LAKE ECOSUMMARY

Lake Russell

September 27, 2012

DEP conducted water quality and biological sampling at Lake Russell in Osceola County on September 27, 2012 to assess attainment of designated uses. Water quality data met some but not all newly adopted water quality standards. Plant community data indicated that the lake met expectations for a healthy, well-balanced lake.

Background

Although healthy, well -balanced lake communities may be maintained 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 ≤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

Lake Russell was sampled on September 27, 2012, by the DEP Central District Office. Surface water samples were collected for analysis of nutrients, chlorophyll *a,* and color 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, 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 Rule 62-302.800(3).a.1.b. 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

Lake Russell, approximately 750 surface acres in size, is located in Osceola County, and is part of the Upper Kissimmee Basin (Figure 1). Surface water enters Lake Russell through Reedy Creek located on the west side of the lake and from sheet flow over a natural area surrounding the lake. Surface water exits the lake through Reedy Creek on the southeast corner. Lake

Russell's watershed is predominantly natural, consisting of Disney's Nature Conservancy Property to the west of the lake and cattle field with scattered natural area to the east.

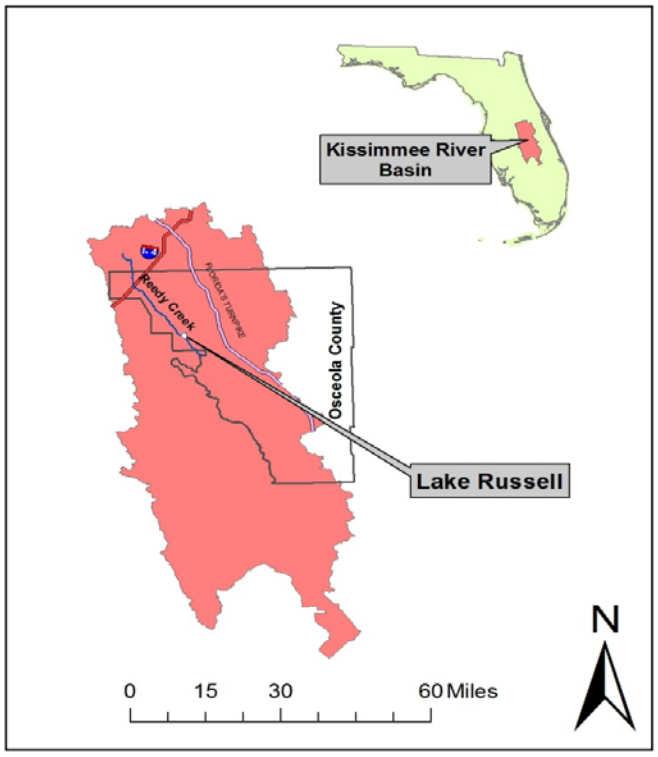


Figure 1. Location of Lake Russell in Osceola County.

Results

Water Quality

The concentrations of total nitrogen (2.3 mg/L) did not meet the newly adopted water quality criteria and dissolved oxygen (DO, 3.5 mg/L) did not comply with the current DO standard. Total phosphorus (0.069 mg/L), chlorophyll *a* (0.55 µg/L U) and other parameters in the sample collected September 27, 2012, met adopted 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).

Lake Vegetation Index

The LVI score for Lake Russell was 71 out of a possible 100 points for the September 27, 2012 sampling event, corresponding with a category II "Healthy" designation. Table 2 contains the species list and occurrence information for this sampling event. A total of 4 invasive exotic plants were observed in the lake during this sampling event in sections 2, 5, 8, and 11 (Figure 2; Table 2).

Table 1. Water quality results for Lake Russell.

Analyte	Results 9/27/2012	Remark	Applicable Class III Water Quality Criteria
Field Temperature (°C)	27.9		
Secchi Depth	0.25		
Field pH (SU)	7.2		
Field Dissolved Oxygen (mg/L)	3.5		≥ 5
Field Specific Conductance (µmhos/cm)	166		
Alkalinity (mg $CaCO_3$/L)	29		
Color (PCU)	750		
Chlorophyll a (µg/L)	0.55	U	≤20*
Total Phosphorus (mg/L)	0.069		≤0.16*
Turbidity (NTU)	1.5		
Ammonia (mg/L)	0.039		
Nitrate+Nitrite (mg/L)	0.015		
Total Kjeldahl Nitrogen (mg/L)	2.3		
Total Nitrogen (mg/L)	2.3		≤2.23*

*newly adopted 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.

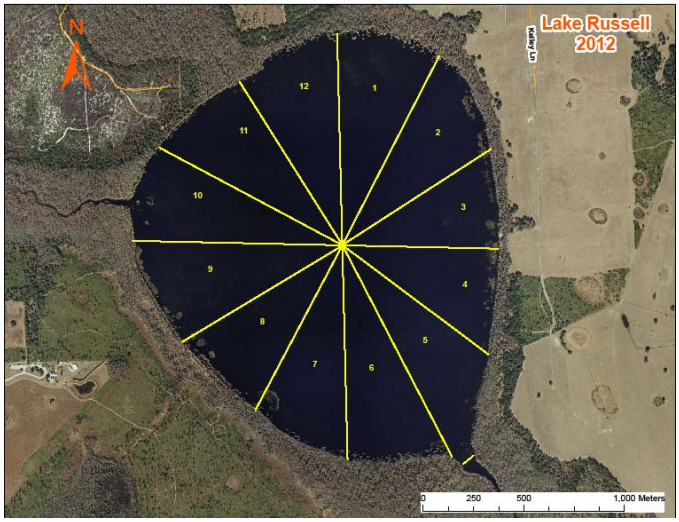


Figure 2. Sampling map of Lake Russell. Sections 2,5,8,11 were sampled for the Lake Vegetation Index.

Table 2. Species list for the September 27, 2012, LVI at Lake Russell. An asterisk (*) indicates an invasive exotic plant species. P = present, D = dominant, C = codominant.

Species	Common Name	Sections:	2	5	8	11
Acer rubrum	RED MAPLE		P	P	P	P
Alternanthera philoxeroides*	ALLIGATOR WEED		P	P	P	P
Andropogon	BROOM GRASS					P
Annona glabra	POND APPLE					P
Baccharis	SALT BUSH			P	P	P
Blechnum serrulatum	SWAMP FERN		P		P	
Boehmeria cylindrica	FALSE NETTLE; BOG HEMP		P			
Centella asiatica	SPADELEAF			P		
Cephalanthus occidentalis	COMMON BUTTONBUSH		P		P	P
Cyperus articulatus	JOINTED FLATSEDGE		P	P		
Eichhornia crassipes*	WATER HYACINTH		P		P	P
Eupatorium capillifolium	DOGFENNEL		P	P		P
Fraxinus	WHITE ASH		P	P	P	P
Hibiscus coccineus	SCARLET ROSEMALLOW					P
Hydrocotyle	MARSHPENNYWORT		P		P	P
Hymenachne amplexicaulis*	WEST INDIAN MARSH GRASS		P	P		P
Ilex cassine	DAHOON					P
Juncus effusus	SOFT RUSH		P			
Lemna	DUCK WEED		P	P	P	
Liquidambar styraciflua	SWEETGUM					P
Ludwigia leptocarpa	ANGLESTEM PRIMROSEWILLOW			P		
Luziola fluitans	SOUTHERN WATERGRASS		P	P		
Lycopus rubellus	TAPERLEAF WATERHOREHOUND		P			
Mikania scandens	CLIMBING HEMPVINE			P		P
Myrica cerifera	SOUTHERN BAYBERRY; WAX MYRTLE		P	P		P
Nuphar	COW LILLY		P	P		
Nyssa sylvatica biflora	SWAMP TUPELO		P	P	P	P
Panicum dichotomiflorum	FALL PANICGRASS		P	P	P	
Panicum hemitomon	MAIDENCANE		P	P	P	P
Panicum repens*	TORPEDO GRASS		P	P		P
Paspalidium geminatum	KISSIMMEEGRASS		P	P		
Paspalum repens	WATER PASPALUM		P	P	P	
Polygonum glabrum	HAIRY SMARTWEED				P	
Polygonum punctatum	DOTTED SMARTWEED				P	P
Pontederia cordata	PICKERELWEED		P			P
Sabal palmetto	CABBAGE PALM		P	P	P	
Sagittaria lancifolia	BULLTONGUE ARROWHEAD					P
Salix caroliniana	CAROLINA WILLOW		P	P	P	P
Salvinia minima	WATER SPANGLES		P	P	P	P
Schoenoplectus californicus	GIANT BULLRUSH		C	D	D	C
Sesbania	SEED BOX		P		P	P
Symphyotrichum elliottii	ELLIOTT'S ASTER		P			
Symphyotrichum subulatum	ANNUAL SALTMARSH ASTER					P
Taxodium	CYPRESS		C	P	P	C
Thalia geniculata	ALLIGATORFLAG; FIREFLAG		P	P	P	P
Typha	CAT TAIL		P	P	P	P
Ulmus americana	AMERICAN ELM		P			
Woodwardia virginica	VIRGINIA CHAIN FERN					P

Summary

Lake Russell's water quality data met some, but not all water quality standards. Total nitrogen (2.3 mg/L) exceeded the applicable 2.23 mg/L numeric interpretation of the nutrient criteria in Rule 62-302.530 (47) (b), Florida Administrative Code. The likely source of nitrogen is natural, with contributions from Lake Russell's and Reedy Creek's extensive wetland buffer. Dissolved oxygen also did not comply with State Water Quality Standards. The low dissolved oxygen was likely a natural condition caused by the contribution of water from surrounding wetlands, high water color and low chlorophyll *a.* Reedy Creek above Lake Russell was verified as impaired for low dissolved oxygen, but it was determined that it was a natural condition for these reasons and removed from the Impaired Waters List for dissolved oxygen.

A LVI score of 71, corresponding with the upper range of category II "Healthy" designation, indicates minimal disturbance to the plant community. Lake Russell would benefit from a management plan that results in continued suppression of 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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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