LAKE ECOSUMMARY

Lake Gleason
WBID 2893G
Volusia County
August 21, 2017 and July 11, 2018



Figure 1. Lake Gleason in Volusia County.

DEP conducted water quality and biological sampling at Lake Gleason (WIN ID G2CE0114, SBIO ID GLEASONCEN) in Volusia County on August 21, 2017 and July 11, 2018 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 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

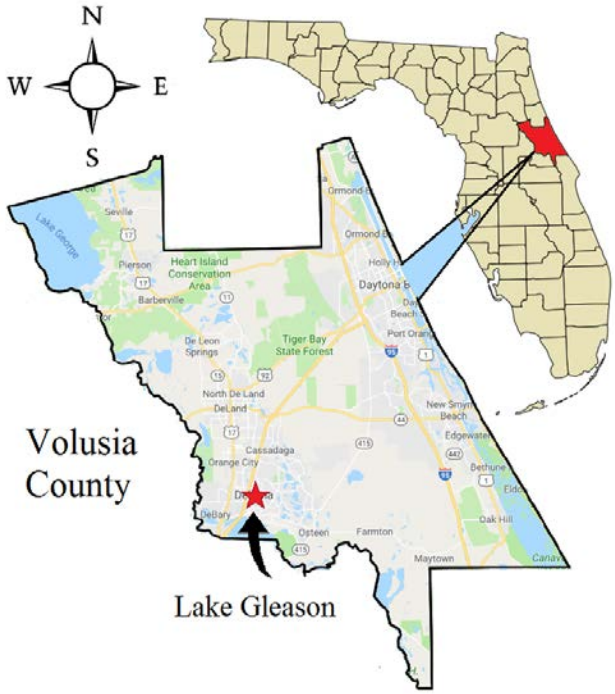


Figure 2. Location of Lake Gleason in Volusia County.

Lake Gleason (Figure 1) is in southwest Volusia County (Figure 2). The predominant land use surrounding Lake Gleason is residential, with some natural area, resulting in a Landscape Development Intensity Index (LDI) score of 6.55. The LDI (Brown and Vivas, 2007) functions as an objective measure of how human disturbance affects

biological, chemical, and physical processes of aquatic systems. To calculate an LDI score for lakes, a 100-meter buffer of land around the waterbody is used; an LDI score of 1 indicates minimal human disturbance while a score of 10 indicates extreme disturbance.

There is a county park located on one acre on the southwest shore, consisting of a boat launch, picnic area, pavilion, playground, and beach volleyball court. Lake Gleason is about 3 meters deep in most locations, with a few deeper spots of 4 meters. It contains an abundance of submersed and floating shoreline vegetation (Figure 3). This lake is not currently listed on the Impaired Waters Verified List. Additional information about this WBID is available in the TMDL Tracker application (http://prodenv.dep.state.fl.us/DearTmdl/welcomehz.do).

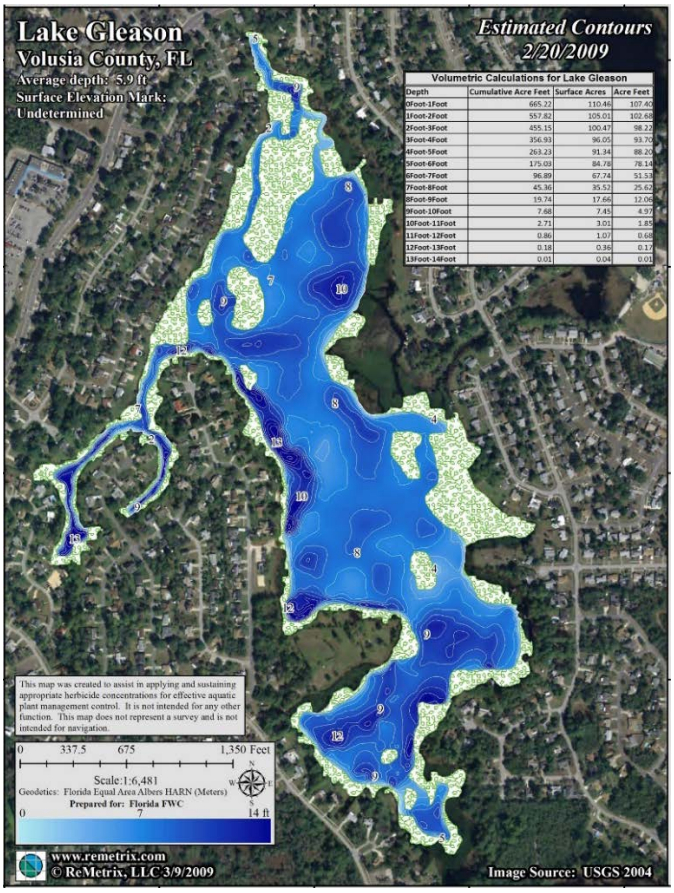


Figure 3. Bathymetry map of Lake Gleason in Volusia County. (Source: UF/IFAS)

Methods

Water Quality

This lake was sampled on August 21, 2017 and July 11, 2018 by the DEP Central Regional Operations Center (ROC). Surface water samples were collected from the center of the lake for analysis of turbidity, chloride, sulfate, color, alkalinity, total dissolved solids, total suspended solids, fluoride, ammonia, nitrogen, phosphorous, carbon, and orthophosphate 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 long-term color and alkalinity, Lake Gleason 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 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 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 Gleason. Sections 2, 5, 8, 11 were sampled for the Lake Vegetation Index on both dates. The water quality sample was collected from the lake center.

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 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.

Table 2. Water quality results from 8/21/2017 and 7/11/2018 at Lake Gleason.

Analyte	Result 8/21/2017	Result 7/11/2018	Applicable Class III Water Quality Criteria
Field Temperature (°C)	31.8	29.87	N/A
Field pH (SU)	7.5	6.87	Within 1 unit of natural background
Field Dissolved Oxygen (% saturation)	113	82	*>38 (8/21/17), >37 (7/11/18)
Field Specific Conductance (µmhos/cm)	165	157	50% above background or 1275, whichever is greater
Alkalinity (mg $CaCO_3$/L)	42	42	Shall not be depressed below 20 [or if natural alkalinity is low, shall not be reduced by more than 25%]
Color (PCU)	30	31	N/A
Chlorophyll a (µg/L)	3.1 A	3.3	≤ 20 for colored and alkaline clear lakes
Total Phosphorus (mg/L) as P	0.012	0.013	***<0.09 mg/L
Nitrate+Nitrite (mg/L) as N	0.004 U	0.004 U	N/A
Ammonia (mg/L) as N	0.004 I	0.005 I	**<1.63 (8/21/17), <2.61 (7/11/18)
Total Kjeldahl Nitrogen (mg/L) as N	0.84	0.62	N/A
Total Nitrogen (mg/L) as N	0.844	0.624	***<1.91 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

*** Numeric nutrient criteria in lakes (NNC), 62-302.531, with lake color ≤ 40 Platinum Cobalt Units and > 20 mg/L $CaCO_3$

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

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 51 out of a possible 100 points on August 21, 2017, corresponding to a "Healthy" designation, and 40 out of a possible 100 points on July 11, 2018, corresponding with an "Impaired" designation. Table 3 contains the species list and occurrence information for the August 21, 2017 LVI event, and a total of 8 invasive exotic plants were observed in the lake. Table 4 contains the species list and occurrence information for the July 11, 2018 LVI event, and a total of 9 invasive exotic plants were observed in the lake. In addition, the extent of H*ydrilla verticillata* and *Salivina minima* species has expanded.

Table 3. Species list for the August 21, 2017 LVI at Lake Gleason. An asterisk (*) indicates an invasive exotic plant species. P = present, D = dominant, C = codominant.

Lake Gleason, August 21, 2017		Sections			
Scientific Name	**Common Name**	**1**	**2**	**3**	**4**
Acer rubrum	RED MAPLE	P	P		
Alternanthera philoxeroides*	ALLIGATORWEED				P
Baccharis sp.	SALTBUSH	P	P		P
Cephalanthus occidentalis	BUTTONBUSH	P	P	P	P
Cyperus blepharoleptos*	CUBAN BULRUSH				P
Cyperus odoratus	FRAGRANT FLATSEDGE	P	P		
Cyperus polystachyos	MANYSPIKE FLATSEDGE	P			
Eleocharis elongata	SLIM SPIKERUSH	P	P	P	P
Eupatorium capillifolium	DOGFENNEL	P	P	P	P
Fuirena scirpoides	SOUTHERN UMBRELLASEDGE	P	P	P	
Hydrilla verticillata*	WATERTHYME				P
Hydrocotyle sp.	PENNYWORT	P			
Hypericum fasciculatum	PEELBARK ST.JOHN'S-WORT	P			
Lachnanthes caroliniana	CAROLINA REDROOT	P			
Ludwigia leptocarpa	ANGLESTEM PRIMROSEWILLOW	P			P
Ludwigia peruviana*	PERUVIAN PRIMROSEWILLOW	P	P	P	P
Melaleuca viminalis*	BOTTLEBRUSH	P	P	P	
Mikania scandens	CLIMBING HEMPVINE	P	P	P	
Myrica cerifera	WAX MYRTLE	P	P	P	
Najas guadalupensis	SOUTHERN NAIAD	P	P	P	D
Nitella sp.	STONEWORT	P			
Nuphar sp.	SPATTERDOCK	P	P	P	P
Nymphaea odorata	FRAGRANT WATERLILY	P	P	P	P
Panicum hemitomon	MAIDENCANE	P	P	P	P
Panicum repens*	TORPEDO GRASS	P	P	P	P
Pinus elliottii	SLASH PINE	P	P	P	
Polygonum glabrum	DENSEFLOWER KNOTWEED				P
Pontederia cordata	PICKERELWEED	P	P	P	P
Rhynchospora inundata	NARROWFRUIT HORNED BEAKSEDGE	P	P		
Rhynchospora nitens	SHORTBEAK BEAKSEDGE	P			
Rhynchospora tracyi	TRACY'S BEAKSEDGE	P		P	
Sagittaria lancifolia	BULLTONGUE ARROWHEAD	P	P	P	P
Salix caroliniana	CAROLINA WILLOW	P	P	P	P
Salvinia minima*	WATER SPANGLES				P
Schinus terebinthifolius	BRAZILIAN PEPPER			P	
Sphagneticola trilobata*	CREEPING OXEYE		P	P	
Taxodium sp.	CYPRESS				P
Typha sp.	CATTAIL	P			P
Utricularia foliosa	LEAFY BLADDERWORT		P		P
Utricularia gibba	HUMPED BLADDERWORT	P	P	P	P
Utricularia inflata	FLOATING BLADDERWORT	P			P
Utricularia olivacea	PIEDMONT BLADDERWORT	P	P	P	P
Utricularia radiata	LITTLE FLOATING BLADDERWORT			P	P
Utricularia resupinata	LAVENDER BLADDERWORT	P	P	P	P
Vallisneria americana	EELGRASS	P	P	P	P
Vigna sp.	COWPEA				P

Table 4. Species list for the July 11, 2018 LVI at Lake Gleason. An asterisk (*) indicates an invasive exotic plant species. P = present, D = dominant, C = codominant.

Lake Gleason, July 11, 2018		Sections			
Scientific Name	**Common Name**	**1**	**2**	**3**	**4**
Acer rubrum	RED MAPLE	P	P	P	
Bacopa caroliniana	LEMON BACOPA				P
Cephalanthus occidentalis	BUTTONBUSH	P	P	P	P
Ceratophyllum demersum	COONTAIL		P		P
Cinnamomum camphora*	CAMPHORTREE	P	P	P	
Cyperus odoratus	FRAGRANT FLATSEDGE				P
Eleocharis elongata	SLIM SPIKERUSH		P		
Eupatorium capillifolium	DOGFENNEL	P	P		P
Fuirena scirpoides	SOUTHERN UMBRELLASEDGE	P	P	P	P
Hydrilla verticillata*	WATERTHYME	P	P	P	P
Hydrocotyle sp.	PENNYWORT	P	P	P	P
Lachnanthes caroliniana	CAROLINA REDROOT			P	
Ludwigia octovalvis	MEXICAN PRIMROSEWILLOW				P
Ludwigia peruviana*	PERUVIAN PRIMROSEWILLOW	P			P
Melaleuca viminalis*	BOTTLEBRUSH	P	P	P	
Myrica cerifera	WAX MYRTLE	P	P	P	P
Najas guadalupensis	SOUTHERN NAIAD	P	P	D	P
Nuphar sp.	SPATTERDOCK	P	P	P	P
Nymphaea odorata	FRAGRANT WATERLILY	D	D	P	D
Panicum hemitomon	MAIDENCANE		P	P	
Panicum repens*	TORPEDO GRASS	P	P	P	P
Paspalum urvillei	VASEYGRASS				P
Polygonum glabrum	DENSEFLOWER KNOTWEED				P
Pontederia cordata	PICKERELWEED	P	P	P	P
Sagittaria lancifolia	BULLTONGUE ARROWHEAD	P	P	P	
Salix caroliniana	CAROLINA WILLOW	P	P	P	P
Salvinia minima*	WATER SPANGLES	P	P		P
Sambucus canadensis	ELDERBERRY	P	P		P
Sapium sebiferum*	CHINESE TALLOWTREE	P	P	P	
Schinus terebinthifolius*	BRAZILIAN PEPPER			P	
Sphagneticola trilobata*	CREEPING OXEYE		P	P	
Typha sp.	CATTAIL		P	P	
Utricularia foliosa	LEAFY BLADDERWORT	P	P	P	P
Utricularia gibba	HUMPED BLADDERWORT	P	P	P	P
Utricularia resupinata	LAVENDER BLADDERWORT	P	P	P	P
Vallisneria americana	EELGRASS	P	P	P	P
Vigna sp.	COWPEA				P
Vitis sp.	MUSCADINE		P	P	

Conclusions

The Lake Vegetation Index for 2017 indicated plant communities that are consistent with expectations for a healthy, well-balanced lake. However, the 2018 LVI score was just under the threshold for a healthy designation and may indicate human disturbance such as introduction and transfer of exotic plant species from boat ramps and recreation, and the removal of native shoreline and/or upland buffer vegetation from homeowners. Once exotic plant taxa become

established, they can persist even if the water quality is meeting its designated uses. Lake Gleason has been treated in the past for *Panicum repens*, *Cyperus blepharoleptos*, *Najas guadalupensis*, *Hydrilla verticillata*, and general floating plants, but it is unknown if this treatment is ongoing.

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