LAKE ECOSUMMARY

Lake Drawdy
WBID 3033D
Orange County
August 15, 2018 and June 12, 2019



Figure 1. Lake Drawdy in Orange County.

DEP conducted water quality and biological sampling at Lake Drawdy (STORET G2CE0079 and G2CE0078, DRAWDYNNE, Figure 1), in Orange County on August 15, 2018, and June 12, 2019, to assess attainment of designated uses. This lake was sampled as part of a strategic monitoring program. Overall, the water quality data indicated that the lake met expectations for a healthy, well-balanced lake, however plant community data was inconclusive.

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

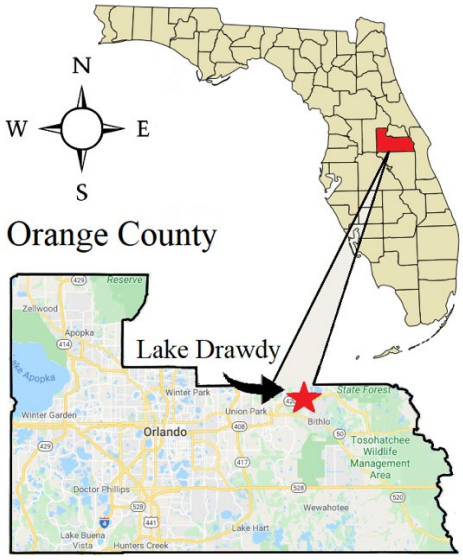


Figure 2. Location of Lake Drawdy in Orange County.

Lake Drawdy is located in Orange County and is part of the Econlockhatchee River Planning Unit (Figure 2). The area of the lake is approximately 52 acres with depths up to 15 feet. Water flows from Lake Drawdy through a culvert on its northeastern end into Lake Pickett. The predominant land use surrounding Lake Drawdy is low density residential with some natural wetland areas (Figure 3). This lake is currently not 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).



Figure 3. Predominant land uses surrounding Lake Drawdy.

Methods

Water Quality

This lake was sampled on August 15, 2018 and June 12, 2019 by the FDEP Central Regional Operations Center (CEROC). Surface water samples were collected from 150 meters north-northeast of the lake center for analysis of nutrients, metals, chlorophyll *a*, color, alkalinity, total suspended solids, total dissolved solids, turbidity, chloride, fluoride, sulfate, and E. coli, 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 chlorophyll *a* annual geometric mean (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 Drawdy is a high color 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, so the 38 percent saturation threshold applies 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.

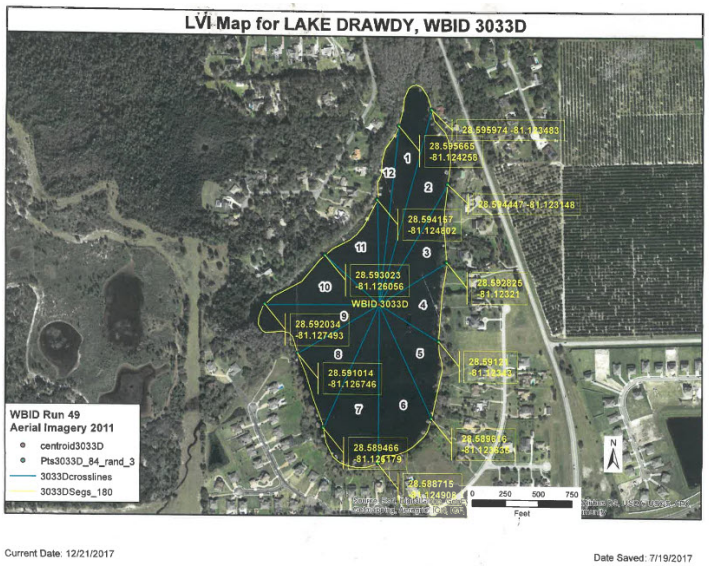


Figure 4. LVI sampling map of Lake Drawdy. Sections 2, 5, 8, 11 were sampled for the Lake Vegetation Index in 2018, and sections 1, 4, 7, 10 were sampled for the Lake Vegetation Index in 2019. The water quality samples were collected 150m NNE of the lake center in 2018 and 2019.

Results

Water Quality

The water quality results are shown in Table 2.

Based on these two sampling events, the lake met 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 08/15/2018 and 06/12/2019 at Lake Drawdy.

Analyte	Result 08/15/2018	Result 06/12/2019	Applicable Class III Water Quality Criteria
Field Temperature (°C)	29.95	29.04	
Field pH (SU)	5.51	6.35	Within 1 unit of natural background
Field Dissolved Oxygen (% saturation)	69%	92%	*39.5% for 6/12/19, *34.2% for 8/15/18
Field Specific Conductance (µmhos/cm)	96	140	50% above background or 1275, whichever is greater
Alkalinity (mg $CaCO_3$/L)	2.6	5.0	Shall not be depressed below 20 [or if natural alkalinity is low, shall not be reduced by more than 25%]
Color (PCU)	330	120	N/A
Chlorophyll a (µg/L)	16	10	≤ 20 for colored lakes
Total Phosphorus (mg/L) as P	0.020	0.017	0.16
Nitrate+Nitrite (mg/L) as N	0.01 I	0.004 U	
Ammonia (mg/L) as N	0.003 I	0.003 I	**2.97 for 6/12/19, 2.80 for 8/15/18
Total Kjeldahl Nitrogen (mg/L) as N	0.90	0.60	N/A
Total Nitrogen (mg/L) as N	0.91	0.60	2.23

* 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 between the laboratory method detection limit and 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.

Lake Vegetation Index

The LVI score for this lake was 58 out of a possible 100 points on August 15, 2018, corresponding with a "Healthy" designation, and was 39 on June 12, 2019, corresponding with a "Not Healthy" designation. In the 2018 assessment, no exotic taxa were noted as having a dominant presence in the assessed sections of the lake. In 2019, four species of invasive exotic taxa were identified as co-dominant with other native taxa in the assessed sections. This increase in exotic invasive dominance on the waterbody contributed to its lower score.

Tables 3 and 4 contain the species lists and occurrence information for these sampling events. A total of 8 invasive exotic plants were observed in the lake.

Table 3. Species list for the August 15, 2018, LVI at Lake Drawdy. An asterisk (*) indicates an invasive exotic plant species. P = present, D = dominant, C = codominant.

Lake Drawdy, August 15, 2018		Sections			
Scientific Name	Common Name	2	5	8	11
Acer rubrum	RED MAPLE		P	P	P
Alternanthera philoxeroides*	ALLIGATORWEED	P	P		
Blechnum serrulatum	TOOTHED MIDSORUS FERN	P	P		
Boehmeria cylindrica	BOG HEMP			P	
Canna flaccida	BANDANA-OF-THE-EVERGLADES		P		
Cephalanthus occidentalis	COMMON BUTTONBUSH	P	P	P	P
Cladium jamaicense	JAMAICA SWAMP SAWGRASS				P
Cyperus haspan	HASPAN FLATSEDGE		P		
Cyperus prolifer*	DWARF PAPYRUS	P	P	P	P
Eichhornia crassipes*	WATER HYACINTH	P	P	P	P
Eleocharis baldwinii	BALDWIN'S SPIKERUSH		P		
Eupatorium capillifolium	DOGFENNEL		P	P	
Hydrocotyle	MARSHPENNYWORT	P	P	P	P
Ilex cassine	DAHOON HOLLY	P		P	
Lachnanthes caroliniana	CAROLINA REDROOT				P
Ludwigia octovalvis	ANGLESTEM PRIMROSEWILLOW		P		P
Ludwigia peruviana*	PERUVIAN PRIMROSEWILLOW	P	P		
Magnolia virginiana	SWEETBAY			P	
Mikania scandens	CLIMBING HEMPVINE	P		P	

Myrica cerifera	WAX MYRTLE	P		P	
Nuphar	SPATTERDOCK	P	P	P	P
Nymphaea odorata	FRAGRANT WATERLILY	D	P	P	D
Nyssa sylvatica biflora	SWAMP TUPELO	P		P	
Osmunda cinnamomea	CINNAMON FERN				P
Osmunda regalis	ROYAL FERN	P		P	
Panicum hemitomon	MAIDENCANE	P	P	P	P
Panicum repens*	TORPEDO GRASS	P		P	P
Pluchea	CAMPHORWEED		P		P
Pontederia cordata	PICKERELWEED	P	P	P	P
Rhexia cubensis	WEST INDIAN MEADOWBEAUTY				P
Sabal palmetto	CABBAGE PALM			P	
Sagittaria lancifolia	BULLTONGUE ARROWHEAD	P	P	P	P
Salvinia minima*	WATER SPANGLES	P			
Scirpus cubensis*	CUBAN BULRUSH	P		P	P
Taxodium	CYPRESS	P	D	D	P
Triadenum virginicum	VIRGINIA MARSH ST.JOHN'S-WORT				P
Typha	CATTAIL	P	P	P	
Utricularia gibba	HUMPED BLADDERWORT		P	P	P
Utricularia radiata	LITTLE FLOATING BLADDERWORT	P	P	P	P
Vitis	MUSCADINE	P	P	P	
Woodwardia virginica	VIRGINIA CHAIN FERN		P		
Zizaniopsis miliacea	GIANT CUTGRASS	P	P		

Table 4. Species list for the June 12, 2019, LVI at Lake Drawdy. An asterisk (*) indicates an invasive exotic plant species. P = present, D = dominant, C = codominant.

Lake Drawdy, June 12, 2019		Sections			
Scientific Name	**Common Name**	**1**	**4**	**7**	**10**
Acer rubrum	RED MAPLE	P	P	P	P
Bidens mitis	BEGGARTICK	P			
Blechnum serrulatum	TOOTHED MIDSORUS FERN	P	P	P	P
Cephalanthus occidentalis	COMMON BUTTONBUSH	P	P	P	P
Cladium jamaicense	JAMAICA SWAMP SAWGRASS				P
Cyperus prolifer*	DWARF PAPYRUS	C	P	C	P
Eichhornia crassipes*	WATER HYACINTH	C	P	P	P
Eleocharis submersed viviparous (species unknown)	SPIKERUSH	P		P	
Eupatorium capillifolium	DOGFENNEL			P	
Gordonia lasianthus	LOBLOLLY BAY	P			P
Hydrocotyle	MARSHPENNYWORT		P		P
Ilex cassine	DAHOON HOLLY	P			
Ludwigia peruviana*	PERUVIAN PRIMROSEWILLOW	P	P	P	P
Magnolia virginiana	SWEETBAY	P			
Micranthemum glomeratum	MANATEE MUDFLOWER	P			
Mikania scandens	CLIMBING HEMPVINE	P	P	P	P
Myrica cerifera	WAX MYRTLE	P	P	P	P
Nuphar	SPATTERDOCK	P	P	P	P
Nymphaea odorata	FRAGRANT WATERLILY		P	C	C
Nyssa sylvatica biflora	SWAMP TUPELO	P	P		P
Panicum hemitomon	MAIDENCANE		C	P	
Panicum repens*	TORPEDOGRASS	P	C		P
Paspalum repens	WATER PASPALUM				P
Pontederia cordata	PICKERELWEED	P	P	P	P
Sagittaria lancifolia	BULLTONGUE ARROWHEAD			P	
Salix caroliniana	CAROLINA WILLOW	P			
Schinus terebinthifolius*	BRAZILIAN PEPPER			P	
Scirpus cubensis*	CUBAN BULRUSH	P	P	P	C
Taxodium	CYPRESS	P	P	P	P
Typha	CATTAIL			P	P
Utricularia gibba	HUMPED BLADDERWORT	P			

Conclusions

Sampling at Lake Drawdy was inconclusive in terms of meeting applicable State Water Quality Criteria. Water quality results were well within acceptable limits for chlorophyll *a*, total nitrogen and total phosphorus on August 15, 2018 and June 12, 2019.

The 2018 LVI score indicated plant communities that are consistent with expectations for a healthy, well-balanced lake; however, the 2019 LVI score was less than expected for a healthy lake. Different sections were assessed during each LVI, which could have contributed to the differences, but it's likely that the lower score in 2019 was due to an increase in abundance of invasive exotic taxa. Four exotic invasive taxa were identified as co-dominant in the 2019 Lake Vegetation Index: *Cyperus prolifer, Eicchornia crassipes, Panicum repens,* and *Cyperus blepharoleptos (Scirpus cubensis).* Unfortunately, there are no other vegetation index scores to which we can compare these two events. While the mean LVI score from these two assessments is in the "Healthy" range, additional monitoring is needed to determine if the plant community quality is declining in Lake Drawdy. 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