LAKE ECOSUMMARY

Lake Barber
WBID 3036A1, Orange County
Sampled August 1, 2018 and June 3, 2019



Figure 1. Lake Barber in Orange County.

DEP conducted water quality and biological sampling at Lake Barber (STORET G2CE0209 and G2CE0152; SBIO Name LAKEBARBER and LKBarber) in Orange County on 08/01/2018 and 06/03/2019, to assess attainment of designated uses. This lake 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

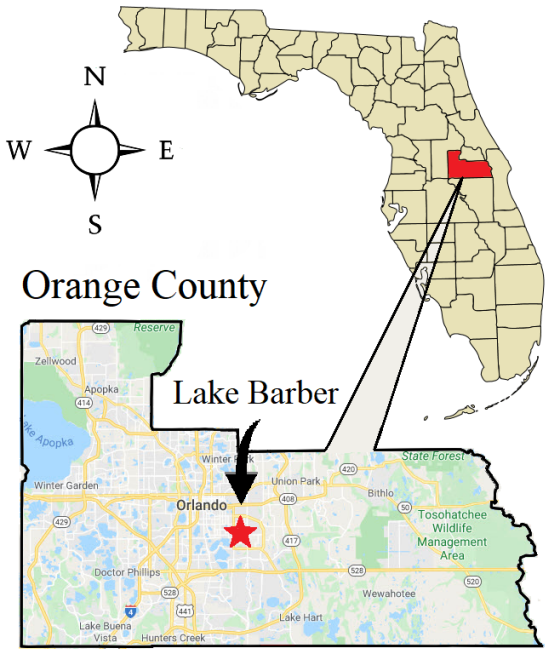


Figure 2. Location of Lake Barber in Orange County.

Lake Barber (Figures 1 and 2), aka Lake George, is within Orange County and is part of the Little Econlockhatchee River Drainage Basin. The area of the lake is approximately 69 acres, with depths up to 13.3 meters. Water flows from Lake Barber via pipe and a network of channels to the Little Econlockhatchee River. The predominant land uses surrounding Lake Barber are medium to high density residential, improved pastures, and a public park (Figure 3). This lake is not currently listed on the Impaired Waters Verified List (10/25/2019). The Lake is listed on the Study List for the Lake Vegetation Index (LVI) due to LVI results presented in this report. 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).

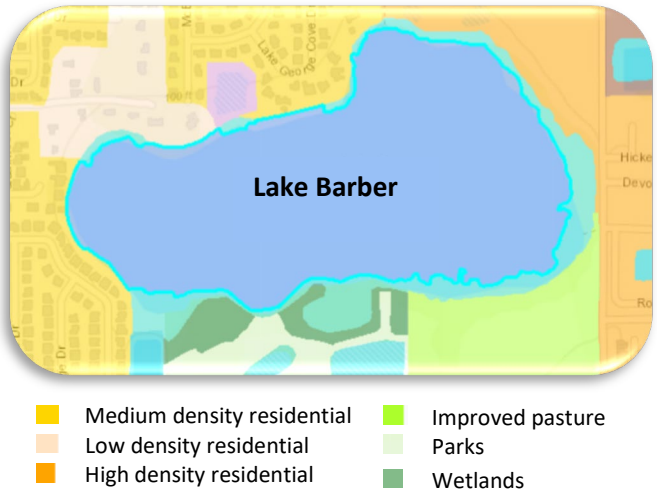


Figure 3. Map displaying predominant land uses in the area surrounding Lake Barber.

Methods

Water Quality

This lake was sampled on 08/01/2018 and 06/03/2019 by the DEP Central Regional Operations Center (CEROC). Surface water samples were collected from the center of the lake and at a station west of the center for analysis of nutrients, metals, chlorophyll α, alkalinity, color, turbidity, *Escherichia coli* (*E. coli*), chloride, fluoride, sulfate, and pesticides 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 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 alkalinity and color presented in this report, Lake Barber is a low 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 4), 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.

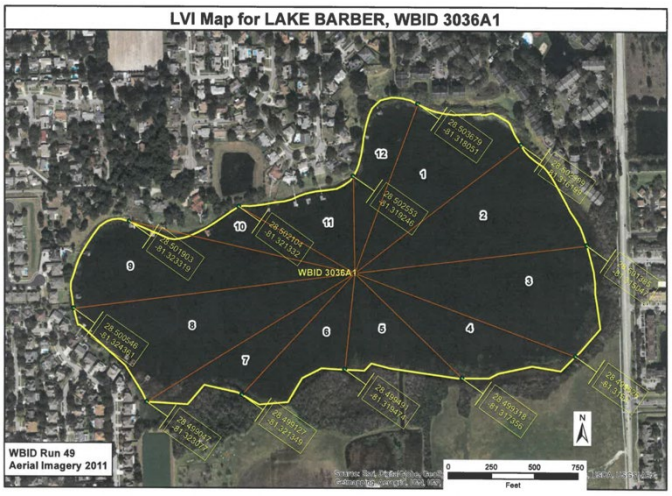


Figure 4. LVI sampling map of Lake Barber. Sections 3,6,9,12 were sampled for the Lake Vegetation Index in 2019. Sections 1,4,7,10 were sampled for the Lake Vegetation Index in 2018. The water quality sample was collected from the lake center in 2019 and west of the lake center in 2018.

Results

Water Quality

The water quality results are shown in Table 2. All of the water quality results met the applicable water quality criteria.

Based on these two sampling events, the lake met the nutrient thresholds for low 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.

A suite of pesticide analyses was conducted during the 08/01/2018 sampling event. Low levels of the insecticides Imidacloprid and Fipronil and the herbicides 2,4-D, Ametryn, Atrazine, Bentazon, Haxazinone, Imazapyr, Fluridone, and Metolachlor were detected.

Table 2. Water quality results from 08/01/2018 and 06/03/2019 at Lake Barber

Analyte	Result [08/01/2018]	Result [06/03/2019]	Applicable Class III Water Quality Criteria
Field Temperature (°C)	30.36	30.76	
Field pH (SU)	7.3	7.6	Within 1 unit of natural background
Field Dissolved Oxygen (% saturation)	93	102	>35.59%, >36.11%
Field Specific Conductance (µmhos/cm)	141	149	50% above background or 1275, whichever is greater
Alkalinity (mg $CaCO_3$/L)	22	24	Shall not be depressed below 20 [or if natural alkalinity is low, shall not be reduced by more than 25%]
Color (PCU)	13	11	N/A
Chlorophyll a (µg/L)	5.9	3.4	≤20 ug/L for clear alkaline lakes
Total Phosphorus (mg/L) as P	0.01	0.008	< 0.09 mg/L
Nitrate+Nitrite (mg/L) as N	0.004 U	0.004 U	
Ammonia (mg/L) as N	0.002 I	0.002 I	** < 2.10 mg/L, < 1.66 mg/L
Total Kjeldahl Nitrogen (mg/L) as N	0.43	0.52	N/A
Total Nitrogen (mg/L) as N	0.43	0.52	< 1.91 mg/L
2,4-D (ug/L)	0.0050 I	N/A	
Ametryn (ng/L)	20	N/A	
Atrazine (ng/L)	2.3	N/A	
Atrazine Desethyl (ng/L)	3.9 I	N/A	
Bentazon (ug/L)	0.0055	N/A	
Hexazinone (ng/L)	0.63 I	N/A	
Imazapyr (ug/L)	0.047	N/A	
Imidacloprid (ug/L)	0.0024 I	N/A	
Fipronil Sulfide (ng/L)	0.17 I	N/A	
Fipronil Sulfone (ng/L)	1.1	N/A	
Fluridone (ug/L)	0.031	N/A	
Metolachlor (ng/L)	0.032 I	N/A	

* 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

U = Value is less than the laboratory method detection limit.
I = Value is between the laboratory method detection limit and the laboratory practical quantification limit.

Lake Vegetation Index

The 08/01/2018 LVI score for this lake was 38 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 6 invasive exotic plants were observed in the lake. The

invasive exotic *Panicum repens* was identified as the dominant species in one section.

The 06/03/2019 LVI score for this lake was 45 out of a possible 100 points, corresponding with a "Healthy" designation. Table 4 contains the species list and occurrence information for this sampling event. A total of 5 invasive exotic plants were observed in the lake. There were no known restoration activities on the lake between the two sampling events. Several native plant species were identified as dominant or codominant in the assessed sections of the lake which contributed to the improved score. Additionally, different lake sections were assessed during the sampling events in 2018 and 2019, possibly contributing to a difference in final score.

Table 3. Species list for the 08/18/2018 LVI at Lake Barber. An asterisk (*) indicates an invasive exotic plant species. P = present, D = dominant, C = codominant.

Lake Barber, 08/18/2018		Sections			
Scientific Name	Common Name	1	4	7	10
Acer rubrum	Red maple	P	P	P	
*Alternanthera. philoxeroides**	Alligator weed	P			P
Chara	Muskgrass	P	P		P
*Cinnamomum camphora**	Camphor tree	P		P	
Diodia virginiana	Virginia buttonweed				P
Eleocharis. interstincta	Knotted spikerush			P	
Eleocharis submersed viviparous	Spikerush	P	P		
Eupatorium capillifolium	Dogfennel		P	P	P
Fuirena scirpoidea	Southern umbrellasedge	P	P	P	
Hydrocotyle	Marshpennywort	P		P	P
Lacnanthes.caroliniana	Carolina redroot		P		
*Melalueca quinquenervia**	Melaleuca	P			
Mikania scandens	Climbing hempvine	P		P	P
Myrica cerifera	Southern bayberry; wax myrtle	P	P	P	P
Najas guadalupensis	Southern waternymph	P			
Nitella	N/A		P	D	P
Nuphar	Spatterdock	P	P	P	P
Nymphaea odorata	American white waterlily	P	P	P	P
Panicum hemitomon	Maidencane	P	P	P	P
*Panicum repens**	Torpedo grass	P	D	P	P
Pluchea	Sweetscent			P	P
Polygonum hirsutum	Hairy smartweed	P		P	P
Pontederia cordata	Pickerelweed	P			
Rhexia	Meadow Beauty		P		
Rhynchospora nitens	Shortbeak beaksedge		P	P	
Ricciocarpus natans	n/a				
Rumex	Dock			P	
Sagittaria lancifolia	Bulltongue arrowhead	P	P	P	
Salix caroliniana	Carolina willow	P		P	P
Sambucus canadensis	Elderberry	P			
*Sapium sebiferum**	Chinese tallow	P	P	P	P
*Schinus terebinthifolius**	Brazilian pepper	P		P	
Taxodium	Cypress		P		
Typha	Cat-tails	P		P	P
Vigna luteola	Hairypod cowpea				P
Xyris	Yelloweyed grass		P	P	

Table 4. Species list for the 06/03/2019 LVI at Lake Barber. An asterisk (*) indicates an invasive exotic plant species. P = present, D = dominant, C = codominant.

Lake Barber, 06/03/2019		Sections			
Scientific name	Common name	3	6	9	10
*Alternanthera philoxeroides**	Alligator weed			P	
Baccharis	Falsewillow		P		
Canna	Golden canna			P	
Cladium jamaicense	Jamaica swamp sawgrass			P	
Eleocharis interstincta	Knotted spikerush	P		P	
Eleocharis submersed viviparous (species unknown)	Spikerush			P	
Eupatorium capillifolium	Dogfennel	P			
Fuirena scirpoidea	Southern umbrellasedge	C	D	P	P
Hydrocotyle	Marshpennywort	P		P	P
Lachnanthes caroliniana	Carolina redroot		P		
Ludwigia leptocarpa	Anglestem primrosewillow			P	
*Ludwigia peruviana**	Peruvian primrosewillow	P		P	P
*Melaleuca quinquenervia**	Melaleuca	P			
Mikania scandens	Climbing hempvine	P		P	P

Myrica cerifera	Wax myrtle		P		P
Nelumbo lutea	American lotus				
Nuphar	Spatterdock			P	P
Nymphaea odorata	American white waterlily	C		P	P
Panicum hemitomon	Maidencane	P	P	C	D
*Panicum repens**	Torpedo grass	P	P	P	P
Pluchea	Camphorweed			P	
Polygonum punctatum	Dotted smartweed			P	P
Pontederia cordata	Pickerelweed		P	P	
Sagittaria lancifolia	Bulltongue arrowhead	P	P	P	
Sagittaria latifolia	Duck potato				
Salix caroliniana	Carolina willow	P	P	P	P
Sambucus canadensis	American elder; elderberry	P	P		
*Sapium sebiferum**	Chinese tallow		P		P
Schoenoplectus tabernaemontani	Bulrush			P	
Taxodium	Cypress			P	
Typha	Cattail	P	P	C	P
Utricularia resupinata	Small purple bladderwort			P	
Vallisneria americana	Tapegrass; american eelgrass			P	
Vigna luteola	Hairypod cowpea	P	P	P	P

Conclusions

Sampling at Lake Barber indicates that the lake met applicable State Water Quality Criteria but did not meet expectations for a healthy, well balanced plant community.

Water quality results were well within acceptable limits for chlorophyll *a*, total nitrogen and total phosphorus on 08/01/2018 and 06/03/2019. The Lake Vegetation Index results differed between sampling events, from "Not Healthy" in 2018 to "Healthy" in 2019, but because the average score of these two LVI events was less than 43, the plant community does not meet expectations of a healthy, well balanced lake.
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

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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