LAKE ECOSUMMARY

Camel Lake, WBID 1039A
Liberty County
July 24, 2019 and October 5, 2020



DEP conducted water quality and biological sampling at Camel Lake (STORET/WIN 31010183, SBIO CAMELREF) in Liberty County on July 24, 2019 and October 5, 2020 to assess attainment of designated uses. This lake was sampled as part of the DEP Reference Lake Sampling Project. Overall, the water quality and plant community data indicated that the lake met 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 Camel Lake in Liberty County. Solid line is the Liberty County boundary.

Located in the northwest area of the Apalachicola National Forest and within Camel Lake Campground, the predominant land uses surrounding Camel Lake are natural/forest and silviculture (Figure 2). With the exception of a beach connected to Camel Lake Campground, Camel Lake is surrounded by natural vegetation that provides a buffer of greater than 18 m (Figure 1). This lake is not currently listed for any parameters on the Impaired Waters Verified List. Additional information about this WBID is available in the Water Quality Assessments, TMDLs, and BMAPs map application.

Methods

Water Quality

This lake was sampled on July 24, 2019 and October 5, 2020 by the DEP, Division of Environmental Assessment and Restoration (DEAR), Aquatic Ecology and Quality Assurance Section (AEQAS). Surface water samples were collected from the center of the lake for analysis of chlorophyll *a*, alkalinity, chloride, color, fluoride, sulfate, nutrients, and metals following DEP Standard Operating Procedures. 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 and alkalinity results presented in this report, Camel Lake is a low color, low 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 & Alkalinity	AGM Chlorophyll *a* (µg/L)	AGM TP Range (mg/L)	AGM TN Range (mg/L)
> 40 Platinum Cobalt Units	20	0.05 - 0.16[1]	1.27 - 2.23
≤ 40 Platinum Cobalt Units and > 20 mg/L $CaCO_3$	20	0.03 - 0.09	1.05 - 1.91
≤ 40 Platinum Cobalt Units and ≤ 20 mg/L $CaCO_3$	6	0.01 - 0.03	0.51 - 0.93

[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 Panhandle West region for DO criteria assessment. Percent saturation considers 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 and calculated 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.

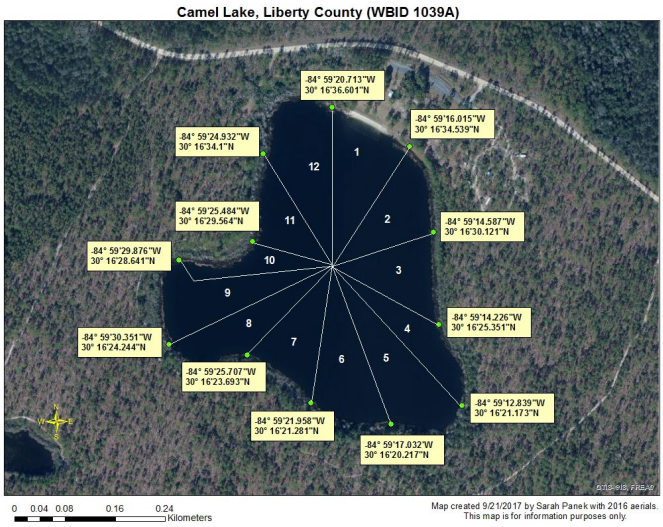


Figure 3. LVI sampling map of Camel Lake. Sections 1,4,7,10 were sampled for the LVI. The water quality sample was collected from the lake center.

Results

Water Quality

The water quality results are shown in Table 2. Based on the laboratory results, water quality criteria were not exceeded for any of the parameters collected. Based on these two sampling events, the lake met the nutrient thresholds for low color, low 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 July 24, 2019 and October 5, 2020 at Camel Lake.

Analyte	Result 7/24/19	Result 10/5/20	Applicable Class III Water Quality Criteria
Field Temperature (°C)	30.9	23.5	
Field pH (SU)	5.23	5.5	Within 1 unit of natural background
Field Dissolved Oxygen (% saturation)	85.8	88.2	*Panhandle West Criterion: 70% for 7/24/19, 66% for 10/5/20
Field Specific Conductance (µmhos/cm)	14.6	15.5	50% above background or 1275, whichever is greater
Alkalinity (mg $CaCO_3$/L)	0.65 U	0.65 U	Shall not be depressed below 20 [or if natural alkalinity is low, shall not be reduced by more than 25%]
Color (PCU)	5.9 I	7.9	N/A
Chlorophyll a (µg/L)	1.6 I	2.5 I	≤ 20 for colored and alkaline clear lakes
Total Phosphorus (mg/L) as P	0.005	0.006	0.03
Nitrate+Nitrite (mg/L) as N	0.004 U	0.009 I	N/A
Ammonia (mg/L) as N	0.003 I	0.005 I	**2.64 for 7/24/19, 4.25 for 10/5/20

Total Kjeldahl Nitrogen (mg/L) as N	0.19 I	0.22	N/A
Total Nitrogen (mg/L) as N	0.19	0.229	0.93

* 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
I: The reported value is greater than or equal to the laboratory method detection limit but less than the laboratory practical quantitation limit.
U: Material was analyzed for but not detected. The reported value is the method detection limit for the sample analyzed.

Phytoplankton

The algal community in the water column for the 7/24/2019 and 10/5/2020 sampling dates consisted of 10.96% and 37.5% cyanobacteria (blue-green algae), 55.81% and 33.22% green algae, 15.28% and 14.47% diatoms, and 3.32% and 4.28% dinoflagellates, respectively. Dominance in algal groups varies naturally throughout the year, but prolonged dominance of cyanobacteria may be associated with a higher risk for harmful algal blooms.

Lake Vegetation Index

The LVI score for this lake was 96 (2019) and 93 (2020) out of a possible 100 points, corresponding with an "Exceptional" (≥78) designation. Table 3 contains the species list and occurrence information for the July 24, 2019 sampling event. Table 4 contains the species list and occurrence information for the October 5, 2020 sampling event. No invasive exotic plants were observed in the lake for either sampling date.

Table 3. Species list for the July 24, 2019 LVI at Camel Lake. An asterisk (*) indicates an invasive exotic plant species. P = present, D = dominant, C = codominant.

Camel Lake, July 24, 2019		Sections			
Scientific Name	**Common Name**	**1**	**4**	**7**	**10**
Andropogon	BLUESTEM	P			
Centella asiatica	SPADELEAF	P			
Cyrilla racemiflora	TITI	P	P	P	P
Diodia virginiana	VIRGINIA BUTTONWEED	P			
Eclipta prostrata	FALSE DAISY	P			
Eleocharis submersed viviparous	VIVIPAROUS SPIKERUSH	P	P	P	P
Hypericum fasciculatum	SANDWEED; PEELBARK ST.JOHN'S-WORT	P	P	C	P
Juncus scirpoides	NEEDLEPOD RUSH	P			
Juncus tenuis	PATH RUSH; POVERTY RUSH	P			
Mayaca fluviatilis	STREAM BOGMOSS	C	P	P	P
Myriophyllum laxum	LOOSE WATERMILFOIL	P	C	P	C
Nuphar	SPATTERDOCK; YELLOW PONDLILY	P	P	P	P
Nymphaea odorata	AMERICAN WHITE WATERLILY	P	P		
Panicum hemitomon	MAIDENCANE	P	P	P	P
Rhexia	MEADOWBEAUTY	P			
Rhynchospora inundata	NARROWFRUIT HORNED BEAKSEDGE	P			
Sagittaria graminea	GRASSY ARROWHEAD	P			
Taxodium ascendens	POND-CYPRESS	P	P	P	P
Utricularia floridana	FLORIDA BLADDERWORT	C	C	C	C

Table 4. Species list for the October 5, 2020 LVI at Camel Lake. An asterisk (*) indicates an invasive exotic plant species. P = present, D = dominant, C = codominant.

Camel Lake, October 5, 2020		Sections			
Scientific Name	**Common Name**	**1**	**4**	**7**	**10**
Centella asiatica	SPADELEAF	P			
Cyrilla racemiflora	TITI	P	P	P	P
Eleocharis submersed viviparous	VIVIPAROUS SPIKERUSH	P		P	
Eupatorium	THOROUGHWORT	P			
Hypericum fasciculatum	SANDWEED; PEELBARK ST.JOHN'S-WORT	P	P	P	P
Ludwigia linearis	NARROWLEAF PRIMROSEWILLOW	P			

Mayaca fluviatilis	STREAM BOGMOSS	P			P
Myriophyllum laxum	LOOSE WATERMILFOIL	P	P	P	P
Nuphar	SPATTERDOCK; YELLOW PONDLILY	P	P	P	P
Nymphaea odorata	AMERICAN WHITE WATERLILY	P	P		
Panicum hemitomon	MAIDENCANE	P	P	P	P
Rhexia	MEADOWBEAUTY	P			
Rhynchospora fascicularis	FASCICLED BEAKSEDGE	P			
Scleria reticularis	NETTED NUTRUSH	P			
Taxodium	CYPRESS		P	P	P
Utricularia floridana	FLORIDA BLADDERWORT	D	D	D	D
Woodwardia virginica	VIRGINIA CHAIN FERN	P			

Conclusions

Sampling at Camel Lake indicates that the lake met applicable State Water Quality Criteria.

Water quality results were well within acceptable limits for chlorophyll *a*, total nitrogen and total phosphorus on July 24, 2019 and October 5, 2020. The Lake Vegetation Index indicated plant communities that are consistent with expectations for 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:

Jennifer Piacente
(850) 245-8073
Jennifer.Piacente@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