chemistry | 2695 | Active |
| Newnans Lake and Hatchet Creek | SJRWMD | LHATWR | Little Hatchet Creek on Waldo Road NW of Gainesville Airport | 29.69868 | -82.2804 | Bi-Monthly | 2009 | Field parameters; Water chemistry | 2695 | Active |
| Newnans Lake and Hatchet Creek | SJRWMD | LRC | Lake Ridge Creek | 29.66254 | -85.2538 | Bi-Monthly | 2009 | Field parameters; Water chemistry | 2709 | Active |

| Sub-basin | Entity | Station Identification | Station Description | Lat. | Long. | Sampling Frequency | Year Site Est. | Sampling Parameters * | WBID | Status 2016 |
|---|---|---|---|---|---|---|---|---|---|---|
| Newnans Lake and Hatchet Creek | SJRWMD | GRSC | Gum root Swamp Creek NE of Gainesville Airport | 29.70037 | -82.2547 | Bi-Monthly | 2009 | Field parameters; Water chemistry | 2695 | Active |
| Newnans Lake and Hatchet Creek | SJRWMD | PC20 | Prairie Creek at SR 20 | 29.61116 | -82.24824 | Bi-Monthly | 1998 | Field parameters; Water chemistry | 2705A | Active |
| Newnans Lake and Hatchet Creek | ACEPD | LFCNE25 | Upstream of University Ave on NE 25th St | 29.62845 | -82.30590 | Quarterly | 1998 | Fecal coliform; Flow | 2709 | Inactive |
| Orange Lake | SJRWMD | OLC | Orange Lake center (between Cow Hammock & Samsons Point) | 29.465 | -82.1775 | Bi-Monthly | 1994 | Field parameters; Water chemistry; Chlorophyll *a*; Light attenuation | 2749A | Active |
| Orange Lake | SJRWMD | OC301 | Orange Lake Outlet West of US 301 | 29.4433 | -82.1086 | Bi-Monthly | 1994 | Field parameters; Water chemistry | 2749A | Active |
| Orange Lake | SJRWMD | CCN325 | Cross Creek about 50 feet north of County Road (CR) 325 Bridge | 29.4911 | -82.1661 | Bi-Monthly | 1994 | Field parameters; Water chemistry | 2754 | Active |
| Orange Lake | SJRWMD | STX346 | River Styx at CR 346 | 29.5172 | -82.2222 | Bi-Monthly | 1994 | Field parameters; Water chemistry | 2744 | Active |
| Orange Lake | SJRWMD | CC234 | Camps Canal at CR 234 | 29.57662 | -82.24972 | Bi-Monthly | 2003 | Field parameters; Water chemistry | 2705 | Active |
| Lake Lochloosa | SJRWMD | LOL | Lochloosa Lake Center | 29.52 | -82.1247 | Bi-Monthly | 2003 | Field parameters; Water chemistry; Chlorophyll *a*; Light attenuation | 2738A | Active |
| Lake Lochloosa | SJRWMD | CELC | Tributary on north shore of Lochloosa Lake, east of Lochloosa Creek | 29.5637 | -82.1248 | Bi-Monthly | 2003 | Field parameters; Water chemistry | 2728 | Active |
| Lake Lochloosa | SJRWMD | CELCS | Creek East of Lochloosa Creek South | 29.55526 | -82.1282 | Bi-Monthly | 2006 | Field parameters; Water chemistry | 2728 | Active |
| **Lake Lochloosa** | **SJRWMD** | **LC1LB** | **Lochloosa Creek about 2 miles north of Lochloosa Lake** | **29.565** | **-82.1406** | **Bi-Monthly** | **2003** | **Field parameters; Water chemistry** | **2693** | **Inactive** |
| **Lake Lochloosa** | **SJRWMD** | **LOCH20** | **Lochloosa Creek at SR 20** | **29.60022** | **-82.14468** | **Bi-Monthly** | **1994** | **Field parameters; Water chemistry** | **2693** | **Inactive** |

| Sub-basin | Entity | Station Identification | Station Description | Lat. | Long. | Sampling Frequency | Year Site Est. | Sampling Parameters * | WBID | Status 2016 |
|---|---|---|---|---|---|---|---|---|---|---|
| Lake Wauberg | ACEPD | LWAUBERG | Center of Lake Wauberg east of US 441 | 29.55034 | -82.61136 | ~~**Bi-Monthly**~~ **Quarterly** | ~~**2003**~~ **2001** | Field Parameters; ~~**Fecal Coliform;**~~ Water Chemistry; Chlorophyll *a* | Lake Wauberg/ 2741 | Active |
| Lake Wauberg | ACEPD | LWAUBERGS | Dock at UF's Lake Wauberg South | 26.53442 | -82.30436 | Quarterly | 2013 | Field Parameters; ~~**Fecal Coliform;**~~ Water Chemistry; Chlorophyll *a* | Lake Wauberg/ 2741 | Back-up station, only sampled when center of lake not sampled |
| Hogtown Creek | ACEPD | HOGNW16 | Ring Park, north of NW 16th Avenue | 29.66703 | -82.34863 | Quarterly | 1998 | Field Parameters; **Bacteria**; Water Chemistry | Hogtown Creek/2698 | **Active** |
| Hogtown Creek | ACEPD | HOG30US | North side of CR 30 (SW 20th Ave) Upstream of Bridge | 29.63839 | -82.39219 | Quarterly | 1999 | Field Parameters; ~~**Fecal Coliform;**~~ Water Chemistry | Hogtown Creek/2698 | **Active** |
| Hogtown Creek | ACEPD | HOGSINK | Hogtown Creek approx. 100 meters Upstream of Haile Sink | 29.62973 | -82.41117 | Quarterly | ~~**1998**~~**1971** | Field Parameters; **Bacteria;** Water Chemistry; Flow | Haile Sink/2717A | **Active** |
| Hogtown Creek | ACEPD | POSNW16 | South of NW 16th Ave west of NW 27th Terr. | 29.66662 | -82.36423 | Quarterly | ~~**1996**~~ **1984** | Field Parameters; **Bacteria;** Water Chemistry | Possum Creek/2696 | **Active** |
| Hogtown Creek | ACEPD | GLENSP | Glen Springs at Spring Boil in the Concrete Pool | 29.67223 | -82.34589 | Quarterly | 2005 | Field Parameters; Flow; ~~**Micro;**~~ Water Chemistry | Hogtown Creek/2698 | **Active** |
| Sweetwater Branch | ACEPD | SWBSE4 | Site is east of SE 4th St between SE 13th Lane and SE 11th Place. | 29.63805 | -82.31809 | Quarterly | ~~**2003**~~ ~~**1998**~~ | Field Parameters; ~~**Fecal Coliform**~~ **Bacteria**; Water Chemistry; Flow | Sweetwater Branch/2711 | **Active** |
| Sweetwater Branch | ACEPD | SWBNE10 | East of North Main Street near NE 2nd Street | 29.63805 | -82.31809 | Quarterly | ~~**2015**~~ ~~**2002**~~ | ~~**Field; Fecal Coliform; Surface Water; Flow**~~ ~~**Bacteria; Turbidity**~~ | Sweetwater Branch/2711 | Active |
| Sweetwater Branch | ACEPD | SWB331 | West of SR 331 (Williston Rd) just north of SE 16th Ave. | 29.63040 | -82.32242 | Quarterly | ~~**1994**~~ ~~**1985**~~ | Field Parameters; ~~**Fecal Coliform;**~~ Water Chemistry; Chlorophyll *a* (if also sampling on Paynes Prairie) | Sweetwater Branch/2711 | **Active** |

| Sub-basin | Entity | Station Identification | Station Description | Lat. | Long. | Sampling Frequency | Year Site Est. | Sampling Parameters * | WBID | Status 2016 |
|---|---|---|---|---|---|---|---|---|---|---|
| Tumblin Creek | ACEPD | TUMSW5 | South of SW 5th Ave between SW 8th St and SW 10th St. | 29.64705 | -82.33366 | Quarterly | ~~2001~~ 1984 | Field Parameters; ~~Fecal Coliform;~~ Water Chemistry; Flow | Tumblin Creek/ 2718A | Active |
| Tumblin Creek | ACEPD | TUM441 | West of SW 13th Street end of Concrete Channel. | 29.63317 | -82.34058 | Quarterly | ~~1998~~ 1984 | Field Parameters; ~~Fecal Coliform;~~ Bacteria; Water Chemistry; Flow | Tumblin Creek/ 2718A | Active |
| **Tumblin Creek** | **ACEPD** | **BIVARM** | **Center of Bivens Arm** | **29.62361** | **-82.34389** | **Quarterly** | **1998** | **Field Parameters; Water Chemistry; Chlorophyll *a*** | **Tumblin Creek South/ 2718B** | **Active** |
| Tumblin Creek | ACEPD | ~~BIVARM~~ BIV441 | Bivens Arm Lake at US 441 | 29.62163 | -82.34003 | ~~Semi-annually~~ Quarterly | 1998 | Field Parameters; ~~Fecal Coliform;~~ Water Chemistry; Chlorophyll *a* | Tumblin Creek South/2718 ~~C~~ | Back-up station, only sampled when center of lake not sampled |
| Alachua Sink | ACEPD | ALACHCHAN | Channel at Alachua Sink leading to Primary Sink Feature, gate code #0105 | 29.60542 | -82.30189 | Quarterly | ~~1990~~ 2000 | Field Parameters; Flow; ~~Micro;~~ Water Chemistry | Alachua Sink 2720A | Active |
| Alachua Sink | ACEPD | BOULSP | Boulware Spring at Spring Boil Near Base of Concrete Wall | 29.62097 | -82.30724 | Quarterly | 2000 | Field Parameters; Flow; ~~Micro;~~ Water Chemistry | Alachua Sink 2720A | Active |
| **Beville Creek** | **ACEPD** | **BEVNW8** | **Beville Creek upstream of NW 8th Ave in Cofrin Park. Sample upstream of culvert near playground** | **29.65985** | **-82.39389** | **Quarterly** | **2003** | **Bacteria; Turbidity** | **Unnamed Drain 2710** | **Active** |
| **Elizabeth Creek** | **ACEPD** | **ELIZNW7** | **Elizabeth Creek upstream of NW 7th Road** | **29.65708** | **-82.36002** | **Quarterly** | **2005** | **Bacteria; Turbidity** | **Hogtown Creek/2698** | **Active** |

| Sub-basin | Entity | Station Identification | Station Description | Lat. | Long. | Sampling Frequency | Year Site Est. | Sampling Parameters * | WBID | Status 2016 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Elizabeth Creek** | **ACEPD** | **ELIZUNIV** | **Elizabeth Creek upstream of University Ave at fence along UF historic president's house property** | **29.65196** | **-82.35533** | **Quarterly** | **2006** | **Bacteria; Turbidity** | **Hogtown Creek/2698** | **Active** |
| **Hogtown Creek** | **ACEPD** | **HOGUSRAT** | **Hogtown Creek just upstream of Rattlesnake Branch** | **29.66381** | **-82.35265** | **Quarterly** | **2006** | **Bacteria; Turbidity** | **Hogtown Creek/2698** | **Active** |
| **Hogtown Creek** | **ACEPD** | **RATUSHOG** | **Rattlesnake Branch upstream of the confluence with Hogtown Creek** | **29.66337** | **-82.35206** | **Quarterly** | **2003** | **Bacteria; Turbidity** | **Hogtown Creek/2698** | **Active** |
| **Hogtown Creek** | **ACEPD** | **RATNW8** | **Rattlesnake Branch downstream of NW 8th Avenue and NW 13th Street** | **29.65908** | **-82.34038** | **Quarterly** | **2004** | **Bacteria; Turbidity** | **Hogtown Creek/2698** | **Active** |
| **Tumblin Creek** | **ACEPD** | **TUMSW9** | **Tumblin Creek upstream of SW 9th Street at Tumblin Creek Apartments** | **29.64182** | **-82.33302** | **Quarterly** | **1984** | **Bacteria; Turbidity** | **Tumblin Creek/ 2718A** | **Active** |
| **Sweetwater Branch** | **ACEPD** | **ROSESE9** | **Rosewood Branch upstream of SE 9th Street** | **29.64292** | **-82.31505** | **Quarterly** | **2005** | **Bacteria; Turbidity** | **Sweetwater Branch/ 2711** | **Active** |
| **Sweetwater Branch** | **ACEPD** | **SWBSE1** | **Sweetwater Branch upstream of SE 1st Avenue behind Library and Post Office** | **29.65118** | **-82.32059** | **Quarterly** | **2002** | **Bacteria; Turbidity** | **Sweetwater Branch/ 2711** | **Active** |
| **Sweetwater Branch** | **ACEPD** | **SWBTB** | **Sweetwater Branch at Thelma Bolton Senior Activity Center** | **29.65387** | **-82.32007** | **Quarterly** | **2009** | **Bacteria; Turbidity** | **Sweetwater Branch/ 2711** | **Active** |
| Lochloosa Lake | Lake Watch | Lochloosa Lake | 3 Sampling Locations | Unknown | Unknown | Monthly March–November; Annual Vegetation Survey | Unknown | TN; TP; Secchi depth; Chlorophyll *a* | 2738A | |

| Sub-basin | Entity | Station Identification | Station Description | Lat. | Long. | Sampling Frequency | Year Site Est. | Sampling Parameters * | WBID | Status 2016 |
|---|---|---|---|---|---|---|---|---|---|---|
| Newnans Lake | Lake Watch | Newnans Lake | 3 Sampling Locations | Unknown | Unknown | Monthly; Annual Vegetation Survey | Unknown | TN; TP; Secchi depth; Chlorophyll *a* | 2705B | |
| Orange Lake | Lake Watch | Orange Lake | 3 Sampling Locations | Unknown | Unknown | Monthly March–November | Unknown | TN; TP; Secchi depth; Chlorophyll *a* | 2749A | |
| Lake Wauberg | Lake Watch | Lake Wauberg | 3 Sampling Locations | Unknown | Unknown | Monthly | 1990 | TN; TP; Secchi depth; Chlorophyll *a* | 2741 | |

## Table C-2. Discharge and water level monitoring stations in the Orange Creek Basin

*Funding provided by City of Gainesville Public Works and Alachua County Public Works Department.

| Sub-basin | Entity | Station ID | Station Description | Latitude | Longitude | Station Type | Frequency | Status 2015 |
|---|---|---|---|---|---|---|---|---|
| Sweetwater Branch | SJRWMD | 01980199 | Sweetwater Branch | 29.63021 | -82.32223 | Discharge | Daily | Active |
| Paynes Prairie | SJRWMD | 27274763 | Paynes Prairie Channel | 29.60252 | -82.30295 | Discharge | Daily | Active |
| Newnans Lake | SJRWMD | 19244274 | Lake Forest Creek CR329B | 29.65194 | -82.25139 | Discharge | Daily | Active |
| Newnans Lake | SJRWMD | 02840233 | North Branch Little Hatchet Creek | 29.69078 | -82.25568 | Discharge | Daily | Active |
| Newnans Lake | ACEPD | LHATWALDO | Little Hatchet Creek east of Waldo Rd. | 29.69827 | -82.27998 | Discharge | | |
| Newnans Lake | SJRWMD | 08631958 | Prairie Creek | 29.61094 | -82.24815 | Discharge | Daily | Active |
| Newnans Lake | SJRWMD | 04831007 | Newnans Lake | 29.63584 | -82.24365 | Water Level | Daily | Active |
| Orange Lake | SJRWMD | 08661963 | Camps Canal | 29.57630 | -82.24944 | Discharge | Daily | Active |
| Orange Lake | SJRWMD | 02601462 | Orange Lake Outlet | 29.44178 | -82.10851 | Discharge | Daily | Active |
| Orange Lake | SJRWMD | 19274284 | Cross Creek | 29.48528 | -82.16528 | Discharge | Daily | Active |
| Orange Lake | SJRWMD | 19974721 | River Styx | 29.51711 | -82.22254 | Discharge | Daily | Active |
| Orange Lake | SJRWMD | 02611465 | Orange Lake Boardman | 29.46198 | -82.19181 | Water Level | Daily | Active |
| Lake Lochloosa | SJRWMD | 01930189 | Lochloosa Creek | 29.60022 | -82.14468 | Discharge | | Inactive |
| Lake Lochloosa | SJRWMD | 19234272 | Lochloosa Creek South | 29.56500 | -82.14056 | Discharge | Daily | Active |
| Lake Lochloosa | SJRWMD | 71481615 | Lochloosa Lake | 29.51639 | -82.10389 | Water Level | Daily | Active |
| Hatchet Creek | SJRWMD | 14342633 | Hatchet Creek | 29.69328 | -82.20056 | Discharge | Daily | Active |
| Hogtown Creek | ACEPD* | HOGNW16 | Hogtown Creek at NW 16th Avenue | 29.66703 | -82.34863 | Discharge | | Active |
| Hogtown Creek | SJRWMD | 08641960 | Hogtown Creek at Arredondo | 29.63827 | -82.39254 | Discharge | Daily | Active |
| Haile Sink | ACEPD | HAILESINK | Haile Sink (terminus of Hogtown Creek) | 29.62878 | -82.41096 | Stage | | Active |
| Possum Creek | ACEPD* | POSNW16 | Possum Creek at NW 16th Avenue | 26.66662 | -82.36423 | Discharge | | Active |
| Tumblin Creek | ACEPD* | TUM441 | Tumblin Creek west of US Hwy 441 | 29.63317 | -82.34058 | Discharge | | Active |

# Appendix D. References

Magley, W. August 2016. *Draft summary of data*. DEP.