LAKE ECOSUMMARY

Lake Hooker, WBID 1547D, Hillsborough County, 08/14/2018 and 05/20/2019



Figure 1. Lake Hooker in Hillsborough County.

DEP conducted water quality and biological sampling at Lake Hooker (WIN G2SW0069, SBIO LAKEHOOKER) in Hillsborough County on August 14, 2018 and May 20, 2019 to assess attainment of designated uses. This lake was sampled as part of the 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

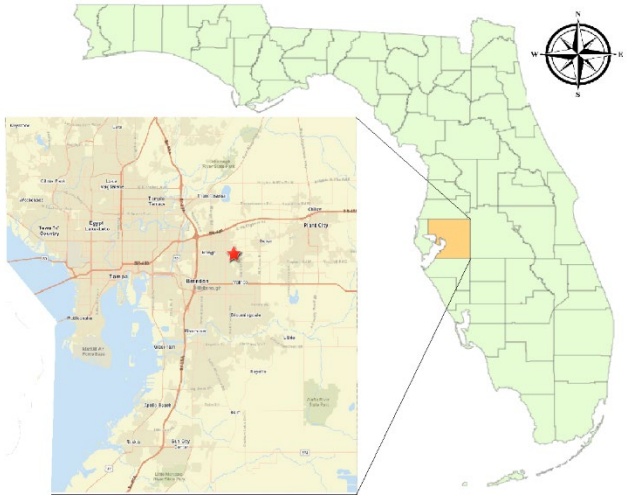


Figure 2. Location of Lake Hooker in Hillsborough County.

Lake Hooker (Figure 1 & 2) is in Valrico, in the center of Hillsborough County and is 16.5 hectares in area. Water depths of 1.3 m (4.2 ft) have been recorded near the center of the lake. Seffner Canal flows into wetlands surrounding the northeast quadrant of the lake and the lake outflows into wetlands to the southwest. The predominant land uses surrounding Lake Hooker are non-forested wetlands, high density residential, and low density residential. This lake is not currently listed on the Impaired Waters Verified List (11/15/2019). Additional information about this WBID is available in the Water

Quality Assessments, TMDLs, and BMAPs map application (https://fdep.maps.arcgis.com/home/webmap/viewer.html?webmap=1b4f1bf4c9c3481fb2864a415fbeca77).

Methods

Water Quality

Lake Hooker was sampled on August 14, 2018 and May 20, 2019 by the DEP Southwest Regional Operations Center (ROC). Surface water samples were collected from the center of the lake for analysis of nutrients, chlorophyll *a*, turbidity, chloride, color, alkalinity, total dissolved solids, total suspended solids, fluoride, and *Escherichia coli* following DEP Standard Operating Procedures (SOPs; see http://dep.state.fl.us/water/sas/sop/sops.htm). 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 in Table 1 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 data provided in this report, Lake Hooker would be assessed as a colored 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:

http://www.dep.state.fl.us/water/wqssp/swq-docs.htm.

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 a LVI score of 43 or greater meets the expectation of a healthy, well balanced community, and scores below 43 are considered impaired.

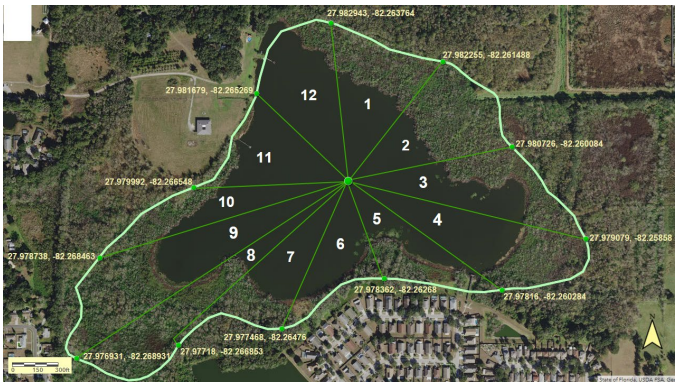


Figure 3. LVI sampling map of Lake Hooker. Sections 2, 5, 8, 11 were sampled for the Lake Vegetation Index. The water quality sample was collected from the lake center.

Results

Water Quality

The water quality results are shown in Table 2. Dissolved oxygen and pH met the Class III criteria, but chlorophyll a, total phosphorus, and total nitrogen were in exceedance of the criteria for both sampling events. Total nitrogen, the measure of nitrate+nitrite plus total Kjeldahl nitrogen (TKN), was almost entirely comprised of TKN. TKN is the measure of organic nitrogen and ammonia.

Escherichia coli (*E. coli*) are measured in colony forming units (cfu). The August 2018 sample measured 4 cfu/100 mL after dilution. *E. coli* was not sampled in May 2019. Criteria for *E. coli* are based on a monthly geometric mean of a minimum of 10 samples collected over a 30-day period or Ten Percent Threshold Value (TPTV) of 130 in 10% or more of the samples over the 30-day period.

Based on these two sampling events, the lake exceeded the nutrient thresholds for high color 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 08/14/2018 and 05/20/2019 at Lake Hooker.

Analyte	**Result** 08/14/2018	**Result** 05/20/2019	**Applicable Class III Water Quality Criteria**
Field Temperature (°C)	29.4	28.1	
Field pH (SU)	7.07	7.45	Within 1 SU of natural background
Field Dissolved Oxygen (% saturation)	104	97	*35.35 and 35.05
Field Specific Conductance (µmhos/cm)	141	187	50% above background or 1275, whichever is greater
Alkalinity (mg $CaCO_3$/L)	27	17	
Color (PCU)	80	81 Q	N/A

Chlorophyll a (µg/L)	100	200 A	≤ 20 for colored and alkaline clear lakes
Total Phosphorus (mg/L) as P	0.22	0.49	0.05 m/g
Nitrate+Nitrite (mg/L) as N	0.004 U	0.004 U	
Ammonia (mg/L) as N	0.005	0.015	**2.50 and 2.16
Total Kjeldahl Nitrogen (mg/L) as N	1.8	5.0	N/A
Total Nitrogen (mg/L) as N	1.8	5.0	1.27
Turbidity (NTU)	9.6	35 Q	≤ 29 above natural background conditions
Chloride (mg Cl/L)	19	31	
Total Dissolved Solids (mg/L)	99	120	
Total Suspended Solids (mg/L)	11	50	
Fluoride (mg F/L)	0.18	0.29	≤ 10.0 mg/L
Escherichia coli Bacteria (cfu/100 mL)	4 B	Not Sampled	≤ 410 Count/ 100 mL

* Instantaneous DO criterion calculated per DO Saturation Calculator.

** Total ammonia criterion calculated per Total Ammonia Nitrogen Calculator

A – value reported is the mean of two or more determinations.

B – colony counts outside the acceptable range.

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

Q - sample held beyond the accepted holding time.

Lake Vegetation Index

The LVI scores for this lake were 17 and 28 out of a possible 100 points, corresponding with a "Not Healthy" designation. Table 3 and Table 4 contain the species lists and occurrence information for these sampling events. Seven exotic FLEPPC species were observed in 2018, with five of the species present in all four of the assessed segments. Five exotic FLEPPC species were observed in 2019, with three of the species present in all four of the assessed segments. Exotic FLEPPC species are marked with an asterisk in Tables 3 and 4. Two FLEPPC species, *Triadica sebifera* and *Eichhornia crassipes*, were codominant in one section of Lake Hooker in 2018. *Ludwigia peruviana*, a FLEPPC species, was codominant in two sections with a native species, *Salix caroliniana* in 2019.

Table 3. Species list for the 08/14/2018 LVI at Lake Hooker. An asterisk (*) indicates an invasive exotic plant species. P = present, D = dominant, C = codominant.

Lake Hooker, August 14, 2018		Sections			
Scientific Name	**Common Name**	**2**	**5**	**8**	**11**
Acer rubrum	RED MAPLE	P	P		P
Aeschynomene americana	SHYLEAF				P
*Alternanthera philoxeroides	ALLIGATOR WEED	P	P	P	P
Baccharis	SALT BUSH		P	P	
Ceratopteris thalictroides	WATERSPRITE		P		
Commelina	DAYFLOWER		P		
Cyperus lecontei	LECONTE'S FLATSEDGE		P		
Cyperus odoratus	FRAGRANT FLATSEDGE		P		
Cyperus surinamensis	TROPICAL FLATSEDGE		P		
Echinochloa walteri	COAST COCKSPUR		P		P
*Eichhornia crassipes	WATER HYACINTH	P	C	P	P
Eleocharis baldwinii	BALDWIN'S SPIKERUSH; ROADGRASS	P	P		P
Hydrocotyle	MARSHPENNYWORT	P	P	P	P
Juncus effusus	SOFT RUSH		P		P
Juncus megacephalus	BIGHEAD RUSH		P		
Lemna	DUCKWEED	P	P	P	P
Ludwigia grandiflora	LARGEFLOWER PRIMROSEWILLOW		P		
Ludwigia leptocarpa	ANGLESTEM PRIMROSEWILLOW	P	P	P	P
*Ludwigia peruviana	PERUVIAN PRIMROSEWILLOW	P	P	P	P
Luziola fluitans	SOUTHERN WATERGRASS		P		
Micranthemum glomeratum	MANATEE MUDFLOWER		P		
Micranthemum umbrosum	SHADE MUDFLOWER	P			P
Mikania scandens	CLIMBING HEMPVINE	P	P		P

Morella cerifera	SOUTHERN BAYBERRY; WAX MYRTLE		P		P
Panicum hemitomon	MAIDENCANE		P	P	
*Panicum repens	TORPEDO GRASS		P	P	
Paspalidium geminatum	EGYPTIAN PASPALIDIUM; KISSIMMEEGRASS				P
Paspalum repens	WATER PASPALUM	P	P		P
Paspalum urvillei	VASEYGRASS				P
*Pistia stratiotes	WATER-LETTUCE	P	P	P	P
Persicaria glabra	DENSEFLOWER SMARTWEED	P	P	P	P
Persicaria punctata	DOTTED SMARTWEED	P	P	D	D
Rhynchospora perplexa	PINELAND BEAKSEDGE		P		
Ricciocarpus natans	DEER PAW	P	P	P	P
Sacciolepis striata	AMERICAN CUPSCALE		P	P	
Salix caroliniana	CAROLINA WILLOW; COASTALPLAIN WILLOW	D	P	P	P
*Salvinia minima	WATER SPANGLES	P	P	P	P
*Triadica sebifera	CHINESE TALLOW		C	P	P
Scirpus cubensis	CUBAN BULRUSH	P	P	P	P
Scleria	NUTRUSH		P		
Thelypteris interrupta	HOTTENTOT FERN; WILLDENOW'S FERN	P	P	P	P
Typha	CATTAIL		P	P	P

Table 4. Species list for the 05/20/2019 LVI at Lake Hooker. An asterisk (*) indicates an invasive exotic plant species. P = present, D = dominant, C = codominant.

Lake Hooker, May 20, 2019		**Sections**			
Scientific Names	**Common Names**	**2**	**5**	**8**	**11**
Acer rubrum	RED MAPLE	P	P	P	P
*Alternanthera philoxeroides	ALLIGATOR WEED	P	P	P	P
Bidens laevis	BURRMARIGOLD; SMOOTH BEGGARTICKS	P	P	P	
Chasmanthium nitidum	SHINY WOODOATS		P		
Cyperus odoratus	FRAGRANT FLATSEDGE	P	P		P
Echinochloa walteri	COAST COCKSPUR		P		P
Eleocharis baldwinii	BALDWIN'S SPIKERUSH; ROADGRASS		P	P	P
Hydrocotyle	MARSHPENNYWORT	P	P	P	P
Juncus effusus	SOFT RUSH				P
Lemna	DUCKWEED	P	P	P	P
Ludwigia leptocarpa	ANGLESTEM PRIMROSEWILLOW		P		
Ludwigia peploides	FLOATING PRIMROSEWILLOW	P			P
*Ludwigia peruviana	PERUVIAN PRIMROSEWILLOW		C	P	C
Mikania scandens	CLIMBING HEMPVINE		P	P	P
Morella cerifera	SOUTHERN BAYBERRY; WAX MYRTLE	P			
Nuphar	SPATTERDOCK		P	P	P
Panicum hemitomon	MAIDENCANE		P	P	P
Paspalidium geminatum	EGYPTIAN PASPALIDIUM; KISSIMMEEGRASS	P	P		P
Paspalum repens	WATER PASPALUM		P		P
*Pistia stratiotes	WATER-LETTUCE	P	P	P	P
Persicaria glabra	DENSEFLOWER SMARTWEED		P	P	P
Persicaria punctata	DOTTED SMARTWEED	P	P		P
Rumex			P	P	P
Sacciolepis striata	AMERICAN CUPSCALE	P			P
Salix caroliniana	CAROLINA WILLOW; COASTALPLAIN WILLOW	D	C	D	C
*Salvinia minima	WATER SPANGLES		P	P	
Sambucus canadensis	ELDERBERRY				P
*Triadica sebifera	CHINESE TALLOW	P	P	P	P
Scirpus cubensis	CUBAN BULRUSH		P	P	
Sesbania			P		
Thelypteris interrupta	HOTTENTOT FERN; WILLDENOW'S FERN	P	P	P	P
Typha	CATTAIL	P	P		P

Conclusions

Sampling at Lake Hooker indicates that the lake did not meet applicable state Water Quality Criteria.

High nutrient levels measured in Lake Hooker were associated with imbalances in the lake's floral community. High chlorophyll *a* measured in Lake Hooker indicates that phytoplankton has become the primary consumer of the lake's elevated nutrients instead of beneficial, native aquatic plants. Consequently, the LVI score was less than expected for a healthy lake. Additional nutrient and chlorophyll data from the assessment period will be required to fully determine an impairment listing status for this waterbody.

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

Sarah Meyer, Sarah.Meyer@dep.state.fl.us

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