LAKE ECOSUMMARY

Trout Lake, August 8, 2011

DEP conducted water quality and biological sampling at Trout Lake in Lake County on August 8, 2011 to assess attainment of designated uses. Overall, the water quality, plant community, and phytoplankton data indicated that the lake did not meet expectations for a healthy, well-balanced lake.

Background

Although healthy, well-balanced lake communities may be maintained even with some level of human disturbance, human activities 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 the condition where a particular waterbody has exceeded water quality criteria (Chapter 62-302, Florida Administrative Code), 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. Chlorophyll *a* is a measure of algal biomass in the water column. In clear, low alkalinity lakes (lakes where color is < 40 PCU and alkalinity is < 20 mg/L $CaCO_2$), a healthy system is expected to have $\leq$ 6 µg/L of chlorophyll *a*. In colored ($\geq$ 40 PCU) lakes or clear, high alkalinity ($\geq$20 mg/L $CaCO_2$) lakes, healthy systems are expected to have $\leq$ 20 µg/L of chlorophyll *a*. Chlorophyll *a* values greater than those shown above may result in unwanted shading of aquatic plants and/or greater potential for harmful algal blooms. The Lake Vegetation Index (LVI) assesses how closely the plant community of a lake resembles a native undisturbed community. These tools are often used in conjunction with one another because it is possible to detect imbalance in the plant community while the algal community appears healthy (and vice versa).

Methods

This lake was sampled on August 8, 2011 by the DEP Central District Office. Surface water samples were collected for analysis of nutrients, chlorophyll *a*, color, alkalinity and microcystin toxin following DEP Standard Operating Procedures (SOPs; see http://www.dep.state.fl.us/water/sas/qa/sops.htm). Sampling and analyses met DEP quality assurance/quality control standards (see http://www.dep.state.fl.us/water /sas/qa/index.htm). For the LVI, species lists were developed for four of twelve sections of the lake (Figure 1), and the following information was derived from those lists: percent native species, percent invasive exotic species, percent sensitive species, and the coefficient of conservatism (C of C; a measure of how tolerant a species is to disturbance) of the dominant species. According to DEP SOP LT 7000, the LVI score ranges and categories are: (78-100) Exceptional; (38-77) Healthy; and (0-37) Impaired. DEP's new draft F.A.C. Chapter 62.302 requires at least two temporally independent LVIs with an average score of 43 or above in order to meet the expectation of a healthy, well balanced community. The LVI was sampled per DEP SOP FS7310 and calculated per DEP SOP LT7000.

Site Information

Trout Lake is located in the Ocklawaha basin, in central Lake County near Eustis. It has a surface area of approximately 102 acres and a mean depth of nine feet. Roughly half the lake has natural wetland surroundings. The remaining portion of the lake is surrounded by medium to high density residential land use and State Road 19 lies to the west. A stream (Hicks Ditch), located northeast of the lake, collects surface runoff from the watershed and discharges stormwater into the lake. Trout Lake's single major surface-water outlet discharges into Lake Eustis. Trout Lake was verified as impaired by nutrients based on elevated levels of the Trophic State Index for lakes, and was included on the verified list of impaired waters for the Ocklawaha Basin that was adopted by DEP Secretarial Order on August 28, 2002.

Results

Water Quality

Concentrations of total nitrogen and total phosphorus in the sample collected August 8, 2011 exceeded the proposed state water quality criteria (Table 1, note that compliance with lake numeric nutrient criteria involves an annual geometric mean, and is not based on single samples). The chlorophyll *a* concentration was 100 ug/L (95 ug/L in the duplicate), which is five times higher than the proposed chlorophyll *a* criterion. A significant amount of natural area surrounds Trout Lake. This area, consisting mostly of hardwood swamp, may be a contributor to the elevated Kjeldahl Nitrogen.

Table 1. Water quality results August 8, 2011 at Trout Lake

Analyte	Result	Quality Assurance Duplicate	Applicable Class III Water Quality Criteria
Field Temperature (°C)	32.3		
Field pH (SU)	9.3		
Field Dissolved Oxygen (mg/L)	8.13		≥ 5
Field Specific Conductance (µmhos/cm)	231		
Alkalinity (mg $CaCO_3$/L)	65	65	
Color (PCU)	56	55	
Chlorophyll a (µg/L)	100	95	*20
Total Phosphorus (mg/L)	0.37	0.37	*0.05
Nitrate+Nitrite (mg/L)	0.004 U	0.004 U	
Ammonia (mg/L)	0.017 I	0.011 I	
Total Kjeldahl Nitrogen (mg/L)	2.1	1.9	
Total Nitrogen (mg/L)	2.1	1.9	*1.27

*proposed 62-302 thresholds for Annual Geometric Mean Total

U - Material was analyzed for but not detected. The reported value is the method detection limit for the sample analyzed.

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 88.85% cyanobacteria (blue-green algae), 5.58% green algae, 2.95% diatoms, and 2.62% cryptomonads. As part of Quality Assurance procedures, a duplicate sample was collected. Duplicate sample results were within 1% relative standard deviation (RSD). 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. During the August 8, 2011 sample event, the Trout Lake algal community was dominated by potentially toxic blue-green algae, *Microcystin* spp., so an additional sample was analyzed to determine the presence of microcystin toxin. During this sample event, microcystin toxin was not detected.

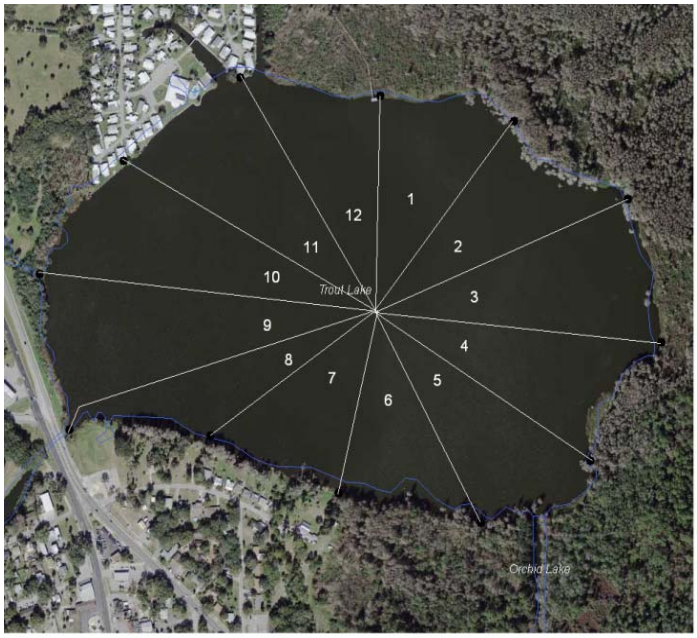


Figure 1. Sampling map of Trout Lake. Sections 1,4,7,10 were sampled for the Lake Vegetation Index. The water quality sample was collected from the lake center.

Lake Vegetation Index

The LVI score for this lake was 33 out of a possible 100 points, corresponding with a category III "Not Healthy" designation. Table 2 contains the species list and occurrence information for this sampling event. A total of 9 invasive exotic plants were observed in the lake.

Table 2. Species list for the August 8, 2011 LVI at Trout Lake. An asterisk (*) indicates an invasive exotic plant species. P = present, D = dominant, C = codominant.

Scientific Name	Common Name	Sections:	1	4	7	10
Acer rubrum	RED MAPLE		P	P	P	P
Alternanthera philoxeroides*	ALLIGATOR WEED		P	P	P	P
Amaranthus australis	SOUTHERN AMARANTH			P	P	
Asclepiadaceae	MILK WEED		P			
Aster carolinianus	CAROLINA ASTER		P	P	P	
Baccharis	SALT MYRTLE			P		
Bidens mitis	SMALLFRUIT BEGGARTICKS				P	
Cephalanthus occidentalis	COMMON BUTTONBUSH		P	P		
Ceratophyllum demersum	COONTAIL		P		P	P
Cicuta mexicana	WATER HEMLOCK		P			
Colocasia esculenta*	TARO; WILD TARO		P	P	P	P
Eclipta prostrata	FALSE DAISY					P
Fraxinus caroliniana	CAROLINA ASH; WATER ASH; POP ASH		P	P	P	
Gordonia lasianthus	LOBLOLLY BAY		P			
Hibiscus grandiflorus	SWAMP ROSEMALLOW		P		P	
Hydrilla verticillata*	HYDRILLA		P	P	D	P
Hydrocotyle	MARSHPENNYWORT		P		P	P
Ilex cassine	DAHOON				P	
Kosteletzkya virginica	VIRGINIA SALTMARSH MALLOW				P	
Ludwigia peruviana*	PERUVIAN PRIMROSEWILLOW		P	P	P	
Magnolia virginiana	SWEETBAY			P		
Mikania scandens	CLIMBING HEMPVINE		P	P		P
Myrica cerifera	SOUTHERN BAYBERRY; WAX MYRTLE		P	P	P	P
Myriophyllum aquaticum*	PARROT FEATHER WATERMILFOIL		P		P	P
Nephrolepis	FERN			P	P	
Nyssa sylvatica biflora	SWAMP TUPELO			P	P	
Osmunda regalis	ROYAL FERN		P	P		
Panicum hemitomon	MAIDENCANE		P	C	P	P
Paspalidium geminatum	EGYPTIAN PASPALIDIUM; KISSIMMEEGRASS		P	P	P	P
Pistia stratiotes*	WATER-LETTUCE		P	P	P	P
Polygonum glabrum	DENSE FLOWER KNOTWEED		P			
Polygonum punctatum	DOTTED SMARTWEED		P			P
Pontederia cordata	PICKERELWEED			P		
Sabal palmetto	CABBAGE PALM		P		P	P
Sacciolepis striata	AMERICAN CUPSCALE		C		P	
Sagittaria lancifolia	BULLTONGUE ARROWHEAD		P			P
Salix caroliniana	CAROLINA WILLOW; COASTALPLAIN WILLOW		C	P	P	P
Salvinia minima*	WATER SPANGLES		P	P	P	P
Sapium sebiferum*	CHINESE TALLOW		P			P
Schinus terebinthifolius*	BRAZILIAN PEPPER					D
Schoenoplectus californicus	GIANT BULL RUSH			P		P
Taxodium	CYPRESS TREE		P	C	P	P
Thelypteris	FERN				P	
Typha	CAT TAIL		P	P		P
Urochloa mutica*	PARA GRASS			P		
Vitis	GRAPE VINE				P	
Wolffiella	DUCK WEED		P	P	P	P

Summary

High nutrient levels measured in Trout Lake were associated with imbalances in the lake's floral community. Chlorophyll *a* measured in Trout Lake (100 µg/L) during the August 8, 2011 sample indicates that phytoplankton has become the primary consumer of the lake's elevated nutrients instead of beneficial, submersed native plants. Consequently, the LVI score (33) was less than expected for a healthy lake. The lake was also dominated by blue-green algae, which have the potential to produce toxins such as microcystin, though none was detected during this sampling event. Trout Lake would benefit from a management plan focused on reducing nutrient loads from its watershed, promotion of native submersed and littoral vegetation and upland buffers, and control of submersed and emergent exotic vegetation.

Thank you for your interest in maintaining the water quality of Florida's lakes. Please feel free to contact us if you have any questions.

Contact and resources for more information

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Trout Lake's TMDL document: http://www.dep.state.fl.us/water/tmdl/docs/tmdls/final/gp1/trout_lake_nut_tmdl.pdf

DEP publications on Best Management Practices and Environmental Stewardship and Education: http://www.dep.state.fl.us/water/nonpoint/pubs.htm DEP biological assessment resources: http://www.dep.state.fl.us/water/bioassess/index.htm FWCC Aquatic Plant Management: http://myfwc.com/wildlifehabitats/habitat/invasive-plants/aquatic-plant/

Freshwater Algal Bloom information: http://www.dep.state.fl.us/labs/biology/hab/index.htm