

Waterbody: Lake Lafayette



Basin: Lake Lafayette

Lake Lafayette was historically a meandering, wetland/prairie lake system located in eastern Leon County, but land alterations in the mid-1900s separated the lake into four distinct sections, known as Upper Lake Lafayette, Lake Piney Z, Alford Arm, and Lower Lake Lafayette. Limited hydraulic connectivity occurs between the various sections, much of which is present only during high water elevations. Because of the compartmentalization of the four sections, each section is treated as a separate “lake” with its own watershed.

Wetland or Lake?

Lower Lake Lafayette appears and functions like a cypress dominated swamp, while Alford Arm is a combination of cypress and various emergent/floating plant species. Typical of wetlands, there is little open water at either location, and the open water that currently exists in Lower Lake Lafayette is due to Fish and Wildlife’s maintenance of the canoe trails. Due to access issues (low water and the extreme amounts of vegetation) Leon County staff have been unable to sample Alford Arm for several years and have only intermittently sampled Lower Lake Lafayette.

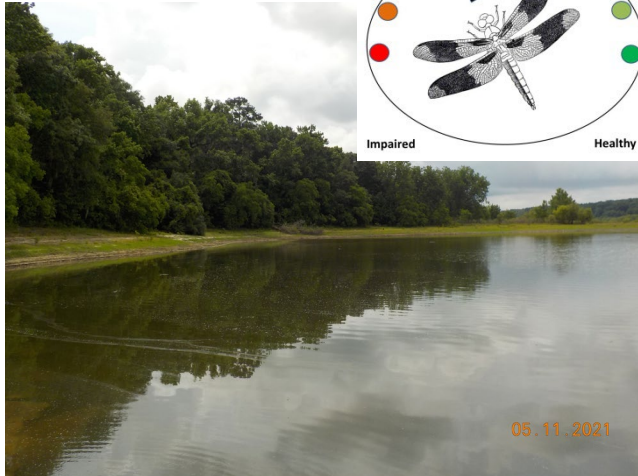
Background

Healthy, well-balanced lake communities may be maintained with some level of human activity, but excessive human disturbance may result in waterbody degradation. Human stressors may include increased inputs of nutrients, sediments, and/or other contaminants from watershed runoff, adverse hydrologic alterations, undesirable removal of habitat or riparian buffer vegetation, and introduction of exotic plants and animals. Water quality standards are designed to protect designated uses of the waters of the state (e.g., recreation, aquatic life, fish consumption), and exceedances of these standards are associated with interference of the designated use.

Methods

Surface water and sediment samples were collected to determine the health of Upper Lake Lafayette, Piney Z and Lower Lake Lafayette and met the requirements of the Florida Department of Environmental Protection (FDEP). Although Alford Arm contains areas of standing water, the vast majority is covered by dense stands of both submergent and emergent wetland vegetation. Because of the dense vegetation and low water conditions, samples could not be collected for most of 2010, and no samples were collected in 2011-2015. The station was eliminated in 2015.

Upper Lake Lafayette

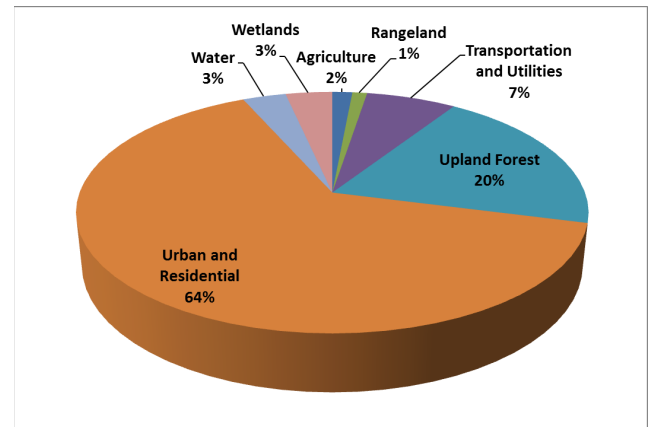


The typically phosphorus-limited Upper Lake Lafayette is the westernmost lake in this system. The most dominant feature of Upper Lake Lafayette is the sinkhole (Lafayette Sink) located in the north-eastern portion of the lake and draining into the Floridan Aquifer. Much of the water entering Upper Lake Lafayette ultimately discharges into the sink area. As a result, the area and volume of the lake is highly variable. During typical rainfall periods, the area around Lafayette Sink becomes a 354-acre lake, but following dry periods, the lakebed can drain almost completely into the sinkhole. The heavily urbanized Northeast Drainage Ditch and Lafayette Creek are the primary sources of water for the lake. Three other minor contributing sources are two small tributaries to the north of the lake and Lake Piney Z.

As shown in the following pie chart, agriculture, rangeland, transportation, utilities, urban and residential uses make up approximately 74% of the 14,792-acre Upper Lake Lafayette watershed. Increases in stormwater runoff and waterbody nutrient loads can often be attributed to these types of land uses.

The U.S. EPA established a TMDL on Upper Lake Lafayette in March 2012 that requires a 36% reduction in total phosphorus. Upstream of Upper Lake Lafayette is a stormwater facility known as the Weems Pond Regional Stormwater Treatment

Facility (Weems Pond). The City of Tallahassee converted Weems Pond into an alum-injection facility that was brought online in October 2015. The retrofit of the facility is hoped to reduce pollutant loads leaving the pond, which flow downstream through the Northeast Drainage Ditch and into Upper Lake Lafayette.



The construction of the stormwater treatment facility for a single-family subdivision immediately north of Upper Lake Lafayette is underway. The stormwater treatment facility is planned to be a wet detention facility with littoral plantings, with the discharge from the facility approximately 600 feet west of the sinkhole. The construction of this facility is challenging because an existing stream located immediately adjacent to the planned facility discharges directly into the sink. However, the facility is constructed (berm and outfall structure) in such a manner to protect the stream from additional impact of the subdivision. The construction has, at times limited Leon County staff access to the sample location and prevented water quality sampling during the latter part of the 2021.

Results

Nutrients

The nutrient thresholds and results for Upper Lake Lafayette are found in Table 1. According to FDEP requirements, Numeric Nutrient Criteria (NNC) (expressed as an annual geometric mean) cannot be exceeded more than once in a three-year period. When viewing tables and figures, the absence of da-

ta means there was not enough data collected (due to lack of access) to fulfill data requirements. FDEP's current NNC data requirements state "that there shall be at least four temporally independent samples per year . . .".

The table shows that the geometric means of chlorophyll-a and total phosphorus exceeded the state criteria several times since sampling began. This is the result of urbanized inflow streams combined with fluctuating lake levels and rainfall. Oftentimes, the reduced lake volume concentrates incoming pollutants, thus reducing the lake's ability to assimilate incoming nutrients. While chlorophyll-a and nitrogen levels met the NNC in 2020, total phosphorus levels slightly exceeded the criteria. Land clearing due to the development of the adjacent Falls Chase property prevented water quality sampling during the latter part of the 2021. Based on the two samples collected in 2021, the geometric means of chlorophyll-a (1 µg/L), and total nitrogen (0.45 mg/L) were below the NNC criteria, while total phosphorus (0.10 mg/L) was slightly above the criteria.

Fish Kills

Upper Lake Lafayette has a history of fish kills. The latest reported fish kill occurred in September of 2019. Lake levels at the time of the fish kill were at the level of the sinkhole, meaning that the fish community was concentrated to a very small area. The elevated phosphorus and nitrogen levels caused increased microbial activity, causing lower oxygen levels in the water. In this case, it was concluded that the fish, already stressed from being in a concentrated area, died mostly from low oxygen levels.

For more information regarding fish kills, please visit: <https://myfwc.com/research/saltwater/health/abnormalities/causes/>

Other Parameters

Historically, elevated Biological Oxygen Demand (BOD) results (average is 4.2 mg/L) have been an issue since Leon County sampling began in 2006 (Figure 1). Like the elevated nutrients and chloro-

phyll-a levels, urbanized inflow streams and a fluctuating lake volume appear to be detrimentally affecting water quality.

Table 1. FDEP's chlorophyll-a, total nitrogen and phosphorus criteria for lakes applied to Upper Lake Lafayette. Results in bold signify exceedances of the State criteria.

Clear Lakes, High Alkalinity	Chlorophyll-a 20.0 µg/L	Total Nitrogen Threshold 1.05-1.91 mg/L	Total Phosphorus Threshold 0.03-0.09 mg/L
2004	2.3	0.33	0.04
2005	25.2	0.81	0.10
2006	3.3	0.56	0.09
2007	4.9	0.60	0.07
2008	24.5	0.60	0.15
2009	6.9	0.43	0.08
2010	6.9	0.77	0.07
2011	32.7	0.68	0.10
2012	31.0	0.90	0.15
2013	16.8	0.79	-
2014	-	-	-
2015	48.5	0.88	0.12
2016	-	-	-
2017	40.4	1.24	0.08
2018	-	-	-
2019	48.2	1.55	0.14
2020	14.1	0.39	0.10
2021	-	-	-

Conclusions

Upper Lake Lafayette has a history of elevated nutrients, chlorophyll-a levels and microbial activity and continues to not meet the NNC. Fish kills continue to occur with the latest reported fish kill occurring in September of 2019. Urbanized inflow streams combined with fluctuating lake volume exacerbated the various challenges that Upper Lake Lafayette continues to have.

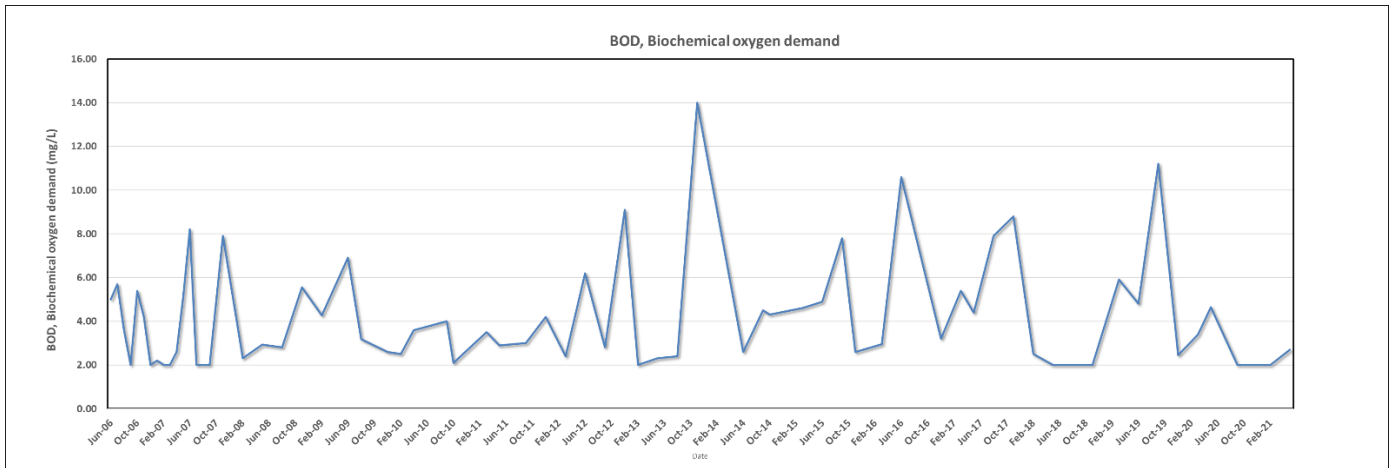


Figure 1. BOD results for Upper Lake Lafayette.

Lake Piney Z



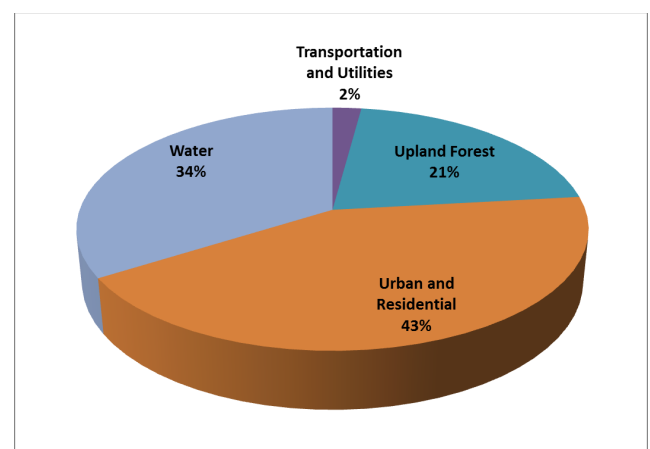
Lake Piney Z is a 228-acre waterbody located between Upper Lake Lafayette and Lower Lake Lafayette which consists primarily of an open water system, although substantial stands of vegetation were historically present within the lake.

As shown in the following pie chart, transportation, utilities, urban and residential land uses make up approximately 45% of the 691-acre Piney Z watershed. Increases in stormwater runoff and waterbody nutrient loads can often be attributed to these types of land uses.

Lake Piney Z can discharge to Lower Lake Lafayette via two outfalls located on the east end of the lake and/or discharge to Upper Lake Lafayette via a ditch

and outfall located on the west side of the lake. Lake Piney Z receives stormwater inflow from the Piney Z Plantation development and the Swift Creek Middle School stormwater pond on its northern shore, from a few holding ponds near the southern portion of the lake and from the dirt road that surrounds the lake.

In 1997, Lake Piney Z was drawn down and organic matter was scraped from the bottom and used to construct fishing fingers extending north from the southern bank. Following construction of the fishing fingers, the lake was restocked with game fish. Currently, the Florida Fish and Wildlife Conservation Commission, in cooperation with the City of Tallahassee, manage Piney Z as a Fish Management Area.



Results

Nutrients

The nutrient thresholds and results are found in Table 2. According to FDEP requirements, Numeric Nutrient Criteria (NNC) (expressed as annual geometric means) cannot be exceeded more than once in a three-year period. FDEP's current numeric nutrient data requirements state "that there shall be at least four temporally independent samples per year . . .". When viewing tables and figures, the absence of data means there was not enough data collected (due to low water levels or the inability to access the lake) to fulfill data requirements.

The table shows that the geometric mean of chlorophyll-a and total phosphorus normally exceeds the state criteria throughout the sampling period. The 2021 results showed that the NNC was met for all parameters. This is the first time the chlorophyll-a criteria has been met since 2009.

Past excessive chlorophyll-a and nutrient levels are the result of past lake management practices. The overuse of herbicides and the addition of grass carp to Piney Z have led to an almost completely open water system. Nutrients are being assimilated by algae instead of being taken up by vascular plants, leading to massive and long-lasting algal blooms. Fortunately, management practices have changed, most notably with the replanting of emergent vegetation and the reestablishment of other native vegetation via the natural seedbank. With the apparent improvement in chlorophyll-a, it is hoped that long term ecosystem health will continue to improve.

Floral Assessment

The Lake Vegetation Index (LVI) score for Piney Z was 46, placing the lake's vegetative community at the lower end of the Healthy category.

Forty-three species were found during the survey. Denseflower knotweed (*Polygonum densiflorum*) and the Invasive Exotic water hyacinth (*Eichornia crassipes*) were the most dominant species at the

lake. Other native vegetation included buttonbush (*Cephalanthus occidentalis*), American lotus (*Nelumbo lutea*), red maple (*Acer rubrum*), and maidencane (*Panicum hemitomon*).

Unfortunately, camphor tree (*Cinnamomum camphora*), the aforementioned water hyacinth (*Eichhornia crassipes*), wild taro (*Colocasia esculenta*), torpedo grass (*Panicum repens*), Peruvian primrose willow (*Ludwigia peruviana*), and Chinese tallow (*Sapium sebiferum*), all listed as Category I Invasive Exotics by the Florida Exotic Pest Control Council were found in or along the shoreline of Piney Z. Alligator weed (*Alternanthera philoxeroides*) is a Category II Invasive Exotic found in the lake. Water spangles (*Salvinia minima*) was another exotic plant found in Lake Piney Z.

For more information concerning Florida Invasive Exotics, please click on the Florida Exotic Pest Control Council website; <http://www.fleppc.org/>.

[Click here for more information on the Lake Piney Z LVI.](#)

[Click here for more information on common exotic and invasive plants in Leon County wetlands and waterbodies.](#)

Fish Consumption Advisory

The Florida Department of Health has issued consumption limits for certain fish in Lake Piney Z due to elevated levels of mercury.

[Click here for more information about fish consumption advisories.](#)

Other Parameters

Other water quality parameters appear to be normal for the area and no other impairments were noted.

Table 2. FDEP's chlorophyll-a, total nitrogen and phosphorus criteria for lakes applied to Lake Piney Z. Results in bold signify exceedances of the State criteria.

Clear Lake, Low Alkalinity	Chlorophyll-a 6.0 µg/L	Total Nitrogen Threshold 0.51-0.93 mg/L	Total Phosphorus Threshold 0.01-0.03 mg/L
2004	6.48	0.45	0.04
2005	12.98	0.78	0.05
2006	25.17	0.70	0.08
2007	2.92	0.96	0.04
2008	8.78	0.73	0.04
2009	4.43	1.33	0.06
2010	17.2	1.06	0.07
2011	36.43	1.28	0.08
2012	32.62	1.65	0.06
2013	27.01	1.12	-
2014	6.02	1.05	0.04
2015	15.00	0.67	0.04
2016	-	-	-
2017	17.3	1.01	0.05
2018	21.6	0.84	0.04
2019	23.5	0.87	0.05
2020	-	-	-
2021	1.92	0.58	0.03

Conclusions

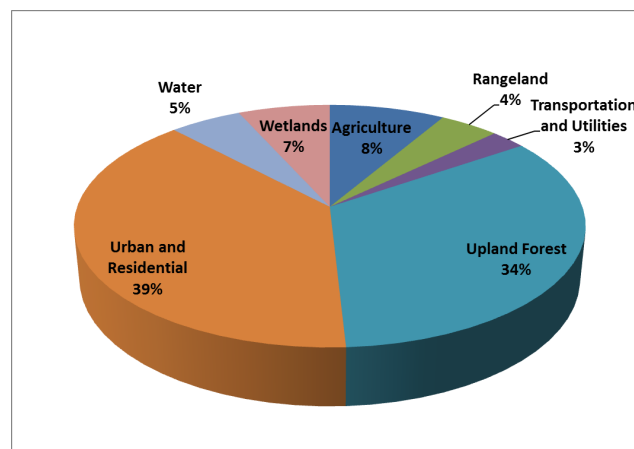
Based on ongoing sampling, Lake Piney Z did not meet the nutrient thresholds for the East Panhandle Region. The elevated nutrients and chlorophyll-a are in response to past fishery management strategies. Fortunately, management practices have changed, most notably with the replanting of emergent vegetation and the reestablishment of other native vegetation via the natural seedbank. The LVI score for Piney Z was 46, placing the lake's vegetative community at the lower end of the Healthy category. Other water quality parameters appear to be normal for the area and no other impairments were noted.

Lower Lake Lafayette



Lower Lake Lafayette is the largest of the four lake compartments, covering an area of 1,006 acres and bordered by the Leon County Apalachee Regional Park Solid Waste Facility, Talquin Electric Sewage Treatment Plant and various residential and commercial developments. Lower Lake Lafayette is also home to a wood stork colony.

As shown in the following pie chart, agriculture, rangeland, transportation, utilities, urban and residential uses make up approximately 54% of the 36,966-acre Lower Lake Lafayette watershed. Increases in stormwater runoff and waterbody nutrient loads can often be attributed to these types of land uses.



Water from Alford Arm enters Lower Lake Lafayette via pipes located under the FGA railroad track. Discharges from Lower Lake Lafayette occur through an

earthen channel on the eastern end of the lake and pass under Chaires Crossroad before entering the wetland system associated with the St. Marks River. Depending on water levels, water from the St. Marks River will flow into Lower Lake Lafayette.

Lake or Wetland?

Lower Lake Lafayette has gradually transitioned from a lake to what appears and functions like a cypress dominated swamp, Florida Administrative Code 62-302(16) defines a lake as “. . . a lentic fresh water-body with a relatively long water residence time and an open water area that is free from emergent vegetation under typical hydrologic and climatic conditions. Aquatic plants, as defined in subsection 62-340.200(1), F.A.C., may be present in the open water.” As Figure 2 shows, there is little open water; the open water that currently exists is due to Fish and Wildlife’s maintenance of the canoe trails. Leon County staff and FDEP were in discussions regarding the re-classification of this waterbody from a lake to a wetland. FDEP decided that they would not reclassify the system.

Due to access issues (low water and the extreme amounts of vegetation) Leon County staff have only been able to intermittently sample the system.

Results

Nutrients

The nutrient thresholds and results are found in Table 3. According to FDEP requirements, Numeric Nutrient Criteria (NNC) (expressed as an annual geometric mean) cannot be exceeded more than once in a three-year period. State Numeric Nutrient Criteria were not exceeded during the period of record.

Other Parameters

Due to the wetland like nature of Lower Lake Lafayette, dissolved oxygen (DO) levels can be very low. Staff considers the low DO levels normal for this type of system (Figure 3).

Other water quality parameters appear to be normal for the area and no other impairments were noted.

Conclusions

When the sampling requirements were met, State criteria were not exceeded for the NNC. Due to the wetland like nature of Lower Lake Lafayette, Staff considers the lake’s low DO levels normal for this type of system.

Table 3. FDEP’s chlorophyll-a, total nitrogen and phosphorus criteria for lakes applied to Lower Lake Lafayette.

Colored Lakes	Chlorophyll-a 20.0 µg/L	Total Nitrogen Threshold 1.27-2.23 mg/L	Total Phosphorus Threshold 0.05-0.16 mg/L
2004	3.0	0.49	0.02
2005	2.9	0.56	0.02
2006	2.3	0.72	0.03
2007	1.9	0.62	0.02
2008	-	-	-
2009	2.2	0.42	0.02
2010	2.6	0.53	0.01
2011-2015	-	-	-
2016	5.5	0.52	0.02
2017	5.4	0.64	0.02
2018-2021	-	-	-

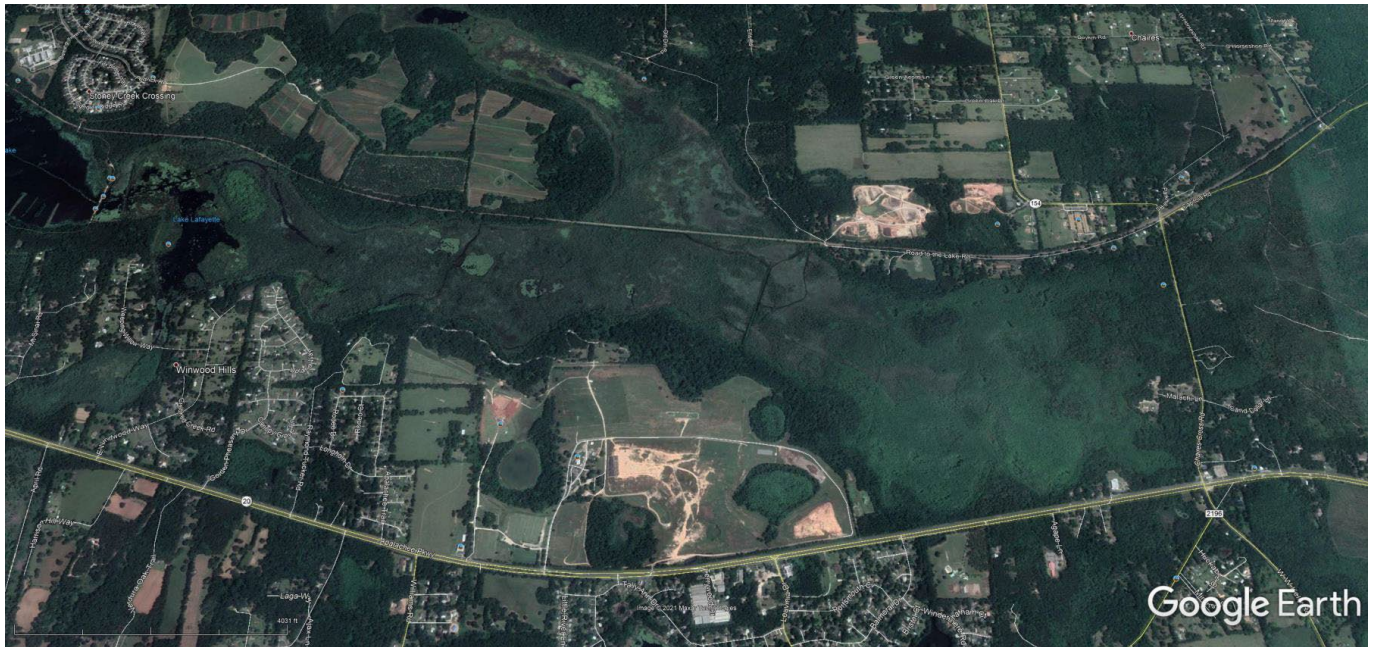


Figure 2. Lower Lake Lafayette.

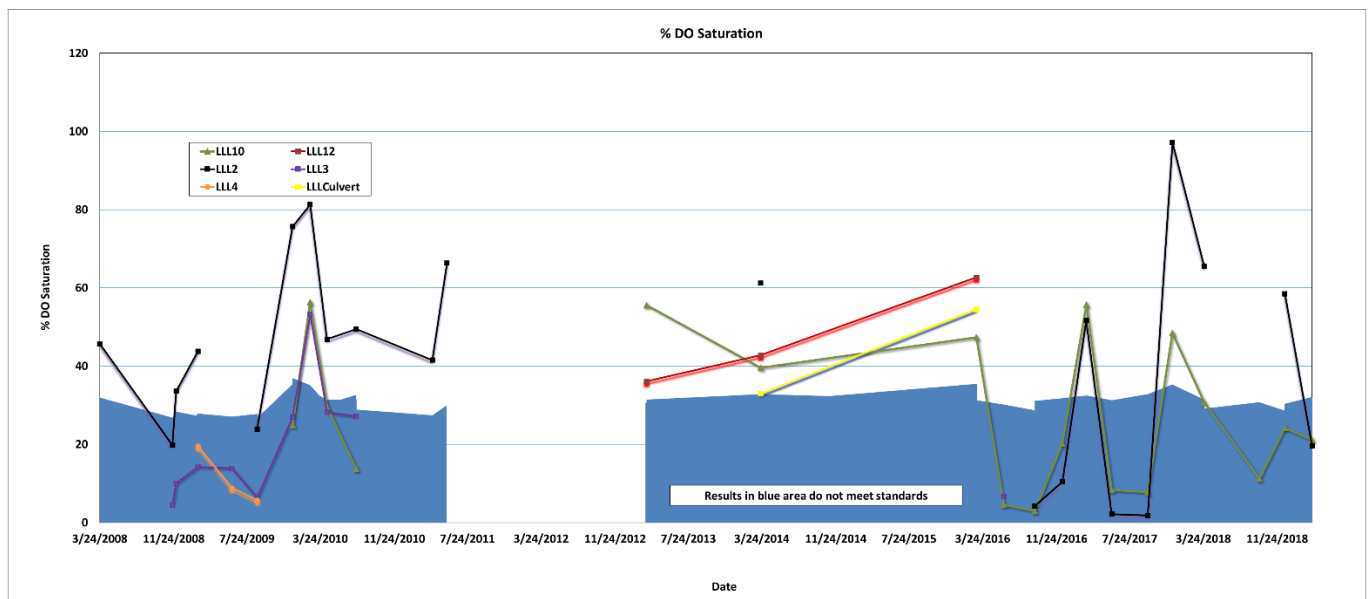


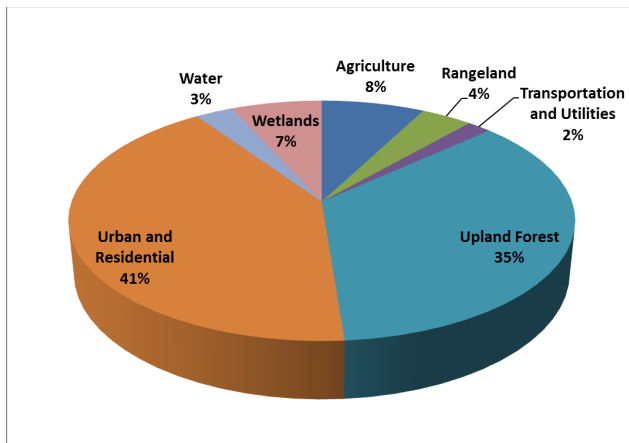
Figure 3. Dissolved Oxygen Percent Saturation results for Lower Lake Lafayette. The data gap reflects low (or no) water in the system at that time.

Alford Arm



Alford Arm is a 371-acre waterbody which was separated from Lower Lake Lafayette by construction of the FGA Railroad. As shown in the following pie chart, agriculture, rangeland, transportation, utilities, urban and residential uses make up approximately 55% of the 30,116-acre Alford Arm watershed. Low water crossings constructed in the 1950's affected water flow through the system. Increases in stormwater runoff and waterbody nutrient loads can often be attributed to these types of land uses.

Although Alford Arm contains areas of standing water, the vast majority is covered by dense stands of both submergent and emergent wetland vegetation.



Because of the dense vegetation and low water conditions, samples could not be collected for most of 2010, and no samples were collected in 2011 through 2014. Because of ongoing conditions, staff

eliminated this sampling station in 2015. Like Lower Lake Lafayette, Leon County staff and FDEP are in discussions regarding the re-classification of this waterbody from a lake to a wetland.

Thank you for your interest in maintaining the quality of Leon County's water resources. Please feel free to contact us if you have any questions.

Contact and resources for more information

www.LeonCountyWater.org

[Click here to access the results for all water quality stations sampled in 2021.](#)

[Click here for map of watershed – Sample sites L02, L30, LPZ3, LLL2, LLL3, and LLL10.](#)

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