

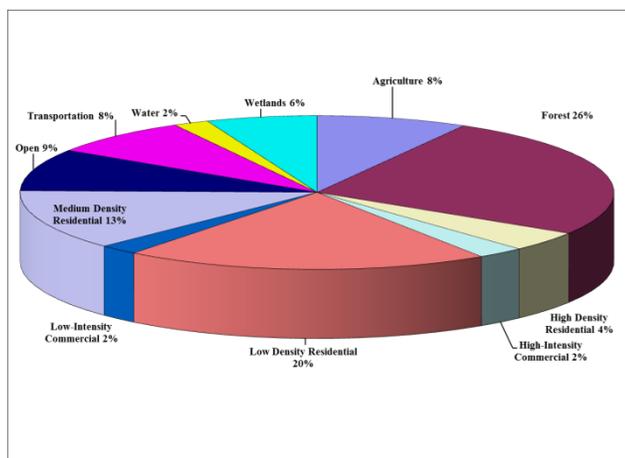
## Waterbody: Lake Lafayette



## 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”.

As shown in the following pie chart, commercial, residential, agriculture and transportation uses make up approximately 57% of the 53,097 acre Lafayette Basin. Increases in stormwater runoff, and waterbody nutrient loads can often be attributed to these types of land uses.



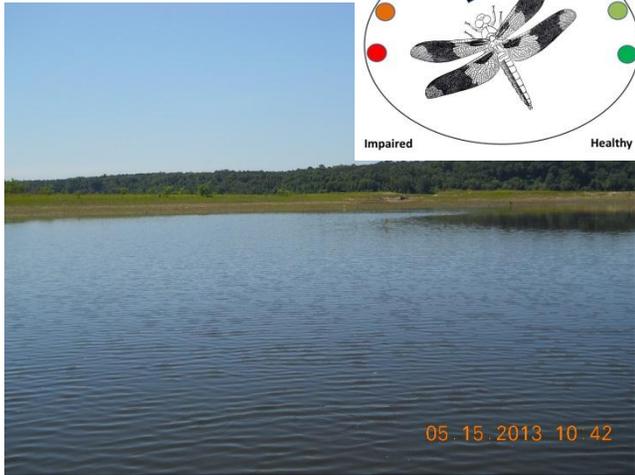
## Background

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 2011-2013. Staff also conducted a Lake Vegetation Index (LVI) on Lake Piney Z to evaluate the health of the floral (plant) community.

## 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) that is located in the northeastern portion of the lake and drains into the Floridan Aquifer. The majority 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 300 acre lake, but following dry periods, the lake bed 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.

The EPA established a TMDL on Upper Lake Lafayette in March 2012 that requires a 36% reduction in total phosphorus. The City of Tallahassee hopes to comply with the TMDL by the converting the Weems Pond Regional Stormwater Treatment Facility (Weems Pond) into an alum facility. The retrofit of the facility will improve the pollutant removal efficiencies of the system and reduce pollutant loads that leave the pond and flow downstream through the Northeast Drainage Ditch and ultimately, to Upper Lake Lafayette.

Construction is ongoing and the facility should be online in early 2015.

## Results

### Nutrients

The nutrient thresholds and results are found in Table 1. According to FDEP requirements, Numeric Nutrient Criteria (expressed as an annual geometric mean) cannot be exceeded more than once in a three year period.

**Table1.** 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- <i>a</i> 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	<b>25.2</b>	0.81	<b>0.10</b>
2006	3.3	0.56	0.09
2007	4.9	0.60	0.07
2008	<b>24.5</b>	0.60	<b>0.15</b>
2009	6.9	0.43	0.08
2010	6.9	0.77	0.07
2011	<b>32.7</b>	0.68	<b>0.10</b>
2012	<b>31.0</b>	0.90	<b>0.15</b>
2013	16.8	0.79	-

The table shows that the geometric mean of chlorophyll *a* and total phosphorus exceeded the state criteria in 2005, 2008, 2011 and 2012. Due to an apparent erroneous reading, the total phosphorus result could not be calculated for 2013.

Elevated nutrient levels in Upper Lake Lafayette may occur due to the urbanized inflow streams combined with the fluctuating lake volume. The reduced volume concentrates incoming pollutants, reducing the lake's ability to assimilate the incoming nutrients.

### *Metals*

Upper Lake Lafayette exceeded Class III water quality criteria for lead during the 1<sup>st</sup> quarter. Relict anthropogenic sources such as leaded gasoline are most likely to be the cause of this exceedance.

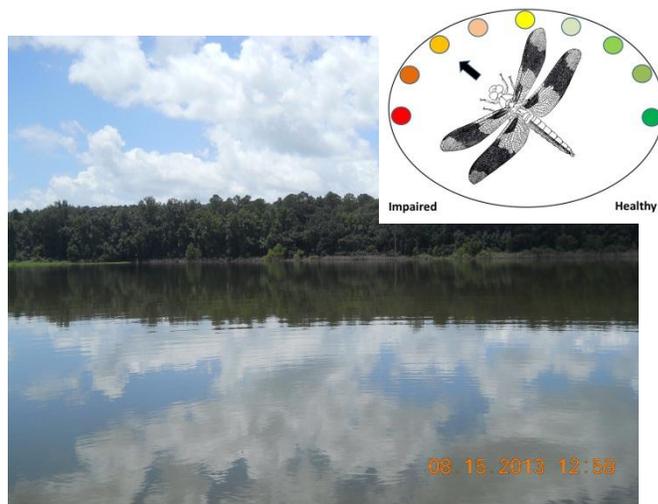
[Click here for more information on metal levels in Leon County waterbodies.](#)

### *Other Parameters*

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

### **Conclusions**

Based on ongoing sampling, Upper Lake Lafayette did not meet the nutrient thresholds for the East Panhandle Region. Elevated nutrient levels in the lake may occur due to the urbanized inflow streams combined with the fluctuating lake volume. The reduced volume concentrates incoming pollutants, reducing the lake's ability to assimilate the incoming nutrients. The lake exceeded Class III water quality criteria for lead during the 1<sup>st</sup> quarter. Relict anthropogenic sources such as leaded gasoline are most likely to be the cause of this exceedance. Other water quality parameters appear to be normal for the area and no other impairments were noted.



### **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.

Lake Piney Z can discharge to Lower Lake Lafayette via two outfalls located on the east end of the lake and/or can 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 also 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 1. According to FDEP requirements, Numeric Nutrient Criteria (expressed as annual geometric means) cannot be exceeded more than once in a three year period.

**Table 1.** 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 Piney Z	Chlorophyll- <i>a</i> 6.0 µg/L	Total Nitrogen Threshold 0.51-0.93 mg/L	Total Phosphorus Threshold 0.01-0.03 mg/L
2004	<b>6.48</b>	0.45	<b>0.04</b>
2005	<b>12.98</b>	<b>0.78</b>	<b>0.05</b>
2006	<b>25.17</b>	<b>0.70</b>	<b>0.08</b>
2007	2.92	<b>0.96</b>	<b>0.04</b>
2008	<b>8.78</b>	<b>0.73</b>	<b>0.04</b>
2009	4.43	<b>1.33</b>	<b>0.06</b>
2010	<b>17.2</b>	<b>1.06</b>	<b>0.07</b>
2011	<b>36.43</b>	<b>1.28</b>	<b>0.08</b>
2012	<b>32.62</b>	<b>1.65</b>	<b>0.06</b>
2013	<b>27.01</b>	<b>1.12</b>	-

The table shows that the geometric mean of chlorophyll *a* and total phosphorus exceeded the state criteria throughout the sampling period. Due to an apparent erroneous reading, the total phosphorus result could not be calculated for 2013.

The excessive chlorophyll *a* and nutrient levels are the result of the lake's management. The ongoing herbicide program 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. While this may lead to a productive largemouth bass fishery in the short term, overall long term ecosystem health continues to suffer.

### Biological Oxygen Demand (BOD)

BOD results were elevated, ranging from 3.4-6.0 mg/L. Like the elevated nutrients and chlorophyll *a*, this is in response to the fishery management strategy.

### Floral Assessment

Ironically, the Lake Vegetation Index score for Lake Piney Z was 47, placing the lake's vegetative community in the healthy category.

Fifty four species were found in the survey. False nettle (*Boehmeria cylindrical*), buttonbush (*Cephalanthus occidentalis*), American sweetgum (*Liquidambar styraciflua*), American elderberry (*Sambucus canadensis*), pond cypress (*Taxodium ascendens*) and Chinese tallow tree (*Sapium sebiferum*) were the most dominant species in the littoral zone of the lake. Other native shoreline vegetation included red maple (*Acer rubrum*). Unfortunately, camphor tree (*Cinnamomum camphora*), water hyacinth (*Eichhornia crassipes*), Chinese privet (*Ligustrum sinense*), Japanese climbing fern (*Lygodium japonicum*), torpedo grass (*Panicum repens*) and Chinese tallow, all listed as Category I Invasive Exotics by the Florida Exotic Pest Control Council, were found in the littoral zone of Piney Z. Alligator weed (*Alternanthera philoxeroides*), and creeping oxeye (*Sphagneticola trilobata*) are Category II Invasive Exotics found in the lake.

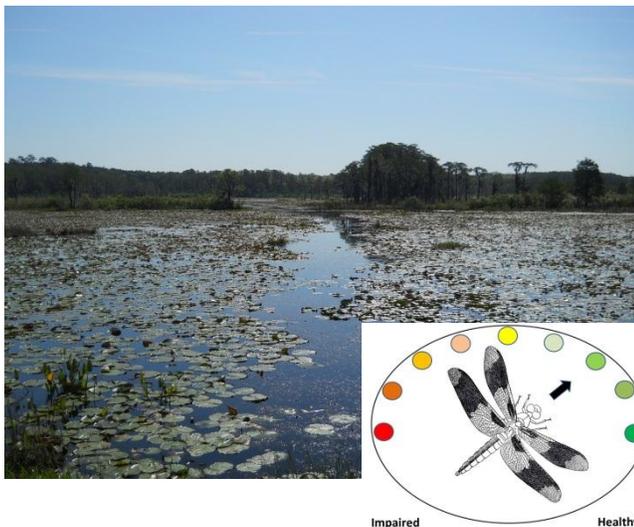
[Click here for more information on the Lake Piney Z LVI.](#)

*Other Parameters*

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

**Conclusions**

Based on ongoing sampling, Lake Piney Z did not meet the nutrient thresholds for the East Panhandle Region. BOD results were elevated, ranging from 3.4-6.0 mg/L. Like the elevated nutrients and chlorophyll  $\alpha$ , this is in response to the fishery management strategy. The Lake Vegetation Index score for Lake Piney Z was 47, placing the lake’s vegetative community in the healthy category. Other water quality parameters appear to be normal for the area and no 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.

Although pockets of open water are scattered throughout Lower Lake Lafayette, the vast majority of the area is covered by dense growths of emergent

and submerged vegetation, including many mature trees. Water from Alford Arm enters Lower Lake Lafayette via pipes located under the CSX 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. The extended drought caused low water levels in this section, which prevented water sampling during several quarters of 2007, 2008, 2010 and 2011. No water quality samples were collected in 2012 and only one water sample was collected in 2013.

**Results**

*Nutrients*

The nutrient thresholds and results 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. State numeric nutrient criteria were not exceeded during the period of record.

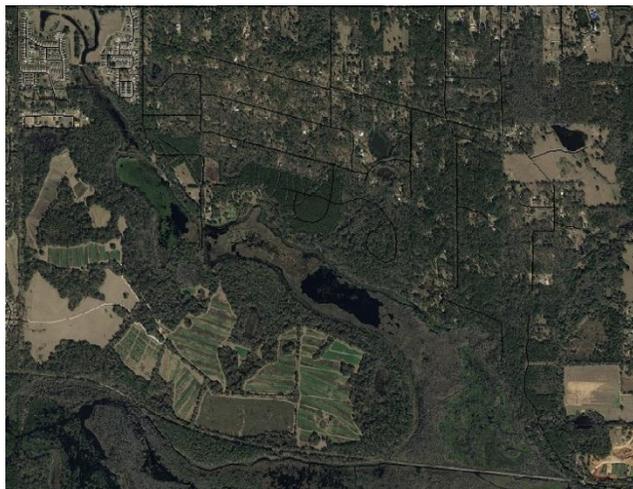
**Table1.** FDEP’s chlorophyll  $\alpha$ , total nitrogen and phosphorus criteria for lakes applied to Lower Lake Lafayette.

Colored Lakes	Chlorophyll- $\alpha$ 20.0 $\mu\text{g/L}$	Total Nitrogen Threshold 1.27-2.23 mg/L	Total Phosphorus Threshold 0.05-0.16 mg/L
LLL			
<b>2004</b>	3.04	0.49	0.02
<b>2005</b>	2.85	0.56	0.02
<b>2006</b>	2.34	0.72	0.03
<b>2007</b>	1.94	0.62	0.02

Colored Lakes LLL	Chlorophyll- <i>a</i> 20.0 µg/L	Total Nitrogen Threshold 1.27-2.23 mg/L	Total Phosphorus Threshold 0.05-0.16 mg/L
2008	-	-	-
2009	2.19	0.42	0.02
2010	2.59	0.53	0.01
2011-2013	-	-	-

### Conclusions

Intermittent sampling has made conclusions difficult. Based on existing data, Lower Lake Lafayette met the nutrient thresholds for the East Panhandle Region.



### Alford Arm

Alford Arm is a 231 acre waterbody which was separated from Lower Lake Lafayette by construction of the CSX Railroad. Of the four segments that define historic Lake Lafayette, Alford Arm receives flow from the greatest area with natural cover, including Welaunee Plantation, the Miccosukee Greenway and the Alford Arm Greenway. Due to significant drought conditions in

recent years, available storage along the channel intercepted most flows during the year. Although Alford Arm contains areas of standing water, the vast majority is covered by dense stands of both submergent and emergent wetland vegetation (Harper and Baker, 2005). 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 2013. Because of ongoing conditions, staff is eliminating this sampling station. [Click here for additional information on Alford Arm from the 2013 Water Quality Report.](#)

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.LeonCountyFL.gov/WaterResources](http://www.LeonCountyFL.gov/WaterResources)

[Click here to access the results for all water quality stations sampled in 2013.](#)

Johnny Richardson, Water Resource Scientist  
(850) 606-1500  
[Richardsonjo@leoncountyfl.gov](mailto:Richardsonjo@leoncountyfl.gov)