

LAKE ECOSUMMARY

Lake Bradford

Lake Bradford is located near Capital Circle Southwest and just north of the airport. With a surface area of 149 acres, Lake Bradford is the largest and most accessible member of the Bradford Brook Chain of Lakes. All the lakes in this chain are located within the Munson Sandhills Physiographic province. Maximum depth at mean high water is 13 feet, and the estimated average depth is 6 feet. Because of the numerous residents who live on the lake and the presence of the Florida State University student retreat camp, Lake Bradford is a favorite recreational lake for swimming, fishing, water skiing, sailing, canoeing, and many other activities. Residential development surrounds lake Bradford on all banks except for the northwestern shoreline where the Apalachicola National Forest is present. The City of Tallahassee’s Lakes Monitoring group conducts chemical sampling within Lake Bradford at two locations, “North” and “South” and a representative biological assessment (e.g., vegetation survey). Overall, the water quality and plant community data indicate that the lake meets expectations for a “healthy, well-balanced lake”.

Background

Although healthy, well balanced lake communities may be maintained even with some level of human disturbance, excessive human activities may result in lake degradation. Human stressors include increased inputs of nutrients, sediments and/or pesticides from watershed runoff, undesirable removal of native shoreline and/or upland buffer vegetation, and introduction of nuisance (generally exotic) plants and animals. DEP has methods to evaluate if human activities have resulted in conditions where a particular waterbody has exceeded water quality criteria (Chapter 62-302, Florida Administrative Code), including whether adverse impacts to biological communities have occurred. DEP water quality standards are designed to protect designated uses of the waters of the state (e.g., recreation, aquatic life support). Exceedances of these standards impede the designated use. Chlorophyll-*a* is a measure of algal biomass in the water column. In clear, low alkalinity lakes (lakes where color is ≤ 40 PCU and alkalinity is ≤ 20 mg/L CaCO₃), a healthy system is expected to have ≤ 6 μ g/L of chlorophyll-*a*. In colored (≥ 40 PCU) lakes or clear, high alkalinity (≥ 20 mg/L CaCO₃) lakes, healthy systems are expected to have ≤ 20 μ g/L of chlorophyll-*a*. Chlorophyll-*a* values greater than those referenced may result in unwanted shading of aquatic plants and/or greater potential for harmful algal blooms. The Lake Vegetation Index (LVI) assesses how closely the plant community of a lake

resembles a native undisturbed community. These tools are often used in conjunction with one another because it is possible to detect imbalance in the plant community while the algal community appears healthy (and vice versa).

Below is the chart for the FL Department of Environmental Protection’s Numeric Nutrient Criteria for the state’s lakes.

Long Term Geometric Mean Lake Color and Alkalinity	Annual Geometric Mean Chlorophyll <i>a</i>	Minimum calculated numeric interpretation		Maximum calculated numeric interpretation	
		Annual Geometric Mean Total Phosphorus	Annual Geometric Mean Total Nitrogen	Annual Geometric Mean Total Phosphorus	Annual Geometric Mean Total Nitrogen
> 40 Platinum Cobalt Units	20 μ g/L	0.05 mg/L	1.27 mg/L	0.16 mg/L ¹	2.23 mg/L
≤ 40 Platinum Cobalt Units and > 20 mg/L CaCO ₃	20 μ g/L	0.03 mg/L	1.05 mg/L	0.09 mg/L	1.91 mg/L
≤ 40 Platinum Cobalt Units and ≤ 20 mg/L CaCO ₃	6 μ g/L	0.01 mg/L	0.51 mg/L	0.03 mg/L	0.93 mg/L

Methods

This lake is sampled on a quarterly basis each year. Surface water samples are collected for analysis [e.g. nutrients, chlorophyll *a*, color, etc.] following [DEP Standard Operating Procedures \(SOPs\) and quality assurance/quality control \(QA/QC\) standards](#).

For the LVI, species lists were developed for four of twelve sections of the lake (Figure 1), and the following information was derived from those lists: percent native species, percent invasive exotic species, percent sensitive species, and the coefficient of conservatism (C of C; a measure of how tolerant a species is to disturbance) of the dominant species. According to DEP SOP LT 7000, the LVI score ranges and categories are: (78-100) Exceptional; (43-77) Healthy; and (0-42) Impaired. DEP’s revised impairment threshold score of 43 and higher fully meet the expectation of a healthy, well balanced community, and scores below 42 are considered impaired. The LVI was sampled per DEP SOP FS7310 and calculated per DEP SOP LT7000.

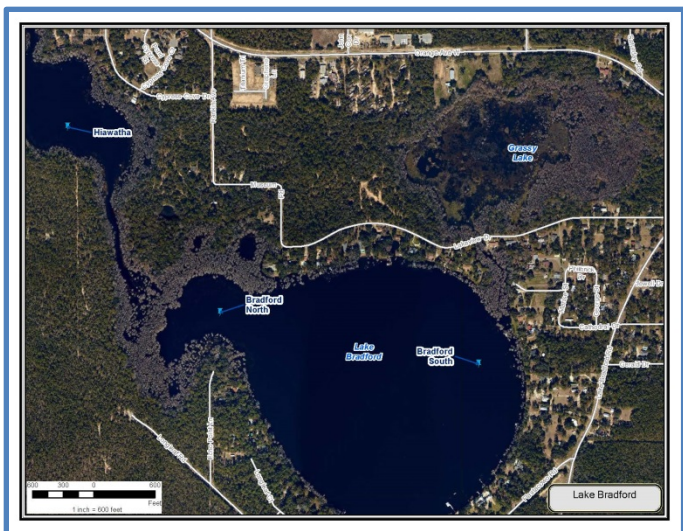


Figure 2. Map of Lake Bradford. Sampling sites are marked “North” and “South” on the map below. Water quality samples are collected from each site along with water parameters such as Dissolved Oxygen, Conductivity, pH level, Temperature, Secchi Disk reading and depth.

Results

Water Quality

The water quality samples meet the FLDEP Nutrient Criterion water quality standards as explained in the earlier text. Lake Bradford nutrient criteria is of high color (>40 PCU) but with low alkalinity (< 20 mg/L). Meeting TN levels of <1.05 mg/L of nitrogen and TP levels of < 0.03 mg/L of phosphorus for any given time, chlorophyll levels are to be less than 20 µg/L. The most recent 10-year geomean data is shown in **Table 1**. The data show no indications of exceeding any of these nutrient limits. The high color of the lake water (long term geomean of 118 PCU) helps prevent the sunlight from allowing possible nutrient reactions within the water to develop to a eutrophic state. The dark color keeps chlorophyll-*a* under control and from potentially forming algal blooms. While chlorophyll values fluctuate to some extent over time, as noted in **Table 1**,

the 10-year geomean is 8.5 µg/L. The water quality is supportive to Lake Bradford’s uses as a recreational waterbody.

Table 1. Water quality results from Lake Bradford.

Yearly Geomeans of FLDEP Nutrient Criterion Parameters Lake Bradford					
Year	Chlorophyll *	Color	Alkalinity	TN *	TP*
2011	3	85	3	0.77	0.030
2012	Low water levels prevented sampling				
2013	14	160	8	0.59	0.020
2014	12	215	2	0.71	0.020
2015	6	163	2	0.75	0.010
2016	7	108	2	0.61	0.020
2017	12	77	2	0.84	0.030
2018	17	86	2	0.40	0.030
2019	4	151	2	0.50	0.020
2020	14	90	2	0.67	0.020

*DEP’s Numeric Nutrient Criteria (Data based on annual geometric means calculated on minimum of 4 samples).

Lake Vegetation Index

The 2020 Lake Vegetation Survey was not performed due to low water levels during year 2020 along with Covid-19 restrictions which caused scheduling complications. (The 2019 LVI data is kept here in this summary to show typical aquatic macrophytes within Lake Bradford.)

The 2019 LVI score for this lake was 75 out of a possible 100 points, corresponding with a "Healthy" designation. **Table 2** contains the species list and occurrence information for this sampling event. The LVI score has dropped in quality points from 78 in 2017 to 75 in 2019. There is not an apparent reason for this decline. There is only one invasive exotic plant species *Panicum repens* (Torpedo Grass) that was observed in the lake. The dominant taxa are *Taxodium* sp. (Bald Cypress). Unfortunately, Lake Bradford’s vegetation is limited to the banks of the lake. The highly tannic-colored water prevents submerged or floating vegetation from becoming established. However, in the prior years at other sites within the lake, *Utricularia* sp. (Bladderworts) were often seen below the lake’s water surface as submerged vegetation. Bladderworts, are considered to be great vegetation for lakes to support. They help oxygenate the water column and provide habitat for invertebrates and small fish. Bladderworts are also a type of carnivorous aquatic plant, consuming small critters such as water fleas and other invertebrates.

Table 2. Species list for the 2019 LVI at Lake Bradford. An asterisk (*) indicates an invasive exotic plant species. P = present, D = dominant, C = codominant.

Lake Bradford Year 2019		Sections			
Scientific Name	Common Name	3	6	9	12
<i>Acer rubrum</i>	Red Maple			P	
<i>Azolla caroliniana</i>	CAROLINA MOSQUITO FERN			P	
<i>Cephalanthus occidentalis</i>	COMMON BUTTONBUSH	P	P	P	P
<i>Cyrilla racemiflora</i>	TITI	P	P	P	P
<i>Liquidambar styraciflua</i>	SWEETGUM		P		P
<i>Lycopus rubellus</i>	TAPERLEAF WATERHOREHOUND				P
<i>Magnolia virginiana</i>	SWEETBAY		P		
<i>Nyssa sylvatica biflora</i>	WATER TUPELO		P		P
<i>Panicum repens</i>	TORPEDO GRASS	P	P		P
<i>Sacciolepis striata</i>	AMERICAN CUPSCALE	P	P		P
<i>Taxodium</i>	BALD-CYPRESS	D	D	D	D
<i>Triadenum virginicum</i>	VIRGINIA MARSH ST.JOHN'S-WORT				P

Below: Typical aquatic macrophytes that are found within Lake Bradford.



Azolla caroliniana "Floating Mosquito Fern"



Sacciolepis striata "American Cupscale Grass"

Thank you for your interest in maintaining the exceptional water quality within the City of Tallahassee area lakes. Visit the web-links below for more information on Florida natural water resources.

DEP publications on Best Management Practices and Environmental Stewardship and Education:
https://ffl.ifas.ufl.edu/media/fflifasufledu/docs/GIBMP_Manual_Web_English.pdf

DEP biological assessment resources:
<https://floridadep.gov/dear/bioassessment/content/bioassessment-training-evaluation-and-quality-assurance#LVI>

FWCC Aquatic Plant Management:
<http://myfwc.com/wildlifehabitats/habitat/invasive-plants/aquatic-plant/>

Freshwater Algal Bloom information:
<https://floridadep.gov/AlgalBloom>