LAKE ECOSUMMARY

Fishing Fool Lake

WBID 1223A, Wakulla County

August 23, 2017, August 28, 2018, and July 11, 2019



Figure 1. Fishing Fool Lake in Wakulla County.

DEP conducted water quality and biological sampling at Fishing Fool Lake (WIN WAK17FIS1, FISHFOOLLK) in Wakulla County on August 23, 2017, August 28, 2018, and July 11, 2019 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

Fishing Fool Lake (Figures 1 and 2) is in southern Wakulla County and is part of the Dickerson Bay watershed in the Ochlockonee - St. Marks Basin. It is in the Gulf Coast Lowlands Lake Region, which consists of xeric coastal strand and pine scrub vegetation. Dark-water, acidic, soft-water lakes with low to moderate nutrients are characteristic of this region. Fishing Fool Lake has a surface area of approximately 10 acres (4 hectares).

The predominant land uses surrounding Fishing Fool Lake are Pine Flatwoods, Coniferous Plantations, and Low Density, Fixed Single Family Units. This lake is not currently listed on the Impaired Waters Verified List (11/15/2019). Additional information about this WBID is available in the TMDL Tracker application (http://prodenv.dep.state.fl.us/DearTmdl/welcomehz.do).

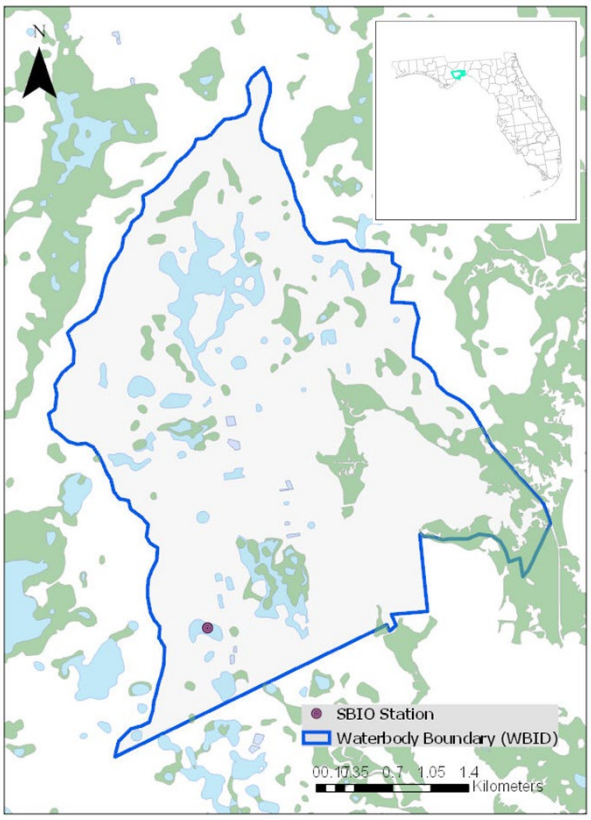


Figure 2. Location of Fishing Fool Lake in Wakulla County.

Methods

Water Quality

This lake was sampled on August 24, 2017, August 28, 2018, and July 11, 2019, by the members of the Aquatic Ecology and Quality Assurance Section of the DEP Tallahassee Office. Surface water samples were collected from the center of the lake for analysis of alkalinity, color, chlorophyll *a*, ammonia, nitrate+nitrite, total phosphorus, ortho-phosphate, and total Kjeldahl nitrogen (TKN) 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 color and alkalinity results presented in this report, Fishing Fool Lake is a high 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 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 Big

Bend region for DO criteria assessment. Percent saturation takes into account 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 a LVI score of 43 or greater meets the expectation of a healthy, well balanced community, and scores below 43 are considered impaired.

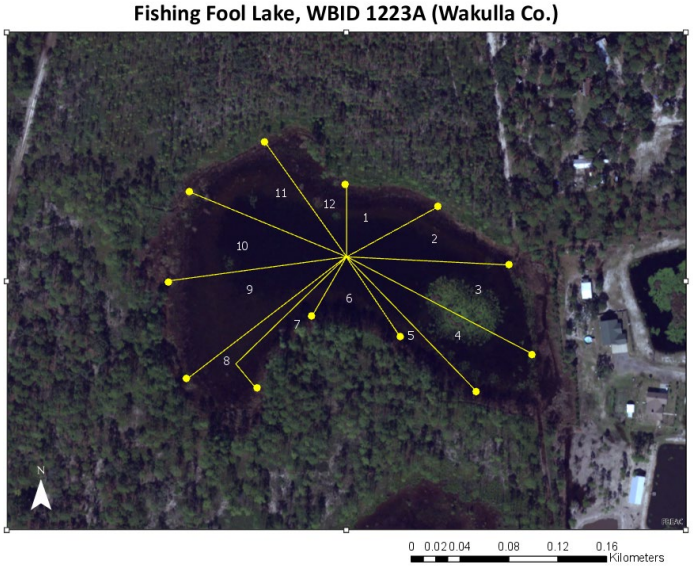


Figure 3. LVI sampling map of Fishing Fool Lake. Sections 1,4,7,10 were sampled for the LVI on August 23, 2017, and August 28, 2018. Sections 2,5,8,11 were sampled for the LVI on July 11, 2019. The water quality sample was collected from the lake center.

Results

Water Quality

The water quality results are shown in Table 2. The chlorophyll *a* and TP values measured during the three sampling events (Table 2) were below the numeric nutrient criteria thresholds for high color lakes. On July 11, 2019, the ammonia and TN criteria were exceeded, 3.9 mg/L and 4.606 mg/L, respectively. The field specific conductance was also elevated on the 7/11/2019 sampling date at 9,011 µmhos/cm most likely due to saltwater intrusion from Hurricane Michael which impacted the area in October 2018. Concentrations of sodium, chloride, and other salts were also elevated during the 7/11/2019 event (results not shown), but there were no elevated levels of toxic metals. Further sampling is planned to assess Fishing Fool Lake water quality.

Based on these three sampling events, the lake met the nutrient thresholds for high 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 August 23, 2017, August 28, 2018, and July 11, 2019 at Fishing Fool Lake.

Analyte	Result [8/23/2017]	Result [8/28/2018]	Result [7/11/2019]	Applicable Class III Water Quality Criteria
Field Temperature (°C)	32.0	31.5	30.4	
Field pH (SU)	5.9	6.34	4.92	Within 1 SU of natural background
Field Dissolved Oxygen (% saturation)	88.6	97.2	82.3	*Big Bend Criterion: 34%, 30% and 42%
Field Specific Conductance (µmhos/cm)	42.9	33	9,011	50% above background or 1275 µmhos/cm, whichever is greater
Alkalinity (mg $CaCO_3$/L)	3.1	3.0	0.65 U	Shall not be depressed below 20
Color (PCU)	110	84 A	15	N/A
Chlorophyll a (µg/L)	4.8	6.6	2.9	≤ 20 µg/L for colored and alkaline clear lakes
Total Phosphorus (mg/L) as P	0.012	0.012	0.009 I	0.16 mg/L
Nitrate+Nitrite (mg/L) as N	0.004 U	0.004 U	0.006 I	N/A
Ammonia (mg/L) as N	0.004 I	0.002 I	3.9	**2.45 mg/L, 2.54 mg/L, and 2.72 mg/L
Total Kjeldahl Nitrogen (mg/L) as N	0.69	1.0	4.6	N/A
Total Nitrogen (mg/L) as N	0.694	1.004	4.606	2.23 mg/L

* Instantaneous DO criterion calculated per DO Saturation Calculator and adjusted for time of day.

** Total ammonia criterion calculated per Total Ammonia Nitrogen Calculator, for single sample maximum.

A – Value reported is the average or two or more determinations.

U – Indicates that the compound was analyzed for but not detected.

I – The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.

Phytoplankton

The algal community in the water column consisted of 8% cyanobacteria (blue-green algae), 64% green algae, and 11% diatoms in the August 23, 2017 sample. The algal community in the water column consisted of 9% cyanobacteria, 51% green algae, and 27% diatoms in the August 28, 2018 sample. In the July 11, 2019 sample, the algal community in the water column consisted of 0.3% cyanobacteria, 10% green algae, and 24% diatoms. 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 87 on August 23, 2017, out of a possible 100 points, 89 on August 28, 2018, and 86 on July 11, 2019, all corresponding with an "Exceptional" (≤ 78) designation. The LVI indicated plant communities that are consistent with expectations for a healthy, well-balanced lake. Tables 3-5 contains the species list and occurrence information for these sampling events. No invasive exotic plants were observed in the lake for all three sampling events.

Submersed plants, specifically *Utricularia purpurea* and *U. floridana*, which were codominant in the 2017 and 2018 LVI sampling events, were noticeably absent from the 2019 LVI sampling event. Saltwater intrusion from Hurricane Michael (October 2018) most likely contributed to these observations.

Table 3. Species list for the August 23, 2017 LVI at Fishing Pool Lake. P = present, D = dominant, C = codominant.

Fishing Pool Lake, August 23, 2017		Sections			
Scientific Name	**Common Name**	**1**	**4**	**7**	**10**
Andropogon	BLUESTEM	P	P	P	
Bacopa caroliniana	LEMON BACOPA; BLUE WATERHYSSOP		P	P	P
Bidens mitis	SMALLFRUIT BEGGARTICKS		P		
Centella asiatica	SPADELEAF	P	P	P	
Dichanthelium commutatum	VARIABLE WITCHGRASS	P		P	
Eleocharis cellulosa	GULF COAST SPIKERUSH		P	P	P
Eleocharis elongata	SLIM SPIKERUSH	D	C	C	C
Eriocaulon	PIPEWORT			P	
Fuirena scirpoidea	SOUTHERN UMBRELLASEDGE	P	P	P	P
Habenaria repens	WATERSPIDER FALSE REINORCHID		P		
Hypericum fasciculatum	SANDWEED; PEELBARK ST.JOHN'S-WORT	P	P	P	P
Lachnanthes caroliniana	CAROLINA REDROOT		P		
Leersia hexandra	SOUTHERN CUTGRASS			P	
Ludwigia arcuata	PIEDMONT PRIMROSEWILLOW		P		
Ludwigia linifolia	SOUTHEASTERN PRIMROSEWILLOW		P		P
Ludwigia octovalvis	MEXICAN PRIMROSEWILLOW		P		
Myrica cerifera	SOUTHERN BAYBERRY; WAX MYRTLE			P	P
Nymphaea odorata	AMERICAN WHITE WATERLILY	P	P	P	P
Nymphoides aquatica	BIG FLOATINGHEART	P	P		P
Proserpinaca pectinata	COMBLEAF MERMAIDWEED	P	P	P	P
Rhynchospora	BEAKSEDGE	P	P	P	P
Rhynchospora inundata	NARROWFRUIT HORNED BEAKSEDGE		P		
Rhynchospora tracyi	TRACY'S BEAKSEDGE	P	P	P	P
Spartina bakeri	SAND CORDGRASS		P	P	P
Triadenum virginicum	VIRGINIA MARSH ST.JOHN'S-WORT	P	P	P	
Typha	CATTAIL				P
Utricularia floridana	FLORIDA BLADDERWORT	P		P	P
Utricularia gibba	HUMPED BLADDERWORT	P	P		
Utricularia purpurea	PURPLE BLADDERWORT	P	C	C	C
Xyris	YELLOWEYED GRASS	P	P	P	P

Table 4. Species list for the August 28, 2018 LVI at Fishing Pool Lake. P = present, D = dominant, C = codominant.

Fishing Pool Lake, August 28, 2018		Sections			
Scientific Name	**Common Name**	**1**	**4**	**7**	**10**
Andropogon	BLUESTEM	P	P	P	P
Bacopa caroliniana	LEMON BACOPA; BLUE WATERHYSSOP		P	P	
Bidens mitis	SMALLFRUIT BEGGARTICKS		P		
Cyrilla racemiflora	TITI	P	P	P	
Dichanthelium erectifolium	ERECTLEAF WITCHGRASS			P	
Eleocharis cellulosa	GULF COAST SPIKERUSH	P	C	P	P
Eleocharis elongata	SLIM SPIKERUSH	P	C	P	C
Eriocaulon	PIPEWORT	P			
Fuirena scirpoidea	SOUTHERN UMBRELLASEDGE	P	P	C	P
Habenaria repens	WATERSPIDER FALSE REINORCHID		P		
Hypericum fasciculatum	SANDWEED; PEELBARK ST.JOHN'S-WORT	P	P	P	P
Ilex glabra	INKBERRY; GALLBERRY				P
Lachnanthes caroliniana	CAROLINA REDROOT		P	P	
Ludwigia linifolia	SOUTHEASTERN PRIMROSEWILLOW		P		
Ludwigia microcarpa	SMALLFRUIT PRIMROSEWILLOW		P		
Myrica cerifera	SOUTHERN BAYBERRY; WAX MYRTLE	P	P	P	P
Nitella	STONEWORT			P	
Nymphaea odorata	AMERICAN WHITE WATERLILY	P	P	P	P
Nymphoides aquatica	BIG FLOATINGHEART	P			
Nyssa sylvatica biflora	SWAMP TUPELO			P	
Pinus elliottii	SLASH PINE	P			
Rhynchospora chapmanii	CHAPMAN'S BEAKSEDGE		P		
Rhynchospora corniculata	SHORTBRISTLE HORNED BEAKSEDGE		P		
Rhynchospora fascicularis	FASCICLED BEAKSEDGE	P			
Rhynchospora tracyi	TRACY'S BEAKSEDGE	C	P	P	P
Spartina bakeri	SAND CORDGRASS	P	P	P	P
Triadenum virginicum	VIRGINIA MARSH ST.JOHN'S-WORT		P		
Typha	CATTAIL				P
Utricularia floridana	FLORIDA BLADDERWORT	C	P	C	C
Utricularia gibba	HUMPED BLADDERWORT	P	P	P	
Utricularia purpurea	PURPLE BLADDERWORT	P	P	P	P
Xyris	YELLOWEYED GRASS	P	P	P	P

Table 5. Species list for the July 11, 2019 LVI at Fishing Fool Lake. P = present, D = dominant, C = codominant.

Fishing Fool Lake, July 11, 2019		Sections			
Scientific Name	**Common Name**	**2**	**5**	**8**	**11**
Bidens mitis	SMALLFRUIT BEGGARTICKS	P			
Centella asiatica	SPADELEAF	P			
Cyperus odoratus	FRAGRANT FLATSEDGE	P			
Cyrilla racemiflora	TITI		P		
Eleocharis cellulosa	GULF COAST SPIKERUSH	P	P	P	P
Eleocharis elongata	SLIM SPIKERUSH	D	D	D	D
Eleocharis olivacea	BRIGHTGREEN SPIKERUSH	P			
Eleocharis submersed viviparous (species unknown)	SPIKERUSH	P			
Eupatorium capillifolium	DOGFENNEL	P			
Hydrocotyle	MARSHPENNYWORT	P			
Juncus marginatus	SHORE RUSH; GRASSLEAF RUSH	P			
Myrica cerifera	SOUTHERN BAYBERRY; WAX MYRTLE	P	P	P	P
Nymphaea odorata	AMERICAN WHITE WATERLILY	P	P	P	P
Panicum hemitomon	MAIDENCANE	P	P	P	
Persea palustris	SWAMP BAY		P		
Phyla nodiflora	TURKEY TANGLE FOGFRUIT; CAPEWEED	P			
Polygonum hydropiperoides	MILD WATERPEPPER; SWAMP SMARTWEED	P			
Rhexia cubensis	WEST INDIAN MEADOWBEAUTY	P			
Rhynchospora fascicularis	FASCICLED BEAKSEDGE	P			
Solidago	GOLDENROD	P			
Spartina bakeri	SAND CORDGRASS	P	P	P	P
Symphyotrichum	ASTER	P			
Triadenum virginicum	VIRGINIA MARSH ST.JOHN'S-WORT	P			
Typha	CATTAIL				P
Woodwardia virginica	VIRGINIA CHAIN FERN		P		
Xyris	YELLOWEYED GRASS	P		P	

Conclusions

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

Water quality results were well within acceptable limits for chlorophyll *a* and total phosphorus on August 23, 2017, August 28, 2018, and July 11, 2019. Total nitrogen results were well within acceptable limits on August 23, 2017, and August 28, 2018; however, on July 11, 2019, the ammonia and TN criteria were exceeded. Hurricane Michael impacted the area in October 2018 and is thought to have contributed to these unexpected values in Fishing Fool Lake as well as other nearby lakes. Further sampling is planned to continue to assess Fishing Fool Lake water quality. 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

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DEP Division of Environmental Assessment and Restoration homepage:
https://floridadep.gov/dear
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