LAKE ECOSUMMARY

Lake Florida, WBID 2998A

Seminole County

Sampled July 23, 2018 and May 22, 2019

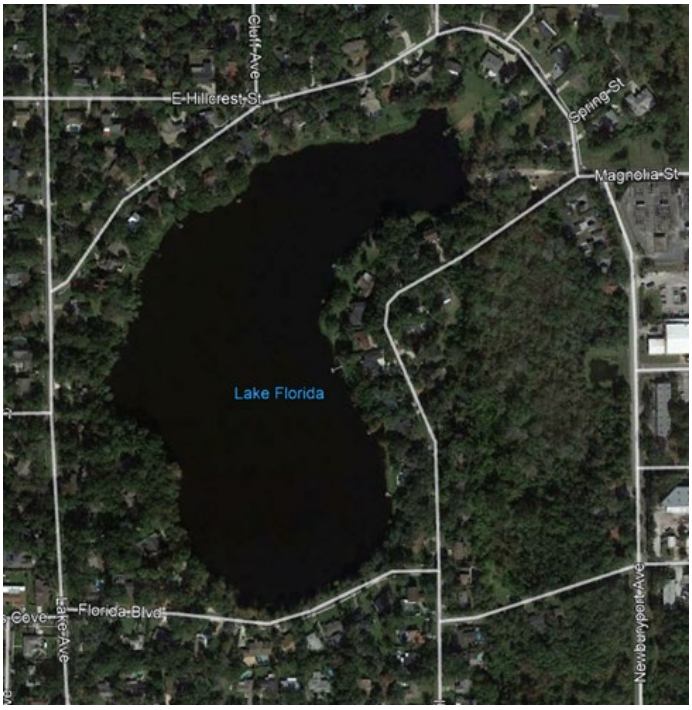


Figure 1. Lake Florida in Seminole County.

DEP conducted water quality and biological sampling at Lake Florida (WIN ID G2CE0150, SBIO ID LKFLORIDA) in Seminole County on July 23, 2018 and May 22, 2019 to assess attainment of designated uses. This lake, shown in Figure 1, was sampled as part of a Strategic Monitoring Program. Overall, the water quality and plant community data indicated that the lake did not meet expectations for a healthy, well-balanced lake.

Background

Healthy, well-balanced lake communities may be maintained with some level of human activity, but excessive human disturbance 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 a specific waterbody exceeding water quality criteria (Chapter 62-302, Florida Administrative Code [F.A.C.]), 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), and exceedances of these standards are associated with interference with the designated use. DEP assesses the health of plant communities in Florida lakes, as one indication of whether adverse impacts to biological communities have occurred.

Site Description

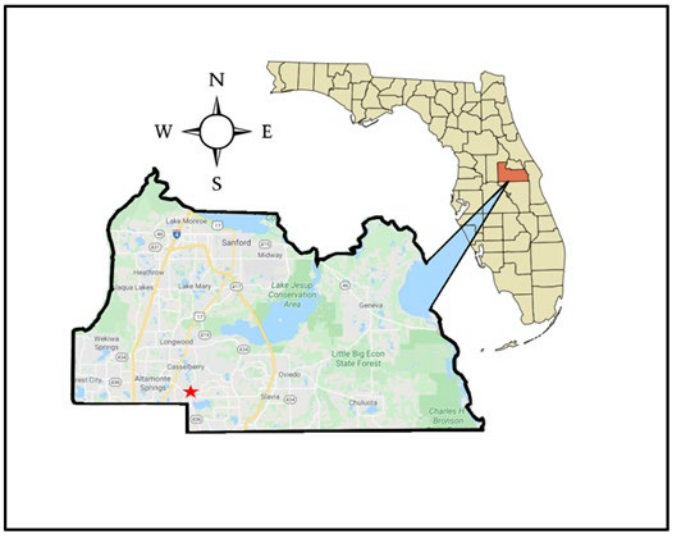


Figure 2. Location of Lake Florida in Seminole County.



Figure 2-1. Depth Contour Map for Lake Florida
(Source: Seminole County Water Resource Atlas)

The lake is approximately 25 acres in size. It is part of the Middle St. Johns River drainage basin and is located in Seminole County, near the border of Orange County (Figure 2). The bathymetric depth contours shown in Figure 2-1, are using a surface water elevation of 54.36 ft (NAVD 88). Depths measured on 07/23/2018 and 05/22/2019 were 3.9 meters and 2.9 meters, respectively. The predominant land uses surrounding Lake Florida are medium density residential and forested wetland. This lake is not currently listed on the Impaired Waters Verified List (11/15/2019). Per an assessment of watershed data, WBID Run 58 dated 09/17/2019, the lake is on the Study List for biological parameters. Additional information about this WBID is available in the TMDL Tracker application (https://fdep.maps.arcgis.com/home/webmap/viewer.html?webmap=1b4f1bf4c9c3481fb2864a415fbeca77).

Methods

Water Quality

This lake was sampled on 07/23/2018 and 05/22/2019 by the DEP Central Regional Operations Center (CEROC). Surface water samples were collected from the center of the lake for analysis of nutrients, chlorophyll *a*, color, and alkalinity following DEP Standard Operating Procedures (SOPs; see https://floridadep.gov/dear/quality-assurance/content/dep-sops). Sampling and analyses met DEP quality assurance/quality control standards. Results were compared with applicable Class III water quality criteria contained in 62-302, F.A.C., including nutrients, dissolved oxygen, and other indicators.

Chlorophyll *a* is a measure of algal biomass in the water column. Chapter 62-302.531, F.A.C., provides numeric criteria for chlorophyll *a*, total nitrogen (TN), and total phosphorus (TP) in lakes, and is dependent upon the long term mean color and alkalinity of the lake (Table 1). If the annual geometric mean chlorophyll *a* (calculated with at least four samples, representing seasonal variability) does not exceed the chlorophyll *a* value for the lake type in Table 1, then the TN and TP criteria for that calendar year shall be the annual geometric means of lake TN and TP samples, subject to the minimum and maximum limits in Table 1. If there are insufficient data to calculate the annual geometric mean chlorophyll *a* for a given year or the annual geometric mean chlorophyll *a* exceeds the values for the lake type, then the applicable numeric interpretations for TN and TP shall be the minimum values in Table 1. Based on the color and alkalinity results presented in this report, Lake Florida is a high color, high alkalinity lake.

Table 1. Numeric nutrient criteria in lakes, 62-302.531 (2)(b)(1), F.A.C. AGM = annual geometric mean

Long Term Geometric Mean Lake Color and Alkalinity	AGM Chlorophyll *a*	AGM TP Range	AGM TN Range
> 40 Platinum Cobalt Units	**20 µg/L**	**0.05 to 0.16[1] mg/L**	**1.27 to 2.23 mg/L**
≤ 40 Platinum Cobalt Units and > 20 mg/L $CaCO_3$	**20 µg/L**	**0.03 to 0.09 mg/L**	**1.05 to 1.91 mg/L**
≤ 40 Platinum Cobalt Units and ≤ 20 mg/L $CaCO_3$	**6 µg/L**	**0.01 to 0.03 mg/L**	**0.51 to 0.93 mg/L**

[1] For lakes with color > 40 PCU in the West Central Region, the maximum TP limit is 0.49 mg/L

Dissolved Oxygen

Rule 62-302.533 (1), F.A.C., states that no more than 10 percent of the daily average percent dissolved oxygen (DO) saturation values shall be below 67 percent in the Panhandle West bioregion, 38 percent in the Peninsula and Everglades bioregions, or 34 percent in the Northeast and Big Bend bioregions. This site is in the Peninsula region for DO criteria assessment. Percent saturation incorporates factors such as temperature, atmospheric pressure, and salinity. For lakes, the daily average DO level shall be calculated as the average of measurements collected in the upper two meters of the water column at the same location on the same day.

The daily average freshwater DO criteria is preferentially assessed using daily average values calculated from full days of diel (collected over a 24 hour period) monitoring data. If diel monitoring data are not available as was the case for this report, instantaneous samples are used to assess the DO criterion by comparing the instantaeous value with a time-of-day-specific translation of the daily average criterion (62-303.420(9), F.A.C.), and a spreadsheet calculator for this purpose is available at: https://floridadep.gov/dear/water-quality-standards-program/documents/do-saturation-calculator%C2%A0

Lake Vegetation Index

The Lake Vegetation Index (LVI) assesses how closely the plant community of a lake resembles a native undisturbed community. The LVI was sampled per DEP SOP LVI 1000 and calculated per DEP SOP LVI 2000. Species lists were developed for four of twelve sections of the lake (Figure 3), and the following information was derived from those lists: percent native species, percent Category 1 invasive exotic species as identified by the Florida Exotic Pest Plant Council, percent sensitive species, and the coefficient of conservatism (C of C; a measure of how tolerant a species is of disturbance) of the dominant or co-dominant species. Chapter 62-303.330 and 62-303.430, F.A.C., provide that an LVI score of 43 or greater meets the expectation of a healthy, well balanced community, and scores below 43 are considered impaired.

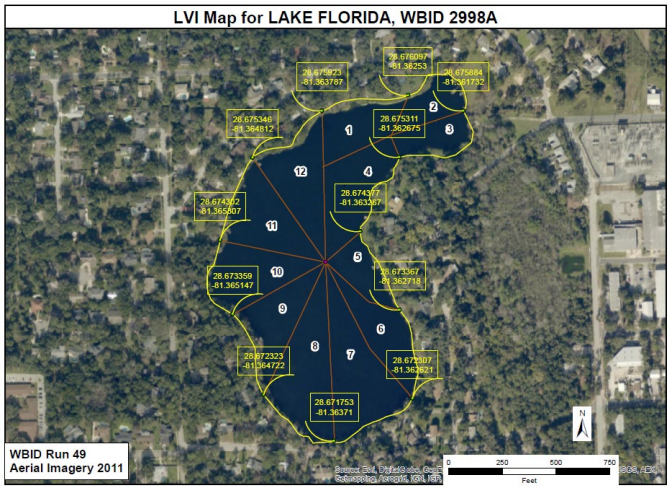


Figure 3. LVI sampling map of Lake Florida. Sections 1,4,7,10 were assessed in 2018 and sections 3, 6, 9, 12 were assessed in 2019 for the LVI. The water quality sample was collected from the lake center.

Results

Water Quality

The water quality results are shown in Table 2. The chlorophyll *a* and total phosphorus concentrations exceeded the applicable criteria in 2018 but were below their respective thresholds in 2019.

Based on these two sampling events, the results are inconclusive and do not allow for a determination of attainment of the nutrient thresholds for high color, high alkalinity lakes; however, the thresholds represent annual geometric mean concentrations (minimum of four samples) not to be exceeded more than once in any three-calendar year period. DEP's Watershed Assessment Section will evaluate the complete dataset for this lake to assess compliance with nutrient criteria.

Table 2. Water quality results from 07/23/2018 and 05/22/2019 at Lake Florida.

Analyte	**Result** 07/23/2018	**Result** 05/22/2019	**Applicable Class III Water Quality Criteria**
Field Temperature (°C)	29.88	29.30	N/A
Field pH (SU)	7.25	8.36	Within 1 SU of natural background
Field Dissolved Oxygen (% saturation)	97.6%	105.4%	*Peninsula Criteria: >7.57 mg/L, >7.65 mg/L; (>38.85%, >33.42%)
Field Specific Conductance (µmhos/cm)	158.0	161.5	50% above background or 1275 µmhos/cm, whichever is greater
Alkalinity (mg $CaCO_3$/L)	50	50	Shall not be depressed below 20
Color (PCU)	72 (A)	43	N/A
Chlorophyll a (µg/L)	39	13	≤ 20 µg/L for colored and alkaline clear lakes
Total Phosphorus (mg/L) as P	0.055	0.034	≤ 0.05 mg/L, ≤ 0.16 mg/L
Nitrate+Nitrite (mg/L) as N	0.004 (U)	0.004 (I)	N/A
Ammonia (mg/L) as N	0.003 (I)	0.005 (I)	**<2.21 mg/L, <0.60 mg/L
Total Kjeldahl Nitrogen (mg/L) as N	0.83	0.83	N/A
Total Nitrogen (mg/L) as N	0.83	0.83	≤ 1.27 mg/L, ≤ 2.23 mg/L

* Instantaneous DO criterion calculated per DO Saturation Calculator

** Total ammonia criterion calculated per https://floridadep.gov/dear/water-quality-standards-program/documents/total-ammonia-nitrogen-calculator%C2%A0

A - Value reported is the mean of two or more determinations.

I – The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.

NA - Not applicable

U – Material was analyzed for but not detected. The reported value is the method detection limit for the sample analyzed.

Lake Vegetation Index

The 2018 LVI score for this lake was 15 out of a possible 100 points, corresponding with a "Not Healthy" designation. Table 3 contains the species list and occurrence information for this sampling event. A total of 9 invasive exotic plants were observed in the lake.

The 2019 LVI score for this lake was 16 out of a possible 100 points, corresponding with a "Not Healthy" designation. Table 4 contains the species list and occurrence information for this sampling event. A total of 7 invasive exotic plants were observed in the lake.

Table 3. Species list for the 07/23/2018 LVI at Lake Florida. An asterisk (*) indicates an invasive exotic plant species. P = present, D = dominant, C = codominant.

Lake Florida, 07/23/2018		**Sections**			
Taxon Name	**Common Names**	**1**	**4**	**7**	**10**
Acer rubrum	Red maple		P		P
**Alternanthera philoxeroides*	Alligator weed	P	P	P	P
Baccharis	Groundsel tree		P		
Boehmeria cylindrica	False Nettle		P		
Cephalanthus occidentalis	Common Buttonbush	P	P	P	P
Cicuta maculata	Spotted Water Hemlock		P		
**Cinnamomum camphora*	Camphor Tree		P		P
**Colocasia esculenta*	Taro; Wild Taro	P	P	P	P
Cyperus surinamensis	Tropical Flatsedge				P
Echinochloa walteri	Coast Cockspur			P	P
**Eichhornia crassipes*	Water Hyacinth	P	P		P
Eupatorium capillifolium	Dogfennel		P		
Hibiscus coccineus	Scarlet Primrose			P	
Hydrocotyle	Marsh Pennywort	P	P		P

**Ludwigia peruviana*	Peruvian Primrosewillow*	P	P		P
Mikania scandens	Climbing Hempvine	P	P	P	
Myrica cerifera	Southern Bayberry		P	P	
Panicum hemitomon	Maidencane			D	C
**Panicum repens*	Torpedo grass	C	C	P	C
Rumex	Dock		P		P
Sacciolepis striata	American cupscale	C	C		P
Sagittaria lancifolia	Bulltongue	P			
Salix caroliniana	Carolina Willow	P	P		P
**Salvinia minima*	Water Spangles	P	P		P
**Sapium sebiferum*	Chinese Tallow	P	P		P
Schoenoplectus californicus	Bullrush			P	
Taxodium	Cypress				P
Thalia geniculata	Alligator Flag			P	
Typha	Cattail	P			P
Vigna luteola	Hairypod cowpea	P			
Vitis	Grapevine	P	P		P
**Wedelia trilobata*	Creeping oxeye	P			P

Table 4. Species list for the 05/22/2019 LVI at Lake Florida. An asterisk (*) indicates an invasive exotic plant species. P = present, D = dominant, C = codominant.

Lake Florida, 05/22/2019		Sections			
Taxon Name	**Common Name**	**3**	**6**	**9**	**12**
Acer rubrum	Red Maple	P		C	
**Alternanthera philoxeroides*	Alligator Weed	P	P		P
Baccharis	Groundsel Tree	P			
Cephalanthus occidentalis	Common Buttonbush	P		P	P
Cicuta maculata	Spotted Water Hemlock		P		P
**Cinnamomum camphora*	Camphor Tree	P		C	P
**Colocasia esculenta*	Taro; Wild Taro	P	P	P	P
**Eichhornia crassipes*	Water Hyacinth	P	P	P	D
Hydrocotyle	Marshpennywort	P	P	P	P
Ilex cassine	Dahoon	P			P
Lemna	Duckweed	P			
Ludwigia octovalvis	Mexican Primrosewillow		P		
Magnolia virginiana	Sweetbay	P			
Mikania scandens	Climbing Hempvine		P		
Myrica cerifera	Southern Bayberry; Wax Myrtle	P			
Panicum hemitomon	Maidencane	P	P	P	
**Panicum repens*	Torpedo Grass	P	D		P
Phyla nodiflora	Turkey Tangle Fogfruit; Capeweed	P	P		
Polygonum punctatum	Dotted Smartweed	P	P		
Rubus	Blackberry	P			
Rumex	Dock			P	P
Sabal palmetto	Cabbage Palm			P	P
Salix caroliniana	Carolina Willow	D			
**Salvinia minima*	Water Spangles	P			
**Scirpus cubensis*	Cuban Bulrush	P	P		
Sesbania punicea	Purple Sesban	P			
Taxodium	Cypress		P	P	
**Urochloa mutica*	Para Grass		P		P
Vitis	Cattail	P			P
**Wedelia trilobata*	Creeping Oxeye				P

Conclusions

Sampling at Lake Florida indicates that the lake did not meet applicable State Water Quality Criteria. The Lake Vegetation Index indicated plant communities that are not consistent with expectations for a healthy, well-balanced lake. Chlorophyll *a* and total phosphorus results were inconclusive, indicating that the lake failed to meet applicable State Water Quality Criteria for these analytes in 2018 but did meet them in 2019.

During the 2019 LVI assessment, it was observed that herbicide treatments had been applied around the entire lake, targeting the invasive exotic water hyacinth (*Eichhornia crassipes*). Such treatments may affect both chemical and biological parameters. High chlorophyll *a* can be indicative of phytoplankton becoming the primary consumer of nutrients within lake instead of beneficial, native aquatic plants. The LVI scores assessed during both sampling events were lower than expected for a healthy lake. The presence of numerous invasive exotic taxa, and the abundance of three of these invasive taxa, is largely responsible for the LVI failures.

Additional nutrient and chlorophyll data from throughout the assessment period will be required to establish a more definitive assessment. DEP will continue to monitor and assess this waterbody to ensure compliance with Florida water quality standards.

Thank you for your interest in maintaining the water quality of Florida's lakes. Please contact us if you have any questions.

Contact and resources for more information

Kathryn March, 407-897-4174
Kathryn.W.March@FloridaDEP.gov

Or Terry Riordan, 407-897-2959,
Terry.Riordan@FloridaDEP.gov

DEP biological assessment resources:
https://floridadep.gov/dear/bioassessment
FWCC Aquatic Plant Management:
http://myfwc.com/wildlifehabitats/invasive-plants/
Freshwater Algal Bloom information:
https://floridadep.gov/dear/algal-bloom