

# LAKE ECOSUMMARY

## Lake Hall

The City of Tallahassee’s Lakes Monitoring group conducts chemical and biological sampling at Lake Hall within the Alfred B. Maclay Gardens State Park. Lake Hall, which lies partly within the boundary of the State Park, is classified as an Outstanding Florida Waterbody (OFW). This 180-acre lake is an oligotrophic system with virtually no nutrient imbalances and is the largest of the lakes sampled by the City’s Lakes Monitoring staff. Maximum depth at mean high water is approximately 30 feet, and the estimated average depth is 14 feet. It is often perceived that Lake Hall is a spring-fed lake, however no direct connection to the Floridan Aquifer has been discovered to date. Impacts to this lake are limited, which is reflected in its excellent water quality and biological diversity. Overall, the water quality and plant community data indicate 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  $\leq 40$  PCU and alkalinity is  $\leq 20$  mg/L CaCO<sub>3</sub>), a healthy system is expected to have  $\leq 6$   $\mu\text{g/L}$  of chlorophyll-*a*. In colored ( $\geq 40$  PCU) lakes or clear, high alkalinity ( $\geq 20$  mg/L CaCO<sub>3</sub>) lakes, healthy systems are expected to have  $\leq 20$   $\mu\text{g/L}$  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 $\mu\text{g/L}$	0.05 mg/L	1.27 mg/L	0.16 mg/L <sup>1</sup>	2.23 mg/L
$\leq 40$ Platinum Cobalt Units and > 20 mg/L CaCO <sub>3</sub>	20 $\mu\text{g/L}$	0.03 mg/L	1.05 mg/L	0.09 mg/L	1.91 mg/L
$\leq 40$ Platinum Cobalt Units and $\leq 20$ mg/L CaCO <sub>3</sub>	6 $\mu\text{g/L}$	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 1. Map of Lake Hall.** Sampling sites are numbered 2, 5, & 6. 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

Lake Hall is a low color, low alkaline lake that is expected to meet chlorophyll-a concentrations  $\leq 6 \mu\text{g/L}$ , total nitrogen concentrations of  $\leq 0.51 \text{ mg/L}$  and total phosphorus concentrations of  $\leq 0.01 \text{ mg/L}$ . From 2011 thru 2020, Lake Hall has met these nutrient criteria limits with no exceedances. The TN and TP concentrations increased slightly for the year 2020. This was most likely due to homeowners physically removing large swaths of aquatic vegetation from their waterfront property, which is located near sampling site 6. It was noted that the water at site 6 was cloudy and disturbed when water samples were collected. The data from that day in October show the low-level total phosphorus concentration was elevated considerably to  $0.46 \text{ mg/L}$  over the previous sampling event in August of a  $0.007 \text{ mg/L}$  reading. This a 4500% increase from normal total phosphorus values. However, this one-time exceedance did not impact the nutrient criterion annual geometric mean for total phosphorus for the year 2020.

Lake Hall is a highly utilized lake for boating, water-skiing, fishing, and many other recreational activities. There are several housing developments along the Northeastern portion of Lake Hall that represent potential sources of anthropogenic inputs, however the majority of these homeowners have vegetative buffer zones leading to the water's edge which helps limit possible nutrient inputs. Additionally, plentiful submerged aquatic macrophytes act as a natural filter and help

to keep potential algal blooms at bay by keeping nutrient levels low.

Natural biological cycles within a lake can produce an internal self-eutrophic system. However, Lake Hall is considered to be oligotrophic, which is indicative of low nutrient levels (TN) and (TP), but with sustainable biological productivity. Algal blooms within Lake Hall are very rare although short-lived occurrences of blue-green algal blooms have occurred the past. Below (Table 1) details the nutrient data for all 5 measured criteria for the last 10-years.

**Table 1. Water quality results from Lake Hall.**

Yearly Geomeans of FLDEP Nutrient Criterion Parameters Lake Hall					
Year	Chlorophyll *	Color	Alkalinity	TN *	TP*
2011	3	5	5	0.25	0.008
2012	4	6	6	0.23	0.009
2013	2	6	6	0.31	0.011
2014	2	7	5	0.26	0.008
2015	2	8	4	0.21	0.009
2016	2	5	4	0.21	0.011
2017	2	3	5	0.32	0.011
2018	4	4	5	0.24	0.009
2019	2	4	3	0.39	0.010
2020	4	5	5	0.44	0.012

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

### Lake Vegetation Index

The 2020 LVI score for this lake was 81 out of a possible 100 points, corresponding with a "Healthy" designation. Table 2 contains the species list and occurrence information for this sampling event. There are many species of submerged aquatic macrophytes such as *Cabomba caroliniana* (Carolina Fanwort) and *Utricularia floridana* (Florida Bladderwort), which is a particularly interesting species as this highly specialized plant feeds on zooplankton caught in its "bladder-like" traps. Unsuspecting prey brush against tiny hairs that trigger the "trap doors" to close. Another very sensitive macrophyte to high nutrient water is *Mayaca fluviatilis* (Bogmoss). The presence of Bogmoss is a good indicator that Lake Hall has very low nutrient levels and, in fact, is also used in the aquaria industry. Overall, the plant community is stable and is very similar to the survey in 2019. No major plant community shifts have occurred since last year's survey. No invasive exotic plants were observed during this survey, however, *Hydrilla* sp. has been documented in an isolated location near the boat ramp and is treated occasionally. This invasive exotic does not thrive in Lake Hall due to the extremely low nutrients in the lake.

**Table 2. Species list for the 2020 LVI at Lake Hall. An asterisk (\*) indicates an invasive exotic plant species. P = present, D = dominant, C = co-dominant.**

Lake Hall Year 2020	LVI Score: 81	Sections			
Scientific Name	Common Name	2	5	8	11
<i>Acer rubrum</i>	RED MAPLE	P		P	P
<i>Andropogon sp.</i>	BLUESTEM GRASS	P			P
<i>Bacopa caroliniana</i>	LEMON BACOPA	P		P	P
<i>Bidens laevis</i>	BURRMARIGOLD; SMOOTH BEGGARTICKS	P	P	P	P
<i>Bidens mitis</i>	SMALLFRUIT BEGGARTICKS	P	P	P	P
<i>Brasenia schreberi</i>	WATERSHIELD	C	C	D	P
<i>Cabomba caroliniana</i>	CAROLINA FANWORT	C	P	P	P
<i>Cephalanthus occidentalis</i>	COMMON BUTTONBUSH	P	P	P	P
<i>Ceratophyllum demersum</i>	COONTAIL	P			P
<i>Cyperus blepharoleptos</i>	CUBAN BULRUSH	P			P
<i>Decadon verticillatus</i>	SWAMP LOOSESTRIFE		P		
<i>Eleocharis baldwinii</i>	BALDWIN'S SPIKERUSH		P		
<i>Eupatorium capillifolium</i>	DOGFENNEL	P	P		
<i>Habenaria repens</i>	WATERSPIDER	P	P		
<i>Hydrocotyle</i>	MARSHPENNYWORT	P	P		P
<i>Juncus marginatus</i>	SHORE RUSH; GRASSLEAF RUSH		P		
<i>Liquidambar styraciflua</i>	SWEETGUM	P	P	P	P
<i>Ludwigia leptocarpa</i>	ANGLESTEM PRIMROSEWILLOW	P	P	P	
<i>Ludwigia suffruticosa</i>	SHRUBBY PRIMROSEWILLOW	P			P
<i>Magnolia virginiana</i>	SWEETBAY	P	P		
<i>Mayaca fluviatilis</i>	STREAM BOGMOSS	P	P		
<i>Myrica cerifera</i>	WAX MYRTLE	P	P	P	P
<i>Myriophyllum heterophyllum</i>	TWO-LEAF WATERMILFOIL	P	P		
<i>Nelumbo lutea</i>	AMERICAN LOTUS	P	P		P
<i>Nymphaea odorata</i>	AMERICAN WHITE WATERLILY	P	C		P
<i>Nymphoides aquatica</i>	BIG FLOATINGHEART	P			
<i>Nyssa sylvatica biflora</i>	SWAMP TUPELO		P	P	
<i>Persicaria hirsutum</i>	HAIRY SMARTWEED				P
<i>Pontederia cordata</i>	PICKERELWEED	P	P	P	P
<i>Saccharum giganteum</i>	SUGARCANE PLUMEGRASS		P		
<i>Sacciolepis striata</i>	AMERICAN CUPSCALE	P	P	P	P
<i>Sagittaria kurizana</i>	SPRINGTAPE GRASS				
<i>Salix caroliniana</i>	CAROLINA WILLOW	P	P	P	
<i>Taxodium sp (ascendens)</i>	POND CYPRESS	P			P
<i>Typha sp.</i>	CATTAIL		P		P
<i>Utricularia floridana</i>	FLORIDA BLADDERWORT	P	P	P	D
<i>Xyris jupicai</i>	RICHARD'S YELLOWEYED GRASS	P	P		

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

Best Management Practices for Protection for Water Resources

[https://ffl.ifas.ufl.edu/media/fflifasufledu/docs/GIBMP\\_Manual\\_Web\\_English.pdf](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>

