LAKE ECOSUMMARY

LAKE ROWELL, October 20, 2011

DEP conducted water quality and biological sampling at Lake Rowell in Bradford County on October 20, 2011 to assess attainment of designated uses. The plant community data indicated that the lake was dominated by the exotic plant hydrilla, which led to an imbalance of the aquatic macrophyte community. The water quality values met expectations for a healthy, well-balanced lake.

Background

Although healthy, well-balanced lake communities may be maintained with some level of human activities, such 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 water body 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 ≤ 6 µg/L of chlorophyll *a*. In colored (≥ 40 PCU) lakes or clear, high alkalinity (≥20 mg/L $CaCO_2$) lakes, healthy systems are expected to have ≤ 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 October 20, 2011 by Biologists from the DEP Northeast District Office. Mid depth (0.8m) samples were collected for analysis of nutrients, chlorophyll *a*, color, and alkalinity 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 has proposed a revised impairment threshold, in which scores of 43 and higher fully meet the expectation of a healthy, well balanced community, and scores below 43 are considered impaired. The LVI was sampled per DEP SOP FS7310 and calculated per DEP SOP LT7000.

Site Information

Lake Rowell is a 360-acre lake, connected by a canal with Lake Sampson to the West, and Alligator Creek flowing into Lake Rowell from the east. The City of Starke Wastewater plant discharges into Alligator Creek approximately three miles upstream from where it enters Lake Rowelll. Lake Rowell is surrounded by a large amount of natural wetlands. The landscape

development intensity (LDI) index is 1.2, considered minimally disturbed. Lake Rowell is characterized as a high-color lake with high alkalinity.

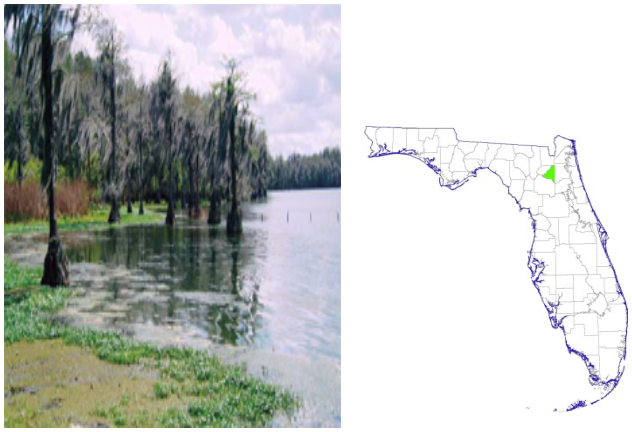


Figure 1. Photo of Lake Rowell & Bradford County location

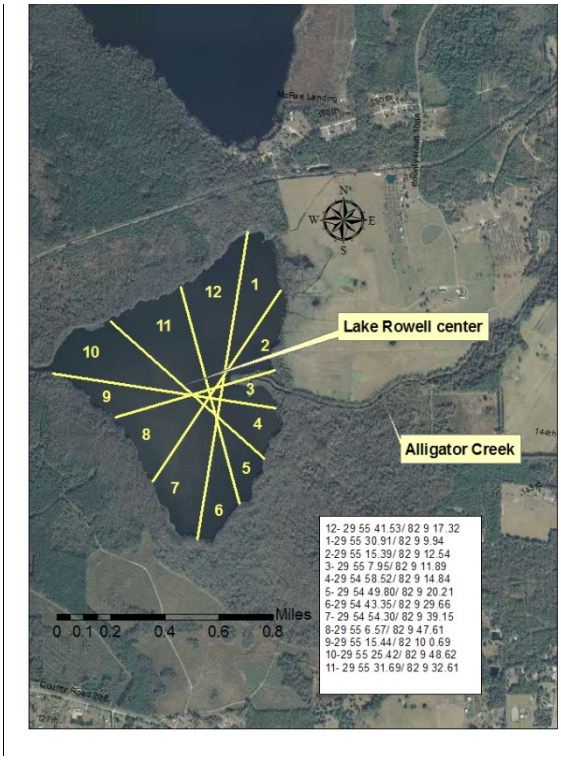


Figure 2. Sampling map of Lake Rowell. Sections 1,4,7,10 were sampled for the Lake Vegetation Index. The water quality sample was collected from the lake center. Lat/Longs denote the end of a transect, going in a clockwise direction.

Results

Water Quality

The water quality samples complied with water quality standards (Table 1). The concentrations of total nitrogen and total phosphorus in the sample collected on 10/20/2011 did not exceed 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 elevated dissolved oxygen can sometimes indicate an algal bloom but in this case appears to be a result of the abundant hydrilla producing oxygen.

Table 1. Water quality results from 10-20-2011 at Lake Rowell.

Analyte	Result	Remark	Applicable Class III Water Quality Criteria
Field Temperature (°C)	22.8		
Field pH (SU)	8.43		
Field Dissolved Oxygen (mg/L)	10.14		≥ 5
Field Specific Conductance (µmhos/cm)	162		
Alkalinity (mg $CaCO_3$/L)	26		
Color (PCU)	61		
Chlorophyll a (µg/L)	8.3		*20ug/l
Total Phosphorus (mg/L)	0.025		*0.05mg/l
Nitrate+Nitrite (mg/L)	<0.004	Non detect	
Ammonia (mg/L)	0.013		
Total Kejldahl Nitrogen (mg/L)	0.5		
Total Nitrogen (mg/L)	0.5		*1.27mg/l

*Federally promulgated numeric nutrient criteria for Florida lakes

Phytoplankton

The chlorophyll *a* concentration was within the range of values considered to be healthy for colored lakes, so the phytoplankton was not of nuisance or unhealthy abundance. The algal community in the water column consisted of green algae, cyanobacteria (blue-green algae), and diatoms. The highest percentage was green algae with 54%, contribution, followed by blue green algae with 38%. The most abundant single taxon was *Synechocystis*, a blue green alga, which comprised 16% of the sample. *Microcystis* and *Anabena*, toxin forming species, were found in the sample, although in small amounts.

Lake Vegetation Index

The LVI score for this lake was 31 out of a possible 100 points, corresponding with a "Not Healthy" designation. Table 2 contains the species list and occurrence information for this sampling event. Twenty percent of

the plants observed were invasive exotic plants, as designated by the Florida Exotic Pest Plant Council (FLEPPC). Hydrilla was the most abundant taxon, and is in the FLEPPC category of highest concern. Hydrilla spreads vegetatively by "turions" and fragmentation, making it very hard to eliminate. Additional FLEPPC listed taxa included alligator weed, wild taro, torpedo grass, and water hyacinth.

Table 2. Species list for the 10/20/2011 LVI at Lake Rowell. An asterisk (*) indicates an invasive exotic plant species. P = present, D = dominant, C = codominant.

Lake Rowell 10/20/2011 — Sections

Scientific name	Common name	1	4	7	10
Acer rubrum	RED MAPLE	P	P	P	P
*Alternanthera philoxeroides**	ALLIGATOR WEED *	P	P	P	P
Azolla caroliniana	CAROLINA MOSQUITO FERN				P
Bidens laevis	BURRMARIGOLD; SMOOTH BEGGARTICKS	P	P	P	P
Boehmeria cylindrica	FALSE NETTLE; BOG HEMP		P	P	P
Centella asiatica	SPADELEAF	P	P	P	P
Cephalanthus occidentalis	COMMON BUTTONBUSH	P			P
Ceratophyllum demersum	COONTAIL	P	P	P	P
Cicuta mexicana	WATER HEMLOCK		P		
Colocasia esculenta *	TARO; WILD TARO; DASHEEN; COCO YAM*			P	P
Cyperus odoratus	FRAGRANT FLATSEDGE	P		P	P
Decodon verticillatus	WILLOW-HERB; SWAMP LOOSESTRIFE			P	
Echinochloa crusgalli	BARNYARDGRASS	P	P	P	P
Eichhornia crassipes *	WATER HYACINTH *	P	P	P	P
Eupatorium capillifolium	DOGFENNEL	P	P	P	P
Hydrilla verticillata *	HYDRILLA *	D	D	D	D
Juncus effusus	SOFT RUSH	P	P		P
Ludwigia arcuata	PIEDMONT PRIMROSEWILLOW	P			P
Ludwigia decurrens	WINGLEAF PRIMROSEWILLOW		P	P	
Ludwigia leptocarpa	ANGLESTEM PRIMROSEWILLOW	P	P	P	P
Ludwigia peruviana *	PERUVIAN PRIMROSEWILLOW *	P	P	P	P
Mikania scandens	CLIMBING HEMPVINE	P		P	P
Myrica cerifera	SOUTHERN BAYBERRY; WAX MYRTLE	P	P	P	P
Nelumbo lutea	AMERICAN LOTUS	P			
Nymphoides aquatica	BIG FLOATINGHEART	P		P	P
Nyssa sylvatica biflora	SWAMP TUPELO	P	P	P	P
Panicum dichotomiflorum	FALL PANICGRASS	P	P	P	P
Panicum repens *	TORPEDO GRASS *				P
Paspalum repens	WATER PASPALUM		P		
Polygonum hydropiperoides	MILD WATERPEPPER; SWAMP SMARTWEED	P	P	P	P
Polygonum pensylvanicum	PENNSYLVANIA SMARTWEED	P			
Pontederia cordata	PICKERELWEED	P	P	P	P
Sacciolepis striata	AMERICAN CUPSCALE	P		P	P
Salix caroliniana	CAROLINA WILLOW; COASTALPLAIN WILLOW	P	P	P	P
Salvinia minima *	WATER SPANGLES *	P	P	P	P
Sesbania herbacea	DANGLEPOD	P	P	P	
Sesbania punicea *	PURPLE SESBAN *	P			P
Setaria magna	GIANT BRISTLEGRASS	P		P	P
Taxodium	CYPRESS	P	P	P	P
Typha	CATTAIL	P	P	P	P
Wolffiella	FIORIDA MUDMIDGET	P		P	

Conclusion

The water samples met Class III Water Quality Standards. The algal community appeared balanced. Nitrogen and phosphorous flow into Lake Rowell from the City of Starke's Wastewater Treatment Plant (WWTP) and Storm water conveyance systems. A March 2010 water quality assessment of Starke's WWTP showed that nitrogen and phosphorous values were three times higher downstream of the plant than upstream. ftp://ftp.dep.state.fl.us/pub/labs/lds/reports/10222.pdf These nutrients flow into Lake Rowell and are deposited in the sediments and are being used by the hydrilla. Lake Rowell has been sprayed with herbicides to control hydrilla and hyacinth. The Florida Fish and Wildlife Commission (FWCC) proposed a project in 2008 for removing sediment to restore aquatic habitat, but was not funded. The FWCC is currently monitoring the growth and spread of hydrilla in Lake Rowell.

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

Jeremy Parrish email: Jeremy.M.Parrish@dep.state.fl.us

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