LAKE ECOSUMMARY

Lake Waunatta, October 4, 2010

DEP conducted chemical and biological sampling at Lake Waunatta in Orange County on October 4, 2010 in response to a homeowner's concern about the declining water quality. Overall, the water quality met some but not all of the federally promulgated water quality standards for nutrients. Nutrient levels were high, but in range. Chlorophyll *a* was significantly higher than the criterion allows. The plant community data indicated that the lake just met current expectations for a healthy, well-balanced lake, while phytoplankton results indicated an imbalance in the algal community.

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 October 4, 2010 by the DEP Central District Office. Surface water samples were collected for analysis of nutrients, chlorophyll *a*, color, and turbidity following DEP Standard Operating Procedures (SOPs; DEP SOPs can be found at http://www.dep.state.fl.us/water/sas/qa/sops.htm) and 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 plans to propose a revised impairment threshold, in which scores of 46 and higher fully meet the expectation of a healthy, well balanced community, and scores below 46 are considered impaired. The LVI was sampled per DEP SOP FS7310 and calculated per DEP SOP LT7000.

Site Information

Lake Waunatta, located in the Middle St. Johns watershed, is approximately 70 acres in area. The surrounding watershed is completely urbanized, and there is minimal upland buffer between dwellings and the lake edge. Stormwater enters the lake from surrounding yards and through a culvert located on the southern side of the south cove. Water from this culvert consists of overflow from an adjacent wetland, which is bordered by commercial business and a roadway. Adjacent property owners and others living on the lake are concerned that discharge from the culvert adversely affects the lake In an effort to control *Hydrilla* infestation in Lake Waunatta, an aggressive herbicide treatment occurred in 2004, and grass carp were introduced for biological *Hydrilla* control. While *Hydrilla* was significantly reduced by this chemical

treatment, the grass carp subsequently consumed the beneficial native *Vallisneria*, (eel grass) present in the lake, and algal growth increased in response to the nutrients released from the decaying Hydrilla. Prior to the herbicide treatment, water quality sampling conducted by Orange County on June 6, 2004 indicated that chlorophyll *a* was 1.1 µg/L, total nitrogen was 0.56 mg/L, and total phosphorus was 0.01 mg/L. LAKEWATCH sampling that month measured a Secchi depth of 10 ft. The lake wide chemical treatment began in August, 2004.

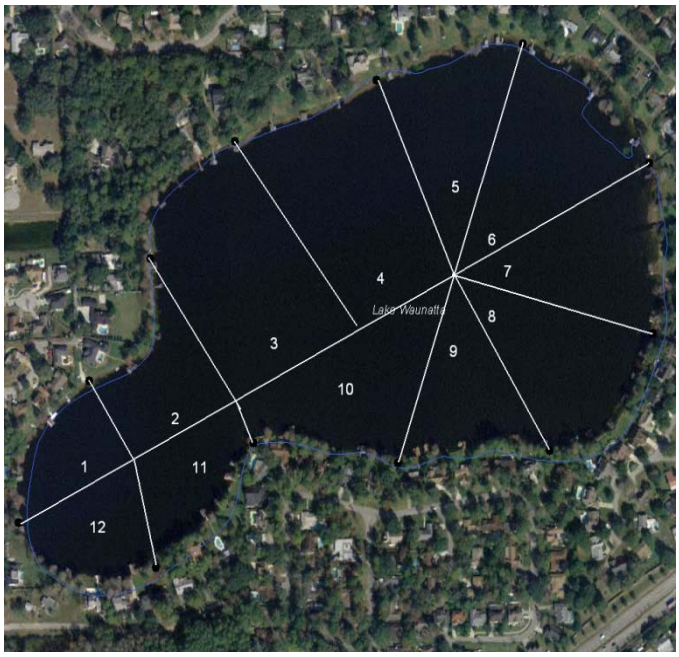


Figure 1. Sampling map of Lake Waunatta Sections 9,12,3 and 6 were sampled for the Lake Vegetation Index. The water quality sample was collected from the lake center.

Results

Water Quality

Chlorophyll *a* measured in Lake Waunatta (33 µg/L) during the October 4, 2010 sampling event exceeded the federally promulgated criterion of 20 µg/L (Table 1). This elevated chlorophyll was associated with decreased water clarity (a Secchi depth of 2.6 ft) compared to a previously measured Secchi value of 5 ft (on October 16, 2008) when chlorophyll was 15 µg/L. Note that the total phosphorus and total nitrogen concentrations during the 2010 sampling event complied with but were close to the federally promulgated nutrient criteria for lakes.

Table 1. Water quality results from October 4, 2010 at Lake Waunatta.

Analyte	Result	Remark	Applicable Class III Water Quality Criteria
Field Temperature (°C)	27.4		
Field pH (SU)	7.7		
Field Dissolved Oxygen (mg/L)	8.57	J	≥ 5
Field Specific Conductance (µmhos/cm)	146		Not to exceed 50% of background or 1275
Color (PCU)	20		
Turbidity (NTU)	4.1		
BOD_5 (mg/L)	2.7		Shall not produce nuisance conditions
Chlorophyll a (µg/L)	33		*≤ 20
Total Phosphorus (mg/L)	0.026		*≤ 0.03
Nitrate+Nitrite (mg/L)	0.005		
Ammonia (mg/L)	<.010		
Total Kejldahl Nitrogen (mg/L)	0.94		
Total Nitrogen (mg/L)	0.95		*≤ 1.05

*Federally promulgated numeric nutrient criteria for Florida lakes will take effect in March 2012. Alkalinity sampling by Orange County indicates that the criterion of 20 µg/L for chlorophyll *a* is appropriate for Lake Waunatta.

J – Estimated Value - The field calibration verification did not meet calibration acceptance

Phytoplankton

The algal community in the water column consisted of 70% cyanobacteria (blue-green algae), 13% green algae, and 12% 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. The large proportion of cyanobacteria in the 2010 sampling suggests an imbalance in aquatic flora.

Table 2. Species list for the October 4, 2010, LVI at Lake Waunatta. An asterisk (*) indicates an invasive exotic plant species. P = present, D = dominant, C = codominant.

Lake Waunatta October 4, 2010						
Species	Common Name	Sections:	9	12	3	6
Acer rubrum	RED MAPLE		P		P	P
Alternanthera philoxeroides *	ALLIGATOR WEED		P			
Andropogon glomeratus	BUSHY BLUESTEM					P
Cephalanthus occidentalis	COMMON BUTTONBUSH			P	P	P
Cladium jamaicense	JAMAICA SWAMP SAWGRASS			P		P
Colocasia esculenta *	TARO; WILD TARO; COCO YAM		P	P	P	
Cyperus alternifolius *	UMBRELLA SEDGE			P	P	
Cyperus papyrus *	PAPYRUS FLATSEDGE			P		
Cyperus polystachyos	MANYSPIKE FLATSSEDGE					P
Eupatorium capillifolium	DOGFENNEL				P	P
Hydrocotyle	MARSHPENNYWORT				P	P
Ilex cassine	DAHOON				P	
Ludwigia leptocarpa	ANGLESTEM PRIMROSEWILLOW				P	P
Ludwigia peruviana *	PERUVIAN PRIMROSEWILLOW		P	P	P	P
Lycopus rubellus	TAPERLEAF WATERHOREHOUND			P		
Magnolia virginiana	SWEETBAY				P	
Mikania scandens	CLIMBING HEMPVINE		P	P		P
Myrica cerifera	SOUTHERN BAYBERRY; WAX MYRTLE		P	P	P	
Myriophyllum	WATER MILFOIL					P
Nuphar	COW LILY		P	P	P	P
Nymphaea odorata	AMERICAN WHITE WATERLILY			P	P	P
Nymphoides aquatica	BIG FLOATINGHEART					P
Panicum hemitomon	MAIDENCANE		P			
Panicum repens *	TORPEDO GRASS		P	P	P	P
Pontederia cordata	PICKERELWEED		P	P	P	P
Sagittaria lancifolia	BULLTONGUE ARROWHEAD		P	P	P	P
Sapium sebiferum *	CHINESE TALLOW			P		P
Schinus terebinthifolius *	BRAZILIAN PEPPER		P			P
Schoenoplectus californicus	GIANT BULLRUSH			P		
Schoenoplectus tabernaemontan	BULLRUSH					P
Taxodium	CYPRESS TREE		P	P	P	P
Thalia geniculata	ALLIGATORFLAG; FIREFLAG					P
Thelypteris hispidula	HAIRY MAIDEN FERN			P		
Typha	CATTAIL		P			P
Urochloa mutica *	PARA GRASS		P	P		P
Vallisneria americana	TAPEGRASS; AMERICAN EELGRASS		D	D	D	D
Vitis	GRAPE VINE				P	
Wedelia trilobata *	CREEPING OX EYE		P	P	P	

Lake Vegetation Index

The LVI score for this lake was 45 out of a possible 100 points, corresponding with the lower range of the currently established "healthy" designation. However, this value is less than a DEP- proposed revised impairment threshold, in which scores below 46 are considered impaired. Table 2 contains the species list and occurrence information for this sampling event. Although *Vallisneria*, a beneficial submersed species, was the dominant plant in each section, coverage is less than in previous observations. The common occurrence of invasive exotic plants (ten in total) reduced the LVI score. A previous LVI conducted in 2008 yielded a score of 54, only slightly higher than the 2010 result. The Lake Waunatta vegetation community would be improved by reducing the abundance of these invasive exotic plants. *Hydrilla*, though not observed in this sample event, has had a significant role in changing the lakes submersed vegetation community. Lake wide chemical treatment for *Hydrilla*, in addition to grass carp, and decreased light penetration has reduced the coverage of *Vallisneria* from previous observations and may be contributing to the increase in chlorophyll *a*

Summary

Lake Waunatta, like many other urban lakes has been disturbed by several factors. Chlorophyll *a* has increased over time, a condition which may create unfavorable conditions for aesthetics, recreation and healthy biological function. The aggressive management of *Hydrilla* likely created conditions in which algae became the principle consumer of Lake Waunatta's nutrients. Physical alterations to shorelines also influenced the current condition of Lake Waunatta. As beaches are cleared or enhanced, the buffering and soil stabilization benefits of the littoral zone are reduced. Through wave action, unprotected shoreline may be eroded, leading to increased turbidity and decreased light penetration, potentially harming submersed, beneficial aquatic vegetation such as *Vallisneria*. Lake Waunatta would benefit from a management plan focused on reducing nutrients from its watershed, promotion of native submersed and littoral vegetation, 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

David Scharr, (407) 894-7555,
david.scharr@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://www.myfwc.com/WILDLIFEHABITATS/InvasivePlants_AquaticPlantManagement.htm
Freshwater Algal Bloom information:
http://www.dep.state.fl.us/labs/biology/hab/index.htm